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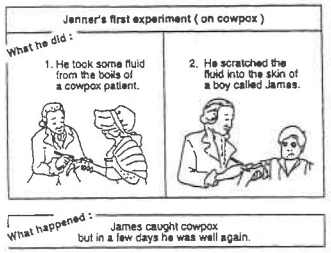
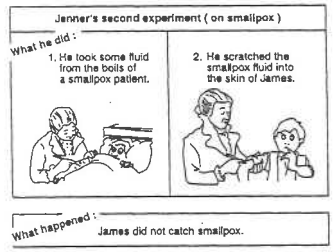
Past HKCEE Questions
Body Defence
Paper I

1. About 200 years ago, many people died of an infectious disease called smallpox. If a patient suffers from smallpox, a lot of small boils will appear on the skin. A British doctor, Edward Jenner, noticed that milkmaids often caught a similar but mild disease called cowpox. However, they never seemed to catch smallpox.
The following diagrams show two consecutive experiments performed by Jenner:





i. With reference to the first experiment, explain why James caught cowpox and in a few days he was well again. (4 marks)

ii. With reference to the second experiment, explain why James did not catch smallpox. (4 marks)

iii. At the end of the second experiment, would James become immune to other infectious disease? Why? (2 marks)
(HKCEE 1995)

2. Hepatitis B is a disease of the liver caused by a virus. Three members of a family, P, Q and R, took a blood test to find out if they are immune to this disease. The results of the blood test are shown in the table below:

	P	Q	R
Hepatitis B antigen in the blood	absent	absent	present
Level of antibody against hepatitis B in the blood (unit per dm^3)	0	297	0

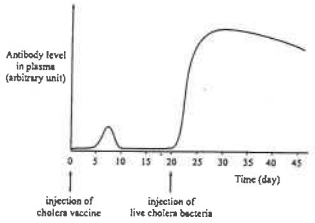
i.
(1) P was advised to have a hepatitis B vaccination. Explain how P could become immune against the disease after vaccination. (4 marks)

(2) Would this vaccination allow P to become immune to other types of hepatitis? Why? (2 marks)

ii. Both Q and R have not received any hepatitis B vaccination before. Suggest a reason to explain the difference in their blood test results. (2 marks)

iii. Hepatitis B is transmitted through contact with the body fluid of an infected person. Apart from vaccination, suggest two measures that can prevent the transmission of this disease. (2 marks)
(HKCEE 1998)

3. Cholera is a human disease caused by a type of bacteria. It is transmitted through contaminated water and food. A vaccine against this disease is made up of killed cholera bacteria. To study the effectiveness of the vaccine, a mouse was first injected with the vaccine and then with live cholera bacteria 20 days later. During the study, the mouse showed no sign of cholera. The changes in the antibody level in the plasma of the mouse are shown in the graph below:



(i) Explain the rise in the antibody level between day 5 and day 7. (2 marks)

(ii) State two differences between the patterns of

(iii) People may be infected with cholera through eating contaminated seafood. Besides vaccination, suggest *two* ways to reduce the risk of cholera infection through eating seafood. (2 marks)
(HKCEE 2003)

Past HKCEE Questions
Body Defence
Paper II

90-37.
The following table shows the results of a test to match the blood groups of three persons P, Q and R for blood transfusion:

		Donor		
		P	Q	R
Recipient	P		X	√
	Q	√		√
	R	X	X	

Key : √ = blood can be transfused without ill-effect
X = blood cannot be transfused

The blood groups of Q and R must be

	Q	R
A.	AB	O
B.	O	AB
C.	A	B
D.	O	A

91-28.
Which of the following blood transfusions causes harm to the recipient?

	Donor's blood group	Recipient's blood group
A.	A	AB
B.	AB	B
C.	O	AB
D.	O	A

92-35.
Two samples of human blood were mixed. Observation under the microscope showed no clumping of blood cell. Which of the following is the best conclusion?

A. The samples were of blood group O.
B. The samples were of blood group AB.
C. Tire simples were of the same blood group.
D. The samples were of different blood groups.

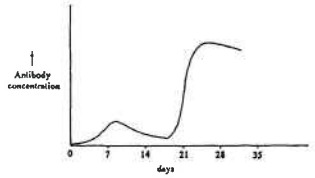
93-28.
Dianna belongs to blond group A and her brother John belongs to blood group B. Their father can receive a blood donation from John only and their mother can donate blood to Dianna only. To which blood groups do their parents belong?

	Father	Mother
A.	B	A
B.	A	O
C.	AB	B
D.	O	AB

94-13.
Cindy can only receive blood of group B and group O in a blood transfusion. Her blood group is

A. A.
B. B.
C. AB.
D. O.

94.
Directions: Questions 48 and 49 refer to the graph below which shows the changes; in the concentration of antibodies in the blood of a person with time:



94-48.
The increase in the antibody concentration on day 7 might be caused by

A. excessive bleeding.
B. the entry of bacteria.
C. recovery from a disease.
D. the intake of a large amount of antibiotics.

94-49.
The antibody concentration increased rapidly on day 21 because the person

A. developed a fever.
B. received a vaccination.
C. was infected by the same type of antigen:
D. produced a large number of phagocytes,

96-30.
The table below summarizes the compatibility for blood transfusion among three persons

		Recipient		
		Mary	John	David
Donor	Mary		X	✓
	John	X		✓
	David	X	X	

Key : ✓ = blood can be transfused with no ill effects
X = blood should not be transfused

If the blood group of Mary is A, what are the blood groups of the others?

	John	David
A.	O	A
B.	O	AB
C.	B	A
D.	B	AB

97-32.
Which of the following components of the blood can destroy bacteria that have entered the body?

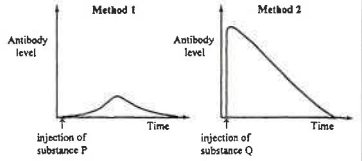
(1) antibodies
(2) phagocytes
(3) blood platelets

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1). (2) and (3)

99-40
Which of the following statements about antibodies is ***incorrect***?
A. They are proteins.
B. They can kill bacteria.
C. They are specific in action.
D. They have a memory of the bacteria.

99-46
Which of the following are examples of artificial immunity?
(1) injection of vaccine into the body
(2)injection of antibodies into the body
(3) injection of antibiotics into the body
A. (1) only
B. (1) and (2) only
C. (2) and (3) only
D. (1), (2) and (3)

00.
Directions: Questions 49 and 50 refer to the graphs below, which show the changes in the antibody level in the blood as a result of two methods of inducing immunity in humans:



00-49
Substance P can be
(1) bacteria.
(2) antigens.
(3) antibodies.
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

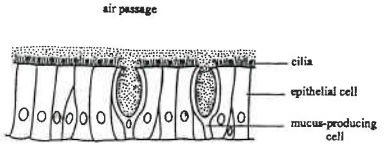
00-50
What is the advantage of method 2 over method 1 in inducing immunity?
A. The immunity can last longer.
B. The immunity can develop faster.
C. It can stimulate the white blood cells to produce more antibodies.
D. The body can become immune against a wider range of diseases.

01-18
Which of the following statements about antibodies is correct?
A. They act on specific antigens.
B. They are produced by phagocytes.
C. They can develop a memory for antigens.

01-57
A person's blood takes a long time to clot. This may be due to a diet lacking in
A. iron.
B. calcium.
C. vitamin A.
D. vitamin C.

01-60
Which of the following structures produce secretions that can protect the body from infection?
(1) skin .
(2) stomach
(3) trachea
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

02.
Directions: Questions 26 and 27 refer to the diagram below, which shows a section of the inner lining of the human respiratory tract



02-26
This section is most probably taken from
A. the nostril.
B. the pharynx.
C. the bronchus.
D. the air sac.

02-27
What features of the inner lining help in protecting the body against bacterial infection?
(1) beating of cilia
(2) presence of mucus
(3) close packing of the epithelial cells
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

02-41
The table below shows the compatibility for blood transfusion of two persons:

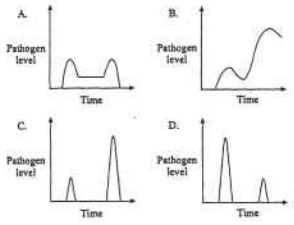
		Blood group of donor	
		A	B
Recipient	Peter	×	×
	Mary	✓	✓

Key: ✓ = blood can be transfused with no ill effects
× = blood should not be transfused

Which of the following combinations correctly shows the compatibility for blood transfusion between Peter and Mary?

	Peter donating blood to Mary	Mary donating blood to Peter
A.	✓	✓
B.	X	X
C.	✓	X
D.	X	✓

02-42
A person was infected by the same kind of pathogen twice within a month.
Assuming the quantity of pathogen for both infections was the same, which of the following graphs correctly shows the change in the pathogen level in the person's blood?



04-56
Which of the following statements about antibodies is correct?
A. Injection of antibodies can provide immunity against certain infectious diseases.
B. Antibodies against a particular antigen can act on a wide range of pathogens.
C. Antibodies can develop a memory for pathogens.
D. Antibodies can be reused.

05-12
Mary, of blood group A, and her husband, of blood group 0, have two children. Both children are found to have blood group A. Mary concludes that she must be homozygous for blood group A. Given that blood group A is dominant to blood group 0, is Mary's conclusion correct?
A. Yes, because each of Mary's children has inherited at least one allele for blood group A from her.
B. Yes, because if Mary is heterozygous, one child should be of blood group A and the other should be of group O.
C. No, because both children can be of blood group A even if Mary is heterozygous.
D. No, because there are other blood groups besides blood groups A and O.

06-12
Which of the following acts as a chemical barrier for preventing the entry of pathogens into the body?
A. bile released from the gall bladder
B. saliva secreted from the salivary glands
C. blood clot formed on the wounds of the skin
D. mucus secreted from the epithelial cells of the trachea

06-53
When there is a cut on the skin, the area around the wound will become red and swollen. The wounded area
A. gets red because the capillaries under the skin undergo vasodilation.
B. swells because phagocytes produce antibodies.
C. swells because tissue fluid accumulates.
D. gets red because the body temperature increases.

07-25
Which of the following diseases can be transmitted by mosquitoes?
(1) Avian flu (禽流感)
(2) Dengue fever(登革熱)
(3) Japanese encephalitis(日本腦炎)
A. (1) and (2) only
B. (1) and **(3) only**
C. (2) and (3) only
D. (1), (2) and (3)

07
Directions: Questions 56 and 57 refer to the table below, which shows the results of a blood test of three individuals. None of them have received any vaccinations related to hepatitis A before.

	Level of hepatitis A antigen in blood (arbitrary unit)	Level of antibody against hepatitis A antigen in blood (arbitrary unit)
X	0	0
Y	0	297
Z	500	351

07-56
Which individuals have contracted hepatitis A?
A. X and Y only
B. X and Z only
C. Y and Z only
D. X, Y and Z

07-57
Vaccination can confer protective effect to individual(s)
A. X only.
B. Z only.
C. X and Y only.
D. Y and Z only.

Past HKCEE Questions
Body Defence
Suggested Answer

Paper I

1. (i) The fluid in the boils contains the cowpox virus / pathogen / germ which cannot be killed by the body on its first exposure to the pathogen 1
The virus multiplies / damages body cells, so James became ill. 1
After a few days s sufficient antibodies / phagocytes (white blood cells) are produced to kill the pathogen , so James got well again. 1
Communication Skill (c) 1

(ii) The previous exposure to the cowpox antigen was 'memorized' by certain white blood cells 1
The pathogens / antigens of smallpox and cowpox are similar 1
It can stimulate the production of a lot of antibodies / phagocytes in a short time and kill the smallpox virus. 1

(iii) No 1
Because his immunity is specific to the antigen /pathogen 1
OR
because antibodies are specific in action

2. (i) (1) The vaccine contains the hepatitis B antigen 1
which stimulates certain white blood cells 1
to develop a memory for the antigen. 1
If P is exposed to the hepatitis B virus, large amount of specific antibodies will be produced in a short time so as to destroy the virus 1
Communication Skill (c) 1
(2) No 1
because the memory developed in the white blood cells is specific to the hepatitis B virus only 1

(ii) Both Q and R contacted the hepatitis B virus before 1
but only Q can form antibodies to destroy the virus while R cannot/has not yet produced antibodies 1

(iii) Wear gloves when handling wounds
Do not share toothbrush / nail cutter / razor etc. 1
Use condom during sexual intercourse +
Screen the blood used in blood transfusion 1
(any 2)

3. (i) The antigen in the cholera vaccine 1
stimulates specific white blood cells 1
to produce antibody, resulting in the rise in antibody level.

(ii) (Any 2 points below:) 2
- For the second injection, the rise in antibody level occurs earlier,
- the rise in antibody level is faster,
- and the peak of the antibody level is higher.

This is because as a result of the first injection, certain white blood cells will develop a memory for the antigen. 1
When the same antigen enters the body in the second injection, the white blood cells will produce a large amount of antibodies 1
within a short time. 1

(iii) Cook the seafood thoroughly. 1
Irradiate seawater used in fish tanks with UV light. 1
(or other reasonable answers)

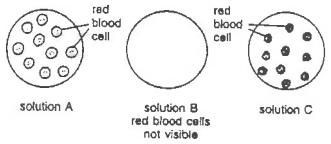
Paper II

90-37	A
91-28	B
92-35	C
93-28	A
94-13	B
94-48	B
94-49	C
96-30	D
97-32	A
99-40	D
99-46	DELETED
00-49	C
00-50	B
01-18	A
01-57	DELETED
01-60	D

02-26	C
02-27	D
02-41	C
02-42	D
04-56	A
05-12	C
06-12	B
07-25	C
07-56	C
07-57	A

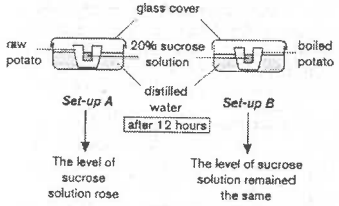
Past HKCEE Questions
Cell Activities
Paper I

1. A sample of human blood was dropped onto 3 clean slides, each containing a salt solution.



(i) Explain why the red blood cells are not visible in solution B.
(ii) Which salt solution has a concentration similar to that of human plasma? Explain your answer.
(iii) Briefly describe the part played by the kidneys in regulating the salt concentration of the plasma in order to avoid shrinkage of the red blood cells.
(iv) A plant cell, whose cell-sap concentration is similar to the concentration of the contents of human red blood cells, is placed in solution B.
Describe and explain its appearance after half an hour. (11 marks)
(HKCEE 1982)

2. In order to study the conditions for osmosis, a student prepared two set-ups as shown in the diagrams below. The skin of each potato was removed and a cavity was made for holding the sucrose solution.



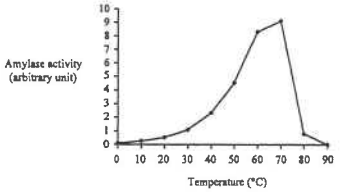
(i) Explain why the level of sucrose solution of set-up A rose after 12 hours. (3 marks)
(ii) What can you conclude from the results of the two set-ups? (2 marks)
(iii) Referring to set-up A, draw a labeled diagram to show the possible appearance of a complete potato cell which is in contact with
(1) the sucrose solution,
(2) the distilled water. (4 marks)
(iv) At the end of the experiment, sucrose was found in the distilled water in set-up B. Explain why this occurred. (2 marks)

3. Jelly contains a kind of protein called gelatin, which causes the jelly solution to solidify after cooling. In order to prepare some jelly for a party, Mary dissolved the jelly powder in different ways as shown in the table below:

Jelly solution	Method of preparation
A	Jelly powder dissolved in water at 40°C
B	Jelly powder dissolved in water at 40°C + fresh pineapple juice
C	Jelly powder dissolved in water at 80°C + fresh pineapple juice

(i) Solution A solidified after cooling while solution B did not. Suggest why solution B failed to solidify. (2 marks)
(ii) Solution C was found to solidify after cooling. How would you explain the difference in the results between solutions B and C? (3 marks)
(iii) It is found that if beef is mixed with small pieces of fresh pineapple and left to stand for about half an hour before cooking, the meat will become tender (less tough). Based on the answer to (ii), explain why this treatment can tenderize the beef. (3 marks)
(HKCEE 1999)

4. In the production of beer, the raw material used is barley grains, which contain a large amount of starch. When barley grains germinate, amylase is produced. The grains are then crushed and mixed with warm water. After several hours, yeast is added to the mixture for fermentation.
(i) What is the action of amylase on the starch in the barley grains? (1 mark)
(ii) After the crushed grains are mixed with warm water, why is it necessary to wait for several hours before adding the yeast? (1 mark)
An investigation was carried out to study the effect of temperature on the activity of barley amylase. For each temperature, the same amount of crushed grains and water were used. The amylase activity was estimated by the rate of disappearance of starch using the iodine test. The results obtained are shown in the graph below:



(iii) What conclusions can be drawn from the graph about the effect of temperature on amylase activity? (3 marks)
(iv) If you want to store the mixture of crushed grains and water with minimal reaction so that it can be used several days later, what temperature would you choose? Why? (3 marks)
(v) Suggest another method to estimate the amylase activity for this investigation. (2 marks)
(HKCEE 2000)

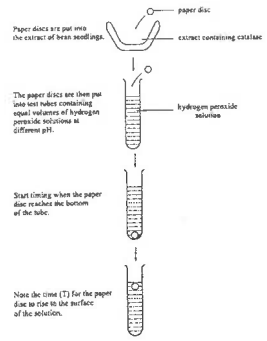
5. A kind of Chinese dessert is made by mixing milk with ginger juice so that the milk becomes coagulated. The coagulation of milk is due to the conversion of a soluble milk protein into an insoluble form. To find out the conditions for milk coagulation, a person mixed milk at different temperatures with some fresh ginger juice. The mixtures were observed for 15 minutes to see if coagulation would occur. The results are shown in the table below:

Temperature of milk (°C)	Result
20	No sign of coagulation after 15 minutes
40	Fully coagulated in 14 minutes
60	Fully coagulated in 1 minute
80	Fully coagulated in 1 minute
100	No sign of coagulation after 15 minutes

Note : The same study was repeated using boiled ginger juice and the milk did not coagulate at any temperature.

(i) Referring to the above results, describe the effect of milk temperature on the rate of milk coagulation by ginger juice. (3 marks)
(ii) How would you explain the action of fresh ginger juice in bringing about the coagulation of milk? Give evidence to support your answer. (2 marks)
(iii) Milk protein also coagulates at low pH. In which part of the alimentary canal does this coagulation occur? Based on your biological knowledge, suggest why the coagulation of milk protein can facilitate its digestion in that part of the alimentary canal. (3 marks)
(HKCEE 2002)

6. The following shows the procedure of an experiment to study the effect of pH on the activity of catalase extracted from bean seedlings:



The results of the experiment are shown below:

pH of hydrogen peroxide solution	T (s)
3	>100
5	50
7	20
9	20
11	27

(i) Explain why the paper discs rose to the surface of the solution in some of the tubes. (2 marks)

(ii)
(1) Work out the rate of reaction from the value of T for each tube. Tabulate your answer. (2 marks)
(2) Using the data obtained in (1), plot a graph on graph paper to show the effect of pH on catalase activity. (3 marks)

(iii)
(1) Based on your graph, estimate the optimum pH of catalase. (1 mark)
(2)In order to get a more accurate estimate of the optimum pH, what further work would you carry out in this experiment? (1mark)

(iv)A sample of bean extract was refrigerated at 4°C and then allowed to warm to room temperature. If the experiment was repeated using this sample, would the catalase activity be different from that of the previous experiment? Explain your answer. (2 marks)
(HKCEE 2003)

7. One day, when Keith and Jane walked past a fresh fruit juice shop, Keith noticed that some pears were cut into pieces and stored in a tank of water before use.
(a) Keith thought that the shopkeeper stored the cut pears in water in order to extract more juice. Explain the

biological principle behind Keith's idea. (3 marks)

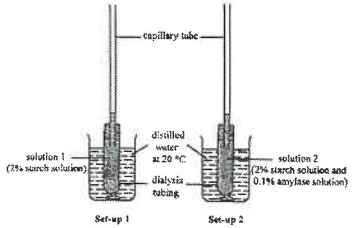
(b) Jane disagreed with Keith because she found that the shopkeeper also stored whole pears in water tanks. Explain why this observation provides Jane with evidence to oppose Keith's idea. (2 marks)

(c) Suggest one possible hygienic problem of storing the cut pears in water tank. (1 mark)

(HKCEE 2007)

Past HKCEE Questions
Cell Activities
Paper II

99.
Directions: Questions 8 and 9 refer to the diagram below, which shows the initial condition of two set-ups:

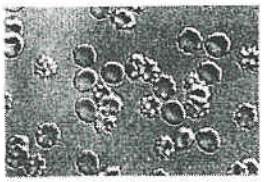


99-8
After 1 hour, the liquid level in the capillary tube of set-up 2 is much higher than that of set-up 1. Which of the following is a probable reason for this result?
A. Solution 1 has a lower water potential than solution 2.
B. The dialysis tubing of set-up 1 is less permeable to water than that of set-up 2.
C. Sugar is produced in solution 2.
D. Less starch is present in solution 2.

99-9
Which of the following treatments might increase the rate of rise of the liquid level in set-up 2?
(1) using a narrower dialysis tubing
(2) using a capillary tube with a smaller internal diameter
(3) raising the temperature of the distilled water from 20°C to 30°C
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

01-4.
Which of the following statements about enzymes is correct?
A. Enzymes are made up of proteins or fats.
B. Enzymes are denatured at 0°C,
C: The optimum temperature of most enzymatic activities is 37°C.
D. The activity of most enzymes is lower than 80°C.

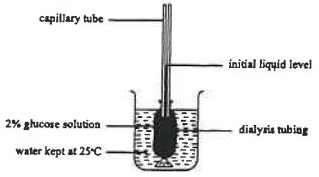
02-35
Which of the following can account for the appearance of the red blood cells shown in the photomicrograph below?



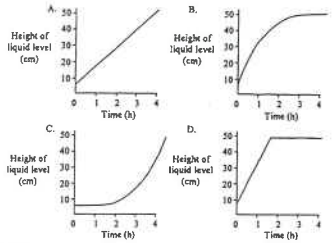
A. The red blood cells are undergoing mitosis.
B. The red blood cells are in the deoxygenated state.
C. The red blood cells are bathed in a concentrated sugar solution.
D. The cell membrane of the red blood cells becomes greatly folded to increase the surface area for oxygen uptake.

04-03
A student defines osmosis as 'the movement of water molecules from a dilute solution to a concentrated solution across a selectively permeable membrane'. This definition is inaccurate because
A. solute molecules can also move along the concentration gradient.
B. water molecules can also move from the concentrated solution to the dilute solution.
C. it should state clearly that the membrane is not permeable to the solute molecules.
D. movement of water molecules can still occur without a selectively permeable membrane.

Directions: Questions 15 and 16 refer to the diagram below, which shows a setup used by Eric to study osmosis:



04-15
If Eric carries out the investigation for four hours, what would be the change in the liquid level in the capillary tube with time?

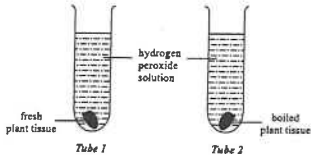


04-16
Which of the following can increase the rate of rise of the liquid level in the capillary tube?

(1) Raise the water temperature to 30°C.
(2) Use a larger beaker with more water inside.
(3) Use a capillary tube with a smaller internal diameter.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

Directions: Questions 59 and 60 refer to an investigation on the enzyme catalase, which breaks down hydrogen peroxide and releases oxygen. In order to show whether a certain plant tissue contains catalase or not, Joyce set up the following experiment:



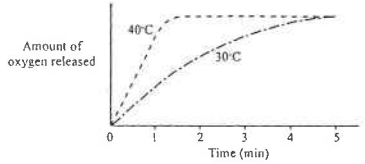
04-59
Joyce observed that a lot of gas bubbles were released in tube I but not in tube 2. In order to conclude that the plant tissue contains catalase, what ***additional*** steps should be taken by Joyce?

(1) Test whether the gas bubbles contain oxygen.
(2) Set up a tube containing water and the fresh plant tissue.
(3) Set up a tube containing hydrogen peroxide but no plant tissue.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

04-60
When gas bubbles stopped coming out from tube 1, Joyce added more hydrogen peroxide into the tube. She observed that gas bubbles were produced again. What can be implied from this observation about the property of enzymes?
A. Enzymes can be reused.
B. Enzymes are specific in action.
C. Enzymes are made up of proteins.
D. Enzymes can speed up chemical reactions.

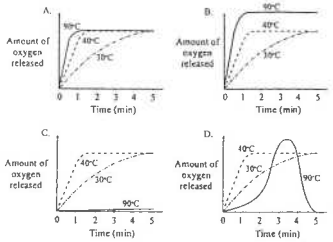
Directions: Questions l to 3 refer to the following experiments:
Two test tubes containing 5 cm^3 of hydrogen peroxide solution and 1 cm^3 of catalase solution respectively were kept at 30°C for 30 minutes. The content of the two tubes were then mixed and maintained at the same temperature, and the amount of oxygen released was recorded for 5 minutes. The same experiment was repeated at 40°C. The results are shown in the graph below:



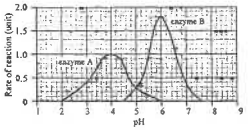
05-1
The initial rate of oxygen production at 40°C is higher than that at 30°C because
A. catalase is denatured at the lower temperature.
B. oxygen is less soluble at the higher temperature.
C. more active sites are present in the enzyme molecules at the higher temperature.
D. the substrate molecules have more kinetic energy at the higher temperature.

05-2
Which of the following is a correct interpretation of the graph?
A. At 30°C, the rate of reaction was highest at the 5th minute.
B. At both temperatures, the amount of oxygen released in 5 minutes was the same.
C. At both temperatures, the time for the decomposition of all hydrogen peroxide was the same.
D. All active sites of the enzymes were occupied at the end of the experiment.

05-3
Which of the follow graphs is correct?



06.
Directions: Questions 23 to 25 refer to the graph below, which shows the rates of reactions catalysed by two enzymes A and B over a range of pH values:

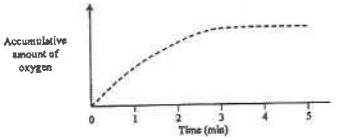


06-23
The rates of the reactions catalysed by enzymes A and B are equal at
A. pH 4.
B. pH 5.
C. pH 6.
D. pH 7.5.

06-24
Which of the following is a correct interpretation of the graph?
A. Enzyme A is found in gastric juice.
B. Enzyme B is more active than enzyme A.
C. The optimum pH value for enzyme B is 1.8.
D. Enzyme A is more active than enzyme B at pH 4.

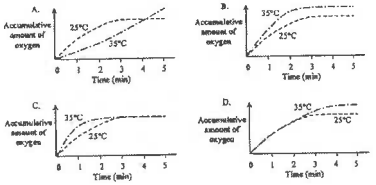
06-25
In the above study, it is important to keep the temperature at which the reactions occur constant because
A. temperature affects enzyme activity.
B. the enzyme becomes inactive at low temperatures.
C. the enzyme becomes denatured at low temperatures.
D. temperature should be the same for control experiments.

07
Directions: Questions 7 and 8 refer to the following experiment: Two boiling tubes containing 5 cm^3 of hydrogen peroxide solution and 1 cm^3 of catalase solution respectively were kept at 25°C for 10 minutes. The contents of the two tubes were then mixed and maintained at the same temperature, and the amount of oxygen released was recorded for 5 minutes. The results are shown in the graph below:



07-07
The line levels off at the 3rd minute. Which of the following is a correct explanation for this?
A. The reaction stops at the 3rd minute because catalase has been used up.
B. The reaction stops at the 3rd minute because hydrogen peroxide has been used up.
C. The reaction rate reaches the maximum at t he 3rd minute because the amount of oxygen released is highest.
D. The reaction rate reaches the maximum at the 3rd minute because there is no more increase in the amount of oxygen released.

07-08
The same experiment was repeated but the contents were kept at 35°C. Which of the following would best indicate the results of this experiment?

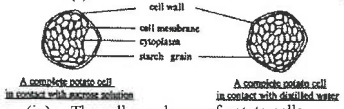


Past HKCEE Questions
Cell Activities
Suggested Answers

Paper I

1. (i) All RBC bursted 1
because water enters by osmosis / as solution B is hypotonic 1
(ii) Solution A 1
No change in shape of RBC 1
Water gain = water loss (*NOT* isotonic) 1
(iii) Increased reabsorption of water from kidney tubules 1
excrete excess salt / decrease reabsorption of salt 1
(iv) becomes turgid 1
because water enters 1
cellulose cell wall can resist the water pressure / prevent bursting 1

2. (i) As the water potential of the sucrose solution is lower than that of the distilled water, 1
water passes through the potato into the sucrose solution, 1
causing the level to rise. 1
Effective communication (C) 1
(ii) Osmosis occurs when two solutions of different concentrations are separated by living tissue 1
Which serves as a selectively permeable membrane 1
(iii) Large, clear drawing with smooth lines (D) 1
*Labels (any three 0.5 x 3): cell wall, cell membrane, cytoplasm (optional: starch grains, nucleus, vacuole) 1.5
Title 0.5
Signs of plasmolysis and turgidity (s) 1



(iv) The cell membrane of potato cells became freely permeable / was destroyed after boiling 1
So sucrose can diffuse out to the distilled water 1

3. (i) Gelatin in jelly solution B was digested / disappeared / lost its effect 1
due to the presence of fresh pineapple juice 1
(ii) Gelatin was present in solution C, but not in solution B 1
This suggests that the pineapple juice contains protease / enzyme that digests protein or gelatin 1
The enzyme is denatured / activated at high temperature 1
Effective communication (c) 1
(accept alternative answers suggesting that pineapple juice contains a heat-sensitive substance that acts on gelatin)
(iii) Beef contains protein 1
which is digested by the protease in the pineapple juice 1
Allowing the beef and pineapple mixture to stand for half an hour will give enough time for the enzyme to work 1

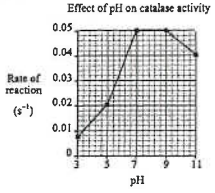
4. (i) The amylase converts starch into maltose 1
(ii) To ensure that sufficient amount of maltose is produced 1
(iii) When the temperature increases from 0-70°C, the amylase activity increases 1
When the temperatures increases from 70-90°C, the amylase activity decreases. 1
The optimum temperature for the activity of barley amylase is 70°C 1
(iv) Keep the mixture at very low temperature (below 10°C) 1
The amylase is inactive at this temperature 1
but it is not denatured / destroyed 1
(v) After incubating the mixture at a given temperature for a fixed period of time, perform the Benedict's test 1
Measure the amount of red precipitate / reducing sugar formed 1

5. (i) From 20°C to 60°C, the rate of coagulation of milk by ginger juice increases with increasing temperature From 80°C to 100°C, the rate of coagulation decreases as temperature increases 1
The rate of coagulation is highest at 60°C – 80°C / is very low at 20°C and 100°C 1
Deduct 1 mark if answer with time of coagulation, instead of rate of coagulation.
Effective communication (C) 1
(ii) Fresh ginger juice contains an enzyme / a heat-sensitive substance that converts soluble milk protein into the insoluble form 1
as the coagulating effect of fresh ginger juice is lost upon boiling / decreases when the temperature of milk increases beyond 80°C 1
(iii) In the stomach 1
Coagulated milk protein, being in semi-solid form, can be retained in the stomach for a longer period of time 1
for the protease to digest it 1

6. (i) The catalase in the paper disc broke down hydrogen peroxide, releasing oxygen. 1
When the amount of oxygen evolved reached a certain level, the oxygen bubbles buoyed up the disc to the surface of the hydrogen peroxide solution. 1
(ii) (1)

pH	Rate of reaction (s^{-1})
3	<0.01
5	0.02
7	0.05
9	0.05
11	0.04

2
(2)



3
(iii) (1) any value between 7 and 9 (or any value read from the graph drawn) 1
(2) Repeat the experiment using hydrogen peroxide solutions with smaller pH intervals between 7 and 9. 1
(iv) The catalase activity would be similar to that of the previous investigation 1
because catalase is not denatured at 4°C and it can become active again at room temperature. 1

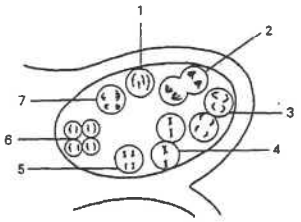
7. (a) The water outside has a higher water potential than the cells of pears 1
water moves into the cells 1
increasing the volume of the cell content / water content of the cell 1
As a result, more fruit juice can be extracted
(b) The skin of the fruit acts as a barrier to water 1
Little / no water movement will occur 1
(c) The water / pear may be contaminated with pathogens / lead to food poisoning 1

Paper II

99-8	C
99-9	C
01-4	D
02-35	C
04-03	B
04-15	B
04-16	B
04-59	A
04-60	A
05-1	D
05-2	B
05-3	C
06-23	B
06-24	D
06-25	A
07-07	B
07-08	C

Past HKCEE Questions
Cell Division
Paper I

1. The diagram below shows stages of cell division in part of a transverse section of an anther. (The parts are not drawn to scale.)



(i) Using the numbers marked on the diagram, list the stages of cell division in their correct order.

(ii) Name this type of cell division and state one other region in a plant where you can find the same type of cell division.

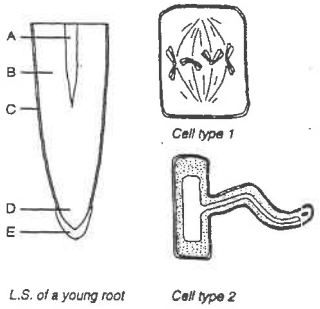
(iii) Name the daughter cells produced by the cell division shown in the diagram.

(iv) What is the importance of this type of cell division in the life history of a flowering plant?

(v) Name two structures where this type of cell division is found in a mammal.

(HKCEE 1981)

2 The diagrams below show the longitudinal section of a young root and two types of cells taken from it:



(i) Using letters in the diagram, state the region where the following can be found:
(1) cell type 1
(2) cell type 2 (2 marks)

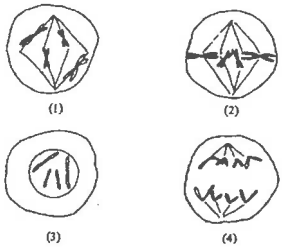
(ii) (1) Name the process occurring in cell type 1 as shown in the diagram. (1 mark)
(2) What is the significance of this process in the root? (2 marks)

(iii) Explain how cell type 2 is structurally adapted to its function. (3 marks)

(HKCEE 1995)

Past HKCEE Questions
Cell Division
Paper II

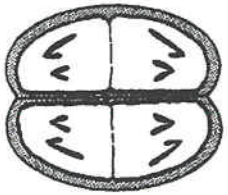
90 -2.
The following diagrams show four different stages during a cell division:



The correct sequence of the stages is

A. (1), (2), (3), (4)
B. (2), (4), (1), (3)
C. (3), (1), (2), (4)
D. (4), (2), (1), (3)

91-7.
The diagram below shows a single cell undergoing cell division:



This type of cell division can be found

A. in the mother.
B. in the testis.
C. at the root tip.
D. in the bone marrow.

91-8.
Which of the following statements concerning cell divisions are correct?

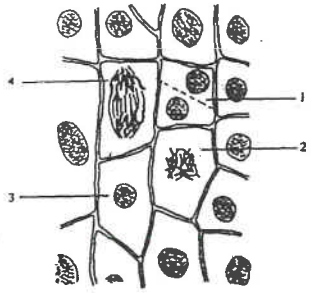
(1) Two daughter cells are formed in mitosis.
(2) Chromosomes replicate once in mitosis and twice in meiosis.
(3) The daughter cells formed in meiosis have the same number of chromosomes.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

92-39.
If the diploid chromosome number of a flowering plant is 24, which of the following structures has 12 chromosomes?

A. an anther
B. an embryo
C. a stigma
D. a pollen grain

93.
Directions: Questions 3 and 4 refer to the diagram below which shows cells in the root tip in various stages of cell division:



93-3.
Which of the following is a correct sequence of the different stages of the cell division?

A. 1→2→3→4
B. 1→3→4→2
C. 3→2→4→1
D. 3→4→2→1

93-4.
This type of cell division occurs during the formation of

(1) skin cells.
(2) sperm cells.
(3) red blood cells.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

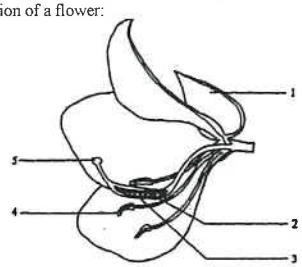
95- 4.
Below are three different stages of a cell division

(1) Chromosomes separate.
(2) Chromosomes arrange themselves at equator of the spindle.
(3) Chromosomes duplicate.

Which of the following shows the correct sequence?

A. (1)→(2)→(3)
B. (1)→(3)→(2)
C. (2)→(1)→(3)
D. (3)→(2)→(1)

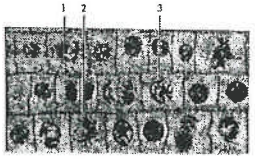
95.
Directions: Questions 46 and 47 refer to the diagram below which shows the longitudinal section of a flower:



95-46
Haploid cells are formed in
A. 2 and 3.
B. 2 and 4.
C. 3 and 5.
D. 4 and 5.

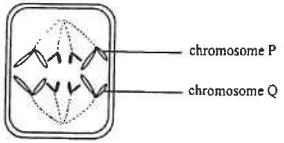
95-47.
Which structure is responsible for receiving the pollen grains?
A. 1
B. 2
C. 4
D. 5

96-9.
The photomicrograph below shows some plant cells at different stages of mitosis:



Which cells contain the same amount of DNA?
A. 1 and 2 only
B. 1 and 3 only
C 2 mad 3 only
D. 1, 2 and 3

03-11
The diagram below shows a dividing cell found at the root tip of a plant:



Which of the following statements is correct?
A. The parent cell has eight chromosomes.
B. P and Q are homologous chromosomes.
C. The daughter cells will be haploid.
D. Each daughter cell will have four chromosomes.

03-57
The photomicrographs below show four stages in the cell division of plant cells:

The correct sequence of the four stages is
A. Q→S→R→P
B. R→P→Q→S
C. S→Q→R→P
D. S→R→P→Q

04-30
Which of the following is a correct statement about meiosis occurring in the human testis?
A. DNA replicates before the start of meiosis I.
B. The pair of chromatids separates in meiosis I.
C. Homologous chromosomes pair up in meiosis II.
D. All daughter cells contain the Y chromosome.

Past HKCEE Questions
Cell Division
Suggested Answers

Paper I

1. (i) 1,5,7,2,4,3,6 — 2/0
   (ii) meiosis — 1
   ovary / ovule — 1
   (iii) pollen grains — 1
   (iv) to reduce the chromosome number of the cell by half so that as a result of fertilization the chromosome number can be restored — 1
   (v) ovary — 1
   testis — 1

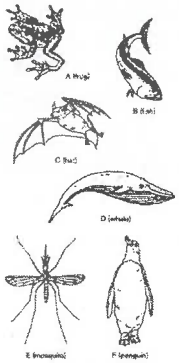
2. (i) (1) cell type 1 - D — 1
   (2) cell type 2 - C — 1
   (ii) (1) Mitosis / cell division — 1
   (2) to increase the cell number for growth / repair of the root — 1
   (iii) It has an outgrowth / root hair — 1
   to provide a large surface area — 1
   Communication skill (c) — 1

Paper II

90-2	C
91-7	A
91-8	B
92-39	D
93-3	C
93-4	C
95-4	D
95-46	B
95-47	D
96-9	D
03-11	D
03-57	C
04-30	A

Past HKCEE Questions
Diversity of Organisms and Classification
Paper I

1. The diagrams below show a variety of animals.



(i) All the animals shown except E can be classified into one group. State the structural feature on which this classification is based. (1 mark)

(ii) Two of the five animals mentioned in (i) belong to the same group as the rabbit. Name the group and the two animals. (2 marks)

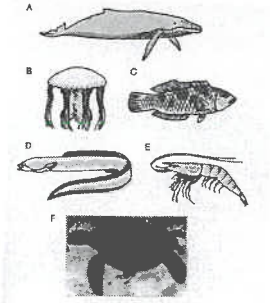
(iii) ***With reference to the animals shown***, name the respiratory structures that can be found in

(1) animal A only.

(2) animal B only. (2 marks)

(HKCEE 1989)

2. In a marine museum, living marine animals are kept in different exhibition areas according to their animal group. Some of the animals in the museum are shown in the diagram below:



(i) Using the letters provided, state all the animals(s) that should be placed in the exhibition area for reptiles. (1 mark)

(ii) B and E are kept in the same exhibition area. Name the animal group to which they belong. (1 mark)

(iii) State two structural differences between A and C which explain why they are kept in different exhibition areas. (2 marks)

(HKCEE 1998)

3.

Photograph 1 (magnification x $\frac{1}{5}$)

Source: N.P.O. Green, G.W. Stout, D.J. Taylor, ***Biological Science***, Cambridge: Cambridge University Press, 1990.

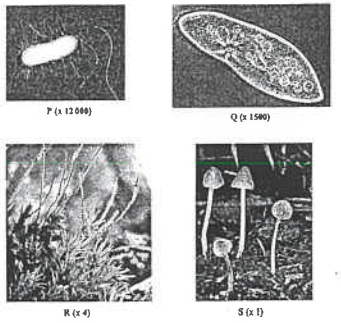
(i)

(1) To which group of vertebrates do bats belong? (1 mark)

(2) Referring to photograph 1, state one external feature of bat A through which it is classified into the group you stated in (1). (1 mark)

(HKCEE 2002)

4. The following pictures show four different organisms:



P (x 12 000) Q (x 1500) R (x 4) S (x 1)

Source: Starr, C., and Taggart, R., *Biology - the Unity and Diversity of Life*, Belmont: Brooks/Cole - Thomson Learning, 2004.
Zhu, R.L., and Se, M.L., *Mosses and Liverworts of Hong Kong (Vol.2)*, HK: Heavenly People Depot, 1996.
Griffiths, D.A., *Along Kong Fungi*, HK: Urban Council & Urban Services Dept., 1977.
Nester, E.W., et al., *Microbiology - A Human Perspective*, International ed., 4th ed., McGraw Hill, 2004.

(a) Organisms can be classified into five kingdoms. Name the kingdom that P and Q each belongs to. (2 marks)

(b) State *two* cell structures that can be found in Q, R and S, but not in P. (2 marks)

(c) Explain the role of S in the cycling of materials in nature. (2 marks)

(d) A number of human diseases such as influenza and SARS are caused by viruses. Some *scientists consider viruses as organisms, but some do not. Give one reason for each of these* views. (2 marks)

(HKCEE 2005)

5. Three samples of specimen were examined in a laboratory. The results are shown below:

Feature of specimen	Sample 1	Sample 2	Sample 3
Size (mm)	0.0002	0.043	180
Cell wall	-	+	+
Mitochondrion	-	-	+
Nucleus	-	-	+
Deoxyribonucleic Acid (DNA)	+	+	+

Key: '+' means present
'-' means absent

The following paragraph summarizes the report about the three samples. Complete the paragraph with suitable word(s). (4 marks)

With reference to the results, the groups that samples 1 and 2 belong to are (a) and (b) respectively. For sample 3, it remains unclassified. It could belong to one of the following groups: plants, (c) or (d).

(HKCEE 2007)

Past HKCEE Questions
Diversity of Organisms and Classification
Paper II

99-1
Which of the following animals have scales covering the skin?


(1)


(2)


(3)


(4)

A. (1) and (4) only
B. (2) and (3) only
C. (1), (2) and (3) only
D. (1), (2), (3) and (4)

99-2
The dichotomous key below lists some features of four different plants P, Q, R and S:

1a	with flowers	P
1b	without flowers	2
2a	with seeds	Q
2b	without seeds	3
3a	with roots	R
3b	without roots	S

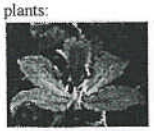
Which of the four plants is a gymnosperm?
A. P
B. Q
C. R
D. S

99-3
Which of the following correctly describes the plant in the diagram below?


(Magnification x3)

A. no true roots present
B. using seeds for dispersal
C. commonly found on dry soil
D. capable of producing pollen grains

00.
Directions: Questions 1 and 2 refer to the photographs below, which show four different plants:


W (Magnification x $\frac{1}{3}$)


X (Magnification x $\frac{1}{4}$)


Y (Magnification x $\frac{1}{10}$)


Z (Magnification x 3)

00-1
Which plant can only survive in a moist and shady environment?
A. W
B. X
C. Y
D. Z

00-2
Which plants are capable of producing seeds?
A. W and X only
B. Y and Z only
C. W, X and Y only
D. X, Y and Z only

00-3
The table below lists some features of three animals:

	Animal		
	P	Q	R
Vertebral column	×	✓	✓
Scales	×	✓	×
Hair	×	×	✓

Key: ✓ = present × = absent

The three animals could be

	P	*Q*	*R*
A.	jellyfish	snake	rabbit
B.	jellyfish	starfish	chicken
C.	goldfish	rabbit	bat
D.	goldfish	turtle	horse

01-1
Which of the following animals lays eggs with a hard shell?
A. toad
B. snake
C: whale
D. goldfish

02-1
Scientists classify organisms into groups on the assumption that closely related organisms
A. are found in similar habitats.
B. have similar behaviour.
C. have similar structures.
D. have similar diets.

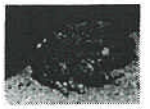
02-2
Which of the following statements about plants is/are correct?
(1) Flowering plants can produce seeds.
(2) Non-flowering plants cannot produce fruit.
(3) Flowering plants cannot reproduce asexually.
A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only

03-01
A student examined four plants, P, Q, R and S, in the field. He constructed the dichotomous key below to identify these plants

1	a with leaves	2
	b without leaves	P
2	a with cones	Q
	b without cones	3
3	a with pollens	R
	b without pollens	S

One of them is a potato plant. Which one is it?
A. P
B. Q
C. R
D. S

04-35
What is the common feature possessed by the three animals shown in the photographs?



Source: Physical Sciences Section, E.D., Kadoorie Farm & Botanic Garden, and Ocean Park, *綜合科學科資料冊——親親大自然*, HK: Education Department, 1998.

A. laying eggs
B. breathing with lungs
C. presence of scales on the skin
D. living both in water and on land

04-58
Which of the following plants does *not* bear flowers but reproduces by seeds?
A. fern
B. grass
C. a pine tree
D. an onion plant

06
Directions: Questions 3 and 4 refer to the key below, which is used for classifying some groups of organisms:

(1)	Presence of protein coat	W
	Absence of protein coat	Go to (2)
(2)	Presence of mitochondria	Go to (3)
	Absence of mitochondria	X
(3)	Presence of chloroplasts	Y
	Absence of chloroplasts	Z

06-3
Which of the following combinations correctly matches the descriptions given in the key?

	W	*X*	*Z*
A.	prokaryote	fungus	animal
B.	virus	protoctist	fungus
C.	virus	prokaryote	animal
D.	prokaryote	protoctist	fungus

06-4
Which of the following structures may be possessed by organisms in group Y?
(1) seed
(2) cone
(3) spore
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

06-5
The table below lists some features of three organisms, P, Q and R:

	Features		
	Chlorophyll	Fruits	Cell wall
P	×	×	✓
Q	✓	×	✓
R	✓	✓	✓

Which of the following correctly matches the identity of the three organisms?

	P	*Q*	*R*
A.	bacterium	pine	grass
B.	fungus	rose	fern
C.	moss	fern	rose
D.	snail	grass	pine

07-06
Which of the following features is common to dogs, ducks and dolphins?

A. They breathe with lungs.
B. They have claws on their limbs.
C. They possess mammary glands.
D. They have hairs on their bodies.

Past HKCEE Questions
Diversity of Organisms and Classification
Suggested Answer

Paper I

1. (i) Vertebral column / backbone 1
   (ii) Mammals 1
   Bat and whale (0.5 x 2) 1
   (iii) (1) Skin 1
   (2) Gills 1

2. (i) F 1
   (ii) Invertebrates 1
   (iii) 1 mark for each difference (1,1) 2

	A	C
Breathing organ	Lungs	Gills
Skin surface	No scales	With scales

3. (i) (1) mammal 1
   (2) body covered with hair 1

4. (a) P : * Prokaryotes 1
   Q: *Protoctists 1
   (b) nucleus, mitochondria 1,1
   (c) S breaks down dead organic matter 1
   into inorganic matter which can be used by plants for growth 1
   (d) Support virus as organisms: because it can reproduce in a cell / it has genetic materials to control its life processes 1
   Against virus as organisms: because it is non-cellular / has no cytoplasm / cannot replicate by itself/ has no metabolism unless it is within a host cell 1

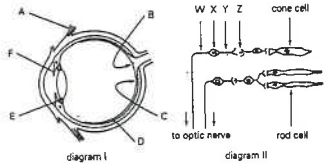
5. (a) Virus 1
   (b) Prokaryotes 1
   (c) Fungi / Protoctist 1
   (d) Protoctist / Fungi 1

Paper II

99-1	B
99-2	B
99-3	A
00-1	D
00-2	C
00-3	A
01-1	B
02-1	C
02-2	A
03-01	C
04-35	B
04-58	C
06-3	C
06-4	D
06-5	A
07-06	A

Past HKCEE Questions
Detection of Environmental Conditions in Mammals
Paper I

1. Diagram I below shows a section of a human eye. Part of the retina has been magnified in diagram II to show the arrangement of some cells.
(The parts are not drawn to the same scale.)

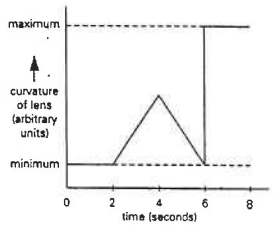


(i) Using letters from diagram I, indicate
(1) a part whose function is sensory, and
(2) a part whose function is motor.
(ii) Name W, X, Y and Z.
(iii) State one reason each, why diagram II cannot represent
(1) the blind spot, and
(2) the fovea (yellow spot).
(iv) State the cause of
(1) colour blindness, and
(2) night blindness.
(v) If the eye were focused on a nearby burning candle, draw a simple diagram to show
(1) the light rays, and
(2) the image formed on the retina.
(vi) What is the size of the image formed in when compared to the object?
(12 marks)
(HKCEE 1983)

2. A young lady, with one of her eyes covered, is using her uncovered normal eye to observe, at random and one at a time, the following objects within a period of eight seconds:

(W) a stationary object nearby
(X) a stationary object far away
(Y) an object approaching her
(Z) an object moving away from her

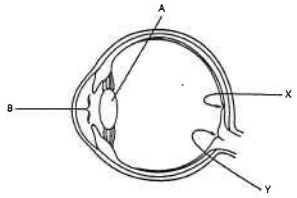
The change in the curvature of the lens of the uncovered eye during these eight seconds is shown in the sketch below:



(i) Using the letters (W), (X), (Y) and (Z), indicate which object is being observed during the following periods:
(1) 0 - 2 seconds
(2) 2 - 4 seconds
(3) 4 - 6 seconds
(4) 6 - 8 seconds

(ii) What is the state of the suspensory ligaments of the uncovered eye
(1) for observing object (W)?
(2) for observing object (X)?
(iii) Which structure, other than the suspensory ligament in the eye, is responsible for changing the curvature of the lens?
(iv) Draw a simple diagram to show the path of the light rays when the eye was watching object. (9 marks)
(HKCEE 1985)

3. The diagram below shows a section of a human eye:

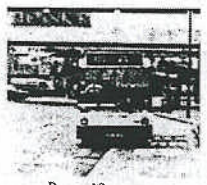


(i) If a person is watching a nearby object which is moving away from him, what change will occur in the shape of structure A? Describe how this change can be brought about. (3 marks)
(ii) State the change in the size of B when the person walks out from a dark room into bright daylight. What is the significance of this change? (2 marks)
(iii) Describe how the eye and the nervous system work together to bring about the reflex in (ii). (4 marks)
(iv) How may a small object be seen by the person when its image falls on spot
(1) X?
(2) y?
Briefly explain your answer. (4 marks)
(HKCEE 1988)

4.

(i) A man came out of the cinema as shown in the diagram on the opposite page. Describe how his eyes would adapt to the bright daylight. Explain why this would be necessary. (4 marks)
(ii) After looking at his watch, the man tried to locate the bus stop at the end of the street. Describe and explain the changes that occurred in his eyes. (3 marks)
(iii) The man had an eye defect in which he was unable to see clearly the number painted on the sign post of the bus stop. Draw a simple diagram to show the path of the light rays when his eye was focusing on the number on the sign post. (2 marks)
(iv) The man tried to shield his eyes from the strong sunlight by putting his hand above his forehead as shown in the diagram. Is this action reflex or voluntary? (1 mark)
(HKCEE 1992)

5. A boy was standing by the roadside and saw a bus moving towards him. The photographs below show what he saw when the bus was 10 m and 5 m away from him respectively:

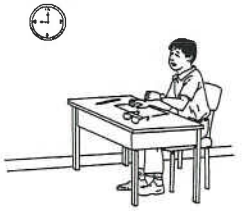


Bus at 10 m away

Bus at 5 m away

(i) (1) What kind of eye defect did the boy probably have? (1 mark)
(2) State two features of the eyeball that might have caused this eye defect. (2 marks)
(ii) Draw a ray diagram to show the pathway of light entering the eye of the buy when he was lurking at the bus 10 m away from him. (3 mark)
(iii) How could this eye defect he corrected? (1 mark)
(iv) The boy had normal colour vision, but when it was getting dark, he found it difficult to distinguish the colour of the cars on the road. Explain this briefly. (2 marks)
(HKCEE 1996)

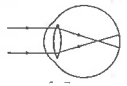
6. The diagram below shows a boy, Bill, sitting for an examination in the school hall. Before the examination started, Bill took off his glasses and relaxed.



(i) Bill looked at the clock on the wall. It was 9:00 a.m. Draw the image of the two hands of the clock formed on the retina of his eye. (1 mark)

(ii) Describe how the image on the retina

(iv) Drawing (D): large, clear and accurate diagram (accuracy includes outline of eyeball, lens of eye, straight lines for light rays) 1
(L): Parallel rays from object (with arrow sign), focus in front of retina, rays extended to retina (3 x 0.5) 1.5
Title (T) 0.5



Ray diagram showing light rays entering a short-sighted eye

9. (i) (1) To allow the transmission of light to the retina without obstruction. 1
(2) aqueous humour / choroid 1
(ii) (1) It helps to reduce the amount of light entering the eyes, so as to prevent over-stimulation / damage of the lightsensitive cells. 1
1
(2) reflex action 1
(3)

Constriction of B	Putting on sunglasses
Does not involve the cerebrum	Involves the cerebrum
Inborn	Learned action
Faster in action	Slower in action
Stereotyped response i.e. same stimulus always evokes the same response	Variable responses to the same stimulus

any two 2

(iii) Dark-coloured sunglasses reduce the light intensity entering the eye, so the pupil will not constrict / constrict to a smaller extent in bright sunlight. 1
As a result, more UV light can enter the eye and cause damage. 1

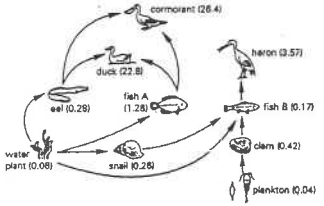
10. (i) (1) * ciliary muscles 1
(2) When the man is looking at a near object, the weakened ciliary muscle contract with less force 1
and the tension of the suspensory ligament remains high 1
Hence, the lens is not thick enough 1
and fails to converge light to form a clear image on the retina 1
Effective Communication 1C
(ii) The lens becomes less elastic / cloudy 1
(iii) Layer B contains light sensitive cells cannot obtain nutrients / oxygen from layer C 1
1+
As a result, light sensitive cells die 1
Light falling on layer B cannot be detected / no nerve impulse can be produced 1
Therefore the vision is impaired

Paper II

90-50	A
91-44	D
91-45	D
93-31	C
93-35	C
94-27	A
94-28	D
95-39	C
97-33	A
97-34	D
97-35	B
97-38	A
99-30	B
99-33	D
02-48	B
02-49	B
02-59	A
04-36	C
04-50	D
05-23	D
05-24	A
05-51	A
06-10	C
06-11	D
06-40	C
06-41	B
06-42	D
07-48	B

Past HKCEE Questions
Ecosystem
Paper I

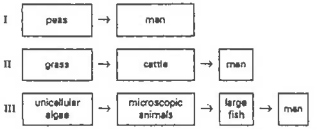
1. The diagram below shows a food web in an estuary (the mouth of a river), downstream from a field which has been sprayed with the insecticide, DDT. The numbers show the concentration of DDT (in parts per million) found in each organism. (The organisms are not drawn to the same scale).



(i) Which organism is an omnivore?
(ii) Write down a food chain consisting of four organisms.
(iii) Explain why a low concentration of DDT sprayed on the field results in a high concentration in the duck.
(iv) If all the cormorants died due to a high concentration of DDT in their tissues,
(1) what would be the immediate effects on the ecosystem, and
(2) how would the population of snails be affected? Why?
(v) Explain how the dead body of a cormorant could supply nutrients for the water plants.

(HKCEE 1982)

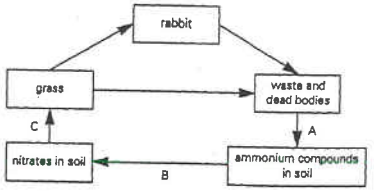
2. The following food chains indicate three ways in which man may obtain protein:



(i) Briefly explain the importance of the plants in the above food chains.
(ii) What is the term used to describe the diet of man?
(iii) With reference to food chain III:
(1) what is the trophic level of man?
(2) state the change in the number of individuals from one trophic level to another.
(3) draw the food web if the unicellular algae were also eaten by some small fish which were preyed upon by both large fish and man.
(iv) For the same amount of energy input, which food chain would produce the greatest quantity of protein for man? Explain your answer fully.

(HKCEE 1983)

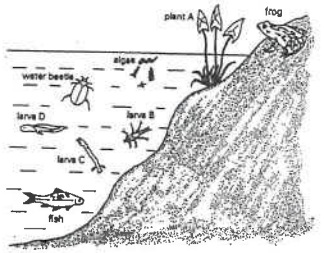
3. The diagram below shows some pathways by which nitrogen is cycled in grassland:



(i) What are the processes represented by A and
(ii) State the importance of the process represented by A, and name two types of organisms which are involved.
(iii) What major compound is formed in grass from the nitrates in the soil?
(iv) State one natural process, other than C, which can decrease the amount of nitrates in the soil.
(v) Continuous hunting of rabbits in this habitat was found to result in a decrease in the nitrogen content of the soil. Give a reason.

(HKCEE 1984)

4. The diagram below shows some of the plants and animals in a slow-flowing stream: (The organisms are not drawn to the same scale.)



(i) From which larva and by what process does the frog develop?
(ii) State one distinct feature for classifying fish and frogs
(1) in the same phylum (major group).

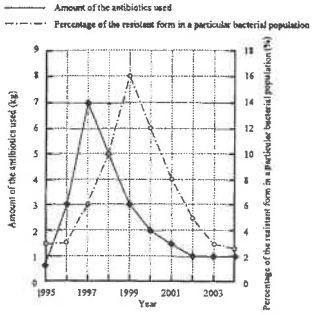
04-53	C
04-54	A
05-21	B
06-35	A
06-36	D
06-37	D
06-38	A
06-43	B
06-44	C
06-45	A
07-04	D
07-05	A
07-37	C
07-38	B
07-39	D
07-43	A

Past HKCEE Questions
Evolution
Paper I

1. Peter moved to a small island ten years ago. He found that there were a lot of mosquitoes, so he sprayed the area around his house with a certain kind of insecticides. The mosquito population dropped rapidly, but rose again after several months. He then sprayed the same insecticide to kill the mosquitoes and this was repeated whenever there was a rise in the mosquito population However, Peter has found that the insecticide has become less and less effective in recent years.
   (i) Explain why the mosquito population rose again after a large number of them were killed by the insecticide. (2 marks)
   (ii) In the same population, the mosquitoes may show different degrees of resistance to the insecticide. Explain *two* genetic causes that may lead to this variation among the mosquitoes. (4 marks)
   (iii) Using the theory of natural selection, explain why the insecticide has become less and less effective in killing the mosquitoes. (4 marks)

   (HKCEE 2005)

2. Antibiotic is a drug commonly used to treat bacterial infections. In recent years, there have been more reported cases of resistant forms of bacteria strains found in hospitals. The graph below shows the percentage of the resistant form in a particular bacterial population and the amount of antibiotics used in one particular hospital each year from 1995 to 2004:



   (i) Explain why the increased amount of antibiotics used will lead to the rise in the percentage of the resistant form in the bacterial population. (4 marks)
   (ii) Some patients in hospitals will have a higher death rate if infected with resistant forms of bacteria. Suggest one group of these patients and give an explanation. (2 marks)
   (iii) If you were a doctor, suggest two practices that you could adopt to slow down the rise of the resistant forms of bacteria. (2 marks)

   (HKCEE 2007)

Past HKCEE Questions
Evolution
Paper II

05-52

Fossil records are valuable in the study of evolution because they provide information about

A. the population size of different species.
B. the cause of mutation in organisms.
C. the time of existence of organisms.
D. the life span of different species.

06-55

The misuse of antibiotics will lead to the development of bacteria with greater resistance to antibiotics. This means that

A. most bacteria are killed and only the more resistant bacteria survive.
B. bacteria will become stronger after applying the antibiotics.
C. bacteria mutate in order to resist the antibiotics.
D. bacteria get used to the antibiotics applied.

06-56

In the nineteenth century, most of the peppered moths in England were white. About 100 years later, 98% of the moths recorded in industrial areas were black while most in rural areas were still white. This is an example of

A. competition.
B. evolution.
C. natural selection.
D. variation.

06-58

If a mutation leads to the development of a character which is dominant, which of the following can be deduced from this?

A. There will be more individuals in the population carrying this allele than if the mutation leads to a recessive character.
B. There will be more individuals possessing this character in the population.
C. All individuals in the population carrying this allele will possess this character.
D. It will cause the death of the individuals carrying this allele.

Past HKCEE Questions
Evolution
Suggested Answers

Paper I

1. (i)
- Some mosquitoes survived after the spraying of the insecticide
- They would reproduce to give many offspring and thus the population would rise again

Or

- Many eggs were laid before the death of the mosquitoes
- The eggs hatched and thus the population would rise again

1,1

(ii)
- Mutation
- It results in the change of the gene(s) controlling sensitivity / resistance to the insecticide

or

- Independent assortment of homologous chromosomes occurs during meiosis
- leading to the formation of gametes with different alleles for insecticide-resistance

or

- Fertilization
- It results in a random combination of alleles for insecticide-resistance in the zygote

1,1

(iii) There are genetic variations among the mosquitoes in their resistance against insecticide 1
Those that are resistant have a higher chance of survival in the presence of the insecticide 1
They have a greater chance of reproduction / producing more offspring 1
Thus the proportion of the insecticide-resistant mosquitoes increases in the subsequent generations 1
Hence, the insecticide becomes less effective in killing the mosquitoes 1
Effective communication

2. (i) Genetic variations exist among the bacteria in their resistance against the antibiotic 1
The increase in the amount of antibiotics kills non-resistant form while the resistant form survive 1
The resistant form continue to reproduce / produce more of its own kind 1
The number of resistant form of bacteria increases faster 1

(ii) Any group with weak immune system plus correct example, e.g. children, elderly, AIDS patients, cancer patient after treatment, patients taking inununosuppressor drugs 2
(Accept other reasonable answers)

(iii) Any 2 1+1
- Prescribe antibiotics only when necessary
- Instruct the patient to finish the whole course of prescription
- Use narrow spectrum antibiotics

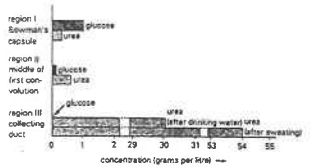
Paper II

05-52	C
06-55	A
06-56	C
06-58	C

Past HKCEE Questions
Excretion and Osmoregulation
Paper I

1. The chart below shows the concentrations of glucose and urea in the fluid inside the following regions of a mammalian kidney:

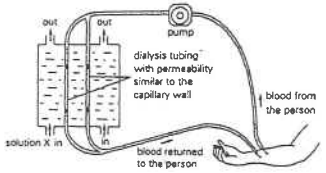
   I. the Bowman's capsule,
   II. the middle of the first convolution (coiled portion) of a kidney tubule, and
   III. the collecting duct.



   (i) State the changes in the glucose concentration as the fluid flows through the three regions.
   (ii) State and explain the changes in the urea concentration with reference to the flow of fluid along the kidney tubule.
   (iii) Compare and explain the differences in the urea concentration after drinking water and after sweating.
   (iv) Under what circumstances might glucose appear in the urine? Explain fully.

(HKCEE 1983)

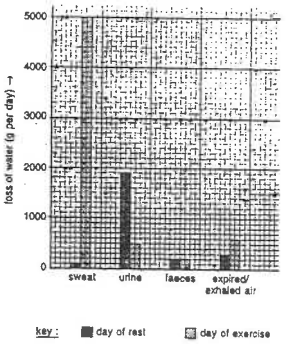
2. The diagram below shows how a person's blood is treated when his kidneys cannot function properly in removing urea. Solution X which is fed into the machine contains glucose and mineral salts at the same concentration as normal plasma.



   (i) State and explain the change in the urea concentration in the blood after treatment.
   (ii) Why is it necessary for solution X to have the same concentration of glucose and mineral salts as normal plasma?
   (iii) What is the advantage of passing solution X in a direction opposite to that of the blood?
   (iv) What would be the effect of allowing the blood to flow through a greater number of dialysis tubes? Give a reason for your answer.

(HKCEE 1984)

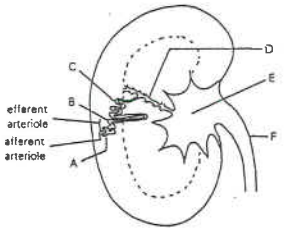
3. A person was confined to the same environmental conditions and was given a similar diet for two days. He rested completely on one day and performed exercises on the other. The weight of water lost from the different parts of his body in each day is shown in the chart below:



   (i) State any two environmental conditions that should be kept constant during these two days.
   (ii) Name the part of the body which produces
      (1) sweat.
      (2) urine.
   (iii) What is the total weight of water lost from the body
      (1) on the day of rest?
      (2) on the day of exercise?
   (iv) On the day of exercise, what is the advantage of producing
      (1) more sweat?
      (2) less urine?
   (v) Explain why the amount of water lost in the faeces was the same for these two days.
   (vi) Suggest a simple way to show that expired air contains water vapour.

(10 marks)
(HKCEE 1985)

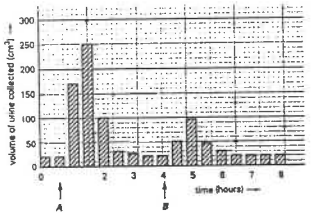
4. The diagram below shows the longitudinal section of a mammalian kidney and one of its nephrons.



   (i) Name the fluids in A and F. (2 marks)
   (ii) B and C are highly coiled. Explain the significance of this. (2 marks)
   (iii) State the process resulting in:
      (1) the absence of protein in A.
      (2) the absence of glucose in D. (2 marks)
   (iv) Compare and explain the concentration of urea in A and E. (2 marks)
   (v) State and explain the change in concentration of the fluid in F if a large amount of water is taken in by the mammal. (2 marks)
   (vi) Compare and explain the amount of glucose in blood entering and leaving the kidneys. (2 marks)

(HKCEE 1987)

5.
   (i) Distinguish between 'excretion' and 'egestion'. (2 marks)
   (ii)
      (1) Name TWO excretory substances that are produced by the human body.
      (2) For each substance named in (1), state where it is formed, and by which process it is formed. (6 marks)
   (iii) A healthy man drank two glasses of distilled water at time A and two more at time B. The chart below shows the volume of urine collected at half-hour intervals when the man tried to empty his bladder. The same environmental conditions were maintained throughout the whole period.



      (1) Explain why the volume of urine produced was greatly increased after drinking water at time A. (2 marks)
      (2) Suggest a reason to explain why the man's response to drinking water at time B was different from that at time A. (2 marks)
      (3) Urine is still formed by the body even when there is no water intake for a long time (e.g. 12 hours). Why? (2 marks)

(HKCEE 1988)

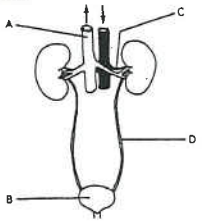
6. Two species of rats (A and B) live iii different habitats. Equal numbers of rats selected from each of the species were used in an experiment to investigate certain aspects of their osmoregulatory control. The rats selected were of similar mass and age. They were kept under the same environmental conditions and fed with the same amount of food - but no water. The results were as follows:

	Species A	Species B
Water gain from metabolism (arbitrary units)	81	80
Water loss by evaporation (arbitrary units)	90	168
Water content in faeces (% by weight)	2	20

   (i) State which species of rat lives in a drier habitat. Give ONE reason to support your answer. (3 marks)
   (ii) Suggest a type of metabolic activity through which the rats can gain water. (1 mark)
   (iii) Give TWO ways in which the rats may lose water by evaporation. (2 marks)
   (iv) Name the part of the alimentary canal responsible for regulating the water content in rat faeces. (1 mark)
   (v) If the experiment were conducted for a long period of time, which group of rats (species A or B) would die off first? Explain your answer. (3 marks)

(HKCEE 1989)

7. The diagram below shows the human urinary system:



Key: arrows indicate the direction of blood flow

(i) Name structures A and B. Give ONE function for each. (4 marks)

(ii) The table below shows the concentration of certain components of two fluids (X and Y) collected from two different regions of the urinary system:

	Concentration ($g\ 100\ cm^{-3}$)	
	Fluid X	Fluid Y
Protein	0.0	8.0
Glucose	0.0	0.1
Urea	2.0	0.03

(1) Using the letters in the diagram, state the respective regions from which fluids X and Y were collected. (2 marks)

(2) Explain why fluids X and Y differ in their concentrations of:

(I) protein

(II) glucose

(III) urea (6 marks)

(HKCEE 1990)

8. An experiment was performed to study the effect of the removal of the liver on the blood urea concentration of a mammal. The blood urea concentration of this mammal was measured from 07:00 to 20:00 hours. The animal's liver was removed at 08:00 hours. The results were as follows:

Time of day (hours)	Blood urea concentration ($mg\ per\ 100\ cm^3$ blood)
07:00	7.0
08:00 (liver removed)	7.0
11:00	3.6
14:00	2.6
17:00	2.0
20:00	1.6

(i) Plot a graph to show how the blood urea concentration varies with time. (3 marks)

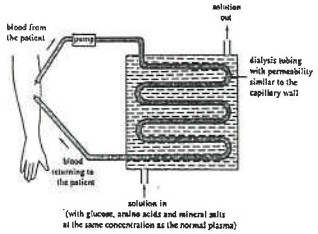
(ii) Explain the change in the blood urea concentration after 08:00 hours. (3 marks)

(iii) Describe and explain the changes in the blood urea concentration if the kidneys instead of the liver of the mammal were removed at 08:00 hours. (3 marks)

(iv) State ONE other function of the liver. (1 mark)

(HKCEE 1991)

9. Patients with kidney failure will die if they do not receive proper treatment. One method of treatment is to use a kidney machine. The diagram below shows the workings of a kidney machine:



(i) Urea is found in the solution passing out of the kidney machine. Account for this. (2 marks)

(ii) Give a reason for each of the following

(1) Each treatment takes a long time (about 6 hours). (1 mark)

(2) The treatment needs to be repeated at regular intervals (about 2-3 times a week). (1 mark)

(iii) Both the human kidney and the kidney machine are able to retain useful substances in the blood. Explain how this is achieved by

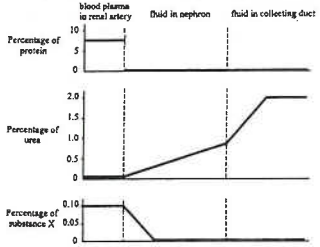
(1) the human kidney, (1 mark)

(2) the kidney machine. (2 marks)

(iv) Another method of treating kidney failure is to transplant a healthy kidney into the patient. Suggest two reasons why only a small number of such patients can receive this treatment in Hong Kong. (2 marks)

(HKCEE 1996)

10. The graphs below show the concentration of three substances in the renal artery, and the changes in their concentration along the nephron and the collecting duct:



(i) Explain the difference in the concentration of protein between the blood plasma and the fluid in the nephron. (2 marks)

(ii) What process causes the increase in urea concentration along the collecting duct? (1 mark)

(iii)

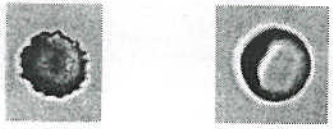
(1) What may substance X be? (1 mark)

(2) Explain the change in the concentration of substance X along the nephron. (3 marks)

(iv) If a person eats a lot of beans, how would the amount of urea excreted be affected? Explain your answer. (4 marks)

(HKCEE 2001)

11. A student carried out a study on the effect of two different sodium chloride solutions on red blood cells. He added a drop of citrated mammalian blood to 2 cm^3 of each solution in separate test tubes, A and B. After five minutes the mixtures in both tubes appeared light red in colour. He then examined 2 drop of each mixture under the microscope. After repeated examinations, he found that intact red blood cells were present in tube B only and they were in two different forms as shown below:



Wrinkled *Smooth*

The results are recorded in the table below:

Tube	Concentration of solution (%)	Average number of different forms of intact red blood cells	
		Wrinkled	Smooth
A	0.3	0	0
B	1.5	15	5

Note: All observations were done under the same magnification.

(i) (1) In tube B, some red blood cells became wrinkled. How would you explain this? (3 marks)

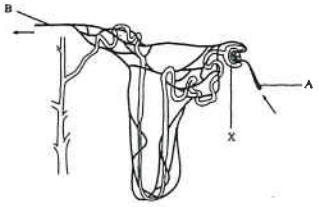
(2) Both forms of red blood cells were observed in tube B. Give reason for this. (1 mark)

(ii) How could the student be sure that the red blood cells in tube B had reached equilibrium with the surrounding solution at the time when he made the observation? (2 marks)

(iii) Account for the absence of intact red blood cells in the mixture in tube A and the light-red appearance of the mixture. (4 marks)

(HKCEE 2003)

12. The diagram below shows the structure of a nephron and its associated blood vessels:



Key: ⟵ direction of blood flow

(i) Name the fluid found in X. Explain how this fluid is formed. (4 marks)

(ii) Describe two ways in which glucose in vessel A may reach vessel B. Your answer should include the routes and the mechanisms involved. (4 marks)

(iii) Coffee contains a chemical called caffeine which causes dilation of vessel A. Explain how the presence of caffeine in the blood may increase the rate of urine production. (3 marks)

(HKCEE 2004)

13. The table below shows some information about the composition of the plasma, glomerular filtrate and urine of a healthy person:

Component	Content (g per 100 mL fluid)		
	Plasma	Glomerular filtrate	Urine
Water	90 – 93	97 – 99	96
Plasma proteins	7 – 9	0	0
Glucose	0.10	0.10	0.00
Chloride	0.37	0.37	0.60
Urea	0.03	0.03	2.00
Others	<1.0	<1.0	<2.0

(i)

(1) The following table shows the percentage change in chloride content of urine when compared with that of glomerular filtrate. Using the above information, complete the table by finding out the percentage change in urea content.

Component	Percentage change
Chloride	62.2 %
Urea	

(2) Give a reason for this change in the urea content. (1 mark)

(ii) Account for the difference in water content between the plasma and the glomerular filtrate. (3 marks)

(iii) A person suffers from diabetes and

glucose is detected in his urine. With reference to the cause of the disease, explain why his urine contains glucose.
(4 marks)

Past HKCEE Questions
Excretion and Osmoregulation
Paper II

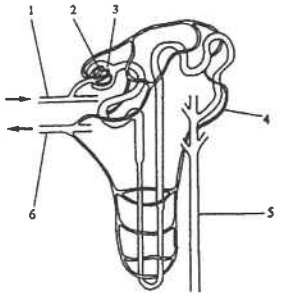
90- 39
Which of the following is NOT an excretory product?
A. urea
B. faeces
C. bile pigments
D. carbon dioxide

90-55
After drinking a lot of salty soup, a healthy person will produce

A. a small volume of urine with a high salt concentration.
B. a small volume of urine with a low salt concentration.
C. a large volume of urine with a high salt concentration.
D. a large volume of urine with a low salt concentration.

91
Directions: Questions 59 and 60 refer to the diagram below which shows the structure of a kidney tubule and is blood supply:

Key: → indicates direction of blood flow



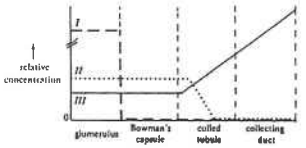
91-59
Which region has the highest blood pressure?
A. region 1
B. region 2
C. region 4
D. region 6

91-60.
In a healthy person, which of the following substances are found in region 1 but not in region 5?
(1) urea
(2) glucose
(3) proteins
(4) mineral salts

A. (1) and (2) only
B. (1) and (4) only
C. (2) and (3) only
D. (3) and (4) only

92-45
Urea is formed in
A. the liver.
B. the bladder.
C. the kidneys.
D. the sweat glands.

93-33
The graph below shows the relative concentration of glucose, proteins and urea in the fluids obtained from various parts of the mammalian kidney

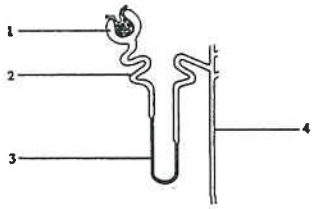


Which of the following correctly matches the three curves?

	I	*II*	*III*
A.	Proteins	urea	glucose
B.	glucose	urea	proteins
C.	proteins	glucose	urea
D.	glucose	proteins	urea

93-34
Which of the following is not an excretory organ of the human body?
A. the lung
B. the rectum
C. the liver
D. the kidney

94.
Directions: Questions 18 and 19 refer to the diagram below which shows the nephron of a mammalian kidney:



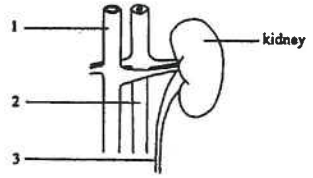
94-19
Which of the following correctly describes the processes occurring in different regions of the nephron?

	Region 1	Region 2	Region 4
A.	filtration	active transport	osmosis
B.	active transport	osmosis	filtration
C.	osmosis	active transport	filtration
D.	filtration	osmosis	active transport

94-20
Which of the following correctly indicates the changes in the amount of water lost from a man when the weather becomes drier and hotter?

	Amount of water lost from the skin	Amount of water lost from the kidneys
A.	increases	remains constant
B.	increases	decreases
C.	decreases	increases
D.	remains constant	decreases

95-34
The diagram below shows a kidney and some associated structures



The fluids in structures 1, 2 and 3 contain urea at different concentrations. Arrange them in descending order of ores concentration.
A. 1, 2, 3
B. 2, 3, 1
C. 3, 1, 2
D. 3, 2, 1

96-15
Which of the following is an excretory process?
A. exhalation
B. removal of undigested wastes
C. release of saliva
D. vomiting

99-35
The metabolic wastes excreted by a mammal include
(1) carbon dioxide.
(2) lactic acid.
(3) undigested food.
A. (1) only
B. (1) and (2) only
C. (2) and (3) only
D. (1), (2) and (3)

99-37
The salt concentration of the urine of a person was found to decrease shortly after he drank a glass of distilled water. Which of the following is a probable reason for this?
A. Less salt is excreted in the urine.
B. More water is excreted in the urine.
C. The water potential of the blood decreases.
D. Less salt is absorbed from the intestine into the blood.

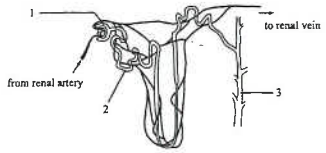
99-38
Compared to the blood in the renal artery, the glomerular filtrate in the Bowman's capsule has
A. a lower glucose concentration.
B. a higher urea concentration.
C. the same oxygen content.
D. less protein.

99-39
Which of the following descriptions of the air sacs of the lungs and the coiled tubules of the nephrons is correct?
A. Both have a rich blood supply.
B. Both have cells covered with cilia.
C. Both are freely permeable to dissolved substances.
D. Both have cells that carry out a high rate of respiration.

01-17
Which of the following are excretory wastes produced by the liver?
(1) urea
(2) bile salts
(3) carbon dioxide
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

02- 8
Which of the following is not a normal component of the faeces of a healthy person?
A. urea
B. cells
C. bacteria
D. bile pigments

03.
Directions: Questions 37 to 39 refer to the diagram below, which shows the structure of a human nephron and its associated blood vessels:



03-37
At sites 1 and 2, there is movement of glucose between the blood and the fluid in the nephron. Which of the following correctly states the processes responsible for the movement of glucose at these two sites?

