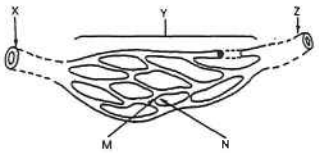
Past HKCEE Questions
Transport in Human
Paper I

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.)

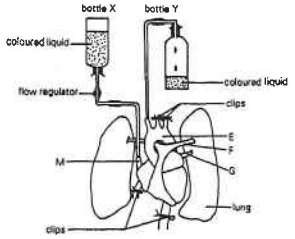
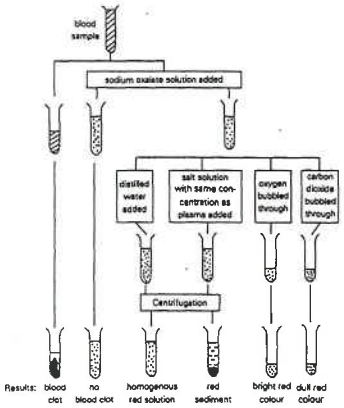


Diagram II below shows the valves present inside the heart.

(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.

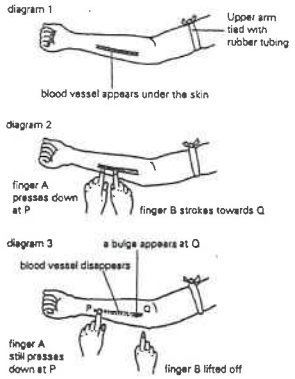


(i) State the effect of adding sodium oxalate solution.
(ii) Referring to tube D, state and explain the effect of adding distilled water to the oxalated blood sample.
(iii) What was the substance which gave the colour of the solution in tube D?
(iv) Which component of blood formed the

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.)



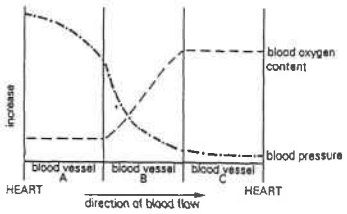
(i) What structure in the blood vessel is indicated by the appearance of the bulge at Q in diagram 3?

(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)

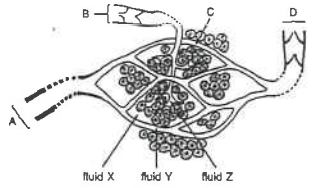
(ii) How does the blood oxygen content change as the blood flows along vessel B? Suggest an organ where this change can occur. (2 marks)

(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)

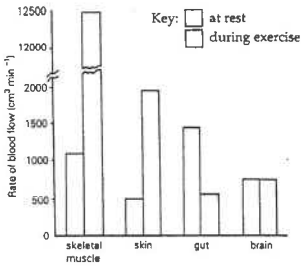
(ii) State ONE structural feature of C which allows exchange of materials between fluids X and Y. Explain your answer. (2 marks)

(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)

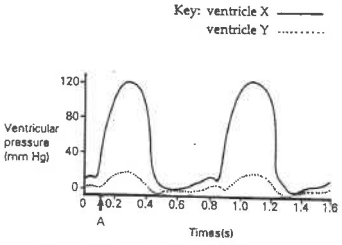
7. The diagram below shows the rate of blood flow to certain organs of a man at rest and during exercise:



(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:



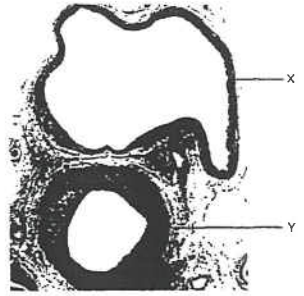
(i) With reference to the graph, calculate the number of heartbeats per minute of this man at rest. (1 mark)

(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.)

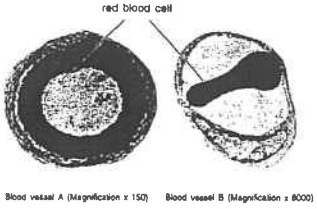


(i) Which vessel, X or Y, is an artery? Explain how an artery is structurally related to its function. (3 marks)

(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)

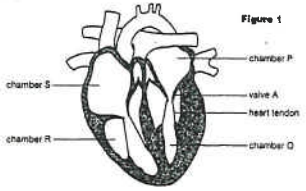
(iii) If these two blood vessels were associated with the lungs, compare the concentrations of carbon dioxide and glucose in vessels X and Y. (2 marks)
(HKCEE 1992)

