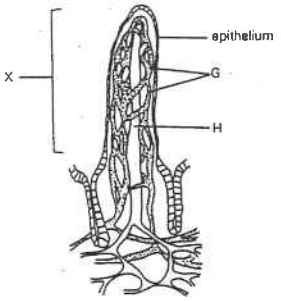
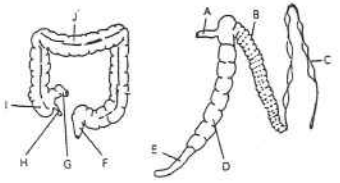
Past HKCEE Questions
Nutrition in Mammals
Paper I

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)

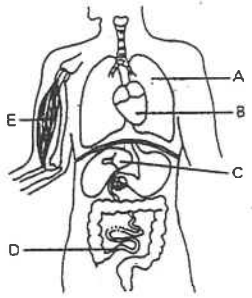
2. The diagrams below show the posterior region of the alimentary canal for both a human and a rabbit. (The parts are not drawn to the same scale.)



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)

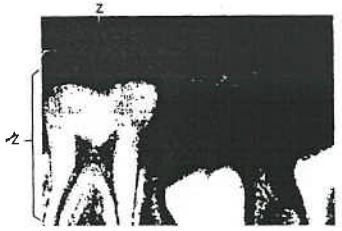
Food test	Biuret test		Benedict's/ Fehling's test	
Tube no.	A1	A2	A3	A4
Time when food test was applied	at 0 hour	after 1 hour	at 0 hour	after 1 hour
Observation	violet colour	blue colour	blue solution	red precipitate

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

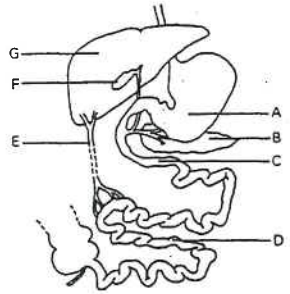
(i) Referring to the tube numbers, indicate which tube(s) gave a positive result for
(1) the Biuret test.
(2) the Benedict's / Fehling's test.
(ii) What conclusion can be drawn from the results of
(1) the Biuret test in experiment I?
(2) the Benedict's / Fehling's test in experiment II?
(iii) Give one 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:



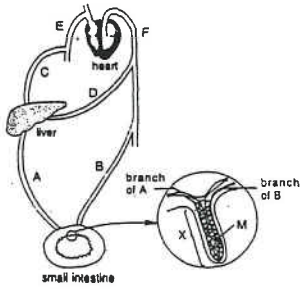
(i) What is Z in the photograph?
(ii) State the function of Z and explain the importance of this function.
(iii) Make a fully labelled drawing to show the structure of Z as revealed in the above photograph.
(iv) Is the photograph taken from a child or an adult? Give a reason for your answer. (10 marks)
(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)

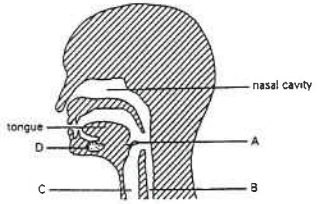
7. The diagram below is a schematic representation showing the heart, and the blood supply to the liver and small intestine in a mammal.



(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.

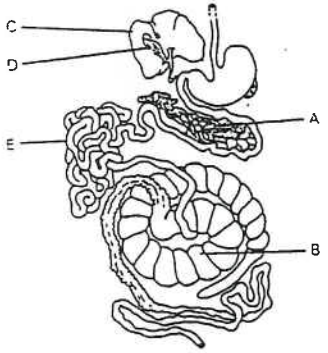
State the transport system to which M belongs. (3 marks)
(iii) A few hours after taking a meal rich in carbohydrates, the amount of a certain hormone Y was found to have increased sharply in the blood of the mammal.
(1) Name hormone Y. State its site of production and its function. (3 marks)
(2) Using 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:



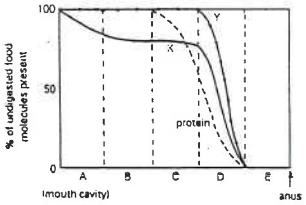
(i) Identify structure B. (1 mark)
(ii) State ONE characteristic feature of the inner surface of C and give its function. (2 marks)
(iii) What is the action of A during swallowing? Why is this action important? (2 marks)
(iv) Name the fluid secreted from D. Give TWO functions of this secretion. (3 marks)
(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)

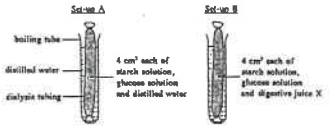
10. Digestion of different types of food substances starts in different regions of the human alimentary canal. The extent to which proteins, fats and starch are being digested in successive regions (A to E) of the alimentary canal can be represented by the graph shown below:



(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	+	+++

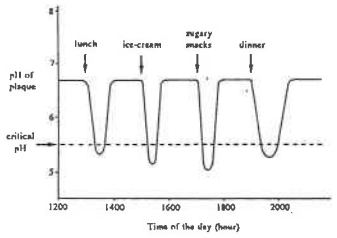
Key : '+' represents a small amount of red precipitate
'+++' represents a large amount of red precipitate

(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.