	Site 1	*Site 2*
A.	filtration	active transport
B.	diffusion	diffusion
C.	filtration	osmosis
D.	diffusion	active transport

03-38
In a healthy person, which of the following substances can be found in the blood of the renal vein?
(1) urea
(2) glucose
(3) mineral salts
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

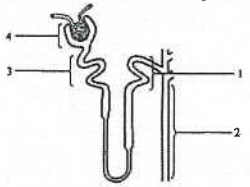
03-39
Which of the following correctly states and explains the change in concentration of the fluid in site 3 of a person after a basketball match?

	Change in fluid concentration	Reason
A.	decrease	a smaller proportion of water is reabsorbed
B.	decrease	less mineral salts are reabsorbed
C.	increase	a greater proportion of water is reabsorbed
D.	increase	more mineral salts are reabsorbed

04-33
Compared to the resting condition, when a person does vigorous exercise, there will be a great decrease in the amount of water lost through
A. exhalation.
B. sweating.
C. egestion.
D. urination.

05-28
Which of the following processes eliminates metabolic waste from the human body?
A. removal of trapped dust particles from the nasal cavity
B. passing out undigested food from the gut
C. breathing out air from the lungs
D. loss of heat from the skin

07
Directions:
Questions 49 and 50 refer to the diagram below, which shows the structure of a nephron.



07-49
Which region of the nephron has cells with the greatest number of mitochondria?
A. 1
B. 2
C. 3
D. 4

07-50
Which regions ate responsible for the reabsorption of water?
A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3 only

Past HKCEE Questions
Excretion and Osmoregulation
Suggested Answers

Paper I

1. (i) decreases towards end of convolution 1
glucose disappears completely / zero concentration in collecting duct 1
(ii) increases continuously 1
owing to water reabsorption from tubule / active secretion of urea into the tubule (any ONE)

(iii)

	after drinking	after sweating	
conc. difference	lower	higher	either)
explanation	water in body increased by drinking	water in body decreased by sweating	either)
	reduced water reabsorp-tion from tubule	stimulate water reabsorp-tion from tubule	either)

(iv) when the person is suffering from diabetes 1
lack of insulin 1
without converting glucose into glycogen / without promoting uptake of glucose from blood by liver 1
blood glucose level remains high exceeding absorptive capacity of kidney tubule 1

2. (i) decrease 1
urea had diffused into solution X 1
(ii) to maintain normal concentration of plasma 1
by preventing net diffusion of glucose &/or salt 1
(iii) increase the efficiency of urea diffusion 1
(iv) by allowing greater area for diffusion 1
more urea will diffuse out / less time required 1

3. (i) temperature, relative humidity, wind, sunlight (any 2) 2
(ii) (1) sweat gland / skin
(2) nephron / kidney
(iii) (1) 2500g +/- 200 g 1
(2) 6300g +/- 200g
(iv) (1) more sweat produced would exert a greater cooling effect on the body 1
(2) less urine produced would compensate for the water loss through sweating / maintain the optimum water content in the body 1

(v) water reabsorption in the intestine &/OR water lost in faeces are not affected by exercise, sweating and urine output 1

(vi)

Method	Observation	
Breathing onto cold surface (e.g. mirror)	water droplets formed (misty)	any ONE 1 + 1
Breathing onto dry cobalt chloride paper	blue to pink	
Breathing onto anhydrous copper sulphate powder	white to blue	

4. (i) A - glomerular *filtrate 1
F - *urine 1
(ii) To increase surface area / time for more reabsorption 1 1
(iii) (1) ultrafiltration / filtration 1
(2) reabsorption / active transport 1
(iv) The urea concentration in E is higher than in A 1
due to water reabsorption 1
(v) the fluid in F becomes less concentrated 1
because a smaller proportion is being reabsorbed 1
(vi) amount of glucose in blood leaving the kidneys is smaller 1
because glucose is oxidised to provide energy 1

5. (i) Excretion - removal of metabolic waste from the body 1
Egestion - removal of undigested or unabsorbed food substances 1
(if candidates show no attempt to distinguish the two term - no marks)
(ii)

any TWO

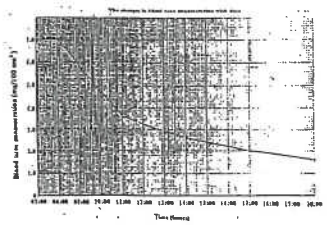
	Substances	CO_2	Urea / Nitrogenous waste	Bile pigments	Water	
(1)						1 + 1
(2)	Site of formation	body cells	liver	liver	body cells	1+1
	process involved	cellular respiration	breakdown (deamination) of amino acids (proteins)	breakdown of RBC / haemoglobin	cellular respiration	1+1

(iii) (1) Blood / body fluid became diluted 1
A greater volume / proportion of water was excreted (a smaller proportion of water was reabsorbed) by the kidney 1
[Do not accept: less water was reabsorbed]
(2) he was probably doing some exercise 1
some water was lost as sweat 1
(3) urea / nitrogenous waste is constantly produced by the body 1
a high concentration of urea is toxic, need to be expelled as urine from the body 1

6. (i) Species A 1
because less water is lost by evaporation / water content in faeces is smaller 1
showing that species A has a better ability to conserve water / less likely to become dehydrated 1
(ii) oxidation of food / respiration 1
(iii) breathing 1
sweating 1
(iv) *large intestine / *colon 1
(v) group B would die off first 1
because both groups of rats gained similar amount of metabolic water 1
but group B has a poorer ability to conserve water / loses more water 1

7. (i) A - *vena cava 1
for transporting blood / wastes to the heart 1
B - urinary *bladder 1
for storage of urine 1
(ii) (1) X from B / D 1
Y from C (also accept A) 1
(2) (I) protein is present in Y but not in X because proteins are too too large to pass through the glomerulus / capillaries 1 1
(II) glucose is present in Y but not X because glucose passes into the nephron is reabsorbed from the glomerular filtrate 1 1
(III) the concentration of urea in X is higher than that in Y because urea passes into the nephron / urea in nephron is not reabsorbed 1
water is reabsorbed from the glomerular filtrate 1

8. (i)



correct choice of axes 1
coned labelling of axes with units 1
correct plotting of all points 1

(ii) At 08:00 hours, the liver was removed 1
no deamination to produce urea but 1
the kidneys continued to excrete urea in the urine. 1
Therefore the blood urea concentration decreased
(iii) increase in blood urea 1
as there is no kidney to excrete the urea 1
which is continuously formed by the liver 1
(iv) storage of blood / vitamin / iron / glycogen / formation of bile / regulation of blood sugar level, etc. 1

9. (i) Urea is present in the blood but not in the solution 1
It diffuses into the surrounding solution 1
(ii) (1) Because only a small volume of blood enters the kidney machine per unit time
OR 1
To allow time to remove most of the urea from the body
(2) Urea will be continuously produced by the body 1
(iii) (1) All useful substances in the glomerular filtrate are reabsorbed back into the blood along the kidney tubule 1
(2) As the solution contains the same concentration of glucose, amino acids and minerals as the normal plasma, 1
there is no net movement of these substances from the blood into the solution. 1
(iv) Not many people are willing to donate their kidneys after their death 1
The kidney transplanted must match with the tissue of the patient 1

10. (i) Proteins are present in the blood plasma but not in the fluid in the nephron . 1
because proteins are too large to pass through the wall of the glomerulus / Bowman's capsule 1

(ii) The reabsorption of water from the fluid as it passes along the collecting duct 1

(iii) (1) glucose / amino acids
(2) The concentration of substance X drops to zero along the nephron 1
because X is reabsorbed from the fluid into the capillaries 1
by active transport 1

(iv) The amount of urea excreted would increase 1
because beans contain a lot of protein 1
which is digested into amino acids / is absorbed in the form of amino acids 1
Excess amino acids are broken down in the liver forming urea
thus an increased amount of urea 1
will be excreted
Effective communication (C) 1

11. (i) (1) The water potential of the red blood cells was higher than that of the surrounding solution. 1
Water moved out of the cells. 1
As a result, the cells shrank and became wrinkled. 1
(2) Because the water potential of some red blood cells was higher than, while that of others was equal to / lower than the water potential of the surrounding solution. 1

(ii) Observe the red blood cells again after some time. 1
The proportion of the two forms should remain the same if they had reached equilibrium in the previous observation. 1

(iii) The water potential of the red blood cells was lower than that of the surrounding solution. 1
Water entered the cells. The red blood cells expanded and burst, releasing the haemoglobin to the solution, thus making it red. 1

12. (i) Glomerular filtrate 1
The high blood pressure in the glomerulus 1
forces some plasma / blood except some large proteins / 1
blood cells out of the glomerulus through the thin / porous wall of 1
the glomerulus and the Bowman's capsule into X.

(ii) Some glucose in the blood of vessel A are filtered into the Bowman's capsule. 1
At the first coiled tubule it is then reabsorbed 1
into the capillaries which drain back to vessel B. 1
Some glucose in vessel A is carried in blood flowing toward vessel B. 1

(iii) The flow rate of blood in vessel A is higher due to the dilation of the vessel. 1
The rate of formation of the glomerular filtrate will increase, while the rate of water 1
reabsorption in the kidney tubule remains relatively the same, 1
thus the rate of urine production increases.

13. (i) (1) 6566.7% 1
(2) The urea content in urine is much higher because a large amount of water is reabsorbed / the amount of water reabsorbed along the kidney tubule is relatively much greater than that of urea 1

(ii) The water content of glomerular filtrate is greater than that of the plasma 1
because protein is too large to pass the wall of the glomerulus and that of the Bowman's capsule 1
The proportion of water in the glomerular filtrate thus increases 1

(iii) The person cannot produce sufficient insulin 1
to stimulate liver cells to convert glucose into glycogen 1
The level of glucose in the blood may become so high / exceed the threshold value 1
that glucose cannot be completely reabsorbed in the kidney 1
Thus it appears in the urine
Effective Communication (C) 1

Paper II

90-39	B
90-55	C
91-59	A
91-60	C
92-45	A
93-33	C
93-34	B
94-19	A
94-20	B
95-34	D
96-15	A
99-35	A
99-37	B
99-38	D
99-39	A
01-17	B
02-8	A
03-37	A
03-38	D
03-39	C
04-33	D
05-28	C
07-49	C
07-50	D

Past HKCEE Questions
Food and Humans
Paper I

1. Digestive juices were collected from two regions, A and B, of the alimentary canal of a rat. Each preparation was divided into four test-tubes, to which a sample of boiled plant tissue was added. Food tests were carried out on each tube, and the results are shown in the tables below:

Experiment I (using digestive juice from region A)

Food test	Biuret test		Benedict's/Fehling's test	
Tube no.	A1	A2	A3	A4
Time when food test was applied	at 0 hour	after 1 hour	at 0 hour	after 1 hour
Observation	violet colour	blue colour	blue solution	red precipitate

Experiment II (using digestive juice from region B)

Food test	Biuret test		Benedict's/Fehling's test	
Tube no.	B1	B2	B3	B4
Time when food test was applied	at 0 hour	after 1 hour	at 0 hour	after 1 hour
Observation	violet colour	violet colour	blue solution	red precipitate

(i) Referring to the tube numbers, indicate which tube(s) gave a *positive* result for
  (1) the Biuret test.
  (2) the Benedict's/Fehling's test.

(ii) What conclusion can be drawn from the results of
  (1) the Biuret test in experiment I?
  (2) the Benedict's/Fehling's test in experiment II?

(iii) Give one name each for the regions A and B and hence suggest the names of the juices collected.

(HKCEE 1984)

2. The table below shows an analysis of the food taken by a 15-year-old boy during the course of one day: (roughage = dietary fibre)

Meal	Food taken	Food components					Energy obtained (kJ)
		carbohydrate (g)	fat (g)	protein (g)	vitamin C (mg)	roughage (g)	
Breakfast	hot dog milk	105	36	18	0	0.5	3105
Lunch	fried chicken leg potato chips soft drink	65	33	45	0	1	3238
Supper	barbecued pork rice	108	15	36	0	1	3000
Daily total		278	74	99	0	2.5	9343

(i) Apart from water, which essential inorganic component of a balanced diet is not listed in the table?

(ii) Of the food taken for lunch and supper, which one would provide the largest proportion of carbohydrate?

(iii) The normal daily requirement of protein and energy recommended for such a boy is 70 g and 11700 kJ respectively.
  (1) Describe what happens to the excess protein in his body.
  (2) How can extra energy be derived from his body to meet his daily requirement?

(iv) It is suggested that oranges should also be taken in order to make up for the deficiency of two of the food components listed.
  (1) Give two reasons supporting this suggestion.
  (2) State two kinds of disorder he would suffer as a result of a long term deficiency of such food components.

(12 marks)
(HKCEE 1985)

3. The table below shows the composition by weight of certain nutrients present in soya beans and milk. The daily requirement of an adult for the respective nutrients is also included.

Nutrient	Amount in 100 g soya bean (g)	Amount in 100 g milk (g)	Daily requirement of an adult (g)
Protein	38.00	3.30	80.00
Carbohydrate	31.30	4.70	380.00
Fat	18.00	3.80	80.00
Calcium	0.06	0.12	0.80

(i) If the adult took in only 1000 g of soya bean in a day,
  (1) which nutrients shown in the table would he in excess of his daily requirement? (2 marks)
  (2) what would be the fate of the excess nutrients in (i) in his body ?(4 marks)

(ii) Given that the energy content of 100 g of milk Is 272 kJ, calculate the minimum amount of milk a baby should take per day in order to meet its daily energy requirement of 3400 kJ. (2 marks)

(iii) Why is milk considered an ideal food for babies? (1 mark)

(iv) What is the importance of calcium in the body? (1 mark)

(v) State a test for the presence of protein in milk, and the result of such a test. (2 marks)

(HKCEE 1987)

4. The table below shows the average body weight, the daily requirements of energy and certain nutrients fur four groups of people

	Body weight (kg)	Energy (kJ)	Protein (g)	Vitamin D (μg)	Iron (mg)
Children (4 to 6 years old)	20	7560	30	10	10
Men (23 to 50 years old)	70	11340	56	5	10
Women (23 to 50 years old)	55	8400	44	5	18
Pregnant women	65	9660	74	10	45

(i)
(1) Which group of people requires the greatest amount of energy per unit body weight? Show how you arrive at your answer. (2 marks)
(2) Suggest a reason why this group of people requires the greatest amount of energy per unit body weight. (2 marks)

(ii) How do men differ from children in their requirements for vitamin D? Give a reason for this difference. (2 marks)

(iii) Of the three adult groups, which group requires the largest amount of protein? Why is this so? (2 marks)

(iv) Account for the difference in iron requirement for the men and the non-pregnant women. (2 marks)

5. The table below shows the contents and the energy value of human milk and cow's milk:

	Human milk (per 100 cm^3)	Cow's milk (per 100 cm^3)
protein fat carbohydrate	1.2 g 3.8 g 7.0 g	3.4 g 3.8 g 4.8 g
vitamin A vitamin C vitamin D	0.053 mg 4.30 mg 0.0008 mg	0.034 mg 1.80 mg 0.0002 mg
calcium phosphorus iron	0.034 g 0.016 g 0.00021 g	0.126 g 0.100 g 0.00015 g
water	87.5 g	87.2 g
energy value	300 kJ	290 kJ

WITH REFERENCE TO THE TABLE ABOVE, answer the following questions:

(i)
(1) Which mineral is present in the least amount in both types of milk? (1 mark)
(2) In the absence of this mineral, what deficiency symptom would develop? (1 mark)

(ii) A one-year-old baby requires 5100 kJ of energy a day. How much human milk should the baby take in one day to meet its energy requirements? (1 mark)

(iii) Give ONE advantage of breast feeding a baby over bottle feeding with cow's milk. Explain your answer. (2 marks)

(iv) Suggest TWO reasons why cow's milk is better for the growth of children and youths. Explain your answer. (4 marks)

6. The table below shows the average daily energy requirements of people of different age groups.

Age	Average daily energy requirements (kJ)	
	Male	Female
10-12	9240	8820
13-15	11340	10080
16-18	13020	9240
19-35	11760	8400
36-55	10500	7560
56-75	8820	6300

(i) From the data in the table, suggest two factors that can affect the daily energy requirements. (2 marks)

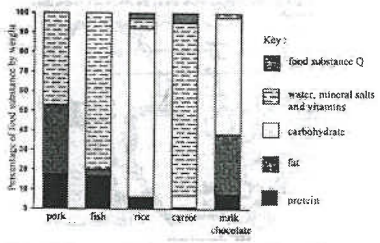
(ii) Which male age group has the highest daily energy requirement? Explain your answer. (2 marks)

(iii) If the above readings were taken in summer, how would you expect the readings to differ if they were taken in winter? (2 marks)

(iv) What will happen to a person if his daily energy intake is less than his daily energy requirement? (1 mark)

(HKCEE 1993)

7. The bar chart below shows the composition of food eaten by an overweight child for lunch:

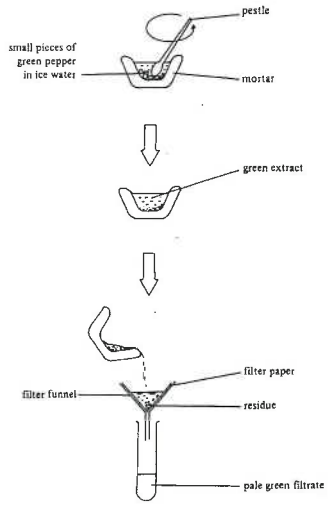


(i) (1) What is food substance Q? (1 mark)
(2) Explain its importance to the body. (2 marks)

(ii) The child often eats milk chocolate as a snack.
(1) Explain how it may contribute to his weight problem. (3 marks)
(2) Explain how it may cause tooth decay. (3 marks)

(iii) Explain why food from animals, such as pork and fish, is an important part of a child's diet. (2 marks)

8. The diagrams below show the steps involved in preparing a filtrate from green peppers:



The pale green filtrate collected was tested for the presence of four types of food substances. The results are shown below:

Test	Result
Benedict's test Biuret test Iodine test DCPIP test	orange precipitate blue solution brown solution pale green solution

(i) Name the pigment responsible for the green colour of the extract. (1 mark)

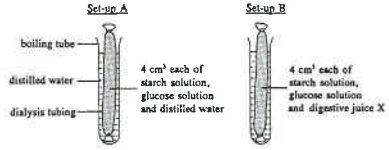
(ii) With reference to the diagrams, explain why filtration is important in this experiment. (2 marks)

(iii) The residue left on the filter paper contained mostly an indigestible substance. Name this substance and explain the importance of its presence in our diet. (3 marks)

(iv) Deduce the types of food substances present in the filtrate. Give reasons for your answers. (4 marks)

(HKCEE 1992)

9. Two pieces of dialysis tubing were filled with different solution mixtures and immersed in distilled water as shown below:



After 30 minutes, 2 cm^3 of the water outside the dialysis tubing in set-up A was transferred into a separate test tube and Benedict's test was performed. The same procedure was repeated with set-up B. The results are recorded in the following table:

	Set-up A	Set-up B
Results of Benedict's test	+	+++

Key : '+' represents a small amount of red precipitate
'+++' represents a large amount of red precipitate

(i) What can you deduce from the result of set-up A? (2 marks)

(ii) (1) Explain why the amount of red precipitate of set-up B is greater than that of set-up A. (3 marks)
(2) Name two digestive juices from the human body that may produce the same result as digestive juice X. (2 marks)

(iii) Suggest three important precautions to reduce experimental errors when setting up this experiment. (3 marks)

10. In order to lose weight, an 18-year-old girl, Jane, had a diet as shown in the table below:

		Energy (kJ)	Protein (g)	Fat (g)	Carbohydrate (g)	Calcium (mg)	Iron (mg)	Vitamin C (mg)	Vitamin D (μg)
Breakfast	Bread	900	8	1	44	80	2.3	0	0
	Jam	300	0	0	20	5	0.4	3	0
	Coffee	400	3	2	20	90	0	0	0
Lunch	Ham sandwich	1050	16	13	15	12	2.5	0	0
	Coffee	400	3	2	20	90	0	0	0
Dinner	Fish	540	20	5	0	300	2.7	0	8.0
	Rice	3000	12	2	174	8	1.0	0	0
	Lettuce	30	1	0	1	23	1.0	15	0
Total intake per day		63	25	294	608	9.9	18	8.0	
Average daily requirement		58	*	*	600	15	30	2.5	

* Amount variable

(i) If the average daily energy requirement for Jane is about 9200 kJ, explain why this diet will be effective in helping her to lose weight. (3 marks)

(ii) Protein in the diet can be absorbed into the body as amino acids. Explain how amino acids can provide energy for Jane's daily activity. (3 marks)

(iii) If Jane continues this diet for several months, what disease will she probably develop as a result of mineral deficiency 7 (1 mark)

(iv) Describe a food test to show that fat is present in ham. (3 marks)

(HKCEE 2000)

11. Some vegetarians eat plant foods only.

(a) From the nutritional point of view, explain two advantages of having a diet rich in plant foods over that with little plant foods. (4 marks)

(b) Most plant foods have low protein content. Suggest a plant food that can provide a lot of protein to the vegetarians. (1 mark)

(HKCEE 2005)

12. Glycemic Index (GI) is a ranking of foods containing carbohydrates. It is based on their immediate effect on the blood glucose level after consumption. The higher the GI value of a food, the quicker the rise of blood glucose level. Below are the major food constituents and the GI values of some common food items:

Food item	Major food constituents			GI value
	Carbohydrate	Fat	Protein	
Whole milk	✓	✓	✓	27
Fat-free milk	✓	x	✓	32
Cornflakes	✓	x	✓	92
Oatmeal	✓	✓	✓	49

Key: '✓' means present
'x' means absent

(i) With reference to the major constituents of whole milk and fat-free milk in the above table, suggest why whole milk has a lower GI value. (3 marks)

(ii) For a diabetic person, which breakfast food item, cornflakes or oatmeal, is more suitable? Explain your choice. (3 marks)

(iii) Besides GI values, state and explain two other considerations regarding the nutritional content of food when you plan a healthy diet to reduce body weight. (4 marks)

(HKCEE 2007)

Past HKCEE Questions
Food and Humans
Paper II

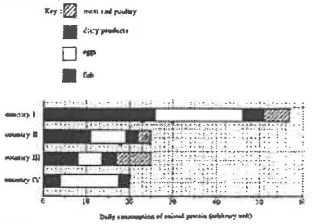
90.
90-06
In a starving mammal, the food reserves in the body will be depleted for energy release according to the following sequence:
A. carbohydrates, proteins, fats
B. carbohydrates, fats, proteins
C. fats, carbohydrates, proteins
D. fats, proteins, carbohydrates

90- 12
Nitrogen compounds are required by plants to form
A. glucose.
B. cellulose.
C. fatty acids.
D. amino acids.

91.
91-10
Which of the following combinations is INCORRECT?

	Deficiency of	Disease
A.	iron	goitre
B.	vitamin B	beri-beri
C.	calcium	rickets
D.	vitamin C	scurvy

Directions: Question 11 and 12 refer to the bar chart below which shows the daily consumption of animal protein by people of 4 countries (I, II, III and IV):



91-11
The daily consumption of fish protein is greatest in
A. country I.
B. country II.
C. country III.
D. country IV.

91-12
In which country, do diary products make up the largest proportion of animal protein in the diet of the people?
A. country I
B. country II
C. country III
D. country IV

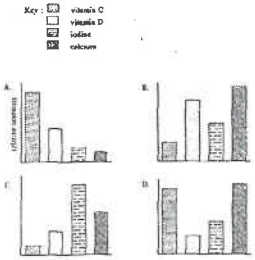
91-13
Which of the following foods provides the greatest amount of protein per unit mass?
A. spinach
B. potatoes
C. mushrooms
D. soya beans

91-37
Which of the following statements concerning a pregnant woman are true?
(1) She needs more protein in her diet.
(2) She needs more calcium in her diet.
(3) She needs more iron in her diet.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

92.
92-12
Which of the following groups of food has the greatest energy value?

	Carbohydrate (g)	Fat (g)	Protein (g)	Water (g)
A.	80	50	50	120
B.	80	60	50	110
C.	100	60	40	100
D.	120	30	50	100

92-17
The following bar chars (A, B, C and D) show the relative amounts of certain food substances taken in daily by 4 different persons. Which person is *least* likely to suffer rickets?



Directions: Question 21 refers to the following plant product:
(1) peanuts
(2) potatoes
(3) rice grains
(4) soya beans

92-21
Which type of plant product is best for supplementing the diet of people in poor countries so as to reduce protein deficiency?
A. (1)
B. (2)
C. (3)
D. (4)

93.
93-14
The table below shows the amount of certain food substance present in 100g of each of the three kinds of food X, Y and Z:

	Food X	Food Y	Food Z
Proteins (g)	8.3	14.8	3.3
Carbohydrates (g)	55.5	0.01	4.8
Fats (g)	1.7	28.2	3.8
Minerals (mg)	103	14.0	122

Which of the following correctly shows identifies the three kinds of food?

	Food X	*Food Y*	*Food Z*
A.	beef	bread	milk
B.	bread	beef	milk
C.	beef	milk	bread
D.	bread	milk	beef

93-23
The table below shows the daily requirements of certain nutrients and energy for four different types of people, namely 2-year-old children. 35-year old male labourers, 25-year old females and pregnant women:
Which row of information (A,B,C or D) describes the daily requirements for the 2-year old children?

	Daily requirements			
	Proteins (g)	Vitamin D (mg)	Calcium (mg)	Energy (kJ)
A	90	0.0025	500	15100
B	60	0.01	1200	10000
C	44	0.005	500	8400
D	35	0.01	500	5900

94.
Directions:
Questions 9 and 10 refer to the table below which shows the composition of food substances in four vegetables:

	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Calcium (mg)	* Carotene (mg)	Vit. C (mg)
Potato (100g)	79	1.9	0.7	16	11	0.01	18
Soya bean (100g)	70	13.6	5.7	7	100	0.28	25
Spinach (100g)	93	2.0	0.2	2	70	2.96	31
Green pepper (100g)	93	0.9	0	5	7	1.56	105

* Carotene can be converted to vitamin A in the human body

94-9
Vivian, a 6-year-old girl, does not have meat or milk in her diet. Which of the vegetables listed in the table is most important for her growth?
A. potato
B. soya bean
C. spinach
D. green pepper

94-10
If Vivian has bleeding gums, which vegetable is most effective in helping her to recover?
A. potato
B. soya bean
C. spinach
D. green pepper

95.
95-9
The table below shows the result of an experiment to compare the amount of vitamin C in four juices P, Q, R and S:

Fruit juice	*Number of drops used to decolourise 1cm³ DCPIP*
P	20
Q	24
R	40
S	28

Which fruit juice has the highest vitamin C concentration?
A. P
B. Q
C. R
D. S

95-13
Poor vision in dim light could be prevented by taking an adequate amount of
A. Beef.
B. Liver.
C. Fresh fruits.
D. Potatoes.

96.
Directions: Questions 3 and 4 refer to the information below:
Food tests were carried out on a certain kind of drink. The results are as follows:

	DCPIP test	*Biuret test*	*Benedict's test*
Result of the test	Colourless solution	Blue solution	Blue solution

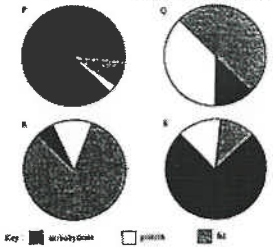
96-3
What can be concluded from the results?
A. The drink contains protein.
B. The drink contains vitamin C.
C. The drink contains protein and reducing sugar.
D. The drink contains vitamin C and reducing sugar.

96-4
A patient is recommended to take this drink regularly as a treatment. What disease might be suffered from?
A. Anaemia
B. Diabetes
C. Night-blindness
D. Scurvy

96-5
Vegetarians mainly eat plant products. Compared to a diet with meat, a vegetarian diet of the same mass contains.
(1) Less fat.
(2) More protein.
(3) More dietary fibre.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

96-6
Which of the following is *not* an essential component of the human diet?
A. Calcium salts
B. Fat
C. Nitrates
D. Water

Directions: Questions 7 and 8 refer to the pie charts below which show the proportion of carbohydrate, fat and protein in four kinds of diet:



96-7
Which diet provides the greatest amount of energy per unit mass?
A. P
B. Q
C. R
D. S

96-8
Which is a balanced diet?
A. P
B. Q
C. R
D. S

96-12
In Hong Kong, many school children are overweight because they
(1) Eat a lot of vegetables.
(2) Eat a lot of sugary food.
(3) Do little sport.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

98.
98-6
Obesity (being very fat) may lead to the following except
A. diabetes.
B. Liver cancer.
C. High blood pressure.
D. Coronary heart disease.

Directions: Questions 7 and 8 refer to the table below which shows the composition of food substances in four vegetables:

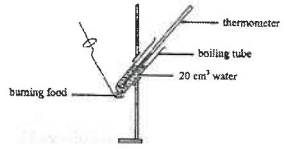
	Carbohydrate (g)	Fat (g)	Protein (g)	Calcium (g)	*Carotene (mg)	Vitamin C (mg)
Broad bean (100g)	12	0.7	9.0	15	0.15	12
Potato (100g)	16	0.7	1.9	11	0.01	18
Spinach (100g)	2	0.2	2.0	70	2.96	31
Green pepper (100g)	5	0	0.9	7	1.56	105

***Carotene can be converted to vitamin A in the** human body.

98-7
Which vegetable listed above has the highest energy value?
A. broad bean
B. potato
C. spinach
D. green pepper

98-8
A person has normal vision in bright conditions but cannot see clearly in dim light. Which vegetable listed above is most effective in helping him to overcome the problem?
A. broad bean
B. potato
C. spinach
D. green pepper

99.
Directions: Questions 10 and 11 refer to the following diagram of a set-up used to estimate the energy value of two types of food:



The table below shows the results obtained :

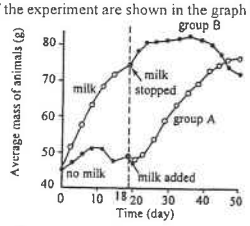
Type of food	Mass of food used (g)	Initial water temperature (°C)	Final water temperature (°C)
Sugar	3	20	60
X	2	20	73

99-10
Food X is mostly likely to be
A. rice.
B. bean.
C. butter.
D. milk powder.

99-11
Which of the following are the possible sources of error in estimating the energy value of food by using the above set-up?
(1) Heat is lost to the surroundings.
(2) The food is not burnt completely.
(3) The mass of food used is not the same.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

99-12
Which of the following food substances is not usually found in pork, milk and egg?
A. fat
B. protein
C. dietary fibre
D. mineral salt

00.
Directions: Questions 59 and 60 refer to the following information:
In the early 1900s, Frederick Hopkins performed an experiment using rats. He divided young rats from the same litter (developed from a single pregnancy) into two groups. Group A was fed with purified protein, sugar, starch, fat, mineral salts and water. Group B received the same food plus 3 mL of milk each day. After 18 days, group A instead of group B was given the milk. The results of the experiment are shown in the graph below:



00-59
Based on the given information, what do you think was the aim of Hopkins's experiment?
A. To show that the growth of rats requires protein, carbohydrates, fat, mineral salts, water and vitamins.
B. To show that milk is more important than protein, carbohydrates, fat, mineral salts and water for the growth of rats.
C. To show that milk contains vitamin A which is necessary for the normal growth of rats.
D. To show that milk contains some substances that are essential for the growth of rats.

00-60
In this experiment, Hopkins used rats from the same litter. This was to ensure that at the beginning of the experiment the two groups of rats
A. showed the least variation.
B. were of the same genotype.
C. were of the same phenotype.
D. did not contain vitamin A.

01-7
A student mixed a 0.1% amylase solution with a 1% starch solution. He performed a number of food tests on the mixture immediately after mixing and obtained the following results:

Iodine test	Biuret test	Benedict's test
+	+	–

Key : + positive result
– negative result

If he repeated the food tests on the mixture 10 minutes later, what would be the possible results?

	Iodine test	*Biuret test*	*Benedict's test*
A.	+	+	+
B.	–	+	–
C.	–	–	+
D.	+	–	–

01.
Directions: Questions 9 and 10 refer to the table below, which shows the composition of 150 g each of four kinds of food:

Food	Protein (g)	Carbohydrate (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A (mg)	Vitamin C (mg)
W	40	30	30	324	18	0.03	4.3
X	50	10	40	974	6	0.01	1.9
Y	30	10	60	226	3	0.09	1.5
Z	20	60	20	181	1	0.16	0.2

01-9
Which food has the highest energy value?
A. W
B. X
C. Y
D. Z

01-10
The haemoglobin content of a person's blood is found to be lower than normal. Which food would be most effective in helping the person to improve this condition?
A. W
B. X
C. Y
D. Z

02-10
For overweight people, beans are better than eggs and meat as sources of protein because beans contain
A. less fat.
B. more iron.
C. more amino acids.
D. less dietary fibre.

02-12
Apples are good for our health because they provide
(1) vitamins.
(2) minerals.
(3) dietary fibre.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

02-29
Which of the following statements about cellulose in plant cells is correct?
A. It stores energy for the plant cells.
B. It can be stained blue-black with iodine solution.
C. It helps to maintain the shape of the plant cells.
D. It regulates the movement of water in and out of the plant cells.

03-06
When a drop of liquid food was added to a piece of filter paper, a translucent spot appeared and remained after drying. What further step should be carried out in order to determine whether the food contains fat?
A. Rinse the spot with alcohol.
B. Put the paper under sunlight.
C. Heat the paper over a water bath.
D. Observe the spot again after 30 minutes.

03-12
Given a solution containing starch, lipase and glucose, which of the following tests will give a negative result with this solution?
A. Benedict's test
B. Biuret test
C. Emulsion test
D. Iodine test

03-15
Some old people suffer from a condition known as osteoporosis in which their bones become porous and brittle. This is due to the loss of a large amount of
A. iron.
B. calcium.
C. vitamin C.
D. vitamin D.

03-16
If a person suffers from night-blindness and constipation, which of the following foods is most effective for treating these disorders?
A. ham
B liver
C. carrot
D. whole meal bread

03-32
A balanced diet helps to prevent
A. AIDS.
B. anaemia.
C. food poisoning.
D. colour-blindness.

04-12
The diet of many children contains only a small amount of fruit and vegetables. This may lead to
A. anaemia.
B. constipation.
C. night-blindness.
D. rickets.

04-31
Man and woman differ in their dietary requirement of iron. This is because
A. man needs more red blood cells.
B. man can store more iron in his liver.
C. woman loses blood in the menstrual flow.
D. the red blood cells of woman have a shorter life span.

04-32
A woman's dietary requirement of calcium increases
A. during menstruation.
B. in the first week of pregnancy.
C. at the onset of labour.
D. during the breast-feeding period.

05-4
Eskimos are a people living in the Arctic regions. Their diet is rich in fat because
A. fat is a good insulator of heat.
B. they hunt polar animals for food.
C. fat has a higher energy value than carbohydrate.
D. their alimentary canal is adapted for digesting fat.

Past HKCEE Questions
Food and Humans
Suggested Answers

Paper I

1. (i) (1) A1, B1, B2 3
(2) A4, B4 2
(ii) (1) Digestive juice from A can break down proteins molecules. 1
(2) Digestive juice from B can break down starch into reducing sugar. 1
(iii) A: Duodenum 1
Juice from A: Pancreatic juice 1
B: Mouth Cavity, 1
Juice from B: Saliva 1

2. (i) Minerals 1
(ii) Rice 1
(iii) (1) Excess protein is deaminated into urea 1
by liver 1
(2) by respiration 1
using reserved food 1
(iv) (1) orange provide vitamin C 1
and roughage 1
(2) scurvy, 1
constipation 1

3. (i) (1) Protein 1
Fat 1
(2) excess amino acids will be deaminated 1
in the liver to form urea for excretion 1
to form carbohydrate / fat 1
excess fat is stored 1
(iii) Milk contains most of the essential nutrients/ milk can he easily taken 1
(iv) for formation of bone or teeth/ blood clotting 1
(v) Biuret test 1
purple colour formed 1

4. (i) (1) children, 1
by calculation : (378 > 162 , 153, 149) children > men > women > pregnant women 1
(2) children need to maintain a higher metabolic rate 1
in order to support greater growth / muscular /compensate for the higher rate of heat loss 1
(ii) men require less vitamin D than children 1
because they have already well developed bones/ *teeth* 1
(iii) pregnant women 1
for the growth of the foetus /embryo 1
(iv) women require more iron than men 1
for the formation of red blood cells in the blood which is lost periodically (during menstruation) 1

5. (i) (1) iron 1
(2) symptoms associated with anaemia 1
(ii) 1700 cm^3 1
(iii) in human milk, more vitamins good for general health 1
prevents deficiency diseases 1
(iv) in cow's milk, more protein 1
for the production of protoplasm / body growth 1
more calcium and / or phosphorus 1
for the growth of bones and teeth 1

6. (i) Age 1
Sex 1
(ii) Age between 16 and 18 1
They are growing actively 1
(iii) The readings would be higher 1
As more energy will be required to maintain their body temperatures during winter 1
(iv) His weight will decrease / he will become thinner 1

7. (i) (1) dietary fibre 1
(2) It adds bulk to food promotes peristalsis of the intestine and prevents constipation 1
(ii) (1) Milk chocolate contains large proportion of energy-rich food substances/carbohydrates/fat 1
If the energy intake of the child is greater than the energy needed. 1
The excess energy-rich food substances will be stored in the body as fat 1
which leads to overweight
(2) Milk chocolate contains high proportion of carbohydrates/It sticks easily to the tooth surface 1
Sugars in the chocolate are broken down by the bacteria in the plaque 1
To form acid which dissolves the enamel and causes tooth decay 1
Communication Skill (C) 1
(iii) Food from animals is rich in protein 1
which is necessary for the growth of the child 1

8. (i) * chlorophyll 1
(ii) to remove the residue / green chloroplasts 1
so that results / any colour changes of subsequent food tests can be easily observed 1
(iii) *cellulose
it increases the bulk of the indigestible material and stimulates the muscular movements along the alimentary canal / peristalsis 1
to prevent constipation 1
(iv) The presence of reducing sugar 1
is shown by the formation of orange precipitate in the Benedict's test 1
The presence of vitamin C 1
is shown by the decolorization of the DCPIP solution 1

9. (i) The formation of red precipitate indicates the presence of reducing sugar (glucose) in the water 1
This shows that the dialysis tubing is permeable to glucose / permits the diffusion of glucose into the external solution 1
(ii) (1) Increased amount of precipitates in set-up A indicates the presence of more reducing sugar which comes 1
from the hydrolysis / break down of starch 1
catalysed by the amylase / enzyme in digestive juice X 1
(2) * saliva / salivary juice 1
* pancreatic juice 1
(iii) Any 3 below: 3
- The knot of the dialysis tubing should be tied tightly
- The outside of the dialysis tubing should be rinsed with distilled water before immersing into the water.
- After putting in the dialysis tubing, the water in the boiling tube should be tested for the presence of reducing sugar immediately.
- The digestive juice X should be tested for the presence of reducing sugar.
- The dialysis tubing should be examined for any damage.
- The volume of distilled water in the boiling tube should be the same.

10. (i) The daily energy intake of Jane is 6620 kJ 1
which is less than her daily energy requirement 1
Thus she has to consume / mobilize the fat / food reserve in her body 1
leading to a loss in her body weight
Effective communication (C) 1
(ii) Amino acids are broken down in the liver 1
to form carbohydrate / a part without nitrogen (and urea) 1
which will be oxidized/used in respiration to release energy 1
(iii) anaemia 1
(iv) Any one set below (1+1+1) 3
- Rub a piece of ham on a filter paper.
- A translucent spot will remain after drying
- Immerse the paper in an organic solvent and the spot will disappear

OR
- Add alcohol to a piece of ham and obtain a clear solution
- Add water to the clear solution
- The solution will turn milky.

11. (a) any 2 sets 2x2
A vegetarian diet has low fat content
This will reduce the risk of obesity / heart diseases.
or
A vegetarian diet has a high content of dietary fibre
This helps maintain normal peristalsis / prevent constipation / reduce the risk of colon cancer / avoid overeating
or
A vegetarian diet has a high vitamin C content
This helps the formation of connective tissue / prevent scurvy
(b) beans / peas / nuts / mushroom 1

12. (i) Whole milk has more fat than fat-free milk 1
Presence of fat slow down the digestion of carbohydrates 1
and hence a slower absorption of glucose 1
(ii) Diabetics cannot lower their blood glucose level if it is too high 1
Oatmeal has a low GI value / causes a slow rise in blood glucose level 1
Therefore, oatmeal is better than cornfake 1

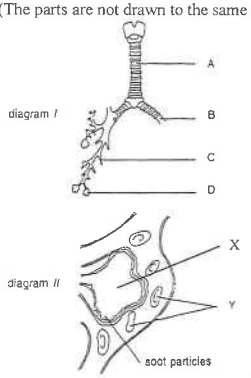
(iii) The overall energy intake should be less than the overall energy expenditure 1
so that the food reserve will be mobilized and used 1
The diet should contain sufficient amount and types of nutrient 1
for proper functioning of the body 1

Paper II

90-9	B
90-12	D
91-10	A
91-11	A
91-12	D
91-13	D
91-37	D
92-12	C
92-17	B
92-21	D
93-14	B
93-23	B
94-9	B
94-10	D
95-9	A
95-13	B
96-3	B
96-4	D
96-5	B
96-6	C
96-7	C
96-8	D
96-12	C
98-6	B
98-7	A
98-8	C
99-10	C
99-11	A
99-12	C
00-59	D
00-60	A
01-7	A
01-9	C
01-10	A
02-10	A
02-12	D
02-29	C
03-06	A
03-12	C
03-15	B
03-16	C
03-32	B
04-12	B
04-31	C
04-32	D
05-4	B

Past HKCEE Questions
Gaseous Exchange in Humans
Paper I

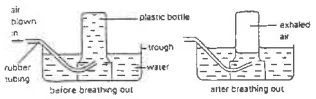
1. Diagram *I* below shows part of the human respiratory system, a portion of which is further magnified in diagram *II* to show greater detail. (The parts are not drawn to the same scale.)



a. Using the letters from diagram *I*, indicate the region which corresponds to diagram *II*. What is the name of the region?
b. Under normal circumstances, a gas G, diffuses from X to Y during gaseous exchange.
   i. What is G?
   ii State the structures (in their correct sequence) through which G passes as it goes from X to Y.
   iii. What immediate change would G undergo after entering Y?
c. What is the gas that diffuses from Y to X during gaseous exchange?
d. The presence of soot particles may affect gaseous exchange.
   i. State and explain the effect of the soot particles.
   ii. State a possible source of soot particles.

(11 marks)
(HKCEE 1983)

2. The diagram below shows an experiment which a person set up to measure the volume of air he breathed out:



The volume of the exhaled air was measured after adjusting the water levels inside and outside the bottle so that they were the same. A sample of the exhaled air was then taken out and analysed. The results are shown in the table below:

Volume of sample taken out for analysis	10.0 cm^3
Volume of sample after the absorption of carbon dioxide	9.6 cm^3
Volume of sample after the absorption of both carbon dioxide and oxygen	8.0 cm^3

(i) Why is it necessary to adjust the water levels before measuring the volume of the exhaled air?
(ii) Suggest a chemical substance that could be used in the above analysis for absorbing
   (1) carbon dioxide.
   (2) oxygen.
(iii) In the sample of exhaled air taken out for analysis, what was the percentage of
   (1) carbon dioxide?
   (2) oxygen?
(iv) If the person were to perform the above experiment again shortly after vigorous exercise, state the change, if any, in
   (1) the volume, and
   (2) the composition of the exhaled air.
   Explain your answer.
(v) What is the term used to describe the maximal volume of air that a person can breathe out?

(HKCEE 1984)

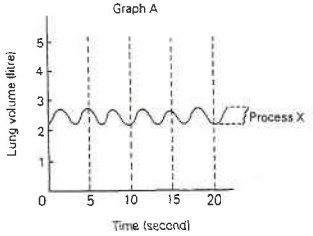
3. The table below shows the different amounts of air breathed out by a young man:

	Breaths per minute	Volume (cm^3) of a single expiration/exhalation
Before exercise	19	500
After exercise	36	1100

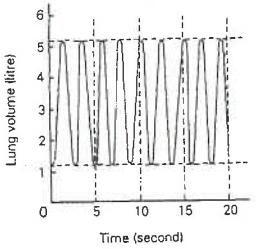
(i) From the above data, state two changes in breathing as a result of performing exercise.
(ii) In order to bring about the changes in (i), state
   (1) the part of the brain involved.
   (2) the stimulus concerned.
   (3) the two effectors responsible.
(iii) What is the volume of air breathed out per minute
   (1) before exercise?
   (2) after exercise?
(iv) If the percentage by volume of oxygen is 20% in atmospheric air and 16% in expired air, what is the volume of oxygen retained in the body per minute
   (1) before exercise?
   (2) after exercise? (HKCEE 1985)

4. Graph A shows the breathing pattern of a man at rest, while graph B shows that of the man doing a different activity.

Graph A

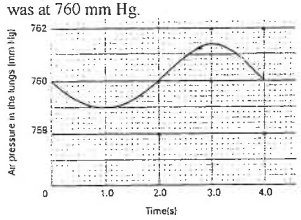


Graph B



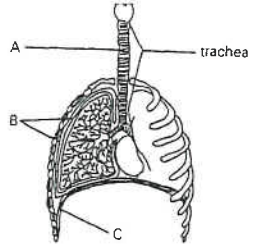
(i)
(1) Name process X (in graph A) which causes an increase in lung volume. (1 mark)
(2) How is process X brought about in man? (3 marks)
(ii) From graph A, calculate the breathing rate of the man in number of breaths per minute. (2 marks)
(iii)Suggest an activity undertaken by the man to account for the breathing pattern in graph B. (1 mark)
(iv) State two differences in the breathing patterns shown in graph A and graph B. What is the significance of these differences? (4 marks)
(HKCEE 1987)

5. The graph below shows the changes in air pressure in the lungs of a man measured during a single breath at rest. The atmospheric pressure was at 760 mm Hg.



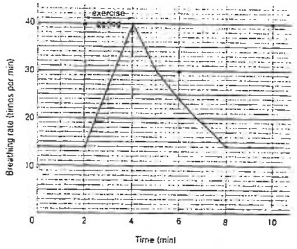
(i) State the period of time during which the man was breathing out air? Explain how you arrive at your answer. (2 marks)
(ii) Describe how the actions of the respiratory muscles brought about the changes in air pressure in the lungs when the man was breathing out. (4 marks)
(iii) Deduce the rate of breathing of the man at rest. (1 mark)
(iv) Copy the axes of the graph above and sketch a curve showing the likely changes in the air pressure in his lungs when the man is exercising. (2 marks)
(HKCEE 1990)

6. The diagram below shows part of the human respiratory system:



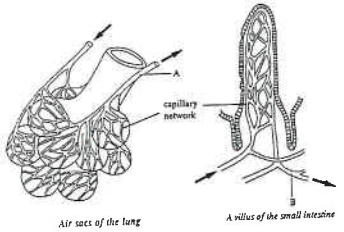
(i) Name the ring-like structure A. State its function. (2 marks)
(ii)
(1) Name the structures labelled B. (1 mark)
(2) Explain why the lung will collapse if structure B is punctured in an accident. (2 marks)
(iii) What would happen to muscle C when a person tries to breathe out as much air as possible? (1 mark)
(iv) Explain how each of the following features of the alveoli facilitates gaseous exchange in the lungs:
(1) one-cell thick
(2) greatly folded
(3) moist (3 marks)
(v) Cigarette smoke may inhibit the beating of the cilia in the respiratory tract. Explain how this could reduce the efficiency of the lungs in gaseous exchange. (2 marks)
(HKCEE 1991)

7. A student was asked to perform a physical exercise. Before and after the exercise, he rested on a chair. His breathing rate was measured at intervals. The results are shown in the graph below:



(i) What is the increase in the breathing rate as a result of the exercise? (1 mark)
(ii) Explain the significance of such an increase in the breathing rate. (3 marks)
(iii) Describe and explain the mechanism of inspiration (breathing in). (5 marks)
(iv) Besides becoming faster, what other change in the breathing movement would occur during exercise? (1 mark)
(HKCEE 1992)

8. The diagrams below show a group of air sacs of the lung and a villas of the small intestine with their associated capillaries. The arrows indicate the direction of blood flow. (The two diagrams are not drawn to the same scale.)



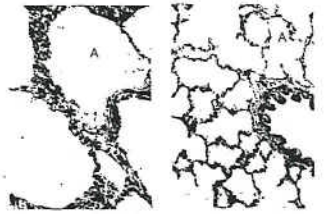
(i) Name one substance that is absorbed into the blood of
(1) the air sacs.
(2) the villus. (2 marks)
(ii) Both the air sacs and the villas are richly supplied with blood capillaries. State two reasons to explain how this feature can speed up the absorption of substances. (4 marks)
(iii) By means of a flowchart, indicate the route by which blood in a person is transported from A to B. Indicate the major blood vessels and heart chambers involved. (2 marks)
(iv) Explain the change in the carbon dioxide content when the blood in A flows to B. (3 marks)
(HKCEE 1994)

9. The table below shows the breathing rate and the volume of air inhaled per breath of a healthy woman at rest and during exercise:

	At rest	During exercise
Breathing rate (times per minute)	18	36
Volume of air inhaled per breath (cm^3)	500	1000
Ventilation rate (cm^3 per minute)	9000	?

(i) Calculate the ventilation rate of the woman during exercise. (2 marks)
(ii) Explain the significance of the increase in ventilation rate during exercise. (4 marks)
(iii) The air inhaled by the woman contains lots of dust particles but very few of them reach her lungs. Explain why. (3 marks)
(iv) Draw and label a set-up to estimate the volume of air exhaled in a breath. (3 marks)
(HKCEE 1995)

10. The photographs below show the sections of the lung tissues of a cigarette smoker and a nun-smoker observed under the microscope with the same magnification:

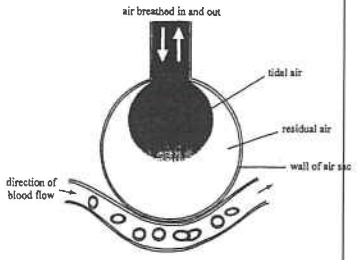


Lung tissue of a smoker Lung tissue of a non-smoker

(i) What is structure A? (1 mark)
(ii) Describe and explain the mechanism by which air from the atmosphere is drawn into structure A. (4 marks)
(iii) With reference to the photographs, explain how the function of structure A is affected by cigarette smoking. (2 marks)
(iv)
(1) State a disease which may he caused by tar in cigarette smoke. (1 mark)
(2) Draw a labelled diagram of a set-up used

to show the presence of tar in cigarette smoke. (3 marks)
(HKCEE 1997)

11. The diagram below shows the structure of an air sac of the human lung. The tidal air refers to the air that can be breathed in and out of the body in each breath. The residual air refers to the air that cannot be exchanged with the atmosphere during breathing.

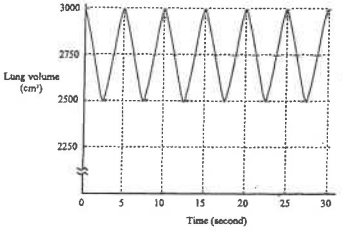


(i) Describe how oxygen in the tidal air reaches the blood. (3 marks)

(ii)
(I) If a person breathes deeply, how will the volume of tidal air inhaled be affected? (1 mark)
(2) Based on your answer to (1), explain the effect of deep breathing on the rate of oxygen uptake in the blood. (2 marks)

(iii) Explain one effect of smoking on the process described in (i). (2 marks)

12. The graph below shows the changes in lung volume of a boy at rest over a period of 30 seconds:



(i) Determine the rate and depth of breathing of the boy at rest. (2 marks)

(ii) State the period of time in the first 5 seconds during which air was flowing out of the lungs. (1 mark)

(iii) Explain how the outflow of air from the lungs was brought about by the breathing mechanism. (4 marks)

(iv) If the pleural membrane on the left side of the boy's thorax is punctured, his left lung will collapse while his right lung will not. What would be the change in
(1) his breathing movement, (1 mark)
(2) the air flow of his left and right lungs? (2 marks)
(HKCEE 2001)

13. To study the effect of concentration of oxygen and carbon dioxide on the breathing rate, a healthy person was asked to inhale different gas mixtures. The results are shown in the table below:

Gas mixture	Concentration of gas (%)		Breathing rate (breaths per min)
	Oxygen	Carbon dioxide	
P	21	0.03	17
Q	21	4.00	34
R	16	0.03	17
S	16	4.00	34

(i) With reference to the above information, state the factor that affects the breathing rate of the person. Explain how you arrive at your answer. (3 marks)

(ii) Which of the four gas mixtures has similar concentrations of oxygen and carbon dioxide as exhaled air? (1 mark)

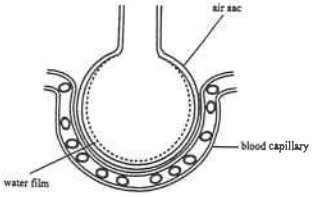
(iii) Mouth-to-mouth ventilation is a method for rescuing a person who fails to breathe but still has heartbeat. It involves blowing exhaled air into the patient's body through the mouth as shown below:

Based on the composition of exhaled air, explain why this method can help the patient stay alive before he can breathe again. (2 marks)

(iv) Suggest why it is necessary to do the following when carrying out mouth-to-mouth ventilation
(1) Tilt the patient's head as shown in the diagram, instead of letting it lie flat. (1 mark)
(2) Observe whether the patient's chest rises when blowing air into the patient. (1 mark)

(v) Which part of the brain controls the breathing rate? (1 mark)
(HKCEE 2003)

14. The diagram below shows an air sac of the lung and its blood supply.



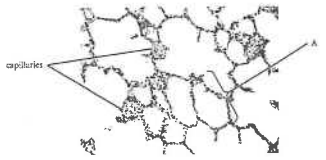
(i) Explain the importance of the water film in gaseous exchange. (2 marks)

(ii) SARS patients may have fluid accumulated in the air sacs. Explain how the accumulation of fluid may affect the oxygen content of the blood of the patients. (3 marks)

(iii) One method to confirm whether a patient is infected with the SARS virus is to test for the presence of antibodies against this virus in the patient's blood. Explain why these antibodies will be produced by a SARS patient. (2 marks)

(iv) Suggest a method that can help the body develop immunity against SARS. Explain how the immunity is developed. (4 marks)
(HKCEE 2004)

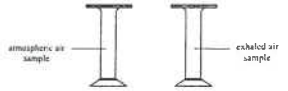
15. The photomicrograph below shows a section of a mammalian lung:



(a) With reference to *two* features observable in the photomicrograph, explain how the lung tissue is adapted to gas exchange. (4 marks)

(b) Oxygen moves continuously from the air in A into the capillaries. However, the oxygen content in A remains relatively high. Explain how this is achieved. (2 marks)

(c) Eric wanted to compare the oxygen content of atmospheric air and exhaled air, so he prepared two jars of gas as shown below:

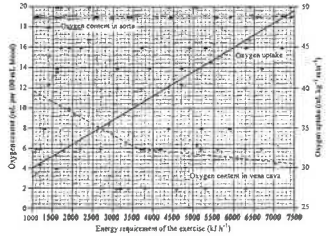


(i) Draw a labelled diagram to show a set-up that can be used to collect the air exhaled from his lungs. (4 marks)

(ii) Describe what Eric should do in order to compare the oxygen content of the two air samples. (2 marks)

(HKCEE 2005)

16. The graph below shows the oxygen content of blood in the aorta and that in the vena cava, and the oxygen uptake of a person performing exercise of different intensities. The intensity of exercise is expressed as the energy requirement of the exercise.



(i) How does the oxygen uptake change with exercise of different energy requirements? (1 mark)

(ii) From the graph, find out the blood oxygen content in the aorta and the vena cava for boxing, which has an energy requirement of 4500 kJ h^{-1}. (1 mark)

(iii) The energy requirements for running and cycling leisurely are 3600 kJ h^{-1} and 1800 kJ h^{-1} respectively. Calculate the difference in the blood oxygen content between the aorta and the vena cava for each type of exercise. (2 marks)

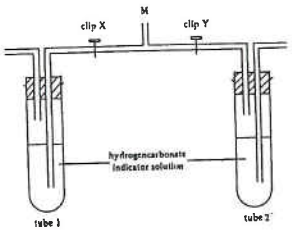
(iv) How does the difference in blood oxygen content between the two blood vessels change with the intensity of exercise? Explain the significance of this change. (3 marks)

(v) As exercise intensity increases, there is a great change in the blood oxygen content in the vena cava, but that in the aorta remains constant and high. Explain how the constant and high blood oxygen content in the aorta can be achieved. (3 marks)

(HKCEE 2006)

Past HKCEE Questions
Gaseous Exchange in Humans and in Plants
Paper II

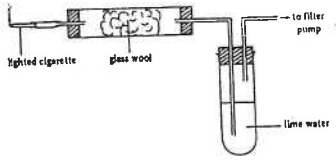
90-14
The following apparatus is used to compare the amounts of a certain component in exhaled and inhaled air:



When a student exhales air through M, which of the following combinations is correct?

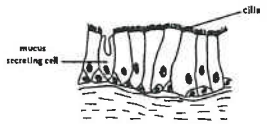
	Clip X	Clip Y	Colour of indicator in tube 1	Colour of indicator in tube 2
A.	closed	open	yellow	red
B.	closed	open	red	yellow
C.	open	closed	red	yellow
D.	open	closed	yellow	red

90-18



Using the above experimental set-up, which of the following substances present in cigarette smoke an be detected?
(1) tar
(2) nicotine
(3) carbon dioxide
A. (1) only
B. (3) only
C. (1) and (3) only
D. (2) and (3) only

90.
Directions: Questions 20 and 21 refer to the diagram below which shows the inner lining of a certain part of the human body



90-20
This inner lining an he found in
A. the trachea.
B. the alveolus.
C. the renal tubule.
D. the small Intestine.

90-21
The function of this lining is to facilitate
A. the exchange of gases.
B. the removal of dust particles.
C. the absorption of food substances.
D. the reabsorption of useful materials.

91-20
Cigarette smoking is hazardous to health because
(1) cigarette smokers eventually die of lung cancer.
(2) there is a high correlation between cigarette smoking and heart diseases.
(3) tar from cigarette making is deposited on the surface of the alveoli thereby reducing the efficiency of gaseous exchange.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

91-25
The table below shows the tar and nicotine content present in the cigarette smoke of 5 brands of cigarettes:

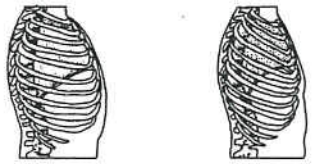
Brand of cigarette	With filter (+) or without filter (-)	Tar (mg/cigarette)	Nicotine (mg/cigarette)
P	+	15	1.0
Q	-	33	2.1
R	+	20	1.3
S	+	22	1.4
T	-	38	3.2

Which of the following statements is correct?
A. Cigarette fillers can reduce the tar content but increase the nicotine content.
B. Cigarette filters can increase the tar content but reduce the nicotine content.
C. Cigarette filters can increase both the tar content and the nicotine content.
D. No conclusion can be drawn from the above results.

91-26
Vital capacity is the maximum volume of air breathed out
A. during exercise.
B. in a resting condition.
C. after the deepest inspiration.
D. after the deepest expiration.

91-27
Which of the following shows the correct sequence of air passage into the lungs?
A. trachea → larynx → air sacs → bronchi
B. larynx → trachea → bronchi → air eau
C. air sacs → larynx → trachea → bronchi
D. larynx → bronchi → trachea → air sac

93.
Directions: Questions 18 and 19 refer to the two diagrams below which show the side view of the human thorax in two different conditions:



Condition I *Condition II*

93-18
Which of the following occurs when the thorax changes from *condition* I to *condition II*?
A. Intercostal muscle contracts and air flows into the lungs.
B. Intercostal muscle contracts and air flows out of the lungs.
C. Intercostal muscle relaxes and air flows into the lungs.
D. Intercostal muscle relaxes and sir flows out of the lungs.

93-19
Which of the following is correct when the thorax changes from *condition II* to *condition I*?

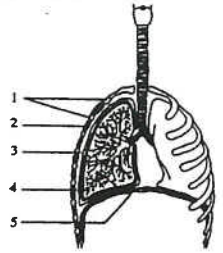
	Diaphragm muscle	Pressure in lungs
A.	contracts	increases
B.	relaxes	increases
C.	contracts	decreases
D.	relaxes	decreases

93-20
What will happen when the pleural membrane is punctured?
A. The air sacs are damaged.
B. The lungs cannot expand.
C. The diaphragm cannot contract.
D. The ribs cannot be raised upwards.

93-21
Which of the following statements about cigarette smoking is correct?
A. Nicotine causes lung cancer.
B. Nicotine stains the lungs brown.
C. Tar is the main factor that causes addiction to smoking.
D. Carbon monoxide reduces blood oxygen content.

94-38
Which of the following sequences of events will occur when a person inhales while he is asleep?
A. The diaphragm muscles contract → atmospheric air rushes into the lungs → the lungs dilate
B. The in ntercostalsuscles contract → atmospheric air rushes into the lungs → the lungs dilate
C. The diaphragm muscles contract → the lungs dilate → atmospheric air rushes into the lungs
D. The in ntercostalsuscles contract → the lungs dilate → atmospheric air rushes into the lungs

95.
Directions: Questions 17 and 18 refer to the diagram below which shows the human respiratory system:

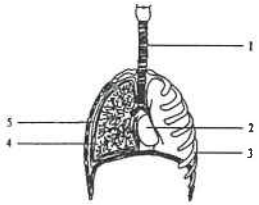


95-17
Which of the following are the functions of structure 1?
(1) forming red blood cells
(2) protecting the lungs
(3) helping ventilation
A. (1) and (2) only
8. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

95-18
Which structures contract rhythmically during breathing?
A. 2 and 4
B. 2 and 5
C. 3 and 4
D. 3 and 5

95-19
Which of the following may cause heart disease and damage of cilia in the trachea?
A. alcohol drinking
B. cigarette smoking
C. too much rally food in the diet
D. too much salted fish in the diet

96.
Directions: Questions 19 to 21 refer to the diagram below which shows some of the structures in the human thoracic cavity:



96-19
Heavy cigarette smoking will affect the functioning of
A. structures 1, 2 and 3.
B. structures 1, 2 and 4.
C. structures 1, 3 and 4.
D. structures 2, 3 and 4.

96-20
Which of the following correctly describes the long-term effect of cigarette smoking on the body?
A. The breathing rate decreases.
B. Voluntary actions become faster.
C. The blood pressure becomes lower.
D. The oxygen level in the blood becomes lower.

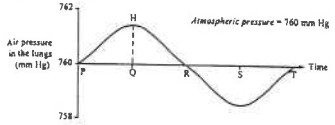
96-21
Which of the following will occur if structure 5 is broken?
A. The lungs will collapse.
B. The ribs will stop moving.
C. The air sacs will be filled with water.
D. The diaphragm will not be able 1o contract.

96-58
The exhaled air from our body consists mostly of
A. carbon dioxide.
B. nitrogen.
C. oxygen.
D. water vapour.

97-19
Which of the following changes will occur when a person is doing vigorous exercise?

	Depth of breathing	Rate of breathing	% O_2 in inhaled air
A.	increases	increases	increases
B.	decreases	constant	increases
C.	increases	increases	constant
D.	decreases	constant	constant

98.
Directions: Questions 14 to 16 refer to the graph below which shows the change in air pressure in the lungs of a person:



98-14
Inhalation occurs from
A. P to Q.
B. P to R.
C. R to S.
D. R to T.

98-15
Which of the following correctly describes the state of the in ntercostalsuscle and the shape of the diaphragm at Q?

	Intercostal muscle	Diaphragm
A.	contracted	flattened
B.	contracted	dome-shaped
C.	relaxed	flattened
D.	relaxed	dome-shaped

98-16
The shape of the curve above will change when the person is doing vigorous exercise. Which of the following correctly describes the changes?

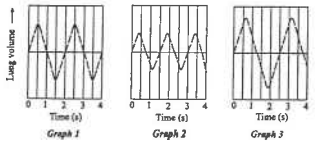
	Distance between *P* and *T*	Distance between *H* and *Q*
A.	increases	increases
B.	increases	decreases
C.	decreases	increases
D.	decreases	decreases

99-36
Regular exercise may increase the vital capacity of a person. What is the advantage of having a larger vital capacity?
A. The lungs can take in more air during exercise.
B. The breathing rate can increase more during exercise.
C. The lungs can take in air with a higher oxygen concentration during exercise.
D. Normal activity can be maintained at a lower breathing rate.

01-15
Which of the following features of the respiratory tract helps to warm the inhaled air?
A. The nasal cavity has a lot of hair.
B. The lining of the trachea is covered with cilia.
C. The lining of the respiratory tract is coated with mucus.
D. The wall of the nasal cavity is richly supplied with capillaries.

01-16
For a person who carries out physical exercise regularly, which of the following will not occur?
A. His joints will become more flexible.
B. He will have a lower heart rate at rest.
C. He will breathe at a higher rate at rest.
D. He will develop a larger vital capacity.

02.
Directions: Questions 30 and 31 refer to the graphs below, which show the rate and depth of breathing of three persons during a fitness test:



02-30
Referring to graph 1, what is the breathing rate of the person?
A. 15 breaths per minute
B. 30 breaths per minute
C. 45 breaths per minute
D. 60 breaths per minute

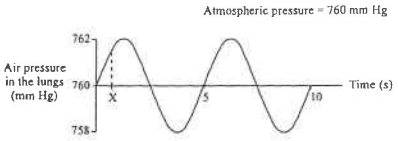
02-31
The three persons are a cigarette smoker, a non-smoker and a professional runner. Which of the following correctly identifies the person represented by each of the graphs?

	Graph 1	Graph 2	Graph 3
A.	smoker	non-smoker	runner
B.	non-smoker	runner	smoker
C.	non-smoker	smoker	runner
D.	runner	smoker	non-smoker

03-17
Which of the following correctly lists the sequence of events that follows the contraction of the in ntercostalsuscles and diaphragm muscle?
(1) Air enters the lungs.
(2) The lung volume increases.
(3) The pressure in the lungs decreases.
A. (2), (1), (3)
B. (2), (3), (1)
C. (3), (1), (2)
D. (3), (2), (1)

05-5
The lining of the nasal cavity is covered with a thin film of mucus. What is the importance of the mucus?
A. It warms up the inhaled air.
B. It helps remove dust from the incoming air.
C. It lubricates the passage of air into the respiratory tract.
D. It helps dissolve oxygen in the inhaled air for gas exchange.

The diagram below shows the changes in the air pressure in the lungs of a person when he is at rest:

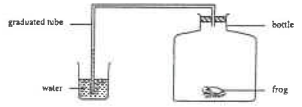


05-17
What is the rate of breathing of this person at rest?
A. 10 breaths per minute
B. 12 breaths per minute
C. 18 breaths per minute
D. 24 breaths per minute

05-18
Which of the following correctly describes the state of the intercostal muscles and the diaphragm at time X?

	Intercostal muscles	*Diaphragm*
A.	contracting	dome-shaped
B.	contracting	flattened
C.	relaxing	dome-shaped
D.	relaxing	flattened

06.
Directions: Questions 19 and 20 refer to the diagram below, which shows a setup designed by a student to study the respiration of a frog:

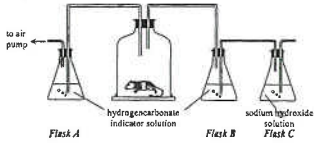


06-19
The set-up failed to show a rise in water level in the graduated tube as expected. How should the student correct the set-up?
A. The bottle should be filled with oxygen.
B. The bottle should be wrapped with cotton

C. A bag of soda lime should be placed inside the bottle.
D. The water should be replaced by hydrogencarbonate indicator solution.

06-20
After the correction, the experiment was repeated. There was a rise in water level in the graduated tube showing a difference in readings of 4 cm^3. Which of the following is the correct interpretation of the result?
A. The amount of oxygen breathed in by the frog is 4 cm3.
B. The amount of carbon dioxide breathed out by the frog is 4 cm3.
C. The amount of oxygen breathed in is 4 cm^3 more than the amount of carbon dioxide breathed out by the frog.
D. The amount of oxygen breathed in is 4 cm^3 less than the amount of carbon dioxide breathed out by the frog.

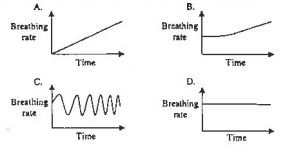
Directions: Questions 21 and 22 refer to the diagram below, which shows a setup used to investigate the respiration of a mammal. The air pump was switched on for 20 minutes.



06-21
Which of the following correctly states the colour of the hydrogencarbonate indicator solution in flask A and flask B after 20 minutes?

	Flask A	*Flask B*
A.	red	purple
B.	red	yellow
C.	yellow	purple
D.	purple	red

06-22
If the air pump is switched off, which of the following graphs shows the breathing rate of the mammal for the next five minutes?



07-12
Which of the following correctly describes the functioning of the human breathing system?

A. The bronchus cannot change its size.
B. The nasal cavity has hairs to trap dust.
C. The diaphragm contracts during inhalation.
D. The lung expels air through its muscular contraction.

07-13
Cigarette smoking results in the deposition of tar on the inner surface of the air sacs. This would decrease
A. the depth of breathing.
B. the efficiency of gas exchange.
C. the resistance for gas diffusion.
D. the amount of oxygen that flows into the lungs.

07-41
The film of water on the surface of human air sacs serves to

A. warm the incoming air.
B. moisten the incoming air.
C. trap dust in the inhaled air.
D. dissolve the gases in the inhaled air.

Past HKCEE Questions
Gaseous Exchange in Humans and in Plants
Suggested Answers

Paper I

1. (i) D (letter only) 1
alveolus / air sac 1
(ii) (1) Oxygen/ O_2 1
(2) X → alveolar wall (NOT for reversed direction) → capillary wall → RBC / Y 1 1 1
(3) combine with haemoglobin / forming oxyhaemoglobin 1
(iii) carbon dioxide / CO_2 1
(iv) (1) slow down / decrease the rate 1
reduce surface 1
(2) smoking / car exhausts / polluted air / etc. 1

2. (i) to ensure that the volume of air is measured at atmospheric pressure / same pressure 1
(ii) (1) potassium hydroxide / sodium hydroxide (solid or solution) 1
(2) alkaline pyrogallol / pyrogallic acid solution 1
(iii) (1) CO_2 % = 4% 1
(2) O_2 % = 16% 1
(iv)

	(1) volume	(2) composition	
change	increase	no or little	1, 1
explanation	increase of CO_2 in blood		1
	causing increase in	depth / rate	1 1
		of breathing	

(v) vital capacity 1

3. (i) rate of breathing increased 1
depth of breathing / volume of exhaled air increased 1 1
(ii) (1) medulla oblongata / breathing centre 1
(2) increased $C0_2$ concentration in blood 1
(3) intercostal muscles 1
diaphragm 1
(iii) (1) 9500 cm^3 1
(2) 39600 cm^3 1
(iv) (1) 380 cm^3 1
(2) 1584 cm^3 1

4. (i) (1) inspiration / inhalation / breathing in 1
(2) intercostal muscles contract/ ribs move upward and outward 1
diaphragm muscles contract / diaphragm becomes flattened 1
thoracic volume increases / air pressure inside the lungs decreases 1
(ii) 6/20 x 60 1
= 18 breaths per minutes 1
(iii) doing exercise 1
[or any other suitable activities]
(iv) In graph B change in lung volume is greater / depth of breathing is greater 1
breathing rate is faster 1
[or vice versa for graph A]
Significance:
to remove more C02 / to remove $C0_2$ produced in exercise 1
to supply more 0_2 / to supply 0_2 for the exercise 1

5. (i) from 2.0 s to 4.0s 1
pressure in the lungs is greater than the atmospheric pressure 1
(ii) - in ntercostalsuscles relax 1
- to lower the ribs 1
- diaphragm relaxes 1
- to curve upward (any 3)
(iii) 15 breaths per minute 1
(no unit, no mark)
(iv) showing a higher frequency 1
showing a greater magnitude 1
(no unit / reference point, no mark)

6. (i) ring cartilage 1
to prevent collapse of the trachea / to allow free passage of air 1
(ii) (1) pleural membranes / pleura
(2) because air leaks in / increases pressure between pleura the lung 1
recoils / collapses due to its own elasticity 1
(iii) muscle C relaxes 1
(iv) (1) to provide a short distance for diffusion 1
(2) to provide a large surface area for diffusion 1
(3) to dissolve the respiratory gases for diffusion to occur 1
(v) dust particles cannot be removed from the respiratory tract / more dust particles enter the lungs 1
thereby reducing the surface area for gaseous exchange 1

7. (i) 26 times/minute (no unit, no mark)
(ii) An increase in breathing rate provides the body with more oxygen (1) and hence more energy is released (1) by respiration / oxidation of food (1) It also helps the body to get rid of carbon dioxide (product of respiration) more quickly (1) (any 3) 3

7. (iii) Intercostal muscle contracts to raise the rib cage 1
Diaphragm muscle contracts to make the diaphragm flattened 1
these 2 actions together increase the volume of thoracic cavity 1
thus decrease the thoracic pressure / pressure inside the lung 1
The greater atmospheric pressure forces air into the lungs 1

(iv) The amplitude / depth of breath is greater 1

8. (i) (1) oxygen 1
(2) glucose / amino acids / mineral salts / vitamins / water 1

(ii) With a rich supply of blood capillaries, substances absorbed can be transported away so as to maintain a steep concentration gradient across the wall of the air sacs / villus 1
The capillary network provides a large surface area 1
As a result, the rate of diffusion of substances increases 1

(iii) A → pulmonary vein → left atrium → left ventricle → aorta → B 0.5 x 4
N.B. 1/2 mark for each correct spelling of the heart chambers / blood vessels in the correct sequence. Deduct 1/2 mark for not showing arrow sign. No mark if the answer is not in the form a flow chart.