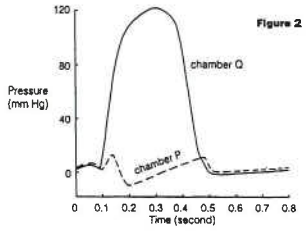
10. The photographs below show the transverse sections of two blood vessels:



(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)

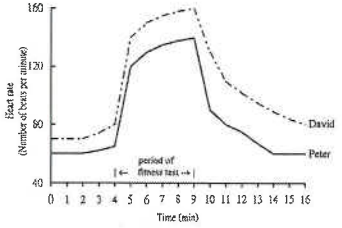
11. Figure 1 shows a section of the human heart. Figure 2 shows the change in pressure in chamber P and chamber Q during a cardiac cycle:





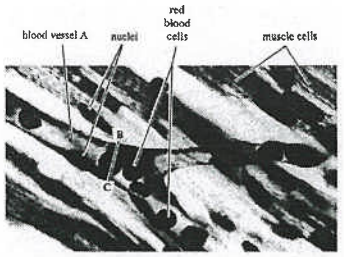
(i) What is chamber Q? (1 mark)
(ii) Describe and explain the change in pressure in chamber Q from 0.1 second to 0.2 second. (2 marks)
(iii)
(1) State the condition of valve A at 0.2 second. (1 mark)
(2) Explain your answer in (1) with reference to figure 1 and figure 2. (2 marks)
(iv) Some patients 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:



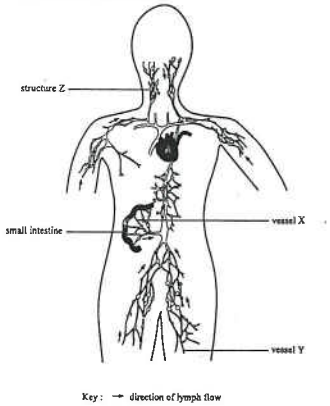
(i) Peter's heart rate increased during the fitness test. Explain the importance of this phenomenon. (5 marks)
(ii) Referring to the heart rates of Peter and David during the fitness test, deduce, with reasons, whose heart can pump out more blood in each beat. (4 marks)
(iii) At the end of the fitness 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:



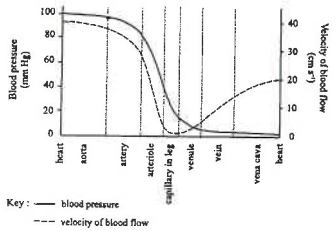
(i)
(1) What type of blood vessel is A? (1 mark)
(2) Based on the photomicrograph, state one feature of A to support your answer to (1). (1 mark)
(ii) The muscle cells in the photomicrograph are surrounded by a fluid. Explain how this fluid is formed from the blood in blood vessel A. (2 marks)
(iii) 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:



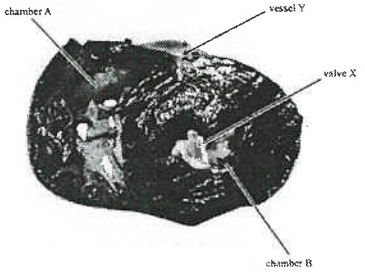
(i) Explain why the lymph in vessel X of a person turns from clear to milky after he has eaten some barbecued pork. (3 marks)
(ii) Describe how a continuous flow of lymph in vessel Y of the leg is maintained. (2 marks)
(iii) For a patient suffering from a disease called elephantiasis, the lymph vessels 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.

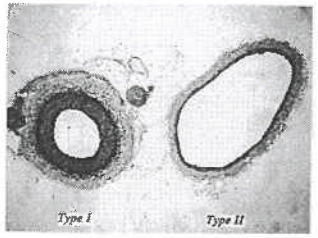


(i) Which chamber of the heart, A or B, is responsible for sending out blood to all parts of the body except the lungs? Explain your choice. (3 marks)
(ii)
(1) Name valve X. (1 mark)
(2) In a type of heart disorder, valve X cannot close properly. A man suffering from this disorder may faint easily when 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)

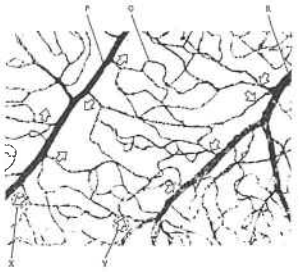
(iv) With reference to organ A,

(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)

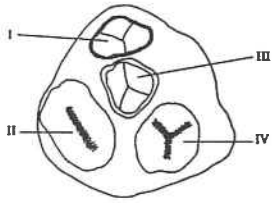
Blood flow in veins is usually under pressure. In the legs, blood in (a) veins flows upwards against to return to the heart. This upward flow is (b) assisted by the contraction of lying next to (c) the veins. The in the veins help to ensure that blood flows in (d) one direction only. If they cannot properly 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