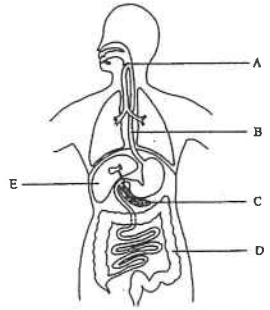
(i) Explain why the PH of the plaque drops after the intake of food. (2 marks)

(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)

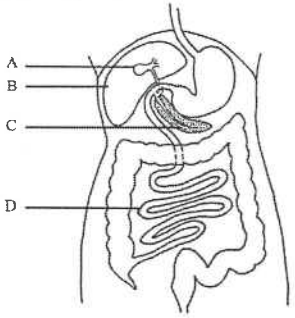
(ii) Name the process by which food is moved along B. (1 mark)

(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:

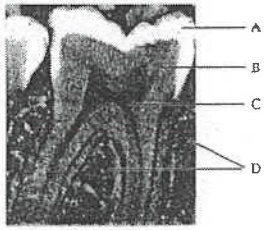


(i) Structure A is removed from a patient by surgical operation. Explain why this patient cannot digest fatty food properly after the operation. (4 marks)

(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:

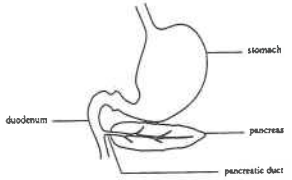


(i) Using the letters in the photograph, state all the structures that is / are
(1) richly supplied with capillaries,
(2) rich in calcium salts. (2 marks)

(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:

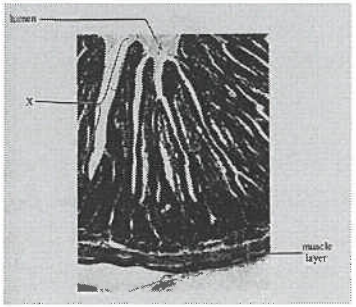


(i) The faeces produced by such patients usually have a high fat content. Explain why. (3 marks)

(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)

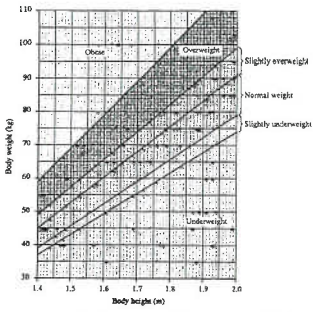
(b) Give two examples of secretions that enter the alimentary canal. (2 marks)

(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	> 0.90	> 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)

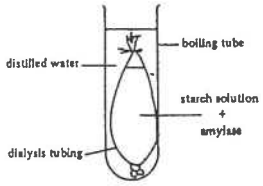
(b) Suggest why the backflow of gastric juice is more likely to occur if a person has a meal just before sleeping. (3 marks)

(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:

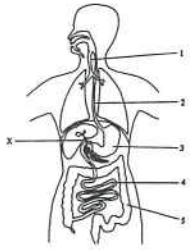


90-4
After one hour, small portions of distilled water in the boiling tube were separately tested using the Biuret test, Iodine test and Benedict's test. The results were

	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

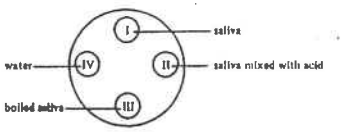
90-10
Which of the following statements about a dental disclosing agent is correct?
A. It kills bacteria.
B. It contains fluoride.
C. It has an abrasive effect.
D. It stains dental plaque red.

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.

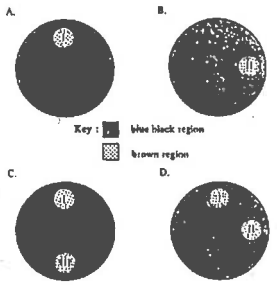
92-16
Which of the following products of digestion is absorbed into the lacteal of the villus?
A. glucose
B. glycogen
C. fatty acids
D. amino acids

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:

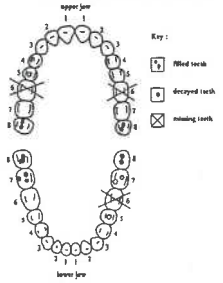


Starch agar plate as viewed from above

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?



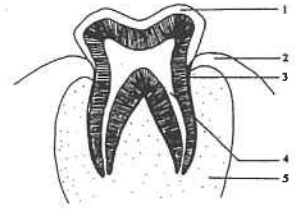
93.
Directions: Question 12 and 13 refer to the dental chart of an adult a shown below:



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:



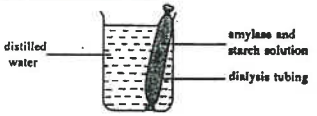
94-3
Which structures contain a large amount of calcium salts?
A. 1, 2 and 3 only
B. 1, 3 and 4 only
C. 1, 3 and 5 only
D. 2, 4 and 5 only

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.