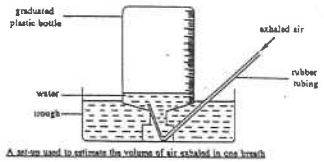
(iv) The blood CO_2 content increases 1
because CO_2 is produced by respiration 1
by the cells in the villus (small intestine) 1

9. (i) Ventilation rate
= 1000 x 36 cm_3 per minute 1
= 36000 cm_3 per minute 1
(no unit, no mark)

(ii) To supply more oxygen to the skeletal muscles for faster respiration / for more energy supply 1
1
1
To remove CO_2 more rapidly 1

(iii) Dust particles are trapped by the hair in the nose and mucus 1
1
along the lining of the air passage / nasal cavity / trachea 1

(iv) large, clear accurate diagram 1
labels and title (any 4) 1/2



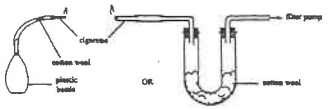
A set-up used to estimate the volume of air exhaled in one breath

10. (i) air sac 1

(ii) The intercostal muscles contract to raise the rib cage 1
The diaphragm muscles contract to flatten the diaphragm 1
The volume of the thoracic cavity increases, 1
and hence the pressure inside decreases 1
so air rushes into structure A 1
Communication skill(c) 1

(iii) The number/surface area of structure A is reduced/the surface of structure A of the smoker is less folded 1
which greatly reduces the rate of gaseous exchange 1

(iv) (1) lung cancer 1
(2) Large and accurate diagram 0.5
Label and title: *cigarette, filter *pump, *cotton wool (No mark if the set-up is not workable) x 4



A set-up to show the presence of tar in cigarette smoke

11. (i) Oxygen in the tidal air diffuses through the residual air 1
and dissolves in the water film lining the air sac 1
It then diffuses across the walls of the air sac and the capillary into the blood 1
Effective communication (C) 1

(ii) (1) The volume of tidal air will increase 1

(2) The oxygen uptake in the blood becomes faster: 1
because (any one below) 1
- the distance of diffusion of oxygen from the tidal air to the water film is reduced
- or because resurface area of the air sac for diffusion of oxygen is increased

(iii) Particles / Tar deposit on the wall of the air sac 1
thus reduce the rate of diffusion of oxygen 1
(accept other correct answers)

12. (i) Rate of breathing = 12 breaths per minute 1
Depth of breathing = 500 cm^3 1

(ii) between 0 and 2.5 second 1

(iii) Intercostal muscles relaxed, so that the ribs moved downward and inward 1
Diaphragm muscles relaxed, so that the diaphragm recoiled to the dome-shape 1
The thoracic / lung volume decreased 1
leading to an increase in air pressure in the lungs 1
Effective communication (C) 1

(iv) (1) The breathing movements would become faster 1
(2) In the left lung, air flow would decrease 1
In the right lung, air flow would increase 1

13. (i)
- Concentration of carbon dioxide. 1
- Because the breathing rate increases / changes with the concentration of carbon dioxide, 1
- while it remains the same regardless of the change in oxygen concentration. 1

(ii) S 1

(iii)
- Exhaled air still contains 16% oxygen. 1
- When blown into the patient's lungs, the oxygen can be supplied to the body cells for respiration. 1

(iv) (1) To ensure the entrance of the trachea is clear / free from obstructions. 1
(2) To ensure that air is blown into the lungs. 1

(v) medulla 1

14. (i) Oxygen in air dissolves in the water film, 1
so that it can diffuse readily through the wall of the air sac into the blood capillary. 1

(ii) The accumulation of fluid increases the distance for diffusion / reduces the surface area for dissolving oxygen, thereby decreases the rate of diffusion of dissolved oxygen into the blood capillaries. 1
Thus the oxygen content of the blood decreases / becomes lower than normal. 1

(iii) The antigen of the SARS virus stimulates the white blood cells of the patient to produce the specific antibodies. 1

(iv) Injection of the weakened virus / the antigen into the body. 1
This will stimulate the white blood cells to develop memory for the antigen. 1
When the same virus enters the body, 1
a large amount of antibodies can be produced rapidly to kill the virus. 1

15. (a) Any one set below: 2
- The wall of A is very thin
- so as to reduce the distance of diffusion of respiratory gases

or
- A is richly supplied with blood capillaries
- This allows a rapid transport of gas to and away from the air sacs / can maintain a steep concentration gradient of gases between A and the blood

or
- The lung tissue is made up of numerous air sacs
- so that there is a large surface area for gas exchange / the diffusion of gases

16. (i) Oxygen uptake increases with exercise of increasing energy requirement 1

(ii) Oxygen content in aorta: 19 mL per 100 mL blood 1
Oxygen content in vena cava: 5.6 mL per 100 mL blood or 0
Difference in oxygen content for running = 19 - 6 = 13 mL per 100 mL blood 1
Difference in oxygen content for cycling = 19 - 10 = 9 mL per 100 mL blood 1

(iv) The difference in blood oxygen content between the aorta and the vena cava increases with increased exercise intensity 1
This is because that more oxygen is consumed by tissue 1
for respiration to release more energy for increased exercise intensity 1

(v) During vigorous exercise, there is an increase in ventilation rate / rate and depth of breathing 1
The oxygen content in air sac increases 1
The diffusion gradient across alveolar wall increases / This increases the diffusion of oxygen into the blood 1
thus maintaining the blood oxygen content of the aorta at a constant and high level 1

Paper II

90-14	D
90-18	C
90-20	A
90-21	B
91-20	C
91-25	D
91-26	C
91-27	B
93-18	D
93-19	C
93-20	B
93-21	D
94-38	C
95-17	D
95-18	B
95-19	B
96-19	B
96-20	D
96-21	A
96-58	B
97-19	C
98-14	D
98-15	D
98-16	C
99-36	A
01-15	D
01-16	C
02-30	B
02-31	C
03-17	B
05-5	B
05-17	B
05-18	C
06-19	C
06-20	A
06-21	C
06-22	B
07-12	C
07-13	B
07-41	D

Past HKCEE Questions
Genetic Engineering
Paper I

1. Long ago, scientists discovered that a certain kind of soil bacteria can produce a protein that is toxic to insects. The scientists intended to transfer the gene coding for this protein to crop plants, so as to reduce the damage of crops by insects. In 1995, the US first developed such a genetically modified (GM) corn plant containing this gene. The flowchart below outlines the development of the GM corn plant:

(a) Name the type of cell division that is involved in step 3. State the significance of this type of cell division in the production of the GM corn plants. (2 marks)

(b) Discuss briefly *one* consequence of cultivating this GM corn plant in the field to the surrounding ecological community. (2 marks)

(c) To improve the quality of food produced, state another character of cultivated plants that scientists would modify besides the insect-resistant character. Give an advantage of this genetic modification. (2 marks)

Past HKCEE Questions
Genetic Engineering
Paper II

07-35
A genetically modified rice is being developed so as to increase its harvest. This can be achieved by the insertion of a gene that can produce

A. vitamin A.
B. a human protein.
C. a toxin to kill pests.
D. a substance to lengthen the shelf life.

Past HKCEE Questions
Genetic Engineering
Suggested Answers

Paper I

1. (a) * Mitotic cell division
This ensures that all the GM corn plants produced carry the inserted gene / are genetically identical

(b) (any 1 set below (1+1)) 2
It may kill some other insects / lead to a drop in the insect population thus resulting in the extinction of the species / reduction of biodiversity
or
It may kill some beneficial insects which may help the pollination of other plants
or
If the corn grains are dispersed into the natural environment, the plants formed will outcompete / displace some other species due to its resistance to insects (accept other reasonable answers)

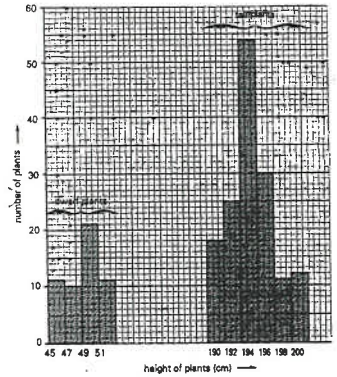
(c) (any 1 set below (1+1)) 2
Increase the ability of producing vitamins, e.g. vitamin A to increase the nutritive value of the food produced
or
Increase the ability to fix nitrogen / nitrogen fixation
to increase protein content of the food produced
(accept other reasonable answers)

Paper II

07-35	C

Past HKCEE Questions
Genetics
Paper I

1. In garden pea plants, the height of the stem is controlled by a pair of alleles. The allele for tallness (T) is completely dominant over that for dwarfness (t).
When the flowers of a single tall plant (195 cm) were self-pollinated, the plants produced were of different heights. Their height variation is shown in the chart below:



(i) With reference to the above chart,
(1) deduce the genotype of the parent plant, and give one reason to support your answer.
(2) construct a genetic diagram to illustrate this cross, and hence work out the genotypic ratio of the F1 generation.
(3) state separately the total number of dwarf plants and that of tall plants.
(ii) Give one reason why the dwarf plants are not of the same height.
(iii) How would you show which individual among the tall plants is homozygous for tallness? (HKCEE 1986)

2. In fruitflies, body colour is controlled by one pair of genes. In a genetic experiment, three groups of fruitflies A, B and C, each of which consisted of individuals of the same genotype for body colour, were crossed as follows:

Cross I

	♂	♀
Parent	grey ×	grey
F_1	72 grey	23 black

Cross II

	♂	♀
Parent	grey ×	grey
F_1	all grey	

Cross III

	♂	♀
Parent	grey ×	black
F_1	62 grey	68 black

(i) Of the crosses I, II and III, which ONE would enable you to determine the dominant character for body colour in fruitflies? State the dominant character for body colour. (2 marks)
(ii) Using the symbol R to represent the dominant gene for body colour and r for the recessive gene,
(1) state the possible genotypes of A, B and C. (3 marks)
(2) illustrate cross III by means of a genetic diagram. (3 marks)
(iii) How would you determine whether a fruitfly with the dominant character for body colour is homozygous or heterozygous? (2 marks)
(HKCEE 1987)

3. In mice, the fur colour is controlled by a pair of alleles. The allele for black fur (B) is dominant over that for brown fur (b). Two black mice (the parental generation) were allowed to mate several times, and their F_1 offspring were always black. When the F_1 mice were allowed to mate among themselves, a total of 80 F_1 offspring were produced, of which 74 were black and 6 were brown.
(i) Based on the fur colours of the F_1 and F_2 generations, state the probable genotype(s) of the F_1 mice. (2 marks)
(ii) Use a genetic diagram to show how the brown F_2 mice were produced from the F_1 mice. (3 marks)
(iii) Suggest the probable genotype(s) of the parental generation. (2 marks)
(iv) What breeding experiment would you perform to confirm the genotype of each parent? Explain your answer. (3 marks)
(HKCEE 1988)

4. In a certain species of pea plant, the flower colour is controlled by a pair of alleles. The table below gives the results of two separate crosses

Parent		Cross I: red flower × white flower	Cross II: red flower × red flower
Number of offspring with	red flowers	503	705
	white flowers	497	224

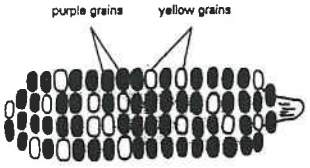
(i) State the recessive character for flower colour. Explain your answer. (2 marks)
(ii) Using the symbol F to represent the dominant allele for flower colour and f for the recessive allele, list all the possible genotypes of
(1) the parent with red flowers in cross I.
(2) the offspring with red flowers in cross II. (2 marks)
(iii) Explain the following genetic terms:
(1) allele,
(2) phenotype, and
(3) hybrid. (3 marks)
(iv) Suppose N is the chromosome number in the gametes of the plant, what is the chromosome number in the cells of its flower petals? (1 mark)
(HKCEE 1989)

5. The following table shows the heartbeat rates of 38 students at rest:

Heart beat per minute	Number of students
56 – 60	4
61 – 65	7
66 – 70	11
71 – 75	9
76 – 80	4
81 – 85	1
86 – 90	1
91 – 95	0
96 – 100	1

(i) Using graph paper, plot a histogram of these results. (4 marks)
(ii) Do these results show continuous or discontinuous variation? Give a reason for your answer. (2 marks)
(iii) Other than heartbeat rate, give ONE human example of
(1) continuous variation.
(2) discontinuous variation. (2 marks)
(HKCEE 1989)

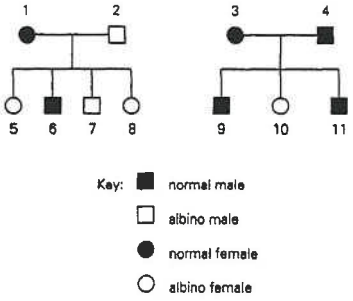
6. A corn (maize) plant produces groups of male flowers at the apex and groups of female flowers in the lower parts of the plant. In a crossing experiment, pollen grains from one plant were transferred to the female flowers of another plant. After fertilization, each group of female flowers developed into corn grains on a cob. The diagram below shows one side of such a corn cob which bears grains of two different colours, purple and yellow.



corn cob

(i)
(1) State the number of yellow and purple grains as shown in the diagram. (1 mark)
(2) To what simple ratio do these numbers approximate? (1 mark)
Assuming that the grain colour is controlled by a single pair of alleles, answer the following questions:
(ii) With respect to grain colour, deduce the genotypes and phenotypes of the parent plants. Explain your answer.
(Note: A genetic diagram will NOT be accepted.) (4 marks)
(iii) If plants developed from two yellow grains are crossed, what is/are the possible colour(s) of the grains in the resulting corn cobs? Explain your answer. (2 marks)
(HKCEE 1990)

7. In humans, normal body pigmentation is determined by a pair of alleles. A person lacking body pigments is called an albino. Answer the questions with reference to the following two pedigrees:



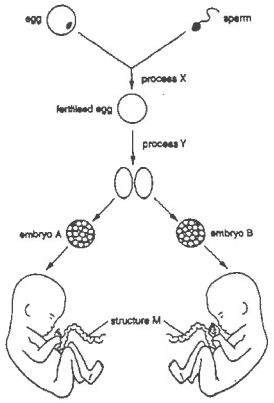
(i) Which character, normal body pigmentation or albino, is recessive? Explain your answer.
(Note: genetic diagrams will NOT be accepted.) (4 marks)
(ii)
(1) Explain by means of a genetic diagram, the expected phenotypic ratio of the offspring when individual 6 is married to individual 10. (Note:

Use D to represent the dominant allele, and d to represent the recessive allele.) (4 marks)

(2) Suppose the first 3 children of this couple have normal body pigmentation, what will be the chance of their 4th child being an albino? (1 mark)

(HKCEE 1991)

8. In human reproduction, occasionally a fertilized egg may split and develop into two embryos. These embryos will eventually develop into two identical offspring. The following diagram shows some of the stages described above:



(i) Name the organ in which sperms are produced. (1 mark)

(ii)

(1) Name the type of cell division by which eggs are produced. (1 mark)

(2) Explain the significance of this type of cell division on the chromosome number of the offspring. (2 marks)

(iii) Where does process X normally occur in the female reproductive tract? (1 mark)

iv. Name the type of cell division involved in process Y. (1 mark)

(iii) Among the children of individuals 1 and 2, list those who can donate blood to

(1) individual 1. (1 mark)

(2) individual 2. (1 mark)

(HKCEE 1991)

9. In maize, the dominant gene G is for chlorophyll production and the recessive gene g is for inability to produce chlorophyll. In a cross between two green plants, seeds were collected and allowed to germinate. Of the 935 seeds germinated, 705 developed into green seedlings. The rest developed into non-green seedlings, all of which died within 14 days after germination.

(i) Deduce the genotypes of the parent plants. Explain your answer without using a genetic diagram. (4 marks)

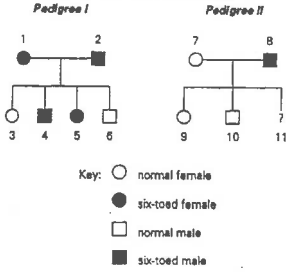
(ii) Of the 705 green seedlings, how many of them have a heterozygous genotype for chlorophyll production? Explain your answer with the help of a genetic diagram. (5 marks)

(iii) Explain why some of the seeds which were unable to produce chlorophyll could still germinate. (1 mark)

(HKCEE 1992)

10. Most people have five toes on each foot. Occasionally a person is born with six toes as shown in the photograph below:

The number of toes is an inherited character controlled by a pair of alleles. The diagram below presents two pedigrees showing the inheritance of this character:



(i) Based on Pedigree 1, which allele, five-toed or six-toed, is dominant? Explain your answer without using a genetic diagram. (5 marks)

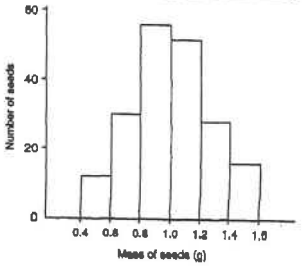
(ii) What will be the chance of individual 11 being six-toed? Explain your answer by means of a genetic diagram.
(Note: Use T to represent the dominant allele, and t to represent the recessive allele.) (4 marks)

(iii) In order to ensure that none of her children will have the six-toed character, individual 5 wants to have her extra toes removed by surgical operation before she marries individual 10. Do you think her idea can work? Explain your answer. (2 marks)

(HKCEE 1993)

11. The seeds of the garden pea are either green or yellow in colour. This character is controlled by a pair of alleles. A yellow seed germinated and developed into a mature plant. This plant was then self-pollinated and 190 seeds were produced. The colour and the mass of the seeds are recorded in the following table and histogram respectively.

Colour of seeds	yellow	green	white
Number of seeds	143	46	1



(i) With reference to the information given, state the type of variation shown by the colour of the seeds. Explain your answer. (2 marks)

(ii) The mass of the seeds can be affected by both environmental and genetic factors.

(1) Suggest one environmental factor that may result in the difference in the mass of the seeds. (1 mark)

(2) Suggest two main causes of genetic variation that lead to the difference in the mass of the seeds. (2 marks)

(iii) Based on the given information, deduce the genotype for seed colour of the original yellow seed. Explain your answer. (Genetic diagrams are not accepted.) (3 marks)

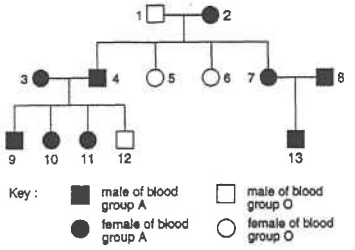
(iv) The white seed colour was most likely caused by a mutation of the allele that controls seed colour.

(1) What is meant by mutation? (1 mark)

(2) Suggest one part of the flower of the mature plant where this mutation could have occurred. (1 mark)

(HKCEE 1994)

12. The pedigree below shows the inheritance of blood groups in a family:



(i) Based on the given information, which blood group, A or O, is the dominant character? Explain your answer without using a genetic diagram. (5 marks)

(ii) State the possible genotype(s) of

(1) individual 7.

(2) individual 13.

Define the symbols you use. (4 marks)

(iii) Among the children of individuals 1 and 2, list those who can donate blood to

(1) individual 1. (1 mark)

(2) individual 2. (1 mark)

(HKCEE 1995)

13. Tomato plants produce fruits of two different shapes, spherical and pear-shaped. The shape of the fruit is controlled by a pair of alleles. In a study, two separate crosses were performed and the results are shown below:

Cross	Parent plants with	Number of daughter plants with	
		pear-shaped fruits	spherical fruits
A	pear-shaped fruits × spherical fruits	48	42
B	pear-shaped fruits × spherical fruits	0	84

(i) Which fruit shape is controlled by the dominant allele? Explain how you arrived at your answer. (Marks will not be given for genetic diagrams.) (4 marks)

(ii) State the genotype of the parent plant with spherical fruits in

(1) cross A,

(2) cross B.

Define the symbols you use. (3 marks)

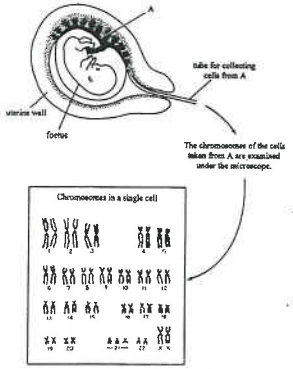
(iii) The parent plant with pear-shaped fruits in

cross A is self-crossed. Use a genetic diagram to show the result. (3 marks)

(iv) Explain whether the self-cross mentioned in (iii) is a kind of sexual or asexual reproduction. (2 marks)

(HKCEE 1996)

14. The diagram below outlines a clinical test used to examine whether a human foetus has any abnormality in its chromosomes:



(i) The cells of A and the cells of the foetus have the same genetic composition. How would you explain this? (2 marks)

(ii)

(1) With reference to the chromosomes in the diagram, state the sex of the foetus. (1 mark)

(2) Describe how the sex of this foetus is determined at the time of fertilization. (3 marks)

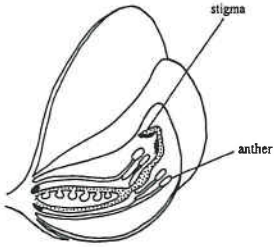
(iii) What abnormality is found in the chromosomes of the foetus? (1 mark)

(iv) As the uterine wall may be stimulated to contract when removing cells from A, what would be the risk associated with this test? (1 mark)

(v) State two differences between the blood entering the foetus and that leaving the foetus. (2 marks)

(HKCEE 2000)

15. The diagram below shows a section of a pea flower:



(i) Under natural conditions, pea flowers are self-pollinated, i.e. the stigma receives pollen grains from the same flower. Suggest one advantage and one disadvantage of this method of pollination. (2 marks)

(ii) In a genetic experiment, a scientist wanted to ensure that the stigma of a pea flower only received the pollen grains of another pea flower. Suggest how the scientist could achieve this by making use of a plastic bag and a brush. (3 marks)

(iii) The colour of the pea pod (fruit) is controlled by a pair of alleles. The scientist first crossed a pea plant homozygous for green pods with another pea plant homozygous for yellow pods to produce the first filial generation (F_1). She then allowed the F_1 plants to self-pollinate to produce the second filial generation (F_2). The results of the crosses are summarized in the table below:

Result of the first cross	All F_1 plants produced green pods
Result of the second cross	428 F_2 plants produced green pods 152 F_2 plants produced yellow pods

(1) What can you conclude from the result of the first cross? (1 mark)

(2) Use a genetic diagram to show how the pod colours of the F_2 plants were inherited from the F_1 plants. (5 marks)

16. The following table shows the information about some of the characteristics of 20 students in a class:

Student	Height (cm)	Blood group	Ability to roll the tongue
1	136	A	roller
2	168	O	non-roller
3	159	A	non-roller
4	139	O	roller
5	174	O	non-roller
6	167	AB	non-roller
7	165	O	roller
8	164	A	roller
9	161	B	non-roller
10	169	O	roller
11	179	O	roller
12	170	A	non-roller
13	163	B	roller
14	166	B	roller
15	164	A	roller
16	165	B	roller
17	162	O	roller
18	170	AB	roller
19	165	A	roller
20	165	O	roller

(i)

(1) Draw a bar chart to show the distribution of students with different blood groups. (3 marks)

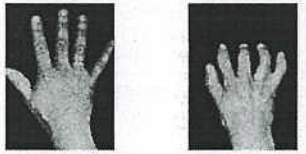
(2) What type of variation does blood group show? (1 mark)

(ii) In humans, the ability to roll the tongue is determined by a pair of alleles. Students 1 and 2 are sisters. Both of their parents are tongue rollers. Deduce, with reasons, whether the allele for tongue rolling is dominant or recessive.
(Marks will not be awarded to genetic diagrams.) (5 marks)

(iii) Students 19 and 20 are twin brothers. Are they identical or non-identical twins? Give a reason for your answer. (2 marks)

(HKCEE 2001)

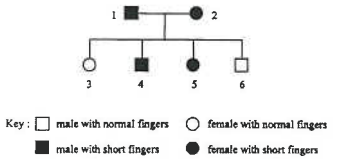
17. An inherited abnormality in humans is the occurrence of unusually short fingers. The photographs below show a hand with normal forgers and a hand with this abnormality:



Normal fingers *Short fingers*

Source: Adrian E. Flatt, *The Care of Congenital Hand Anomalies*, Missouri: Quality Medical Publishing Inc., 1994.

The length of fingers is controlled by a pair of alleles. The allele for short fingers probably arose from a mutation of the allele for normal fingers. The following pedigree shows the inheritance of this abnormality in a family:



(i)

(1) What is meant by mutation? (1 mark)

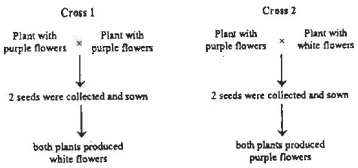
(2) Explain how a mutation in a person may lead to a change in the metabolic activities of his cells. (2 marks)

(ii) Deduce which character, normal forgers or short forgers, is dominant. Explain your deduction. (5 marks)
(Marks will not be awarded for genetic diagrams.)

(iii) Individual 6 is going to marry a female homozygous for normal fingers. Draw a genetic diagram to show the result of the cross.
(Use F to stand for the dominant allele and f for the recessive allele.) (3 marks)

(HKCEE 2002)

18. Individuals of a certain type of plant produce either purple or white flowers. The flower colour is controlled by a pair of alleles. A gardener carried out two crosses with this type of plant and the results are shown below:



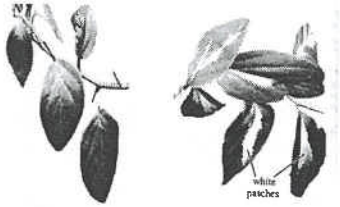
(i) Based on cross 1, deduce the dominant flower colour. Explain your deduction.
(Marks will not be awarded for genetic diagrams.) (5 marks)

(ii) Use symbols to show the possible genotypes of the parents in cross 2. Define the symbols you use. (3 marks)

(iii) If the purple-flower parent in cross 2 was self-pollinated (i.e. the stigma receives pollen grains from the same plant) and a large number of offspring was produced, predict the phenotypes of the offspring and their ratio. (3 marks)

(HKCEE2003)

19. The following pictures show two plants of the same species. Plant A has green leaves. Plant B is a new form recently discovered by a scientist; it has variegated leaves.



Plant A *Plant B*

The scientist performed an experiment by self-crossing plant **A**. A large number of offspring were obtained and they all produced green leaves. He then **repeated** the same procedure with plant B and all the offspring produced variegated leaves.

(i) Assuming that the colour pattern of the leaves is controlled by a pair of alleles, what deductions can be made from the above results regarding the genotypes of plants A and B? Explain how you arrive at your deductions. (3 marks)
(Marks will ***not*** be awarded for genetic diagrams.)

(ii) In order to find out which colour pattern is dominant, the scientist performed another experiment by crossing plant A with plant B. Explain how the results of this cross would enable him to determine the dominant phenotype. (3 marks)

(iii) The white patches on the leaves of plant B might be caused by mineral deficiency instead of genetic changes. If this is the case, what mineral is likely to be deficient? What is the function of this mineral in plants? (2 marks)

(HKCEE 2004)

20. Complete the following paragraph with suitable words selected from the list below:

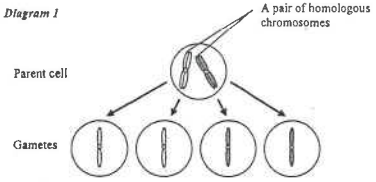
chromosome / diploid / dominant / embryo / gamete / haploid /heterozygote / homozygote / meiotic cell division / mitotic cell division / mutation /protein / recessive

Genes are the basic units of inheritance. They are carried on the (a) in the nucleus of a cell. A gene may exist in different forms called alleles. When an organism contains two different alleles of the same gene, it is described as a (b) and the allele that expresses itself is said to be (c). During reproduction, some cells in the sex organs undergo (d). During this process, the alleles in these cells separate from each other and every (e) thus formed will possess only one allele for each gene. After fertilization, the zygote formed will contain alleles occurring in pairs and its chromosome number will become (f).

(HKCEE 2005)

21. Diagram 1 below shows the result of meiotic cell division in gamete formation in humans: (Note: Only one pair of homologous chromosomes is shown.)

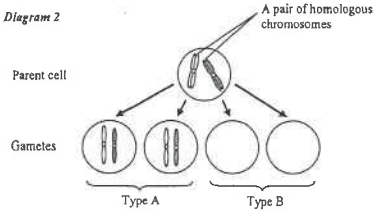
Diagram 1



(i) Based on Diagram 1, give two features that are characteristic of meiotic cell division. (2 marks)

(ii) Sometimes, an abnormality occurs during meiotic cell division in gamete formation in humans. Diagram 2 below shows the abnormality concerning a pair of homologous chromosomes:

Diagram 2

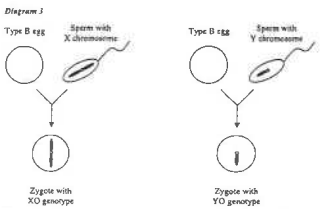


(1) Distinguish between type A and type B gametes. (1 mark)

(2) Name a genetic disorder that will develop if a type A egg is fertilized successfully by a normal sperm (1 mark)

(3) This type of abnormality in cell division may occur in the sex chromosomes. The type B eggs may fertilize with normal sperms to form zygotes with different genotypes as shown in Diagram 3 below:

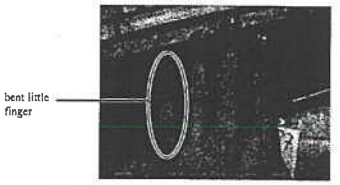
Diagram 3



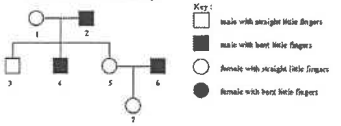
(Note: Only the sex chromosome is shown.)
Suggest why zygotes with XO genotype may develop into an individual but not those with YO genotype. (3 marks)

(HKCEE 2006)

22. The shape of the human little finger can be straight or bent. The photograph below shows a hand with a bent little finger:



The inheritance of the shape of the little finger is controlled by a pair of alleles. The following pedigree shows the inheritance of this trait in a family:



(a) After studying the pedigree, a student could not determine which little finger shape is dominant. However, he drew the following conclusion.

"Either individual 1 or individual 2 must be heterozygous."

Do you agree with this conclusion? Explain your answer with reference to the role of gametes in inheritance. (3 marks)

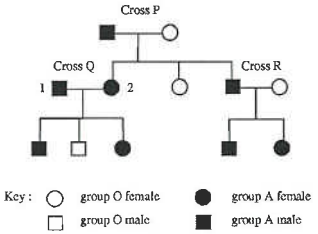
(b) Provided that the allele for the bent little fingers is dominant, deduce the possible genotype(s) of individual 4. (4 marks)
(Marks will not be awarded for genetic diagrams.)

(c) Individuals 5 and 6 are going to have another child. What is the probability of their second child having straight little fingers? Illustrate your answer with a genetic diagram. (5 marks)

(HKCEE 2007)

Past HKCEE Questions
Genetics
Paper II

99
Directions: Questions 50 and 51 refer to the pedigree below, which shows the inheritance of blood groups in a family:



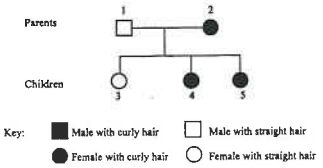
99-50
Which cross(es) can be used to deduce which blood group (A or O) is dominant?
A. cross Q only
B. cross R only
C. crosses Q and R only
D. crosses P, Q and R

99-51
If A represents the allele for blood group A and O represents the allele for blood group O, what are the probable genotypes of individuals 1 and 2?

	Individual 1	*Individual 2*
A.	AO	AA
B.	AO	AO
C.	AA	AA, AO
D.	AO, AA	AA

99-52
Which of the following are genetically identical?
A. seeds in the same fruit
B. a boy and his twin sister
C. potatoes of the same potato plant
D. sperms produced in the same testis

00.
Directions: Questions 40 to 42 refer to the following information:
The allele for curly hair in humans is dominant to the allele for straight hair. The pedigree below shows the inheritance of curly hair and straight hair in a family:



00-40
What is the chance of having another child who is a boy with straight hair?
A. 0%
B. 25%
C. 50%
D. 100%

00-41
If individuals 4 and 5 are twins, which of the following conclusions can be drawn?
A. They were developed from the same zygote.
B. They were developed from two different zygotes.
C. They are genetically identical for all characters.
D. No definite conclusions can be made.

00-42
Individual 3 is taller than individual 4. Which of the following may contribute to such a difference?
(1) diet
(2) meiosis
(3) fertilization
A. (1) only
B. (1) and (2) only
C. (2) and (3) only
D. (1), (2) and (3)

01-39
The tail of a male rat and a female rat were cut off. What will be the phenotype of their offspring if they mate?
A. All offspring will have tails.
B. Half of the offspring will have tails.
C. Only 1/4 of the offspring will have tails.
D. All offspring will not have tails.

01-42
Which of the following descriptions of chromosomes in humans is correct?
A. Each body cell of a man has only one sex chromosome.
B. Each chromosome duplicates before cell division occurs.
C. During gamete formation, the chromosomes are randomly separated into two groups.
D. The red blood cell and the white blood cell contain the same number of chromosomes.

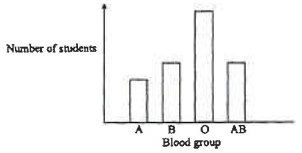
01-55
The eye colour of Siamese cat is controlled by a pair of alleles. A cross between two brown-eyed cats produced four offspring, of which three had green eyes and one had brown eyes. Which of the following is correct?

	Conclusion	Evidence
A.	Brown eye is dominant.	The phenotypic ratio of the offspring is 3:1
B.	Brown eye is dominant.	Two brown-eyed parents produce green-eyed offspring.
C.	Green eye is dominant.	The phenotypic ratio of the offspring is 3:1.
D.	Green eye is dominant.	Two brown-eyed parents produce green- eyed offspring.

02-9
Person Q has a genetic abnormality. The following photograph shows the chromosomes of one body cell of Q

Which of the following statements are correct?
(1) Person Q is a male.
(2) Person Q has 47 chromosomes in all his/her body cells.
(3) All the children of person Q will have this abnormality.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

02-51
The following bar chart shows the distribution of different blood groups in a class of students:



Which of the following can be concluded from the bar chart?
A. Blood group shows continuous variation.
B. Blood group 0 is the dominant phenotype.
C. Blood group A is the least common among these students.
D. Blood group in humans is controlled by four alleles.

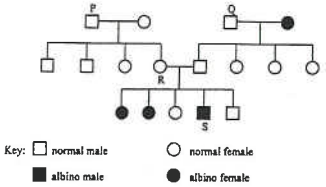
03-55
The table below lists some information about two brothers

	Tom	Andy
Blood group	A	O
Eye colour	brown	brown
Tongue rolling ability	tongue roller	tongue roller

Note : Blood group A, brown eye colour and tongue rolling are dominant characters.

What can be implied from the above information?
A. Tom can receive blood transfused from Andy.
B. They are homozygous for brown eyes.
C. Both their parents are tongue rollers.
D. Their sex chromosomes have the same genetic make-up.

04.
Directions: Questions 38-and 39 refer to the pedigree below, which shows the inheritance of albinism in a family. Albinism is a condition characterized by the lack of a dark brown pigment in the body. The ability to produce this pigment is controlled by a pair of alleles.



04-38
The information in the pedigree allows us to deduce the genotype of
A. P and Q.
B. P and R.
C. Q and S.
D. R and S.

04-39
What is the chance of R giving birth to another albino child?
A. $^1/_4$
B. $^1/_2$
C. $^3/_5$
D. $^3/_4$

04-57
Joe and Jim are twin brothers. Which of the following characteristics of Joe and Jim allows you to determine whether they are identical twins or not?

		Joe	Jim
A.	IQ	110	110
B.	Pulse rate	70	75
C.	Blood group	A	A
D.	Colour vision	Normal	Colour-blind

05-16
A gardener pollinated a purple-flowered pea plant with the pollens from a white-flowered pea plant. When the seeds obtained from this cross were germinated, he obtained 252 purple-flowered plants and 245 white-flowered plants. What conclusion can be drawn from the result of this cross?

A. Purple flower colour is dominant to white flower colour.
B. Neither purple nor white flower colour is dominant.
C. Both parent plants are heterozygous.
D. One parent plant is homozygous and the other is heterozygous.

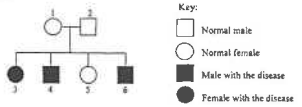
05-60
Which of the following is *not* an advantage of growing genetically modified crop plants in agriculture?

A. The crop plants are more resistant to pests.
B. Overcrowding of the crop plants can be prevented.
C. The production of the crop plants can be increased.
D. The nutritional value of the plant products is higher.

06.
06-13
Two homozygous parents with different phenotypes of the same trait are crossed to produce some offspring. Which of the following correctly describes the offspring with respect to this trait?

A. The offspring may have two different phenotypes.
B. The offspring are similar to both parents.
C. The offspring only show one phenotype.
D. The offspring are homozygous.

Directions: Questions 14 and 15 refer to the pedigree below, which shows the inheritance of a hereditary disease in a family. Whether a person has this disease is controlled by a pair of alleles.



06-14
The allele for this disease is

A. dominant because the ratio of offspring with the disease to normal offspring is 3 to 1.
B. dominant because individual 5 has the same phenotype as that of both parents.
C. recessive because both parents are normal but some offspring have the disease.
D. recessive because both parents have the same phenotype.

06-15
If individual 5 married a man with the disease, what is the probability that their first child would be a male with the disease? (Hint: There are two possible genotypes for the dominant character.)

A. 0 or ¼
B. 0 or 1
C. ¼ or ½
D. ½ or 1

06-16
Which of the following characteristics is an example of continuous variation?

A. blood group
B. iris colour
C. shape of the ear lobe
D. heartbeat rate

06-54
Peter has inherited the problem of G6PD deficiency from his parents. The allele for this character is located on the X chromosome. Which of the following family members of Peter is least likely to have this allele?

A. Peter's father
B. Peter's mother
C. father of Peter's mother
D. grandmother of Peter's mother

07-31
Which of the following statements about chromosomes are correct?

(1) It is made up of DNA and proteins.
(2) It plays a role in protein synthesis.
(3) It is capable of replication.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

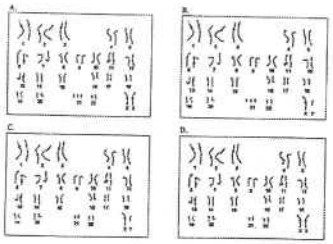
07-51
P, Q and R are triplets. The phenotypes of several traits found in them are listed below:

	Sex	Blood group	Eye colour	Weight (kg)
P	Male	O	Blue	52
Q	Male	O	Brown	52
R	Female	O	Brown	45

Which of the following conclusions is correct?

A. P, Q and R are non-identical triplets.
B. P and Q are identical twins but R is not.
C. P and R are identical twins but Q is not.
D. Q and R are identical twins but P is not.

07-58
Which of the following photomicrographs shows the full set of chromosomes in a body cell of a boy with abnormalities in his chromosomes?



Past HKCEE Questions
Genetics
Suggested Answers

Paper I

1. (i) (1) the genotype of the parent is Tt / heterozygous 1 1
because dwarf plants (tt) are produced 1

(2) P Tt × Tt
G T t T t
F1 TT Tt Tt tt
ratio is 1 : 2 : 1 1
1 or 0
1 or 0

(3) dwarf plants: 53 1
tall plants: 150 1

(ii) due to environmental effect

(iii) test-cross with dwarf plant (tt) 1
the individual producing only tall plants is homozygous (TT) 1

2. (i) Cross (I) 1
grey 1

(ii) (1) A - Rr # 1
B - RR# 1
C - rr# 1
(# No mark if a wrong genotype is also mentioned in the answer)

(2) A × C
P Rr rr 1
gametes R r r 1
F1 Rr rr 1

If symbols other than R and r are used but symbols defined, deduct 1 mark from scores obtained in (ii) but symbols not defined, no marks to be awarded for (ii).

(iii) cross the fruitfly with a black fly / a fly with recessive character 1
if all the offspring were grey / showed the dominant character, then the fruitfly is homozygous
(if some of the offsprings were black / showed the recessive character, then the fruitfly is heterozygous) 1

3. If symbols other than B and b are used but symbols defined, deduct 1 mark from this section, i.e. max. 9 marks but symbols not defined, no marks to be awarded for answers using the undefined symbols.

(i) Some F_1 were homozygously black / BB 1
and some were heterozygously black / Bb 1
(Answers giving 3 genotypes BB, Bb, bb - no marks)

(ii) F_1 Bb × Bb 1
gametes B b B b 1
F_2 BB Bb Bb bb 1
black brown

matching lines absent- deduct 1 mark
wrong matching lines - deduct 1 mark

(iii) Bb, 1
BB 1

(iv) cross each parent with a brown mouse / perform a test-cross for each parent 1
for the parent with BB, all offspring will be black 1
for the parent with Bb, some offspring will be brown 1

4. (i) white flower 1
this trait appears in the offspring but not in parents in cross II 1
(also accept: about 1/4, of the offspring in cross II produce white flowers)

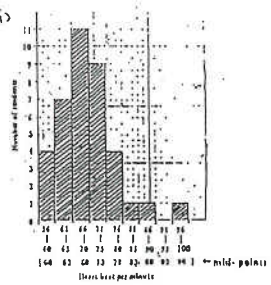
(ii) (1) Ff 1
(2) FF and Ff 1
or 0

N.B. No marks to be awarded for answers using other symbols.

(iii) (1) a pair of genes which controls a certain character / different forms of a gene 1
(2) appearance / expression of a character 1
(3) an individual which results from crossing 2 individuals (homozygous) which are genetically unlike 1

(iv) 2N 1

5. (i)



correct choice of axes 1
correct labels 1
correct plotting of all data 2
(5 data correct - 1 mark only)

(ii) continuous variation 1
characteristics show gradation + 1
(from one extreme to the other)
OR
variation shows a normal distribution

(iii) (1) height / weight / I.Q. / skin colour / etc. (any 1) 1
(2) eye colour / tongue-rolling ability / characteristics of ear lobe / etc. (any 1) 1

6. (i) (1) yellow (18±2); purple (53±2) 1
(2) 1:3 1

(ii) since the purple and yellow grains occur in a 3:1 ratio 1
both parents must be heterozygous 1
purple grain colour is the dominant character 1
therefore the phenotype of both parents must be purple grain colour 1

(iii) all grains will be yellow 1
because both parents are homozygous for yellow grain colour 1

7. (i)
- Albino
- This character is shown in individual 10 but not in their parents (individuals 3 and 4))
- Individual 10 must have received one albino allele from either parent
- who must be heterozygous
- In heterozygous condition, only the dominant allele is expressed OR the recessive allele is masked.

(any 3) 3

(ii) (1) (individual 6) (individual 10)
Parent Dd dd 1
gamete D d d 1
offspring Dd dd 1
(normal) (albino)
therefore, normal:albino = 1:1 1

(2) 1/2 1

8. (i) * testis 1

(ii) (1) * meiosis
(2) the chromosome number of the egg is half of that of the parent cell 1
so that the normal chromosome number is restored after fertilization / in the zygote 1

(iii) oviduct / fallopian tube 1

(iv) * mitosis 1

(v) (1) * umbilical cord 1
(2) carries oxygen / nutrients to the foetus 1

(vi) (1) any discontinuous variation of man, e.g. tongue rolling ability, eye colour, blood group, etc. 1
(2) any continuous variation of man, e.g. height, weight, etc. 1

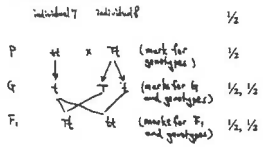
9. (i) the non-green offspring must be homozygous recessive (gg) 1
therefore, they must receive one recessive gene (g) from each parent 1
since both of the parents should have a dominant gene for being green in colour 1
their genotypes must be heterozygous (Gg) 1
OR
According to Mender's Law / Law of Inheritance
If a cross between two green parents gives rise to green and non-green offspring in a 3:1 ratio
(Working of the 3:1 ratio)
Then both parents must be heterozygous (Gg)

(ii) P Gg × Gg
G G g G g 1
F_1 GG Gg Gg gg 1
Genotypic ratio 1 : 2 : 1 1
(green) (green) (non-green)
That is, about 2/3 of the green seedlings have a heterozygous genotype (Gg) for chlorophyll production, i.e. 705 x 2/3 1 1
= 470 1

(iii) seeds make use of their food reserve for germination 1

10. (i) The six-toed allele is dominant 1
individuals 1 and 2 are six-toed / of the same phenotype and 1
produce offspring who are of two phenotypes 1
indicating both parents are heterozygous 1
only the dominant allele expresses itself / recessive allele is masked in heterozygous state 1
OR
Both individuals 1 and 2 are six-toed therefore each of them must possess at least one six toed allele
some of their children (individuals 3 and 6) are five-toed that means at least one of the parents must also possess at least one five-toed allele at least one of the parents is heterozygous in a heterozygous condition, the dominant allele will be expressed
therefore the six-toed allele is the dominant allele

(ii) individual 7 individual 8 ½



∴ the chance of individual being six-toed = 1/2 1

N.B. Deduct 2 marks for undefined symbols.
Deduct 1 mark for defined symbols.
Marks deducted should not exceed marks gained in genetic diagram.

(iii) Her idea cannot work 1
It is because the gene cannot be removed by this surgical operation / six-toed character is inheritable 1

11. (i) Discontinuous variation 1
as the character (seed colour) can + be grouped into a few distinct classes 1

(ii) (1) Environmental factors:
- light supply
- carbon dioxide supply
- water supply
- nutrients supply

(any 1) 1

(ii) (2) Genetic variation may be caused by:
- random fertilization 1
- independent assortment of chromosomes in meiosis 1

(iii) The ratio of the number of yellow seeds to green seeds among the offspring is 143:46; 1
which is approximately 3:1 1
According to the Mendel Law, the parent is thus heterozygous for the seed colour 1
OR
The. parent plant, which set germinated from a yellow seed, 1
should contain alleles for yellow seed
It produces some green seeds which must have received alleles for green seeds from the parent 1
Therefore the parent plant is heterozygous for the seed colour 1

(iv) (1) Mutation is a sudden and inheritable change of genetic material (gene / chromosome) 1
(2) anther / pollen grain / ovary / ovule 1

12. (i) Blood group A is dominant 1

Reasons:
Both individual 3 and 4 have blood group A therefore each of them must posses at least one allele for blood group A 1
One of their children (individual 12) has blood group O, that means at least one of the parents must also possess one allele for blood group O 1
At least one of the parents is heterozygous 1
In a heterozygous condition, only the dominant allele will be expressed 1
OR
Both individuals 3 and 4 have blood group A / are of the same phenotype 1
and produce offspring who are of two phenotypes 1
indicating that both parents are heterozygous 1
Only the dominant allele expresses itself / recessive allele is masked in heterozygous state 1

Communication skill (C) 1

(ii) Defined symbols,
e.g. A = allele for blood group A
a = allele for blood group O 1

No mark for defining symbols if not using capital letter for dominant allele and small letter for recessive allele.

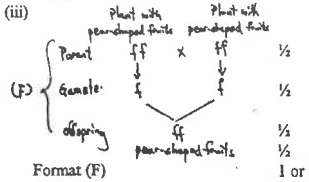
(1) Individual 7 : Aa 1
(2) Individual 13 : AA, 1
Aa 1

(iii) (1) 5 and 6 1
(2) 4, 5, 6 and 7 1

13. (i) Spherical fruits 1
In cross B, some offspring must have received an allele for spherical Fruits and an allele for pear-shaped fruits from their parents / heterozygous 1
All daughter plants have spherical fruits 1
Therefore, the allele for pear-shaped fruits must be masked by the allele for spherical fruits 1
Communication skill (C) 1

(ii) Let F represents the allele for spherical fruits
f represents the allele for pear-shaped fruits
(1) Ff 1
(2) FF 1

(iii)



Format (F) 1 or 0

(iv) Sexual reproduction 1
because the self-cross involves + 1
As fusion of two gametes / fertilization 1

14. (i) The cells of A and the cells of the foetus are formed by mitosis of the 1
zygote 1

(ii) (1) female 1
(2) A sperm carrying an X chromosome 1
fused with an egg, which always contains an X chromosome 1
to form a zygote / offspring with two X chromosomes, 1
thus resulting in a female foetus

(iii) There are 3 chromosomes 21 / an extra chromosome is present 1

(iv) The foetus may be expelled out of the uterus / miscarriage. 1

(v) any two (1,1) 2
Blood from A to the foetus has
higher oxygen content
higher nutrient content
lower carbon dioxide content

lower urea content
(accept other correct answers)

15. (i) Advantage: any one 1
- The chance of pollination / fertilization is higher
- Less wastage of pollen grains
- Desirable characters of the parent are more likely to be transmitted to the offspring

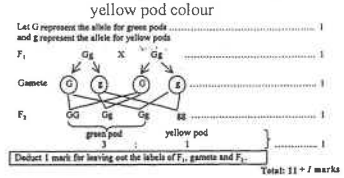
Disadvantage:
Less genetic variation (accept other correct answers) 1

(ii) Remove the anthers from the flower before they are mature 1
Use a brush to dust pollen grains of another pea flower onto the stigma of this flower 1
Cover the flower with a plastic bag to prevent further pollination 1
Effective communication (C) 1

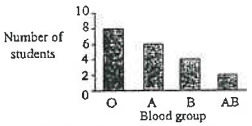
(iii) (1) Any one below: 1
Green pod colour is dominant to yellow pod colour

or
The allele for green pod colour is dominant to the allele for yellow pod colour

(2)



16. (i) (1) Title (T) 0.5
Correct labelling of axis (L) 1
Correct plotting of the bars (P): 2 bars correct, 0.5 marks, 3 bars, 1 mark; all 4 bars, 1.5mark 1.5
No mark if data are not resented in the form of bar chart.
Distribution of students wills different blood groups



(2) Discontinuous variation 1

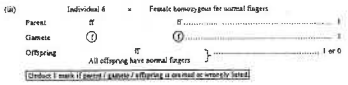
(ii) The parents of students 1 and 2 are tongue-rollers, so each of them must carry at least one allele for tongue rolling 1
Student 2 is a non-roller, so she must have received at least one allele for non-tongue rolling from either of her parents 1
Thus at least one of the parents is heterozygous 1
In a heterozygous condition, only the dominant allele is expressed 1
Thus the allele for tongue rolling is dominant 1

(iii) They are non-identical twins because their blood groups are different, implying that they are genetically different 1

17. (i) (1) Mutation is a sudden change in the genetic materials 1

(2) A mutation may lead to the synthesis of a new protein / failure to synthesize a certain protein 1
Since proteins may be enzymes or may have other functions in the cell 1
absence/change of the original protein will result in a change in the metabolic activities of cells

(ii) Individual 3 / 6 is normal, so she / he must have received at least one allele for normal fingers from either of her/his parents (individual 1 or 2) 1
Individuals 1 and 2 have short fingers, so each of them must carry at least one allele for short fingers 1
Thus at least one of individuals and 2 is heterozygous 1
In the heterozygous condition, only the dominant character is shown 1
Thus short fingers is the dominant character 1
Effective communication (C) 1



18. (i)
- The offspring in cross 1 have white flowers, 1
- so they must have received at least one allele for white flower from either of the parents. 1
- Since both parents have purple flowers, each of them must carry at least one allele for purple flower. 1
- Thus at least one of the parents is heterozygous. 1
- In the heterozygous condition, only the dominant character is shown. Thus purple flower is the dominant character. 1

(ii) F represents the allele for purple flower; f represents the allele for white flower. 1
(or other sets of symbols)
The possible genotypes of the purple-flower parent are FF or Ff and 1
that of the white-flower parent is ff. 1

(iii) If the genotype of purple-flower parent is FF, all offspring will produce purple flowers. 1
If the genotype is Ff, purple-flower offspring and white-flower offspring will be formed 1
and they would be in the ratio of 3:1. 1

19. (i) Plant A is homozygous for the green-leaf allele. 1
Plant B is homozygous for the variegated-leaf allele. 1
This is because all the offspring of each plant have the same phenotype as the parent. 1

(ii) Both plants A and B are homozygous, but of different phenotypes. 1
When they are crossed, all their offspring will be heterozygous. 1
In heterozygous condition, the phenotype shown by the offspring is the dominant phenotype. 1

(iii) Any one set (1 + 1) 2
- Magnesium
- For the formation of chlorophyll

or
- Nitrate
- For the formation of chlorophyll / protein

20. (a) *Chromosome 0.5
(b) *Heterozygote 0.5
(c) *Dominant 0.5
(d) *Meiotic cell division 0.5
(e) *Gamete 0.5
(f) *diploid 0.5

21. (i) Any 2 below 2
- Four daughter cells are formed from a single parent cell
- The two members of a pair of homologous chromosomes are separated; each goes to a different daughter cell
- Each daughter cell contains the haploid number of chromosomes

(ii) (1) Type A gamete has both members the homologous pair, while type B gamete has none 1

(2) *Down / Down's syndrome (Accept other correct answers) 1

(3) (any 1 set below) 3
- The X chromosome carries some vital genes
- that are essential to the survival of the zygote and it subsequent development
- These genes are absent in the Y chromosome

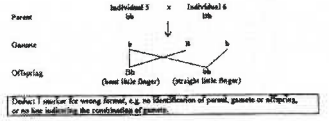
or
- The X chromosome carries more genes than the Y chromosome
- Absence of the X chromosome will result in the loss of some genes
- that may be essential to the survival of the zygote and its subsequent development

22. (a) Yes.
To produce offspring with different phenotypes 1
there must be two different combinations of gametes

Therefore, either one of the parents must be heterozygous, producing two types of gametes carrying 1
different alleles
or
The parents are of different phenotypes, hence, one of the parents must be homozygous recessive. 1
To produce offspring with different phenotypes 1
the other parent must be heterozygous, producing two types of gametes carrying 1
different alleles

(b) Individual I possesses straight little fingers, she must be homozygous recessive 1
and pass an allele for straight little fingers to individual 4 1
Individual 4 possesses bent little fingers, she must have at least one allele for bent little fingers 1
Hence, individual 4 is heterozygous 1
Effective Communication 1C

(c) Define symbols 1
Let B be the allele for bent little fingers and b be the allele for straight little fingers



The probability for their child to have straight little finger is 50% 1

Paper II

99-50	A
99-51	B
99-52	C
00-40	B
00-41	D
00-42	D
01-39	A
01-42	B
01-55	B
02-9	A
02-51	C
03-55	A
04-38	D
04-39	A
04-57	D
05-16	D

05-60	B
06-13	C
06-14	C
06-15	A
06-16	D
06-54	Deleted
07-31	D
07-51	A
07-58	B

Past HKCEE Questions
Growth and Development
Paper I

1. In an experiment to investigate the changes in seeds before and after germination, two batches of sunflower seeds of equal weight were used. One batch, after its dry weight had been determined, was analysed for its components. The other batch was allowed to germinate in the dark. The seedlings formed were then treated similarly. The results are shown in the table below:

Components	Weight (g)	
	seeds	seedlings formed after germination
Sugars	3.1	10.5
Cellulose	2.0	8.2
Fats	44.2	17.4
Simple proteins	19.3	11.0
Others	11.4	24.0
Total dry weight	80.0	71.1

(i) What is meant by the 'dry weight' of the seeds? (1 mark)

(ii) Account for the difference in total dry weights between the seeds and the seedlings formed after germination. (2 marks)

(iii) According to the results, which component is the most abundant food reserve in the seeds? (1 mark)

(iv) Explain the increase in cellulose content in the seedlings as compared with that of the seeds. (2 marks)

(v) The seedlings looked yellow after germination. Suggest one reason for this. (1 mark)

(vi) Besides the dry weight method, suggest another way to measure the growth of seedlings. (1 mark)

(HKCEE 1987)

2. An experiment was carried out to investigate the effect of removing cotyledons on the growth of bean seedlings. 500 bean seeds were soaked in water for 24 hours. They were then divided into 5 batches (A to E) and allowed to germinate. 4 batches of these germinating seedlings had their cotyledons removed at different stages of the germination. At the end of 8 weeks, all the plants were collected, dried in an oven and weighed to obtain the dry weight. The results are shown in the table below:

Batch	Treatment	Average dry weight (per plant) after 8 weeks
A	Cotyledons not removed	4.3 g
B	Cotyledons removed on the 4th day of germination	0.7 g
C	Cotyledons removed on the 7th day of germination	1.8 g
D	Cotyledons removed on the 10th day of germination	4.0 g
E	Cotyledons removed on the 13th day of germination	4.3 g

(i) Give ONE reason why soaking the seeds in water is necessary for germination. (1 mark)

(ii)

(1) What is meant by 'dry weight'? (1 mark)

(2) Why is dry weight preferred to fresh weight in the interpretation of the results of this experiment? (Note: Fresh weight refers to the weight of the plants freshly collected.) (2 marks)

(iii) Why was a large sample size of seeds (100 per batch) used in this experiment? (1 mark)

(iv) Describe the effect on the growth of bean seedlings of the removal of the cotyledons

(1) on the 4th day of germination.

(2) on the 13th day of germination. (2 marks)

(v) From your knowledge of the functions of cotyledons, explain the effect of each of the above cases mentioned in (iv). (3 marks)

(HKCEE 1991)

3. In a study of the growth of mung bean seedlings, two samples of mung bean seeds were grown under the same conditions except that one sample was kept in daylight while the other in darkness. The same number of seedlings was collected from each group every 6 days. The average dry mass of the seedlings of each group was determined and the results are shown below:

Time of growth (day)	Average dry mass of seedlings (g)	
	In daylight	In darkness
0	0.81	0.80
6	0.65	0.65
12	0.57	0.52
18	0.79	0.41

(i) Explain the change in the average dry mass of the seedlings in both daylight and dark conditions from day 0 to day 12. (3 marks)

(ii) From day 12 to day 18, how do

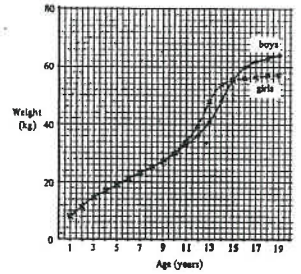
the seedlings grown in daylight differ from those grown in the dark in terms of the change in the average dry mass? Account for this difference. (4 marks)

(iii) Suggest why the dry mass of seedlings was measured instead of the fresh mass in this study. (1 mark)

(HKCEE 2006)

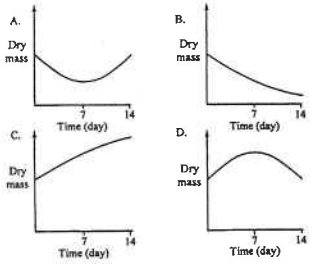
Past HKCEE Questions
Growth and Development
Paper II

91-48
Which of the following can be deduced from the human growth curves shown below?



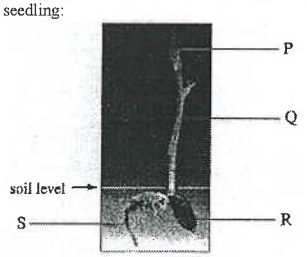
A. Between the ages of 1 and 10, boys and girls have the same height.
B. Between the age of 11 and 14, girls are heavier than boys.
C. At the age of 13, boys and girls have the same growth rate.
D. Between the ages of 16 and 19, males are taller than females.

00-44
A student soaked some mung beans in water for two days and then put them on moist cotton wool in a petri dish. Which of the following graphs indicates the change in dry mass of the seedlings?



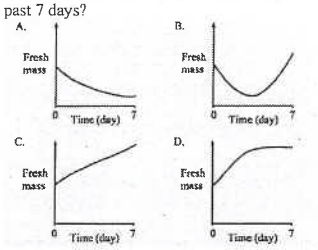
01-40
Which of the following may affect the body mass of newborn babies?
(1) genetic make-up of the father
(2) smoking habit of the mother
(3) diet of the mother
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

01.
Directions: Questions 45 and 46 refer to the photograph below, which shows a 7-day-old bean seedling:

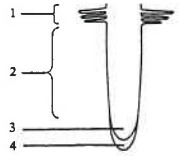


01-45
The food that supported the growth of the seedling up to this stage mainly came from
A. the photosynthesis of P.
B. the photosynthesis of Q.
C. the food stored in R.
D. the absorption of nutrients from the soil by S.

01-46
Which of the following graphs correctly shows the changes in the fresh mass of the seedling in the past 7 days?

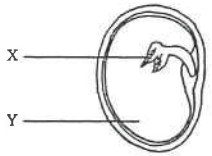


02-56
The diagram below shows the longitudinal section of a young root:

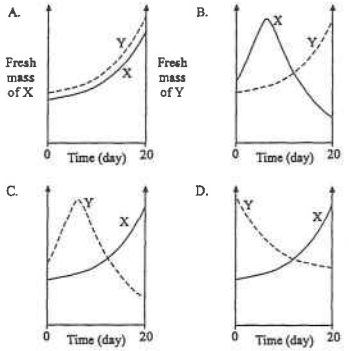


Xylem and phloem are found in region
A. 1.
B. 2.
C. 3.
D. 4.

02-60
The diagram below shows abroad bean seed



Which of the following graphs correctly shows the changes in the fresh mass of parts X and Y during germination?



03-60
Which of the following is a relatively reliable parameter for measuring the growth of a person?
A. body height
B. waistline
C. hair length
D. intelligence quotient (IQ)

Past HKCEE Questions
Growth and Development
Suggested Answers

Paper I

1. (i) weight with water 1
   (ii) During germination, some stored food is used in respiration / oxidation 1 1
   (iii) Fat 1
   (iv) number of cells increases 1
   cellulose is used in the formation of the cell wall 1
   (v) lack of chlorophyll due to absence of light 1
   (vi) to measure the length / size / fresh weight of seedlings 1

2. (i) to activate the enzymes in seeds / to help rupturing the seed coat / to soften the seed coat / other suitable answers 1
   (ii) (1) weight with all water removed 1
   (2) dry weight gives a more accurate measurement of the amount of organic matter present / measurement on fresh weight shows greater variation 1
   water content is affected by different environmental conditions 1
   (iii) to minimize error due to individual variation / death / unsuccessful germination 1
   (iv) (1) retarding / slowing growth 1
   (2) no effect on growth 1
   (v) (1) cotyledons provide food reserve for germination 1
   therefore early removal of cotyledons resulted in less growth
   (2) food reserve in cotyledons would have been used up 1
   seedlings would have developed leaves for photosynthesis 1
   therefore removal of cotyledons had no effect on growth

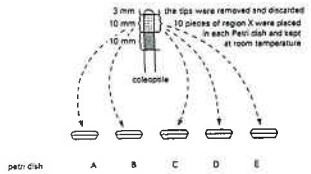
3. (i) The average dry mass of both samples decreases from day 0 to day 12 1
   because the stored food in seed 1
   is used in respiration / is broken down to carbon dioxide and water 1
   (ii) The average dry mass of the seedlings grown in daylight increases from day 12 to day 18, while that of seedlings grown in darkness continues to decrease 1
   because under daylight, the seedlings have developed green leaves 1
   for photosynthesis 1
   The rate of food production is faster than the rate of food consumption 1
   resulting a net gain in dry mass
   Effective Communication (C) 1
   (iii) The dry mass shows the actual biomass / organic matter of the seedlings / The water content of the seedlings varies and hence the fresh mass cannot indicate the actual biomass 1

Paper II

91-48	B
00-44	A
01-40	D
01-45	C
01-46	C
02-56	A
02-60	C
03-60	A

Past HKCEE Questions
Growth Response of Plant
Paper I

1. Some oat seeds were germinated and grown in the dark. Three days later, 50 straight coleoptiles were chosen and treated as shown in the diagram below:

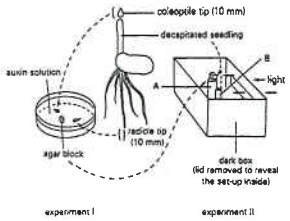


petri dish	A	B	C	D	E
concentration of auxin (ppm)	0	0.1	1	10	100
average length of region X after 48 hours (mm)	14	20	22	24	12

(i) What is the purpose of
(1) removing the tips of the coleoptiles?
(2) using 10 coleoptiles in each dish?
(ii) In what concentration of auxin did most growth occur?
(iii) What conclusions can be drawn from the above results?
(iv) State one difference between the cells of the coleoptiles in dishes A and C after 48 hours.
(v) Why should region X be used instead of region Y?

(HKCEE 1983)

2. The diagram below shows two experiments to study the effect of auxins on the growth of oat seedlings. In experiment I, the tips of radicles and coleoptiles measuring 10 mm were removed and immersed in auxin solutions of different concentrations are left there for two days.
In experiment II, two of these decapitated seedlings, A and B, were then grown inside a dark box illuminated by a unilateral light source. An agar block, previously immersed in an auxin solution of 10^{-1} ppm concentration, was placed on top of seedling A.
(The parts are not drawn to the same scale.)



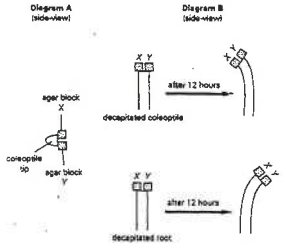
The results of experiment I are shown in the table below:

Concentration of auxin solution (ppm)	Lengths (mm) after two days	
	radicle tips	coleoptile tips
10^{4}	12.3	12.2
10^{3}	13.5	12.2
10^{2}	12.5	12.5
10^{1}	11.1	13.3
10^{0}	10.6	13.9
10^{-1}	10.4	15.1
10^{-2}	10.1	15.7
10^{-3}	10.1	14.6
10^{-4}	10.1	13.3
10^{-5}	10.1	11.3

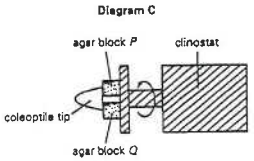
(i) Using graph paper, draw two curves on the same graph to show the data given in the table.
(ii) Which concentration of auxin solution would exert
(1) the greatest inhibitory effect on the radicle?
(2) the greatest stimulative effect on the coleoptile?
(iii) Compare the effect of auxin on the radicle and that on the coleoptile at each of the following concentrations:
(1) 10^{-4} ppm
(2) 10^{3} ppm
(iv) With reference to experiment II, state and explain the direction of bending, if any, for seedlings A and B after they have been growing for two days.

(HKCEE 1986)

3. The following experiment was performed in the dark using oat seedlings. A number of coleoptile tips were placed horizontally, and fixed to each tip were two agar blocks, X and Y, as shown in diagram A. After several hours, the agar blocks were transferred to a coleoptile and a root whose tips had been removed as shown in diagram B. The results were observed after 12 hours.

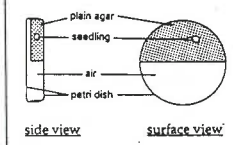


(i) Explain the result observed on the decapitated coleoptile on a hormonal basis. (3 marks)
(ii) Explain why a different response was shown by the decapitated root. (2 marks)
(iii) In another experiment, a coleoptile tip together with agar blocks P and Q was placed on a rotating clinostat, as shown in diagram C below, for several hours. The agar blocks were then placed on top of a decapitated coleoptile as in the previous experiment.
What response would you expect to observe after 12 hours? Explain your answer.
(4 marks)



(HKCEE 1988)

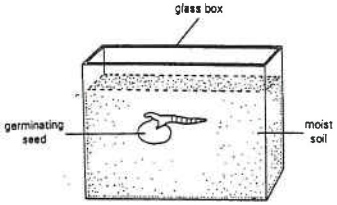
4. An experiment was carried out to investigate factors affecting root growth. A petri dish was held' vertically (diagram A), so that its upper half contained plain agar. A mungo bean seedling was then placed in the agar as shown. Observations were made at day 2 and day 5. The results are shown in diagrams B and C. The plain agar provided a moist medium for the growth of the seedling, and the experiment was carried out in the dark.

Experimental set-up	Time of observation
A 	Day 0 (Beginning of the experiment)
B 	Day 2
C 	Day 5

(i)
(1) Name the growth response of the seedling as observed on day 2.
(2) Explain this growth response on a hormonal basis. (5 marks)
(ii)
(1) Explain the growth response of the seedling as observed on day 5 in terms of the relative effects of the different stimuli acting on it.
(2) Explain the significance of this growth response. (4 marks)

(HKCEE 1989)

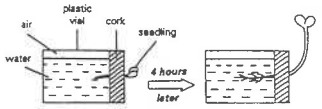
5. The diagram below shows a germinating seed placed horizontally inside a glass box containing moist soil. The radicle of the seed was marked with ink lines at 2 mm intervals. The whole set-up was put in darkness.



(i) What is the purpose of marking the radicle of the seed with lines at equal intervals? (2 marks)
(ii)
(1) Draw a diagram to show the changes in the appearance of the radicle after a few days. (2 marks)
(2) Explain the importance of such changes to the plant. (3 marks)
(iii) If this experiment were to be carried out inside a space shuttle flying in space, what would be the appearance of the radicle after a few days?
Give a reason for your answer. (2 marks)

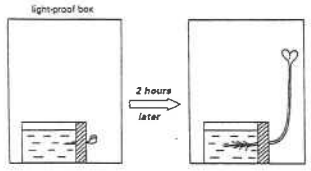
(HKCEE 1990)

6. In a growth response experiment, a bean seedling was inserted into a transparent plastic vial. The whole set-up (A) was held horizontally and placed in a well-illuminated area. It took 4 hours for the seedling to curve upwards as shown below:



Set-up A

Another similar set-up (B) was placed inside a lightproof box. It took 2 hours for the seedling to curve upwards. The seedling, however, is longer and more slender than that grown in light,



Set-up B

(i) Explain the curvature of the seedling observed in set-up B on a hormonal basis. (4 marks)

(ii) Suggest a reason why it took a longer time for the seedling in set-up A to curve upwards. (2 marks)

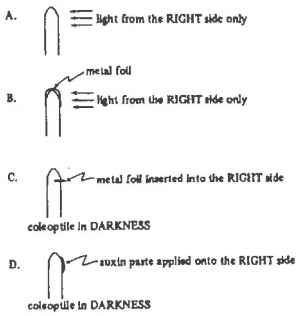
(iii) What other evidence can be obtained from the experimental results to support your answer in (ii)? (1 mark)

(iv) Draw a diagram to show how set-up B could be modified to demonstrate the relative effects of gravity and light on the growth response of the seedling. (2 marks)

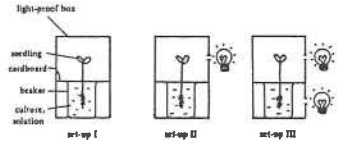
(HKCEE 1992)

Past HKCEE Questions
Growth Response of Plant
Paper II

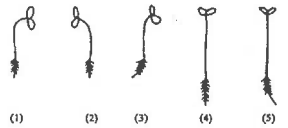
90-46
Which of the following treatments shown below results in the oat coleoptile bending towards the **LEFT** side?



91.
Directions: Questions 40 and 41 refer to the diagram below which shows the experimental set-ups used to study the growth responses of plant seedlings:



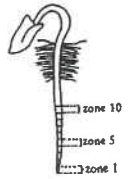
91-40
After a few days, the appearance of the plant seedling in the three set-ups would be



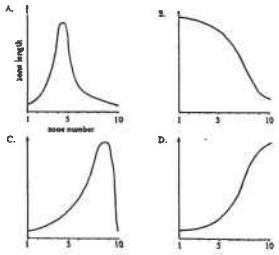
	Set-up I	Set-up II	Set-up III
A.	(1)	(2)	(4)
B.	(2)	(4)	(5)
C.	(4)	(1)	(3)
D.	(5)	(3)	(1)

91-41
The result of set-up I demonstrates
A. etiolation.
B. geotropism.
C. positive phototropism.
D. negative phototropism.

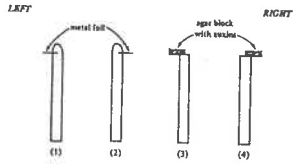
92-60
The root tip of a young seedling was marked with Indian ink at equal intervals of 2 mm from the tip a shown below:



After two days, the length of each zone was measured, and a graph was plotted. Which of the following graphs best represents the growth pattern of the root tip?



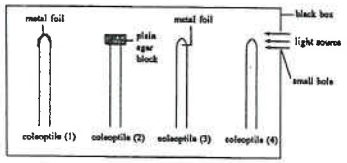
93-30
Four coleoptiles, treated a shown below, are placed in the dark



Which coleoptiles will bend towards the right hand side?

A. (1) and (3)
B. (1) and (4)
C. (2) and (3)
D. (2) and (4)

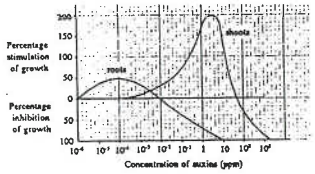
Directions: Questions 31 and 32 refer to the diagram below which shows an experimental set-up-up to study the effect of light on the growth of oat coleoptiles:



94-31
Which coleoptiles will band towards the light source?
A. Coleoptiles (1) and (2) only
B. Coleoptiles (3) and (4) only
C. Coleoptiles (1), (2) and (4) only
D. Coleoptiles (2), (3) and (4) only

94-32
If the hole of the black box is covered up, which of the following is correct with regard to the growth of the coleoptiles?
A. Coleoptile (1) will grow faster.
B. Coleoptile (4) will stop growing.
C. Coleoptiles (2) and (3) will show bending.
D. Coleoptiles (1) and (4) will grow vertically upward.

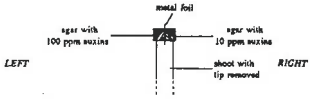
95.
Directions: Questions 40 and 41 refer to the graph below which shows the effect of auxin concentration on the growth of roots and shoots:



95-40
What is the effect of auxins at a concentration of 10^{-3} ppm on the growth of roots and shoots?

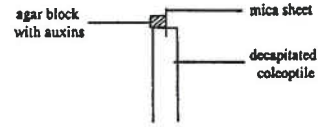
	Growth of roots	Growth of shoots
A.	stimulated	stimulated
B.	stimulated	inhibited
C.	inhibited	stimulated
D.	inhibited	inhibited

95-41
Predict the growth of the shoot when two pieces of agar with different concentrations of auxins are placed on its lip as shown below:

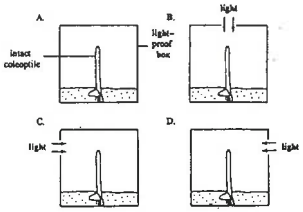


A. It will grow towards the left.
B. It will grow towards the right.
C. It will grow straight upwards.
D. It will not grow at all.

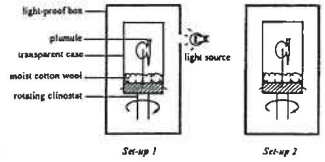
97-36
In a set-up, the tip of a coleoptile was removed and the coleoptile was treated as shown in the diagram below:



Which of the following set-ups will give a similar result as the one above?



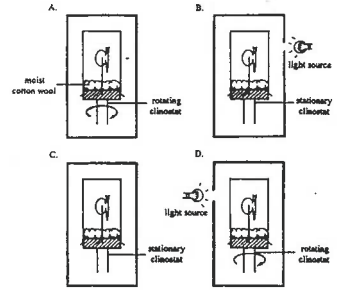
98.
Directions:
Questions 38 and 39 refer to the diagram below which shows two clinostats set up by a student. Both clinostats were rotating throughout the investigation.



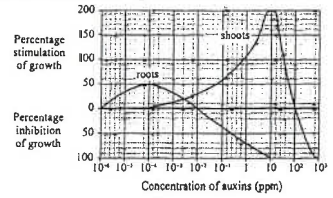
98-38
What would be the change in the plumule after a period of growth?

	Set-up 1	Set-up 2
A.	no bending	no bending
B.	no bending	bend to one side
C.	bend to the right	no bending
D.	bend to the right	bend to one side

98-39
In order to study the phototropic response of the plumule, which of the following set-ups should be used for comparison with *set-up 1*?

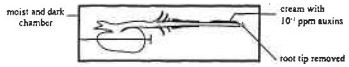


03.
Directions: Questions 50 and 51 refer to the graph below, which shows the effect of auxin concentration on the growth of roots and shoots



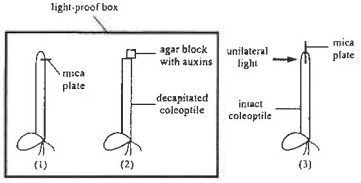
03-50
Which auxin concentration will stimulate growth of both the roots and shoots?
A. 10^{-6} to 10^{-2} ppm
B. 10^{-4} to 10^{-2} ppm
C. 10^{-4} to 10^{0} ppm
D. 10^{-6} to 10^{2} ppm

03-51
A bean seedling, with its root tip removed, was pinned in a moist and dark chamber. A paste of cream containing 10^{-1} ppm auxins was smeared on one side of the root as shown in the diagram below:



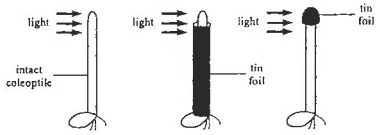
After two days, the root was found to bend upwards. Which of the following is responsible for this change?
A. Cells in the region of elongation grew faster.
B. The root showed negative geotropic response.
C. The effects of hydrotropism and phototropism were cancelled.
D. The upper side of the root received a higher auxin concentration than the lower side.

05-39
Which of the following oat coleoptiles will bend toward the left hand side during growth?



A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

05-58
The diagram below shows an experiment used to study the growth of oat coleoptile:

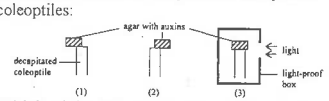


What is the hypothesis being tested in this experiment?
A. The coleoptile is positively phototropic.
B. The tip of the coleoptile is sensitive to light.
C. Auxins are produced by the tip of the coleoptile.
D. Growth occurs mainly in the region of elongation.

06-46
If a mung bean seed is germinated and grown on an agar plate with high concentration of auxins, which of the following may be observed?
A. The shoot and root grow at the same rate.
B. Both the growth of shoot and root are promoted.

C. The growth of shoot is promoted while that of root is inhibited.
D. The growth of shoot is inhibited while that of root is promoted.

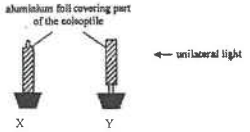
06-47
The following diagram shows an experiment to investigate the growth response of decapitated coleoptiles:



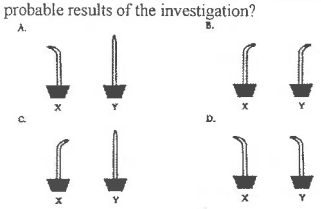
Which of the following correctly states the growth direction of the three decapitated coleoptiles?

	(1)	(2)	(3)
A.	left	right	right
B.	right	left	left
C.	left	right	left
D.	right	left	right

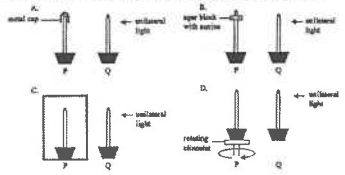
07
Directions: Questions 59 and 60 refer to the diagram below, which shows a set-up designed by a student for investigating the growth response of coleoptiles:



07-59
After a few days, the aluminium foil was removed. Which of the following diagrams shows the most probable results of the investigation?



07-60
Which of the following set-ups would probably serve a similar aim as the student's investigation?



Past HKCEE Questions
Growth Response of Plant
Suggested Answers

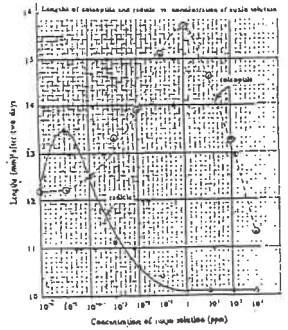
Paper I

1. (i) (1) get rid of cells producing auxin 1
so that the conc. of auxin solution in the dish would not be affected. 1
(2) to obtain a more reliable / accurate result 1
(ii) 10 ppm (NOT D) 1
(iii) growth increases as conc. of auxin increases / auxin stimulates growth 1
up to a maximum effect at 10 ppm / optimum concentration 1
any further increase concentration higher than 10 ppm would diminish growth 1
(iv) 1

Cells in	A (0 ppm)	C (1.0 ppm)
Elongation	Shorter	Longer

(v) X elongates more / is the region of elongation / is region of most active growth 1
giving a more obvious results (or vice versa) 1

2. (i) using correct axes as shown 1
plotting 8 correct points for 1 curve 1
plotting 8 correct pints for the other curve 1
joining points together on each curve 0.5x 2
labelling one or both curves 1



(ii) (1) $1 / 10^1 / 10^2 / 10^3$ /ppm (any concentration within this range) 1
(2) 1 ppm
(iii) (1) resulting in equal elongation in coleoptile and radicle (as auxin concentration increases beyond 10^{-4} ppm, coleoptile elongates more while radicle elongates less) 1
(2) resulting in different elongations in coleoptile and radicle / less inhibitory on coleoptile / coleoptile elongates more (inhibitory effect on both) 1
(iv) A - bends towards the light source 1
auxin on agar block diffused down the coleoptile 1
auxin was redistributed or inhibited by light / more auxin on the shaded side 1
resulting in greater elongation on the shaded side 1
B - no bending 1
no auxin supply 1

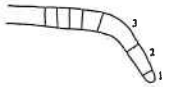
3. (i) in the coleoptile tip of diagram A, auxins moved downwards as a result of gravity 1
more auxins diffused into Y than into X 1
more growth occurred on the side of the decapitated coleoptile below Y [OR vice versa] 1
(ii) greater concentration of auxins in the root may retard growth hence, less growth occurred under Y [OR vice versa] 1
(iii) the decapitated coleoptile would grow vertically / with no bending 1
[accept diagrams conveying the same meaning] 1
the effect of gravity on auxin distribution was cancelled out by the rotation of the clinostat 1
resulting in equal distribution of auxins in P and Q 1

4. (i) (1) * geotropism / geotropic response 1
(2) the force of gravity results in a higher concentration of auxin / hormone on the lower side of the root 1

since a high concentration of auxin / hormone retards growth of the root 1
upper part of the root grows faster / lower side of the root grows slower 1

(ii) (1) the root bends upwards / towards the source of water instead of downwards 1
(2) root grows towards sources of water to ensure enough supply of water for growth 1

5. (i) to compare growth at different regions of the radicle 1
e.g. to find out which region of the radicle grows faster 1

(ii) (1) 

growth in length mainly takes place in the region of elongation (starting from region 2 or region 3) 1
radicle bends downwards 1

(2) enable the roots to grow deeper into the soil for better anchorage 1
to ensure the root to absorb enough water (dissolved mineral salts) / to reach a new source of water (dissolved mineral salts) 1

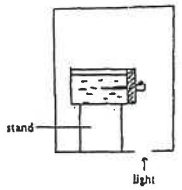
(iii) the radicle grows in length but does not bend 1
(N.B. diagram acceptable)
because no gravity acting on it 1

6. (i) Due to the effect of gravity 1
there is a higher concentration of auxin accumulated on the lower side of the horizontally placed seedling 1
auxin has a growth stimulatory effect 1
therefore the lower side grows faster than the upper side 1
and the seedling curves upwards 1

(ii) Auxin moves away from light / light destroys or inactivates auxins 1
resulting in an overall lower auxin concentration in seedling A 1
therefore it grows more slowly because of the less stimulatory effect

(iii) The shorter seedling in A

(iv) apply a unilateral light source from the bottom as shown below: 2 or 0



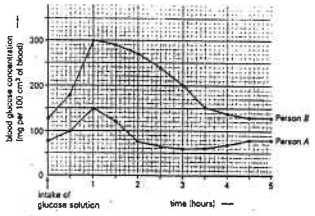
N.B. No light, no mark

Paper II

90-46	D
91-40	C
91-41	A
92-60	A
93-30	C
94-31	B
94-32	D
95-40	A
95-41	A
97-36	D
98-38	A
98-39	B
03-50	B
03-51	D
05-39	B
05-58	B
06-46	C
06-47	Deleted
07-59	C
07-60	A

Past HKCEE Questions
Hormonal Co-ordination
Paper I

1. In an experiment, a normal person A and a person B with a defective pancreas were starved for 12 hours, and were then allowed to drink an equal volume of the same glucose solution. The blood glucose concentration of each person was measured immediately and then at half-hour intervals. The results are shown in the graph below:



(i) Explain why the blood glucose concentration of person Arose during the first hour. (1 mark)
(ii) For person A, state TWO processes that took place in his liver to lower the blood glucose concentration after the first hour. (2 marks)
(iii) When the blood glucose concentration of a person exceeds 180 mg per 100 cm3 of blood, glucose appears in the urine. State the period in which glucose might appear in the urine of person B. (1 mark)
(iv) Describe a test used to detect the presence of glucose in a sample of urine. (2 marks)
(v) What function does the pancreas of person B fail to carry out that results in his high blood glucose concentration? (1 mark)
(HKCEE 1988)

2. Two patterns of response shown by the human body towards stimuli of different nature are outlined below:

Pattern A

stimulus → receptor → central nervous system

e.g. stepping on a sharp nail

→ effector → response

e.g. withdrawal of foot

Pattern B

stimulus → hormone

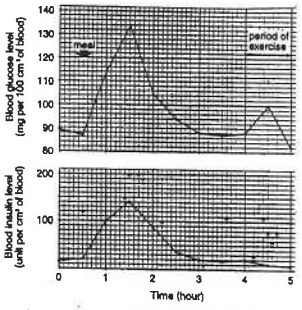
e.g. increase in blood glucose level

→ response

e.g. decrease in blood glucose level

(i) Referring to the specific cell types involved, describe the sequence of events that leads to the withdrawal of the foot. (4 marks)
(ii) Referring to the specific organs and hormone involved, describe the sequence of events that leads to a decrease in blood glucose level. (4 marks)
(iii) With reference to the mechanisms involved, explain why the response in pattern A occurs much faster than that in pattern B. (2 marks)
(iv) Regulation of the blood glucose level is an example of the feedback mechanism in the body. State another example. What is the importance of the feedback mechanism to the body? (2 marks)
(HKCEE 1993)

3. The following graphs show the changes in the levels of glucose and insulin in the blood of a man over a 5-hour period. At different times during this period, the man took a meal of rice and carried out exercise.



