

- 1 (a) Fig. 1.1 shows the human heart and the main blood vessels. The functions of the parts of the heart and some of the blood vessels are given in Table 1.1.

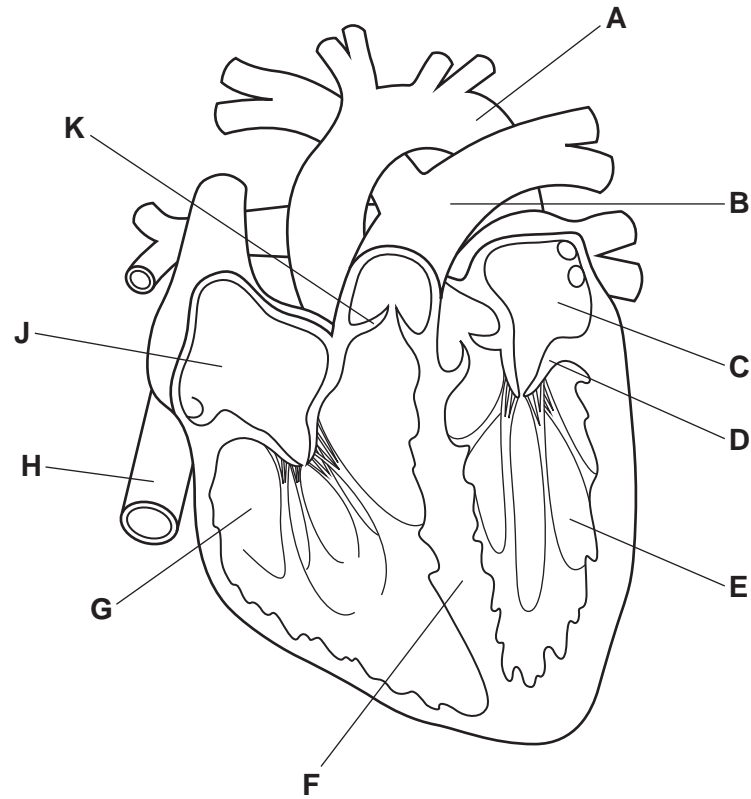


Fig. 1.1

Complete Table 1.1.

One row has been done for you.

Table 1.1

| function | letter on Fig. 1.1 | name |
|--|--------------------|-------|
| structure that separates oxygenated and deoxygenated blood | | |
| structure that prevents backflow of blood from ventricle to atrium | | |
| blood vessel that carries oxygenated blood | A | aorta |
| blood vessel that carries deoxygenated blood | | |
| structure that prevents backflow of blood from pulmonary artery to right ventricle | | |
| chamber of the heart that contains oxygenated blood | | |
| chamber of the heart that contains deoxygenated blood | | |

[6]

- (b) A group of students used a heart monitor to record the pulse rate of an athlete during a 5000 metre race. The recordings started just before the race began and ended just after it had finished, as shown in Fig. 1.2.