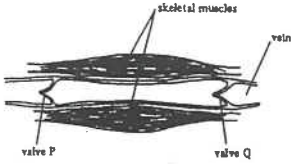
90.
Directions: Questions 31 and 32 refer to the diagram below which shows a pig's heart with certain chambers / parts removed to show the structures of various valves:



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

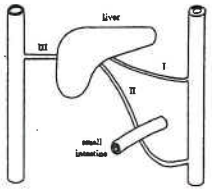
90-35
Which of the following fluids collected from a healthy person gives a red precipitate when heated with Benedict's / Fehling's solution?
A. urine
B. serum
C. saliva
D. gastric juice

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:



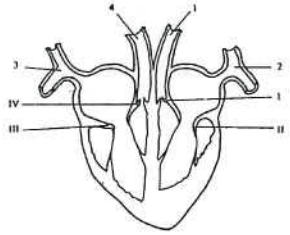
91-26
Which of the following is correct?

	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

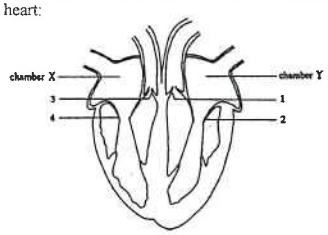
93-27
The closing of which valves produces the characteristic 'heart sounds'?
A. I and II only
B. II and III only.
C. III and IV only
D. I, II, III and IV

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

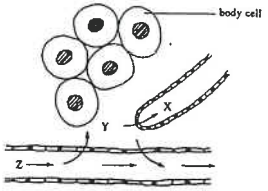
94.
Directions: Questions 14 and 15 refer to the diagram below which show a section of a human heart:



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

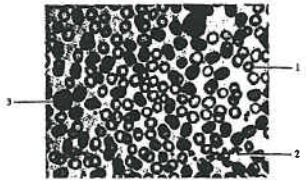
94-17
Which of the following comparisons between fluid X and fluid Z is correct?

	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.

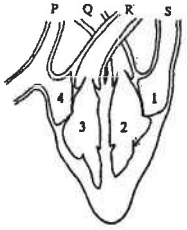
95-24
The photomicrograph below show a human blood smear:



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:

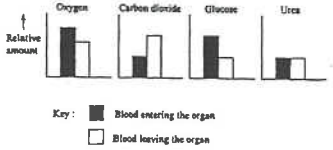


95- 25
With reference to the diagram, which heart chambers are contracting?
A. 1 and 2
B. 1 and 4
C. 2 and 3
D. 3 and 4

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.

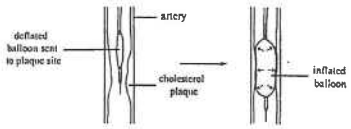
96-28
The blood of a person takes a long time to clot. He may not have enough
A. iron.
B. vitamin D.
C. antibodies.
D. blood platelets.

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

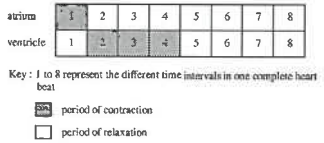
97.
Directions: Questions 25 and 26 refer to the following information:
Cholesterol plaque is formed by the accumulation of cholesterol on the wall of arteries. The diagram: below show a type of operation which is used to treat the blockage of arteries by cholesterol plaque



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?

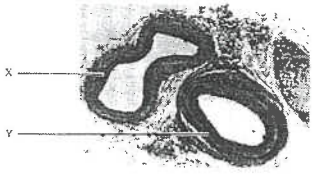
	Bicuspid valve	*Tricuspid valve*
A.	closed	closed
B.	closed	opened
C.	opened	opened
D.	opened	closed

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:

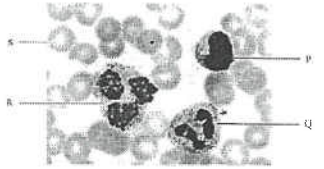


99-24
Which heart chamber is connected to vessel X?
A. left atrium
B. left ventricle
C. right atrium
D. right ventricle

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:



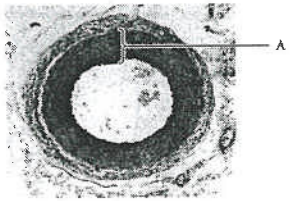
99-26
Which type of cells contains the least amount of DNA?
A. P
B. Q
C. R
D. S

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:

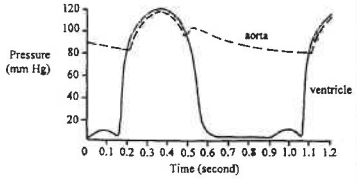


Which of the following are the functions of tissue A?
(1) It helps to regulate the diameter of the arteriole.
(2) It helps the arteriole to withstand high blood pressure.
(3) Its contraction helps to propel blood along the arteriole.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (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:

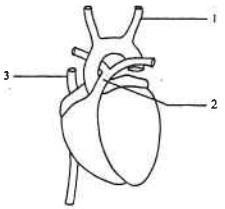
	Blood flow ($mL\ min^{-1}$)	
	At rest	During exercise
Skeletal muscle	1 200	12 500
Organ X	500	2 000

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:

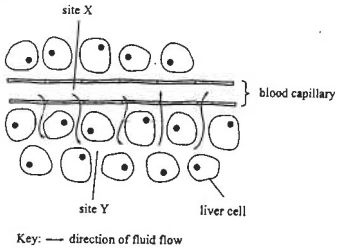
> Atherosclerosis is a condition in which the smooth internal lining of blood vessels becomes covered with fatty deposits. This causes a reduction in the diameter of the blood vessels. The fatty deposits often cause the formation of blood clots which further narrow the blood vessels and eventually block 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:

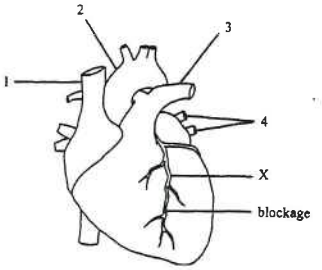


04.-01
Which of the following is a correct comparison of the fluid in X and that in Y when a person has not eaten for 12 hours?

	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

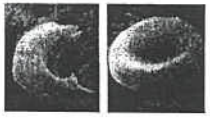
06.
06-33
The table below shows the ratio of the mean diameter of lumen to the mean thickness of vessel wall of three types of blood vessels:

	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

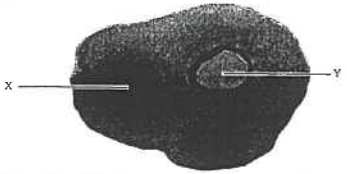
06-34
The photomicrographs below show the appearance of two red blood cells viewed under the same magnification. The one on the left shows a defective red blood cell. The one on the right shows a normal red blood cell.



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.

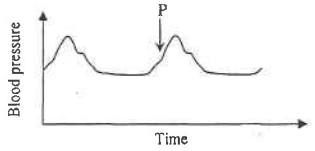
06-48
The following photograph shows the cross section of a structure connecting the foetus to the mother:



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.



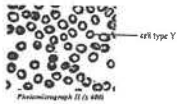
A
vein
artery
capillary

06-49
At point P, what are the conditions of the bicuspid and semilunar valves?
a

	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:



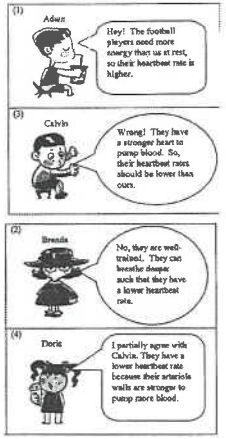
07-10
A student first focused on the blood smear under the microscope and obtained an image as shown in photomicrograph I. In order to obtain an image as shown in photomicrograph 11, which of the following steps are necessary?

(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)

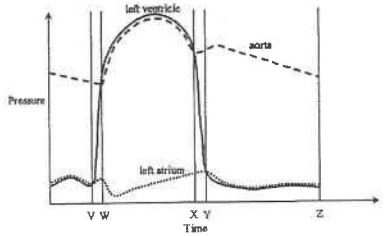
07-11
The characteristic appearance of cell type Y is due to
(1) its thicker periphery.
(2) its large central vacuole.
(3) the absence of a nucleus.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

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

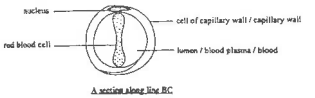
(ii) Peter's heart 1
Because the energy demand of Peter and David was the same for the fitness test 1
and Peter's heart could supply the same amount of blood/oxygen to the skeletal muscle 1
at a lower heart rate 1

(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 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

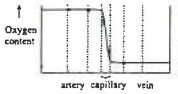
15. (i) The blood pressure in the vein is much lower than that in the artery 1
Reasons: (any two) (1,1) 2
• the blood in the artery is directly under the pumping action of the heart, while that in the vein is not
• the blood in the vein has overcome great friction / resistance after travelling over a 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