(i) Explain why the blood glucose level increased after the meal. (2 marks)
(ii)
(1) Which organ in the body provided the additional glucose to the blood between hour 4 and hour 4.5? What process in this organ caused this rise in the blood glucose level? (2 marks)
(2) Explain the significance of such a rise in the blood glucose level? (2 marks)
(iii) Explain the changes in the blood insulin level from hour 0.5 to hour 3. (5 marks)
(HKCEE 1994)

4. Diabetes mellitus is a disease found in humans and other mammals. The main symptom of this disease is the presence of glucose in the urine. In the early twentieth century, the cause of diabetes mellitus was still unknown. In order to study this disease, a scientist performed the following experiments on dogs:

Experiment	Experimental subject	Treatment	Result
1	Healthy dogs	Removing the pancreas	Symptoms of diabetes appeared
2	Diabetic dogs from experiment 1	Injecting extracts of pancreas	Symptoms of diabetes disappeared
3	Diabetic dogs from experiment 1	(a) Injecting extracts of pancreas which had been treated with protease	Symptoms of diabetes remained
		(b) Injecting extracts of pancreas which had been treated with lipase	Symptoms of diabetes disappeared

(i) Comparing the results of experiments 1 and 2, what conclusion can be drawn? (2 marks)

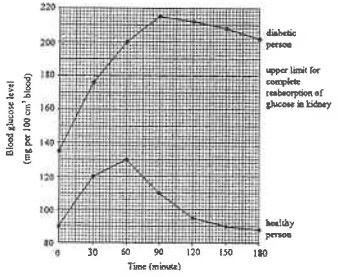
(ii) What is the aim of performing experiment 3? (2 marks)

(iii) Based on the results of experiments 2 and 3 (a), explain whether the diabetic dogs would show symptoms of the disease if they were treated with the extracts of pancreas by feeding instead of by injection. (3 marks)

(iv) Based on your biological knowledge, explain why the urine of a diabetic person usually contains glucose. (5 marks)

(HKCEE 2000)

5. In a study, a healthy person and a person with diabetes mellitus fasted for 12 hours. They then stayed at rest in the same room and drank equal volumes of glucose solutions of the same concentration. Their blood glucose levels were measured immediately afterwards and at 30-minute intervals for three hours. The results are shown in the graph below:



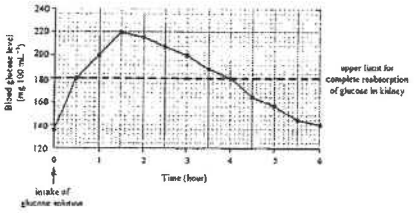
(i) What is the increase in the blood glucose level after 1 hour in
(1) the healthy person,
(2) the diabetic person ? (2 marks)

(ii) Explain why the healthy person had a smaller increase in blood glucose level in the first hour when compared with the diabetic person. (4 marks)

(iii) During the study, a larger volume of urine was produced by the diabetic person than the healthy person. Suggest an explanation for this. (4 marks)

(HKCEE 2002)

6. n a medical test, George drank a glass of glucose solution. The graph below shows the subsequent changes in his blood glucose level:



(i) Based on the graph, state the period in which the urine of George would contain glucose. Explain why glucose in the blood would appear in the urine during this period. (4 marks)

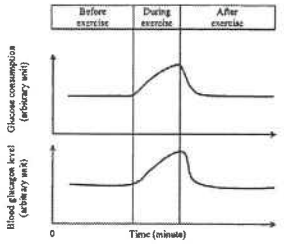
(ii) The doctor diagnosed that George had diabetes mellitus and advised him to get insulin injections for treatment. Which organ of George was likely to be defective? (1 mark)

(iii) The insulin used for treating diabetes mellitus can be obtained from pigs and cattle, or produced by genetically modified bacteria. State two advantages of using insulin produced by the bacteria over that obtained from mammals. (2 marks)

(iv) (1) Besides insulin, name another hormone that is responsible for the regulation of blood glucose level. (1 mark)
(2) State *one* effect of this hormone on the activity of liver cells. (1 mark)

(HKCEE 2005)

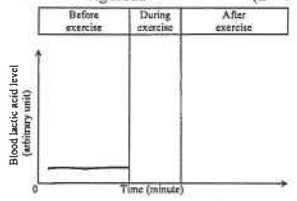
7. The graphs below show the changes in the glucose consumption and the blood glucagon level in a person before, during and after exercise:



(i) Explain the change in glucose consumption during exercise. (3 marks)

(ii) During exercise the blood glucose level remains relatively steady. Explain this phenomenon by referring to the change in the blood glucagon level. (3 marks)

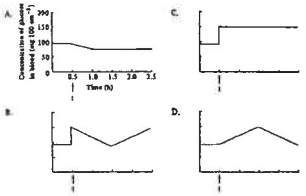
(iii) Draw a line on the graph below to show the change in the blood lactic acid level during and after vigorous exercise. (2 marks)



(HKCEE 2007)

Past HKCEE Questions
Hormonal Co-ordination
Paper II

90-47
A healthy person drank 100 cm^3 of a 80% glucose solution at time t. Which of the following graphs shows the probable changes in his blood glucose concentration?



92-42
Injection of insulin into the vein of a mammal lowers its blood glucose level. This is because
A. glucose is excreted in the urine.
B. glucose is broken down by insulin.
C. glucose is changed to glycogen in the liver.
D. glucose is absorbed from the small intestine.

92-43
Which of the following statements about insulin is true?
A. It is an enzyme.
B. It is carried by blood.
C. It is secreted by the liver.
D. It exerts its action in the pancreas.

94-30
Which of the following statements about insulin is Incorrect?
A. It is a protein.
B. It is secreted by an endocrine gland.
C. It is carried by blood to all parts of the body.
D. It catalyses the conversion of glucose to glycogen.

95-37
Which of the following statements about insulin is correct?
A. It catalyses the conversion of glucose into glycogen in the liver.
B. A lack of insulin will result in a high blood sugar level.
C. Blocking the pancreatic duct will stop the release of insulin from the pancreas.
D. When the blood sugar level is high, the brain stimulates the pancreas to produce more insulin.

05-50
A hormone differs from an enzyme in that
A. it is not made up of protein.
B. it is produced by a gland.
C. it is carried by blood to the target organ.
D. it catalyses a wide range of metabolic reactions.

05-59
Which of the following processes is controlled by hormones?
A. combination of antibodies with antigens
B. emulsification of fat in the small intestine
C. development of mammary glands at puberty
D. breakdown of excess amino acids in the liver

06-51
In humans, which of the following is / are under the influence of hormones?
(1) production of sperms
(2) shivering
(3) uptake of glucose into body cells
A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only

06-52
Which of the following statements about hormones is correct?
A. The effect of glucagon is localized.
B. The target sites of sex hormones are specific.
C. All hormones are made of polypeptides.
D. Insulin is released from the pancreas through the pancreatic duct.

Past HKCEE Questions
Hormonal Co-ordination
Suggested Answers

Paper I

1. (i) Glucose in the small intestine was absorbed into blood
(ii) • glucose is converted to glycogen
• glucose is converted to fat / protein
• glucose is oxidized
(any 2) 2
(iii) From $^1/_2$ hour to $3^1/_4$ hours (or $2^3/_4$ hour) 1
(iv) Add Benedict's solution to the test sample and heat 1
appearance of a red ppt. indicates presence of glucose 1
(Accept the use of clinistix paper, and refer to the chart for colour change)
(v) the pancreas fails to produce sufficient insulin 1

2. (i) Reception of stimulus (skin pierced by the sharp nail) by pain receptors / nerve endings 0.5
in the skin 0.5
Generation of a nerve impulse which is transmitted to the muscles of the leg via the following pathway:
Receptor → . sensory neurone → 0.5
association neurone → motor 0.5
neurone → muscle cells of the 0.5
leg 0.5
Contraction of the muscles cells resulting in the withdrawal of the leg 0.5

If flowchart is use, deduct 1 mark
e.g. pain receptor in skin —(nerve impulse)→ sensory neurone → association neurone → motor neurone → muscle cells of leg → contraction of muscle cells

(ii) An increase in blood glucose level stimulates the pancreas to 1
release more insulin into the blood stream 1
insulin stimulates liver cells 1
to convert more blood glucose into liver glycogen / to increase 1
carbohydrate oxidation resulting in a reduction of blood glucose level
(If flowchart is used, deduct 1 mark)
(iii) It is because nervous impulses are transmitted along nerve fibres at a very high speed 1
while it takes time for hormones to be transported to target cells via the blood circulation 1
(iv) Temperature regulation / osmoregulation 1
to maintain a constant internal environment for the normal functioning of the life processes 1

3. (i) The starch in the rice is first digested into glucose 1
and absorbed into the blood of the small intestine 1
(ii) (1) Liver 1
Glycogen is broken down into glucose which is then released into the blood. 1
(2) This provides more glucose for the respiration of muscle 1
to release more energy for muscle contraction during exercise 1
(iii) From hour 0.5 to 1.5, the increase in blood glucose level 1
stimulates the pancreas to secrete more insulin 1
The increased insulin lowers the blood glucose level 1
From hour 1.5 to 3, a decrease in the blood glucose causes the pancreas to secrete less insulin 1

4. (i) Diabetes is caused by the absence of certain substance(s) 1
which can be found in the pancreas 1
(ii) To determine whether the substance in the pancreas extract effective in treating diabetes is a protein 1
or a fat 1
(iii) Symptoms of diabetes would remain 1
This is because protease in the alimentary canal 1
will digest the active substance which is protein in nature 1

(iv) In the diabetic person, the pancreas cannot produce enough insulin 1
Thus the liver cannot convert excess glucose in the blood into glycogen 1
His blood glucose concentration remains high 1
leading to a high level of glucose in the glomerular filtrate 1
The kidney tubules cannot reabsorb all the glucose from the filtrate 1
thus glucose is excreted in the urine
Effective communication (C) 1

5. (i) (1) 40 mg per 100 cm^3 blood 1
(2) 65 mg per 100 cm^3 blood 1

(ii) In the healthy person, the initial rise in blood glucose level stimulates the secretion of insulin by the pancreas 1
while there is no / less insulin secretion in the diabetic person 1
Insulin stimulates the conversion of glucose into glycogen in the liver / uptake of glucose by body cells 1
so the increase in blood glucose level in the healthy person is smaller 1
Effective communication (C) 1

(iii) Since the 36th minute, the blood glucose level of the diabetic person is higher than the upper limit for complete reabsorption of glucose 1
so glucose is present in the filtrate / urine in the collecting duct 1
The water potential of the filtrate / urine is lowered by the glucose present 1
thus the reabsorption of water is reduced 1
and a larger volume of urine would be produced

6. (i) 0.5 to 4 hour 1
Blood glucose is filtered into the kidney tubule 1
In this period, the glucose level in the glomerular filtrate is higher than the upper limit for complete reabsorption of glucose 1
so some glucose will be left in the glomerular filtrate / cannot be reabsorbed and excreted in the urine 1

(ii) pancreas 1

(iii) Any 2 1,1
Less side effects / More effective in action / Insulin produced from genetically modified bacteria is cheaper and in greater supply)
(accept other reasonable answers)

(iv) (1) *glu cagon 1
(2) Glucagon will stimulate the conversion of glycogen in liver cells to glucose 1

7. (i) Glucose consumption increases during exercise 1
because glucose is used in respiration / respiration rate is faster 1
to provide more energy for muscle contraction 1

(ii) More glucagon is released during exercise 1
Which stimulates the conversion of glycogen to glucose in liver 1
to restore the blood glucose level / compensate for the increase in glucose consumption 1
Effective Communication 1C

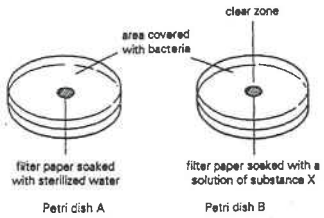
(iii) Trends:
Increase during exercise 1
Decrease after exercise 1

Paper II

90-47	D
92-42	C
92-43	B
94-30	D
95-37	B
05-50	C
05-59	C
06-51	C
06-52	B

Past HKCEE Questions
Man & Microorganisms
Paper I

1. Using sterile techniques, bacteria were grown in a culture medium in two Petri dishes A and B. A disc of filter paper soaked with sterilized water was placed in dish A. Another disc soaked with a solution of substance X was placed in dish B. The dishes were incubated at 37°C for one day. The results are shown in the diagrams below:



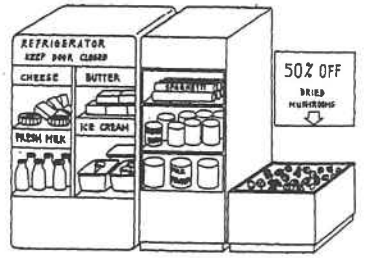
(i) What is substance X? Explain why a clear zone was found in dish B.
(ii) Why was the temperature of the incubator set at 37°C?
(iii) What is the purpose of preparing dish A?
(iv) How many bacterial cells would be formed at the 7th generation from a single bacterial cell which reproduces by binary fission?
(v) Briefly explain how each of the following methods helps to preserve food:
(1) keeping meat in a refrigerator
(2) adding sulphur dioxide to fruit juices
(3) immersing fruits in syrup
(4) keeping food in vacuum-sealed cans.
(HKCEE 1982)

2. A certain bacterium was inoculated (introduced) on sterilized agar plates. It was then covered with a lid and treated in different ways or incubated at different temperatures. The results observed after 24 hours are shown in the table below:

Agar plate	Treatment	Temperature	Observation
A	inoculated	40°C	entire surface cloudy
B	inoculated, a paper disc (soaked with antibiotic X) placed on the surface	40°C	clear zone around the paper disc, remaining surface cloudy
C	inoculated, a paper disc (soaked with antibiotic Y) placed on the surface	40°C	entire surface cloudy
D	inoculated, entire surface covered with vinegar	40°C	entire surface clear
E	inoculated	0°C	entire surface clear
F	not inoculated	40°C	entire surface clear

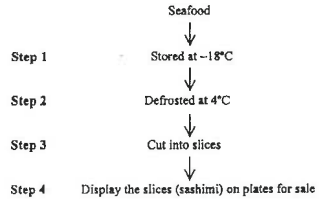
(i) What does this observation on plate A show?
(ii) Compare and explain the effects of antibiotics X and Y on this bacterium.
(iii) Give one possible explanation for the observation on plate D.
(iv) When plate E was re-incubated at 40°C for 24 hours, it then became cloudy. Give a reason for the observations before and after this treatment.
(v) From this experiment; suggest two different methods for preserving food, and indicate the plate from which the principle of each method is derived.
(vi) If plate F was incubated without a lid, a cloudy surface was observed. Give a possible reason for such a result.
(HKCEE 1986)

3. The diagram below shows a corner of a supermarket. The foods shown are preserved by different methods:



(i) State TWO methods of preservation used for these foods and name the foods preserved by each method. (4 marks)
(ii) Briefly explain the biological principle involved in each of the methods mentioned in (i). (2 marks)
(iii) Give TWO reasons why improperly preserved foods are not suitable for human consumption. (2 marks)
(HKCEE 1990)

4. The flowchart below outlines the process of sashimi (刺身) preparation:



(i) What is the biological principle of storing the seafood at -18°C before it is used for making sashimi? (1 mark)

(ii) In order to reduce the risk of food poisoning, suggest a precaution that needs to be taken in
(1) step 3, (1 mark)
(2) step 4. (1 mark)

(iii)
(1) Give two reasons to explain why seafood can be preserved by canning. (4 marks)
(2) Compared with freezing, suggest one advantage and one disadvantage of canning as a method of preserving seafood. (2 marks)
(HKCEE 2001)

5. The following table shows the number of outbreaks of food poisoning due to different causative agents in Hong Kong in 2000:

Period	Causative agent		
	Bacteria	Agricultural chemicals	Biotoxins
January – March	80	2	11
April – June	97	7	11
July – September	189	10	17
October – December	93	37	6
Total	459	56	45

(i) Which period had the greatest number of food poisoning outbreaks due to bacteria? Suggest why the number of outbreaks was the greatest in this period. (3 marks)

(ii) In some cases of bacterial food poisoning, the patient discharges a large amount of watery faeces. Explain why this condition may be fatal. (1 mark)

(iii) Another kind of food poisoning is caused by the consumption of shellfish (e.g. oysters, clams) which contain a high level of a harmful substance. This substance is actually produced in very small quantities by certain marine microscopic algae.
(1) With reference to the table above, into which type of causative agent would you classify this harmful substance? (1 mark)
(2) Explain why shellfish contain such a high level of this harmful substance. (3 marks)

(iv) The following is taken from a pamphlet on the guidelines for lunch box suppliers to Hong Kong schools

Advice for School Lunch Box Suppliers

1. Cook food thoroughly.
2. Keep hot foods at 63°C or higher and cold foods at 4°C or below.
3. Never leave lunch boxes at room temperature for longer than 2 hours.

Explain why points 1 and 3 are crucial in ensuring that food in the lunch boxes is safe to eat. (2 marks)

Past HKCEE Questions
Man & Microorganisms
Paper II

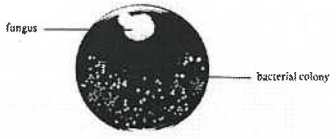
02-11
Honey is not easily spoiled even without refrigeration because of its
A. low pH.
B. low water potential.
C. low oxygen content.
D. low nutrient content.

02-28
Which of the following statements about antibiotics is correct?
A. They are protein in nature.
B. They act against pathogens.
C. They are produced by white blood cells.
D. One kind of antibiotics can kill a specific type of microorganisms only.

03-43
Which of the following foods will turn bad first when stored at room temperature?
A. salted fish
B. instant noodles
C. pasteurised milk
D. vegetables in vinegar

04-40
Which of the following food preservation methods has the least effect on the flavour of the food?
A. heating
B. salting
C. dehydration
D. refrigeration

04-51
The photograph below shows a bacterial culture growing on nutrient agar. The culture is contaminated by a fungus.



Source: Tortora, G.J., Funke, B.R., & Case, C.L., *Microbiology — An Introduction* 4th ed., Redwood City: The Benjamin/Cummings Publishing Company, Inc., 1992.

Which of the following correctly explains the absence of bacterial colonies around the fungus?
A. The fungus digests the bacteria as food.
B. The fungus competes with the bacteria for the nutrients.
C. The fungus needs more space to grow than the bacteria.
D. The fungus produces a substance that inhibits the growth of the bacteria.

Past HKCEE Questions
Man & Microorganisms
Suggested Answers

Paper I

1. (i) X is an antibiotic / name of any antibiotic (penicillin) 1
clear zone is due to absence of bacteria 1
which are killed by X 1
(ii) optimum / favourable / suitable temperature for growth 1
(iii) To serve as a control 1
(iv) 64 1
(v) (1) low temperature slows down microbial activities / multiplication 1
(2) SO_2 kills bacteria present in juice / SO_2 is a preservative 1
(3) syrup has low osmotic potential to dehydrate cells of micro-organisms 1
(4) micro-organisms cannot survive in absence of O_2 in sealed cans 1

2. (i) There is bacterial growth / multiplication 1
(ii)

Inhibition of bacterial growth	explanation	
only X is effective / Y is not effective / X is more effective than Y	X is more specific for this bacterium / this bacterium is more susceptible to X / this bacterium is killed by X	1 + 1

(iii) vinegar can kill this bacterium 1
(iv) at 0°C bacteria not active 1
(v) plate D: pickling of food / putting food in vinegar 1
plate E: refrigeration / keeping food at a low temperature +1
plate B: adding antibiotics
(any 1 pair)
(vi) contamination

3. (i)
- Dehydration: milk powder, dried mushroom, apaghetti, baked bean 1
- Refrigeration: ice cream, cheese, butter, fresh milk 1
- Canning: baked bean, milking powder 1 + 1
- Adding preservative: baked bean, cheese, butter, ice cream, milk powder 1 + 1
(any 2 pairs) +
(N.B. 2 examples of food required for each method) 1

(ii)
- Dehydration: without water, microorganisms cannot grow 1
- Refrigeration: low temperature inactivates the microorganisms / lower enzyme activity in microorganisms 1 + 1 + 1
- Canning: bacteria are killed by heating / sealing the can in vacuum prevents entry of microorganism OR depletes the can of oxygen for further growth of bacteria 1 + 1
- adding preservative: prevent growth
- of microorganism
(any 2 pairs)

(iii) change in quality of food (smell, taste, texture, appearance, etc.) 1
danger of food poisoning / harmful to the body 1

4. (i) To inhibit the growth of microorganisms 1
(ii) (1) Wear gloves when handling the seafood / use a clean knife to cut the seafood 1
(2) Display the sashimi at low temperature / cover the sashimi during display / sashimi must be sold within a short time 1
(accept other correct answers)
(iii) (1) Any two sets below: (1+1, 1+1)I 4
- n the canning process, seafood is subject to high temperature treatment,
- which kills the microorganisms present

or
- There is no oxygen in the cans and this will inhibit the growth of microorganisms

or
- The cans are sealed
- so that further contamination of the food is prevented

(2) Advantage: 1
seafood in cans is more conveniently handled / transported / can be stored for a long time
Disadvantage: 1
canning may cause seafood to lose its original flavour / taste / texture

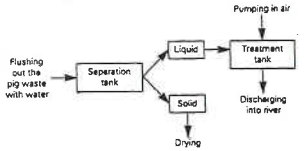
5. (i) July – September 1
because the temperatures in these months were the highest 1
so the growth / activities of bacteria was the fastest 1
(accept other reasonable answers)
(ii) Because the patient suffers from excessive loss of minerals / water / dehydration 1
(iii) (1) Biotoxins
(2) The harmful substance in microscopic algae is passed to shellfish through feeding
As a shellfish feeds on many algae 1
and the substance can neither be excreted nor broken down by shellfish 1
the substance would be accumulated to a high level in the shellfish 1
Effective communication (C) 1
(iv) Cooking the food thoroughly is to kill all the microorganisms in the food 1
The shorter the time for the food to be left at room temperature, the less the microorganisms can grow in the food 1

Paper II

02-11	B
02-28	B
03-43	C
04-40	D
04-51	D

Past HKCEE Questions
Man's Effect on His Environment
Paper I

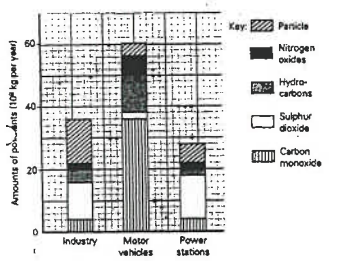
1. The diagram below shows the major steps for treating the waste from a pig farm before discharging it into the river.



(i) State one advantage of flushing the pig waste more frequently.
(ii) State one general method by which the solid can be separated from the liquid.
(iii) Suggest one use for the dried solid waste.
(iv) State the purpose of pumping air into the treatment tank.
(v) State the main biological process taking place in the treatment tank.
(vi) State two effects caused by the direct discharge of untreated pig waste into the river.

(HKCEE 1986)

2. The bar chart below shows the amounts of some atmospheric pollutants of a city in one year:



(i) What is the total mass of pollutants from power stations in a year? (1 mark)
(ii) Which pollutant is produced in the greatest amount in industry? (1 mark)
(iii) Suggest the most effective way to reduce air pollution in this city. Explain your answer. (2 marks)
(iv) State ONE harmful effect of each of the following pollutants to human health:
(1) particles
(2) carbon monoxide (2 marks)
(v) How may sulphur dioxide produced by power stations cause pollution in a nearby pond? (2 marks)
(vi) Suggest ONE other pollutant (not shown in the bar chart) that may be produced by a power station. (1 mark)

(HKCEE 1991)

3. The table below shows the mean monthly concentrations of some common air pollutants collected from September to December, 1988 in 2 different districts, A and B, in Hong Kong:

Air pollutants	Districts	Concentrations (μg m⁻³)			
		Sept.	Oct.	Nov.	Dec.
*Respirable suspended particles	A	78	84	90	108
	B	48	60	72	84
Sulphur dioxide	A	80	96	160	144
	B	64	40	80	56
Nitrogen dioxide	A	16	24	32	40
	B	0	0	0	0

* Respirable suspended particles refer to particles which may be breathed into the human respiratory tract.

(i) Of these 2 districts, one is Tsimshatsui and the other is Kwai Chung. Which district is Kwai Chung? Explain your answer. (2 marks)
(ii) Suggest two possible long-term solutions which the government should consider to reduce the air pollution problem in district A. (2 marks)
(iii) Suggest an explanation for the changes in the concentrations of respirable suspended particles in both districts from September to December, 1988. (2 marks)
(iv) Describe how the body can prevent the entry of respirable suspended particles. (5 marks)

(HKCEE 1992)

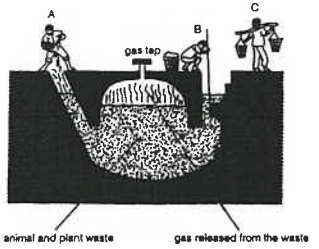
4. The following table shows the quantities of the major types of solid and semi-solid wastes disposed of in Hong Kong in 1988 and their disposal methods:

Waste type	Quantity (tonnes per day)	Disposal method
Domestic waste	4600	incineration (burnt to ashes); landfill
Animal waste	2000	composting (left to decay); landfill; discharged into local water courses after treatment
Fuel ash (煤灰)	2600	deposit in lagoons (煤灰湖); brick manufacturing
Construction waste	6500	landfill
Asbestos (石棉) waste	280	landfill

(i)
(1) Which of the methods listed in the table disposed of the greatest quantity of wastes?
(2) From an ecological point of view, suggest a disadvantage of this method. (2 marks)
(ii) Describe the biological process involved in the 'composting' of animal waste. (2 marks)
(iii) When untreated animal waste is discharged into local water courses, many aquatic organisms would die. Explain why this is so. (4 marks)
(iv) State one major source of fuel ash and suggest a possible health hazard of this waste to man. (2 marks)

(HKCEE 1993)

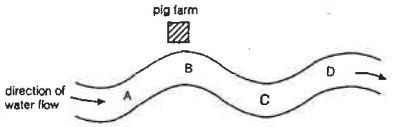
5. The picture on the next page shows an underground pit for collecting animal and plant waste on some Asian farms. The temperature of the waste in the pit is usually quite high, sometimes reaching 60°C or above. A gas mixture is constantly released from the waste. Farmers use this gas as a fuel for cooking and for heating on cold days.



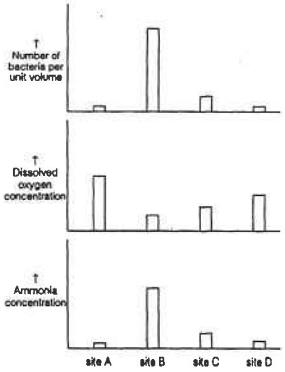
(i) Explain why the waste is usually at such a high temperature. (3 marks)
(ii) Suggest a possible use of the substance collected from the pit by farmers B and C. (1 mark)
(iii) "This method of waste treatment is a means of conservation." Give two reasons to support this statement. (2 marks)
(iv) Suggest two reasons to explain why this practice is not suitable for Hong Kong. (2 marks)

(HKCEE 1994)

6. The diagram below shows a river and the location of a pig farm:



Samples of water were collected from four sites A, B, C and D along the river. They were analyzed and the results are shown in the bar charts below:



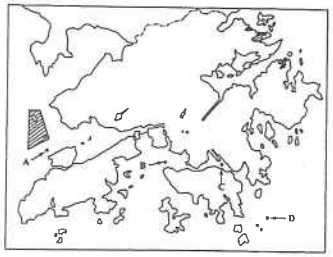
(i)
(1) Which site has the highest bacterial population? (1 mark)
(2) Explain why this site has such a high population of bacteria. (2 marks)
(ii) Explain the difference in the concentration of dissolved oxygen at site A and site B. (2 marks)
(iii) What change has occurred in ammonia which causes its concentration to decrease from site B to site D? (1 mark)
(iv) Based on your answer in (iii), suggest a

possible change in the size of the algal population from site B to site D. Explain your answer. (3 marks)

(v) If the pig farm is to remain at the present location, suggest a way to reduce the water pollution caused by its presence. (1 mark)

(HKCEE 1995)

7. To monitor the quality of seawater in Hong Kong, water samples were taken for analysis from four different sites A, B, C and D as shown in the map below:



The quantities of suspended solids and bacteria in each water sample are as follows:

Site	Suspended solids ($mg\ L^{-1}$)	Bacteria (number per 100 mL)
A	8.3	105
B	6.0	1986
C	5.5	23 140
D	2.5	15

(i)

(1) Explain how the concentration of suspended solids may affect the population of producers in seawater. (3 marks)

(2) Hence, predict which site has the largest population of producers. (1 mark)

(ii) In Hong Kong, domestic sewage is the main source of organic pollutants in seawater.

(1) Explain how the bacterial population in seawater may be affected by the amount of organic pollutants present, (3 marks)

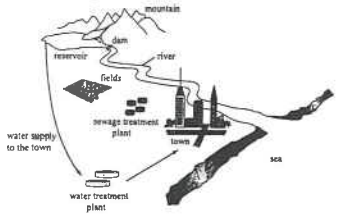
(2) Deduce which site would contain the greatest amount of organic pollutants. (1 mark)

(3) Suggest one reason for the presence of a large amount of organic pollutants at this site. (1 mark)

(iii) Certain regions of Hong Kong waters have been designated as marine parks. What is the significance of this for conservation? (1 mark)

(HKCEE 2000)

8. The diagram below shows a town and its surrounding areas:



(i) Domestic sewage produced in the town is first treated in the sewage treatment plant. The effluent (treated sewage) is then used to irrigate the fields.

(1) During sewage treatment, air is bubbled into the sewage continuously. Explain the importance of this step. (3 marks)

(2) Suggest two reasons why the practice of using the effluent to irrigate the fields is environmentally friendly. (2 marks)

(ii) If the same crop is grown in the fields year, after year, the annual production of the fields will decrease. Suggest two reasons for this. (2 marks)

(iii) Uncontrolled deforestation occurs in the mountain areas. Explain one way in which this activity may affect the water supply to the town. (3 marks)

(HKCEE 2001)

9. Every year, people in Hong Kong consume a lot of big marine fish such as humphead wrasse(蘇眉). This fish takes about five years to reach maturity. Because of the strong market demand, young fish are often caught together with the mature ones, and as a result, the population of this fish has decreased greatly in the past ten years.

(a) Overfishing humphead wrasse is against the principle of sustainable development. Why? (1 mark)

(b) Suggest two ecological consequences of the overfishing of humphead wrasse. (2 marks)

(c) Some people propose that the catching of young humphead wrasse should be prohibited. Explain why this may help maintain the population of this fish. (3 marks)

(HKCEE 2005)

10. Read the passage below and answer the questions that follow:

According to some research, scientists expect the problem of global warming to worsen in coming years. They believe that by the end of this century, the average atmospheric temperature will be increased by 1.4°C to 5.8°C. The main causes of this phenomenon are believed to be over-consumption of fossil fuels and deforestation. Besides global warming, deforestation in areas near a river may lead to serious flooding and other ecological consequences.

a) Explain how over-consumption of fossil fuels and deforestation together contribute to global warming. (5 marks)

(b) Explain briefly how deforestation may cause serious flooding. (3 marks)

(c) Why are fossil fuels considered to be a non-renewable energy source? (1 mark)

(d) In order to tackle the problem of global warming and to reduce the consumption of fossil fuels, some people suggest using renewable energy sources instead of fossil fuels. Suggest *one* of these renewable energy sources and discuss whether it can be used as the main energy supply in Hong Kong. (2 marks)

(HKCEE 2006)

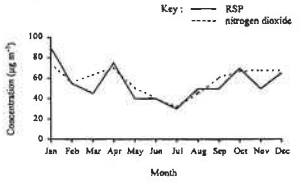
Past HKCEE Questions
Man's Effect on His Environment
Paper II

99-53
If untreated sewage is discharged into a river, which of the following changes would occur in the water a short distance downstream from the site of discharge?

	Bacterial population	*Algal population*	*Dissolved oxygen level*
A.	increases	increases	increases
B.	increases	decreases	decreases
C.	decreases	decreases	increases
D.	decreases	increases	decreases

99-55
If the same kind of crop is grown in a field for many years,
A. soil erosion will be prevented.
B. the population of insect pests will increase.
C. the mineral content of the soil will remain constant.
D. the level of atmospheric carbon dioxide will decrease.

00.
Directions: Questions 47 and 48 refer to the graph below, which shows the monthly variations of nitrogen dioxide and respirable suspended particulates (RSP) in the atmosphere in Central and Western District of Hong Kong during the year 1997.



00-47
Which of the following statements concerning the graph maybe incorrect?
A. The level of RSP in January is twice of that in March.
B. The fluctuations in the levels of nitrogen dioxide and RSP follow a similar pattern.
C. The levels of nitrogen dioxide and RSP in summer are lower than those in winter.
D. The amounts of nitrogen dioxide and RSP released into the atmosphere are greatest in January.

00-48
Exhaust gas from cars is the main source of nitrogen dioxide. Which of the following is not a probable cause of the high level of nitrogen dioxide recorded in December and January?
A. The relative humidity of air is lower.
B. There are more cars on the road.
C. The air temperature is lower.
D. There is less rainfall.

00-55
If fertilizers in farmlands are drained into the sea, they may
A. poison the fish in the sea.
B. promote the growth of algae.
C. reduce the oxygen content of the seawater.
D. stimulate an increase in the bacterial population.

01-51
In many industrial countries, a lot of trees have been killed as a result of air pollution. Which air pollutant is the major cause of death of these trees?
A. ozone
B. carbon dioxide
C. sulphur dioxide
D. carbon monoxide

01-58
Which of the following is not considered as a type of pollution?
A. dumping rubbish into the harbour
B. releasing exhaust gas from motor cars
C. setting the TV to a high volume at midnight
D. clearing woodland for building housing estates

01-59
In recent years, fishermen are banned from fishing in the South China Sea in June and July. The purpose of this measure is to
A. allow fish to grow and reproduce.
B. prevent the occurrence of red tide.
C. reduce the level of pollution of seawater.
D. avoid catching fish with a high level of toxins.

02-37
Organic fertilizers are more environmentally friendly than inorganic fertilizers because organic fertilizers
A. contain more minerals.
B. are readily absorbed by crops.
C. can increase the yield of crops faster.
D. are not easily leached away from the soil.

02-40.
Red tide can be harmful to marine organisms because the algae in the red tide
(1) may produce toxic substances.
(2) compete with marine animals for food.
(3) use up a lot of the oxygen in water at night.
A. (1) and (2) only
B. (1) and (3) only

C. (2) and (3) only
D. (1), (2) and (3)

03-46
Which of the following is *not a* harmful effect of large-scale agricultural activities on the environment?
A. increase in soil temperature
B. increase in pest population
C. loss of natural habitats
D. soil erosion

04-25
Which of the following farming practices would lead to a rapid growth of algae in nearby ponds?
A. spraying the crops with insecticides frequently
B. growing a large number of crops within a small area
C. adding a large amount of organic matters to the farmland
D. applying a large amount of inorganic fertilizers to the farmland

04-37
Aerobic bacteria are important in the process of sewage treatment because they help to
A. break down the organic substances in the sewage.
B. release energy from the sewage in a usable form.
C. remove the excess mineral salts in the sewage.
D. break down the detergent in the sewage.

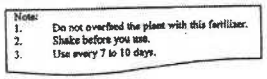
05-8
Timber is considered as a kind of renewable resource because
A. it can be reused.
B. it can be recycled.
C. there is an abundant supply of timber.
D. there is a continuous supply of timber.

05-14
Based on the idea that global warming is caused by a steady increase in carbon dioxide concentration in the atmosphere, which of the following may contribute to global warming?
(1) burning of coal and petroleum
(2) destruction of tropical rain forest
(3) depletion of ozone in the atmosphere
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

05-41
Insecticides are found in the body of penguins living in the South Pole, which is separated from farming areas by oceans. How do insecticides in the farming areas get into the body of penguins?
A. The penguins feed on fish that contain insecticides.
B. The penguins breathe in air polluted by insecticides.
C. The penguins drink seawater contaminated by insecticides.
D. The penguins absorb insecticides in the seawater through the body surface.

07-24
Which of the following does not contribute to global warming?
A. soil erosion
B. deforestation
C. burning fossil fuel
D. release of exhaust fumes from vehicles

07-40
The following shows a label of a chemical fertilizer.


Note:
1. Do not overfeed the plant with this fertilizer.
2. Shake before you use.
3. Use every 7 to 10 days.

What may happen if we overfeed the plant with the fertilizer?

A. Water is drawn out of the roots and there will not be enough water for the plant.
B. The roots grow so fast that they will use up the oxygen in soil air.
C. The roots absorb too much salt and retain too much water.
D. The leaves become so large that they will overlap with one another.

Past HKCEE Questions
Man's Effect on His Environment
Suggested Answers

Paper I

1. (i) avoid accumulation of waste / prevent growth of bacteria / keep the farm cleaner
   (ii) sedimentation / filtration
   (iii) as fertilizer
   (iv) supply oxygen for the bacterial action / for oxidation
   (v) decomposition of organic matter / respiration of bacteria
   (vi)
   - increase in organic matter / suspended solids / bacteria content 1
   - decrease in oxygen content
   - increase in turbidity / decrease in light penetration +
   - increase in foul smell 1
   - OR any other reasonable effects

   (Any 2) [NOT simply pollution]

2. (i) 2.8×10^{9} kg (no unit, no mark) 1
   (ii) particles 1
   (iii) to reduce the number of motor vehicles, 1
   because they produce the greatest total amount of pollutants /carbon monoxide / hydrocarbons per year 1
   OR other suitable answers
   (iv) Particles: irritation of the respiratory tract / reduce the efficiency of gaseous exchange 1
   carbon monoxide: decreases oxygen carry capacity of blood 1
   (v) it dissolves in raindrops / water increases the acidity of water and affects lives there 1
   (vi) hot water / radioactive wastes / carbon dioxide / other suitable answer 1

3. (i) District A 1
   because Kwai Chung is an industrial area 1
   The factories there produce a lot of sulphur dioxide / nitrogen dioxide / respirable suspended particles in the exhaust during the burning of fossil fuels
   (ii)
   - to reallocate the industrial area to other remote sites 1
   - stricter legislation / measures on exhaust from factories +
   - use of precipitators / taller chimneys, etc. 1

   (other reasonable answers) (any 2)
   (iii) The concentrations of respirable suspended particles increases 1
   due to accumulation of these particles in air 1
   OR
   September is still a rainy month in Hong Kong 1
   and the washout effect of the rainfall on the air might reduce the concentration of suspended particles 1
   OR
   Other suitable answers with explanation
   (iv)
   - nasal hairs 1
   - help to strain large dust particles 1
   - the mucous lining of the trachea / nasal cavity 1
   - traps tiny dust particles in the mucus 1
   - which is moved upwards by cilia
   - into the pharynx and coughed out or swallowed 1

   (any 5)

4. (i) (1) landfill 1
   (2) Destruction of habitats / creates pollution / formation of toxic substance 1
   (ii) saprophytic bacteria / fungi / decomposers 1
   decompose organic matter into minerals / plant nutrients 1
   (iii)
   - animal waste is rich in organic matter 1
   - which promotes the growth of bacteria in water
   - aerobic respiration of bacteria 1
   consumes much of the dissolved oxygen 1
   - causing suffocation of aquatic organisms / aquatic organisms die due to lack of oxygen 1
   - toxic substances produced kill the organisms

   (any 4)

   (iv) power station / burning of coal 1
   blocking breathing tract causing respiratory ailments / radioactivity in fuel ash can induce cancer 1

5. (i) The high temperature is due to the breakdown / decay of organic wastes 1
   by respiration / activities of microorganisms 1
   which release heat 1
   (ii) as fertilizer for plant growth 1
   (iii)
   - it causes less pollution to the environment. 1
   - it reduces the consumption of fossil fuels / chemical fertilizers. 1
   - the wastes can be recycled into useful matters, e.g. fertilizer, fuel (any 2)

   (iv)
   - land in Hong Kong is too expensive / not enough for building such pit. 1
   - it is smelly in a crowded area.
   - there are problems of collection and transport of wastes. 1
   - energy production by this practice cannot meet the great demand in Hong Kong.
   - and other acceptable suggestions

   (any 2)

6. (i) (1) site B 1
   (2) Pig farm discharges animal waste 1
   (ii) A large number of bacteria / decomposers at site B consumes a lot of oxygen
   Thus the dissolved oxygen content is lower at site B than at site A
   (iii) Ammonia is converted to nitrate
   (iv) Algal population increases
   due to an increasing level of nitrate which is a nutrient for the growth of algae
   (v)
   - To treat the waste before discharging
   - To reuse the waste as fertilizer
   - To set up laws to control the discharge of waste

   (any 1) 1

7. (i) (1) High concentration of suspended solids reduces the light intensity in water 1
   Thus the rate of photosynthesis of the producers decreases 1
   and this leads to a drop in the population of the producers 1
   Effective communication (C) 1
   (2) Site D 1
   (ii) (1) The greater the amount of organic pollutants in water, the higher the bacterial population 1
   because the organic pollutants provide food 1
   for the growth / multiplication of bacteria 1
   (2) Site C 1
   (3) any one 1
   - Slow water current in the harbour
   - There is sewage outfall at this site
   - Large human population

   (iii) To protect endangered species 1
   (accept other correct answers)

8. (i) . (1) Bubbling air into the sewage facilitates the aerobic respiration of microorganisms in the sewage 1
   This stimulates the growth / metabolic activities of the microorganisms 1
   thus promoting the decomposition of organic substances in the sewage 1
   Effective communication (C) 1
   (2) any two below:(1,1) 2
   - It can save the valuable water resource / recycle the water resource
   - It can prevent the contamination of the river with excessive amount of minerals
   - It can recycle the nutrients / reduce the demand of inorganic fertilizers / makes use of the effluent as a source of nutrient supply for the crop growth
   - It can prevent algal blooming in the river due to the discharge of the effluent

   (iii) Pest population may increase / Diseases may spread rapidly among the crop 1
   Certain minerals in the soil may become exhausted rapidly 1

(iii) Any one set below: (1,1,1) 3
- Soil erosion may occur in the mountains
- This leads to the deposition of silt in the reservoir / a reduction in the water storage capacity of the reservoir
- thus reducing the water supply to the town

or
- Soil erosion may occur in the mountains
- Water in the reservoir may carry a lot of suspended particles / soil minerals
- The water quality may become poor

or
- Surface run-off of water increases
- Less water is gathered in the reservoir
- thus reducing the water supply to the town

9. (a) Our offspring / future generations may be deprived of the chance of enjoying the fish in meals 1

(b) Because it leads to extinction of the species / decrease in biodiversity 1
and an increase in the population of its prey 1

(c) It allows the young fish to reach sexual maturity 1
so that they can carry out reproduction 1
As a result, the production of offspring can compensate for the loss of the fish 1
(effective communication) 1

10. (a) Over-consumption of fossil fuels will generate a large amount of carbon dioxide 1
Deforestation leads to a decrease in the overall photosynthetic activity 1
and hence a reduction in the removal of carbon dioxide from the atmosphere 1
As a result, the carbon dioxide concentration in the atmosphere increases 1
This will trap more heat radiated from the Earth's surface / increase the greenhouse effect 1
resulting in global warming
Effective Communication (C) 1

(b) (any 1 set below) 3
- Soil erosion increases as a result of deforestation
- because rain falls onto the soil directly without the covering of canopy / there is no root systems to hold soil together
- The riverbed of the lower course of the river rises due to sedimentation / rainwater tends to run off on the soil surface leading to a sudden rise in the volume of water.

or
- **Soil erosion occurs as a result of deforestation**
- **The riverbed in the lower** course of the river rises due to increased sedimentation
- Due to deforestation, rainwater tends to run off on the soil surface resulting in a sudden rise in the volume of water

Thus the river is more likely to flood

(c) Because the rate of regeneration of the fossil fuels is too slow to have a sustainable supply for human consumption 1

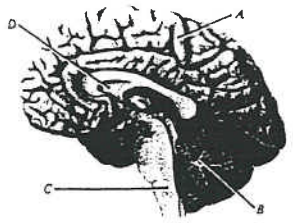
(d) solar energy / wind / tidal waves / hydroelectric power 1
It is not feasible because the production of energy from this source is not cost-effective in large scale power generation / there is not enough land available for large-scale electricity generation by wind / solar energy / the tidal waves or rivers in HK are too small for power generation 1
(accept alternative answers / approaches)

Paper II

99-53	B
99-55	B
00-47	D
00-48	DELETED
00-55	B
01-51	C
01-58	D
01-59	A
02-37	D
02-40	B
03-46	A
04-25	D
04-37	A
05-8	D
05-14	A
05-41	A
07-24	A
07-40	A

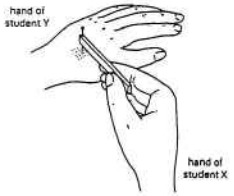
Past HKCEE Questions
Nervous Co-ordination
Paper I

1. The photograph below shows a sectional view of a human brain:



(i) Identify regions A, B and C and state ONE function for each. (6 marks)
(ii) Region A is highly folded. What is the significance of this feature? (2 marks)
(iii) State TWO functions of the fluid in D. (2 marks)
(HKCEE 1988)

2.

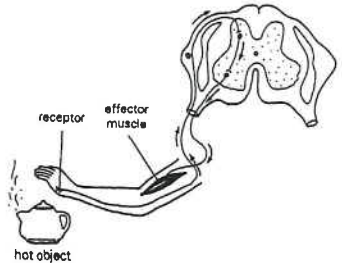


In an experiment to study the sensitivity of different parts of the skin to touch, student X used a felt pen to mark out an area on a certain part of the skin of student Y as shown in the diagram above. While student Y was blindfolded, student X used a pin to touch gently every mark on the test region. Student Y would say 'yes' if he felt the touch. The percentage of positive responses (that is, when student Y could feel the touch) was recorded. The experiment was then repeated on different regions of the skin and the results are summarized as below:

Region of skin	Percentage of positive responses
back of hand	50
palm of hand	85
fingertip	100
forearm	75

(i) Which of the tested regions was most sensitive to touch? (1 mark)
(ii) Why was student Y unable to feel the touch of the pin on some occasions during the experiment? (1 mark)
(iii) Describe the nervous pathway that enables student Y to feel the touch and to speak out. (4 marks)
(iv) At one point during the experiment, student X carelessly applied a strong force on the pin and student Y withdrew his hand immediately.
(1) Name this type of response. (1 mark)
(2) This type of response usually occurs very rapidly. What is the significance of this characteristic? (1 mark)
(3) State ANOTHER characteristic of this type of response. (1 mark)
(HKCEE 1990)

3. The diagram below shows the cross section of a human spinal cord and the nervous supply to the arm:

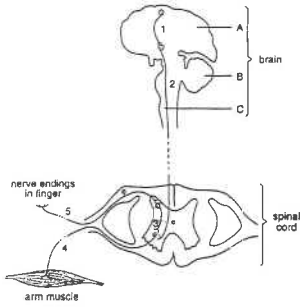


(i) If the hand touches a hot object accidentally, the hand will withdraw from it immediately.
(1) What happens to the effector muscle in this response? (1 mark)
(2) The action of this effector muscle results in movement at a joint.
(I) Name this joint. (1 mark)
(II) What is the characteristic of the movement at this joint? (1 mark)
(ii) Three men (X, Y and Z) were injured in a traffic accident. A doctor found out that their brains were still functioning normally. He then conducted further tests to check if there was any damage to other parts of their nervous systems.

Man	Test(s) conducted with the eyes of the patients blindfolded	Observations
X	X's finger tip was pricked by a pin	X felt the pain but he did not withdraw his hand
Y	Y's finger tip was pricked by a pin	Y could not feel the pain and did not withdraw his hand
	Y was asked to move his hand	Y could move his hand
Z	Z's finger tip was pricked by a pin	Z withdrew his hand but he was unaware of the touch and the withdrawal of his hand

Which part of the nervous system was most likely damaged in X, Y and Z respectively? Explain your answer in each case. (8 marks)
(HKCEE 1991)

4. The diagram below shows the arrangement of some neurones in man:



(i) Using numbers in the diagram, indicate the pathway of nerve impulses that bring about
(1) the withdrawal reflex of the arm. (1 mark)
(2) the voluntary action of the arm. (1 mark)
(ii) State two differences between reflex actions and voluntary actions. (2 marks)
(iii) For parts A, B and C of the brain, state and explain one role that each plays when a man is riding a bicycle. (6 marks)
(HKCEE 1995)

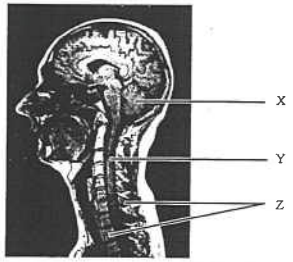
5. Irritability is the ability of an organism to respond to an external stimulus. Most cases of irritability work in the following pattern:

Below are three examples of irritability in humans

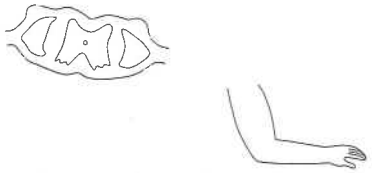
(I) Secretion of saliva when food is ingested
(II) Constriction of pupil under bright light
(III) Running out of the classroom upon hearing the fire alarm

(i) For case I, state the receptor and effector involved. (2 marks)
(ii) Based on the above pattern, use a flowchart to show the nervous pathway for case II, including the types of neurones involved. (3 marks)
(iii)
(1) Name the region of the brain where the coordinating centre for case III is located. (1 mark)
(2) State *two* features of the responses controlled by this region. (2 marks)
(HKCEE 2004)

6. The figure below shows a magnetic resonance image of the lateral side of the upper body of a person:



(a) Name structure X and state its function. (2 marks)
(b) What is the importance of structure Z to structure Y? (1 mark)
(c) The diagram below shows the transverse section of structure Y and an outline of the arm:



On the above diagram, draw the reflex arc for the withdrawal reflex of the arm and label the different components of the reflex arc. (4 marks)

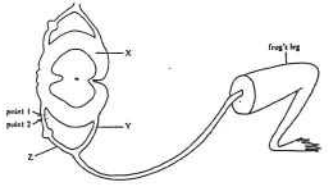
Past HKCEE Questions
Nervous Co-ordination
Paper II

90-19
After a car accident, a man had difficulty in balancing himself when walking but he could still hear well. Which of the following structures might have been damaged?
(1) cerebrum
(2) cerebellum
(3) cochlea
(4) semicircular canals
A. (1) and (3) only
B. (1) and (4) only
C. (2) and (3) only
D. (2) and (4) only

91-5

Which of the following features of the neurone shown in the diagram above are essential for the coordinating function of an organism?
(1) possession of a nucleus
(2) long cellular extension
(3) branched endings
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

92.
Directions: Questions 46 and 47 refer to the diagrammatic representation of part of the nervous system in a frog. The basic structural organization of the nervous system of a frog is similar to that of a mammal.



92-46
The parts labelled X. Y and Z are

	X	Y	Z
A.	white matter	ventral root	dorsal root
B.	while matter	dorsal root	ventral root
C.	grey mattes	ventral root	dorsal root
D.	grey matter	dorsal root	ventral root

92-47
Application of an electric current of suitable strength onto a nerve fibre will set off a nerve impulse. A segment of structure Z between points 1 and 2 is cut and removed. An electric current is then applied at point 1 and 2 in turns. What would be the responses of the frog's leg?

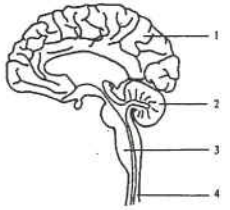
	Point 1	Point 2
A.	contracting	no response
B.	no response	contracting
C.	contracting	contacting
D.	no response	no response

92-48
The flow diagram below shows the basic pattern of nervous co-ordination in mammals:

Stimulus → Receptor → Effector → Response

X can be
(1) the cerebrum.
(2) the spinal cord.
(3) the medulla oblongata
A. (1) only
B. (2) only
C. (2) and (3) only
D. (1), (2) and (3)

93-32
The diagram below shows a sectional view of a part of the human central nervous system



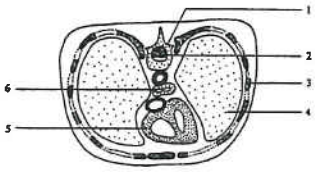
Which of the following is a correct matching between the structure and its function?

	Structure	Function
A.	4	a centre of reflex actions
B.	3	responsible for body balance
C.	2	controlling movement of eyeballs
D.	1	coordinating movement of limbs

94-29
Which of the following response is controlled by the medulla of the brain?
A. You put down your pencil when you are told to do so.
B. Your leg kicks forward when your knee is hit.
C. Your heart beats faster when you are running.
D. Your band withdraws quickly from a hot object on touching it.

96-29
A patient diagnosed to be a 'vegetable' shows reflex actions, normal heart beat and breathing, but no voluntary responses. Which part of the central nervous system is probably damaged?
A. cerebrum
B. cerebellum
C. medulla oblongata
D. spinal cord

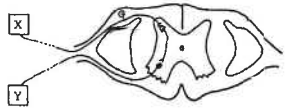
96.
Directions: Questions 36 and 37 refer to the diagram below which shows a transverse section of the human thorax:



96-36
Which structure is responsible for coordinating reflex actions?
A. 1
B. 2
C. 3
D.4

96- 37
Which structure can produce red blood cells?
A. 3
B. 4
C. 5
D.6

96-38
The diagram below shows a nervous pathway in the human body



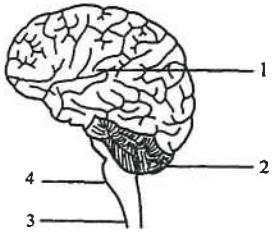
Structures X and Y are probably

	X	Y
A.	intercostal muscles	ribs
B.	pancreas	liver
C.	skin of finger tips	arm muscles
D.	tongue	teeth

98-25
Which of the following are examples of simple reflex action?
(1) pulling one's hand from a hot object
(2) shedding tears when one hears a sad story
(3) shutting one's eyes as an object approaches the face rapidly
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

99-34
Which of the following parts of the central nervous system are directly involved in some reflex actions?
(1) cerebrum
(2) medulla
(3) spinal cord
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

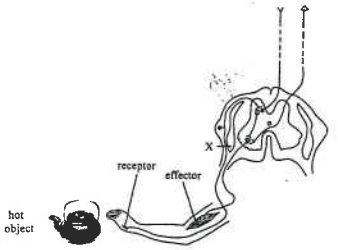
00.
Directions: Questions 32 and 33 refer to the diagram below, which shows part of the human central nervous system:



00-32
Nerve impulses generated in taste buds are interpreted in
A. 1.
B. 2.
C. 3.
D. 4.

00-33
The movement of the diaphragm is under the control of
A. 1 and 2.
B. 1 and 4.
C. 2 and 3.
D. 3 and 4.

01.
Directions: Questions 27 and 28 refer to the diagram below, which shows the nervous pathway involved in the withdrawal reflex when a person touches a hot object:



01-27
How many neurones are involved in this reflex arc?
A. 2
B. 3
C. 4
D. 5

01-28
In an accident, the dorsal root of a man was damaged at position X. What would happen if this man touched a hot object in a dark room?

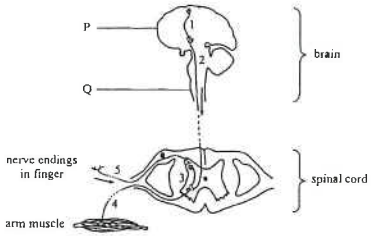
	Feel the pain	*Withdraw hand immediately*
A.	yes	yes
B.	yes	no
C.	no	yes
D.	no	no

03-56
Which of the following comparisons of the cerebrum and the spinal cord is correct

	Cerebrum	*Spinal cord*
A.	protected by bones	not protected by bones
B	with blood supply	without blood supply
C.	white matter on the surface	grey matter on the surface
D.	can generate sensation	cannot generate sensation

05-26
Which part of the central nervous system coordinates the muscles of a person when he is riding a bicycle?
A. medulla
B. cerebellum
C. spinal cord
D. motor areas of cerebrum

Directions: Questions 29 and 30 refer to the diagram below, which shows the arrangement of some neurones in a person:



05-29
If neurone 2 were damaged, would the person be able to detect a sharp prick at the finger tip and withdraw his arm by reflex?

	Detection of sharp prick	*Withdrawing the arm by reflex*
A.	Yes	Yes
B.	Yes	No
C.	No	Yes
D.	No	No

05-30
Which of the following correctly compares structures P and Q?

	Structure P	*Structure Q*
A.	grey matter inside	grey matter outside
B.	protected by bone	not protected by bone
C.	controlling voluntary actions	controlling involuntary actions
D.	receiving food from cerebrospinal fluid	not receiving food from cerebrospinal fluid

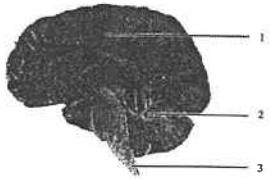
05-31
Which of the following responses does *not* involve the brain as the coordinating centre?
A. playing the piano
B. increase in heart rate during exercise
C. constriction of the pupil under bright light
D. kicking up the lower leg when the knee cap is tapped

07-26
The diagram below shows a cross section of the spinal cord. At which part(s) of the spinal cord can synapses be found?

A. P only
B. Q Only
C. P and R only
D. Q and R only

07-27
John has some problems in his nervous system. When he is blindfolded and the finger of his left hand is pricked with a needle, he cannot feel the pain and does not withdraw his hand. However, he can move his left arm voluntarily. Which of the following components of the corresponding reflex arc is / are probably damaged?
A. interneurone
B. sensory neurone
C. motor neurone
D. motor and sensory neurones

07-28
The photograph below shows part of the human central nervous system.



The movement of the legs is under the coordination of

A. 1 and 2 only.
B. 1 and 3 only.
C. 2 and 3 only.
D. 1, 2 and 3.

Past HKCEE Questions
Nervous Co-ordination
Suggested Answers

Paper I

1. (i) A - * cerebrum / cerebral hemisphere 1
controls voluntary action / memory / thinking 1
(accept any reasonable function)
B - * cerebellum 1
controls balance of the body / co-ordinates muscle movements 1
C - * medulla oblongata 1
controls breathing movements / heart beat 1
(accept any reasonable function)

(ii) this increases the surface area 1
so that a greater number of cell bodies / neurones can be packed in this region 1

(iii)
- the fluid supplies nutrients / oxygen to the brain cells 1
- removes the wastes from the brain cells +
- maintains the shape of the brain 1
- serves as a shock absorber

(any 2)

2. (i) fingertip 1

(ii) because the pin (stimulus) is not applied directly onto a touch receptor / nerve ending 1
(or other reasonable answers)

(iii) touch receptor stimulated 1
nerve impulses pass along the sensory neurone 1
and via the association neurone to the brain where the sensation of touch is produced 1
and then nerve impulses are sent from the brain via the motor neurone to the muscles responsible for speech 1
(N.B. accept flowchart)

(iv) (1) * reflex 1
(2) avoid danger immediately / provide immediate protection 1
(3)
- inborn / leaning not required
- involuntary / not controlled by will
- stereotype / fixed response 1

(any 1)

3. (i) (1) it contracts 1
(2) (I) * elbow joint / * hinge joint 1
(II) it allows movement in one plane / 180° only 1

(ii) Man X:
the motor / association neurone was damaged 1
so that no impulses could be transmitted to the effector muscle /arm to produce the response 1

Man Y:
the sensory neurone / receptor was damaged 1
so that no impulses from the receptor could be transmitted to the brain for producing the painful feeling 1

Man Z:
the association neurone to the brain / the spinal cord above the arm level was damaged 1
no impulses could be carried to the brain 1
since Z can withdraw his hand therefore the reflex arc was not damaged. 1

4. (i) (1) 5 → 3 → 4 1
(2) 1 → 2 → 4 1

(ii)

Reflex actions	Voluntary actions
cerebrum is not involved	cerebrum is involved
stereotyped response is produced	different responses are produced
a receptor is involved	a receptor may not be involved / may be initiated spontaneously
inborn	inborn
usually faster	usually faster

any 2 1, 1

(iii) **A:** receives / integrates sensory impulses — 1
to make an appropriate decision for action — 1
OR
A : sends nerve impulses to the skeletal muscles — 1
to bring about the movement — 1
(any 1 set for A)
B: co-ordinates the action of the skeletal muscles / receives impulses from semi-circular canals, etc. — 1
to maintain balance of the body — 1
C: increases / controls the rate of heart beat / the rate and depth of breathing — 1
to supply more oxygen to the skeletal muscles — 1

5. (i) Receptor: taste buds/ smell receptor — 1
Effector: salivary glands — 1

(ii) — 3

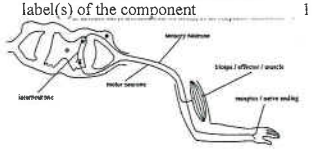
(ii) (light) → light sensitive cells —sensory neurone→ relay neurone in brain —motor neurone→ muscle of iris → (contraction of iris muscle / pupil constriction)

(iii) (1) Cerebrum — 1
(2) Any two: — 2
- The responses can be controlled voluntarily.
- They are not stereotyped.
- They need to be learned.

6. (a) *cerebellum — 1
It is for coordinating the activities of muscles in maintaining body balance — 1

(b) Z protects Y from mechanical damage — 1

(c) Drawing of different neurones (D): correct position of cell bodies, presence of 2 synapses only — 0.5*2
* Labels (L): receptor / nerve ending, sensory neurone, interneurone, motor neurone, effector / biceps / muscle (any four) — 0.5*4
Correct pathway (P):
Indicate the direction of nerve impulse transmission
Or
direction can be identified from the label(s) of the component — 1

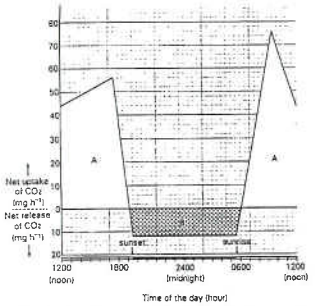


Paper II

90-19	D
91-5	D
92-46	A
92-47	A
92-48	D
93-32	A
94-29	C
96-29	A
96-36	B
96-37	A
96-38	C
98-25	B
99-34	C
00-32	A
00-33	B
01-27	B
01-28	D
03-56	D
05-26	B
05-29	A
05-30	C
05-31	D
07-26	A
07-27	B
07-28	A

Past HKCEE Questions
Nutrition and Gaseous Exchange in Plants
Paper I

1. The graph below shows the net uptake and net release of carbon dioxide of an actively growing plant over a 24-hour period:



(i) At what times) of the day was there no net uptake and no net release of carbon dioxide by the plant? (1 mark)

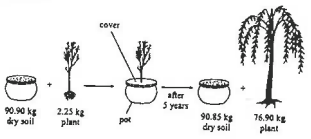
(ii)
(1) What was the respiration rate of the plant in the dark period? (1 mark)
(2) Calculate the total amount of carbon dioxide released by the plant in the same period. (2 marks)

(iii) Assuming that the plant had the same respiration rate throughout the 24-hour period, what was the highest rate of photosynthesis of the plant? (1 mark)

(iv) What information from the graph suggests that the plant was actively growing? Explain your answer. [Hint: Compare area A and area B.] (4 marks)

(HKCEE 1993)

2. In the 17th century, a Dutch scientist, van Helmont, wanted to test the following hypothesis: The soil is the main source of food for plant growth. He grew a young willow plant in a known mass of soil for five years. In this period, he only supplied the plant with water. His investigation is summarized in the diagram below:



(i) Calculate the change in mass of the dry soil and that of the plant in these five years. (1 mark)

(ii) Based on the results obtained in (i), what conclusion can you draw with reference to the above hypothesis? Explain your answer. (3 marks)

(iii) Explain why it is important to put a cover on the pot in this investigation. (2 marks)

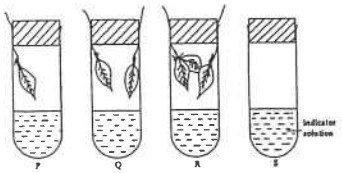
(iv) At van Helmont's time, people did not know that carbon dioxide in the air is also needed by plants for making food.
(1) You are provided with a destarched potted plant. Draw a labelled diagram of an experimental set-up which can be used to show that carbon dioxide is necessary for the plant to make food. (3 marks)
(2) What is the purpose of destarching the plant before the experiment? State how you would destarch the plant. (2 marks)

(HKCEE 2003)

Past HKCEE Questions
Nutrition and Gaseous Exchange in Plants
Paper II

90-12
Nitrogen compounds are required by plants to form
A. glucose.
B. cellulose.
C. fatty acids.
D. amino acids.

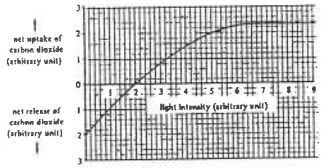
90.
Directions: Questions 16 and 17 refer to the experimental set-up shown below. Each tube contains the same volume of an indicator solution but a different number of leaves. The tubes are uniformly illuminated.



90-16
The indicator solution changes from red to purple when it becomes less acidic. In which of the tubes does the indicator solution change from red to purple most rapidly?
A. Tube P
B. Tube Q
C. Tube R
D. Tube S

90-17
If a similar set-up were kept in the dark for several hours, which tube would contain most oxygen at the end of the experiment?
A. Tube P
B. Tube Q
C. Tube R
D. Tube S

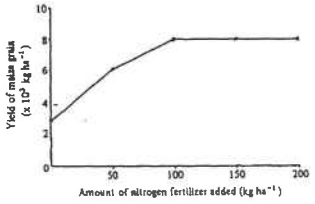
91.
Directions: Questions 21 and 22 refer to the graph below which shows the exchange of carbon dioxide between a green plant and the atmosphere under different light intensities



91-21
Which of the following can be deduced from the graph?
(1) At a light intensity of 1 arbitrary unit, only respiration takes place.
(2) At a light intensity of 2 arbitrary units, there is no cad carbon dioxide taken in or given out.
(3) At a light intensity of 9 arbitrary units, the rate of photosynthesis is greater than the rate of respiration.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

91-22
At a light intensity of 5 arbitrary units, how many units of carbon dioxide are used up in photosynthesis?
A. -2
B. 0
C. 2
D. 4

92-58
The graph shown the yield of maize grain in relation to the amount of nitrogen fertilizer added to the soil:

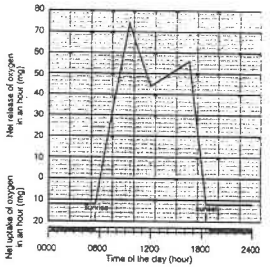


What conclusion can be drawn from the graph?
A. There would be so yield of maize grain without the addition of nitrogen fertilizer.
B. The yield of maize grain is directly proportional to the amount of nitrogen fertilizer added.
C. It is not economical to add nitrogen fertilizer beyond 100 kg ha^{-1}.
D. The addition of nitrogen fertilizer at a concentration of 200 kg ha^{-1} has a damaging effect on the environment.

93-15
In order to make proteins, plants require

	Chemicals absorbed from the soil	Chemicals synthesized by the plant
A.	nitrates	carbohydrates
B.	nitrates	vitamins
C.	magnesium compounds	vitamins
D.	magnesium compounds	carbohydrates

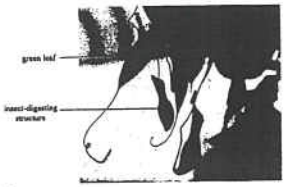
97.
Directions: Questions 15 and 16 refer to the graph below which shows the net release and net uptake of oxygen of a plant over a 24-hour period:



97-15
Which of the following can he deduced from the graph?
A. At 0600 hour, there is no respiration.
B. The fastest rate of photosynthesis occurs at 0930 hour.
C. The lowest rate of respiration occurs at 1200 hour.
D. At 1800 hour, there is no photosynthesis.

97-16
Assuming that the plant has the same respiration rate throughout the 24-hour period, how much oxygen is produced by the plant in an hour at 1630 hour?
A. 12 mg
B. 44 mg
C. 56 mg
D. 68 mg

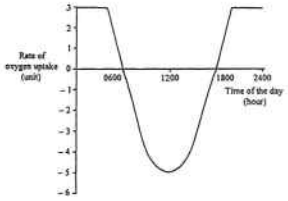
98.
Directions: Questions 12 mad 13 refer to the photograph below which shows part of a pitcher plant:



98-12
Pitcher plants carry out
(1) autotrophic nutrition.
(2) holozoic nutrition.
(3) parasitic nutrition.
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

98-13
The insect-digesting structure helps pitcher plants to grow
A. in dry soil.
B. on tree trunks.
C. in areas of low light intensity.
D. in soil with low nitrogen content.

00.
Directions: Questions 9 and 10 refer to the graph below, which shows the rate of oxygen uptake of a plant in 24 hours:

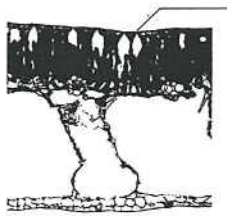


00-9
Which of the following correctly describes the plant at 1200 hour?
A. It carried out photosynthesis, but not respiration.
B. It carried out photosynthesis at the maximum rate.
C. The rate of photosynthesis was equal to the rate of respiration.
D. The rate of photosynthesis was lower than the rate of respiration.

00-10
Based on the graph, we may conclude that at 1800 hour the rate of photosynthesis was 3 units. What assumption has to be made in order to arrive at this conclusion?
A. The plant did not carry out respiration at 1800

hour.
B. The rate of photosynthesis of the plant varied at different times of the day.
C. The rate of respiration of the plant was constant throughout the 24-hour period.
D. The rate of respiration of the plant was equal to the rate of photosynthesis at 1800 hour.

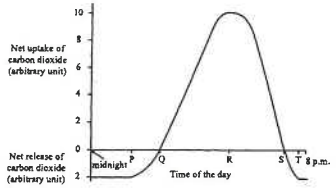
03.
Directions: Questions 27 and 28 refer to the following photomicrograph of a section of a leaf



03-27
Which of the following is the function of X?
A. for the absorption of water into the leaf
B. for the transmission of sunlight into the leaf
C. for the passage of carbon dioxide into the leaf
D. for the regulation of the pressure inside the leaf

03-28
The section is probably taken from
A. a floating leaf.
B. a submerged leaf.
C. a leaf of a plant living in dry habitats.
D. a leaf of a plant growing on highlands.

04.
Directions :Questions 8 and 9 refer to the graph below, which shows the gaseous exchange of a green leaf from midnight to 8 p.m:

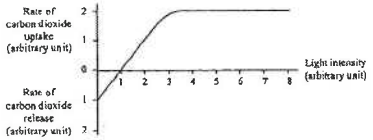


04-08
The leaf carried out photosynthesis during the period
A. P to S only.
B. P to T only.
C. Q to R only.
D. Q to S only.

04-09
What is the highest rate of photosynthesis of the leaf?
A. 6 arbitrary units
B. 8 arbitrary units
C. 10 arbitrary units
D. 12 arbitrary units

05-43
A student found that the leaves of a plant growing in the laboratory had turned yellow. Which of the following is the ***least*** probable explanation for this observation?
A. shortage of nitrate in the soil
B. shortage of magnesium in the soil
C. insufficient light supply to the plant
D. insufficient carbon dioxide supply to the plant

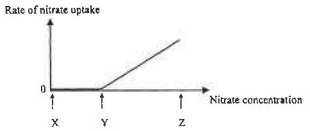
Directions: Questions 45 and 46 refer to the graph below, which shows the rates of carbon dioxide uptake and release of a plant under different light intensities:



05-45
When the light intensity is 6 units, what is the actual rate of photosynthesis of the plant in terms of the rate of carbon dioxide uptake?
A. 1 unit
B. 2 units
C. 3 units
D. 4 units

05-46
At 1 unit of light intensity, the rate of carbon dioxide uptake is zero. This is because at this light intensity,
A. the plant cannot undergo photosynthesis.
B. the closure of stomata stops gas exchange.
C. the rate of photosynthesis of the plant is equal to its rate of respiration.
D. the plant takes in oxygen instead of carbon dioxide from the atmosphere.

06-6
The graph below shows the rate of nitrate uptake by root hair cells. The root hair cells are immersed in solutions of different nitrate concentrations.



Which of the following can be deduced from the graph?
A. Between X and Y, the root hair cells take up nitrate by diffusion.
B. Between Y and Z, the root hair cells take up nitrate by diffusion.
C. Between Y and Z, the root hair cells take up nitrate by active transport.
D. Between X and Z, the root hair cells take up nitrate by active transport and diffusion.

Past HKCEE Questions
Nutrition and Gaseous Exchange in Plants
Suggested Answers

Paper I

1. (i) 1800 hour and 0600 hour 1

(ii) (1) rate of respiration = 12 mg of CO_2 released per hour (N.B. No unit, no mark) 1

(2) The total amount of CO_2 released = rate x time =12x11 1
= 132 mg (N.B. No unit, no mark for the answer) 1

(iii) The highest rate of photosynthesis = highest net uptake of CO_2 + net release of $C0_2$ in the dark
= 76 + 12 = 88 mg of C02 per hour 1
(N.B. no unit, no mark)

(iv) The total area of A could be taken as the net food production by the plant 1
The total area of B could be taken as the net food consumption by the plant 1
The total area of A is greater than that of B 1
indicating there is an overall gain in food production which is a characteristic feature of an actively growing plant 1

2. (i) dry soil : 50 g / 0.05 kg
plant : 74.65 kg 1

(ii) The soil is not the main source of food for plant growth, 1
because the drop in mass of the dry soil is very small in comparison 1
with the gain in mass of the plant. 1

(iii) To reduce the amount of substance in air added to the soil / the amount of soil lost to the air, 1
so that the loss in weight of the soil is mainly due to the plant. 1

(iv) (1)

3

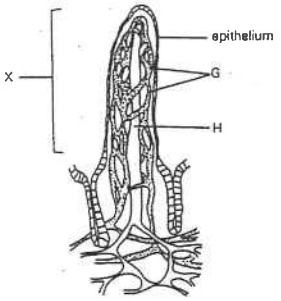
(2) To make sure that the starch detected at the end of the experiment was made during the experiment. 1
By keeping the plant in darkness for two days. 1

Paper II

90-12	D
90-16	C
90-17	D
91-21	C
91-22	D
92-58	C
93-15	A
97-15	B
97-16	D
98-12	C
98-13	D
00-9	B
00-10	C
03-27	C
03-28	A
04-08	B
04-09	D
05-43	D
05-45	C
05-46	C
06-6	B

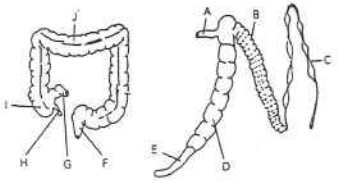
Past HKCEE Questions
Nutrition in Mammals
Paper I

1. The diagram below shows part of ileum highly magnified.



(i) Name G and H.
(ii) Explain how structure X, shown in the diagram, is adapted for absorption of food.
(iii) What kinds of digested food enter G?
(iv) What kinds of digested food enter H?
(v) Trace the path of digested food from G to the heart. (HKCEE 1980)

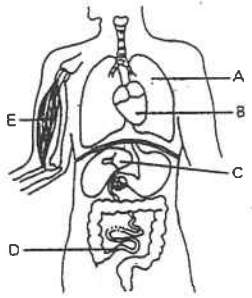
2. The diagrams below show the posterior region of the alimentary canal for both a human and a rabbit. (The parts are not drawn to the same scale.)



human rabbit

(i) Write down the letters from the TWO diagrams which correspond to the following parts:
(1) ileum
(2) caecum
(3) appendix
(4) colon
(ii) With reference to their diets, state and explain two differences between the caecum of a human and that of a rabbit.
(iii) Name the process by which food is passed along the large intestine.
(iv) State the main function of
(1) the colon, and
(2) the rectum. (HKCEE 1982)

3. The diagram below shows part of the human body:
(The parts are not drawn to the same scale.)



(i) What is D? Apart from digestion, what other function does it have?
(ii) What are the two blood vessels that carry blood to C?
(iii) What is the blood vessel that drains blood away from C?
(iv) State and explain the difference in glucose level between the blood leaving D and that leaving C shortly after a meal.
(v) Using the letters in the diagram, show the route by which blood flows from D to E.
(vi) State two ways by which blood glucose can be used in E. (HKCEE 1984)

4. Digestive juices were collected from two regions, A and B, of the alimentary canal of a rat. Each preparation was divided into four test-tubes, to which a sample of boiled plant tissue was added. Food tests were carried out on each tube, and the results are shown in the tables below:

Experiment I
(using digestive juice from region A)

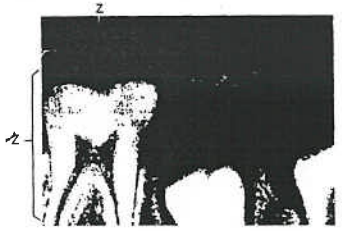
Food test	Biuret test		Benedict's/ Fehling's test	
Tube no.	A1	A2	A3	A4
Time when food test was applied	at 0 hour	after 1 hour	at 0 hour	after 1 hour
Observation	violet colour	blue colour	blue solution	red precipitate

Experiment II
(using digestive juice from region B)

Food test	Biuret test		Benedict's/ Fehling's test	
Tube no.	B1	B2	B3	B4
Time when food test was applied	at 0 hour	after 1 hour	at 0 hour	after 1 hour
Observation	violet colour	violet colour	blue solution	red precipitate

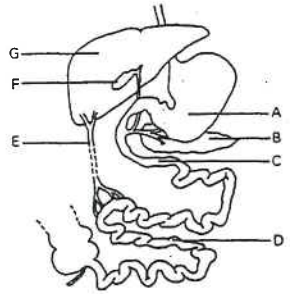
(i) Referring to the tube numbers, indicate which tube(s) gave a positive result for
(1) the Biuret test.
(2) the Benedict's / Fehling's test.
(ii) What conclusion can be drawn from the results of
(1) the Biuret test in experiment I?
(2) the Benedict's / Fehling's test in experiment II?
(iii) Give one name each for the regions A and B and hence suggest the names of the juices collected. (8 marks)
(HKCEE 1984)

5. The X-ray photograph below shows a certain part of the human body:



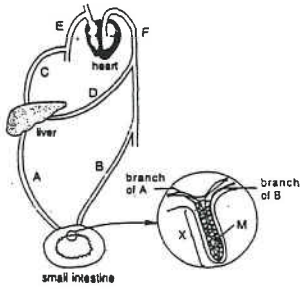
(i) What is Z in the photograph?
(ii) State the function of Z and explain the importance of this function.
(iii) Make a fully labelled drawing to show the structure of Z as revealed in the above photograph.
(iv) Is the photograph taken from a child or an adult? Give a reason for your answer. (10 marks)
(HKCEE 1984)

6. The diagram below shows a certain region of the human digestive system. (The parts are not drawn to the same scale.)



(i) Compare the pH values of the juices contained in A and F.
(ii) What juice is contained in F? State its effect on peanut oil.
(iii) Using the letters in the diagram, name all the parts which produce the juices required for the complete digestion of egg white.
(iv) The digestive product of egg white is transported to G through E.
(1) What is this product?
(2) What process is carried out by G when an excess of this product is present?
(HKCEE 1986)

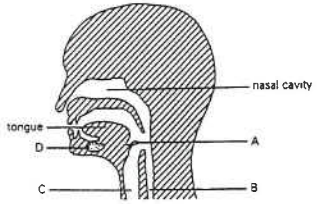
7. The diagram below is a schematic representation showing the heart, and the blood supply to the liver and small intestine in a mammal.



(i)
(1) Name structure X and state its function. (2 marks)
(2) State and explain two adaptive features possessed by X to perform its function. (4 marks)
(ii) Name structure M and state its function.

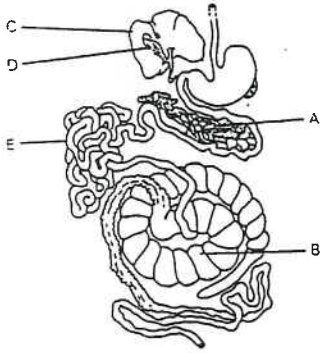
State the transport system to which M belongs. (3 marks)
(iii) A few hours after taking a meal rich in carbohydrates, the amount of a certain hormone Y was found to have increased sharply in the blood of the mammal.
(1) Name hormone Y. State its site of production and its function. (3 marks)
(2) Using the letters in the diagram, trace the pathway by which the digested products of carbohydrates are transported from the small intestine to the heart. (1 mark)
(HKCEE 1987)

8. The following diagram shows a section through a human head:



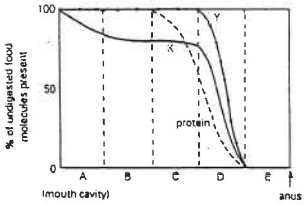
(i) Identify structure B. (1 mark)
(ii) State ONE characteristic feature of the inner surface of C and give its function. (2 marks)
(iii) What is the action of A during swallowing? Why is this action important? (2 marks)
(iv) Name the fluid secreted from D. Give TWO functions of this secretion. (3 marks)
(HKCEE 1988)

9. The following diagram shows part of the alimentary canal of a rabbit:



(i) Name structures A and B. (2 marks)
(ii) Of structures A, C and D, give the letters of the TWO structures which produce secretions for the digestion of fats. (1 mark)
(iii) Describe and explain the action of each secretion in (ii) on fat digestion. (5 marks)
(iv) How would you show that an extract from E contains an enzyme similar in action to salivary amylase? (2 marks)
(HKCEE 1989)

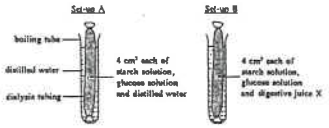
10. Digestion of different types of food substances starts in different regions of the human alimentary canal. The extent to which proteins, fats and starch are being digested in successive regions (A to E) of the alimentary canal can be represented by the graph shown below:



(i) In which region (A to E) does digestion of proteins start? Name this region. (2 marks)
(ii) Which curve (X or Y) represents the digestion of starch? Explain your answer. (2 marks)
(iii) Name all the digestive juices found in region D. (3 marks)
(iv) In which region (A to E) does absorption of digested food occur most? (1 mark)
(v) Name region E and state its main function. (2 marks)
(HKCEE 1992)

11. If you were a doctor, what dietary restriction would you recommend for the following patients?
(i) patient A whose gall bladder has been removed
(ii) patient B who suffers from tooth decay. Explain the biological principle behind your recommendation. (8 marks)
(HKCEE 1993)

12. Two pieces of dialysis tubing were filled with different solution mixtures and immersed in distilled water as shown below:



After 30 minutes, 2 cm^3 of the water outside the dialysis tubing in set-up A wax transferred into a separate test tube and Benedict's test was performed. The same procedure was repeated with set-up B. The results are recorded in the following table:

	Set-up A	Set-up B
Results of Benedict's test	+	+++

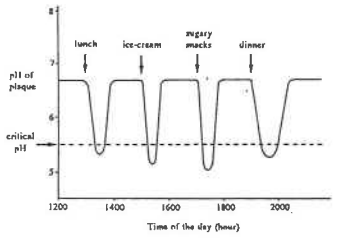
Key : '+' represents a small amount of red precipitate
'+++' represents a large amount of red precipitate

(i) What can you deduce from the result of set-up A? (2 marks)

(ii)
(1) Explain why the amount of red precipitate of set-up B is greater than that of set-up A. (3 marks)
(2) Name two digestive juices from the human body that may produce the same result as digestive juice X. (2 marks)

(iii) Suggest three important precautions to reduce experimental errors when setting up this experiment. (3 marks)
(HKCEE 1994)

13. Plaque on tooth surface is mainly composed of bacteria. The graph below shows the changes in pH of the plaque of a child in a certain period. The critical pH is the pH below which tooth decay may occur.