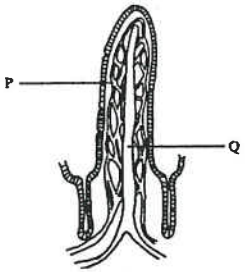
94-6
When bile juice is added to a sample of oil containing a few drops of universal indicator solution, the colour change indicates an increase in pH. The pH increases because
A. bile juice contains bile pigments.
B. bile juice contains alkaline salts.
C. bile juice emulsifies the oil.
D. bile juice 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)

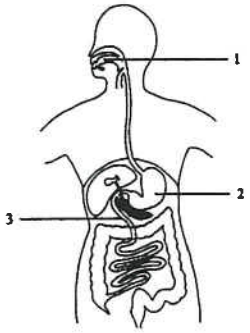
95-15
Structure P receives blood from
A. the aorta.
B. the lymph vessel.
C. the hepatic artery.
D. the hepatic portal vein.

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.

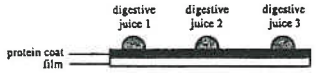
97-10
The diagram below show two types of teeth of an adult man. Which of the following statements about the teeth is incorrect?

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.

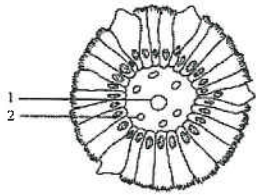
98-5
The stomach wall produces mucus to cover its surface. Which of the following statements correctly describe(s) the function of the mucus?
(1) It kills the bacteria in the ingested food.
(2) It prevents the rubbing of food against the stomach wall.
(3) It protects the stomach wall from the action 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)

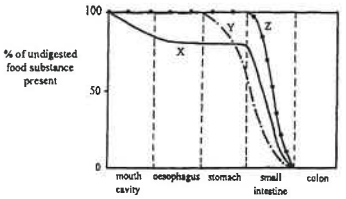
99.
Directions: Questions 15 and 16 refer to the diagram below, which shows the transverse section of an intestinal villus:



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?

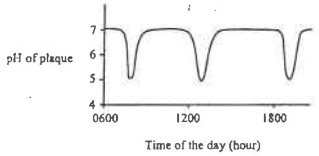
	X	*Y*	*Z*
A.	starch	protein	fat
B.	starch	fat	protein
C.	protein	fat	starch
D.	protein	starch	fat

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)

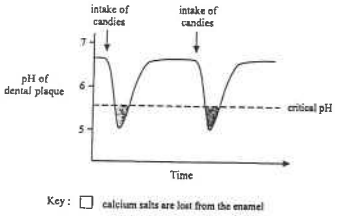
01-13
The graph below shows the changes in pH of the plaque on the tooth surface of a child:



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

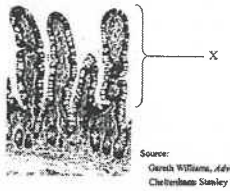
A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

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

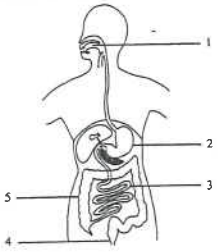
02-23
The photomicrograph below shows part of a human organ



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.

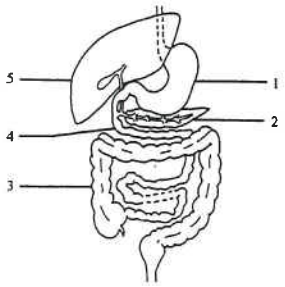
03-13
Most of the fat absorbed in the small intestine is first transported to the
A. liver.
B. heart.
C. pancreas.
D. large intestine.

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:

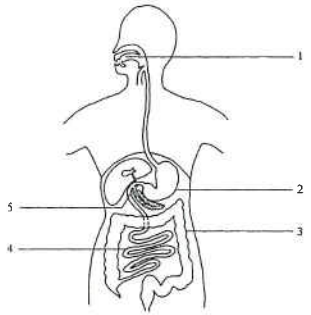
04-28
Which structures are hard and rigid?
A. 1, 2 and 3
B. 1, 2 and 4
C. 1, 3 and 5
D. 2, 4 and 5

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:

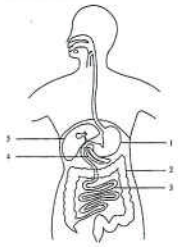


05-19
Chemical digestion of carbohydrate occurs in

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:

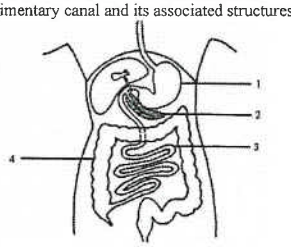


06-1
Which structures are responsible for producing secretions that help the digestion of fat?
A. 1 and 3 only
B. 1 and 5 only
C. 2 and 3 only
D. 4 and 5 only

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 1
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

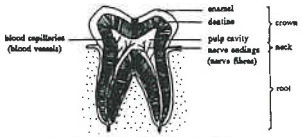
13. (i) Bacteria break down the food 1
releasing acid 1

(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

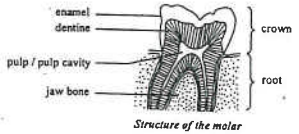
15. (i) Bile produced in the liver cannot be stored in A 1
When food enters the duodenum, insufficient amount of bile is released 1
for emulsifying fats in the food 1
Thus the surface area for the action of lipase decreases 1
Effective communication (c) 1

(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