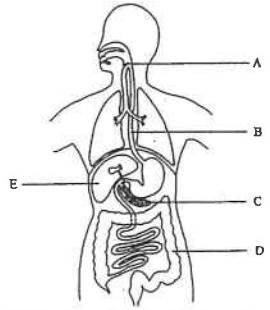
(i) Explain why the PH of the plaque drops after the intake of food. (2 marks)

(ii) Explain why a low pH in the plaque may cause tooth decay. (1 mark)

(iii) Based on the information provided. Suggest one way of reducing the chance of tooth decay. Explain your answer. (2 marks)

(iv) Draw a labelled diagram of a vertical section of a tooth al the early stage of decay. (4 marks)
(HKCEE 1995)

14. The diagram below shows the alimentary canal and the associated glands of a man:



(i) What is the function of A? (1 mark)

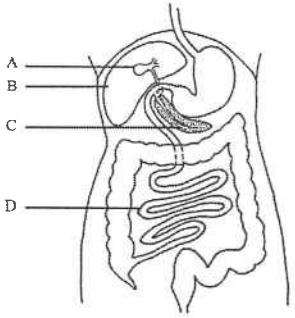
(ii) Name the process by which food is moved along B. (1 mark)

(iii) Explain how the secretion from C helps the digestion of protein. (4 marks)

(iv) In an operation, a large part of D of the man was removed. Explain what change will occur to his faeces. (2 marks)

(v) State two functions of E that are not related to digestion. (2 marks)
(HKCEE 1996)

15. The diagram below shows part of the human digestive system:

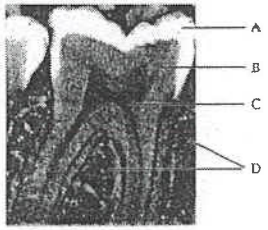


(i) Structure A is removed from a patient by surgical operation. Explain why this patient cannot digest fatty food properly after the operation. (4 marks)

(ii) An obese (very fat) person had a surgical operation to remove part of structure D. Explain why this method may lead to a significant reduction of his body weight several months after the operation. (3 marks)

(iii)
(1) Name one substance that is secreted by structure C directly into the blood. (1 mark)
(2) If a person failed to produce this substance, how would the homeostatic function of structure B be affected? Give a reason for your answer. (2 marks)
(HKCEE 1999)

16. The X-ray photograph below shows a human molar:

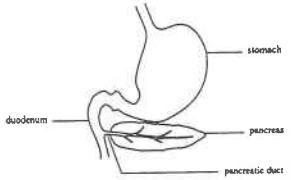


(i) Using the letters in the photograph, state all the structures that is / are
(1) richly supplied with capillaries,
(2) rich in calcium salts. (2 marks)

(ii) Based on the X-ray photograph, make a labelled drawing of this tooth. (4 marks)

(iii) Explain how the process of digestion would be affected if a person lost most of this type of tooth. (3 marks)

17. The function of the pancreas in some people may become impaired due to the blockage of the pancreatic duct. The diagram below shows the pancreas and part of the alimentary canal:

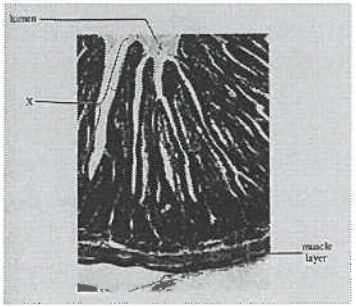


(i) The faeces produced by such patients usually have a high fat content. Explain why. (3 marks)

(ii) In these patients, tissues of the pancreas may get digested. How would you account for this? (2 marks)

(iii) Explain why the patients may produce urine containing glucose if the tissues of the pancreas are damaged by digestion. (4 marks)
(HKCEE 2003)

18. The photomicrograph below shows a cross section of the small intestine of a mammal:



(i) With reference to *two* features of X observable from the photomicrograph, explain how these features facilitate the absorption of digested food substances. (4 marks)

(ii) Use a flowchart to show how amino acids are transported to the heart after entering X. Indicate the major organs and blood vessels along the pathway. (2 marks)

(iii) Describe how the muscle layer helps the movement and digestion of food inside the small intestine. (3 marks)
(HKCEE 2004)

19. Read the passage below and answer the questions that follow:

For many years, doctors believed that gastric ulcer (damage and bleeding of the stomach wall) was caused by excessive acid secretion in the stomach, so they used certain chemicals to treat ulcer patients. However, after recovery, many patients might develop gastric ulcer again. In the 1980s, an Australian doctor, Barry Marshall, observed that all his ulcer patients had a type of bacteria called Helicobacter pylori (幽門螺旋桿菌) in their stomach. He therefore put forward a new hypothesis about gastric ulcer. Based on this hypothesis, he treated his patients with antibiotics which are chemicals that kill bacteria. Many of his

patients recovered rapidly and did not develop gastric ulcer again.

(a) If gastric ulcer is caused by excessive secretion of acid, what kind of chemicals should be used for treatment? (1 mark)

(b) Many doctors were surprised at Marshall's observation because they thought that bacteria could not survive in the stomach. Why did they think so? (1 mark)

(c) With reference to the treatment used by Marshall, what do you think is his hypothesis about gastric ulcer? (1 mark)

(d) Suggest a method to test Marshall's hypothesis. What result would be obtained if his hypothesis is correct? (2 marks)

(e) Explain the importance of the churning action of the stomach in the digestion of food. (3 marks)

(HKCEE 2005)

20. The table below shows the average amount of water entering the alimentary canal and the average amount being absorbed in the intestine of a person each day:

Water entering the alimentary canal		Water absorbed by the intestine	
Source	Volume (mL)	Site	Volume (mL)
Ingestion	2000	Small intestine	9000
Secretions along the alimentary canal	8000	Large intestine	850

(a) Based on the above information, how much water is egested with the faeces each day? (Note: Neglect the amount of water absorbed in the other parts of the alimentary canal.) (1 mark)

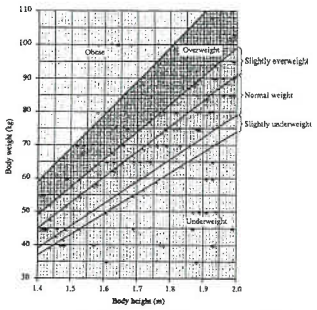
(b) Give two examples of secretions that enter the alimentary canal. (2 marks)

(c) (i) Based on one structural difference between the small intestine and the large intestine, explain why a much larger volume of water is absorbed in the small intestine. (2 marks)

(ii) Explain how the absorption of digested food facilitates the absorption of water in the small intestine. (2 marks)

(HKCEE 2006)

21. Body mass index (BMI) is a figure used to assess the body weight condition of a person. It is determined by two factors: weight and height of the person. The BMI chart below allows people to check their body weight conditions based on their weight and height:



(a) (i) Mr. Wong weighs 70 kg and his height is 1.7 m. Using the descriptions given on the chart, state the body weight condition of Mr. Wong. (1 mark)

(ii) Mr. Wong's son is 1.55 m tall. What should be the ideal range of his body weight if he wants to be fit and healthy? (1 mark)

(b) According to the deposition of fat in the body, scientists classify body shape into two basic categories: apple shape and pear shape. To determine the category of body shape, the waist-to-hip ratio (WHR) can be used and it is represented by the following formula:

$$\text{WHR} = \frac{\text{waist circumference}}{\text{hip circumference}}$$

The table below shows the categorization of the body shapes of men and women using the WHR:

	WHR	
	Men	Women
Apple shape	> 0.95	> 0.85
Pear Shape	≤ 0.90	≤ 0.85

(i) For most people, having extra fat around their waist increases health risk more than having extra fat around their hip. With reference to this information, which body shape has a higher health risk? (1 mark)

(ii) Mr. and Mrs. Wong have similar BMI, but their body shapes are different. Mr. Wong's waist and hip circumferences are 0.87 m and 0.97 m respectively, whereas Mrs. Wong's are 0.87 m and 0.95 m. Who has a higher health risk? Show how you arrive at your answer. (3 marks)

(c) Dieticians recommend that overweight people should have a diet with more vegetables. Suggest two reasons to explain why this diet may help these people to reduce the chance of becoming obese. (4 marks)

22. Read the paragraph below and answer the questions that follow.

> Gastric reflux describes a backflow of the gastric juice from the stomach into the oesophagus. This can irritate and sometimes damage the lining of the oesophagus, giving a feeling of heartburn. In Hong Kong, the rate of patient suffering from gastric reflux rose from 2.3 per 10 000 in 1996 to 6.2 per 10 000 in 2005. It is believed that the alarming rise is related to the lifestyles of people in Hong Kong. These include having midnight snack right before sleeping, excessive fatty foods, large meals, irregular mealtime, and drinking a lot of alcohol or coffee.

(a) (i) With reference to the content of gastric juice, suggest a probable reason for its damage to the oesophagus. (1 mark)

(ii) Food entering the small intestine carries some gastric juice from the stomach. Explain why the gastric juice does not normally damage the small intestine. (3 marks)

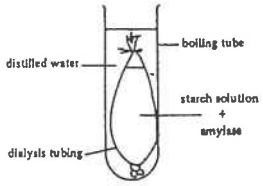
(b) Suggest why the backflow of gastric juice is more likely to occur if a person has a meal just before sleeping. (3 marks)

(c) A patient suffering from severe gastric reflux will also likely to have tooth decay. Give an explanation for this. (2 marks)

(HKCEE 2007)

Past HKCEE Questions
Nutrition in Mammals
Paper II

90.
Directions: Questions 4 and 5 refer to the diagram below which shows the experimental set-up used to demonstrate the importance of digestion in the absorption of food:

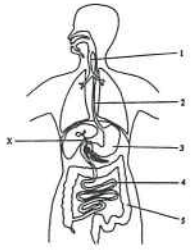


90-4
After one hour, small portions of distilled water in the boiling tube were separately tested using the Biuret test, Iodine test and Benedict's test. The results were

	Biuret test	Iodine test	Benedict's test
A.	blue	brown	red precipitate
B.	blue	blue-black	red precipitate
C.	violet	brown	blue
D.	violet	blue-black	blue

90-5
Which of the following is a necessary precaution for this experiment?
A. Put the experimental set-up in a water bath kept at 37°C.
B. Stir the distilled water in the boiling tube occasionally.
C. Shake the contents inside the dialysis tubing occasionally.
D. Rinse the outside of the dialysis tubing with distilled water before putting it into the boiling tube.

90.
Directions: Questions 7 to 9 refer to the diagram below which shows some internal structures of the human body:



90-7
Which region (s) is /are lined with mucus?
A. 1 only
B. 1 and 3 only
C. 2, 3 and 4 only
D. 1, 2, 3, 4 and 5

90-8
Which region absorbs most water from it/ contents?
A. region 2
B. region 3
C. region 4
D. region 5

90-9
The juice collected from duct X is boiled and then added to the following test-tubes:
Tube 1 - containing water with a few drops of peanut oil
Tube 2 - containing water with small cubes of egg white
Tube 3 - containing water with a few grains of rice
Which tube, on shaking, will form an emulsion which will persist when left to stand?
A. Tube 1
B. Tube 2
C. Tube 3
D. None of the above tubes

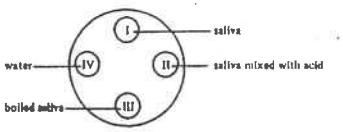
90-10
Which of the following statements about a dental disclosing agent is correct?
A. It kills bacteria.
B. It contains fluoride.
C. It has an abrasive effect.
D. It stains dental plaque red.

91-15
Bile juice helps in the digestion of fit because it contains
A. enzymes.
B. vitamins.
C. bile alts.
D. bile pigments.

92-14
Bacteria play a part in tooth decay by
A. neutralizing the acidity of the saliva.
B. causing a foul small in the mouth cavity.
C. dissolving the enamel of the tooth.
D. converting the food trapped between the teeth into acid.

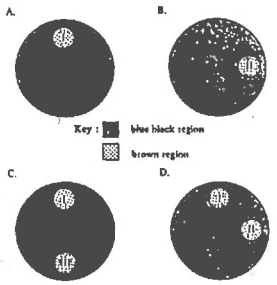
92-16
Which of the following products of digestion is absorbed into the lacteal of the villus?
A. glucose
B. glycogen
C. fatty acids
D. amino acids

93.
Directions: Question 5 refer to the following experiment. Four filter paper discs (I to IV) soaked with different solutions were put onto the surface of a starch agar plate as shown below:

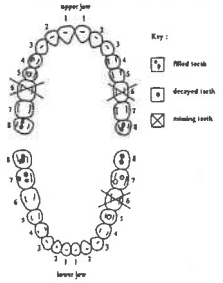


Starch agar plate as viewed from above

93-5
After incubations at 25°C for one hour, the paper discs were removed and the starch agar plats was flooded with iodine solution. Which of the following shows the probable result?



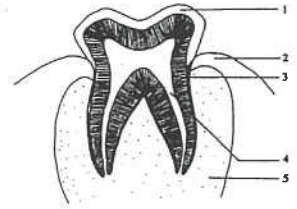
93.
Directions: Question 12 and 13 refer to the dental chart of an adult a shown below:



93-12
The teeth labelled 3 in the dental chart are
A. incisors.
B. canines.
C. premolars.
D. molars.

93-13
Which of the following conclusions can be drawn by referring only to the dental chart?
A. Rear teeth have thinner enamel.
B. Frontal teeth are more resistant to decay.
C. Most of the tooth decay occurs in the rear part of the tooth set.
D. Tooth decay occurs randomly in different parts of the tooth set.

94.
Direction: Questions 3 and 4 refer to the diagram below which shows a vertical section of a human tooth in the jaw:



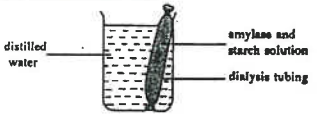
94-3
Which structures contain a large amount of calcium salts?
A. 1, 2 and 3 only
B. 1, 3 and 4 only
C. 1, 3 and 5 only
D. 2, 4 and 5 only

94-4
Which of the following structures has a rich supply of nerve endings?
A. 1
B. 3
C. 4
D. 5

94-5
In an operation, a large part of the colon of a person was removed. As a result, the person could not
A. take in solid food.
B. produce sufficient digestive enzymes.
C. absorb amino acids efficiently.
D. produce solid faeces.

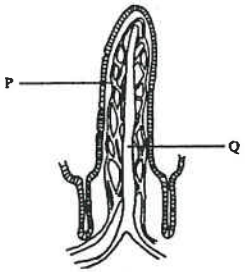
94-6
When bile juice is added to a sample of oil containing a few drops of universal indicator solution, the colour change indicates an increase in pH. The pH increases because
A. bile juice contains bile pigments.
B. bile juice contains alkaline salts.
C. bile juice emulsifies the oil.
D. bile juice breaks down the oil into fatly acids.

95-5
The diagram below shows a set-up to study the effect of amylase on starch. After 3 hours, water in the beaker was heated with Benedict's solution and a red precipitate appeared.



Which of the following can be deduced from the above experiment?
A. Glucose was formed from the digestion of starch.
B. Starch could not pass through the dialysis tubing.
C. The dialysis tubing allowed reducing sugar to pass through.
D. The water potential of the solution in the dialysis tubing increased.

95.
Directions: Questions 14 to 16 refer the diagram below which shows a section through a villus:



95-14
Which of the following are the functions of structure P?
(1) It transports fat away.
(2) It transports glucose and amino acids away.
(3) It transports oxygen to the cells.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1). (2) and (3)

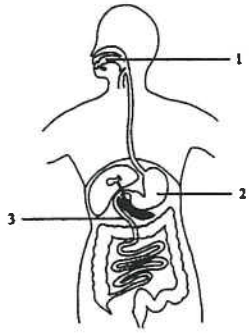
95-15
Structure P receives blood from
A. the aorta.
B. the lymph vessel.
C. the hepatic artery.
D. the hepatic portal vein.

95-16
The fluid in Q
A. contains antibodies.
B. is milky during fasting.
C. is rich in glucose after a meal.
D. contains a large amount of oxygen.

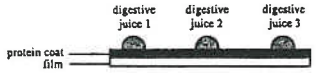
97-10
The diagram below show two types of teeth of an adult man. Which of the following statements about the teeth is incorrect?

A. The surface material of region M prevents the teeth from decay.
B. Plaque is usually formed on the surface of region N.
C. Tooth X is used for cutting food while tooth Y is for grinding food.
D. Tooth X is located at the front of the jaw while tooth Y is located at the back.

97.
Directions: Questions 11 to 12 refer to the diagram below which shows the human digestive system:



97-11
Digestive juices 1, 2 and 3 were collected from structures 1, 2 and 3 respectively. Small drops of these juices were put on a strip of film which was coated with protein as shown in the diagram below:



The protein coat will be digested by the digestive juices
A. 1 and 2 only.
B. 1 and 3 only.
C. 2 and 3 only.
D. 1, 2 and 3.

97-12
If the digestive juices in question 11 were mixed with a buffer solution of pH 2 before putting them on the film, then the protein coat
A. would be digested at a slower rate by juice 1.
B. would be digested by juice 2 only.
C. would be digested at a faster rate by juice 3.
D. would not be digested at all.

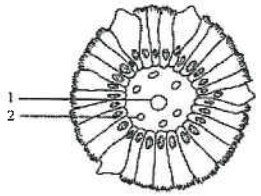
98-5
The stomach wall produces mucus to cover its surface. Which of the following statements correctly describe(s) the function of the mucus?
(1) It kills the bacteria in the ingested food.
(2) It prevents the rubbing of food against the stomach wall.
(3) It protects the stomach wall from the action of the digestive enzymes.
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

98-9
Which of the following is most effective in preventing tooth decay?
A. using a toothbrush with a larger head
B. brushing the teeth after meals
C. brushing the teeth harder
D. avoiding sugary food

98-10
Which of the following statements about the function of the different ingredients of toothpaste is correct?
(1) It contains calcium compounds for the growth of the teeth.
(2) It contains fluoride compounds for protecting the teeth from decay.
(3) It contains grinding particles for removing plaque on the tooth surface.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

99-14
If the diet of a person is rich in carbohydrate, his body will store the excess carbohydrate as
(1) fat.
(2) starch.
(3) glycogen.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

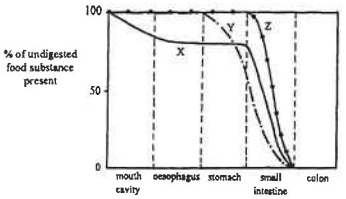
99.
Directions: Questions 15 and 16 refer to the diagram below, which shows the transverse section of an intestinal villus:



99-15
The main food substance absorbed into structure 1 is
A. fatty acids.
B. vitamins.
C. glucose.
D. fat.

99-16
Food substances absorbed into structure 2 will be first transported to
A. the liver.
B. the heart.
C. the kidneys.
D. the pancreas.

00
Directions: Questions 6 to 8 refer to the graph below, which shows the digestion of three types of food substances, X, Y and Z, along the alimentary canal:



00-6
Which food substance(s) is/are digested in the stomach?
A. X only
B. Y only
C. X and Y only
D. X, Y and Z

00-7
What are food substances X, Y and Z?

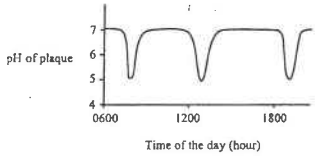
	X	*Y*	*Z*
A.	starch	protein	fat
B.	starch	fat	protein
C.	protein	fat	starch
D.	protein	starch	fat

00-8
In the alimentary canal, most water is absorbed in the
A. oesophagus.
B. stomach.
C. small intestine.
D. colon.

00-34
In the alimentary canal, bacteria in food are mainly killed by
A. saliva.
B. mucus.
C. gastric juice.
D. pancreatic juice.

01-12
The absorption of water in the small intestine is facilitated by
(1) the presence of numerous capillaries.
(2) the absorption of digested food.
(3) the folding of the inner lining.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

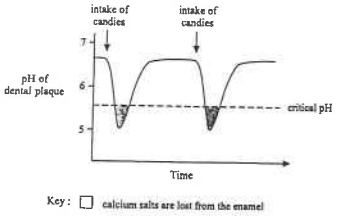
01-13
The graph below shows the changes in pH of the plaque on the tooth surface of a child:



The change in pH from 12:00 to 12:30 hour is most probably caused by
A. the destruction of the enamel by bacteria.
B. the bacteria reacting with the food debris.
C. the release of saliva into the mouth cavity.
D. the breakdown of the food debris by bacteria.

01-14
The liver is regarded as a digestive gland because it
A. converts stored glycogen into glucose.
B. breaks down excess amino acids.
C. produces bile.
D. stores iron.

01.
Directions: Questions 15 to 17 refer to the graph below, which shows the changes in pH of the dental plaque of a person after he has eaten some candies



Key: ☐ calcium salts are lost from the enamel

01-15
Calcium salts are lost from the enamel as a result of their reaction with
A. acid.
B. sugar.
C. bacteria.
D. salivary amylase.

01-16
Which of the following statements about the critical pH is correct?
A. It is the pH of the candies.
B. It is the normal pH of the dental plaque.
C. It is the optimum pH for tooth decay to occur.
D. It is the pH below which tooth decay may occur.

01-17
According to the graph, which of the following can help to prevent tooth decay?
(1) reducing the frequency of eating sugary food
(2) adding fluoride to drinking water
(3) brushing our teeth after eating
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

01-19
Which of the following food substances is/are absorbed directly without digestion?
(1) vitamin C
(2) sucrose
(3) polypeptide

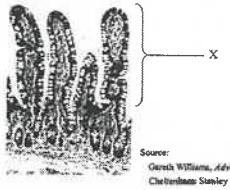
A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

02-22
Which of the following comparisons between the milk dentition and the permanent dentition of humans is/are correct?

	Milk dentition	Permanent dentition
(1)	fewer molars	more molars
(2)	no canines	with canines
(3)	serves babies whose main diet is milk	serves adults whose main diet is solid food

A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

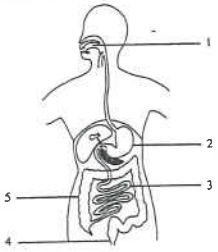
02-23
The photomicrograph below shows part of a human organ



Source:
Gareth Williams, *Advanced Biology for you*, Cheltenham: Stanley Thornes Publishers Ltd., 2000.

The function of structure X is to
A. detect light on the retina.
B. move the ovum along the oviduct.
C. reabsorb glucose in the kidney tubule.
D. absorb digested food in the alimentary canal.

03.
Directions: Questions 4 and 5 refer to the diagram below, which shows the human digestive system:



03-04
Protein digestion occurs mainly in
A. 1 and 3.
B. 2 and 3.
C. 2 and 5.
D. 3 and 5.

03-05
Most mineral salts are absorbed in
A. 2.
B. 3.
C. 4.
D. 5.

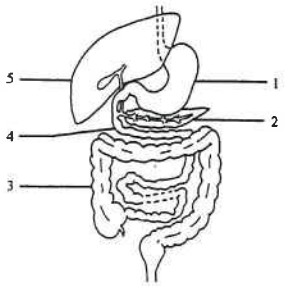
03-13
Most of the fat absorbed in the small intestine is first transported to the
A. liver.
B. heart.
C. pancreas.
D. large intestine.

03-14
Frequent intake of candies causes tooth decay because
(1) they are rich in sugar.
(2) they have a high energy value.
(3) they leave traces on the tooth surface.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

03-26
Which of the following correctly describes the emulsification of oil by bile?
A. It produces fatty acids.
B. Its rate is highest at 37°C.
C. It occurs in the gall bladder.
D. It increases the surface area of the oil.

04-05
The fluid inside the lacteals of the intestinal villi becomes milky after a meal. This is due to the presence of
A. fatty acids.
B. amino acids.
C. fats.
D. proteins.

Direction: Questions 20 to 22 refer to the diagram below, which shows part of the human digestive system:



04-20
Which structures produce enzymes for digesting proteins in the alimentary canal?
A. 1, 2 and 4
B. 1, 2 and 5
C. 1, 3 and 5
D. 2, 4 and 5

04-21
Which structures are responsible for the regulation of blood glucose level?
A. 2 and 4 only
B. 2 and 5 only
C. 4 and 5 only
D. 2, 4 and 5

04-22
In a healthy person, structure 3 normally contains a large number of bacteria. What is the ecological relationship between the human and the bacteria?
A. predation
B. parasitism
C. mutualism
D. competition

Directions: Questions 28 and 29 refer to the diagram below, which shows the vertical section of a human tooth:

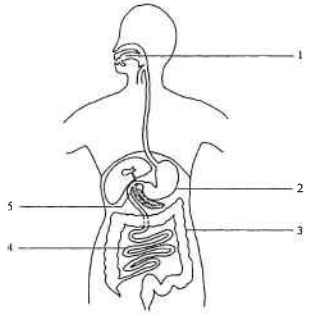
04-28
Which structures are hard and rigid?
A. 1, 2 and 3
B. 1, 2 and 4
C. 1, 3 and 5
D. 2, 4 and 5

04-29
Which structures receive a continuous supply of nutrients?
A. 1, 2 and 3 only
B. 3, 4 and 5 only
C. 1, 2, 4 and 5 only
D. 2, 3, 4 and 5 only

05-11
Excess amino acids absorbed into the human body will be
A. used to form bile.
B. used to form new cells.
C. stored in the liver as protein.
D. converted to urea and carbohydrate.

05-13
Which of the following about bile is correct?
A. It is produced by the gall bladder.
B. It contains an enzyme that digests fat.
C. It helps break down fat into droplets.
D. It stimulates peristaltic movement of the small intestine.

Questions 19 and 20 refer to the diagram below, which shows the alimentary canal and its associated structures:

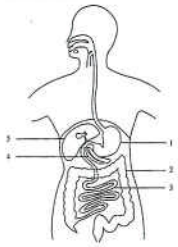


05-19
Chemical digestion of carbohydrate occurs in

A. 1 and 2 only.
B. 1 and 4 only.
C. 2 and 3 only.
D. 3 and 4 only.

05-20
If structure 5 of a person were blocked, which of the following would occur?
A. His faeces would contain a lot of fat.
B. His faeces would become hard and dry.
C. His blood insulin level would decrease.
D. He would produce a large volume of dilute urine.

06
Directions: Questions 1 and 2 refer to the diagram below, which shows the alimentary canal and its associated structures:

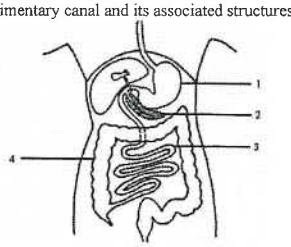


06-1
Which structures are responsible for producing secretions that help the digestion of fat?
A. 1 and 3 only
B. 1 and 5 only
C. 2 and 3 only
D. 4 and 5 only

06-2
Which of the following operations may help an obese person to control body weight?
(1) decrease the volume of 1
(2) decrease the length of 2
(3) decrease the length of 3
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

07-09
Which of the following structures is supported by cartilage?
A. aorta
B. urethra
C. trachea
D. oesophagus

07
Directions: Questions 19 and 20 refer to the diagram below, which shows the human alimentary canal and its associated structures:



07-19
Which of the following structures are responsible for producing secretions that help the digestion of proteins?
A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2and 3

07-20
Which of the following would be the possible effect of removing part of structure 4 in an operation?
A. Less faeces will be produced.
B. Oily faeces will be produced.
C. Hard faeces will be produced.
D. Watery faeces will be produced.

Past HKCEE
Questions
Nutrition in Mammals
Suggested Answers

Paper I

1. (i) *G - blood capillaries 0.5
*H - lacteal 0.5
(ii) thin epithelium: 1
easy for diffusion of digested food presence of a capillary system and/or lacteal: 1
for transport of digested food 1
finger-like/surface folded/large surface: 1
increase surface area for absorption 1
(iii) glucose, 1
amino acids 1
(iv) fatty acids, glycerol, fat droplets 1
(any 2) 1
(v) hepatic portal vein 1
liver 1
hepatic vein 1
posterior vena cava/inferior vena cava 1
(Accept words or labeled diagrams with arrows in correct sequence. Marks are awarded to right links only)

2. (i) (1) A, C 0.5
(2) D, I 0.5
(3) E, H 0.5
(4) B, J 0.5

(ii)

Difference	Explanation	
In rabbit - longer/larger/better developed caecum	can store more undigested cellulose material	1 + 1
bacteria present/ accommodated	to digest cellulose by bacterial action	1 + 1

(vice versa)

(iii) *Peristalsis 1
(iv) (1) absorb water
(2) temporarily store faeces / expel faeces / egestion 1

3. (i) small intestine / ileum 1
absorption 1
(ii) hepatic artery 1
hepatic portal vein 1
(iii) hepatic vein 1

(iv)

blood	leaving C	leaving D	
glucose level	low	high	1
explanation	excess glucose has been converted to glycogen	blood has absorbed plenty of glucose from D	1, 1
	and stored in liver		1

(v) D → C → B → A → B → E 1
(vi) for oxidation to release energy for metabolic activities/for respiration 1
for conversion into glycogen for storage 1

4. (i) (1) A1, B1, B2 1
(2) A4, B4 1
(ii) (1) protein has been digested / juice A contains protein digesting enzymes 1
(2) reducing sugar has appeared / juice B contains starch digesting enzymes 1

(iii)

region	A	B	
name of region	small intestine / duodenum / jejunum / ileum	mouth cavity	1, 1
name of juice	pancreatic juice / intesitinal juice	saliva	1, 1

5. (i) tooth / premolar / molar 1
(ii) to break food into small pieces 1
increase surface area for enzyme action 1
easier to swallow 1
(iii) Drawing:
Accuracy 1
size/clarity 1
* labels: enamel, dentine, pulp cavity, crown, root, cement (any 4) 2
(iv) child 1
presence of permanent teeth below milk teeth 1

6. (i) pH value of F higher than A (A is acidic, F is alkaline) 1
(ii) bile 1
emulsify oil/change oil into oil droplets 1
(iii) A, B, C, D 1
(iv) (1) amino acids 1
(2) deamination (urea production) 1

7. (i) (1) X: *villus / *villi 1 1
Absorption / secrete enzymes for digestion 1
(2)

Adaptive feature	Explanation	
thin epithelium	facilitate diffusion	any 2 (1 + 1 1 + 1)
well supplied by lacteals/ blood capillaries	transport the absorbed products	
folded/ presence of microvilli	increase surface area	
secrete digestive enzymes	to digest food	
movements of villi	increase contact with food	

(ii) M: *lacteal 1
transport or absorb fat/fatty acid 1
lymphatic system 1
(iii) (1) *insulin 1
pancreas 1
regulate glucose level in blood 1
(2) A → C → E 1

8. (i) B: *oesophagus / *esophagus / *gullet 1
(ii) • cilia present - sweep the trapped dust particles/mucus up 1
• mucus present - traps the dust particles in inhaled air / moistens the inhaled air 1
• moist surface - moistens the inhaled air (any 1)
(iii) during swallowing, 'A' moves downwards / covers up the trachea 1
to prevent food from entering the trachea 1
(iv) *saliva / salivary secretion 1
functions: (any 2) 2
• softens/moistens the food
• as a lubricant during swallowing
• contains an enzyme which can break down starch
• dissolves the substances to be tested

9. (i) A - *pancreas 1 1
B - *caecum / large intestine 1
(ii) A and C 1
(iii) • bile secreted by the liver
• causes emulsification of fat
• by reducing surface tension of fat
• to increase surface area for the enzymatic action
• enzyme from pancreas
• breaks down fat into absorbable forms
• pancreatic juice / bile neutralizes acid from stomach
• to provide an alkaline medium for enzyme to work
(any 5) 5
(iv) mix the extract with starch solution for some time 1
test for disappearance of starch with iodine solution/test for presence of reducing sugar with Benedict's solution 1

10. (i) region C 1
*stomach 1
(ii) curve X 1
digestion of starch starts in the mouth cavity 1
(iii) *pancreatic juice 1
*bile 1
*intestinal juice 1
(iv) region D 1
(v) *large intestine/ *colon/ *rectum 1
absorption of water/temporary storage of faeces 1

11. (i) Patient A should take less fat 1
Gall bladder stores bile juice which is released when fatty food is present in the small intestine 1
#Bile juice contains bile salts for emulsification of fat 1
to provide a large surface area for action of lipase / enzymes 1
(Award only 1 mark for simple answers such as: bile juice / salts facilitates digestion of fat.)
(ii) Patient B should take less sweet (sticky) food/less candy, chocolate, biscuit/starchy food, etc. 1
Bacteria (in the tooth plaque) break down the food debris left between teeth 1
into acids 1
which erodes /dissolves enamel / dentine of the teeth 1

12. (i) The formation of red precipitate indicates the presence of reducing sugar (glucose) in the water 1
This shows that the dialysis tubing is permeable to glucose/permits the diffusion of glucose into the external solution 1

(ii) (1) Increased amount of precipitate in set-up B indicates the presence of more reducing sugar 1
which comes from the hydrolysis/ breakdown of starch 1
catalysed by the amylase /enzyme in digestive juice X. 1

(2) *saliva/ *salivary juice 1
*pancreatic juice 1

(iii) The knot of the dialysis tubing should be tied tightly 1
The outside of the dialysis tubing should be rinsed with distilled water before immersing into the water 1

Any one of the following: 1
- after putting in the dialysis tubing the water in the boiling tube should be tested for the presence of reducing sugar immediately.
- the digestive juice X should be tested for the presence of reducing sugar
- the dialysis tubing should be examined for any damage.
- the volume of distilled water in the boiling tube should be the same

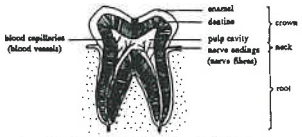
13. (i) Bacteria break down the food 1
releasing acid 1

(ii) The acid dissolves the enamel / dentine of the tooth 1

(iii) Any 1 of below:
- avoid eating snacks between meals to reduce the chance of acid formation 1
- rinse the mouth/brush the teeth after eating to + remove food debris / acid / plaque 1
- use alkaline toothpaste to neutralize the acid

(accept other reasonable answers)

(iv) large and clear diagram (D) 1
labels and title (any 5) (L) (0.5x5) 2.5
sign of early decay (S) 0.5



A vertical section of a tooth at the early stage of decay

14. (i) to close the opening of the trachea / to prevent food from entering the trachea during swallowing 1

(ii) *peristalsis 1

(iii) It contains protease 1
to digest protein into short peptides / amino acids / polypeptides 1
It is alkaline 1
to neutralize the acid from the stomach / to provide a suitable pH for the functioning of protease 1

(iv) The faeces will become more watery 1
because less water is absorbed if a large part of D is removed 1

(v)
- breakdown of excess amino acids / formation of urea
- storage of iron / vitamin A
- / vitamin D / glycogen regulation of blood sugar level

(any 2) 2

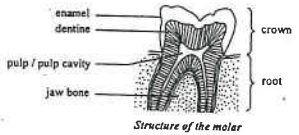
15. (i) Bile produced in the liver cannot be stored in A 1
When food enters the duodenum, insufficient amount of bile is released 1
for emulsifying fats in the food 1
Thus the surface area for the action of lipase decreases 1
Effective communication (c) 1

(ii) When part of structure D is removed, digestion and absorption of food is reduced 1
Energy intake becomes less than the energy expenditure in the body 1
This may lead to the use /mobilization of fat / food reserves stored in the body 1

(iii) (i) *insulin 1
(ii) It cannot regulate the blood glucose level 1
as blood glucose would not be converted into glycogen in the cells of B 1

16. (i) (1) C 0.5
(2) A, B, C (0.5 x 3) 1.5

(ii) Drawing (D) : (resemblance, large & clear drawing) 1
Labels (L) : * enamel, dentine, pulp / pulp cavity, jaw bone, root, crown (any five) (5 x 0.5) 2.5
Title (T) 0.5



Structure of the molar

17. (i) The pancreas is the major organ that produces lipase. 1
Due to blockage of the pancreatic duct, pancreatic lipase cannot reach the duodenum. 1
Thus fat in the food cannot be digested and is egested in the faeces. 1

(ii) Due to the blockage of the pancreatic duct, digestive enzymes accumulate / become active in the pancreas. 1
The protease accumulated digests the tissue of the pancreas / the lipase accumulated digests the cell membrane of pancreatic tissue cells. 1

(iii) The damaged pancreas secretes less insulin. 1
Thus excessive glucose in the blood cannot be converted to glycogen in the liver. 1
Blood glucose level in these patients remains so high that the kidneys cannot reabsorb all glucose from the glomerular filtrate. 1
Thus glucose is found in the urine. 1

18. (i) X is a finger-like projection of the intestinal wall. 1
This feature provides a large surface area for food absorption. 1
The epithelium of X is very thin / one-cell thick. 1
This shortens the distance of diffusion / transport of digested food substances. 1

(ii) X → hepatic portal vein → liver → hepatic vein → vena cava → (heart) 2

(iii) The peristaltic contraction of the muscle layer pushes food along the small intestine. 1
This also helps to mix food with digestive enzymes. 1

19. (a) alkaline substance / substance that inhibits acid secretion / substance that protects the stomach wall 1

(b) Because usually bacteria are killed by the acid secreted by the stomach 1

(c) *Helicobacter pylori* is the cause of ulcer 1

(d) Introduce *Helicobacter pylori* into the stomach of healthy mammals 1
If the hypothesis is correct, these animals would develop gastric ulcer symptom 1

(e) The churning action of the stomach will break down food into smaller pieces 1
This helps to increase the surface area of food for the action of enzymes 1
It also helps to mix the food with the digestive enzymes 1
(effective communication) 1

20. (a) 150 ml 1

(b) saliva, mucus, gastric juice, pancreatic juice, bile, intestinal juice (any two) 2

(c) (i) Any 1 set below (1+1) 2
The small intestine is longer than the large intestine
so the time for water absorption is longer / surface area for water absorption is larger
or
The inner wall of the small intestine is highly folded / has a large number of villi. Thus the surface area for water absorption is larger

(ii) The absorption of digested food into blood increases the water potential of the gut content. 1
As a result, water is drawn into the blood by osmosis. 1
Effective Communication (C)

21. (a) (i) slightly overweight 1
(ii) 49.0-56.5 kg 1

(b) (i) apple shape 1
(ii) WHR of Mr Wong = 0.90, thus he is of pear shape 1
WHR of Mrs Wong = 0.92, thus she is of apple shape 1
Mrs Wong has a higher health risk 1

(c) This diet has high content of dietary fibre 1
which is indigestible / add bulks to the food to give the sense of fullness 1
It also has low fat content 1
and hence the overall energy intake through this diet will be lowered reducing the chance of obesity 1
Effective Communication (C) 1

22. (a) (i) Gastric juice is acidic / contains hydrochloric acid 1
(ii) Pancreatic juice / bile / intestinal juice in the small intestine 1
are alkaline 1
which neutralizes the gastric juice 1
Effective Communication 1C

(b) After meal, the release of gastric juice increases 1
and the pressure inside the stomach increases 1
Also, the stomach and oesophagus are at the same level while sleeping 1
These increase the chance of gastric reflux

(c) The acid in the gastric content dissolves 1
the enamel / calcium salts of the tooth 1

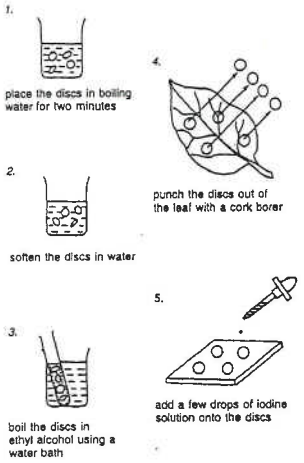
Paper II

90-4	A
90-5	D
90-7	D
90-8	C
90-9	A
90-10	D
91-15	C
92-14	D
92-16	C
93-5	A
93-12	B
93-13	C
94-3	C
94-4	C
94-5	D
94-6	B
95-5	C
95-14	C
95-15	A
95-16	A
97-10	B
97-11	C
97-12	B
98-5	D
98-9	B
98-10	C

99-14	B
99-15	D
99-16	A
00-6	B
00-7	A
00-8	C
00-34	C
01-12	D
01-13	D
02-14	C
02-15	A
02-16	D
02-17	B
02-19	A
02-22	A
02-23	D
03-04	B
03-05	B
03-13	B
03-14	B
03-26	D
04-05	C
04-20	A
04-21	B
04-22	C
04-28	B
04-29	D
05-11	D
05-13	C
05-19	B
05-20	A
06-1	D
06-2	B
07-09	C
07-19	D
07-20	D

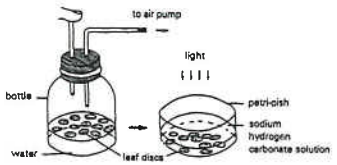
Past HKCEE Questions
Photosynthesis
Paper I

1. The following series of diagrams show the steps involved in testing for starch in green leaves.



(i) Using the numbers on the diagrams, indicate the correct sequence for such a test.
(ii) What are the reasons for carrying out the steps shown in diagrams 1 and 3?
(iii) If starch is present in the leaf discs, what would be the observable result of the above test?
(iv) What inference is usually made if starch is detected in the leaf discs using the above test?
(v) If the discs were taken from the non-pigmented part of the leaf, what result would you expect to get from the above test? Explain your answer. (10 marks)
(HKCEE 1979)

2.

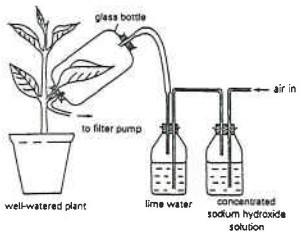


The diagram above shows the apparatus used in an experiment on photosynthesis. The leaf discs were punched from the same dicotyledonous leaf and were put in a bottle. Air trapped in the discs was removed by means of an air pump until all the discs sank to the bottom.
Equal numbers of leaf discs were then transferred to separate dishes containing sodium hydrogen carbonate solutions of different concentrations.
All dishes were exposed to light of the same intensity. The time required for all discs in each petri-dish to rise to the surface was measured for calculating the rate of photosynthesis as shown in the table below:

Concentration of sodium hydrogen carbonate solution (%)	Time (T) for the leaf discs to rise to the surface (seconds)	Rate of photosynthesis in terms of 1/T ($second^{-1}$)
0	∞	0
0.10	135	7.4×10^{-3}
0.20	105	9.5×10^{-3}
0.30	90	11.1×10^{-3}
0.40	83	12.0×10^{-3}
0.50	83	12.0×10^{-3}

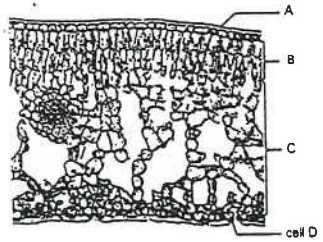
(i) Using graph paper, draw a curve to show the relationship between the rate of photosynthesis and the concentration of sodium hydrogen carbonate solution.
(ii) Describe the relationship shown by the curve drawn in (i).
(iii) Before transferring the leaf discs to the sodium hydrogen carbonate solution, why was it necessary to remove the air so that they all sank?
(iv) Explain why the leaf discs
(1) failed to rise in 0% sodium hydrogen carbonate solution.
(2) rose in the solutions of other concentrations.
(v) Why would the results be less accurate if the discs were punched from the mid-rib region of the leaf?
(vi) If the experiment were to be repeated with the same number of leaf discs, suggest one way to shorten the time to obtain the results.
(HKCEE 1985)

3. The following apparatus is put under sunlight to show that a certain condition is necessary for photosynthesis:



(i) What is the condition being studied? (1 mark)
(ii) In this experiment, what is the purpose of using
(1) the concentrated sodium hydroxide solution?
(2) the lime water? (2 marks)
(iii) Explain what should be done to the plant before the experiment starts. (2 marks)
(iv) After two hours, the leaf in the glass bottle is detached and tested to see whether photosynthesis has taken place. Describe how the test should be carried out. (4 marks)
(v) Suggest a control for this experiment. (2 marks)
(HKCEE 1989)

4. The following photomicrograph shows the transverse section of part of a leaf:



(i) Name C and D. (2 marks)
(ii) Structure B is the major site of photosynthesis. Describe TWO structural features which enable it to carry out photosynthesis efficiently. (2 marks)
(iii) What is the significance of the large intercellular spaces in C with respect to photosynthesis? (1 mark)
(iv) A leaf of the same kind as that shown in the photomicrograph was placed in hot water. Bubbles were found to evolve from one surface only.
(1) Explain why bubbling occurred.
(2) Explain why bubbling occurred only on one surface. (3 marks)
(v) Which TWO labelled structures may be absent in the leaves of certain aquatic plants? Explain your choice (4 marks)

5. The net carbon dioxide uptake and release from the stem and a single leaf of a herbaceous plant were measured at different light intensities. The results are shown below:

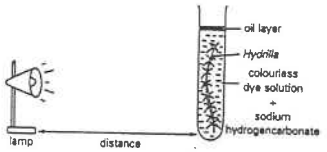
Light intensity (arbitrary units)	Net uptake (+)/net release (–) of carbon dioxide (mg $cm^{-2}h^{-1}$)	
	stem	leaf
0	–1.0	–1.0
2	+0.6	+5.6
4	+2.2	+9.2
6	+3.4	+11.0
8	+4.4	+12.0
10	+5.0	+12.6

(i) Plot the above data on the same graph. (4 marks)
(ii) Considering a leaf of 10 cm2 at a light intensity of 5 units,
(1) state the net carbon dioxide uptake by the leaf in one hour. (1 mark)
(2) calculate the actual amount of carbon dioxide used by this leaf in photosynthesis in the same period. (2 marks)
(iii)
(1) With reference to the graph you have drawn, state which organ, the stem or the leaf, is more efficient in carrying out photosynthesis. Explain how you arrive at your answer. (2 marks)
(2) Suggest TWO structural features which enable this organ to carry out photosynthesis more efficiently. (2 marks)
(HKCEE 1990)

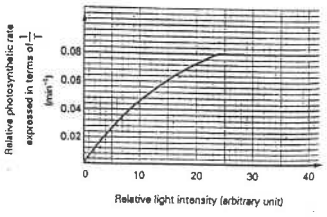
6. A water soluble dye has a colourless form which changes to blue if oxygen is provided:

colourless form —(add oxygen)→ blue form

(i) The diagram below shows an experimental setup to study the effect of light intensity on the rate of photosynthesis of *Hydrilla*.. The time taken (T) for the colourless dye solution to change to blue is a measure of the relative rate of photosynthesis.



Using the results of the experiment, a graph is plotted as shown below:



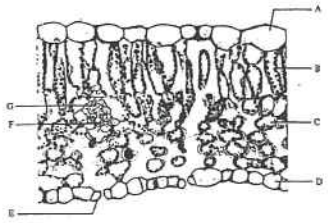
(1) What is the purpose of adding a layer of oil on top of the solution? (1 mark)
(2) Why is sodium hydrogencarbonate added? (1 mark)
(3) What is the relationship between the distance of the lamp away from the boiling tube and the relative light intensity? (1 mark)
(4) How long did it take for the solution to change to blue when the relative light intensity was at 10 arbitrary units? Show all your calculations. (2 marks)
(5) What conclusion can you draw from the results of this experiment? (2 marks)

(ii) A student found that gently blowing air into a solution of the colourless form of this dye could change it into the blue form. He doubted that this colour change was due to carbon dioxide rather than oxygen in his breath. Draw and label a simple experimental set-up to show that this colour change is NOT caused by carbon dioxide. (4 marks)
(HKCEE 1991)

7.

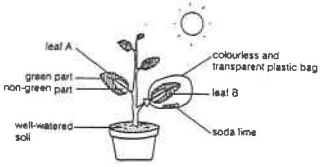
(i) Most leaves have the following features in common
(1) they are thin, and
(2) they are green in colour.
Explain the importance of each of these features in relation to the photosynthetic function of leaves. (5 marks)
(HKCEE 1994)

8. The photomicrograph below shows the transverse section of a leaf:



(i) Using Tellers in the photomicrograph, state the cell types which
(1) contains chlorophyll.
(2) regulates water loss. (2 marks)
(ii) Describe how cell type B obtains
(1) water from cell type G. (2 marks)
(2) carbon dioxide from the atmosphere. (3 marks)
(iii) Describe what happens to water and carbon dioxide in cell type B during photosynthesis. (3 marks)
(HKCEE 1996)

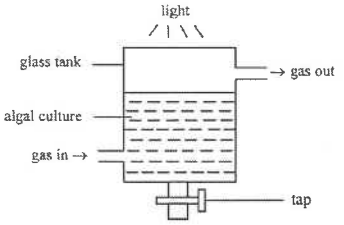
9. To study the conditions required for photosynthesis, a destarched plant with variegated leaves was put under sunlight for 4 hours as shown in the diagram below:



(i) Explain why the plant can be destarched by keeping it in darkness for 48 hours. (1 marks)
(ii) What is the use of soda lime in the set-up? (1 mark)
(iii) After 4 hours, both leaf A and leaf B were detached and tested to see whether photosynthesis had taken place. Describe how the test should be carried rut. (4 marks)
(iv) After the test in (iii), what is the observed result of
(1) leaf A,
(2) leaf B? (2 marks)
(v) What conclusion, if any, can be drawn by comparing the results of
(1) the green part and the non-green part of leaf A only,
(2) the green part of leaf A and the green part of leaf B only,

(3) the green part of leaf A and the non-green part of leaf B only?
Give an explanation if no conclusion can be drawn. (4 marks)
(HKCEE 1997)

10. Exhaust gas from power stations is rich in carbon dioxide. Some scientists attempted to make use of the exhaust gas for growing microscopic green algae. The diagram below shows a set-up used to compare the effect of air and exhaust gas on the growth of algae:

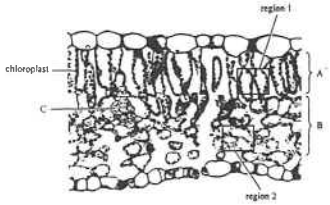


In the first treatment, air was passed into the glass tank. Two samples of the algal culture, each of 1 litre, were withdrawn at an interval of 24 hours. The dry mass of the algae in each sample was determined. In the second treatment, the same procedure was repeated but exhaust gas was used instead of air. The results are shown in the table below:

Treatment	Gas used	Dry mass of algae (g) at hour 0	Dry mass of algae (g) at hour 24
I	Air	3.60	3.64
II	Exhaust gas	3.70	3.68

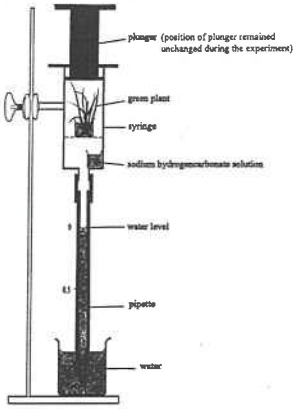
(i) What is meant by the dry mass of the algae? (1 mark)
(ii) Explain the difference in dry mass of the two algal samples in treatment I. (4 marks)
(iii)
(1) Based on the results of treatments I and II, what is the effect of aerating the algal culture with the exhaust gas? (1 mark)
(2) Suggest a reason to explain why there is such an effect. (2 marks)
(iv) Explain how the global air temperature may be affected if the practice of using exhaust gas from power stations to culture algae is adopted all over the world. (3 marks)
(HKCEE 1999)

11. The diagram below shows part of a section of a leaf:



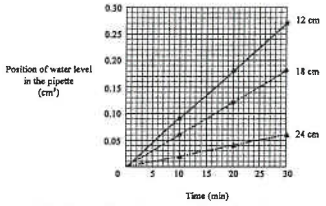
(i) Name tissues A and B. (2 marks)
(ii) Regions 1 and 2 have the same area. Work out the ratio of the density of chloroplasts in region 1 to that in region 2. (2 marks)
(iii) With reference to your answer to (ii), what would be the significance of this pattern of chloroplast distribution in the leaf? Explain your answer. (4 marks)
(iv) It is suggested that cell type C is responsible for the transport of water from the stem to the leaf. Design an investigation to test this idea using a leafy shoot. (4 marks)
(HKCEE 2000)

12. The set-up below is used to measure the rate of photosynthesis of a green plant. The sodium hydrogencarbonate solution helps to maintain a constant level of carbon dioxide inside the syringe during the experiment.



(i) Explain why the water level in the pipette will drop when the set-up is put under bright light condition. (4 marks)
(ii) A fluorescent lamp was placed 12 cm away from the set-up. The position of the water level was recorded at 10-minute intervals

for 30 minutes. The same procedure was repeated with the lamp placed 18 cm and 24 cm away. The results of the experiment are shown in the graph below:



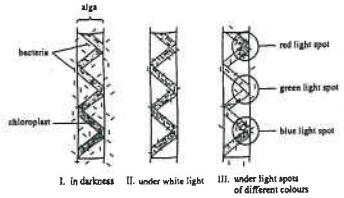
(1) Given that the rate of respiration of the plant is 0.002 cm^3 0_2 min^{-1}, calculate the rate of photosynthesis of the plant when the lamp was 12 cm away from the set-up. (2 marks)

(2) What was the effect on the rate of photosynthesis of the plant when the distance between the lamp and the plant increased? How would you explain this? (2 marks)

(iii) The set-up can be modified to measure the rate of respiration of the plant. State three necessary modifications. (3 marks)

(HKCEE 2001)

13. In 1883, a German scientist, Engelmann, used a green alga to study the effect of light on photosynthesis. This alga has long ribbon-like chloroplasts. He placed the alga on a slide with a suspension of bacteria which would migrate to regions with high oxygen concentration. He observed the distribution of the bacteria under different light conditions. The results are shown in the diagram below:



(i) Describe the distribution of bacteria in I and II. (2 marks)

(ii) How would you account for the bacteria distribution in II? (2 marks)

(iii) What did Engelmann wish to find out by setting up the experiment in III? (1 mark)

(iv) What conclusions can you draw from the results in III? (2 marks)

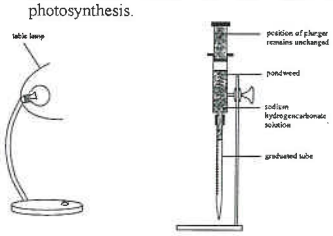
(v)

(1) Draw a labelled diagram to show an experimental set-up used to test whether the conclusions in (iv) are correct or not. You are provided with a waterweed, a table lamp, colour filters and materials that you can get in the laboratory. (3 marks)

(2) What data would you collect with this set-up? (1 mark)

(HKCEE 2004)

14. The diagram below shows a set-up used to measure the rate of photosynthesis of a pondweed. A lamp was placed at different distances from the pondweed. At each distance, the volume of gas collected per minute was taken as the rate of photosynthesis.



The results of the experiment are shown in the table below:

Light intensity (arbitrary unit)	Rate of photosynthesis (mm^3 min^{-1})
0.4	0.0
0.6	0.8
1.6	2.0
2.5	2.7
5.0	3.5
10.0	3.5

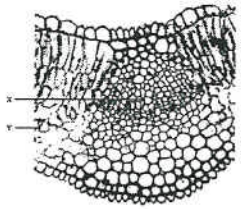
(i) How would you measure the volume of gas collected per minute using this set-up? (1 mark)

(ii) Present the results of the experiment in the form of a graph. (4 marks)

(iii) Describe and explain the change in the rate of photosynthesis with light intensity. (4 marks)

(iv) Explain why the rate of photosynthesis becomes 0 even there is 0.4 arbitrary unit of light. (2 marks)

14. The photomicrograph below shows a cross section of a dicotyledonous leaf:



(a) With reference to the photomicrograph, give two structural differences between cell types X and Y. (2 marks)

(b) (i) In the presence of light, carbohydrates are formed and then stored in cell type Y.

(1) State the carbohydrate stored. (1 mark)

(2) If you have prepared a thin section of a leaf, how would you show the presence of the stored carbohydrate in it? (3 marks)

(ii) Explain why the stored carbohydrate in cell type Y disappears when the plant is kept in darkness. (3 marks)

(c) During transpiration, water evaporates from the surface of cell type Y. How does this help cell type Y to obtain minerals? (3 marks)

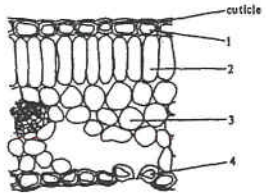
(HKCEE 2007)

15.

Past HKCEE Questions
Photosynthesis
Paper II

91-6
Which of the following cells possess chloroplasts?
(1) a guard cell
(2) a leaf mesophyll cell
(3) an onion epidermal cell
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

92.
Directions: Questions 1 and 2 refer to the diagram below which shows a transverse section of a leaf:

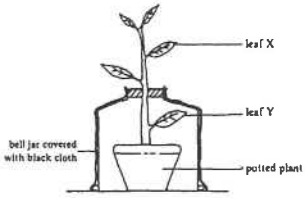


92-1
Which of the cells are green?
A. (1) and (4) only
B. (2) and (3) only
C. (1), (2) and (3) only
D. (2), (3) and (4) only

92-2
The cuticle covering the upper and lower surfaces is for
(1) supporting the leaf.
(2) preventing the invasion by germs.
(3) reducing water evaporation from the surfaces.
A. (1) and (2) only
R. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

92-5
The oxygen released during photosynthesis of green leaves comes from
A. air.
B. water.
C. chlorophyll.
D. carbon dioxide.

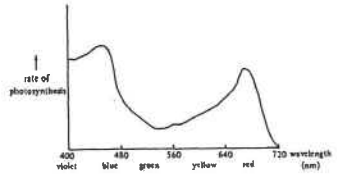
92-8
The experimental set-up shown below was kept in the dark for 48 hours before exposing it to sunlight for another 3 hours. Leaf X and Y were then tested for starch. Which of the following would be the probable results?



	Leaf X	Leaf Y
A.	starch present	starch present
B.	Starch present	starch absent
C.	starch absent	starch present
D.	starch absent	search absent

92-9
When testing a leaf for starch, the leaf is boiled with alcohol in a water bath to
A. kill the cells.
B. make it soft.
C. dissolve the starch.
D. extract the chlorophyll.

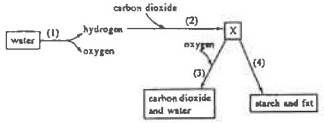
93.
Directions: Questions 16 and 17 refer to tire graph below. The graph shows the rate of photosynthesis of a green plant when it is placed under lights of different colours:



93-16
Which coloured lights are moat effective for photosynthesis?
A. yellow and green
B. yellow and blue
C. red and green
D. red and blue

93-17
Which of the following would occur if only green light reached the earth?
A. The total number of animals on earth would decrease.
B. The amount of food produced by green plants would increase.
C. The amount of oxygen in the atmosphere would increase.
D. The amount of carbon dioxide in the atmosphere would decrease.

94.
Directions: Questions 7 and 8 refer to the diagram below which shows certain metabolic pathways that take place in a mesophyll cell:



94-7
Which of the following processes requires light energy?
A. (1)
B. (2)
C. (3)
D. (4)

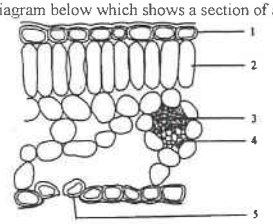
94-8
What is substance X?
A. amino acid
B. cellulose
C. chlorophyll
D. simple sugar

95-10
The diagram below shows a plant viewed from the top

The leaves of the plant are so arranged in order to allow the leaves to
A. have more space to grow.
B. absorb the maximum amount of light.
C. spread out for the landing of insects.
D. absorb the maximum amount of rain water.

96-10
Which of the following elements in plants are obtained from the air through the leaves?
A. carbon and oxygen
B. carbon and nitrogen
C. nitrogen and oxygen
D. carbon, nitrogen and oxygen

97.
Directions: Questions 17 and 18 refer to the diagram below which shows a section of a leaf:

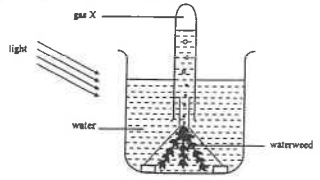


97-17
Which cell types are green?
A. 1 and 4 only
B. 2 and 5 only
C. 1, 2 and 4 only
D. 1, 2 and 5 only

97-18
Respiration occurs in all cell types except
A. 2.
B. 3.
C. 1 and 2.
D. 3 and 4.

01-13
The oxygen produced during photosynthesis comes from
A. water.
B. glucose.
C. chlorophyll.
D. carbon dioxide.

02.
Directions: Questions 5 and 6 refer to the set-up below, which is used to investigate the photosynthesis of a waterweed



02-5
The waterweed produces gas X and starch from

	Gas X	Starch
A.	water	carbon dioxide
B.	water	carbon dioxide and water
C.	carbon dioxide	Glucose
D.	carbon dioxide	carbon dioxide and water

02-6
Arrange in the correct order the following steps for testing the presence of starch in the green leaves of the waterweed

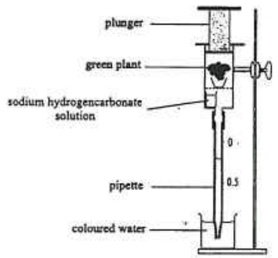
(1) Add iodine solution.
(2) Soak the leaves in warm water.
(3) Boil the leaves in water for two minutes.
(4) Immerse the leaves in alcohol heated in a hot water bath.

A. (1), (2), (3), (4)
B. (2), (4), (3), (1)
C. (3), (4), (2), (1)
D. (4), (1), (3), (2)

03-3
Which of the following correctly compares an epidermal cell and a mesophyll cell of a leaf?

	Epidermal cell	*Mesophyll cell*
A.	without nucleus	with nucleus
B.	without cell wall	with cell wall
C.	without chloroplasts	with chloroplasts
D.	without large vacuole	with large vacuole

03.
Directions: Questions 7 and 8 refer to the diagram below, which shows a set-up used to find the rate of photosynthesis of a green plant. The sodium hydrogencarbonate solution helps to maintain a constant level of carbon dioxide inside the syringe. During the study, the position of. the plunger remained unchanged.



The results of the study are:
Initial pipette reading = 0.20 mL
Pipette reading after 30 minutes = 0.45 mL

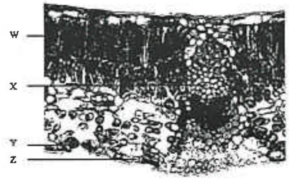
03-7
Based on the results, what is the rate of photosynthesis of this plant?
A. 0.25 mL CO_2 absorbed per hour
B. 0.50 mL CO_2 absorbed per hour
C. 0.25 mL O_2 produced per hour
D. 0.50 mL O_2 produced per hour

03-8
The rate obtained in this study is lower than the actual rate of photosynthesis of the plant. This is because
A. the plant carried out respiration at the same time.
B. the plant carried out transpiration at the same time.
C. there might be a rise in the air temperature during the study.
D. there might be a change in the relative humidity in air during the study.

05-10
Water is a raw material for photosynthesis. In which of the following substances will the hydrogen and oxygen from water be found at the end of photosynthesis?

	Hydrogen	*Oxygen*
A.	carbohydrate	oxygen gas
B.	carbohydrate	carbohydrate
C.	hydrogen gas	oxygen gas
D.	hydrogen gas	carbohydrate

06.
Directions: Questions 26 and 27 refer to the photomicrograph below, which shows the cross section of a leaf:



Source: Department of Biology, 5500 University of Parkway, *Biology Images*. URL: http://bi...leaf_cross_section.jpg

06-26
Which of the following correctly lists the functions of cell types W, X and Z?

	W	*X*	*Z*
A.	support	transport	protection
B.	photosynthesis	transport	storage
C.	storage	support	photosynthesis
D.	photosynthesis	support	protection

06-27
Which of the following comparisons of the different cell types are correct?

(1) Cell type W contains more mitochondria than cell type Z.
(2) Cell type W contains more chloroplasts than cell type Y.
(3) Cell type X contains a larger vacuole than cell type Z.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

07-03
Which of the following correctly describe photosynthesis?

(1) It is a catabolic process.
(2) It is an energy conversion process.
(3) It is a process by which producers make food.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

Past HKCEE Questions
Photosynthesis
Suggested Answers

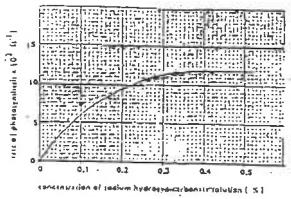
Paper I

1. (i) 4, 1, 3, 2, 5 — 2
   (ii) diagram 1:
   - to kill the leaf cells
   - to stop any chemical changes
   - for easier extraction of chlorophyll

   diagram 3:
   - to extract chlorophyll / to decolourize leaf

   (any 2) — 2
   (iii) leaf discs change to dark blue
   (iv) photosynthesis has taken place in the leaf
   (v) no colour change / stained brown — 1
   no starch is formed — 1
   because chlorophyll is absent — 1

2. (i) Graph:
   axes - correct with labels — 1
   points - at least 5 correctly plotted — 1
   curve - joining up the points plotted — 1



   (ii) no photosynthesis at 0% — 1
   rate of photosynthesis increases rapidly from 0 - 0.2%
   AND/OR increasing steadily from 0.2 - 0.4% — 1
   becoming constant beyond 0.4% — 1
   (iii) to prepare the discs in such a position so that they may be buoyed up by the gas evolved from photosynthesis — 1
   (iv)

	CO_2 supply	Rate of photosynthesis	Surplus O_2 accumulated / density lowered	
(1)	lacking	zero / equal or slower than respiration rate	no	1 + 1 + 1
(2)	increasing	faster than respiration rate	yes	1 + 1 + 1

   (v) mid-rib region contains mainly vascular tissues (main vein) with less photosynthetic cells — 1
   (vi) increase the temperature / increasing the light intensity / increase the concentration of each $NaHCO_3$ solution used by say 0.1 % — 1

3. (i) carbon dioxide — 1
   (ii) (1) to absorb carbon dioxide from the incoming air — 1
   (2) to check that all carbon dioxide from the incoming air has been removed — 1
   (iii) (any 2) — 2
   - by putting the plant in darkness for a few days before setting up
   - destarch the leaves
   - to ensure that any starch detected was formed during the experiment

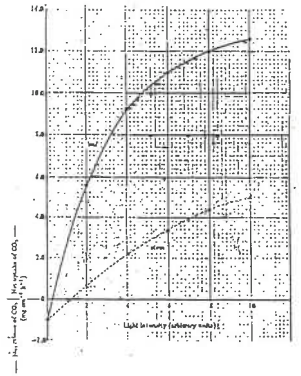
   (iv) put the leaf in boiling water for a few minutes — 1
   put the leaf in a tube of alcohol in a hot water bath — 1
   put the leaf in water — 1
   add iodine solution — 1
   (v) replace both sodium hydroxide solution and lime water by water / put the leaf outside the glass bottle — 1

4. (i) C - spongy mesophyll / cells / layer — 1
   D - guard cell — 1
   (ii) cells are closely packed possessing a large number of chloroplasts — 1
   (iii) for rapid diffusion of gases to facilitate photosynthesis — 1
   (iv) (1) air in the intercellular spaces expands on heating — 1
   (2) and passes out through the stomata — 1
   (v)

A (cuticle)	there is no danger of desiccation	1 + 1
cell D (guard cell)	gaseous diffusion occurs all over the plant surfaces where there is no cuticle	1 + 1

(accept other suitable answers)

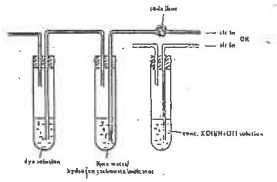
5. (i) correct choices of axes — 1
   correct labelling of axes and giving a key to each curve — 1
   correct plotting of 5 points for each curve (1+1) — 2



   (ii) (1) (10.2 +/- 0.2) x 10 mg = 102 +/- 2 mg — 1
   (N.B. No unit, no mark.)
   (2) [(10.2 +/- 0.2) + 1.0] x 10 mg — 1
   = 112 +/- 2 mg — 1
   (N.B. No unit, no mark.)
   (iii) (1) the leaf because the carbon dioxide uptake by the leaf is always higher than that by the atmosphere — 1
   (2) (Any 2) (1 x 2) — 2
   - more chloroplast (per unit area) / closely packed palisade cells
   - more stomata / numerous air spaces
   - thin / flat

6. (i) (1) to prevent oxygen in air dissolving into the solution — 1
   (2) to provide sufficient carbon dioxide in the tube — 1
   (3) the relative light intensity is inversely proportional to the (square of) distance of the lamp away from the test-tube — 1
   (4) $1/T = 0.05\ min^{-1}$ — 1
   $T = 20$ min (no unit, no mark) — 1
   (5) the rate of photosynthesis increases with increasing light intensity up to a certain point, — 1
   beyond which the rate levels off — 1

   (ii) Points to note for in the diagram:
   soda lime / conc. KOH / conc. NaOH solution in an enclosed container to absorb CO_2 — 1
   lime water / hydrogen carbonate indicator in an enclosed container to check the absence of CO_2 — 1
   correctly linked glass tubings and rubber tubings — 1
   dye solution in container with an air outlet — 1
   (N.B. No mark is to be awarded if the set-up is not workable.)



7. (i) (1) It allows the mesophyll cells (photosynthetic cells) — 1
   to have a rapid supply of gases, — 1
   and adequate supply of light — 1
   (2) Because mesophyll cells contain chloroplasts / chlorophyll — 1
   to absorb light — 1

8. (i) (1) B, C (E optional) — 1
   (2) E — 1
   (ii) (1) Water moves from cell to cell by osmosis — 1
   (2) Carbon dioxide in air diffuses through stomatal pores — 1
   into the air spaces to cell type B — 1
   (iii) Water is split into hydrogen and oxygen — 1
   Hydrogen combines with carbon dioxide — 1
   to form carbohydrate inside cell type B — 1

9. (i) In darkness, starch in the leaves is converted to sugars — 1
   which are transported away from the leaves / oxidized in respiration — 1
   (ii) To absorb carbon dioxide in the plastic bag — 1
   (iii) Put the leaf in boiling water — 1
   Immerse the leaf in hot alcohol — 1
   Immerse it in water — 1
   Add iodine solution onto the leaf — 1

(iv) (1) In leaf A, the green part turned to dark blue and the non-green part became brown in colour after the iodine test 1

(2) In leaf B, both the green part and non-green part became brown after the iodine test 1

(v) (1) Chlorophyll is necessary for photosynthesis 1

(2) Carbon dioxide is necessary for photosynthesis 1

(3) No conclusion can be drawn because the non-green part of leaf B differs from the green part of leaf A by the absence of chlorophyll and carbon dioxide / by two variables 1

10. (i) Dry mass of the algae is the mass of the algae in which all the water has been removed 1

(ii) The dry mass of the algae at hour 24 was greater than that at hour 0 because the algae have carried out photosynthesis in the 24 hours to make carbohydrates / organic compounds 1
And the rate of photosynthesis is greater than the rate of respiration of the algae 1
Effective communication (C) 1

(iii) (1) The algae grow faster when they are supplied with exhaust gas 1

(2) The exhaust gas is rich in carbon dioxide so that the algae can carry out photosynthesis at a higher rate 1

(iv) The carbon dioxide output to air is reduced 1
leading to a decrease in the greenhouse effect which is caused by carbon dioxide 1
Thus it helps to slow down / prevent global warming 1

11. (i) Tissue A is 'palisade mesophyll 1
Tissue B is 'spongy mesophyll 1

(ii) Number of chloroplasts in region 1 is 20; while that in region 2 is 12 1
Ratio of chloroplast density in region 1 to that in region 2 is 5:3 1

(iii) This allows the leaf to carry out photosynthesis at a higher rate 1
because tissue A has a higher density of chloroplasts 1
and it is located in the upper layer of the leaf 1

so its cells are under direct illumination / can receive more sunlight than the cells of tissue B . 1
Effective communication (C) 1

(iv) Put the stem of a leafy shoot in a dye solution for some time 1
Cut cross sections of the stem and the leaf 1
Examine the sections under the microscope 1
Cell type C would be stained by the dye 1

12. (i) Under bright light condition, the rate of photosynthesis of the plant becomes greater than the rate of respiration 1
Thus there is a net production of oxygen by the plant 1
Meanwhile, the carbon dioxide level inside the syringe remains constant 1
This results in an increase in air pressure inside the syringe 1
Effective communication (C) 1

(ii) (1) Net rate of oxygen produced by the plant = 0.009 cm^3 O_2 min^{-1} 1
Rate of photosynthesis of the plant when the lamp was 12 cm from it
= (0.009 + 0.002) cm^3 O_2 min^{-1}
= 0.011 cm^3 O_2 min^{-1} 1

(2) The rate of photosynthesis decreased 1
because the light intensity decreased as the distance between the plant and the lamp increased 1

(iii) Remove the sodium hydrogencarbonate solution 1
Put a vial of soda lime / sodium hydroxide solution into the syringe 1
Wrap the syringe with black paper / aluminium foil 1

13. (i) The bacteria distributed evenly in I, but concentrated on the chloroplast in II. 1

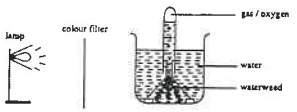
(ii) In the presence of light, the chloroplast produced oxygen during photosynthesis. 1
This led to the movement of bacteria toward the chloroplast. 1

(iii) To study the effect of light of different colours on (the rate of) photosynthesis. 1

(iv) Photosynthesis occurs at similar rates in red and blue lights which are higher than that in green light. 1

(v)

(1) Workable set-up : (must include light source, water, waterweed & colour filters) 1
Labels : ① colour filters, ② waterweed, ③ water / lamp / gas or oxygen
Title

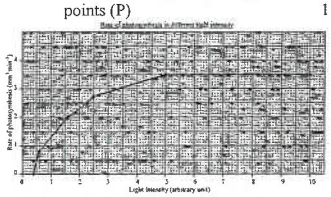


Set-up for studying the effect of light colours on photosynthesis

(2) Measure the volume of oxygen produced / number of oxygen bubbles released per unit time / over a period of time. 1

14. (i) Measure the displacement of the solution level in the graduated tube 1

(ii) Title (T) 1
Correct choice of axes (A) 0.5
Correct labelling of axes together with units (L) 1
Correct plotting and joining of points (P) 1.5



(iii) From 0.4 — 5.0 arbitrary units light intensity, the rate of photosynthesis increases with increasing light intensity 1
because there is more energy trapped for dark reaction 1
Above 5.0 arbitrary units light intensity, the rate of photosynthesis remains the same 1
because there is insufficient supply of carbon dioxide at high light intensity / enzyme activity is not high enough at high light intensity 1
Effective Communication (C) 1

(iv) Because at 0.4 arbitrary unit of light, the rate of respiration is equal to the actual rate of photosynthesis 1
so there is no net oxygen released 1

15. (a) Cell type X has no celilular content while cell type Y has 1
Cell type X has a thicker cell wall than cell type Y 1

(b) (i) (1) Starch
(2)
Add a drop of iodine solution to the leaf section 1
Observe the leaf section under the microscope 1
The section turns blue black 1

(ii) In darkness, photosynthesis stops 1
The stored carbohydrate is converted to sugars 1
which are transported away to other parts of the plant / are used in respiration 1
Effective Communication 1C

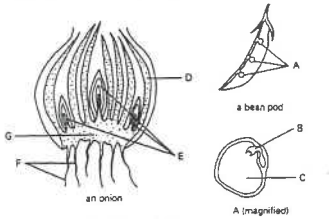
(c) When water evaporates from cell type Y, a transpiration pull is set tip 1
Water is drawn from xylem to cell type Y 1
together with dissolved minerals 1

Paper II

91-6	A	01-13	A
92-1	D	02-5	B
92-2	C	02-6	C
92-5	B	03-3	C
92-8	B	03-7	D
92-9	D	03-8	A
93-16	D	05-10	A
93-17	A	06-26	D
94-7	A	06-27	A
94-8	D	07-03	C
95-10	B		
96-10	A		
97-17	B		
97-18	B		

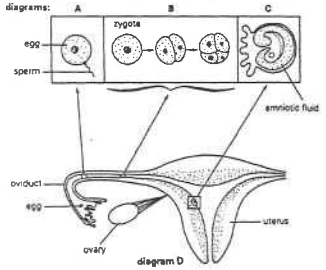
Past HKCEE Questions
Reproduction
Paper I

1. The diagram below shows longitudinal sections of an onion, a bean pod and a magnified part of the pod:
(The parts are not drawn to the same scale.)



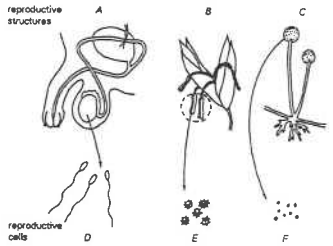
(i) Name B, C, E and G.
(ii) State one function each for B and C.
(iii) Using the letters in the diagram, indicate the part of the onion which serves the same function as
(1) B.
(2) C.
(iv) State the type of cell division that must have occurred in the parent plant to give rise to the genotypes of
(1) A.
(2) E.
(v) If A and E were to develop into new plants, compare the genotypes among the new plants developed from
(1) A.
(2) E.
(vi) The new plants developed from E may face a problem which does not occur with those developed from A. What is this problem? (HKCEE 1984)

2. The diagrams below show some of the stages of foetal development and their corresponding locations in the female reproductive system of a mammal.
(The parts are not drawn to the same scale.)



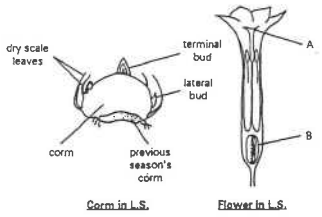
(i) State how the sperm moves in the sperm fluid.
(ii) State how the egg, within the oviduct, reaches the site of fertilization.
(iii) Compare the chromosome number of the zygote with that of the sperm.
(iv)
(1) Name the type of cell division taking place in the stages shown in diagram B.
(2) What is the significance of such cell division on the chromosome number?
(v) State one change in the uterine wall before the attachment of the embryo.
(vi) What structure is developed for the attachment of the embryo to the uterine wall?
(vii) At the birth of the foetus, what is the role played by
(1) the amniotic fluid?
(2) the uterine wall?
(HKCEE 1986)

3. The following diagrams show three different reproductive structures A, B and C, and the respective reproductive cells D, E and F formed from them:



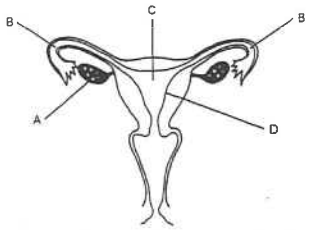
(i) In what medium is
(1) D
(2) F
released from its reproductive structure? Describe how each travels from one place to another after its release. (4 marks)
(ii) D, E and F are always produced in large numbers. What is the advantage of this feature? (1 mark)
(iii) State ONE feature of B; as shown in the diagram, which helps the spreading of E. (1 mark)
(iv) What different roles are played by E and F in reproduction? (4 marks)
(HKCEE 1988)

4. The diagrams below show the longitudinal section (L.S.) of two reproductive structures from the same type of plant:



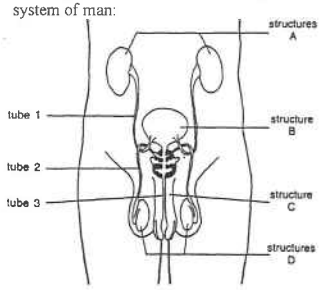
(i) A corm is an underground vegetative structure. Describe the natural process by which it may propagate vegetatively. (4 marks)
(ii) State another function of the corm that is important for the survival of the plant. (1 mark)
(iii) State whether the flower shown above is wind-pollinated or not. Give ONE reasonyou're your answer. (2 marks)
(iv) What will be the fates of structures A and B after fertilization? (2 marks)
(v)
(1) Explain why gardeners often use corms to produce new plants for flowers.
(2) Give ONE advantage of using seeds instead. (3 marks)
(HKCEE 1989)

5. The diagram below shows the human female reproductive system:



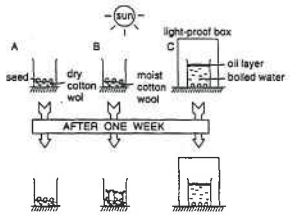
(i) State TWO functions of A. (2 marks)
(ii)
(1) What is meant by fertilization? (1 mark)
(2) Using the letters in the diagram, state where it takes place. (1 mark)
(iii) Some women are not able to have children if structure B is blocked. It is now possible to remedy this situation by "in vitro fertilization". The woman is given hormones in order to increase egg production. The eggs are then removed from the body and fertilized by sperms in a culture solution. Three days after fertilization, an embryo is transferred onto structure D; and if successful, a "test-tube baby" will develop.
(1) Explain why a woman cannot become pregnant if structure B is blocked. (1 mark)
(2) Give a reason why it is necessary to wait for three days before transferring the embryo onto structure D. (1 mark)
(3) Describe the role of structure D in the further development of the embryo. (3 marks)
(4) According to the procedure outlined above, explain why the term "test-tube baby" is inappropriate. (1 mark)
(HKCEE 1990)

6. The diagram below shows the urinogenital system of man:



(i) Which tube (1, 2 or 3) is involved in both reproduction and excretion? State its role in both processes. (2 marks)
(ii) Name structure D. (1 mark)
(iii) Explain why a man can survive without structures D but not structures A. (3 marks)
(iv) In a healthy person, which two structures (A, B, C or D) can change in size according to his physiological state? State the importance of these changes. (4 marks)
(HKCEE 1992)

7. In order to study the conditions necessary for seed germination, a student designed three experimental set-ups (A, B and C). These set-ups were put under the sun as shown below:



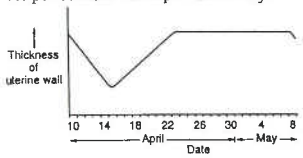
(i) What conclusion(s), if any, can be drawn by comparing the results in
(1) set-ups A and B only?
(2) set-ups B and C only?
Explain how you arrive at your answer. (5 marks)

(ii) Give two reasons why the condition studied in (i) (1) is important in seed germination. (4 marks)

(iii) After one week, there was a decrease in the dry mass of the seeds in set-up B. Explain why this occurred. (2 marks)

(HKCEE 1993)

8. The following graph shows the changes in the thickness of the uterine wall of a woman during the period from 10th April to 8th May:



(i) On which date was fertilization most likely to take place? Explain your answer. (2 marks)

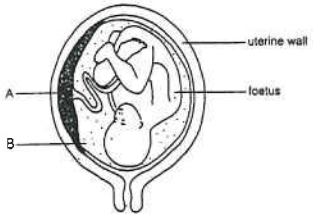
(ii) On which dates was menstruation occurring?
Explain your answer. (2 marks)

(iii) What is the significance of the increase in thick ness of the uterine wall during the period from 15th April to 22nd April? (1 mark)

(iv) In one method of birth control, a surgical operation is done on the oviducts. Briefly describe how the operation is performed and explain whether the secondary sexual characteristics of the woman would be affected after the operation. (4 marks)

(HKCEE 1993)

9. The diagram below shows a foetus inside the uterus of a woman just before birth:



(i) Describe how the foetus obtains nutrients for growth. (3 marks)

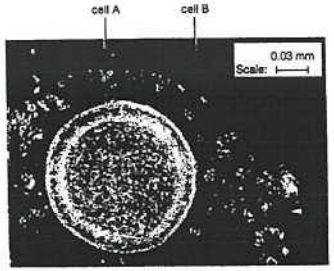
(ii) Name the fluid in B. State two functions of the fluid in B during the development of the foetus. (3 marks)

(iii) Explain what will happen to structure A shortly after the birth of the baby. (2 marks)

(iv) Explain why a woman should drink more milk during pregnancy. (4 marks)

(HKCEE 1994)

10. The photograph below shows two types of human cells, A and B:



(i)
(1) Using the scale given, calculate the diameter of cell A. (2 marks)
(2) Account for the large size of cell A. (1 mark)

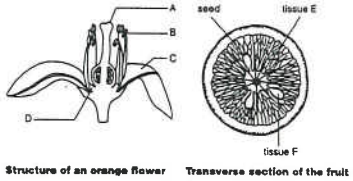
(ii) Name the organ that produces
(1) cell A.
(2) cell B. (2 marks)

(iii)
(1) State the biological process that might take place when cell B meets cell A. (1 mark)
(2) What is the significance of this process? (2 marks)

(iv) Cell B is found in a fluid called semen. Describe how semen is transferred from a man to a woman. (3 marks)

(HKCEE 1995)

11. Pollen grains from a flower of an orange tree were transferred to a flower of another orange tree. After some time, a fruit was formed. The diagrams on the opposite show the structure of an orange flower and the transverse section of the fruit.



Structure of an orange flower **Transverse section of the fruit**

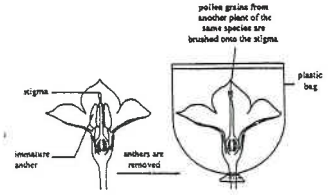
(i) With reference to the diagram,
(1) state the agent involved in the transfer of pollen grains between the orange flowers under natural conditions. (1 mark)
(2) explain one way in which the structure of the flower is adapted to this mode of pollination. (2 marks)

(ii)
(1) State the dispersal mechanism of orange seeds. (1 mark)
(2) Explain one way in which the fruit helps in this dispersal mechanism. (2 marks)

(iii) Explain why the genetic composition of cells in tissue E is different from that in tissue F (3 marks)

(HKCEE 1997)

12. The diagrams below show some of the steps carried out by a farmer in the reproduction of a certain species of plant



(i) What is the purpose of
(1) removing the anthers. (1 mark)
(2) covering the flower with a plastic bag ? (1 mark)

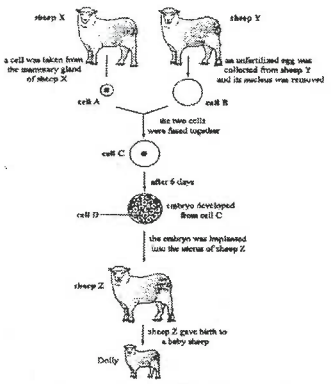
(ii) Describe the events that lead to the formation of the zygote after pollen grains are brushed onto the stigma. (3 marks)

(iii) Suggest the advantage of employing the procedure shown in the above diagrams for reproducing the plant. (2 marks)

(iv) This species of plant is usually reproduced by means of its stem tubers. Give two reasons to explain why farmers prefer to grow the plant from its tubers. (4 marks)

(HKCEE 1998)

13. Scientists can now propagate mammals by a method called cloning. The diagram below outlines how a sheep named Dolly was produced by using this method:



(i) Does cell C contain a haploid or diploid set of chromosomes? Explain your answer. (3 marks)

(ii) Explain why cell D is much smaller in size than cell C. (2 marks)

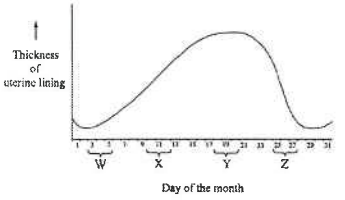
(iii) Dolly shows the same characteristics as one of the three parents. Which parent is this? Explain your answer. (3 marks)

(iv) Is Dolly produced by a sexual process? Give a reason for your answer. (2 marks)

(HKCEE 1999)

14.
(i) State the function of the uterus during the birth of a baby. (3 marks)

(ii) The graph below shows the changes in the thickness of the uterine lining of a woman in a certain month:

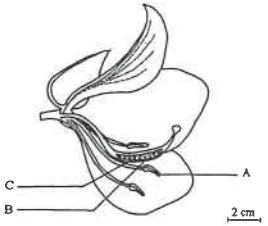


State the period (W, X, Y or Z) during which sexual intercourse might have a good chance of leading to pregnancy. Explain your answer. (4 marks)

(iii) One method of contraception is to avoid having sexual intercourse during the period stated in the answer to (ii). Suggest two reasons why this method of contraception may not be so reliable. (2 marks)

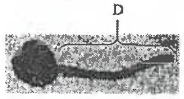
(HKCEE 1999)

15. The diagram below shows the structure of a flower:



(i) With reference to the diagram, state two observable features that suggest this flower is insect-pollinated. (2 marks)

(ii) Some tiny grains from structure A were put in a 15% sugar solution. After 2 hours, the grains were observed under the microscope. The photograph below shows one of these grains:

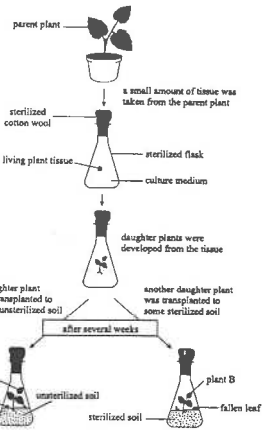


(1) Name structure D. (1 mark)

(2) What is the function of structure D? (2 marks)

(iii) What structures are formed from B and C respectively after fertilization? Describe the roles of these structures in reproduction. (5 marks)

16. Some plants can be propagated vegetatively using tissue culture. In this method, the culture medium is sterilized before use and it provides essential materials for plant growth. The diagram below shows an outline of an investigation involving tissue culture. The whole process is conducted in the presence of light.



(i) Sugar is one of the essential components of the culture medium. Explain why sugar must be added. (3 marks)

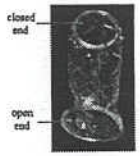
(ii) Compare the genetic make-up of the daughter plants with that of the parent plant. Give a reason for your answer. (2 marks)

(iii) After several weeks, plant B showed signs of yellowing while plant A remained green. Based on the information provided, suggest an explanation for the yellowing of plant B. (3 marks)

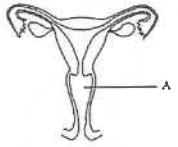
(iv) Give two advantages of this method of plant propagation over the propagation using seeds. (2 marks)

(HKCEE 2002)

17. The following photograph shows a female condom while the diagram on the right shows the human female reproductive system:



Female condom



Female reproductive system

(i) The female condom is placed in A during sexual intercourse. How does the female condom contribute to contraception? (2 marks)

(ii) Give an example of an infectious disease that can be prevented by wearing the condom. (1 mark)

(iii) Another contraceptive method is to tie and cut both the oviducts. State whether or not menstruation will still occur in a young

woman who has received this operation. Explain your answer with reference to the physiological processes involved. (4 marks)

(iv) The following is a simplified diagram of a cell which is undergoing cell division to form an ovum. (Only two pairs of homologous chromosomes are shown in the diagram.)

Based on the above diagram, make a drawing of the ovum formed showing the chromosomes contained inside. (3 marks)

18. The cartoon below shows a foetus crying for help inside the mother's body:

(i) Smoking during pregnancy is hazardous to the foetus. The foetus may be affected in a number of ways, such as a reduced supply of oxygen and the entry of toxic chemicals.

(1) Suggest an explanation for the reduced oxygen supply to the foetus. (2 marks)

(2) Using a flowchart, show the route by which nicotine in cigarette smoke is transported from the mother's lungs to the foetus. Indicate only the major organs and blood vessels involved. (3 marks)

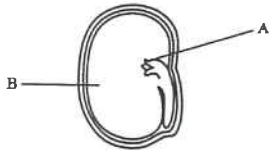
(ii)

(1) An early sign of the birth process is the breaking of the amnion. What is the significance of this event in the birth process? (2 marks)

(2) Describe what happens afterwards that leads to the birth of the baby. (3 marks)

(HKCEE 2003)

19. The diagram below shows a section of a seed



(i)

(1) Name structure A. (1 mark)

(2) What organs will A develop into during seed germination? (2 marks)

(ii) During germination, amylase activity is detected in region B. Explain the importance of amylase activity to the growth of the seedling. (4 marks)

(iii) The dry mass of the seedling decreases in the initial stage of germination but starts to increase after one week. Explain the increase in dry mass of the seedling in the later stage. (3 marks)

(HKCEE 2004)

20. The table below shows the average number of pregnancies for women adopting different contraceptive methods:

Contraceptive method	Pregnancies per 100 women in 12 months
Condom	15
Diaphragm	13
Intra-uterine device (IUD)	2
Rhythm method	25

(i) The use of condoms and diaphragms are based on the same principle in bringing about contraception. What is this principle? (1 mark)

(ii) How can an IUD prevent pregnancy to occur? (1 mark)

(iii)

(1) Explain the biological basis of the rhythm method. (3 marks)

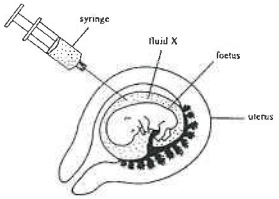
(2) Why does this contraceptive method have a high rate of failure? (1 mark)

(iv) Even though some couples do not use any contraceptive methods and have regular intercourse, the wives fail to become pregnant. Suggest *two* reasons for this. (2 marks)

(v) A man received an operation for contraception and had his sperm ducts tied and cut. Explain why his secondary sexual characteristics will not be affected after this operation. (3 marks)

(HKCEE 2004)

21. The diagram below shows how the fluid surrounding the foetus (fluid X) can be collected j using a syringe. The fluid collected contains some foetal cells. These cells are cultured for several weeks and then examined under the microscope to determine whether the foetus has certain genetic disorders.



(i) (1) Name the membrane that surrounds fluid X. (1 mark)
(2) Give two reasons why fluid X is important to the foetus during its development. (2 marks)

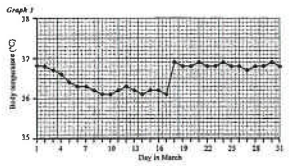
(ii) Suggest why it is necessary to culture the foetal cells for several weeks before they are examined under the microscope. (2 marks)

(iii) If microscopic examination shows that the foetus has Down Syndrome, the parents will have to decide whether to continue with the pregnancy or to end the pregnancy by abortion. Which choice do you support? Justify your answer. (2 marks)

(iv) Explain how we can find out the sex of the foetus through microscopic examination of the cultured cells. (2 marks)

(HKCEE 2005)

22. Lily is a healthy young woman. She adopts the 'safe period' method for contraception. In order to do so, she measures her body temperature every morning when she wakes up. Graph 1 below shows the body temperature recorded in March and Graph 2 shows the change in the thickness of her uterine lining in the same month:



(a) Identify the period that corresponds to menstruation. Give *one* piece of evidence from the information provided to support your answer. (2 marks)

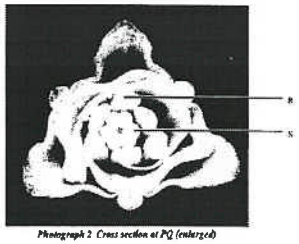
(b) Referring to the graphs, state the period in which there will be a high chance of pregnancy if sexual intercourse occurs. Explain your answer. (4 marks)

(c) The 'safe period' method is not very reliable for contraception because it can only predict part of the fertile period. Explain why it cannot predict the whole fertile period. (2 marks)

(HKCEE 2006)

23. The photographs below show the structure of a lily flower:

Photograph 1 Whole flower with one petal removed



Photograph 2 Cross section at PQ (enlarged)

(i) Label the following structures: (2 marks)
R: S:

(ii) State the method of pollination for this flower. Support your answer with two observable features from Photograph 1. (3 marks)

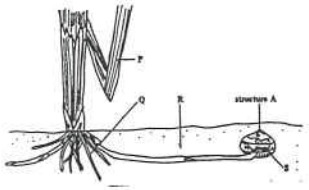
(iii) After pollination, describe how the male gamete meets the female gamete. (4 marks)

(iv) The lily plant can also reproduce asexually. What is this type of asexual reproduction? (1 mark)
(HKCEE 2007)

Past HKCEE Questions
Reproduction
Paper II

90-22
Which of the following statements about binary fission in amoeba is INCORRECT?
A. Two daughter amoebae are formed in each fission.
B. The daughter amoebae are Identical in their genetic contents.
C. The chromosome number of the daughter amoebae is half of that of the parent.
D. The newly-formed daughter amoebae are smaller in size than their parent.

90.
Directions: Questions 43 and 44 refer to the diagram below which shows the underground structures of a flowering plant

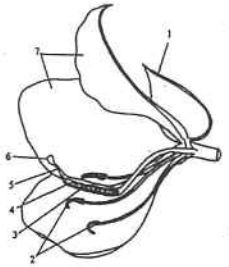


90-43
The daughter plant developed from structure A
(1) possesses the same genotype as the parent plant.
(2) has the same chromosome number as the parent plant.
(3) can carry out sexual reproduction.
A. (1) only
B. (3) only-
C. (1) and (2) only
D. (1), (2) and (3)

90-44
Which of the following provides the major source of food for the development of the daughter plant from structure A?
A. P
B. Q
C. R
D. S

90-52
Which of the following is/are true for sexual reproduction?
(1) It always involves two different parents.
(2) The resulting offspring are genetically different.
(3) The resulting offspring are always healthy.
A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only

91.
Directions: Questions 31 to 33 refer to the diagram below which shows a section of a flower:



91-31
Structures 1 and 5 are

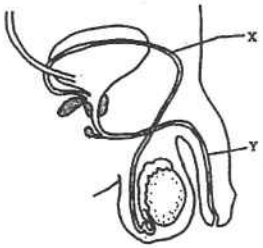
	Structure 1	Structure 5
A.	sepal	style
B.	petal	stigma
C.	sepal	stigma
D.	petal	style

91-32
Which of the following characteristics shown in the diagram indicate that the flower is insect-pollinated?
(1) Structures 2 and 6 are enclosed within structure 7.
(2) Structure 4 occurs in small numbers.
(3) Structure 7 is large and conspicuous.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

91-33
Which structures will usually wither after fertilization?
A. 1, 2, 3 and 5
B. I, 3, 6 and 7
C 2, 5. 6 and 7
D. 3, 5, 6 and 7

91-34
The following events are involved in the process of giving birth to a baby:
(1) The placenta is detached and expelled from the uterus.
(2) The umbilical cord is tied and cut.
(3) The cervix dilates.
(4) The baby is pushed out.
(5) The uterus contracts rhythmically causing the amniotic membrane to rupture.
Which of the following is the correct order?
A. (1), (3), (4), (5), (2)
B. (1), (5), (3), (4), (2)
C. (3), (4), (5),(2), (1).
D. (5), (3), (4), (2), (1).

91.
Directions: Question 35 end 36 refer to the diagram below which shows part of the male urinogenital system of man:



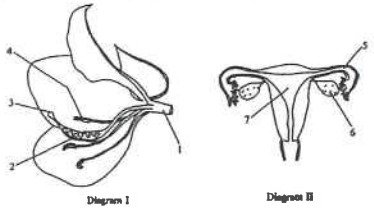
91-35
Structures X and Y are

	Structure X	Structure Y
A.	Sperm duct	Urethra
B.	Urethra	Sperm duct
C.	Ureter	Sperm duct
D.	Sperm duct	Ureter

91-36
If duct X is blocked, which of the following is true?
A. no urination
B. no sperm in the semen
C. no sperm production
D. no sex hormone production

92-36
Which of the following are advantages of seed dispersal?
(1) It reduces competition.
(2) It prevents the spread of diseases.
(3) It increases the chances of genetic variations.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

92.
Directions: Questions 37 and 38 refer to the diagrams below. Diagram II shows a longitudinal section of a flower. Diagram II shows a section of the human female reproductive system.



92-37
Where dots fertilization normally occur?

	Diagram I	Diagram II
A.	3	5
B.	2	5
C.	3	7
D.	2	7

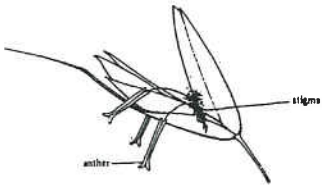
92-38
Which structure of the flower is comparable to structure 6 in humans?
A. 1
B. 2
C. 3
D. 4

92-40
One of the functions of the placenta of a mammal is to
A. expel the foetus during childbirth.
B. protect the foetus from mechanical injury.
C. allow the mother's blood to flow into the capillary network of the foetus.
D. allow metabolic wastes to pass from the foetal circulation to that of the mother.

92-41
The conditions necessary for germination for all kinds of seeds are
(1) light
(2) water
(3) oxygen
(4) a suitable temperature
A. (1) and (2) only
B. (1), (3) and (4) only
C. (2), (3) and (4) only
D. (1), (2), (3) and (4)

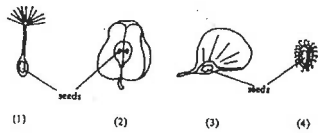
93-44
Which of the following is a male secondary sexual characteristic in humans?
A. production of sperms
B. development of the testis
C. widening of the hip girdle
D. development of stronger muscles

93-45



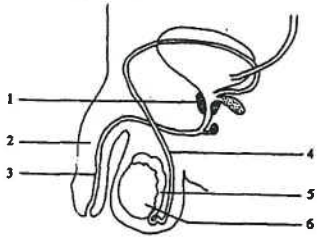
With reference to the above diagram, which of the following characteristics indicates that this flower is adapted to wind pollination?
A. It is s bisexual flower.
B. Its stigma hangs outside the flower.
C. Its anthers lie below the stigma.
D. Its anthers produce numerous pollen gains.

93-46
The diagram below shows sections of four different fruit:



Which of the above fruits carry seeds that are dispersed by animals?
A. (1) and (2)
B. (1) and (3)
C. (2) and (4)
D. (3) and (4)

94-40
The diagram below shows part of the male urinogenital system of man:



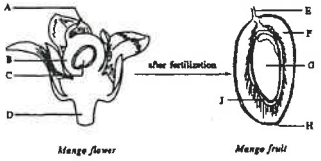
Which of the following is correct?

	Structure for the production of seminal fluid	Structure for transmitting urine	Structure for the production of gametes
A.	1	3	5
B.	2	4	5
C.	1	3	6
D.	2	4	6

94-41
Which of the following statements about birth control methods is correct?
A. A condom can prevent the entry of sperms into the uterus.
B. Cutting the sperm duct / can stop the production of sperms.
C. Contraceptive pills can prevent the implantation of the embryo.
D. The 'natural rhythm' method involves avoiding copulation after menstruation.

94-43
Pollen grains are usually produced to large numbers so that
A. the species can explore new environment:
B. competition among the new plants can be reduced.
C. they can help the dispersal of new plants.
D. they can have a grater chance of reaching other flowers.

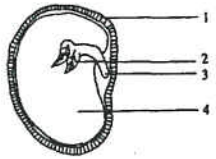
94.
Directions: Questions 44 and 45 refer to the diagrams below which show the flower and the fruit of a mango plant:



94-44
Which of the following statements is correct?
A. E is developed from D.
B. F is developed from C.
C. G is developed from B.
D. H is developed from A.

94-45
Which of the following features helps the dispersal of G?
A. F is fleshy and juicy.
B. G can be carried by the wind.
C. H can stick to the fur of mammals.
D. J is hairy.

94.
Directions: Questions 46 and 47 refer to the diagram below which shows a longitudinal section of a broad bean seed:



94-46
Which of the following occurs when the seed germinates?
A. Structure 1 carries out photosynthesis.
B. Structure 2 is the first part that grows out through structure 1.
C. Structure 3 shows positive geotropism.
D. Structure 4 undergoes rapid growth.

94-47
When the broad bean seed germinates, which of the following is incorrect?
A. the dry mass increase
B. the fresh mass increases
C. the length of the stem increases
D. the length of the root increases

95-42
Which of the following is an example of reproduction involving fertilization?
A. binary fission in amoeba
B. production of spores; in bread mould
C. formation of stem tubers in potato
D. formation of seeds is maize

95.
Directions: Questions 43 and 44 refer to the experiment below which attempted to study the conditions for seed germination. Equal numbers of broad bean seeds were placed in three different pots of soil. The conditions of the pots and the results were as follows:

Pot	Condition			Results after one week
	Water supply	Light	Temperature	
1	✓	✓	25°C	germination occurred
2	x	✓	5°C	no germination
3	x	✓	25°C	no germination

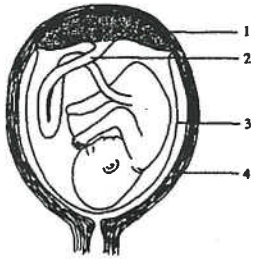
Key : ✓ indicates the presence of the factor concerned
x indicates the absence of the factor concerned

95-43
Based on the above results, germination of broad bean seeds requires
A. water.
B. warmth.
C. water and warmth.
D. water, light and warmth.

95-44
In pot 1, some seeds failed to germinate. What is the most probable reason for this?
A. The seeds were dead.
B. These seeds could not carry out photosynthesis.
C. There was not enough light.
D. The temperature was too high.

95-45
Which of the following is an advantage of vegetative propagation in flowering plants?
A. The daughter plants will develop more rapidly.
B. The daughter plants will show more genetic variation.
C. The daughter plants will not get diseases from the parent.
D. The daughter plants will be better adapted to a changing environment.

95.
Directions: Questions 48 and 49 refer to the diagram below which shows a foetus in the mother's body:



95-48
When the baby is born, which structures will be expelled from the mother's body?
A. 1 and 2 only
B. 3 and 4 only
C. 1, 2 and 3 only
D. 2, 3 and 4 only

95-49
Which structures are responsible for removing waste from the foetus?
A. 1 and 2
B. 1 and 3
C. 2 and 4
D. 3 and 4

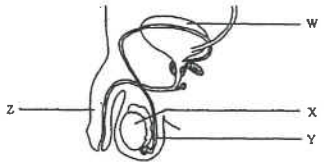
96-39
If both oviducts of a woman are tied up and cut, which of the following is correct?

	Ovulation	Menstruation
A.	✓	✓
B.	X	X
C.	✓	X
D.	X	✓

Key: ✓ - occurs
X - does not occur

96-40
Which of the following birth control methods is the least reliable?
A. using condoms
B. the rhythm method
C. using contraceptive pills
D. tying up the sperm ducts

96.
Directions: Questions 41 and 42 refer to the diagram below which shows part of the urinogenital system of a man:



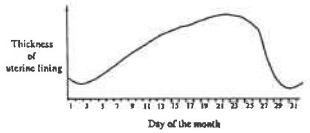
96-41
Which of the following correctly shows the function of structures W, X and Y?

	W	X	Y
A.	Produces urine	Produces sperms	Transfers urine
B.	Produces urine	Produces hormone	Transfers sperms
C.	Stores urine	Produces sperms	Transfers urine
D.	Stores urine	Produces hormone	Transfers sperms

96-42
Which structure increases significantly in size during sexual intercourse?
A. W
B. X
C. Y
D. Z

96-43
Which of the following cannot pass from the maternal blood to the foetal blood through the placenta?
A. antibodies
B. oxygen
C. red blood cells
D. sugars

96.
Directions: Questions 44 and 45 refer to the diagram below which shows the changes in the thickness of the uterine lining of a woman in a certain month:

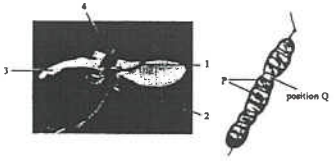


96-44
Menstruation is likely to have occurred during.
A. the 3rd - 7th day.
B. the 10th - 14th day.
C. the 20th - 24th day.
D. the 26th - 30th day.

96-45
Pregnancy might have resulted if sexual intercourse took place during
A. the 3rd - 7th day.
B. the 10th - 14th day.
C. the 20th - 24th day.
D. the 26th - 30th day.

96-46
In which of the following does meiosis occur?
(1) the ovaries
(2) the uterus
(3) the placenta
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

96.
Directions: Questions 47 to 49 refer to the photographs below which show a flower and a fruit of a local plant:

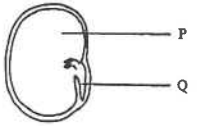


96-47
Which parts of the flower produce gametes?
A. 1 and 3
B. 1 and 4
C. 2 and 3
D. 2 and 4

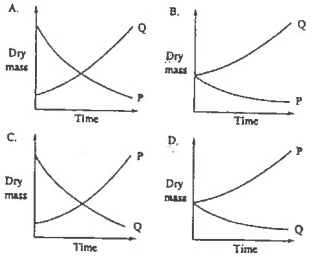
96-48
The fruit develops from part
A. 1.
B. 2.
C. 3.
D. 4.

96- 49
Structure P is not found at position Q. Which of the following are the possible reasons for this?
(1) There was no ovule at position Q.
(2) The ovule at position Q was not fertilized.
(3) The pollen grains did not reach position Q.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

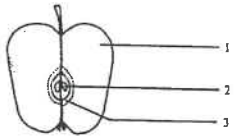
96-50
The diagram below shows the longitudinal section of a bean seed:



Which of the following graphs correctly shows the changes in dry mass of structures P and Q during germination?



96-51
The diagram below shows the vertical section of an apple



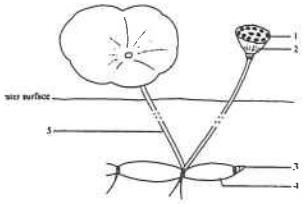
Which of the following structures contain(s) stored food for seed germination?
A. 1 only
B. 2 only
C. 1 and 2 only
D. 1, 2 and 3

97-39
Which of the following are the advantages of seed dispersal?
(1) to reduce competition within a species
(2) to allow the species to explore new environments
(3) to enable the species to become more adaptable to a changing environment
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

97-40
Which of the following combinations is incorrect?

	Human structure	*Function*
A.	ovary	to produce eggs
B.	testis	to produce hormones
C.	seminal vesicle	to store sperms
D.	mammary gland	to produce milk

97.
Directions: Questions 42 and 43 refer to the diagram below which shows part of a lotus plant:

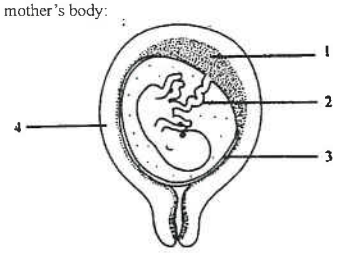


97-42
Both structures 1 and 3 can give rise to new plants. Which of the follow following comparisons between the two ways of reproduction is incorrect?

	Reproduction by structure 1	*Reproduction by structure 3*
A.	results in genetic variations	no genetic variation
B.	relies on external agent	does not need external agent
C.	both can prevent overcrowding of offspring	
D.	both can enable the plant to survive adverse conditions	

97-43
Which structures store food for the development of new plants?
A. 1 and 4
B. 1 and 5
C. 2 and 4
D. 2 and 5

97.
Directions: Questions 44 and 45 refer to the diagram below which shows a foetus in the mother's body:



97-44
Which of the following are the functions of structures 1, 2 and 3?

	Structure 1	Structure 2	Structure 3
A.	food supply	gaseous exchange	protection
B.	protection	food supply	gaseous exchange
C.	food transport	protection	gaseous exchange
D.	gaseous exchange	food transport	protection

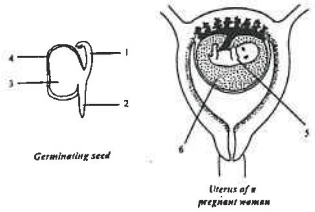
97-45
Which structures have the same genotype in their cells?
A. 2 and 3 only
B. 2 and 4 only
C. 3 and 4 only
D. 2, 3 and 4

97-46
Which of the following comparison of the two birth control methods used by women is correct?

	Contraceptive pills	Tying up of oviducts
A.	ovulation occurs	no ovulation
B.	no implantation of embryo	implantation of embryo occurs
C.	no menstruation	menstruation occurs
D.	easy to cancel its contraceptive effect	hard to cancel its contraceptive effect

97-47
Arrange the following events of the birth process in the correct sequence.
(1) expulsion of placenta
(2) breaking of amnion
(3) dilation of cervix
(4) expulsion of foetus
(5) cutting of umbilical card
(6) onset of labour
A. (3), (2), (6), (4), (1), (5)
B. (3), (6), (4), (2), (1), (5)
C. (6), (2), (4), (3), (5), (1)
D. (6), (3), (2), (4), (5), (1)

98.
Directions: Questions 35 and 36 refer to the diagrams below which show a section of a germinating seed and the uterus ore pregnant woman:



98-35
Which structures of the germinating seed are comparable to structure 5?
A. 1 and 2
B. 2 and 3
C. 3 and 4
D. 4 and 1

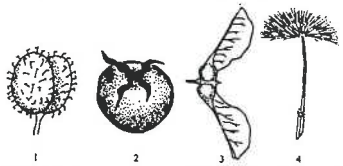
98-36
Which of the following correctly states the function of structure 3 and fluid 6 at the stage of development shown above?

	Structure 3	*Fluid 6*
A.	for protection	for gaseous exchange
B.	for supplying food	for gaseous exchange
C.	for protection	for protection
D.	for supplying food	for protection

98-37
Arrange the following processes of human reproduction in the correct sequence:
(1) copulation
(2) fertilization
(3) meiosis
(4) pregnancy
A. (2), (1), (4), (3)
B. (2), (3), (1), (4)
C. (3), (1), (2), (4)
D. (3), (2), (1), (4)

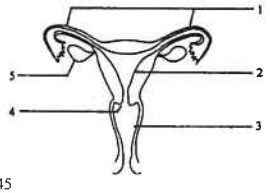
98-40
Which of the following organisms can produce offspring from a single parent?
(1) bread mould
(2) African violet
(3) yeast
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D: (1), (2) and (3)

98-42
The diagram below shows four types of fruits:



Which fruits above carry seeds that are dispersed by animals?
A. 1 and 2
B. 2 and 3
C. 3 and 4
D. 4 and 1

98.
Directions: Questions 45 and 46 refer to the diagram below which shows the human female reproductive system:

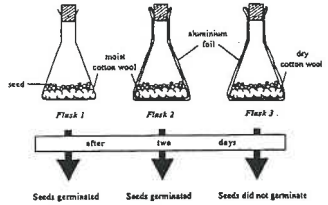


98-45
Which of the following combinations of birth control methods and their site of action is correct?

	Birth control method	Site of action
A.	female condom	2
B.	contraceptive pills	3
C.	diaphragm	4
D.	sperm-killing chemicals	5

98 - 46
If both structures labelled 1 are tied up and cut, which of the following will not occur?
(1) fertilization
(2) menstruation
(3) formation of ova
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

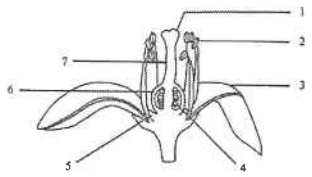
98.
Directions: Questions 47 and 48 refer to the diagram below which shows three flasks set up by a student to investigate the conditions necessary for seed germination. The flasks were kept at 30°C.



98-47
What conclusion can be drawn from the results above?
A. Light is necessary for germination.
B. Water is necessary for germination.
C. 30°C is the optimum temperature for germination.
D. No conclusion can be drawn.

98-48
The seedlings in flask 2 died after one week. Which of the following are possible reasons for this?
(1) The stored food is used up.
(2) The seedlings cannot carry out photosynthesis.
(3) Auxins in the seedlings are destroyed in darkness.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

99. Directions: Questions 41 to 43 refer to the diagram below, which shows the longitudinal section of a flower:

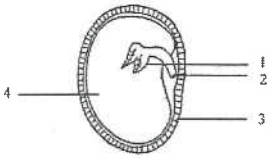


99-41
Meiosis occurs in
A. 1 and 4.
B. 1 and 6.
C. 2 and 4.
D. 2 and 6.

99-42.
Fertilization may take place in
A. 1.
B. 4.
C. 6.
D. 7.

99-43
Which structures would be reduced or absent in a wind-pollinated flower?
A. 1 and 2
B. 1 and 3
C. 2 and 5
D. 3 and 5

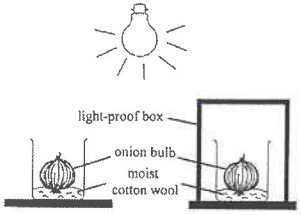
99.
Directions: Questions 44 and 45 refer to the diagram below, which shows a section of a broad bean:



99-44
Which parts of the broad bean are formed from the fertilized egg?
A. 1 and 2 only
B. 3 and 4 only
C. 1, 2 and 4 only
D. 1, 2, 3 and 4

99-45
Which part of the broad bean would be stained blue-black by iodine solution?
A. 1
B. 2
C. 3
D. 4

99
Directions: Questions 47 to 49 refer to the diagram below, which shows a set-up used by Eric in an experiment. After one week, he noted whether the onion bulb in each beaker had germinated into a new plant.



99-47
This experiment was designed to find out whether the development of new plants from the onion bulbs required
A. light.
B. water.
C. light and water.
D. light or water.

99-48
If the onion bulbs in both beakers germinate after one week, what conclusion can be drawn?
A. Light is not necessary for the germination of onion bulbs.
B. Water is not necessary for the germination of onion bulbs.
C. Either light or water is necessary for the germination of onion bulbs.
D. No conclusion can be drawn.

99-49
If the onion bulbs in both beakers do not germinate after one week, what conclusion can be drawn?
A. Light is not necessary for the germination of onion bulbs.
B. Water is not necessary for the germination of onion bulbs.
C. Besides light and water, other factors are necessary for the germination of onion bulbs.
D. No conclusion can be drawn.

00-16
What would happen to a man if his sperm ducts were tied and cut?
A. No sperms would be produced.
B. No sex hormones would be produced.
C. His voice would become high-pitched.
D. He would become sterile.

00.
Directions: Questions 37 to 39 refer to the passage below:

Test tube babies

Some couples are unable to have children. This problem may now be solved by the technique of in vitro fertilization (IVF).

Before undergoing the IVF, a woman is given hormones to stimulate a large number of eggs to develop and mature simultaneously in her ovaries. Several eggs are then collected by suctioning through a hollow needle. They are transferred to a petri dish with a nutrient solution and a sample of semen. The fertilized eggs are allowed to develop for two to three days, by which time they have reached the eight- or sixteen-cell stage. Several of these embryos are then placed into the woman's uterus.

00-37
Which of the following are the possible causes of infertility in married couples?
(1) The sperm count is low.
(2) The oviducts are blocked.
(3) The duration of the menstrual cycle is not constant.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

00-38
In IVF, fertilization occurs in
A. the oviduct.
B. the uterus.
C. the needle.
D. the petri dish.

00-39
The doctor has to wait for two to three days before transferring the embryos into the woman's uterus. This is to
A. allow time for fertilization to occur.
B. allow the embryos to obtain sufficient nutrients.
C. make sure that the uterus is ready for the implantation of the embryos.
D. ensure that the embryos to be placed into the uterus are developing normally.

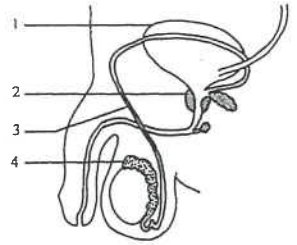
00-51
Potato plants can be reproduced by seeds or by stem tubers. Stem tubers are organs for vegetative propagation. Which of the following comparisons between these two methods of reproduction is correct?

		Seed	Stem tuber
A.	Genetic variation in offspring	less	more
B.	Chromosome number of the cells of offspring	haploid	diploid
C.	Chance of dispersal of offspring	smaller	greater
D.	Chance of passing infectious diseases to offspring	smaller	greater

00-54
Which of the following are the functions of the amniotic fluid in humans?
(1) It acts as a shock absorber.
(2) It provides nutrients to the embryo.
(3) It protects the embryo from desiccation.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

01-21
A fertilized ovum differs from an ovum in that it
A. has two cells.
B. is double in size.
C. divides by meiosis.
D. contains more DNA.

01.
Directions: Questions 33 and 34 refer to the diagram below, which shows part of the urinogenital system of a man:



01-33
Which of the following structures contribute to the content of semen?
A. 1 and 3
B. 1 and 4
C. 2 and 3
D. 2 and 4

01-34
Which of the following may still occur after structure 3 on both sides of the body are tied up and cut?
(1) production of sperms
(2) production of seminal fluid
(3) production of male sex hormone
A. (1) and (2) only
B. (1) and (3) only

C. (2) and (3) only
D. (1), (2) and (3)

01-35
Which of the following can pass from the maternal blood to the foetal blood through the placenta?
(1) antibody
(2) nicotine
(3) red blood cell
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

01-36
The foetus in the uterus obtains oxygen through
(1) its lungs.
(2) the amnion.
(3) the placenta.
A. (1) only
B. (3) only
C. (1) and (3) only
D. (2) and (3) only

01-37
What is the function of contraceptive pills?
A. to prevent ovulation
B. to increase the thickness of the uterine lining
C. to stimulate the development of the mammary glands
D. to maintain a high level of sex hormones in the blood

02-18
Which of the following is a similarity between a human sperm and a male gamete of a flowering plant?
A. Both are motile.
B. Both have a tail.
C. Both are haploid.
D. Both determine the sex of the offspring.

02-20
Which of the following comparisons between the reproductive methods of yeast and Bauhinia is incorrect?

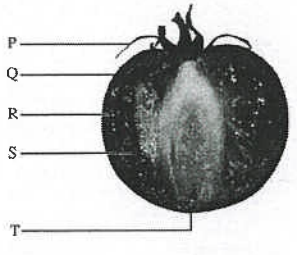
	Budding of yeast	Seed formation in Bauhinia
A.	involves only one sex	involves two sexes
B.	meiosis not involved	meiosis involved
C.	involves one type of gametes	involves two types of gametes
D.	offspring genetically identical to parents	offspring genetically different from parents

02-24
Just before undergoing binary fission, an amoeba will
(1) store a lot of water.
(2) duplicate the chromosomes.
(3) double the amount of cytoplasm.
A. (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

02-25
Normally, a woman discharges bloody fluid from her uterus for several weeks after giving birth. Which of the following is the reason for this?
A. The remaining amniotic fluid is released from the uterus.
B. The blood of the woman cannot clot properly.
C. Menstruation re-starts after giving birth.
D. The thickened uterine lining is shed.

02-55
Some pollen grains of a mango tree are transferred to the stigma of another mango tree. Which of the following statements about the pollen grains of the mango tree is/are correct?
(1) They are the male gametes.
(2) They help in the dispersal of mango plants.
(3) They help to transfer genetic materials from one mango tree to another.
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

02.
Directions: Questions 57 and 58 refer to the diagram below, which shows a section of a tomato:



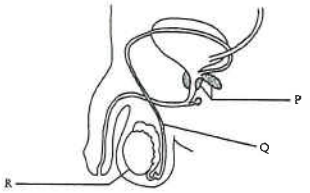
02-57
Which part(s) of the tomato helps in the dispersal of S?
A. P only
B. R only
C. P and Q only
D. P, Q and R

02-58
T is a scar on the surface of the tomato. Which of the following gives rise to T?
A. detachment of the flower stalls
B. detachment of the petals
C. detachment of the stamens
D. detachment of the style

03-18
Which of the following are genetically identical?
A. pollens of the same flower
B. seeds in the same fruit
C. stem cuttings from the same *Coleus* plant
D. maize grains on the same cob

03-42
A pair of identical twins are developed from
A. an egg which has fused with a sperm.
B. an egg which has fused with two sperms.
C. two eggs which have fused with a sperm.
D. two eggs which have fused with two sperms.

03.
Directions: Questions 44 and 45 refer to the diagram below, which shows part of the urinogenital system of a man:



03-44
The following statements describe the functioning of structures P and R at different stages of a man's life. Which one is correct?
A. At age 4, structures P start to secrete seminal fluid.
B. At puberty, structures P start to secrete male sex hormones.
C. From puberty to age 50, structure R releases sperms once a month.
D. After age 50, structure R still produces sperms.

03-45
Which of the following will occur after structure Q has been tied and cut?
A. The breasts will enlarge.
B. Structure R will shrink in size.
C. Pubic hair will become thinner.
D. The semen will contain no sperms.

03-54
Cross pollination is the transfer of pollens from one plant to another plant of the same species. It may be beneficial to the plant species because it leads to
A. greater genetic variation.
B. wider dispersal of the species.
C. the production of more seeds.
D. the elimination of alleles for undesirable characters.

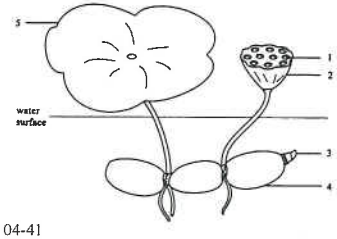
03.
Directions: Questions 58 and 59 refer to the diagrams below, which show the human female reproductive system and the carpel of a flower:

03-58
Which of the following pairs of structures and their roles in reproduction are correctly matched?

	Structures	*Role*
A.	1 and 8	the site of fertilization
B.	2 and 7	the site of gamete production
C.	3 and 7	for supplying food and oxygen to the embryo
D.	4 and 5	for protecting the male gametes

03-59
Which of the following parts will increase greatly in size after fertilization?
A. 1 and 8
B. 2 and 5
C. 3 and 7
D. 4 and 6

04.
Directions: Questions 41 and 42 refer to the following diagram of a lotus plant:

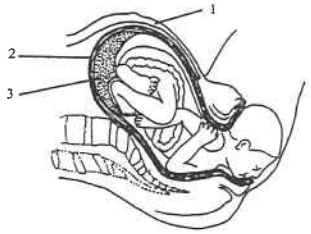


04-41
Among the following structures, which has a different genotype?
A. 1
B. 2
C. 3
D. 4

04-42
Which part of this plant produces food for the development of 3?

A. 1
B. 2
C. 4
D. 5

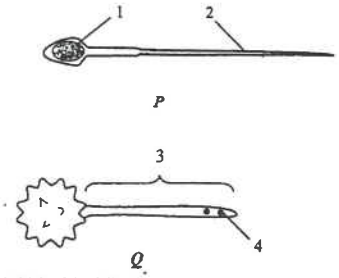
Directions: Questions 47 and 48 refer to the diagram below, which shows a foetus in the mother's body:



04-47
Which of the following help(s) to expel the foetus from the mother's body during birth?
A. 1 only
B. 2 only
C. 1 and 2 only
D. 1, 2and 3

04-48
Which of the following ***cannot*** pass through 3 from the mother's blood to the foetus?
A. alcohol
B. antibodies
C. haemoglobin
D. urea

04-55
P and Q in the diagram below are the reproductive structures of a mammal and a flowering plant respectively.



Which of the following comparisons between P and Q is correct?
A. Both P and Q are male gametes.
B. Both structures 1 and 4 carry the Y chromosome.
C. Both structures 1 and 4 contain the same number of chromosomes.
D. Both structures 2 and 3 enable the male gamete to meet the female gamete.

05-27
A human egg is much smaller than a chicken's egg. This is because
A. the human egg is fertilized inside the mother's body.
B. the human egg has to develop in the uterus after fertilization.
C. the human egg supplies food only for the early stage of embryo development.
D. the human embryo takes a much longer time to develop into a baby.

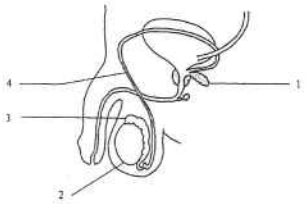
05-32
Some women have to take pills containing iron during pregnancy. The purpose is
A. to replace the iron lost during menstruation.
B. to ensure the mother's milk contains enough iron.
C. to supply iron for the development of the foetal skeleton.
D. to provide iron for the formation of foetal red blood cells.

05-34
The following is a calendar for the month of May:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

A woman predicts that her next menstrual flow will start on 25th May. She would have a higher chance of becoming pregnant if she has sexual intercourse between
A. 1st and 7th May.
B. 8th and 15th May.
C. 15th and 21st May.
D. 28th and 31st May.

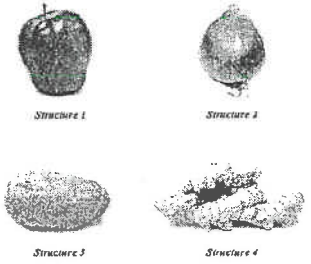
Directions: Questions 35 and 36 refer to the diagram below:



05-35
Which structure is responsible for the storage of mature sperms?
A. 1
B. 2
C. 3
D. 4

05-36
If structure 4 were tied and cut, which of the following would occur?
A. The semen would not contain any sperms.
B. The testes would stop producing sperms.
C. The voice of the man would become high-pitched.
D. The man would fail to ejaculate during sexual intercourse.

Directions: Questions 37 and 38 refer to the following photographs of four different plant structures:

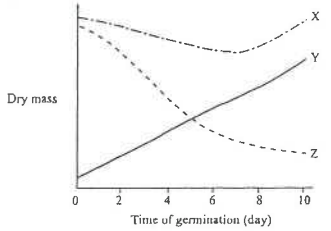


05-37
Which of these structures is *not* an organ for vegetative propagation?
A. 1
B. 2
C. 3
D. 4

05-38
All the four structures have
(1) buds.
(2) seeds.
(3) stored food.
A. (2) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only

05-49
Flowering plants may reproduce by forming stem tubers, rhizomes, bulbs or corms. These ways of reproduction are said to be asexual because
A. no fertilization takes place.
B. only one parent is involved.
C. they occur under favourable conditions.
D. they produce offspring that are similar to the parents.

Directions: Questions 53 and 54 refer to the graph below, which shows the changes in dry mass of a bean seedling, the cotyledons and the plumule of the same seedling during the early stages of germination:

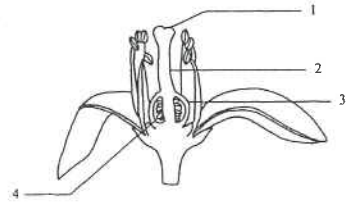


05-53
Which curves represent the changes in dry mass of the whole seedling and the cotyledons?

	Whole seedling	*Cotyledons*
A.	*X*	*Y*
B.	*X*	*Z*
C.	*Y*	*X*
D.	*Y*	*Z*

05-54
In which period is the photosynthetic rate of the seedling higher than its respiration rate?
A. day 1 to day 5
B. day 1 to day 10
C. day 5 today 10
D. day 7 today 10

Directions: Questions 55 and 56 refer to the diagram below, which shows a longitudinal section of a flower:

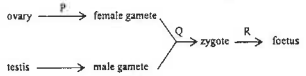


05-55
Fertilization occurs in structure
A. 1.
B. 2.
C. 3.
D. 4.

05-56
The flower produces numerous pollen grains. What is the importance of this?
A. to attract insects
B. to disperse the offspring
C. to increase the chances of fertilization
D. to increase the variation of the species

05-57
Which of the following are advantages of breast-feeding?
(1) Mother's milk contains the right amount of protein and fat.
(2) Mother's milk contains enzymes to help digesting the food.
(3) Mother's milk contains antibodies that provide immunity to the baby.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

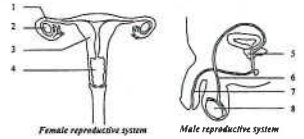
06.
06-29
The following flowchart shows the main processes involved in human reproduction:



The contraceptive methods used at P, Q and R for birth control could be

	P	Q	R
A.	contraceptive pills	condom	intra-uterine device
B.	intra-uterine device	contraceptive pills	spermicide
C.	contraceptive pills	spermicide	condom
D.	spermicide	condom	intra-uterine device

Directions: Questions 30 and 31 refer to the diagrams of the human reproductive systems below.



06-30
Which of the following structures serve similar functions?
A. 1 and 6
B. 2 and 5
C. 3 and 7
D. 4 and 8

06-31
Which of the following will be affected if 3 is removed?
(1) fertility
(2) ovulation
(3) implantation
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

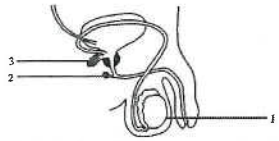
06-32.
Which of the following descriptions about tubal ligation and vasectomy (i.e. tying and cutting of oviducts and sperm ducts respectively) is correct?
A. Sperms are still produced after vasectomy.
B. Pregnancy is impossible after vasectomy.
C. There is no menstruation after tubal ligation.
D. The secondary sexual characteristics will be affected after tubal ligation.

06-57
Which of the following processes concerning reproduction in flowering plants will lead to variation in offspring?
(1) formation of gametes
(2) fusion of gametes from the same plant
(3) fusion of gametes from two plants of the same species
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

06-59
Which of the following descriptions about reproduction is correct?
A. Sexual reproduction must involve two parents.
B. Sexual reproduction must require a water medium for fertilization.
C. Asexual reproduction always produces more offspring than sexual reproduction.
D. Offspring produced by asexual reproduction are better adapted to their natural environment than those produced by sexual reproduction.

06-60
Which of the following correctly describes pollen grains and sperms?
A. They are motile.
B. They are haploid.
C. They are male gametes.
D. They both carry the Y chromosome.

07-15
The diagram below shows part of the urinogenital system of a man:



Which of the following structures contribute to the content of semen?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

07-16
Which of the following is a female secondary sexual characteristic?
A. the growth of pubic hair
B. growing taller
C. menstruation
D. acne on face

07-17
Which of the following cannot help the sperm to get into the uterus during sexual intercourse?

A. contraction of the uterus
B. contraction of the sperm duct
C. beating action of the sperm tail
D. beating action of the cilia on the oviduct

07-18
Which of the following substances will diffuse from maternal blood to foetal blood through the placenta?

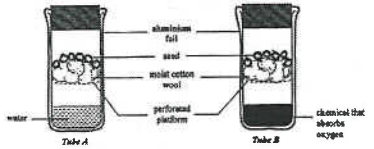
A. urea
B. oxygen
C. carbon dioxide
D. blood platelets

07-52
A couple, who have already had three children, decided not to have babies in the future. Which of the following contraceptive measures is most reliable?

A. restricting sexual intercourse to safe periods
B. tying and cutting the oviducts
C. using a diaphragm
D. using a condom

07-53
Amniotic fluid cannot provide protection to the foetus against
A. desiccation.
B. mechanical injury.
C. chemical poisoning.
D. sudden change in temperature.

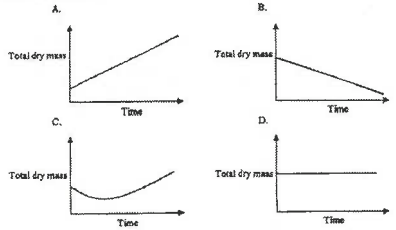
07
Directions: Questions 54 and 55 refer to the diagram below, which shows a set-up used to investigate the conditions for seed germination. The tubes were kept at 30°C. The seeds in tube A germinated while those in tube B did not.



07-54
Based on the design of the set-up, the investigation is to test whether

A. water is necessary for seed germination.
B. oxygen is necessary for seed germination.
C. soil is necessary for seed germination.
D. light is necessary for seed germination.

07-55
Which of the following correctly shows the change in the total dry mass of the germinating seeds in tube A?



Past HKCEE Questions
Reproduction
Suggested Answers

Paper I

1. (i) * B - plumule 0.5
* C - cotyledon 0.5
* E -buds 0.5
* G - stem 0.5

(ii) B - it develops into a new shoot 1
C - it stores / supplies food for developing new plant 1

(iii) (1) E (not named or with other letters) 1
(2) D (not named or with other Letters) 1

	(1) A	(2) E	
(iv) Cell division	meiosis	mitosis	1
(v) genotype	different	same	1,1

(vi) overcrowding / competition 1

2. (i) by active movement / movement of its tail 1

(ii) by passive movement / ciliary action / muscular contraction of oviduct 1

(iii)

Zygote	sperm
Diploid	Haploid
2n	n
Twice as many	Half as many

(any 1) 1

(iv) (1) mitosis 1
(2) maintain / preserve the chromosome number constant 1

(v) thickened / blood vessels increased (placenta formation NOT acceptable) 1

(vi) placenta 1

(vii) (1) reduces friction / lubricates passage 1
(2) expels foetus by contraction 1

3.

(i)

(1) D	(2) F	
water / seminal fluid	air	1,1
swims / propelled by muscular contraction of the genital tract	carried by air current / animals	1,1

(ii) this increases the chance of successful reproduction / compensates for loss 1

(iii) anthers hanging outside the flower 1

(iv) E - provide male gametes / are carriers of pollen grains for fertilization / sexual reproduction 1
F - are spores 1
which can develop directly into new organisms / for asexual reproduction 1

4. (i)
- with food supplied from the corm
- buds develop into aerial shoots
- carry out photosynthesis
- storage of excess food in base of stems
- to form daughters corms

any 4 (1 x 4) 4

(ii) food storage / pass over unfavourable periods (winter) / perennation 1

(iii) No 1
any 1 below: 1
- the stamens / stigma are not out
- the stigma is not feathery

(iv) A - dries up / withers / falls off 1
B - forms fruit wall / fruit 1

(v) (1) get flowers / new plants more easily / rapidly 1
maintain the desired quality of the flowers 1
(2) variation occurs / may give rise to flowers of a better quality 1

5. (i) production of eggs 1
secretion of hormones 1

(ii) (1) the union of male and female gametes 1
(2) B 1

(iii) (1) the egg and the sperms cannot reach each other 1
(2) Any 1 below: 1
- to ensure that the fertilized eggs develop into embryos
- to ensure that the embryo is ready for implantation
- to ensure that the uterine wall is ready for implantation

(3) to allow the formation of a placenta / for implantation of embryo 1
for gaseous exchange / nutrition / excretion of the embryo 1
and for protection of the embryo 1

(4) the baby is, in fact, developing inside the uterus of the mother for most of the time 1

6. (i) tube 3 1

(ii) is a passage for sperms / semen and urine 1

(iii) D is for reproduction / production of sperms 1
A is for excretion / osmoregulation which is essential for the maintenance of a constant internal environment / prevents accumulation of toxic materials 1

(iv) B 1
The elasticity of B enables the temporary stowage of urine 1
C 1
Erection of C facilitates the transfer of sperms / semen into the female reproductive tract 1

7. (i) (1) Water is necessary for seed germination 1
only the seeds in B germinate 1
B differs from A by the supply of water 1

(2) no conclusion can be drawn since C differs from B by the absence of oxygen and light
the 2 set-ups differ in more than one variable
(any 1)

(ii)
- to soften seed coat to facilitate emergence of the radicle
- to swell the seed to rupture seed coat
- to activate enzymes to hydrolyse (digest) stored food / speed up cellular activity
- as a medium for transport of food
- to hydrolyse stored food for transport

any 2 pairs (2 x 2) 4

(iii) the stored food is oxidized / respired to release energy for growth 1

8. (i) April 23 (+/-3 days) 1
because it was most likely that ovulation occurred on April 23 1
April 10 to April 14/15 (and May 8) 1

(ii) The uterine wall broke down / decreased in thickness 1

(iii) to repair the uterine wall / to prepare for the implantation of the embryo 1

(iv) The oviducts are tied and cut
no effect on secondary sexual characteristics 1
because sex hormones can still be produced by ovaries 1
and being transported by blood to the target organs to exert their effects 1

9. (i) Through placenta (structure A), 1
nutrients diffuse from the maternal blue into the foetal blood 1
and carried by the umbilical cord to the foetus 1

(ii) * amniotic fluid 1
any 2 (1, 1) 2
- act as shock absorber to protect the foetus from mechanical damage
- prevent desiccation of the foetus
- maintain a relatively constant environment around the foetus
- allow the foetus to move freely / support the foetus inside the uterus

(iii) A will be expelled out of the woman's body by the contraction of the uterus 1

(iv) Milk is rich in protein 1
which is important for the growth of the foetus 1
Milk is rich in vitamin D / calcium 1
which is important for the development of bones and teeth of the foetus 1

10. (i) (1) Diameter
= 5.3 (5.0 to 5.5) X 0.03mm 1
= 0.159 mm (0.150 mm to 0.165 mm) 1
(no unit, no mark)
(2) because cell A contains food store 1
(ii) (1) * ovary 1
(2) * testis 1
(iii) (1) fertilization
(2) any 2 points (1, 1) 2
- It forms a zygote
- which will develop into a new individual
- It combines the genes from both parents
- to result in genetic variation in the offspring
- It restores the diploid chromosome number
- which has been reduced to half by meiosis during gamete formation / so as to maintain the chromosome number of the species constant

(iv) The penis becomes-erect 1
and it is inserted into the vagina 1
Semen is then ejaculated 1

11. (i) (1) insect 1
(2) Any 2 points (1, 1) 2
- A is club-shaped/has a broad tip
- to receive pollen grains
- on the insect body
- Presence of nectary / D
- which produces sugary secretion / nectar to attract insects
- C is relatively large in size
- to attract insects

(ii) (1) Animal dispersal 1
(2)
- The fruit has fleshy portion / E is fleshy and juice
- The fruit has a good smell taste
- The outer skin of the fruit is in bright colour to attract animals to eat the fruit

Any 1 above 1

Because cells in tissue E are formed from cells/ovary wall of the mother plant only 1
while cells in tissue F are developed from the zygote 1
which contains a combination of genes from two parent plants 1
Communication skill (C) 1

12. (i) (1) to prevent self-pollination / fertilization 1
(2) to prevent any unwanted pollination / fertilization from 1
(ii) The pollen grains germinate and develop pollen tubes 1
which carry the male gametes towards the ovules 1
The male gamete fuses with the egg to form the e zygote 1
Communication skill (C) 1
(iii) Parents with selected characters are crossed 1
so that offspring with desirable characters can be produced 1
(iv) The desired quality of the plant can be maintained 1
because the daughter plants produced from the tubers are genetically identical to the parent 1
The daughter plants can develop faster / they have a greater chance to develop 1
as more food is available in the tuber for the development / the development is more independent of environmental conditions 1

13. (i) Cell C contains a diploid set of chromosomes 1
because is nucleus / chromosomes comes from cell A 1
which is a body / diploid cell 1
(ii) Because the cytoplasm of cell D is formed by repeated divisions 1
of the cytoplasm of cell C / without cell enlargement 1
(iii) Sheep X 1
Because the body characteristics of Dolly is determined by its genetic material, 1
which is derived from and identical to that in the body cell of sheep X 1
(iv) No 1
because the process does not involve the fertilization of gametes 1

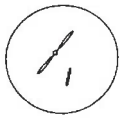
14. (i) The muscular wall of the uterus contracts I
rhythmically and powerfully 1
to push the baby out of the uterus 1
(ii) Period X 1
Ovulation occurred around period X 1
thus fertilisation might occur after sexual intercourse 1
Besides, around this period, the uterine lining is ready for the implantation of the embryo 1
(iii) The day of ovulation may vary from cycle to cycle 1
The duration of the menstrual cycle of a woman may vary 1

15. (i) any two (1,1) 2
- Presence of insect guide
- Large petals
- Stigma / anthers lie within the flower
- Broad / club-shaped stigma

(ii) (1) *pollen tube 1
(2) It carries the male gamete to meet the female gamete in the ovule 1
(iii) C will develop into the seed 1
which will form a new plant 1
B will develop into the fruit 1
which serves to protect the seeds 1
and helps in seed dispersal 1

16. (i) The plant tissue cannot carry out photosynthesis / produce its own sugar 1
So it needs an external supply of sugar for respiration to release energy 1
and as raw material for growth 1
Effective communication (C) 1
(ii) The genetic make-up of the daughter plants was the same as that of the parent plant 1
because the daughter plants were formed by mitosis of the parent tissue cells 1
(iii) For plant B, the sterilized soil had no microorganisms 1
for recycling the fallen leaves into minerals . 1
After several weeks, the minerals in the soil became exhausted, so insufficient chlorophyll was made 1
(iv) This method is a faster / surer way of producing daughter plants 1
The desirable characteristics of the parent can be retained in the daughter plants 1
(accept other reasonable answers)

17. (i) It forms a physical barrier 1
to prevent sperms from meeting the ovum 1
(ii) AIDS / hepatitis B, C or E / gonorrhea / syphilis (accept other correct answers) 1
(iii) Menstruation will still occur 1
because the operation does not affect the production of the female sex hormone by the ovary 1
and the transport of the hormone by blood 1
Under the influence of the female sex hormone, the uterine lining will get thicker and shed off later 1
Effective communication (C) 1
(iv) Title (T) 0.5
Drawing including cell outline (D) 0.5
Two chromosomes shown i.e. haploid, chromosomes as single thread (1+1) 2



The ovum

18. (i) (1) Tar in cigarette smoke deposits on the surface of the air sacs in the mother's lungs. 1
As a result, less oxygen can be absorbed into the mother's blood hence reducing the oxygen supply to the foetus. 1
(2) Mother's lung → pulmonary vein → heart → aorta → artery to uterus → placenta → umbilical vein → foetus 3
(ii) (1) This results in the discharge of the amniotic fluid 1
which lubricates the passage of the foetus through the vagina. 1
(2) The cervix continues to dilate. 1
The uterus and the abdominal muscles contract strongly to expel the foetus through the vagina. 1

19. (i) (1) Plumule
(2) Stem and leaf
(ii) Amylase hydrolyses the starch stored in 1
the seed into maltose / sugar, 1
which is used for forming new cells 1
and for respiration / release of energy for the growth of the 1
seedling.

(iii) The seedling has developed green leaves. 1
The rate of photosynthesis of the leaves is greater than the rate of respiration of the seedling, 1
so there is a net gain in the amount of organic substances / new cells are produced. 1

20. (i) Both of them are based on the use of a barrier / prevent the sperms from meeting the egg. 1
(ii) IUD prevents the implantation of the embryo. 1
(iii) (1) Egg and sperms are viable for only a few days once they are released. 1
The rhythm method is to avoid having intercourse around the time of ovulation, 1
so that sperms and egg will have no chance of meeting each other. 1
(2) Because it is hard to predict the time of ovulation accurately. 1
(iv) Any two: 2
- Time of intercourse does not necessarily fall in the period around ovulation.
- Gametes produced may not be viable / may be defective.
- Oviducts of some women may be blocked.
- The sperm count of the husbands is too low.

(v) This is because the development of secondary sexual characteristics is controlled by the male sex hormone, 1
which is still produced by the testes and transported in the blood after the operation. 1
1

21. (i) (1) *amnion 1
(2) Any 2 1,1
Fluid X helps to protect the foetus from mechanical shock) / It can prevent desiccation of the foetus / It allows movement of the foetus in the uterus / It can maintain a constant internal environment for the growth of the foetus
(ii) To allow time for obtaining enough foetal cells for analysis 1

(iii) Any 2 from the same set 1,1
Continue with pregnancy: (accept other reasonable answers)
- the foetus has life; we have no right to terminate the life of an individual)
- people with Down Syndrome can lead a quality and meaningful life
- abortion may have potential risk to the mother and may have psychological impact) on the mother

End pregnancy: (accept other reasonable answers)
- the child may become a burden to his / her parents / society as it needs more care
- the child may be discriminated due to his physical / mental disabilities

(iv) Under the microscope, if two X chromosomes are found / the sex chromosomes are identical, the foetus is a female 1
If an X and a Y chromosome are found / the sex chromosomes are different, the foetus is a male 1

22. (a) 4th to 8th March 1
There is a great drop in the thickness of the uterine lining in this period 1
(b) 12th to 21st March 1
The rise in body temperature indicates that / Uterine lining is thickened and ready for implantation 1
ovulation occurs at around day 17
Also, sperms and the egg can survive for a couple of days in the female reproductive tract 1
If sexual intercourse occurs in this period, there is a high chance of pregnancy 1
Effective Communication (C) 1
(c) This method only allows her to detect ovulation when there is a rise in the body temperature 1
But it fails to predict the fertile period before ovulation 1

23. (a) (i) R: * filament 1
S: * ovary / ovule 1
(ii) Insect pollination 1
Any 2 reasons below: 1+1
- Large / brightly coloured petal
- Anther / stigma located inside flower
- Presence of insect guide

(iii) Pollen grain develops to form a pollen tube 1
Pollen tube carries the male gametes 1
down the style to the ovary / and digests the tissues of the style 1
and releases the stale gametes into the ovule 1
(iv) Vegetative propagation 1

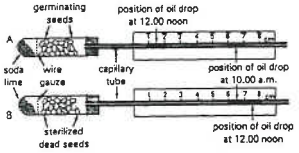
Paper II

90-22	C
90-43	D
90-44	D
90-52	B
91-31	A
91-32	B
91-33	C
91-34	D
91-35	A
91-36	B
92-36	A
92-37	B
92-38	B
92-40	D
92-41	C
93-44	D
93-45	B
93-46	C
94-40	C
94-41	A
94-43	D
94-44	A
94-45	A
94-46	C
94-47	A
95-42	D
95-43	A
95-44	A
95-45	A
95-48	C
95-49	A
96-39	A
96-40	B
96-41	D
96-42	D
96-43	C
96-44	D
96-45	B
96-46	A
96-47	B
96-48	A
96-49	A
96-50	A
96-51	B
97-39	A
97-40	C
97-42	C
97-43	A
97-44	D
97-45	A
97-46	D
97-47	D
98-35	A
98-36	D
98-37	C
98-40	D
98-42	A
98-45	C
98-46	A
98-47	B
98-48	A
99-41	C
99-42	B
99-43	D
99-44	C
99-45	D
99-47	A
99-48	A
99-49	D
00-16	D
00-37	A
00-38	D
00-39	D
00-51	D
00-54	B
01-21	D
01-33	D
01-34	D
01-35	A
01-36	B
01-37	A
02-18	C
02-20	C
02-24	A
02-25	D
02-55	B
02-57	B
02-58	D
03-18	C
03-42	A
03-44	D
03-45	D
03-54	A
03-58	A
03-59	C
04-41	A
04-42	D
04-47	C
04-48	C
04-55	D
05-27	C
05-32	D
05-34	B
05-35	C
05-36	A

05-37	A
05-38	B
05-49	A
05-53	B
05-54	D
05-55	D
05-56	C
05-57	B
06-29	A
06-30	A
06-31	B
06-32	A
06-57	D
06-59	Deleted
06-60	B
07-15	D
07-16	A
07-17	D
07-18	B
07-52	B
07-53	C
07-54	B
07-55	B

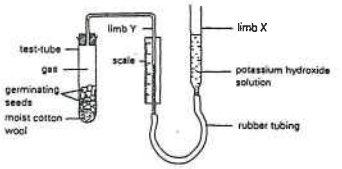
Past HKCEE Questions
Respiration
Paper I

1. A student used the following apparatus to measure the rate of respiration of some seeds. The positions of the oil drop in each capillary tube are shown in the diagrams below:

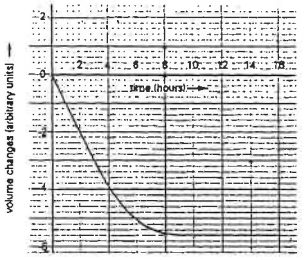


(i) What is the distance travelled by the oil drop
(1) in A, and
(2) in B?
(ii) Calculate the rate of respiration of the germinating seeds in A.
(iii) Fully explain the results shown in A and B.
(HKCEE 1982)

2.

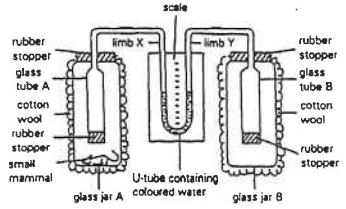


The diagram above shows an experimental set-up used to measure the changes in the volume of gas enclosed in the apparatus during the germination of seeds. At fixed time intervals the volume of the gas was measured on the scale after adjusting the liquid in limbs X and Y to the same level. The volume changes with time are shown in the graph below:



(i) State the purpose of adjusting the liquid levels before each measurement.
(ii) Name one external factor that would affect the accuracy of the measurements.
(iii) Name the process carried out by the seeds that brought about the changes in gas volume.
(iv) State and explain the changes in gas volume during the first 4 hours.
(v) Explain why the curve levelled off after the 10th hour, even though the seeds remained alive.
(vi) Suggest a control for this experiment.
(vii) Why is it necessary to cover the test-tube with a dark cloth if leafy seedlings are used instead of germinating seeds?
(HKCEE 1986)

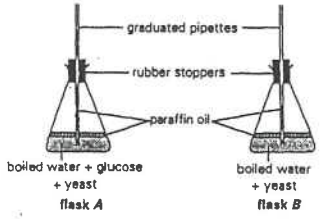
3. The diagram below shows an experimental set-up to investigate the respiration of a small mammal. All the joints are airtight.



At the start of the experiment

(i) What will be the change in the level of the coloured water in the U-tube at the end of the experiment? Explain your answer. (3 marks)
(ii) What is the purpose of surrounding the glass jars with cotton wool? (1 mark)
(iii) State the function of glass jar B. (1 mark)
(iv) If you were provided with a beaker of potassium hydroxide solution, describe and explain how you would modify this experimental set-up, without using additional apparatus, to indicate the uptake of oxygen by the small mammal. (6 marks)
(HKCEE 1987)

4. The following experiment was set up to study the anaerobic respiration of yeast cells. The air temperature was maintained at 27°C throughout the experiment.

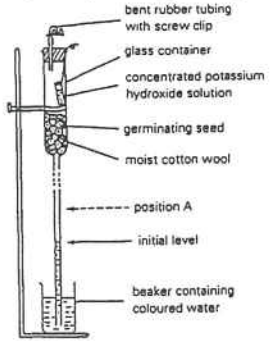


After 40 minutes, the rates of respiration in the two flasks were compared by measuring the change in liquid levels in the graduated pipettes.
The results are shown below:

	Flask A	Flask B
Rise in liquid level (cm)	3.1	−0.5

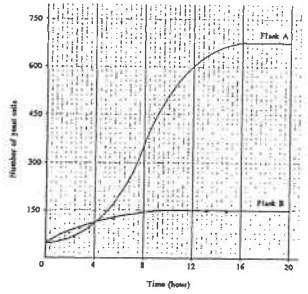
(i) State and explain TWO precautions used in this experiment to ensure that the yeast cells were under anaerobic conditions. (4 marks)
(ii) Explain why the liquid level of the pipette in flask A rose at the end of the experiment. (2 marks)
(iii) Suggest a reason for the drop in the liquid level of the pipette in flask B. (1 mark)
(iv) By comparing the results observed in flasks A and B, what conclusion can be drawn about the condition for anaerobic respiration? (1 mark)
(HKCEE 1988)

5. The diagram below shows an apparatus used to study the respiration of germinating seeds:



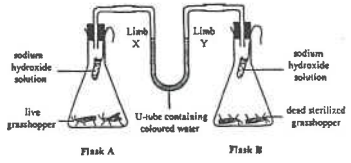
(i) At the beginning of the experiment, it is better to set the initial water level near the middle of the glass tubing.
(1) Suggest a reason for this. (1 mark)
(2) Suggest a method of doing this. (2 marks)
(ii) After one hour the water level rose to position A. Explain this phenomenon. (5 marks)
(iii) In another experiment, the concentrated potassium hydroxide solution was replaced by water. After one hour, the water level remained unchanged. Explain this observation in terms of gaseous exchange. (1 mark)
(HKCEE 1991)

6. Two flasks contained yeast cells growing in equal volumes of a sugar solution. Flask A received a constant air supply whereas flask B did not have any air supply at all. The graph below shows the changes in the number of yeast cells with time:



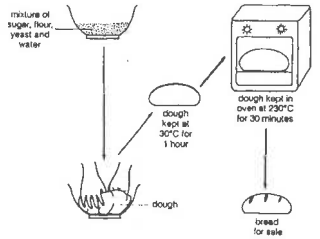
(i) Calculate the difference in the number of yeast cells at hour 20 between the two flasks. Give a reason to explain why there is such a difference. (5 marks)
(ii) Suggest two reasons for the different rates of reproduction of yeast in flask A at hour 8 and hour 16. (3 marks)
(iii) Draw and label a simple experimental set-up to show whether heat is released by the yeast cells in flask A. (4 marks)
(HKCEE 1994)

7. The diagram below shows a set-up used to measure the rate of respiration of grasshoppers:



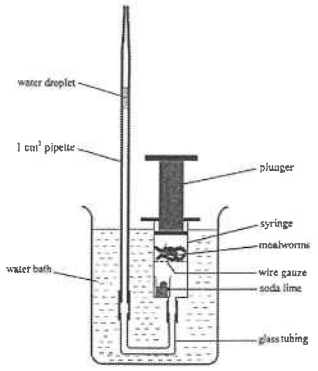
(i)
(1) Write a simple word equation of aerobic respiration. (1 mark)
(2) The set-up measures the change in the amount of a substance in the word equation. What is this substance? (1 mark)
(ii) What change will occur to the water level in the U-tube after 15 minutes? Explain your answer. (4 marks)
(iii) What is the use of flask B? (1 mark)
(iv) How will the result be different if the experiment is repeated at a higher room temperature? Explain your answer. (2 marks)
(HKCEE 1996)

8. Yeast is commonly used in the making of bread. The diagrams below show the steps in bread-making:

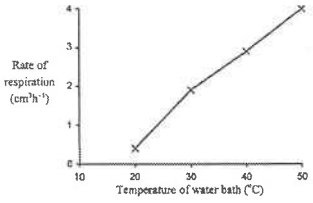


(i) Explain what happens to the volume of the dough after keeping it at 30°C for 1 hour. (3 marks)
(ii) Give a reason why the volume of the dough will not change any more after it has been kept in the oven for 10 minutes. (1 mark)
(iii) Suggest another industrial application of yeast. (1 mark)
(iv) if the bread is left in a warm and humid place for several days, black dots will be found on the bread surface. Make a labelled drawing to show some of these black dots and their associated structures when observed under a microscope. (3 marks)
(HKCEE 1997)

9. The diagram below shows an experimental set-up used by John to study the changes in the rate of respiration of mealworms at different temperatures. During the experiment, the position of the plunger remained unchanged.

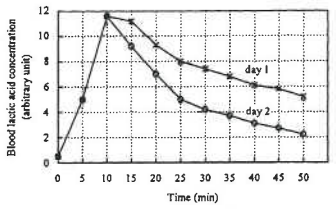


(i) Explain why this set-up can be used to measure the rate of respiration of the mealworms. (4 marks)
(ii) Using the data obtained from this set-up, John worked out the rate of respiration of the mealworms at different temperatures and the results are shown in the graph below:



(1) What conclusion can be drawn from the results of the experiment? (2 marks)
(2) Based on biological principles, explain the conclusion obtained in (1). (3 marks)
(iii) Whenever the water bath was changed to a new temperature, John waited for 10 minutes before he started to take any reading. Explain why this is necessary. (2 marks)
(HKCEE 1999)

10. An experiment was carried out to study the changes in blood lactic acid concentration of an athlete during and after exercise. On day 1, the athlete ran for 10 minutes and then sat down to rest for 40 minutes. On day 2, she performed the same exercise, followed by slow jogging for 40 minutes. The results of the experiment are shown in the graph



(i) Account for the increase in blood lactic acid concentration in the first 10 minutes. (3 mark)

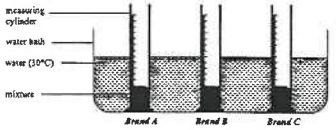
(ii) The rate of carbon dioxide production also increased in the first 10 minutes. Write a word equation to show how carbon dioxide is produced. (2 marks)

(iii) Why is it harmful to the body cells if the blood contains a high level of lactic acid? (1 mark)

(iv) Referring to the graph, which method, sitting down or slow jogging, is more effective in removing lactic acid from the blood after exercise? Based on your biological knowledge, explain why this method is more effective. (4 marks)

(HKCEE 2004)

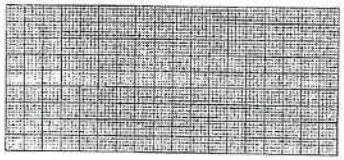
11. A student carried out an investigation to compare the activity of three brands of yeast. He added a mixture of fixed amounts of dough and yeast into a measuring cylinder and recorded the volume of the mixture. After putting the measuring cylinder in a water bath at 30°C for one hour, the volume of the mixture was recorded again. The diagram below shows his set-up:



(a) The results of the investigation are shown in the table below. Complete the table by finding out the percentage change in the volume of mixture for brand C. (1 mark)

Brand of yeast	Initial volume of mixture (cm^3)	Volume of mixture after 1 hour (cm^3)	Percentage change in the volume of mixture (%)
A	20	28	40
B	20	49	145
C	20	46	

(b) Draw a bar chart to show the activity of the three brands of yeast in terms of the percentage change in the volume of mixture. (3 marks)



(c) Explain why the yeast can make the mixture rise. (3 marks)

(d) The student wants to make a cake that is the spongy. Based on the above results, which brand of yeast should be used? (1 mark)

(e) Why should the set-up be kept in a water bath? (1 mark)

(f) If the student wanted to study the effect of temperature on the activity of yeast, suggest two changes that should be made in his experimental design. (2 marks)

(HKCEE 2007)

Past HKCEE Questions
Respiration
Paper II

90-45
Which of the following shows the correct end product of the corresponding metabolic process occurring in a mammal?

	metabolic process	end product
A.	breakdown of amino acids	nitrogen
B.	breakdown of red blood cells	bile salts
C.	breakdown of glucose aerobically	Water
D.	breakdown of glucose anaerobically	alcohol

91-19
The following table shows two types of cells P and Q and the product(s) of anaerobic respiration in these cells:

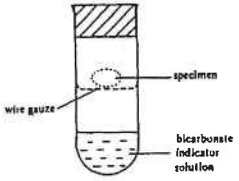
Cell	Product(s)
P	lactic acid
Q	alcohol and carbon dioxide

Cells P and Q most likely to be

	cell P	cell Q
A.	muscle	yeast
B.	guard cells	liver
C.	liver	muscle
D.	yeast	guard cells

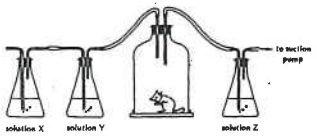
92-10
When compared with aerobic respiration, anaerobic respiration
A. releases more energy.
B. oxidises food incompletely.
C. produces no carbon dioxide.
D. occurs in microorganisms only.

92-11
The experimental set-up drown below was placed in a well-illuminated area.
After 24 hours the bicarbonate indicator solution changed from red to purple.



The specimen placed inside the tube would probably be
A. a green leaf.
B. a grasshopper.
C. a germinating seed.
D. a sterilized boiled seed.

92.
Directions: Questions 23 and 24 refer to the experimental set-up below which shows the release of carbon dioxide from a small mammal:



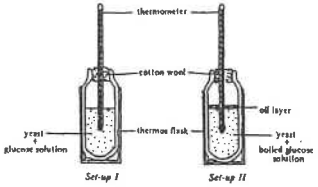
92-23
Which or the following are the correct solutions for X, Y and Z?

	Solution X	Solution Y	Solution Z
A.	potassium hydroxide solution	lime water	lime water
B.	lime water	potassium hydroxide solution	potassium hydroxide solution
C.	lime water	potassium hydroxide solution	lime water
D.	potassium hydroxide solution	lime water	potassium hydroxide solution

92-24
Which of the following would be the probable results of the experiment?

	Solution X	Solution Y	Solution Z
A.	milky	clear	clear
B.	clear	clear	milky
C.	clear	milky	milky
D.	milky	milky	clear

93.
Directions: Questions 24 and 25 refer to the diagram below which shows two set-up used to investigate respiration of yeast under different conditions:



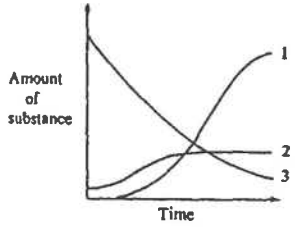
93-24
Which of the following substances will be produced?

	Set-up I	Set-up II
A.	carbon dioxide	carbon dioxide and ethanol
B.	carbon dioxide	carbon dioxide and lactic acid
C.	carbon dioxide and lactic acid	carbon dioxide
D.	carbon dioxide and ethanol	carbon dioxide

93-25
If the experiment is conducted at a room temperature of 25°C, what will be the probable thermometer readings after one hour?

	Set-up I	Set-up II
A.	24°C	27°C
B.	27°C	24°C
C.	27°C	25°C
D.	28°C	27°C

96.
Directions: Questions 22 and 23 refer to the information below:
In a set-up, some living yeast cells were added to a 10% gluons solution under anaerobic conditions. The graph below shows the changes in the amount of three substances in the set-up



96-22
Which curves represent yeast and glucose respectively?

	Yeast	Glucose
A.	1	2
B.	1	3
C.	2	3
D.	3	1

96-23
What products are formed in the set-up?
A. ethanol and lactic acid
B. ethanol and carbon dioxide
C. lactic acid and carbon dioxide
D. ethanol, lactic acid and carbon dioxide

00-4
Which of the following reactions occurs in the skeletal muscle when a person is performing vigorous exercise?

(1) glucose → lactic acid
(2) glucose → lactic acid + carbon dioxide
(3) glucose + oxygen → carbon dioxide + water

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

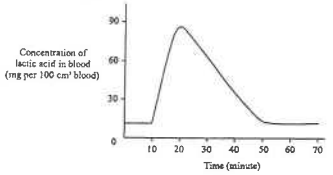
00-5
What is the significance of anaerobic respiration to yeast?
A. It produces a large amount of ethanol.
B. It provides energy to yeast when there is a lack of oxygen.
C. Yeast can only use anaerobic respiration to release energy from food.
D. It provides additional energy to yeast when it is undergoing budding.

00-12
Which of the following processes requires energy from respiration?
A. movement of water in xylem vessels caused by transpiration pull
B. absorption of water by mesophyll cells from xylem vessels
C. absorption of mineral salts by root hair cells
D. water loss through the stomata of the leaf

01-6
During a 100 m race, the lactic acid concentration in the blood of an athlete increases rapidly. Which of the following word equations represents the process that leads to the formation of lactic acid?
A. glucose → lactic acid
B. glucose → lactic acid + carbon dioxide
C. glucose + oxygen → lactic acid + water
D. glucose + oxygen → lactic acid + water + carbon dioxide

02-7.
Which of the following can carry out anaerobic respiration?
(1) biceps
(2) yeasts
(3)xylem vessels
A. (1) only
B. (2) only
C. (1) and (2) only
D. (1), (2) and (3)

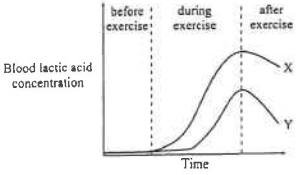
02.
Directions: Questions 32 and 33 refer to the graph below, which shows the change in lactic acid concentration in the blood of a person when he performed vigorous exercise:



02-32
The person stopped doing exercise at
A. the 10th minute.
B. the 20th minute.
C. the 50th minute.
D. the 70th minute.

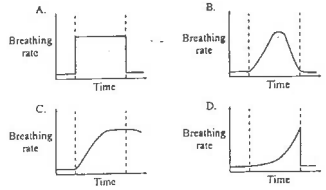
02-33
Which of the following lead to the change in lactic acid concentration in the blood during the 10th to 20th minute?
(1) an increase in the breakdown of glucose
(2) a reduction in oxygen supply to the muscles
(3) an increase in energy demand of the muscles
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

03.
Directions: Questions 9 and 10 refer to the graph below, which shows the change in lactic acid concentration in the blood of a trained athlete and an untrained person when they performed the same amount of vigorous exercise

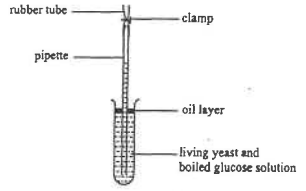


03-09
The athlete is
A. X because more lactic acid is produced.
B. X because anaerobic respiration starts earlier.
C. Y because less lactic acid is produced.
D. Y because aerobic respiration stops at a later time.

03-10
Which of the following is the correct sketch of the change in breathing rate of the untrained person?



03.
Directions: Questions 24 and 25 refer to the diagram below, which shows an experimental set-up used to study the action of yeast on glucose:

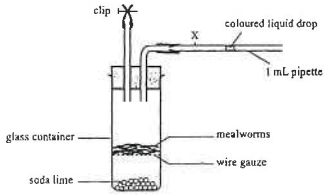


03-24
Which of the following correctly states and explains the change in liquid level in the pipette after 30 minutes?

	Change in liquid level	*Cause for the change*
A.	rises	ethanol is produced
B.	rises	oxygen is consumed
C.	drops	glucose is consumed
D.	drops	carbon dioxide is produced

03-25
To show that living yeast is essential for bringing about the change in liquid level in the pipette, the control set-up should contain
A. boiled glucose solution only.
B. living yeast and boiled water.
C. dead yeast and boiled water.
D. dead yeast and boiled glucose solution.

Directions: Questions 6 and 7 refer to the set-up below, which is used to estimate the rate of respiration of mealworms:



05-6
At the end of the experiment, the liquid drop was found to be at position X. The movement of the liquid drop indicated
A. the amount of oxygen used by the mealworms.
B. the amount of carbon dioxide produced by the mealworms.
C. the amount of heat released by the mealworms.
D. the change in atmospheric pressure.

05-7
What modification should be made in the above set-up in order to prepare a control for this investigation?
A. replacing soda lime with distilled water
B. removing the mealworms from the set-up
C. putting the set-up in a refrigerator set at 5°C
D. covering the glass container with black paper

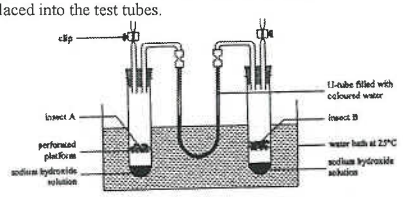
05-15
Which of the following cells probably have the lowest rate of respiration?
A. liver cells
B. muscle cells
C. cells of the wall of kidney tubules
D. epithelial cells of air sacs of the lungs

05-40
Why is anaerobic respiration important to skeletal muscles during exercise?
A. The muscle cells cannot carry out aerobic respiration due to a lack of oxygen.
B. The muscle cells can oxidize the lactic acid formed in anaerobic respiration.
C. Anaerobic respiration provides additional energy for muscle contraction.
D. More energy is released from a glucose molecule in anaerobic respiration than in aerobic respiration.

06-9
Which of the following correctly compares alcoholic fermentation and lactic acid fermentation?

	Alcoholic fermentation	*Lactic acid fermentation*
A.	produces carbon dioxide	does not produce carbon dioxide
B.	uses alcohol as the substrate	uses lactic acid as the substrate
C.	by-products will be further metabolized	by-products will not be further metabolized
D.	occurs in plants only	occurs in animals only

07
Directions: Questions 29 and 30 refer to the experimental set-up below, which was used to compare the rate of respiration of two different types of insects. Insects of the same mass were placed into the test tubes.



07-29
The movement of coloured water in the U-tube is caused by the
A. heat released.
B. food consumed.
C. oxygen absorbed.
D. carbon dioxide released.

07-30
Which of the following modifications can shorten the time for the experiment?

A. use a larger test tube
B. use a larger water bath
C. use a U-tube with a larger internal diameter
D. use a water bath set at a higher temperature

07-42
When a person is running an 800m race, which of the following changes will happen in this body?
(1) The blood volume returning to the heart increases.
(2) The rate of anaerobic respiration in the exercising muscles increases.
(3) The rate of aerobic respiration in the exercising muscles remains unchanged.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

Past HKCEE Questions
Respiration
Suggested Answers

Paper I

1. (i) (1) 5 cm 1
(2) 1 cm 1
(ii) (5+1) / 2 or 3 1
cm per hour 1
(iii) A:
O_2 is used up in seed by respiration 1
CO_2 produced is absorbed by soda lime 1
B:
O_2 is not used up by dead seeds / no respiration in dead seeds 1
volume increase is due to gas expansion caused by increase in room temperature (OR decrease in atm. pressure) 1

2. (i) to take all readings at the same (atmospheric) pressure 1
(ii) atmospheric pressure / temperature 1
(iii) respiration / oxidation of food 1
(iv) decrease 1
O_2 absorbed / consumed by seeds 1
CO_2 liberated from seeds 1
potassium hydroxide solution absorbed the CO_2 liberated 1
(v) O_2 has been completely used up 1
only anaerobic respiration takes place 1
potassium hydroxide solution absorbed the CO_2 produced 1
(vi) use sterilized dead seeds / dry seeds / boiled seeds / no seeds in similar apparatus 1
(vii) to prevent photosynthesis 1

3. (i) coloured water in limb Y will rise / in limb X will drop 1
the heat liberated by respiration will cause the air in glass tube A to expand 1
(ii) reduce heat loss / for insulation 1
(iii) for comparison with glass jar A / as a control 1

(iv)

Modification (in words or by drawing)	Explanation	
Remove the rubber stopper of the glass tube A.	To enable a continuous air flow between the glass jars and glass tubes	1 + 1
Replace the coloured water with potassium hydroxide solution / Place the beaker of KOH in jar A.	To absorb CO_2 released by the mammal.	1 + 1
Remove cotton wool from both glass jars.	To eliminate the effect of heat on gas volume	1 + 1

4. (i) use boiled water 1
to ensure the water does not contain dissolved O_2 1
Use an oil layer 1
to prevent O_2 from dissolving into the solution 1
(ii) CO_2 / a gas produced 1
the pressure / volume of gas inside the flask increased, therefore the liquid rose up the pipette 1
(iii) a rise in atmospheric pressure 1
(iv) glucose is necessary for anaerobic respiration in yeast cells 1
(if "glucose + any other substance" are mentioned – no marks)

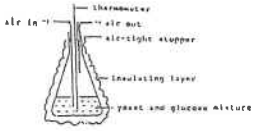
5. (i) (1) It would be easier to observe any changes in the water level in the glass tubing 1
(2) to suck up the water column through the rubber tubing 1
and then close the rubber tubing with the screw clip 1
(ii) germinating seeds used up O_2 in the glass container for respiration 1
and released CO_2 1
which was absorbed by conc. KOH 1
As the gas in the glass container became less / the gas pressure reduced, 1
the higher atmospheric pressure would force the water level up to position A. 1
(iii) the volume of O_2 used up in respiration was equal to the volume of CO_2 released 1

6. (i) The difference in no. of yeast cells between flasks A and B at hour 20
= 675 - 150 1
= 525 1
Either
In flask A, the yeast cells undergo aerobic respiration whereas in flask B, the yeast cells undergo anaerobic respiration 1
Anaerobic respiration releases less energy 1
for cell division / growth of the yeast 1
Or
In flask A, the yeast cells under aerobic respiration whereas in flask B, the yeast cells undergo anaerobic respiration 1 1
Anaerobic respiration produces ethanol / alcohol
which inhibits the cell division / growth of the yeast 1

any 1 set (1+1+1)

(ii) The rate of reproduction of the yeast at hour 8 is much faster than that at hour 16 1
Reasons:
at hour 16, nutrients in the solution may become exhausted 1
at hour 16, there may be accumulation of toxic wastes 1
Both cause a decline in the reproductive rate of yeast

(iii) No marks for the whole set-up if it is not workable (e.g. using dry yeast, with an oil layer).
Insulating layer and stopper 1
thermometer (the bulb must be immersed in the mixture) 1
correct connection of tubes 1
clear, well-labelled and accurate diagram (D) 1



7. (i) (1) food + oxygen → carbon dioxide + water (+energy) 1
(2) Oxygen 1
(ii) The water level in limb X would rise 1

Reasons:
The live grasshoppers take up oxygen during respiration 1
and give out carbon dioxide which is absorbed by the sodium hydroxide solution 1
As a result, the air pressure inside flask A becomes lower than that in flask B 1
Communication skill (C) 1

(iii) To eliminate the error caused by changes in environmental temperature / pressure 1

(iv) The rise in the water level is faster / the water level rises higher 1
because the rate of respiration of grasshoppers is faster at a higher temperature 1

8. (i) The volume of the dough increases 1
because the yeast carries out anaerobic respiration / alcoholic fermentation 1
which produces carbon dioxide that raises the dough 1
Communication skill (C) 1

(ii) The yeast are killed/enzymes are denatured under high temperature, thus no more carbon dioxide is produced 1

(iii) brewing of beer / wine 1

(iv) Large, accurate drawing (D) 1
Labels and title (any 4): (4 x 0.5) 2
*sporangium, *sporangiophore, *spore, *hypha, *rhizoid, *columella (optional)

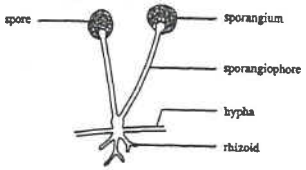


Diagram of bread mould observed under the microscope

9. (i) The mealworms take in oxygen during respiration 1
Any carbon dioxide produced by the mealworms is absorbed by the soda lime 1
This leads to a drop in air pressure inside the syringe 1
and the water droplet will be drawn downwards. Thus the rate of movement, of the water droplet indicates the rate of respiration 1
Effective communication (C) 1

(ii) (1) The rate of respiration of mealworms increases with an increase in temperature 1
from 20°C to 50°C 1

(2) With an increase in the external temperature, the body temperature of mealworms rises 1
Thus the enzymatic activity of the worms increases 1
This leads to an increase in the metabolic rate / body activities / energy demand 1
thus the respiration rate of the mealworms rises

(iii) To allow time for the air temperature inside the syringe to become equal to the temperature of the water bath 1
and the respiratory rate of the mealworms to become adjusted to the new temperature 1

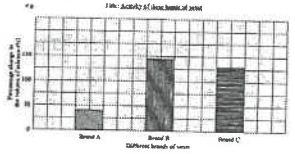
10. (i) The muscles carry out anaerobic respiration 1
to release additional energy for muscle contraction. 1
As anaerobic respiration produces lactic acid, 1
it will lead to an increase in blood lactic acid concentration.

(ii) glucose + oxygen → carbon dioxide + water 2

(iii) Because it lowers the pH of the blood / tissue fluid which adversely affects cellular activities / it inactivates enzymes. 1

(iv) Slow jogging 1
This is because slow jogging can maintain a relatively high rate of heart beat / blood flow / breathing, 1
which increases the rate of oxygen supply to the body, 1
thus enhances the breakdown of lactic acid / conversion of lactic acid to glycogen. 1

11 (a) 130 1
(b) correct title 0.5
correct labelling of axes 1
correct drawing and labelling of bars 1.5



(c) Anaerobic respiration of yeast 1
produce carbon dioxide 1
which is trapped inside the dough 1
making it rises
Effective Communication 1C

(d) Brand B 1

(e) To ensure the temperature of the three mixtures are the same / maintain the temperature at 30°C throughout the investigation 1

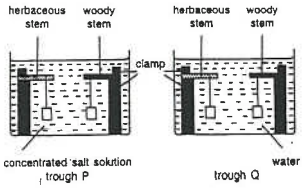
(f) Use only one brand of yeast 1
Put the measuring cylinder in water baths at different temperatures 1

Paper II

90-45	C
91-19	A
92-10	B
92-11	A
92-23	A
92-24	B
93-24	A
93-25	D
96-22	C
96-23	B
00-4	C
00-5	B
00-12	C
01-6	A
02-7	C
02-32	B
02-33	B
03-09	C
03-10	C
03-24	D
03-25	D
05-6	A
05-7	B
05-15	D
05-40	C
06-9	A
07-29	C
07-30	D
07-42	A

Past HKCEE Questions
Support and Movement
Paper I

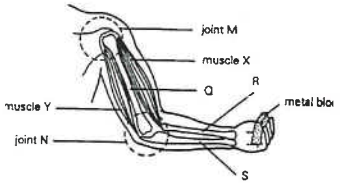
1. The diagram below shows an experimental set-up in which straight stems of similar length and diameter were immersed in troughs containing different liquids. A 5 g weight was suspended from each stem.



(i) After three hours what would be the appearance of the stems in
(1) trough P?
(2) trough Q?
(ii) Explain the expected observation in the herbaceous stem in trough P.
(iii) What possible conclusion could be drawn from this experiment about the means of support in
(1) herbaceous stems?
(2) woody stems?

(8 marks)
(HKCEE 1984)

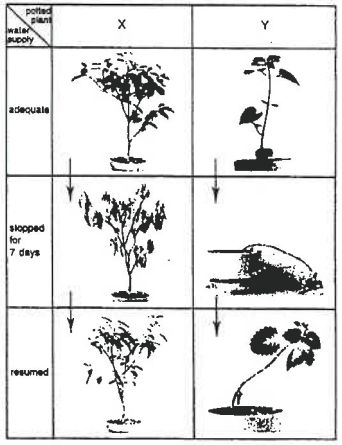
2. The diagram below shows the arm muscles and bones of a man:



(i) Both muscles X and Y are involved in raising the metal block.
(1) Which is the extensor?
(2) Which is the flexor?
(3) What is the term used for describing this pair of muscles for this mode of action?
(ii) What is the tissue connecting
(1) bone Q to bone S?
(2) muscle X to bone R?
(iii) After rotating the arm vigorously for some time, the man felt tired.
(1) Which joint, M or N, was involved in this movement?
(2) Which carbon compound, stored in the muscles, was used to provide the energy for this movement?
(3) Which carbon compound, accumulating in the muscles, caused muscle fatigue?
(iv) If the man were blindfolded, what type of sensory receptor would enable him to detect a drawing pin dropped on his hand
(1) with its blunt end downwards?
(2) with its pointed end downwards?

(HKCEE 1985)

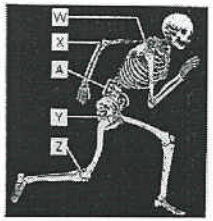
3. In an experiment, two different potted plants X and Y, kept under the same laboratory conditions, were given varying supplies of water. The changes in their appearance are shown in the series of photographs below:



(i) With reference to the appearance of plants X and Y after receiving no water supply for 7 days,
(1) explain the change in X.
(2) draw a labelled diagram of a mesophyll cell of X as seen under high-power magnification.
(3) point out the difference in appearance of the stems in X and Y.
(4) state one feature, related to their structures, that caused the difference in (3).
(ii) With reference to the effects on plants X and Y after the water supply was resumed, state the cell(s) concerned and the process involved for
(1) entry of water from soil to root,
(2) movement of water along the stem, and
(3) water to reach the leaves for photosynthesis.

(13 marks)
(HKCEE 1986)

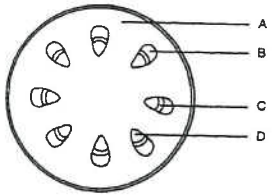
4. The photograph below shows the side view of a human skeleton:



(i) Give three functions of structure A. (3 marks)
(ii) Name the type of movable joint to which
(1) both W and Y belong.
(2) both X and Z belong. (2 marks)
(iii) State the difference in the range of movement allowed by joint W and joint Z. (2 marks)

(HKCEE 1987)

5. The diagram below shows a cross section of a young stem:



(i) Using the letters in the diagram, state TWO different parts which provide support to the stem.
Based on its structure, explain how each part can carry out this support function. (6 marks)
(ii) When this plant is placed in direct sunlight for a few hours, explain why the stem might be unable to remain upright. (2 marks)

(HKCEE 1988)

6. Figure 1 below shows a human leg. Figure 2 shows a model used to demonstrate leg movement.

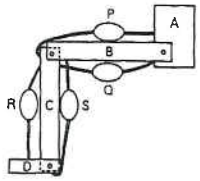


Figure 2

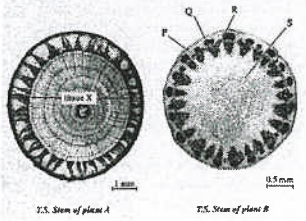
The component parts of the model and their corresponding structures in the human leg are summarised in the table below:

component part in the model	material used in the model	corresponding structure in the human leg
⬭	balloon	muscle
▭	wooden board	X
o	screw	joint
═	inelastic string	Y

(i) Name the type of structures represented by X and Y respectively. (2 marks)
(ii) If the model were set to a position to show the human leg standing erect on tiptoe, which balloons (P, Q R or S) would appear to be thinner and longer? (2 marks)
(iii) Put P, Q R and S into two categories according to the function of the muscles they represent. Explain your answer. (4 marks)
(iv) Explain why the relative movement between the wooden boards A and B carrot fully illustrate the degree of movement between the corresponding structures in the human leg. (2 marks)

(HKCEE 1989)

7. The photomicrographs below show the transverse sections of stems taken from two plants

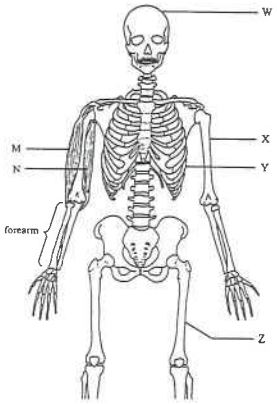


T.S. Stem of plant A
T.S. Stem of plant B

(1) On a hot sunny afternoon, plant B becomes wilted and its stem bends. Explain why this occurs. (4 marks)
(2) In contrast to plant B, the stem of plant A remains upright under the same conditions. Account for this. (2 marks)

(HKCEE 2001)

8. The diagram below shows the human skeleton and two muscles of the right arm, M and N:

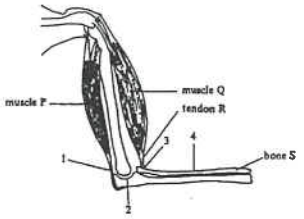


(i) Deficiency of vitamin D in childhood will lead to deformity of bones.
(1) Using the letters in the diagram, indicate which part of the skeleton is most easily deformed. Explain your choice. (3 marks)
(2) Apart from diet, suggest another way by which the body gets vitamin D. (1 mark)
(ii) Why are muscles M and N described as an antagonistic (opposing) pair? (1 mark)
(iii) Draw a diagram to show the lever system involved in lifting the right forearm. Indicate the positions of the load, the effort and the fulcrum in your diagram. In lifting the right forearm, what will form the load, the effort and the fulcrum respectively? (5 marks)

(HKCEE 2002)

Past HKCEE Questions
Support and Movement
Paper II

90.
Directions: Questions 40 to 42 refer to the diagram below which represents the relative positions of the bones, associated muscles and tendons of the human arm:



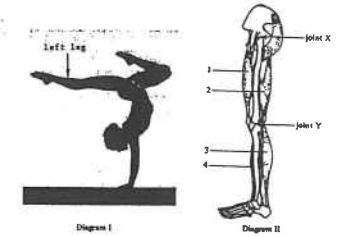
90-40
What is the advantage of having the tendon R attached to position 3 rather than to position 4 of the bone S?
A. to provide a stronger surface for tendon attachment
B. to produce a greater forearm movement when muscle Q contracts
C. to prevent dislocation of the joint
D. to counteract the contraction of muscle P more effectively

90-41
Which of the following happens when muscle Q contracts?
A. Muscle P increases in length.
B. Muscle Q decreases in thickness.
C. The tension on tendon R is reduced.
D. The arm straightens out.

90-42
Cartilage is found at
A. position 1.
B. position 2.
C. position 3.
D. position 4.

91-29
Which of the following descriptions about skeletal muscles are correct?
(1) They are attached to bones by ligaments.
(2) Their activities are usually under voluntary control.
(3) They become fatigued easily during exercise.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

92.
Directions: Questions 31 and 32 refer to diagrams I and II below. Diagram I shows a girl maintaining a posture on a balance beam. Diagram II shows some muscles associated with bar left leg.



92-31
Which of the following muscles in the girl's left leg are contracting when she keeps such a posture?
A. (1) and (3)
B. (1) and (4)
C. (2) and (3)
D. (2) and (4)

92-32
The degree of movement allowed in joints X and Y are:

	Joint X	Joint Y
A.	in one plane	in one plane
B.	in one plane	in all planes
C.	in all planes	in as plane
D.	in all planes	in all planes

93-9
When compared with woody plants, young herbaceous plants are less tolerant to a temporary shortage of water supply because
A. they are smaller in size.
B. they have less food reserves.
C. they have a faster growth rate.
D. they rely on cell turgidity for support.

93.
Directions: Questions 37 and 38 refer to the diagrams below which show the conditions of certain muscles associated with the hind limb of a rabbit. Diagram I shows the condition when the rabbit is about to jump. Diagram II shows the condition at a later stage when the rabbit's hind limb is about to lift off from the ground:

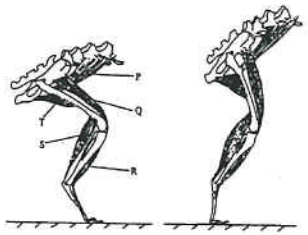
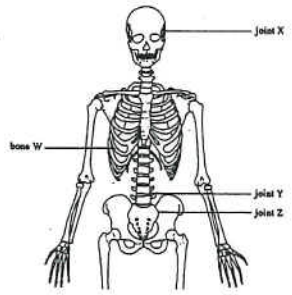


Diagram I Diagram II

93-37
Which muscles contract to effect a change from the condition shown in Diagram I to that in Diagram II?
A. P, Q and R
B. P, Q and S
C. P, R and T
D. Q, S and T

93-38
Apart from tea structures labelled, which of the following are essential for support in the rabbit?
(1) bone
(2) tendons
(3) ligaments
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

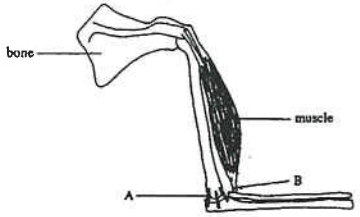
94.
Directions: Questions 33 and 34 refer to the diagram below which shown part of the human skeleton:



94-33
Which of the following functions are carried out by bone W?
(1) producing red bloat cells
(2) helping in ventilation of this lungs
(3) protecting internal organs
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

94-34
Which of the joints X, Y and Z allow(s) movement between the bones?
A. Y only
B. Z only
C. X and Y only
D. Y and Z only

94.
Directions: Questions 35 and 36 refer to the diagram below which shows some structures associated with the elbow joint:



94-35
Which comparison between structures A and B is correct?

	Structure A	Structure B
A.	rigid	soft
B.	elastic	not elastic
C.	can stand a high tension	cannot stand a high tension
D.	contains a large amount of calcium salts	contains a small amount of calcium salts

94-36
Which of the following correctly describes the functions of structures A and B?

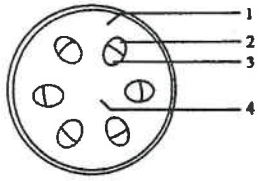
	Structure A	Structure B
A.	holding the bones together	transmitting force to the bone
B.	acting as a pivot	protecting the joint
C.	protecting the joint	preventing dislocation of the joint
D.	transmitting force to the bone	acting as a pivot

94-37
The diagram below shows a man at a certain stage of swimming:

Which of the following combinations correctly describes the conditions of his arm muscles at this stage?

	Left arm		Right arm	
	Biceps	Triceps	Biceps	Triceps
A.	contracted	relaxed	relaxed	contracted
B.	relaxed	contracted	contracted	relaxed
C.	contracted	relaxed	contracted	relaxed
D.	relaxed	contracted	relaxed	contracted

95.
Directions: Questions 28 to 30 refer to the diagram below which slows a section of a certain part of a plant:

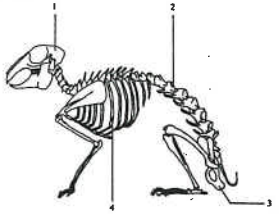


95-28
This section is takes from
A. a yours stem.
B. young root.
C. woody stem.
D. a woody root.

95-29
Which regions provide support by cell turgidity?
A. 1 and 2
B. 1 and 4
C. 2 and 3
D. 3 and 4

95-30
Which region is responsible for the transport of sugars?
A. 1
B. 2
C. 3
D. 4

95.
Directions: Questions 31 and 32 refer to the diagram below which shows the skeleton of a rabbit:

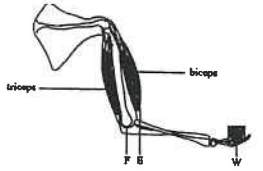


95-31
Which structures are parts of the axial skeleton?
A. 1, 2 and 3
B. 1, 2 and 4
C. 1, 3 and 4
D. 2, 3 and 4

95-32
Which of the following correctly lists the structures protected by the different parts of the skeleton?

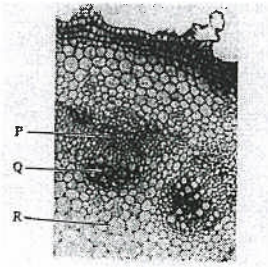
	1	2	3
A.	brain	aorta	stomach
B.	ears	aorta	heart
C.	brain	spinal cord	heart
D.	ears	spinal cord	stomach

95-33
The diagram below show a human arm holding a weight:



'The length of EF is shorter than the length of WF. What is the advantage of this arrangement?
A. The biceps would not become fatigue easily.
B. This would make the biceps stronger than the triceps.
C. Less energy would be used by the biceps in supporting the weight.
D. A small contraction of the biceps would move the weight through a large distance.

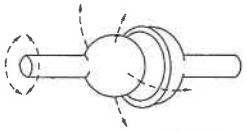
96-32
The photomicrograph below shown part of a: section through a plant organ



Which of the following correctly states the functions of P, Q and R?

	P	Q	R
A.	food transport	water transport	photosynthesis
B.	water transport	food transport	support
C.	food transport	support	support
D.	photosynthesis	water transport	food transport

96-34
The diagram below shows a model of a movable joint:

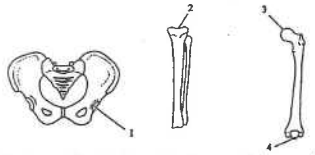


Key : ←→ direction of possible movements

Which of the following combinations is correct?

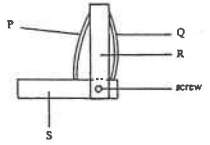
	Type of joint represented by the model	Example
A.	hinge joint	knee joint
B.	hinge joint	shoulder joint
C.	ball and socket joint	shoulder joint
D.	ball and socket joint	knee joint

96-35
The diagrams below show three sets of bones of the human skeleton:



The type of joint shown by the model in question 34 can be formed between
A. 1 and 3.
B. 1 and 4.
C. 2 and 3.
D. 2 and 4.

96.
Directions: Questions 59 and 60 refer to the model below which is used to illustrate the movement at the elbow join:



Key : P and Q are rubber bands
R and S are wooden planks

96-59
Which of the following occurs when Q is shortened?

	P	S
A.	shortened	raised
B.	shortened	lowered
C.	stretched	raised
D.	stretched	lowered

96-60
This model is useful for demonstrating
A. the movement of the upper arm.
B. that the joint allows 360° movement.
C. that the biceps is stronger than the triceps.
D. the actions of a pair of antagonistic muscles.

99.
Directions: Questions 31 and 32 refer to diagrams I and II below. Diagram I shows a certain posture of a dancer. Diagram II shows some of the muscles associated with her right leg.

Diagram I

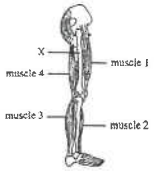


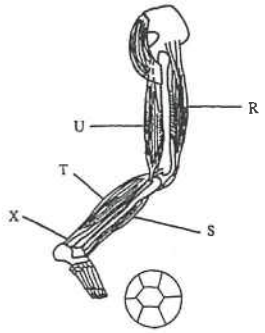
Diagram II

99-31
Which muscles of the right leg of the dancer are contracting when she maintains the posture shown in diagram I?
A. muscles 1 and 2
B. muscles 1 and 3
C. muscles 2 and 4
D. muscles 3 and 4

99-32
Which of the following can be found in structure X?
(1) vitamin D
(2) living cells
(3) calcium salts
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

00-24
Which of the following does not contain cartilage?
A. teeth
B. trachea
C. rib cage
D. vertebral column

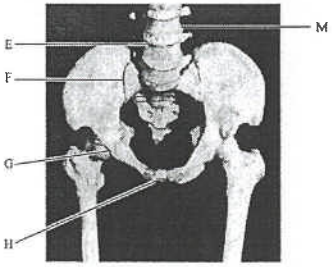
00.
Directions: Questions 25 and 26 refer to the following information:
A football player is going to kick a ball with his right leg. The diagram below shows his right leg and its associated muscles:



00-25
At this moment, which muscles are in the contracted state?
A. R and S
B. R and T
C. S and U
D. T and U

00-26
Which of the following correctly describes structure X?
A. It is inelastic.
B. It is hard and rigid.
C. It is rich in calcium.
D. It is able to contract.

00.
Directions: Questions 27 to 29 refer to the photograph below, which shows the hip girdle and the associated structures:



00-27
Which joints allow movement between the bones?
A. E and F
B. E and G
C. F and H
D. G and H

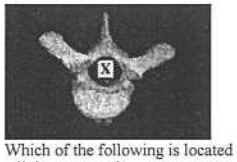
00-28
Which of the following is not a function of bone M?
A. formation of white blood cells
B. breakdown of old red blood cells
C. protection of the central nervous system
D. providing surfaces for muscle attachment

00-29
In a pregnant woman, which of the following may be supplied by bone M for the growth of the foetus?
A. blood cells
B. protein
C. iron
D. calcium

01-3
Which of the following are the functions of ribs?
(1) supporting body weight
(2) producing red blood cells
(3) protecting internal organs
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

D. They can replicate rapidly during infection.

01-19
The photograph below shows a mammalian vertebra:



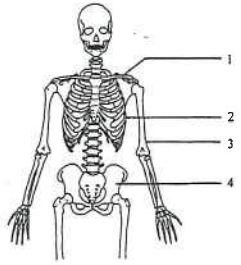
Which of the following is located in position X in a living mammal?
A. artery
B. muscle
C. cartilage
D. spinal cord

01-20
Skeletal muscles usually work in pairs because
A. a pair of muscles is stronger than a single muscle.
B. when one muscle is damaged, the other can still function.
C. the two muscles of the same pair cannot contract at the same time.

D. two muscles are required for producing movements in opposite directions.

02-47
When there is bone fracture, the broken parts can reconnect and the bone heals after some time. This shows that
A. bone is a living tissue.
B. bone growth is unlimited.
C. bone can respond to an external stimulus.
D. the healing of the bone is an immune response.

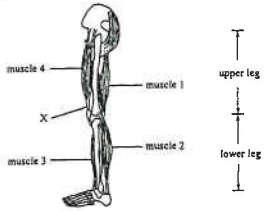
03.
Directions: Questions 21 and 22 refer to the diagram below, which shows part of the human skeleton



03-21
Which structures are parts of the appendicular skeleton?
A. 2 and 3 only
B. 3 and 4 only
C. 1, 2 and 4 only
D. 1, 3 and 4 only

03-22
Which of the following is *not a* function of structure 2?
A. assisting ventilation
B. storing red blood cells
C. giving shape to the body
D. protecting internal organs

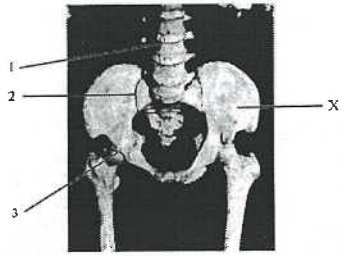
03.
Directions: Questions 33 and 34 refer to the diagram below, which shows some muscles of the leg:



03-33
Which of the following muscles are flexors?
A. 1 and 2
B. 1 and 3
C. 2 and 4
D. 3 and 4

03-34
If structure X is broken, which of the following will occur?
A. The lower leg cannot move properly.
B. The upper leg cannot move properly.
C. The knee joint can move in many planes.
D. When muscle 1 contracts, muscle 4 becomes extended.

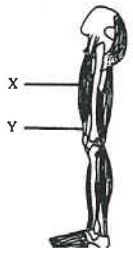
04.
Directions: Questions 6 and 7 refer to the photograph below, which shows part of the human skeleton:



04-06
Which joints allow movement between the bones?
A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

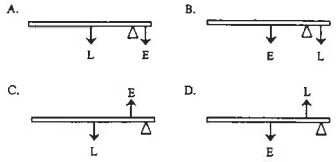
04-07
Which of the following is a function of structure X?
A. storing iron
B. protecting the spinal cord
C. destroying red blood cells
D. producing white blood cells

Directions: Questions 26 and 27 refer to the diagram below, which shows the muscles associated with the leg of a person:

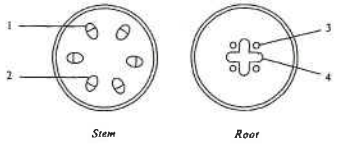


04-26
When X contracts, Y will
(1) become shorter.
(2) become thicker.
(3) increase in tension.
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only.

04-27
Which of the following correctly represents the lever system involved in the straightening of the leg at the knee joint?
(Key: E = effort; L = load)

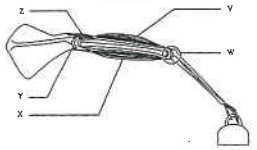


05-22
The root of a leafy plant was immersed in a red dye solution for several hours. Transverse sections of the stem and root were then prepared and examined under the microscope. Referring to the diagram below, which tissue of the stem and root would be stained red?



	Stem	*Root*
A.	1	3
B.	1	4
C.	2	3
D.	2	4

06
Directions: Questions 7 and 8 refer to the diagram below, which illustrates a human arm holding a case:

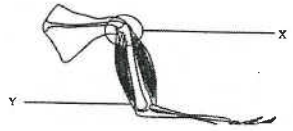


06-7
While holding the case and maintaining the position as shown in the diagram,
A. V is contracting and Z is shortened.
B. V is contracting and Z is under tension.
C. X is contracting and Z is lengthened.
D. X is contracting and Z is slackened.

06-8
Which of the following correctly describes the functions of structures W and Y?

	Structure W	*Structure Y*
A.	allows movement in one plane	reduces friction during movement
B.	allows movement in one plane	produces fluid for lubrication
C.	allows movement in all planes	reduces friction during movement
D.	allows movement in all planes	produces fluid for lubrication

07
Directions: Questions 33 and 34 refer to the diagram below, which shows the skeleton and the associated muscles of a human upper limb.



07-33
Which of the following correctly describes joint X?
A. The ends of the bones at X are ball-shaped.
B. The degree of movement at X increases with age.
C. X is surrounded by ligaments to reduce the chance of dislocation.
D. X is a hinge joint because it allows the upper limb to move in a single plane.

07-34
Which of the following is a correct description of structure Y?

	Property	Importance during movement
A.	elastic	allows the attached bones to move more freely
B.	inelastic	transmits forces to bone with minimum loss
C.	rich in protein	creates a smooth surface to reduce friction
D.	rich in glucose	releases more energy for muscle contraction

Past HKCEE Questions
Support and Movement
Suggested Answers

1. (i) (1) herbaceous stem – bends downwards 1
woody stem – remains straight / unchanged 1
(2) both stems - remain straight / unchanged 1

(ii)

because	salt solution	cell sap	
concentration	high	low	any 1
osmotic potential	lower	higher	
water potential	lower	higher	

water moves out of cells by osmosis 1
cells become plasmolysed / flaccid / decrease in turgor 1

(iii) (1) herbaceous stems - mainly by turgidity of cells 1
(2) woody stems – mainly supported by thick-walled cells / xylem 1

2. (i) (1) muscle Y 1
(2) muscle X 1
(3) antagonistic / opposing muscles 1
(ii) (1) ligament 1
(2) tendon 2
(iii) (1) Joint M 1
(2) glycogen (NOT carbohydrate, starch, glucose) 1
(3) lactic acid 1
(iv) (1) touch receptor 1
(2) pain receptor 1

3. (i) (1) transpiration (water loss) > absorption (water gain) 1
(2) labels: *cell wall, *cell membrane, *nucleus, *cytoplasm, *vacuole, *chloroplast
any 4 (0.5 x 4) 2
accuracy: showing plasmolysis 1
(3) X shows no bending while Y shows bending
(4) xylem / vascular / strengthening / woody tissues in Y (or more in X) 1

(ii)

	cells	processes	
(1)	root hair	osmosis / diffusion	1, 1
(2)	xylem	transpiration / capillarity / root pressure	1, 1
(3)	mesophyll cells	osmosis / diffusion	1, 1

4. (i)
- support
- protection of the spinal cord
- muscle attachment / act as a lever system
- production of RBC / WBC

any 3 (1,1,1) 3
(ii) (1) *ball and socket joint 1
(2) *hinge joint 1
(iii) W - allow movement in many planes 1
Z - allow movement in one plane 1
(if, range of movement of W is greater than that of Z, 1 mark only)

5. (i)

cells	A	D	
structure	thin-walled cells	thick-walled cells	1, 1
support	when filled with water, provide turgidity to the stem	provide mechanical support to the stem / they are hard and rigid	1, 1

(ii) the water lost is greater than the water gained by the plant 1
the cells lose their turgidity / become flaccid 1

6. (i) X - *bone 1
Y - *tendon 1
(ii) Q and R (no other alternatives) (1,1) 2
(iii) P and S 1
both are extensors / extend / straighten the joint 1
Q and R
both are flexors / flex / bend the joint 1

(iv) In the model : movement in one plane only 1
In actual case: movement in 3 planes 1

7. (1) The support of the stem of plant B is mainly due to the turgidity of cells in region S / thin-wall cells 1
Under a hot and sunny condition, 1
the rate of transpiration of the plant becomes greater than the rate of water absorption 1
The cells in region S lose water 1
And hence lose their turgidity / become flaccid 1
And thus causing the bending of the stem
Effective communication (C) 1

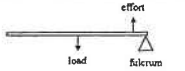
(2) The support of the stem of plant A is due to the presence of xylem / independent of the water content of the plant 1
Because the xylem contains thick-wall cells 1

8. (i) (1) Z 1
Deficiency of vitamin D will lead to poor bone growth 1
As Z is not strong enough; the body weight exerting on it will cause it to bend 1

(2) The body produces its own vitamin D under sunlight / UV light 1

(ii) because when producing movements, one muscle contracts, the other relaxes / the contraction of M bends the arm and that of N extends the arm 1

(iii) Title (T) 0.5
Position of load, effort, fulcrum correct (P) 1
Direction of arrows correct (A)The weight of the forearm forms the load 1
The force generated by the contraction of muscle M forms the effort 1
The elbow joint forms the fulcrum 1



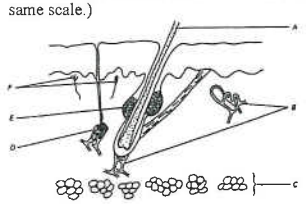
Lever system for lifting the right forearm

Paper II

90-40	B
90-41	A
90-42	B
91-29	C
92-31	A
93-9	D
93-37	D
93-38	D
94-33	D
94-34	A
94-35	B
94-36	A
94-37	A
95-28	A
95-29	B
95-30	B
95-31	B
95-32	C
95-33	D
96-32	C
96-34	C
96-35	A
96-59	D
96-60	D
99-31	D
99-32	C
00-24	A
00-25	C
00-26	A
00-27	B
00-28	B
00-29	D
01-3	C
01-19	D
01-20	D
02-47	C
03-21	D
03-22	B
03-33	B
03-34	A
04-06	B
04-07	D
04-26	B
04-27	C
05-22	D
06-7	B
06-8	A
07-33	C
07-34	B

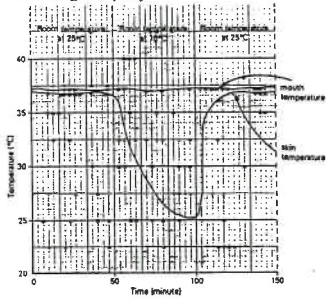
Past HKCEE Questions
Temperature Regulation in Mammals
Paper I

1. The diagram below shows a vertical section of rabbit skin: (The parts are not drawn to the same scale.)



(i) State two structures which indicate that this skin sample belongs to a mammal.
(ii) State, using the letters in the diagram,
(1) the parts which are concerned with the maintenance of a constant body temperature following exposure to rising air temperatures. Explain how these parts function.
(2) the parts which will undergo structural modifications in a cold winter.
(iii) What two different stimuli can be detected by F?
(HKCEE 1984)

2. The following graph shows the variation in mouth temperature and skin temperature of a naked man in a room where the temperature can be changed rapidly:

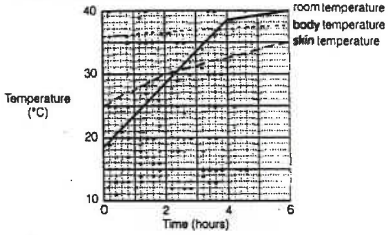


(i)
(1) Describe how the mouth temperature varies throughout the experimental period.
(2) What is the significance of this?
(3 marks)
(ii)
(1) Describe the change in skin temperature during the period from the 50th to the 100th minute.
(2) Explain the physiological process that occurs in the skin to bring about the change in skin temperature in (1).
(3 marks)
(iii) At the 90th minute would the skin still be losing heat to the environment? Explain your answer. (2 marks)
(HKCEE 1989)

3. Below is a simplified diagram of a section of the human skin:

(i)
(1) Name structures A and B. (2 marks)
(2) Explain how they help to speed up heat loss from the body when the body temperature rises. (6 marks)
(ii) In a fire, a large area of C of a person was burnt. Give two reasons why this damage may endanger his life. (2 marks)
(HKCEE 1995)

4. An experiment was performed to study the effect of environmental temperature on the skin temperature and the body temperature of a person. During the experiment, the person was kept in a room with a constant relative humidity of 65%. He was allowed to eat and move around freely but he was not allowed to change the amount of clothing. The results are shown in the graph below:



(i)
(1) Describe the change in the skin temperature when the room temperature rose from 18°C to 28°C.
(1 mark)
(2) What physiological change in the skin may cause this change in skin

temperature? (2 marks)

(ii) When the room temperature rose from 38°C to 40°C,

(1) describe the change in the body temperature. (1 mark)

(2) what was the main way by which body heat was lost to the environment? Explain how you arrived at your answer. (3 marks)

(3) explain why the person's life might be endangered if the relative humidity of the room rose to 95%. (3 marks)

(HKCEE 1996)

5. A person spent two hot days on a beach. He drank plenty of water to avoid the danger of dehydration. The air temperature and the relative humidity at the beach on these two days are recorded in the table below:

	Air temperature (°C)	Relative humidity (%)
Day 1	38	65
Day 2	38	90

(i) Explain why heat loss from the person's body was mainly effected through sweating on Day 1. (4 marks)

(ii) Compared to Day 1, explain why it would be more dangerous for the person to carry out vigorous exercise on the beach on Day 2. (5 marks)

(HKCEE 1999)

6. Simon went hiking in Sai Kung on a hot afternoon.

(i) After walking for half an hour, Simon's face became red.

(1) Explain why his face became red. (3 marks)

(2) Why is this response important? (2 marks)

(ii) After 4 hours of walking, he had drunk all the water he brought along and his sweat production became greatly reduced. His body temperature increased significantly. This might lead to heatstroke. Account for the increase in his body temperature. (2 marks)

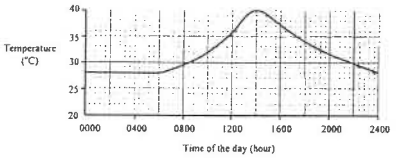
(iii) The following table provides some information on the weather conditions in Sai Kung on three afternoons:

Day	Temperature (°C)	Relative humidity (%)	Ultra-violet light intensity	Wind speed ($km\ h^{-1}$)
1	32.8	90	medium	5
2	33.1	72	high	15
3	32.6	80	high	31

On which afternoon would a person have the highest risk of developing heatstroke if he went hiking in Sai Kung? Justify your answer by stating two special features of the weather of that afternoon as compared with the other two afternoons. (3 marks)

(HKCEE 2001)

7. Jane spent a day on the beach in the summer. The graph below shows the changes in the air temperature on the beach on that day:



(a) Draw a line on the graph to show the possible changes in Jane's body temperature on that day. (1 mark)

(b) Referring to the change in the air temperature from 0600 to 1000 hour, explain how the blood vessels in Jane's skin are involved in the regulation of her body temperature during this period. (4 marks)

(c) What is the main way of heat loss from Jane's body at 1400 hour? Why do you think so? (3 marks)

(HKCEE 2005)

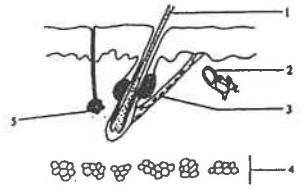
Past HKCEE Questions
Temperature Regulation in Mammals
Paper II

90-49
Which of the following structures of the mammalian skin is NOT Involved in temperature regulation?
A. oil glands
B. nerve endings
C. erector muscles
D. blood capillaries

90-51
Under which of the following conditions would a person doing strenuous exercise lose most heat by evaporation?

	air temperature (°C)	relative humidity (%)
A.	10	60
B.	10	98
C.	30	60
D.	30	98

91.
Directions: Questions 46 and 47 refer to the diagram below which shows a section of the human skin:



91-46
Which of the following will happen when a man feels cold?

	Constricts	Contracts	Inactive
A.	1	5	3
B.	2	3	5
C.	3	2	4
D.	5	4	2

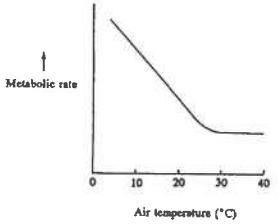
91-47
Which of the following are functions of structure 4?

(1) energy reserve
(2) heat conservation
(3) body defence

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

93-36
In the regulation of body temperature in mammals, the skin acts as
A. a receptor.
B. an effector.
C. both a receptor and an effector.
D. a coordinating centre.

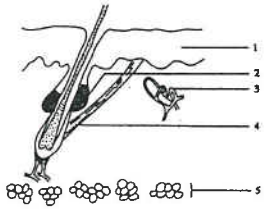
94.
Directions:
Questions 23 and 24 refer to the graph below which shows how the metabolic rate of a naked person varies with the temperature of the surrounding air:



94-23
Which of the following statements about the person is correct when the air temperature changes from 10°C to 20°C?
A. Oxygen consumption increases.
B. The rate of the heart beat increases.
C. Heat loss from the body decreases.
D. The body temperature decreases.

94-24
Which of the following is the main process of heat loss from the body when the air temperature is 40°C?
A. conduction
B. convection
C. radiation
D. evaporation

Directions:
Questions 25 and 26 refer to the diagram below which shows a section of the skin of a man:



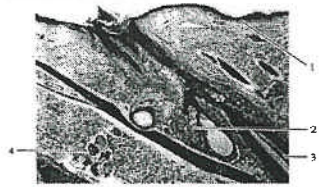
94-25
Which of the following correctly describes the functions of the different structures of the skin?

	Structure 1	Structure 2	Structure 3
A.	absorbs oxygen	produces sweat	Absorbs vibration
B.	prevents against mechanical damage	Stores food	reduces heat loss
C.	prevents the entry of bacteria	reduces evaporation	stores food
D.	detects changes in air temperature	kills bacteria	supplies food to the skin

94-26
Which of the following correctly describes the immediate responses of the different structures of the skin when the man enters a cold room?

	Structure 3	Structure 4	Structure 5
A.	dilates	contracts	no change
B.	constricts	contracts	no change
C.	dilates	relaxes	becomes thicker
D.	constricts	relaxes	becomes thicker

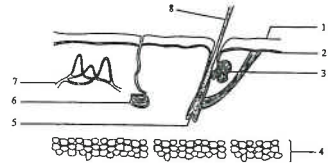
99.
Directions: Questions 6 and 7 refer to the photomicrograph below, which shows a section of the mammalian skin:



99-6
Which structure produces a secretion that can reduce evaporation of water from the skin surface?
A. 1
B. 2
C. 3
D. 4

99-7
Which structure contains cells capable of rapid cell division?
A. 1
B. 2
C. 3
D. 4

02
Directions: Questions 52 to 54 refer to the diagram below, which shows a section of the human skin:

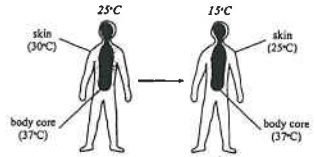


02-52
On a cold day, which of the following changes will occur to help maintain the body temperature?
(1) Structure 4 becomes thicker.
(2) Structure 6 becomes less active.
(3) Structure 7 constricts.
A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

02-53
Which structure(s) in the skin helps to prevent the entry of germs into the body?
A. 1 only
B. 1 and 3 only
C. 3 and 8 only
D. 1, 3 and 8

02-54
Which parts of the skin are capable of active cell division?
A. 2 and 5
B. 2 and 8
C. 4 and 5
D. 4 and 8

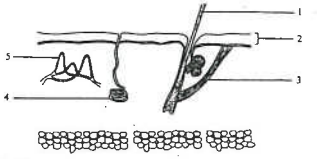
03.
Directions: Questions 35 and 36 refer to the diagram below, which shows the change in the heat distribution of a person's body when the air temperature drops from 25°C to 15°C



03-35
Which of the following are responsible for the change in the skin temperature?
(1) increase in heat loss
(2) decrease in sweat secretion
(3) constriction of the skin arterioles
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

03-36
Which of the following will occur if the person stays at 15°C for 30 minutes without additional clothing?
A. The metabolic rate of muscle will increase.
B. The subcutaneous fat will become thicker.
C. The urine will become more concentrated.
D. The sebaceous glands will become more active.

03.
Directions: Questions 47 to 49 refer to the diagram below, which shows a section of the human skin:



03-47
Which structure has the ability to contract?
A. 1
B. 3
C. 4
D. 5

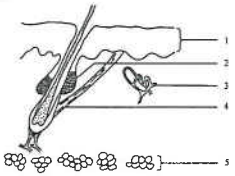
03-48
In a fire, structure 2 of a person was damaged by burning. Which of the following may occur at the damaged part?
(1) excessive evaporation of water
(2) bacterial infection
(3) bleeding
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

03-49
Which of the following will occur in the skin to repair structure 2?
(1) mitosis
(2) cell specialization
(3) increase in blood supply
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

05-33
Which of the following is *not* a correct match of the structures in the skin and their functions?

	Structure	*Function*
A.	sweat gland	regulating the water potential of the body
B.	sebaceous gland	preventing infection of the skin
C.	blood vessel	regulating body temperature
D.	sensory nerve ending	detecting external stimuli

06.
Directions: Questions 17 and 18 refer to the diagram below, which shows a section of the human skin:



06-17
Which of the following correctly describes structure 1?
A. It consists of dead cells only.
B. It reduces water loss from the body.
C. It helps the removal of metabolic wastes.
D. It has a pigment which absorbs infra-red radiation to produce vitamin D.

06-18
Which of the above labelled structures are involved in temperature regulation in humans?
A. 1, 3 and 4 only
B. 1, 4 and 5 only
C. 2, 3 and 5 only
D. 3, 4 and 5 only

07-32
Which of the following are the changes found in the skin when there is a sudden drop in environmental temperature from 25°C to 10°C?

	Sweating	Capillaries beneath the skin
A.	decrease	less blood flow
B.	decrease	more blood flow

C.	increase	less blood flow
D.	increase	more blood flow

Past HKCEE Questions
Temperature Regulation in Mammals
Suggested Answers

Paper I

1. (i) presence of hair / sebaceous gland / sweat gland (any 2) 1 1

(ii)

part	function	
B	by vasodilation to dissipate body heat through radiation	1 + 1
D	by sweating (perspiration) to lose heat through evaporation	1 + 1

(iii) Touch / temperature change / heat / cold / pressure / pain (any 2) 1+1

2. (i) (1) remains relatively constant 1
(2) mouth temperature approximates to internal temperature 1
this indicates that enzyme activity / rate of metabolism remains relatively constant, irrespective of changes in external temperature 1
OR
Mouth temperature is better than skin temperature 1
as an indicator of internal temperature 1

(ii) (1) Skin temperature drops
(2) vasoconstriction / blood vessels in skin constricts 1
and less blood /heat is carried to the skin 1

(iii) yes 1
there is still a temperature gradient / difference between the skin and the environment 1

3. (i) (1) A - * blood capillary 1
B - * sweat gland 1
(2) More blood will reach A 1
As A is close to the surface / provides a large surface area 1
it will lead to faster heat loss by radiation / conduction / convection 1
B will produce more sweat to the skin surface 1
to increase heat loss by evaporation of water which absorbs body heat 1
Communication skill (C) 1

(ii) This damage may lead to excessive loss of water from the body 1
and bacterial infection 1

4. (i) (1) The skin temperature increased 1
(2) Vasodilation occurs in the arterioles of the skin 1
so that more blood bringing heat flows to the skin 1

(ii) (1) The body temperature remains constant 1
(2) Sweating 1
As the room temperature was higher than the body temperature, 1
heat could not be lost by conduction / convection / radiation 1
so sweating was the main way of heat loss. 1
(3) Evaporation of sweat is too slow to lose heat effectively 1
while the body absorbs heat from the environment 1
Thus the body becomes overheated 1

5. (i) On Day 1, the air temperature was higher than the body temperature 1
Heat from the body could not be lost to the environment by conduction, convection and radiation 1
However, he could lose heat through the evaporation of sweat 1
which absorbs heat from the body surface 1
Effective communication (C) 1

(ii) Vigorous exercise would lead to the generation of large amount of heat in the body 1
As sweat could not evaporate efficiently at the higher relative humidity on Day 2, 1
less heat was lost from the body through sweating 1
As a result, the body temperature would rise steadily 1
and this would lead to the breaking down of normal metabolism / enzymatic action 1

6. (i) (1) During exercise, a large amount of heat was generated / Heat was absorbed from the sun 1
As a result, the arterioles in the skin dilated 1
and the blood flow to the skin increased 1
thus the face became red
Effective communication (C) 1

(2) This helps to promote heat loss from the body 1
so as to maintain a constant body temperature 1

(ii) There was a decrease in heat loss by evaporation 1
Thus the rate of heat gain by his body became greater than the rate of heat loss 1
resulting in an increase in his body temperature. 1

(iii) Day 1 1
The relative humidity of the afternoon of day 1 is the highest 1
and the wind speed is the lowest 1

7. (a) Correct line drawn showing a relatively constant body temperature at 37 ± 1 °C 1

(b) From 0600 to 1000 hour, the air temperature increases 1
Blood vessels in the skin dilate 1
so that more blood will flow near to the skin surface 1
More heat can be lost from the blood by conduction, convection and radiation 1
(effective communication) 1

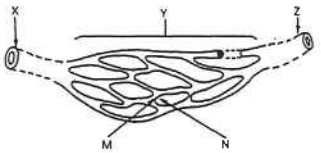
(c) Evaporation of sweat 1
At 1400 hour, the air temperature is higher than the body temperature 1
so heat cannot be lost by conduction, convection and radiation 1
but evaporation can still occur

90-49	A
90-51	C
91-46	B
91-47	A
93-36	C
94-23	C
94-24	D
94-25	C
94-26	B
99-6	B
99-7	A
02-52	D
02-53	B
02-54	A
03-35	B
03-36	A
03-47	B
03-48	A
03-49	D
05-33	A
06-17	B
06-18	D
07-32	A

Paper II

Past HKCEE Questions
Transport in Human
Paper I

1. The diagram below shows part of the blood vessel network in a mammal:



(i) Referring to the cut ends of X and Z, state two differences between X and Z.
(ii) Name X and Z.
(iii) What additional structural difference would be revealed if X and Z were cut longitudinally? State one function of this structure.
(iv) In what direction does blood flow between X and Z?
(v) State two characteristic features of Y as shown by the diagram. What is the importance of each of these features?
(vi) Name the fluids found in M and N.
(vii) State two components in M that cannot normally pass into N. (HKCEE 1984)

2. Diagram I below shows the connection between a freshly-dissected mammalian heart and lungs. Two of the blood vessels of the heart are connected to two separate bottles containing the same coloured liquid. (The parts are not drawn to the same scale.)

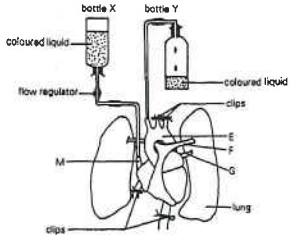
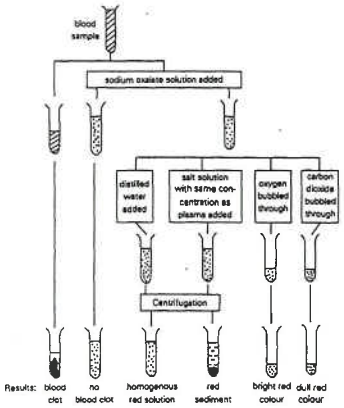


Diagram II below shows the valves present inside the heart.

(i) Using the letters in diagram I, indicate the route for the coloured liquid from bottle X to reach bottle Y, if the liquid is introduced into M.
(ii) In diagram II, name the valve and state the direction of the valve movement when blood is flowing through
(1) C.
(2) D.
(iii) If the liquid is introduced to E by inverting bottle Y, state and explain whether or not the liquid can reach bottle X.
(iv) Compare and explain the oxygen content of the blood in vessels F and G in a living mammal. (HKCEE 1985)

3. The diagram below shows the steps employed in treating a fresh sample of blood, and the results obtained.

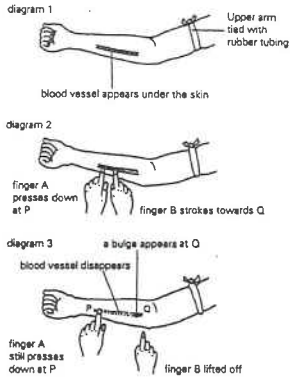


(i) State the effect of adding sodium oxalate solution.
(ii) Referring to tube D, state and explain the effect of adding distilled water to the oxalated blood sample.
(iii) What was the substance which gave the colour of the solution in tube D?
(iv) Which component of blood formed the

red sediment in tube E?

(v) With reference to the blood vessels associated with the lungs, which one will contain blood of the same colour as that in
(1) tube F?
(2) tube G? (HKCEE 1986)

4. The diagrams below show a series of steps carried out to demonstrate the presence of a certain blood vessel in a human arm. (The parts are not drawn to the same scale.)



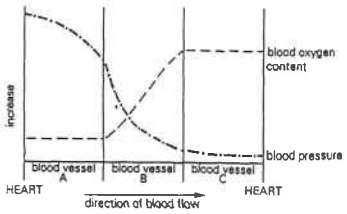
(i) What structure in the blood vessel is indicated by the appearance of the bulge at Q in diagram 3?

(ii) Referring to your answer in (i), state the kind of blood vessel being demonstrated.

(iii) With reference to the steps shown in diagrams 1 to 3, explain why the part of the blood vessel between P and Q disappeared from view temporarily.

(iv)
(1) State the purpose of tying the arm with a rubber tubing.
(2) Why is it necessary to remove the rubber tubing as soon as the demonstration has been completed? (HKCEE 1986)

5. In a portion of the circulatory pathway of a mammal, blood from the heart flows through three types of blood vessels A, B and C in turn, before returning to the heart. The graph below shows the changes in blood oxygen content and blood pressure along A, B and C. (Blood vessels A, B and C are not of the same length.)



(i) What type of blood vessel is A? Give TWO reasons to support your answer. (3 marks)

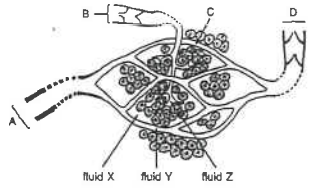
(ii) How does the blood oxygen content change as the blood flows along vessel B? Suggest an organ where this change can occur. (2 marks)

(iii) Describe the process that leads to the change in (ii). (2 marks)

(iv) Identify blood vessel C. Which chamber of the heart receives blood from C? (2 marks)

(v) Apart from oxygen content, state TWO differences in composition between the blood in A and in C. (2 marks)
(HKCEE 1988)

6. The diagram below represents part of a circulatory network and its neighbouring cells found in the human arm:



(i) State TWO structural differences between A and B as shown in the diagram. (2 marks)

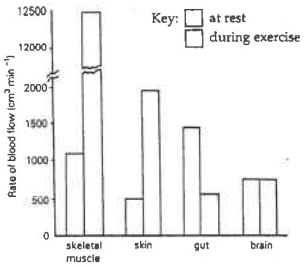
(ii) State ONE structural feature of C which allows exchange of materials between fluids X and Y. Explain your answer. (2 marks)

(iii) Name the chamber of the heart.
(1) from which A receives blood.
(2) to which D returns blood. (2 marks)

(iv)
(1) Which type of blood cell can be found in both fluid X and Y? Explain your answer.
(2) Give ONE function of this type of blood cell. (4 marks)

(v)
(1) Name the fluid Z.
(2) Explain how a continuous flow of fluid Z along B can be maintained. (3 marks)
(HKCEE 1989)

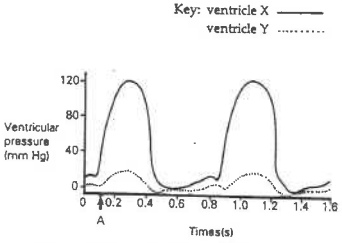
7. The diagram below shows the rate of blood flow to certain organs of a man at rest and during exercise:



(i)
(1) Which of the organs shown above receive(s) an increase in blood supply during exercise? (1 mark)
(2) Explain the importance of the increase in blood supply to the organ(s) in (1). (4 marks)
(3) Suggest TWO ways by which the increase in blood supply to the organ(s) in (1) can be achieved. (2 marks)

(ii) Which organ has a constant blood supply at rest and during exercise? Why is a constant blood supply to this organ necessary? (HKCEE 1990)

8. The graph below shows the pressure changes that occur in the two ventricles X and Y, during 2 consecutive cardiac cycles of a man at rest:



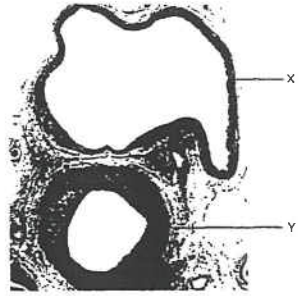
(i) With reference to the graph, calculate the number of heartbeats per minute of this man at rest. (1 mark)

(ii)
(1) Which of the ventricles, X or Y, is responsible for supplying blood to all parts of the body except the lungs?
(2) Explain your answer with reference to the graph. (1 mark)

(iii)
(1) State the function of the heart valves. (2 marks)
(2)
(I) What is the condition of the valves between the auricles and the ventricles at time A? (1 mark)
(II) Explain your answer with reference to the graph. (2 marks)

(iv) Name the blood vessels which receive blood from the left and right ventricles respectively. Compare the oxygen content in their blood. (HKCEE 1991)

9. The photomicrograph below shows the cross section of two blood vessels associated with a certain organ in a mammal. (The organ is not shown in the photomicrograph.)

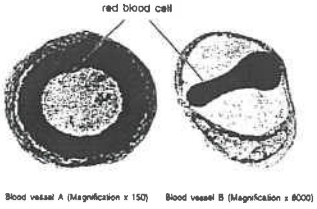


(i) Which vessel, X or Y, is an artery? Explain how an artery is structurally related to its function. (3 marks)

(ii) If these two blood vessels were associated with the kidney, draw a flowchart to show the major organ(s) and blood vessel(s) that a red blood cell in vessel X has to pass through in order to reach vessel Y. (4 marks)

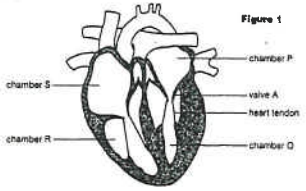
(iii) If these two blood vessels were associated with the lungs, compare the concentrations of carbon dioxide and glucose in vessels X and Y. (2 marks)
(HKCEE 1992)

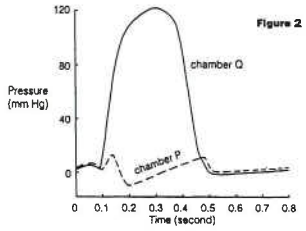
10. The photographs below show the transverse sections of two blood vessels:



(i) What type of blood vessel is
(1) A,
(2) B? (2 marks)
(ii) Referring to one feature observed in each photograph, explain how each vessel is adapted to its function. (4 marks)
(iii) What is the functional significance of the shape of the red blood cell? (2 marks)
(iv) Blood vessel A can be found in the heart wall. Explain the possible effect on the heart if the vessel is partly blocked. (3 marks)
(HKCEE 1996)

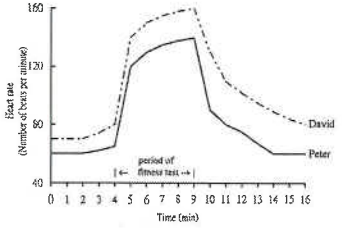
11. Figure 1 shows a section of the human heart. Figure 2 shows the change in pressure in chamber P and chamber Q during a cardiac cycle:





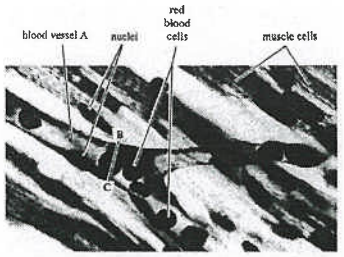
(i) What is chamber Q? (1 mark)
(ii) Describe and explain the change in pressure in chamber Q from 0.1 second to 0.2 second. (2 marks)
(iii)
(1) State the condition of valve A at 0.2 second. (1 mark)
(2) Explain your answer in (1) with reference to figure 1 and figure 2. (2 marks)
(iv) Some patients may suffer from a kind of heart defect in which valve A cannot close completely. Explain the probable effect of this defect on the function of the heart. (2 marks)
(v) Using the letters in the diagram, state the heart chamber which first receives the following substances after their entry into our body:
(1) carbon monoxide in exhaust fumes (1 mark)
(2) vitamin C in food (1 mark)
(HKCEE 1997)

12. Peter and David are both 17 years old. They are healthy and have similar body weight. They were asked to perform a fitness test in which they ran up and down the staircase at the same speed for 5 minutes. The changes in their heart rate are presented in the graph below:



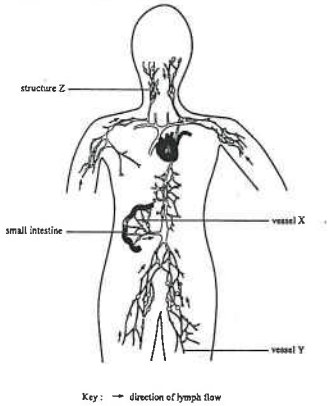
(i) Peter's heart rate increased during the fitness test. Explain the importance of this phenomenon. (5 marks)
(ii) Referring to the heart rates of Peter and David during the fitness test, deduce, with reasons, whose heart can pump out more blood in each beat. (4 marks)
(iii) At the end of the fitness test, Peter's blood was found to contain a high level of lactic acid.
(1) Write a word equation for the process that leads to the production of lactic acid. (1 mark)
(2) Explain the importance of this process. (2 marks)
(HKCEE 1999)

13. The photomicrograph below shows some muscle cells of the human small intestine and their associated blood vessels:



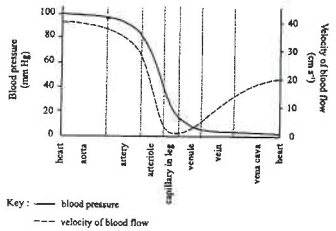
(i)
(1) What type of blood vessel is A? (1 mark)
(2) Based on the photomicrograph, state one feature of A to support your answer to (1). (1 mark)
(ii) The muscle cells in the photomicrograph are surrounded by a fluid. Explain how this fluid is formed from the blood in blood vessel A. (2 marks)
(iii) Draw a labelled diagram to show what you would see in the cross section made along line BC. (3 marks)
(iv) By means of a flowchart, show the route by which a red blood cell from the small intestine reaches the lung. Indicate the major blood vessels and organs involved. (3 marks)
(HKCEE 2000)

14. The diagram below shows part of the human circulatory system:



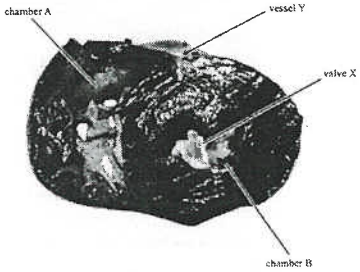
(i) Explain why the lymph in vessel X of a person turns from clear to milky after he has eaten some barbecued pork. (3 marks)
(ii) Describe how a continuous flow of lymph in vessel Y of the leg is maintained. (2 marks)
(iii) For a patient suffering from a disease called elephantiasis, the lymph vessels in his leg are blocked by a kind of parasitic worm. The leg becomes greatly swollen due to the accumulation of tissue fluid. Explain why the tissue fluid accumulates. (2 marks)
(iv) Structure Z may become enlarged when a person has a sore throat. Explain why structure Z is enlarged. (2 marks)
(HKCEE 2001)

15. The graph below shows the changes in blood pressure and velocity of blood flow as the blood travels from the heart to the leg and returns to the heart:



(i) Compare the blood pressure in the artery with that in the vein. Suggest two reasons for the difference. (3 marks)
(ii) Explain the importance of the low velocity of blood flow in the capillary. (2 marks)
(iii) In the vein of the leg, the blood pressure is very low while the velocity of blood flow is quite high. Describe how such a high velocity of blood flow in the vein is maintained. (2 marks)
(iv) Using the same x-axis given above, sketch a graph to show the change in the oxygen content of the blood as it passes through the blood vessels. (3 marks)
(HKCEE 2002)

16. The photograph below shows the transverse section of a pig's heart, which has a structure similar to that of the human heart.

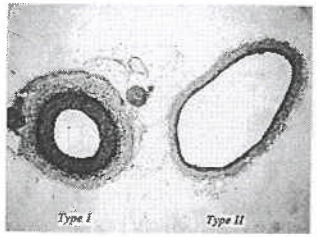


(i) Which chamber of the heart, A or B, is responsible for sending out blood to all parts of the body except the lungs? Explain your choice. (3 marks)
(ii)
(1) Name valve X. (1 mark)
(2) In a type of heart disorder, valve X cannot close properly. A man suffering from this disorder may faint easily when he performs vigorous exercise. How would you explain this? (4 marks)

(iii) Vessel Y is an artery found in the heart wall. Explain why the risk of heart attack would be higher if fatty substances are deposited on the inner wall of vessel Y. (2 marks)

(HKCEE 2003)

17. The photomicrograph below shows the sections of two types of blood vessels in the human body:



(i) State *two* functions of the thick muscular wall of vessel type I. (2 marks)

(ii) Vessel type II has a larger lumen than vessel type I. Explain the importance of this. (2 marks)

The table below shows the gas content of the blood in the two types of vessels transporting blood between the heart and an organ A:

	Gas content (arbitrary unit)	
	Vessel type I	Vessel type II
Carbon dioxide	44	40
Oxygen	40	100

(iii) Identify organ A. (1 mark)

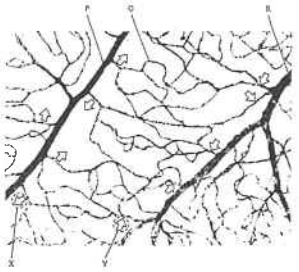
(iv) With reference to organ A,

(1) account for the difference in carbon dioxide content between the blood in vessel types I and II. (3 marks)

(2) explain the low oxygen content of the blood in vessel type I. (3 marks)

(HKCEE 2004)

18. The photomicrograph below shows three types of blood vessels, P, Q and R, in a tissue. The cells of the tissue are not shown.



Key: ⇨ direction of fluid movement between the blood and the tissue cells

(i) (1) Judging from the direction of fluid movement shown above, which blood vessel, P or R, would have a more muscular wall? (1 mark)

(2) Explain the importance of the muscular tissue in the wall of this blood vessel. (3 marks)

(ii) Q forms a highly branched network. What is the significance of this? (2 marks)

(iii) Explain how the fluid movement as indicated by the arrows is brought about at

(1) site X, (2 marks)

(2) site Y. (2 marks)

(HKCEE 2005)

19. The following paragraph describes the blood flow and a defective condition in the veins of the legs. Complete the paragraph with suitable words. (5 marks)

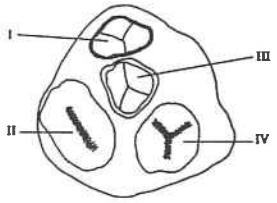
Blood flow in veins is usually under pressure. In the legs, blood in (a) veins flows upwards against to return to the heart. This upward flow is (b) assisted by the contraction of lying next to (c) the veins. The in the veins help to ensure that blood flows in (d) one direction only. If they cannot properly in performing its function, it may (e) result in the accumulation of blood and hence a higher blood pressure in the veins of the legs. Consequently, veins located near the surface of the skin tend to bulge and become visible, forming varicose veins.

(HKCEE 2006)

Past HKCEE Questions
Transport in Human
Paper II

90-25
Which of the following types of blood vessels has the largest total surface area in a mammalian body?
A. the aorta
B. the arteries
C. the capillaries
D. the veins

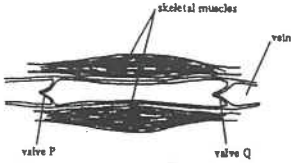
90.
Directions: Questions 31 and 32 refer to the diagram below which shows a pig's heart with certain chambers / parts removed to show the structures of various valves:



90-31
Valve II lies
A. between the aorta and the left ventricle.
B. between the pulmonary artery and the right ventricle.
C. between the left atrium (auricle) and left ventricle.
D. between the right atrium (auricle) and right ventricle.

90-32
Which of the following valves open when the ventricles are contracting?
A. valves I and II
B. valves I and III
C. valves II and IV
D. valves III and IV

90-34
The diagram below shows a small part of a vein and its neighbouring skeletal muscles in longitudinal section:



Which of the following correctly matches the state of the muscles with the corresponding conditions of valves P and Q?

	skeletal muscles	vale P	valve Q
A.	contracting	open	closed
B.	contracting	closed	open
C.	relaxing	open	closed
D.	relaxing	open	open

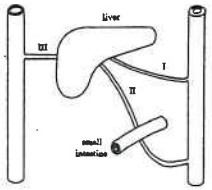
90-35
Which of the following fluids collected from a healthy person gives a red precipitate when heated with Benedict's / Fehling's solution?
A. urine
B. serum
C. saliva
D. gastric juice

90-48
In a fasting condition, which of the following blood vessels carries blood with the highest glucose level?
A. aorta
B. pulmonary artery
C. hepatic vein
D. hepatic portal vein

90-60
How many times must a red blood cell pass through the right ventricles if it is to move from the lungs to the kidney and then back to the lungs again?
A. 0
B. 1
C. 2
D. 3

91-25
The wall of an artery is thicker than that of a vein because an artery
(1) contracts rhythmically to transport blood forward.
(2) possesses valves to prevent the backflow of blood.
(3) has to withstand high blood pressure.
A. (1) only
B. (3) only.
C. (1) and (2) only
D. (2) and (3) only

91.
Directions: Questions 26 and 27 refer to the diagram below which shows the blond vessels associated with the liver and the small intestine of a mammal:



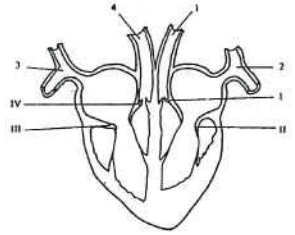
91-26
Which of the following is correct?

	Blood vessel I	Blood vessel III
A.	less oxygen	more oxygen
B.	less urea	more urea
C.	valves present	no valve
D.	thinner wall	thicker wall

91-27
Which of the following statements about vessel II is correct?
A. It carries bile into the intestine.
B. It has a capillary network at both side.
C. It carries blood with the highest concentration of oxygen.
D. It carries blood with the highest concentration of fatty acids.

92-34
In blood donation, blood is collected from the vein instead of the artery because
A. blood in the vein contains lees oxygen.
B. the vein has a larger lumen than the artery.
C. the wall of the vein is thinner than that of the artery.
D. the blood pressure in the vein is lower than that in the artery.

93.
Directions: Questions 26 and 27 refer to the diagram below which shows a section of the mammalian heart



93-26
Which of the blood vessels carries / carry oxygenated blood?
A. 1 only
B. 4 only
C. 1 and 2 only
D. 3 and 4 only

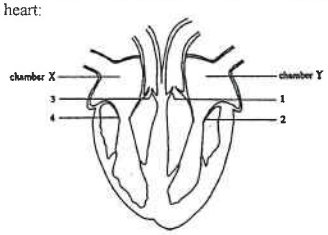
93-27
The closing of which valves produces the characteristic 'heart sounds'?
A. I and II only
B. II and III only.
C. III and IV only
D. I, II, III and IV

94-12
Which of the following correctly describes the difference between the composition of blood in the hepatic portal vein and the hepatic vein of a man after fasting for 12 hours?

	Blood in the hepatic portal vein	Blood in the hepatic vein
(1)	less urea	more urea
(2)	more glucose	less glucose
(3)	without bile	with bile

A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only

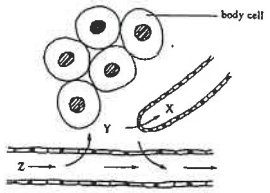
94.
Directions: Questions 14 and 15 refer to the diagram below which show a section of a human heart:



94 -14
What happens to the heart valves when the atria (auricles) and ventricles are all relaxed?
A. Valves 1 and 2 are closed while valves 3 and 4 are open.
B. Valves 1 and 3 are closed while valves 2 and 4 are open.
C. Valves 1 and 3 are open while valves 2 and 4 are closed.
D. The condition of the heart valves depends on the activity of the person.

94-15
What will be the effect on a person if there is a hole in the septum that separates chambers X and Y?
A. The person may develop anemia.
B. The person may have a heart attack easily.
C. The person's blood may not be able to clot normally.
D. The person's arterial blood may contain a lower level of oxygen than normal.

94.
Directions: Questions 16 and 17 refer to the diagram below which shows part of the circulatory system in a mammal:



Key : → indicates the flow direction

94-16
The fluids X, Y and Z are

	X	Y	Z
A.	lymph	blood	tissue fluid
B.	blood	tissue fluid	lymph
C.	lymph	tissue fluid	blood
D.	tissue fluid	lymph	blood

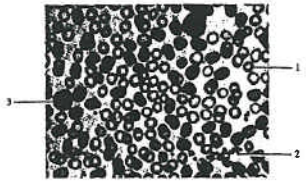
94-17
Which of the following comparisons between fluid X and fluid Z is correct?

	X	Z
A.	white blood cells absent	white blood cells present
B.	dull red	bright red
C.	less protein	more protein
D.	high oxygen content	low oxygen content

95-22
Normally, blood does not contain
A. fat.
B. proteins.
C. bile pigments.
D. carbon dioxide.

95-23
All veins carry
A. deoxygenated blood.
B. blood rich in carbon dioxide.
C. blood with a low glucose level.
D. blood at a relatively low pressure.

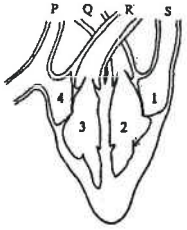
95-24
The photomicrograph below show a human blood smear:



Which of the following are the functions of structures 1, 2 and 3?

	Structure 1	Structure 2	Structure 3
A.	transports oxygen	transports glucose	transport carbon dioxide
B.	transports oxygen	for blood clotting	engulfs bacteria
C.	transports carbon dioxide	transports glucose	engulfs bacteria
D.	transports carbon dioxide	for blood clotting	transports oxygen

95.
Directions: Questions 25 and 26 refer to the diagram below which shows a section of the mammalian heart:

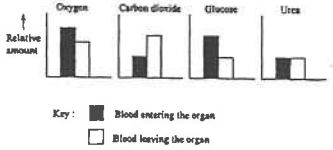


95- 25
With reference to the diagram, which heart chambers are contracting?
A. 1 and 2
B. 1 and 4
C. 2 and 3
D. 3 and 4

95-26
Which blood vessels are connected to the lungs?
B. P and Q
8. Q and R
C. R and S
D. S and P

95-27
Heart attacks are caused by
A. a lack of iron in the diet.
B. reduced blood supply b the heart muscle.
C. an accumulation of lactic acid in the blood.
D. breathing in air containing carbon monoxide.

96-27
The bar charts below show the relative amounts of four substances in the blood entering and leaving a certain organ in the body:



This organ is
A. the brain.
H. the kidney.
C. the liver.
D. the lung.

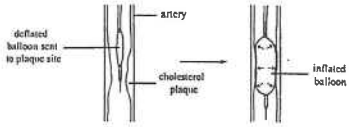
96-28
The blood of a person takes a long time to clot. He may not have enough
A. iron.
B. vitamin D.
C. antibodies.
D. blood platelets.

97-20
The photomicrograph blow shows the appearance of some human red blood cells:

The shape of the red blood cells allows them
A. to carry more haemoglobin.
B. to have closer contact with the tissue cells.
C. to absorb and release oxygen more rapidly.
D. to pass through the wall of the blood capillaries more easily.

97-21
Which of the following correctly shows the route of a red blood cell from the lung to the liver?
A. lung → pulmonary vein → left atrium → left ventricle → aorta → liver
B. lung → pulmonary vein → right atrium → right ventricle → aorta → liver
C. lung → pulmonary artery → left atrium → left ventricle → hepatic artery → liver
D. lung → pulmonary artery → right atrium → right ventricle → hepatic artery → liver

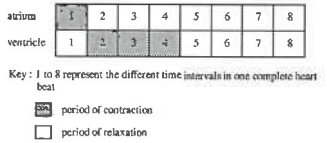
97.
Directions: Questions 25 and 26 refer to the following information:
Cholesterol plaque is formed by the accumulation of cholesterol on the wall of arteries. The diagram: below show a type of operation which is used to treat the blockage of arteries by cholesterol plaque



97-25
Which of the following statements is incorrect?
A. The inflated balloon helps to widen the lumen of the artery.
B. The larger the plaque in the artery, the lower the blood pressure.
C. This operation may restore normal blood flow through the artery.
D. Formation of the plaque in the artery is partly due to a low fibre high fat diet.

97-26
If the arteries of the heart wall are blocked by cholesterol plaque, a heart attack may occur because
A. the rate of heart beat increases.
B. less blood is pumped out from the heart.
C. the heart muscle becomes fatigued easily.
D. less blood is supplied to the heart muscle.

99.
Directions: Questions 18 and 19 refer to the diagram below, which represents the conditions of the atria and the ventricles in one complete heart beat of a person:



99-18
Which of the following correctly describes the conditions of the heart valves during interval 1?

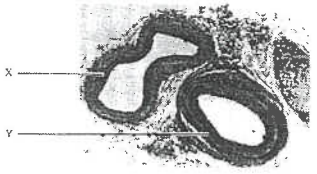
	Bicuspid valve	*Tricuspid valve*
A.	closed	closed
B.	closed	opened
C.	opened	opened
D.	opened	closed

99-19
During intervals 2 to 4, blood flows
A. from the atria into the ventricles.
B. from the veins into the ventricles.
C. from the ventricles into the atria.
D. from the ventricles into the arteries.

99-20
In the liver, excess amino acids will be converted into
(1) urea.
(2) protein.
(3) carbohydrate.
A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

99-22
Which of the following blood vessels has the lowest blood pressure?
A. vena cava
B. hepatic vein
C. hepatic portal vein
D. capillaries in the liver

Directions: Questions 24 and 25 refer to the photomicrograph below, which shows the transverse section of two blood vessels connecting the heart and the lung:

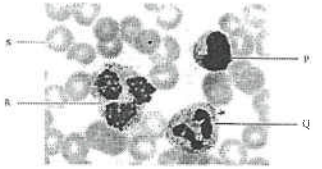


99-24
Which heart chamber is connected to vessel X?
A. left atrium
B. left ventricle
C. right atrium
D. right ventricle

99-25
Which of the following comparisons between the blood in vessels X and Y is correct?

	Oxygen concentration		*Glucose concentration*	
	X	Y	X	Y
A.	higher	lower	higher	lower
B.	lower	higher	lower	higher
C.	higher	lower	lower	higher
D.	lower	higher	higher	lower

Directions: Questions 26 and 27 refer to the photomicrograph below, which shows a human blood smear:



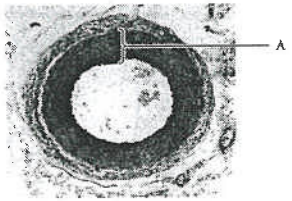
99-26
Which type of cells contains the least amount of DNA?
A. P
B. Q
C. R
D. S

99-27
Which of the following descriptions of cell type Q is incorrect?
A. It can engulf bacteria that enter the body.
B. It can pass through the wall of the capillaries.
C. It decreases in number if the body lacks iron.
D. It increases in number during an infection of the body.

99-28
A person has not taken any food for 24 hours. Which of the following components of the blood increases in concentration after passing through the intestinal villus of the person?
A. urea
B. insulin
C. glucose
D. carbon dioxide

00-13
Which of the following shows the correct arrangement of the blood vessels in descending order of urea concentration in the blood?
A. vena cava, hepatic vein, renal vein
B. vena cava, renal vein, hepatic vein
C. hepatic vein, renal vein, vena cava
D. hepatic vein, vena cava, renal vein

00-20
The photomicrograph below shows the transverse section of an arteriole:

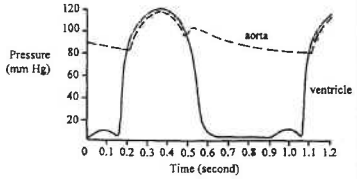


Which of the following are the functions of tissue A?
(1) It helps to regulate the diameter of the arteriole.
(2) It helps the arteriole to withstand high blood pressure.
(3) Its contraction helps to propel blood along the arteriole.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

00-21
Which of the following comparisons between a vein and a lymph vessel is correct?

	Vein	Lymph vessel
A.	valves present	valves absent
B.	oxygen present	oxygen absent
C.	red blood cells present	red blood cells absent
D.	white blood cells present	white blood cells absent

00.
Directions: Questions 22 and 23 refer to the graph below, which shows the changes in pressure in the aorta and that in the left ventricle of the heart in a certain time interval:



00-22
During which period are the semi-lunar valves open?
A. 0 to 0.2 second
B. 0.2 to 0.5 second
C. 0.5 to 0.6 second
D. 0.6 to 0.9 second

00-23
What is the rate of heart beat of this person?
A. 60 beats per minute
B. 67 beats per minute
C. 75 beats per minute
D. 86 beats per minute

01.
Directions: Questions 22 to 24 refer to the table below, which shows the blood flow to the skeletal muscle and an organ, X, at rest and during exercise:

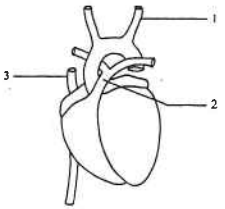
	Blood flow ($mL\ min^{-1}$)	
	At rest	During exercise
Skeletal muscle	1 200	12 500
Organ X	500	2 000

01-22
Blood flow to the skeletal muscle increases during exercise to
(1) remove more urea from the muscle.
(2) carry more heat away from the muscle.
(3) increase the oxygen supply to the muscle.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

01-23
Which of the following is not a cause for the increase in blood flow to the skeletal muscle during exercise?
A. increase in heart rate
B. increase in breathing rate
C. increase in blood pressure
D. dilation of arterioles in the muscle

01-24
Organ X may be
A. the skin
B. the brain.
C. the kidney.
D. the small intestine.

01.
Directions: Questions 25 and 26 refer to the diagram below, which shows the ventral view of a mammalian heart:



01-25
Which blood vessel(s) carries blood with a low oxygen concentration?
A. 1 only
B. 3 only
C. 1 and 2 only
D. 2 and 3 only

01-26
Which of the following is correct when blood is flowing out of the heart through blood vessel 2?
A. The atria are contracting.
B. The ventricles are contracting.
C. The semi-lunar valves are closed.
D. The tricuspid and bicuspid valves are open.

02.
Directions: Questions 38 and 39 refer to the passage below:

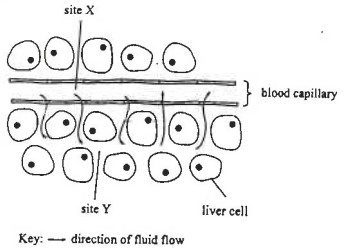
> Atherosclerosis is a condition in which the smooth internal lining of blood vessels becomes covered with fatty deposits. This causes a reduction in the diameter of the blood vessels. The fatty deposits often cause the formation of blood clots which further narrow the blood vessels and eventually block them completely. Atherosclerosis is becoming more common in many countries and this has led to an increase in the incidence of heart attack.

02-38
Narrowing of blood vessels of the heart may lead to heart attack because
A. less blood returns to the atria from the veins.
B. less blood flows out of the ventricles to the arteries.
C. less oxygen reaches the heart muscles.
D. less nutrients are transported in the blood

02-39
Which of the following are possible causes for the increase in number of atherosclerosis cases?
(1) excessive intake of fatty food
(2) insufficient physical exercise
(3) insufficient bile secretion
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

03-23
A person's feet may become swollen after he has been sitting for many hours, such as on a long-distance flight. This is because
A. the blood pressure in the veins of the legs becomes lower.
B. the blood flow in the arteries of the legs becomes slower.
C. tissue fluid is drained from the legs more slowly.
D. tissue fluid is formed in the legs more rapidly.

04.
Directions: Questions 1 and 2 refer to the diagram below, which shows the movement of fluid in and out of a capillary in the liver tissue:

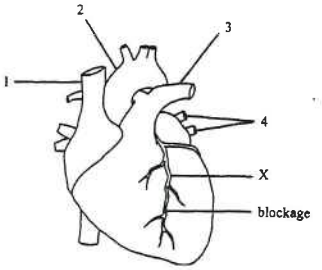


04.-01
Which of the following is a correct comparison of the fluid in X and that in Y when a person has not eaten for 12 hours?

	Fluid in X	*Fluid in Y*
A	urea absent	urea present
B	white blood cells present	white blood cells absent
C	higher glucose content	lower glucose content
D	lower carbon dioxide content	higher carbon dioxide content

04-02
The movement of fluid back into the capillary is mainly caused by
A. active transport.
B. osmosis.
C. secretion.
D. ultrafiltration.

Directions: Questions 10 and 11 refer to the diagram below, which shows the ventral view of the human heart:



04-10
Vessel X is responsible for supplying blood to the heart muscle. It receives blood directly from
A. vessel 1.
B. vessel 2.
C. vessel 3.
D. vessel 4.

04-11
Which of the following will occur if vessel X is blocked as shown in the diagram?
A. Some heart muscles will die.
B. The heart will pump out more blood in each beat.
C. The blood pressure in the arteries will become higher.
D. The carbon dioxide content of the blood in the veins will become lower.

05-44
Which of the following comparisons between blood and lymph is correct?

	Blood	*Lymph*
A.	fat absent	fat present
B.	glucose present	glucose absent
C.	phagocytes absent	phagocytes present
D.	red blood cells present	red blood cells absent

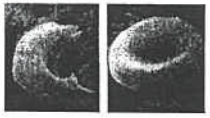
06.
06-33
The table below shows the ratio of the mean diameter of lumen to the mean thickness of vessel wall of three types of blood vessels:

	Blood vessels		
	P	Q	R
Ratio	10	4	16

Which of the following correctly identifies blood vessels P, Q and R?

	P	*Q*
A.	artery	capillary
B.	vein	capillary
C.	vein	artery
D.	capillary	vein

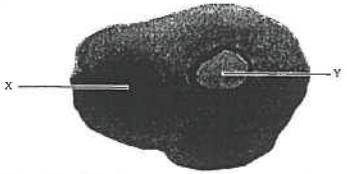
06-34
The photomicrographs below show the appearance of two red blood cells viewed under the same magnification. The one on the left shows a defective red blood cell. The one on the right shows a normal red blood cell.



Source: The Sickle Cell Foundation of Alberta, *What is Sickle Cell Disease*,(2004) URL: http://www.sicklecellfoundationsofalberta.org/

Which of the following descriptions about the defective red blood cell is correct?
A. It has a smaller surface area to volume ratio than the normal red blood cell.
B. It has a lower water potential than the normal red blood cell.
C. It has a higher oxygen carrying capacity than the normal red blood cell.
D. It contains nucleus while the normal red blood cell has lost the nucleus.

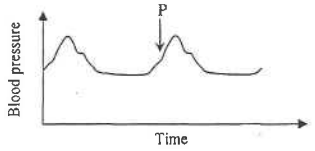
06-48
The following photograph shows the cross section of a structure connecting the foetus to the mother:



Which of the following comparisons between the content of X and Y is correct?

	X	*Y*
A.	less urea	more urea
B.	less protein	more protein
C.	more oxygen	less oxygen
D.	more carbon dioxide	less carbon dioxide

Directions: Questions 49 and 50 refer to the graph below, which shows the periodic change in the blood pressure in the aorta.



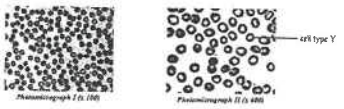
A
vein
artery
capillary

06-49
At point P, what are the conditions of the bicuspid and semilunar valves?

	Bicuspid valve	*Semilunar valves*
A.	open	close
B.	open	open
C.	close	open
D.	close	close

06-50
Which of the following are responsible for the periodic change in the blood pressure in the aorta?
(1) pumping of heart
(2) thickness of the wall of aorta
(3) elasticity of the wall of aorta
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

07
Directions: Questions 10 and 11 I refer to the photomicrographs below, which show a stained human blood smear under different magnifications:



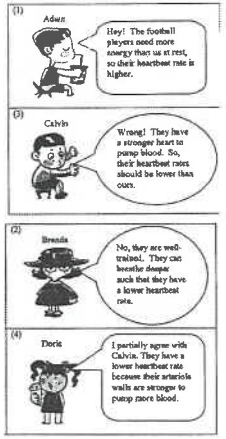
07-10
A student first focused on the blood smear under the microscope and obtained an image as shown in photomicrograph I. In order to obtain an image as shown in photomicrograph 11, which of the following steps are necessary?

(1) Turn the nosepiece.
(2) Turn the fine adjustment knob.
(3) Adjust the position of the condenser.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only D.
D. (1), (2) and (3)

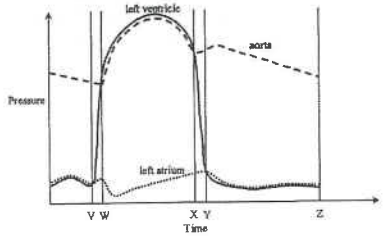
07-11
The characteristic appearance of cell type Y is due to
(1) its thicker periphery.
(2) its large central vacuole.
(3) the absence of a nucleus.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

07-13
One day, Adam, Brenda, Calvin and Doris were watching a football match of the World Cup. The following are their dialogues about the heartbeat rate of the football players.



Whose view is correct?
A. Adam's
B. Brenda's
C. Calvin's
D. Doris's

07
Directions: Questions 21 and 22 refer to the graph below, which shows the changes in pressure of the blood in the aorta, the left atrium and the left ventricle during a heart cycle.



07-21
Which of the following combinations shows a correct interpretation of the graph and its supporting reason?

	Interpretation of the graph	Supporting reason
A.	the left ventricle is contracting between VW	the left ventricle's pressure is increasing
B.	the aorta is contracting between XY	the aorta's pressure is increasing
C.	the left ventricle is relaxing at point V	the left ventricle's pressure is low
D.	the left atrium starts to relax at point Y	the left atrium's pressure starts to decrease

07-22
Which of the following correctly describes the condition of the valves during the period YZ?

	Bicuspid valve	Semi-lunar valve
A.	closed	closed
B.	opened	opened
C.	closed	opened
D.	opened	closed

07-23
Which of the following will lead to high blood pressure in the human body?
(1) Excessive bleeding occurs.
(2) Fat is deposited on the wall of arteries.
(3) The wall of the arteries becomes less elastic.

A. (1) and (2) only
B. (1) and (3) only

C. (2) and (3) only
D. (1), (2) and (3)

07-45
Passengers travelling on long-distance flights often experience the swelling of the feet. They are advised to stretch their legs more often during the flight because stretching legs helps to

A. squeeze the arterioles and hence more blood flows away from the legs.
B. squeeze the lymph vessels and hence more lymph flows away from the legs.
C. increase the heartbeat rate and hence more blood flows away from the legs.
D. increase the blood pressure and hence more lymph flows away from the legs.

Past HKCEE Questions
Transport in Human
Suggested Answers

1. (i)

cut end	X	Z	
lumen	LARGE	smaller	1
wall	thinner	THICK	1

(ii) * X - vein/venule (NOT vena cava) 1
* Z - artery/arteriole (NOT aorta) 1

(iii) presence of valve in X and not Z 1
to prevent backward flow of blood 1

(iv) Z → Y → X OR Z → X 1

(v)

Feature	Importance	
branching	increase surface area / increase cross-sectional area with surrounding cells	to promote filtration /for more efficient diffusion
bore diminished	slow down blood flow from Z to X	any 2 pairs [+ 1] [+ 1]
	decrease blood pressure	
thin-walled	easier for diffusion / for filtration	

(vi) * M - blood / plasma 0.5
* N - lymph / tissue fluid / extracellular fluid / intercellular fluid / interstitial fluid 0.5

(vii) Any 2 (1,1) 2
- R.B.C.
- plasma protein
- blood platelets

2. (i) M → L → K → f → G → H → J → E 2

(ii)

	Valve	Name	Direction of movement	
(1)	C	*semi-lunar valves	upwards / towards wall of artery	½, 1
(2)	D	*tricuspid valve	downwards / towards wall of ventricle	½, 1

(iii) no 1
valves (semi-lunar /B) are present to prevent the backflow of liquid 1

(iv)

Vessel	Oxygen content	Reason	
F	lower	oxygenation takes place in the lungs	1+1
OR G	higher		OR 1+1

3. (i) to prevent the formation of blood clot / to remove Ca^{2+} ions 1

(ii) bursting of RBC / haemolysis occurs 1
cell contents released 1
because the water potential of distilled water is greater than that of RBC 1
there is a net flow / osmosis of water into the RBC 1

(iii) haemoglobin 1

(iv) RBC / blood cells 1

(v) (1) pulmonary vein 1
(2) pulmonary artery 1

4. (i) valves
(ii) vein
(iii) movement of finger B pushed blood away from this segment 1
valves at Q prevent blood to flow back 1
finger A stops blood flowing into P 1

(iv) (1) stop or slow down the blood flow for the moment / make the vein more conspicuous / achieve a more obvious result 1
(2) to allow normal blood flow in the arm again 1

5. (i) A is an artery 1
it carries blood away from the heart 1
it contains blood at a high pressure 1

(ii) oxygen content increases 1
the lungs 1

(iii) oxygen diffuses 1
from alveoli into blood in B 1

(iv) *pulmonary vein 1
left atrium / auricle 1

(v) carbon dioxide concentration higher in A 1
glucose concentration higher in A 1
[OR vice versa]

6. (i) A is thick-walled and B is thin walled 1
valves present in B but absent in A 1

(ii) G is thin-walled (one cell thick) 1
to facilitate exchange by simple diffusion 1

(iii) (1) *left ventricle 1
(2) *right atrium / auricle 1

(iv) (1) white blood cell 1
their amoeboid shape enable them 1
to squeeze through the capillary wall 1

(2) for body defence / to kill germs 1

(v) (1) * lymph 1
(2) contraction of surrounding muscles 1
presence of valves 1

7. (i) skeletal muscle and skin
(ii) skeletal muscle:
to carry more nutrients / oxygen for muscle contraction 1 1
skin:
to carry more blood to surface to increase heat loss 1
to help maintaining a constant body temperature 1

(iii) the brain 1
the brain will be damaged when there is a shortage of blood supply 1
(OR other reasonable answers)

8. (i) 75 (beats per minute)
(ii) (1) X 1
(2) X can produce greater pressure / force to propel blood to all parts of the body 1
(iii) (1) to prevent the backflow of blood into the atria / auricles 1
when the ventricles are contracting 1
OR
to prevent the backflow of blood into the ventricles 1 1
when the ventricles are relaxing
(2) (I) closed 1
(II) At time A, the ventricular pressure is increasing 1
thus forcing the valves to close 1

(iv) From left ventricle: *aorta 1
From right ventricle: *pulmonary artery 1
blood in aorta contains more oxygen than that in the pulmonary artery 1

9. (i) Vessel Y 1
Its thick / elastic wall helps 1
resisting the high blood pressure 1

(ii) vessel X (renal vein) → *vena cava → *heart → *pulmonary artery → *lungs → *pulmonary vein → *heart → *aorta → * vessel Y (renal artery) 4
N.B. 1/2 mark for each correct spelling of the organs in the correct sequence 1/2 mark for the flow chart / direction of blood

(iii)

	vessel X	vessel Y	
carbon dioxide conc.	less	more	1
glucose conc.	less	more	1

10. (i) (1) artery
(2) capillary
(ii) • Blood vessel A has thick wall
• to withstand a high blood pressure
OR
• Blood vessel A has elastic wall
• to withstand / maintain a high blood pressure
OR
• Blood vessel A has muscular wall
• to control the blood flow / the diameter of the blood vessel
(any one set above) (1+1) 2

The wall of blood vessel B is one cell thick 1
so as to facilitate the exchange of substances between the blood and the tissue cells 1

(iii) To provide a large surface area to volume ratio 1
to facilitate the diffusion of gases 1
(iv) The blood supply to the heart muscle is reduced, 1
so there is less food and oxygen supply to the heart muscle cells 1
The heart muscle cells would die / heart attack would occur 1
Effective communication (C) 1

11. (i) left ventricle
(ii) The pressure increases sharply because the muscles of chamber Q is contracting
(iii) (1) closed

(2) The pressure in the left ventricle (Q) is greater than that in the left atrium (P) thus closing valve A 1
The heart tendons prevent valve 1
A from turning into the left atrium (P)

(iv) The unidirectional flow of the blood through the heart cannot be maintained 1
Thus, less blood is pumped out of the heart 1

(v) (1) chamber P 1
(2) chamber S 1

12. (i) During the fitness test, the heart beats rapidly to supply more blood to the skeletal muscle 1

This provides an abundant supply of food and oxygen to the muscles 1
so that a large amount of energy can be released in respiration for the skeletal muscles 1
At the same time, more blood supply to the muscles also helps to remove rapidly the carbon, dioxide / heat produced the muscles 1 1
Effective Communication (c) 1

(ii) Peter's heart 1
Because the energy demand of Peter and David was the same for the fitness test 1
and Peter's heart could supply the same amount of blood/oxygen to the skeletal muscle 1
at a lower heart rate 1

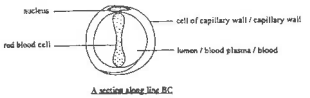
(iii) (1) glucose → lactic acid 1
(2) To provide additional energy to the skeletal muscle cells 1
so that the skeletal muscle can contract more vigorously 1

13. (i) (1) Blood capillary 1
(2) Its wall is one-cell thick /the diameter of the lumen is slightly greater than or similar to that of a red blood cell 1

(ii) The pressure of blood in A is higher than the pressure of the fluid surrounding the muscle cells 1
This forces the plasma except the plasma protein out of A 1

(iii) Drawing (D): clear and accurate diagram, double line for capillary wall, biconcave RBC 1.
Labels (L): any three of the following labels and title; 1/2 mark each 5

1.
5



A section along line BC

(iv) (small intestine) → hepatic portal vein → liver → hepatic vein → vena cava → heart → pulmonary artery → (lung) (1/2 mark for each term)
Deduct 1/2 mark if there is no arrow sign. 3

14. (i) The barbecued pork contains fat The digested products are absorbed into the lacteal in the form of fat / oil droplets 1 1
As a result, there will be numerous fat / oil droplets in the lymph in X 1
Effective communication (C) 1

(ii) Contraction of skeletal muscles around vessel Y forces the lymph to flow upward 1
The valves in vessel Y help to prevent the backflow of the lymph 1

(iii) As the lymph vessels are blocked, tissue fluid in the leg cannot be transported away 1
Meanwhile it is continuously formed in the leg 1
thus tissue fluid accumulates 1

(iv) The pathogen that causes sore throat stimulates the proliferation of lymphocytes / white blood cells in structure Z 1
thus Z becomes enlarged 1

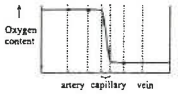
15. (i) The blood pressure in the vein is much lower than that in the artery 1
Reasons: (any two) (1,1) 2
• the blood in the artery is directly under the pumping action of the heart, while that in the vein is not
• the blood in the vein has overcome great friction / resistance after travelling over a long distance
• there is a loss of fluid from the blood during the formation of tissue fluid

(ii) To allow more time for the exchange of materials between the blood and the tissue cells 1 1

(iii) Any one set below: (1,1) 2
- The volume of blood flow through each section of the circulation per unit time is the same
- From the capillary to the vein, the total cross-sectional area decreases, so the velocity of blood flow increases

or
- Contraction of skeletal muscle adjacent to the vein helps to force the blood to flow / set inspiration helps to draw blood toward the thorax
- At the same time, valves are present in the veins to prevent the backflow of the blood

(iv) Title (T) 0.5
Shape of the curve showing the drop in O_2 content at the capillary (S) 1.5
Correct axis labels (A) : oxygen content, heart-heart / artery-vein / aorta-versa cava / arteriole-venule 1



Change in oxygen content of the blood in its circulation between the heart and the

16. (i) Chamber B 1
The wall of B is thicker / more muscular than that of A, 1
showing that it is the left ventricle / it can generate a greater force for pumping blood. 1

(ii) (1) bicuspid valve
(2) If X does not close properly, oxygenated blood in the left ventricle will flow back to the left atrium when the ventricle contracts. 1
This reduces the amount of oxygenated blood pumped out of the heart in each beat. 1
During vigorous exercise, the oxygen consumption of the skeletal muscles is very high. 1
This increases the risk of insufficient oxygen supply to the brain, thus the person would faint easily. 1

(iii) The deposition of fatty substances on the inner wall of vessel Y would block the vessel. 1
This would reduce the oxygen supply to the heart muscle; hence increase the risk of heart attack. 1

17. (i) To withstand the high blood pressure. 1
To regulate the blood flow to the organ / control the diameter of the vessel lumen. 1

(ii) The blood pressure in vessel type II is lower. 1
The larger lumen would have a smaller resistance, thus facilitating the blood flow. 1

(iii) Lung 1

(iv) (1) Vessel type II of organ A has a lower carbon dioxide content than vessel type I. 1
As blood flows from vessel type I to the lung, then to vessel type II, 1
carbon dioxide diffuses out of the blood to the air sac in the lungs. 1

(2) Blood in vessel type I of organ A comes from the veins / the right side of the heart, 1
which collect blood from the body tissues 1
where oxygen is consumed in respiration. 1

18. (i) (1) P 1

(2) The muscular tissue can contract and relax 1
to change the diameter of vessel P 1
so as to regulate the blood flow to the tissue cells 1

(ii) To provide a large surface area for the exchange of materials between the blood and the tissue cells 1 1

(iii) (1) Due to a high blood pressure in the capillary at X 1
some plasma is forced out through the wall of the capillary 1

(2) Due to the retention of plasma proteins / low blood pressure at the venule end of the capillary 1
the water potential of the tissue fluid around Y is higher than that of the blood 1
/ water in the tissue fluid is drawn into the capillary by osmosis 1

19. low 1
gravity 1
muscle 1
valves 1
close 1

Paper II

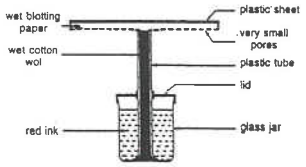
90-25	C
90-31	C
90-32	B
90-34	A
90-35	B
90-48	C
90-60	B
91-25	B
91-26	B
91-27	B
92-34	D
93-26	C
93-27	D
94-12	A
94-14	B
94-15	D
94-16	C
94-17	C
95-22	C
95-23	D
95-24	B
95-25	C
95-26	C
95-27	B
96-27	A
96-28	D
97-20	C
97-21	A
97-25	B
97-26	D
99-18	C
99-19	D
99-20	C
99-22	A
99-24	A
99-25	C
99-26	D
99-27	C
99-28	D
00-13	D
00-20	A
00-21	C
00-22	B
00-23	B
01-22	C
01-23	B
01-24	A
01-25	D
01-26	B
02-38	C
02-39	A
03-23	C
04-01	D
04-02	B
04-10	B
04-11	A
05-44	D
06-33	C
06-34	A
06-48	D
06-49	C
06-50	B
07-10	D
07-11	B
07-13	B
07-21	A
07-22	D
07-23	C
07-45	B

Past HKCEE Questions
Water and Organisms
Paper I

1. The diagram below shows a potted woody plant:

(i) If the plant was kept in darkness for 2 to 3 days, state and explain the direction of the flow of carbohydrate at point A.
(ii) Name the type of carbohydrate transported in the plant.
(iii) Name the tissue through which carbohydrate is transported.
(iv) If a ring of bark containing the tissue in (iii) is removed at B, and the plant is then exposed to sunlight for two months, describe and explain the resulting appearance of the stem above and below B.
(v) Name the tissue which conducts water from the roots to the leaves.
(vi) State and explain what would happen to the leaves if the plant was not watered for 10 days. (15 marks)
(HKCEE 1981)

2 The diagram below shows a model constructed to represent the structures of certain parts of a flowering plant. It is used to demonstrate certain processes.

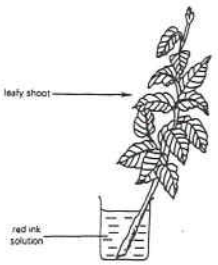


After the model was set up, the cotton wool in the plastic tube gradually became red. The model was placed in different locations and its loss in weight was recorded in the table below:

Experiment	Location of the model	Loss in weight ($g\ h^{-1}$)
I	on a bench	1.0
II	under an electric fan	1.8
III	inside a plastic bag	0.1

(i) Name the structures of the flowering plant represented by
(1) the plastic sheet,
(2) the pores in the plastic sheet, and
(3) the blotting paper.
(ii) What life processes are being demonstrated as revealed by
(1) the colour change of the cotton wool, and
(2) the weight loss of the model?
(3) Why is there a loss in weight in Experiment I?
(4) Explain the differing results from Experiments II and III. (10 marks)
(HKCEE 1982)

3. In order to determine the path and rate of ascent of water in the leafy shoot of a herbaceous plant, a student set up an experiment as shown in the diagram below:



Three hours later, cross-sections of the shoot were cut, starting from the top end, until red ink appeared in the cut section. The length of the remaining shoot in the beaker was measured 15cm.

(i) State and explain the precaution that should always be taken in preparing, the shoot for this experiment.
(ii) Name two causes which are responsible for the ascent of the solution in the shoot.

(iii) Name the tissue in the cut section that was stained red.
(iv) What was the approximate rate of ascent of the solution?
(v) State and explain how the results would differ if the experiment were performed in a brighter location.
(vi) The remaining leafy shoot, together with a strip of the epidermis taken from one of its leaves, were then transferred to a concentrated salt solution and left there overnight.
(1) How would the shoot appear on the following morning?
(2) Draw a labelled diagram to show how one of the epidermal cells would appear under a microscope.
(HKCEE 1983)

4. In an experiment to study osmosis in plant cells, seven similar strips cut from a fresh potato were put in sucrose solutions of different concentrations for three hours. The percentage change in mass in each strip was calculated according to the following formula:

$$\frac{\text{final mass} - \text{initial mass}}{\text{initial mass}} \times 100\%$$

The results obtained are shown in the table below:

Concentration of sucrose solution (%)	Percentage change in mass
0 (water)	+20.0
5	+6.0
10	−7.0
15	−20.0
20	−33.5
25	−40.6
30	−43.6

(i) Use graph paper to draw a curve to show the above results.
(ii) Give an appropriate title to your graph in (i).
(iii) From your graph, find the sucrose concentration at which there is no net water movement in or out of the potato cells.
(iv) If each potato strip used were cut into an equal number of smaller pieces before immersion, state and explain what advantage would be gained by doing this.

(v) Explain why boiled potato strips should not be used in the experiment. (9 marks)
(HKCEE 1984)

5. An experiment was conducted to study the relationship between the rate of transpiration and the number of stomata on a dorsi-ventral leaf from two plants, A and B. A student placed identical strips of dry cobalt chloride papers on both surfaces and recorded the time taken for the paper to change colour. The number of stomata on the epidermis of the leaves was then counted. The results obtained are shown in the table below:

Plant	A		B	
Leaf surface	upper	lower	upper	lower
Time(minutes) taken for cobalt chloride paper to change colour	7	1	more than 60	6
Number of stomata / mm^2	0	170	0	10

(i) Draw a labelled diagram to show the appearance of a stoma and its neighbouring cells on a leaf surface as seen under the high power magnification of a microscope.
(ii) Why should identical strips of cobalt chloride paper be used?
(iii) State the colour of the cobalt chloride paper
(1) when dry.
(2) when wet.
(iv) Give one possible reason why the rate of transpiration from the upper leaf surface of plant A is much greater than that of plant B.
(v) State the conclusion that could be drawn from the results shown by the lower leaf surfaces of plants A and B.
(vi) In what type of terrestrial habitat would you expect to find plant B?
(HKCEE 1985)

6. The following experiment was performed to investigate the effects of sucrose solution on the appearance of epidermal cells of a leaf. Eight similar strips of leaf epidermis were put separately into sucrose solutions of different concentrations. After 10 minutes, each strip was mounted on a microscope slide with a drop of the solution in which it had been immersed. When an area covering about 20 cells from each strip was examined under the microscope, the number of plasmolysed cells was counted. The results are shown in the table below:

Sucrose concentration ($mol\ dm^{-3}$)	Number of plasmolysed cells	Total number of cells examined
0.00	0	22
0.05	0	20
0.10	0	18
0.15	1	20
0.20	3	20
0.25	16	20
0.30	19	19
0.35	21	21

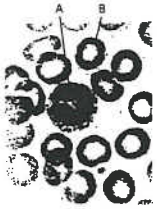
(i) Why should the epidermal strips be kept in the sucrose solutions for at least 10 minutes before being examined under the microscope? (1 mark)

(ii) Plot a graph of the percentage of plasmolysed cells against the concentration of sucrose solution. (4 marks)

(iii) From the graph in (ii), find the percentage of plasmolysed cells when the sucrose concentration is 0.22 mol dm 3. Explain fully why at this concentration some cells were plasmolysed while others were not. (5 marks)

(HKCEE 1988)

7. Photomicrograph 1 shows some cells of a human blood smear.
Photomicrograph 2 shows some cells of an onion epidermis.



Photomicrograph 1

Photomicrograph 2

(i) With reference to the photomicrographs only, state TWO structural differences between cell A and cell C. (2 marks)

(ii)

(1) The central part of cell B looks lighter in colour. Explain this with reference to its shape. (2 marks)

(2) How is this shape related to its function? (2 marks)

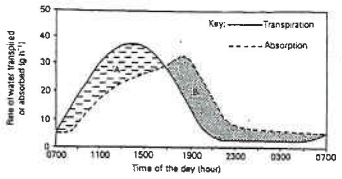
(iii) Cell A is found in large numbers in wounds. What is the function of cell A there? (1 mark)

(iv) Describe and explain what would happen if cell B were put into a concentrated sugar solution for 20 minutes.(2 marks)

(v) Make a labelled drawing of cell C if the onion epidermis were put into a hypertonic solution for 20 minutes. (3 marks)

(HKCEE 1991)

8. The graph below shows the rates of water absorption and transpiration of a plant during a 24-hour period:



(i) Describe and explain the changes in the rates of water absorption and transpiration of the plant in relation to the relative size of the stomatal pores at 1300 hours and 2100 hours. (4 marks)

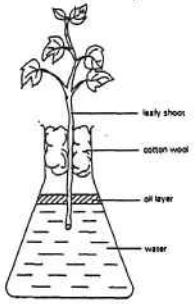
(ii) Explain why area B must be larger than that of A if the plant is to grow normally. (3 marks)

(iii) State one structural feature which enables the guard cells to regulate the size of a stoma. (1 mark)

(iv) Name a structure on the human skin having a function similar to that of the stomata in plants. State this function. (2 marks)

(HKCEE 1992)

9. The experimental set-up shown below is used to study the effect of different environmental factors on the rate of water loss of a leafy shoot:



(i) Briefly describe how you can make use of this set-up to measure the rate of water loss of the leafy shoot. (3 marks)

(ii) What is the purpose of adding a layer of oil on top of the water? (1 mark)

(iii) The set-up was put under different environmental conditions and the rates of water loss were measured. The results were as follows:

Environmental conditions	Rate of water loss ($g\ h^{-1}$)
(A) sunny and humid	14
(B) sunny and dry	32
(C) dark and dry	8

(1) Explain the difference in the rates of water loss under conditions A and B. (2 marks)

(2) With reference to the results shown in the table, what can you conclude about the effect of light on the rate of water loss? Explain how light produces such an effect. (3 marks)

(HKCEE 1993)

10.

(iii) Explain why more water vapour is lost through leaves during the daytime than at night. (3 marks)

(HKCEE 1994)

11. A 10 cm long potato strip was placed in a sugar solution. Its length was measured at regular intervals over a period of 3 hours. The results are shown is the table below

Time (hour)	Length of the potato strip (cm)
0	10.0
0.5	9.7
1.0	9.4
1.5	9.1
2.0	8.9
2.5	8.8
3.0	8.8

(i) Present the results in the form of a graph which should have a suitable title. (3 marks)

(ii) Explain the change in length of the potato strip in the first hour. (4 marks)

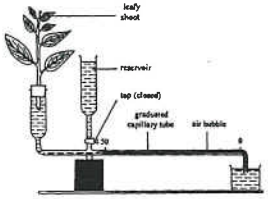
(iii)

(1) From your graph, find the period of time during which the length of the potato strip remained unchanged. (1 mark)

(2) Explain why there was no change in length during this period. (2 marks)

(HKCEE 1994)

12. The diagram below shows a set-up used to compare the rate of water loss from a leafy shoot at different light intensities:



At each light intensity, the initial and final positions of the air bubble were recorded as shown below:

Light intensity (arbitrary unit)	Initial position of bubble (mm)	Position of bubble after 10 minutes (mm)
10	0	15
20	2	22
30	1	26
40	3	33

(i) Explain why the air bubble moved during the experiment. (2 marks)

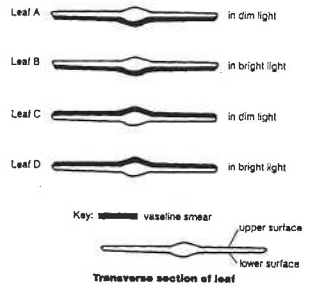
(ii) Calculate the tale of water loss at different light intensities in terms of the distance travelled by the bubble per minute. Present your results in a table. (3 marks)

(iii) Based on the experimental results, explain the effect of light intensity on the rate of water loss. (3 marks)

(iv) How would you adjust the position of the bubble before taking a stew set of readings? (1 mark)

(HKCEE 1996)

13. An experiment was carried out to study the rate of water loss from the leaves of a plant under different conditions. Four similar leaves A, B, C and D were detached. For each leaf, the area of one surface was estimated to be 100 cm^3. The four leaves were then smeared with vaseline and put under different light conditions as shown in the diagrams below: (To illustrate the treatments, only the transverse sections of the leaves are shown.)

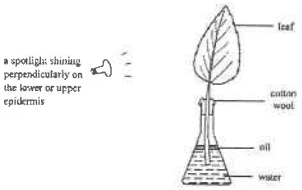


The initial mass of the leaves and their mass after 1 hour of light treatment were measured and the results are shown in the table below:

Leaf	Initial mass of leaf (g)	Mass of leaf after 1 hour (g)
A	9.2	9.0
B	9.4	8.8
C	9.5	9.4
D	9.1	8.9

(i) Name the biological process by which the leaves lose water. (1 mark)
(ii) Describe how the area of one surface of a leaf can be estimated. (2 marks)
(iii) Calculate the rate of water loss of each leaf in terms of the decrease in mass per unit area per hour. Present your results in a table. (2 marks)
(iv)
(1) Based on your calculations in (iii) above, state which leaf surface lost water at a faster rate in bright light. (1 mark)
(2) Suggest one structural feature of this leaf surface which would result in a faster rate of water loss. (1 mark)
(3) Explain the effect of light intensity on the rate of water loss of the leaf. (3 marks)
(HKCEE 1997)

14. The following experiment was carried out under daylight conditions using a leaf freshly removed from a land plant:



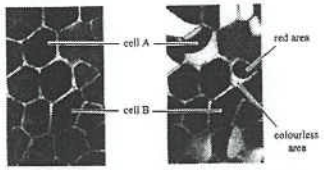
The initial mass of the set-up and its mass after 1 hour were measured. The results are shown in the table below:

Treatment	Surface illuminated by spotlight	Initial mass (g)	Mass after 1 hour (g)
I	lower epidermis	80.6	78.2
II	upper epidermis	78.0	77.4

(i) What is the change in mass of the set-up
(1) in treatment I,
(2) in treatment II? (2 marks)
(ii) What is the purpose of this experiment? (2 marks)
(iii) Given that stomata are only present on the lower epidermis of the leaf, suggest an explanation to account for the results of the experiment. (5 marks)
(iv) Briefly describe how you would demonstrate that stomata are only present on the lower epidermis. (2 marks)
(HKCEE 1999)

15. To study the effect of sucrose solution on plant cells, a student used the lower epidermis of a *Rhoeo discolor* leaf, the cells of which contain a red pigment. He mounted a piece of the lower epidermis in a sucrose solution. He then observed the epidermis under the microscope immediately and after 10 minutes.

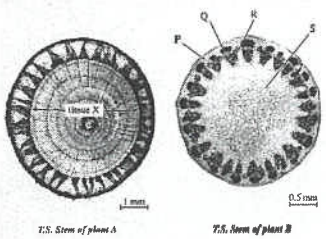
The photomicrographs below show the conditions of the same epidermal cells under the low power of the microscope:



Immediately after mounting 10 minutes after mounting

(i) Describe and explain the change in the appearance of cell A 10 minutes after mounting. (4 marks)
(ii) Suggest a reason why cell B did not show the same change as cell A. (1 mark)
(iii) The student wanted to examine cell A under the high power of the microscope.
(1) State one action that he might need to take before turning to the high power objective. (1 mark)
(2) State two actions that he might need to take after turning to the high power objective. (2 marks)
(HKCEE 2000)

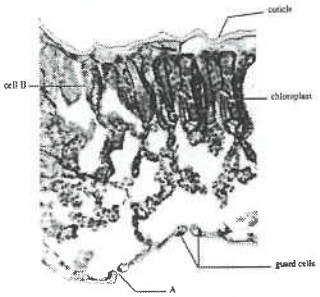
16. The photomicrographs below show the transverse sections of stems taken from two plants:



T.S. Stem of plant A T.S. Stem of plant B

(i)
(1) Name tissue X. (1 mark)
(2) Explain one way in which the cells in tissue X are structurally adapted to the function of transport. (2 marks)
(ii) Which region(s) (P, Q, R or S) in the stem of plant B contains tissue X? (1 mark)
(HKCEE 2001)

17. The photomicrographs below show part of the transverse section of the leaf blade of a terrestrial dicotyledonous plant and that of a moss:

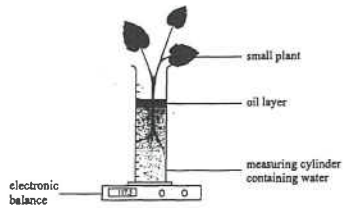


T.S. of the leaf blade of the dicotyledonous plant (magnification x100)

T.S. of the leaf blade of the moss (magnification x200)

(i)
(1) Name structure A. (1 mark)
(2) Explain one way in which A contributes to the function of cell B under bright sunlight. (2 marks)
(ii) The moss above is restricted to damp and shady environments and it is often covered with a thin film of water.
(1) With reference to the leaf structures shown in the two photomicrographs, suggest two reasons why the moss cannot grow well in dry environments. (4 marks)
(2) Describe how the moss leaf obtains oxygen from the atmosphere at night. (3 marks)
(HKCEE 2002)

18. The diagram below shows a set-up used to study the water balance of a small plant. The whole set-up was put in a well-ventilated and well- illuminated room for 8 hours.

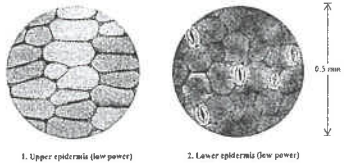


The initial and final readings in the measuring cylinder and the balance are tabulated below:

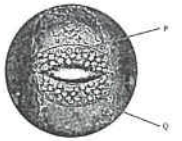
	Initial reading	Final reading	Change in reading
Water level in the measuring cylinder (cm^3)	45.0	43.5	*x*
Reading of the balance (g)	117.5	116.3	*y*

(i)
(1) Find values x and y. (1 mark)
(2) With reference to the water balance of the plant, what do x and y represent respectively? (2 marks)
(3) Compare values x and y. Explain the significance of their difference to the healthy growth of the plant. (3 marks)
(Given: 1 cm^3 of water weighs 1 g)
(ii) Predict, with reasons, the change in value x if the study is repeated with the leaves of the plant smeared with vaseline on both surfaces. (4 marks)
(HKCEE 2002)

19. Mary examined the epidermis of the leaf of a land plant under the microscope. The photomicrographs below show the appearance of the upper and lower epidermis under different magnifications



1. Upper epidermis (low power) 2. Lower epidermis (low power)



3. Lower epidermis (high power)

(i) Using the information provided in photomicrograph 2, calculate the stomata) density (i.e. number of stomata per unit area) of the lower epidermis. (Take It = 3.14) (2 marks)

(ii) Compare the stomatal density of the upper and lower epidermis of the leaf. Explain the significance of this pattern of stomata] distribution to the plain when it is under direct sunlight. (3 marks)

(iii) Name structures P and Q. (2 marks)

(iv) Under certain conditions, the stomata of the leaves may become closed during daytime Explain how this would affect the rate of photosynthesis of the plant. (2 marks)

20. In 1890, a German scientist named Eduard Strasburger conducted an experiment to study the transport of water in plants. He cut the stem of a woody plant and immersed the cut end in a poisonous solution. Upon contact, the poisonous solution killed all living cells in its way.

(i) Strasburger found that the plant continued to take up 30 litres of solution and transport the solution up to a height of 20 metres in two weeks. Based on his findings, what conclusion can you draw regarding the cells involved in water transport? (1 mark)

(ii) Based on present day knowledge of the mechanism of water transport in plants, explain why the treated plant can continue to transport the solution up the stem. (3 marks)

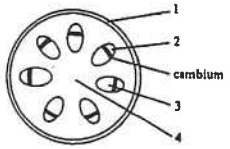
(iii) Describe how you would carry out an investigation with a small dicotyledonous plant that allows you to identify the cell type for water transport. (3 marks)

(iv) Explain why the cut stem of the woody plant can remain upright even after the cells had been killed by the poisonous solution. (2 marks)

(HKCEE 2006)

Past HKCEE Questions
Water and Organisms
Paper II

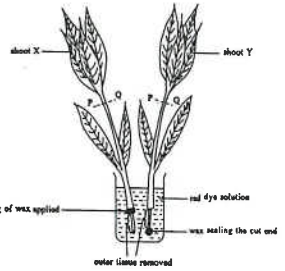
92.
Directions: Questions 3 and 4 refer to the diagram below which shows a transverse section of a young dicotyledonous stem:



92-3
Which region is made up of cells with the thickest cell wall?
A. 1
B. 2
C. 3
D. 4

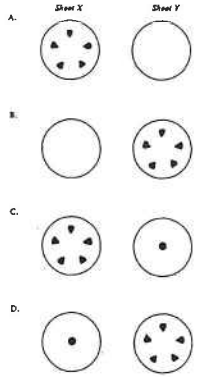
92-4
Which region is responsible for the transport of organic nutrients?
A. 1
B. 2
C. 3
D. 4

94.
Directions: Questions 21 and 22 refer to the diagram below which shows two woody shoots taken from the same plant. The shoots were ringed by removing a ring of the outer tissue at the lower part. Wax was applied to shoot X and shoot Y in the positions shown in the diagram. Both shoots were then placed in a rat dye solution.

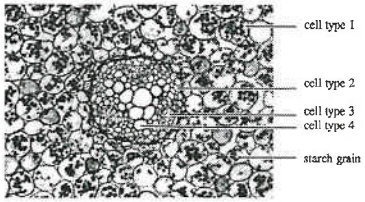


94-21
After one hour, the leaves of shoot X remained upright while those of shoot Y wilted. Which of the following may be deduced from this observation?
A. The xylem in the shoots had been removal.
B. The leaves of the shoots were mainly supported by turgid cells.
C. Food in the leaves of shoot Y was transported away through the phloem.
D. Water in the leaves of shoot Y moved to the dye solution by osmosis.

94-22
Sections were then cut across the shoots at region PQ and examined under a low-powered microscope. Which of the following shows the most probable location of the red colour?
(Key: ■ red colour)



99.
Directions: Questions 4 and 5 refer to the photomicrograph below, which shows part of a section of a young root:

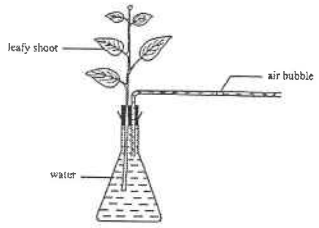


99-4
Which type of cells cannot break down food to release energy?
A. cell type 1
B. cell type 2
C. cell type 3
D. cell type 4

99-5
Which of the following correctly states the functions of cell types 1 and 4?

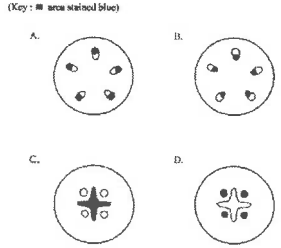
	Cell type 1	*Cell type 4*
A.	photosynthesis	food transport
B.	photosynthesis	water transport
C.	food storage	food transport
D.	food storage	water transport

99-21

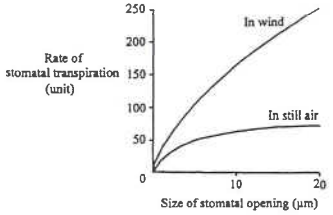


In the set-up above, the rate of movement of the air bubble measures
A. the rate of osmosis.
B. the rate of transpiration.
C. the rate of active transport.
D. the rate of water absorption.

99-29
Mary bought a bunch of blue flowers from the market. In order to find out whether the colour was artificially introduced or not, she prepared a section of the stem and observed it under the microscope. Which of the following correctly shows the condition of the section if the colour of the flowers was artificially introduced?

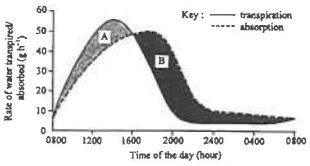


00-14
The graph below shows the relationship between the rate of stomatal transpiration and the size of stomatal opening of a plant:



Which of the following can be concluded from the graph?
A. The stomata open wider under windy conditions.
B. Air movement reduces the relative humidity of air.
C. The wider the stomata, the higher the rate of transpiration.
D. The rate of water absorption of the plant is lower in still air.

00
Directions: Questions 17 to 19 refer to the graph below, which shows the rates of transpiration and water absorption of a plant for a period of 24 hours:

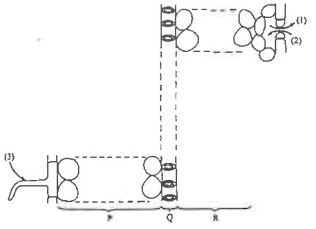


00-17
The change in transpiration rate of the plant from 0800 to 1400 hour was most likely caused by an increase in
A. the rate of water absorption of the plant.
B. the rate of photosynthesis of the plant.
C. air movement.
D. air temperature.

00-18
The rate of water loss from the plant was higher than its rate of water uptake at
A. 0800 hour.
B. 1200 hour.
C. 1600 hour.
D. 2000 hour.

00-19
Area B was found to be greater than area A. A probable reason for this is that
A. the relative humidity of air was high.
B. the plant could absorb moisture from the air.
C. new cells were formed by the plant during plant growth.
D. the respiration rate of the plant was higher than its photosynthetic rate.

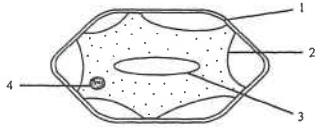
00.
Directions: Questions 30 and 31 refer to the diagram below, which is a diagrammatic representation of the root and the leaf of a plant:



00-30
The direction of oxygen diffusion between the plant and the surroundings under bright daylight is indicated by
A. (1) only.
B. (2) only.
C. (1) and (3) only.
D. (2) and (3) only.

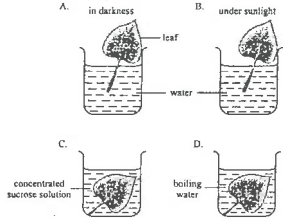
00-31
When the plant is deficient in water, which cell type(s) is/are important for supporting the plant?
A. Q only
B. P and Q only
C. P and R only
D. P, Q and R

01.
Directions: Questions 31 and 32 refer to the diagram below, which shows a cell in the lower epidermis of a leaf:

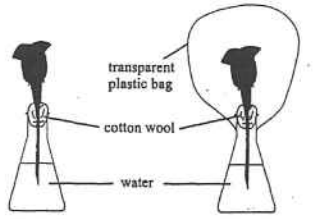


01-31
Which structure allows dissolved substances to pass through freely?
A. 1
B. 2
C. 3
D. 4

01-32
The lower epidermis was taken from a leaf that had been kept under one of the following conditions for 30 minutes. Under which condition was the leaf kept?



01.
Directions: Questions 52 to 54 refer to the diagram below, which shows two experimental set-ups. Two shoots with flower buds were used and after two days, the buds in both shoots developed into flowers.



The mass of each shoot and the whole set-up were recorded at the beginning of the experiment and after two days. The table below shows the measurements taken:

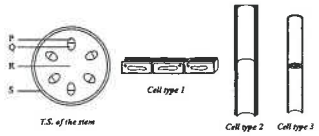
	Mass at the beginning (g)		Mass after 2 days (g)	
	Whole set-up	Shoot	Whole set-up	Shoot
Set-up 1	182.41	5.75	179.10	7.29
Set-up 2	183.86	5.78	183.63	7.38

01-52
The change in mass of the whole set-up 1 during the experiment was mainly caused by
A. respiration.
B. photosynthesis.
C. transpiration.
D. water absorption.

01-53
The change in mass of the shoots during the experiment was due to
A. growth.
B. respiration.
C. evaporation.
D. mineral absorption.

01-54
Based on the results of this experiment, which of the following is a probable conclusion?
A. Transpiration facilitates mineral absorption.
B. Water gained by the shoot is increased by transpiration.
C. The rate of photosynthesis is higher than the rate of respiration.
D. The growth of the buds into flowers is not affected by transpiration.

02.
Directions: Questions 43 to 45 refer to the diagrams below, which show the transverse section of the stem of a young herbaceous plant and three types of cells found in it



02-43
Which of the following correctly lists the location of the three types of cells in the stem?

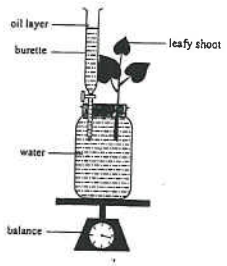
	Cell type 1	Cell type 2	Cell type 3
A.	R	P	Q
B.	S	P	Q
C.	R	Q	P
D.	S	Q	P

02-44
Which of the following comparisons between cell types 2 and 3 is Incorrect?

	Cell type 2	Cell type 3
A.	dead cells	living cells
B.	without end walls	with end walls
C.	for transporting inorganic minerals	for transporting organic substances
D.	direction of transport is downwards	direction of transport is upwards

02-45
On a hot dry day, the young plant wilted and its stem bent. This is due to the loss of water from
A. P.
B. Q.
C. R.
D. S.

03.
Directions: Questions 19 and 20 refer to the set-up below:



03-19
In order to find out the rate of water absorption of the leafy shoot, which of the following data are required?
(1) duration of the study
(2) total surface area of the leaves
(3) change in the reading of the balance
(4) change in the water level in the burette
A. (1) and (3)
B. (1) and (4)
C. (2) and (3)
D. (2) and (4)

03-20
The change in the reading of the balance would be largest if the set-up is placed in
A. a hot and bright condition.
B. a cold and humid condition.
C. a cool and dark condition
D. a warm and still-air condition.

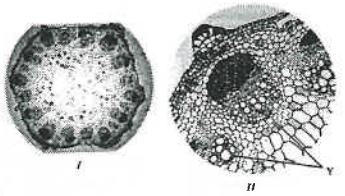
04-04
A student examined the distribution of stomata in the leaves of three different plants: a land plant with broad leaves, a water plant with -floating leaves and a water plant with submerged leaves. The results are shown below:

Plant	Stomatal density (number per mm²)	
	Upper epidermis	Lower epidermis
P	30	0
Q	0	0
R	12	35

Which of the following correctly identifies the three plants?

	Land plant	*Water plant with floating leaves*	*Water plant with submerged leaves*
A.	P	R	Q
B.	Q	P	R
C.	R	Q	P
D.	R	P	Q

Directions: Questions 13 and 14 refer to the photomicrographs below, which show the cross section of a stem under different magnifications:



04-13
A student first focused on the section under the microscope and saw the section as shown in I. In order to see the section as shown in II, the following steps are required. Arrange them in the correct sequence.
(1) Turn the nosepiece for an objective of higher magnification.
(2) Turn the coarse adjustment knob / fine adjustment knob.
(3) Adjust the position of the section on the stage.
A. (2), (1), (3)
B. (2),(3), (1)
C. (3), (1), (2)
D. (3), (2), (1)

04-14
What is the function of cell type Y?
A. to conduct sugar away from the leaves
B. to maintain turgidity of the stem
C. to transport mineral salts
D. to store starch

04-17
On a hot summer afternoon, the shoot of a herbaceous plant may become wilted for several hours and most stomata of its leaves are closed. What is the advantage of the stomatal closure to the wilted plant?
A. to reduce the transpiration rate
B. to reduce the rate of gaseous exchange
C. to cut down water absorption from the root
D. to avoid further increase in leaf temperature

04-18
Referring to question 17, the wilted plant usually restores its upright appearance in the late afternoon. This is because
A. the stomata become opened.
B. the photosynthetic rate drops.
C. the transpiration rate decreases.
D. the respiratory rate increases.

04-46
Which of the following correctly compares the transport of substances in the xylem and phloem?

	Transport in xylem	*Transport In phloem*
A.	occurs in dead cells	occurs in living cells
B.	transports sugars	transports amino acids
C.	occurs both day and night	occurs only at night
D.	transports substances in two directions	transports substances in one direction only

05-9
Which of the following correctly matches the cell types with their features?

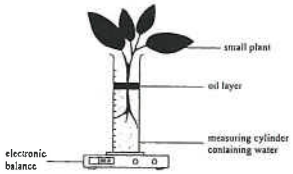
	Cell type	Feature
(1)	xylem vessel	tube-like cell with no nucleus
(2)	mesophyll cell	thin-walled cell with chloroplasts
(3)	root epidermal cell	thin-walled cell with cuticle

A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

05-42
Carbohydrate produced in leaves during photosynthesis can be carried to the roots for storage. What is the form of carbohydrate transported and the path involved?

	Form of carbohydrate	*Path of transport*
A.	sugar	xylem
B.	sugar	phloem
C.	starch	xylem
D.	starch	phloem

Directions: Questions 47 and 48 refer to the set-up below, which is used to study the water balance of a small plant:

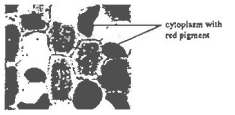


After 5 hours, the following results are recorded: Change in reading of the electronic balance = p gram Change in water level in the measuring cylinder = q cm^3 where p and q represent the magnitude of the change (Given: mass of 1 cm^3 of water = 1 gram)

05-47
Which of the following represents the amount of water retained by the plant in 5 hours?
A. *p*
B. *q*
C. *p-q*
D. *q-p*

05-48
The value p will be the highest when the set-up is put under
A. a bright and windy condition.
B. a bright and humid condition.
C. a dark and humid condition.
D. a dark and windy condition.

06-28
The photomicrograph below shows the appearance of the epidermal cells of a plant after they have been immersed in a sugar solution for an hour. The cytoplasm of the epidermal cells contains a red pigment. The colour intensity and distribution of pigment of different cells vary due to different rates of water loss.



Source: Acadia University, *Biodiversity of Plants and Algae Lab Images*, URL: [illegible]

The rate of water loss varies because
A. the cells have just started to lose water and have not yet reached equilibrium.
B. individual cells are located at different distances from the sugar solution.
C. the cells have different water potentials.
D. the cells have vacuole of different sizes.

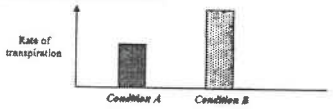
07-01
Which of the following correctly compares a leaf epidermal cell and a root hair cell of a flowering plant?

	Leaf epidermal cell	Root hair cell
A.	with cuticle	without cuticle
B.	with chloroplast	without chloroplast
C.	without vacuole	with vacuole
D.	without mitochondria	with mitochondria

07-02
Which of the following features enables a plant to survive successfully in a shady environment?

A. stem with more lenticels
B. stein with less supporting tissue
C. leaf with very broad and flat leaf blade
D. leaf with similar stomatal density on both surface

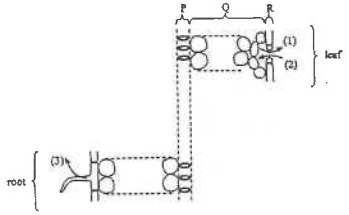
07-44
The graph below shows the transpiration rates of the same plant put under two different environmental conditions.



Which of the following is an unlikely combination of the conditions being studied?

	Condition A	Condition B
A.	still air	moving air
B.	air temperature 15°C	air temperature 25°C
C.	relative humidity 98%	relative humidity 75%
D.	0.03% carbon dioxide in air	0.01% carbon dioxide in air

07
Directions: Questions 46 and 47 refer to the diagram below, which shows a diagrammatic representation of the root and the leaf of a herbaceous plant:



07-46
The direction of carbon dioxide diffusion between the plant and the surroundings under bright daylight is indicated by

A. (1) only.
B. (2) only.
C. (1) and (3) only.
D. (2) and (3) only.

07-47
Which cell type(s) is / are important for supporting the plant?
A. P only
B. P and Q only
C. Q and R only
D. P, Q and R

Past HKCEE Questions
Water and Organisms
Suggested Answers

Paper I

1. (i) upwards 1
food must be supplied for the development of the bud 1
especially when there is no photosynthesis in darkness 1
(ii) Sucrose / sugars 1
(iii) phloem 1
(iv) above B - swollen 1
food above B cannot be transported downwards 1
so food accumulates there to form the swelling 1
stem below B - using up its reserved food without replenishment 1
(v) xylem 1
(vi) refer to the table below 4

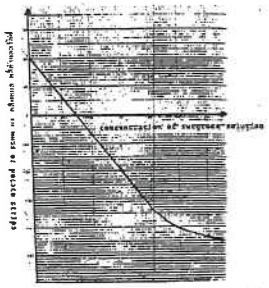
Observation (1 mark each)	Reasons (1 mark each)			observation max. 2
	(1)	(2)	(3)	
wilt	water transpired from leaves > water absorbed	causing plasmolysis of cells	tissue becomes flaccid	reason max. 2
turn yellow		no photosynthesis	reduced chlorophyll formation	
shed off	by root	to cut down water loss		

2. (i) (1) upper and/or lower epidermis
(2) stomata / stoma
(3) palisade and 1
spongy cells 1
(OR mesophyll, 2 marks)
(ii) (1) Transpiration pull / water translocation 1
(2) Transpiration 1
(iii) Evaporation 1
(iv)

Experiment	II	III	
Difference	faster / greater	slower / less	1 (either)
Explanation	wind blows away water vapour	air inside bag is saturated with water vapour	1 + 1

3. (i) cut lower end of shoot under red ink solution 1
to avoid entry of air bubbles / air blocking 1
(ii) capillarity 1
transpiration pull 1
(iii) * xylem 1
(iv) 15/3 or 5 1
cm/hr 1
(v) higher rate of ascent 1
owing to increase in stomatal aperture / increase in transpiration 1
(vi) (1) leaves showing wilting / drooping 1
(2) drawing: plasmolysed cell 1
labels:
cell wall + protoplasm 0.5
cytoplasm 0.5

4. (i) correct axis/ axes 1
at least FIVE points correctly plotted 1
joining up the points to form a smooth curve 1



(ii) N.B. Title given must correspond to the graph drawn
The relationship between (OR the variation of) percentage change in mass of potato strips and concentration of sucrose solutions
OR The percentage change in mass of potato strips against (OR versus) sucrose concentration 1

(e.g.)

(i) axis	(ii) title	marks
correct	correct (y against x)	1, 1
correct	wrong (e.g. x against y)	1, 0
wrong	corresponds to axes in graph	0, 1
wrong	does not correspond to axes in graph	0, 0

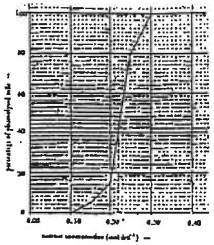
(iii) 7.5% (accept answers within the range of 7-8%) 1
(iv) shorten the time to achieve results 1
because surface area increased for water movement 1
(v) boiling destroyed cell membrane / membrane permeability 1
no osmosis 1

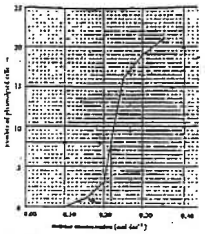
5. (i) Labels: (any 6) (0.5 x 6 = 3 max.) 3
epidermal cell, stomatal aperture / stoma, guard cells, nucleus, chloroplast, vacuole, cytoplasm, cell membrane, thick / inner wall, thin / outer wall (cell wall)
Diagram accuracy: 0.5
kidney-shaped 0.5
thick and thin regions of the cell wall
(ii) to make the covered areas a equal for al for comparison 1
(iii) (1) blue 1
(2) red / pink 1
(iv) A has thinner cuticle 1
(v) the rate of transpiration is proportional to the number of stomata 1
(vi) dry / arid / desert 1

6. (i)
- to ensure enough time is provided such that no net movement of water between the cells and the surrounding solution will take place
- the cells reach osmotic equilibrium with the surrounding solution

any 1 1

(ii) correct choice of axis with labels 1
correct percentage of plasmolysed cell (accept number of plasmolysed cells) 1
correct plotting of all points 1
joining up all the points (provided that the general shape of the graph is correct) 1





(iii) 40 ± 2 % 1
the cell sap of some cells had a higher water potential / water concentration than the surrounding sucrose solution 1
therefore water passed out of the cells by osmosis and the cells became plasmolysed 1
the cell sap of other cells had a lower water potential / water concentrations than the surrounding solution
therefore water passed into the cells by osmosis, and the cells 1
were not plasmolysed 1
[The cells were at different water potentials: 1 mark only]

7. .(i)

Cell A	Cell C	
round shape	angular shape	any 1, 1 2 pairs
no cell wall	has cell wall	
nucleus: large / irregular-shaped / lobed / centrally placed	nucleus: small / round / peripherally placed	
no vacuole	has vacuole	

(N.B. No comparison, no mark)

(ii) (1) The cell is a bi-concave disc 1
The central part contains less cytoplasm 1

(2) this provides a large surface area to volume ratio / shorter diffusion path 1
to facilitate diffusion of gases 1

(iii) to kill / engulf germs 1
(iv) The cell will shrink / become crenated 1
because water tends to move out by osmosis. 1
(v) Drawing:
showing the plasmolysed condition 1
quality of drawing e.g. resemblance to the cell shown, double-lined cell wall 1
labels: *cell wall, *cell membrane, *cytoplasm, *nucleus, *vacuole
(any 2 labels) (0.5 x 2) 1

8. (i) At 1300 hour the transpiration rate is high because the stomatal pores are widely open 1
The resulting high transpiration pull increases the rate of water absorption 1
At 2100 hour, the transpiration rate is low because the stomatal pores are small / closed 1
This leads to a decrease in the rate of water absorption 1
OR
The stomata are more widely open at 1300 hour than that at 2100 hour 1
Transpiration therefore occurs at a faster rate 1
The resulting larger transpiration pull 1
leads to a higher absorption rate 1
(ii) Areas A and B represent either the net amount of water lost or gained during the specified period of time 1
Area B larger than Area A means that there is a net gain of water over the 24-hour period 1
The net gain of water is essential for various life processed e.g. formation of new cells, photosynthesis, etc. 1
(iii) thicker inner cell wall and thinner outer wall / kidney-shaped 1
(iv) sweat pores / glands / blood capillaries prevent overheating 1

9. (i) Weigh the whole set-up at the beginning of the experiment 1
Over a period of time, weigh the set-up again to find the difference in weight 1
The loss in weight divided by the time elapsed equals to the rate of water loss by the leafy shot 1
(ii) To prevent water evaporating from the water surface 1

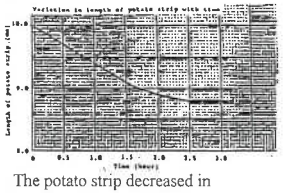
(iii) (1) In a humid condition, the diffusion gradient of water vapour between the air spaces in the leaf and the atmosphere is smaller than that in a dry condition. 1
Water vapour diffuses slowly to the atmosphere. 1
(2) Comparing (B) and (C), the rate of water loss in light (sunny) condition is higher than that in dark condition. 1
2

Any one set below: (1+1)
- It is because the stomata open in the presence of light
- facilitating the diffusion of water vapour through the stomatal pores

Or
- Leaf temperature is increased in the presence of light
- so the water evaporates faster

10. (iii) During daytime, stomata open in the presence of light 1
Temperature of air is higher / the relative humidity of air is lower / the rate of evaporation is faster 1
Water vapour diffuses faster / diffuses along a steeper concentration gradient through the stomatal pore 1

11. (i) title 1
correct choice of axes 1
correct labelling of axes with units 1
correct plotting and joining of all points 1



(ii) The potato strip decreased in length 1
This indicates that the potato cells were at a higher water potential than the sugar solution 1
Water moved out of the potato cells 1
The potato cells shrank in size / cells became less turgid. 1

(iii) (1) hour 2.5 to 3 1
(If the starting time lies between hour 2-2.5, must refer to the graph plotted)
(2) It is because the water potential of potato cells became equal to that of the sugar solution 1
There was no net water movement in and out of the cells (accept: no osmosis or no diffusion) 1

12. (i) As the plant lost water by transpiration / evaporation, 1
it absorbed water from the set-up, 1
so the air bubble moved towards the left.

(ii)

Light intensity (arbitrary unit)	Rate of water loss (mm min^{-1})
10	1.5
20	2.0
30	2.5
40	3.0

Rate of water loss at different light intensities

Results presented in a table with proper headings and units 1
Correct results (4 x 0.5) 2

(iii) The rate of water loss increased with an increase in light intensity 1

Reason: (any one set)
- The temperature increased at 1
- higher light intensity so the rate of diffusion of water / evaporation became faster 1

Or
- The stomatal pore increased in size at higher light intensity set 1
- so the rate of diffusion of water vapour became faster

Effective communication (c)

(iv) Open the tap of the reservoir until the bubble moved to the desired position 1

13. (i) *Transpiration 1
(ii) Trace the outline of the leaf on a graph paper 1
then count the number of (1 cm^2) squares within the outline 1
(No mark if the method is not workable)
(Deduct 0.5 mark if multiply the area by 2)

Leaf	Rate of water loss (g cm^{-2}h^{-1})
A	0.002
B	0.006
C	0.001
D	0.002

Correct results (1 or 0) 1
Results presented in table form with proper headings and units (0.5, 0.5) 1

(iv) (1) the upper surface
(2) • There are more stomata on the upper surface of the leaves
• The cuticle on the upper surface is thinner
Any one 1

(3) The rate of water loss increased at higher light intensity
Reason: (any one set below)
- The stomatal pore opened wider at higher light intensity 1
- so the rate of diffusion of water vapour became faster 1

OR
- The temperature set increased at higher light intensity
- so the rate of diffusion of water / evaporation became faster 1

1

14. (i) (1) mass decreases by 2.4 g 1
(2) mass decreases by 0.6 g 1
(Deduct 1 mark once if no unit is given)

(ii) any one set below: (1+1) 2
- To study the effect of direct illumination on the lower or upper epidermis
- on the rate of transpiration of the leaf

OR
- To compare the rate of transpiration of the leaf
- when the lower epidermis is illuminated by the spotlight with that when the upper epidermis is illuminated

(iii) Any one set below (5) 5

- The decrease in mass in treatment I is greater than that in treatment II,
- thus indicating that the transpiration rate in treatment I is higher
- Due to direct illumination by the spotlight, the temperature of the lower epidermis in treatment I is higher than that in treatment II
- This leads to faster evaporation of water
- Water vapour diffuses out more rapidly through the stomata Thus the transpiration rate is higher in treatment I.

OR

- Due to direct illumination by the spotlight,
- stomata of the lower epidermis open more widely in treatment I than in treatment II
- The surface area for the diffusion of water vapour is greater
- so that diffusion of water vapour becomes faster
- Thus the transpiration rate is higher in treatment I.

(iv) any one set below: (1+1) 2

- Peel off the upper and lower epidermis
- and observe under the microscope whether stomata are only present on lower epidermis

OR

- Immerse the leaf in hot water
- and observe whether bubbles are released from the lower epidermis only

15. (i) The water potential of the cell sap of cell A is greater than that of the sucrose solution 1
Water moves out of the cell by osmosis 1
The vacuole shrinks in size 1

pulling the cytoplasm / cell membrane away from the cell wall 1 1

Effective communication (C)

(ii) The water potential of the cell sap of cell B may be the same / lower than that of the surrounding solution (accept other reasonable answers) 1

(iii) (1) Adjust the position of the slide until cell A is at the centre of the field of vision 1

(2) Adjust the diaphragm/condenser to increase the illumination of the slide 1
Turn the a adjustment knob until the cell is in focus 1

16. (i) (1) *xylem 1
Any one set (1 + 1) 2

Structural feature	Adaptation
The xylem vessels in X have no cell content / no end walls / large lumen	This allows a free flow of water inside
The xylem vessels in X have thick cell wall	This can prevent the collapse of the xylem vessels

(ii) Region R 1

17. (i) (1) Stoma 1

(2) It allows carbon dioxide to enter the leaf 1
for photosynthesis in cell B 1

(ii) (1) The moss leaf has no cuticle / no waterproof covering 1
And it is one-cell thick 1
so the surface area to volume ratio is large 1
This would lead to a high rate of water loss from the plant / so the moss would become dehydrated easily in dry environment 1

(2) Any one set below (1,1,1) 3

- Atmospheric oxygen dissolves into the water film on the moss leaf
- and then diffuses in
- through the entire surface of the leaf

OR

- At night, moss cells carry out respiration only and thus lower the oxygen concentration in the cells
- Atmospheric oxygen dissolves into the water film on the moss leaf
- diffuses into the leaf

18. (i) (1) x= 1.5 0.5
y= 1.2 0.5

(2) x represents the amount of water absorbed by the plant 1
y represents the amount of water transpired/lost by the plant 1

(3) Value x is larger than value y 1
This indicates that there is a net gain of water by the plant 1
The water gained is essential for various life processes 1
e.g. formation of new cells, photosynthesis, support, cellular metabolism, etc
Effective communication (C) 1

(ii) Value x would decrease 1
because vaseline blocks the stomata and the leaf surfaces 1
so the rate of transpiration would drop 1
As transpiration enhances the absorption of water 1
less water would be absorbed by the plant

19. (i) Stomatal density of lower epidermis = $5 / [3.14 \times (0.25)^2]$ 1
$= 25.48 mm^{-2}$ 1

(ii) The upper epidermis has a lower stomatal density than the lower epidermis / the upper epidermis has no stomata while the lower epidermis has stomata 1
This helps to reduce water loss / the rate of transpiration of the leaf 1
because the temperature at the upper epidermis is higher when the plant is under direct sunlight 1
effective communication 1

(iii) P: *chloroplast 1
Q: * cell wall 1

(iv) The closure of the stomata limits the diffusion / intake of carbon dioxide into the leaf 1
Thus the rate of photosynthesis of the plant is reduced 1

20. (i) Living cells are not required in the transport of water up the stem 1

(ii) Water is transported up the stem mainly by transpiration pull 1
which is resulted from a physical process and thus can occur outside living cells 1
The transport of water occurs in dead xylem vessels 1
which remains functional even in the treated plants 1

(iii) Immerse the cut end of the small plant in a dye solution 1
After a few hours, cut a thin section of the upper part of the stem 1
Identify the cell type stained by the dye under the microscope 1

(iv) The woody stem is mainly supported by mechanical strength / rigidity / hardness 1
of the thick-walled cells / xylem vessels 1

Paper II

92-3	C
92-4	B
94-21	B
94-22	A
99-4	D
99-5	D
99-21	D
99-29	B
00-14	C
00-17	D
00-18	B
00-19	C
00-30	A
00-31	A
01-31	A
01-32	C
01-52	C
01-53	A
01-54	D
02-43	D
02-44	D
02-45	C
03-19	B
03-20	A
04-04	D
04-13	C
04-14	C
04-17	A
04-18	C
04-46	A
05-9	C
05-42	B
05-47	D
05-48	A
06-28	C
07-01	A

07-02	C
07-44	D
07-46	D
07-47	B