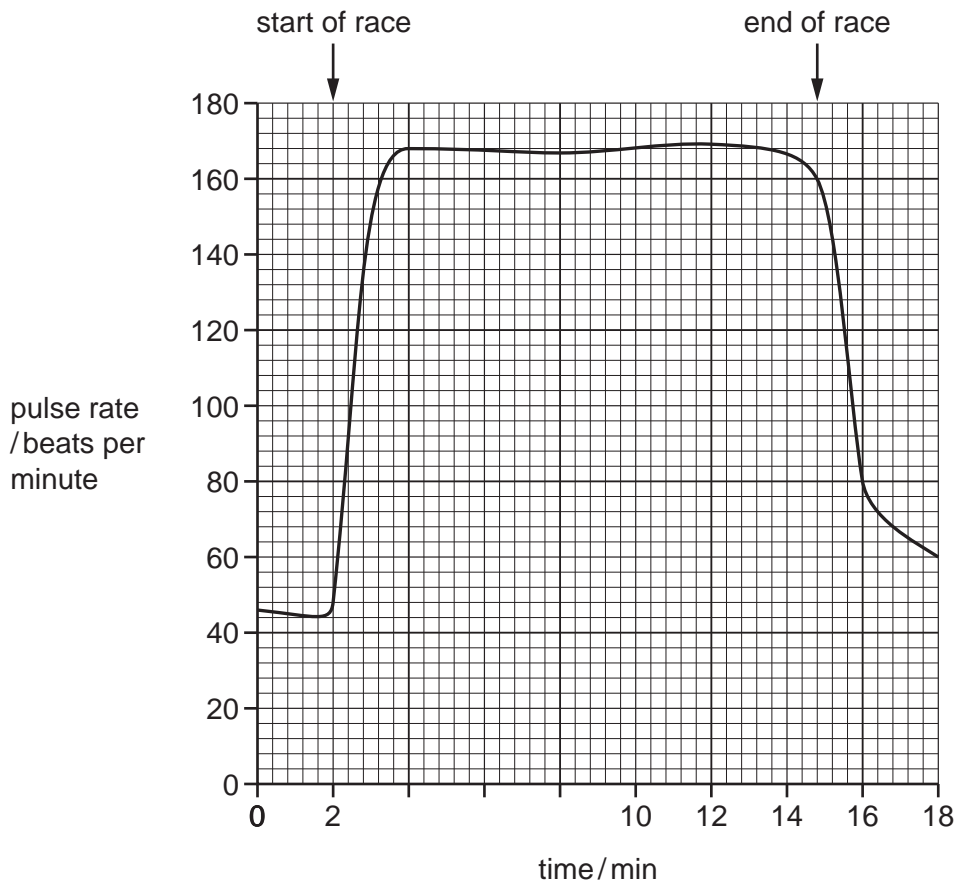


Fig. 1.2

- (i) Use data from Fig. 1.2 to describe the effect of exercise on the pulse rate of the athlete.

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[3]

(ii) Explain the change in pulse rate between 2 minutes and 3 minutes after the recordings started.

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[Total: 13]

- 2 All mammals have a double circulatory system. Fig. 1.1 shows part of the human double circulatory system.

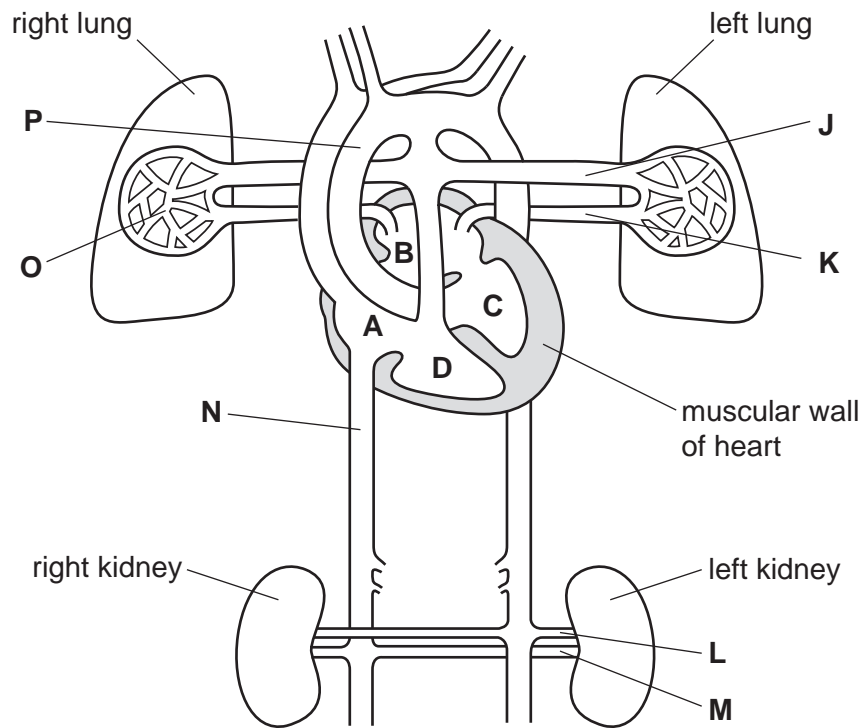


Fig. 1.1

- (a) Name the muscular wall that separates the left and right sides of the human heart.

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- (b) (i) Describe what is meant by the term *double circulation*.

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 [1]

- (ii) State **one** advantage of a double circulation.

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 [1]

(c) Table 1.1 describes some of the structures of the human circulatory system shown in Fig.1.1.

Complete the table.

One row has been done for you.

Table 1.1

| description | name of structure | letter on Fig. 1.1 |
|--|-------------------|--------------------|
| heart chamber with the thickest muscular wall | | |
| blood vessel that carries oxygenated blood to the heart | | |
| blood vessel that carries oxygenated blood away from the heart | | |
| blood vessel that carries blood away from the kidneys | | |
| blood vessel with the largest lumen | vena cava | N |

[4]

(d) Describe how blood is transported from the vena cava to the lungs. You may use the letters on Fig. 1.1 in your description.

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[4]

(e) (i) Doctors recommend that a healthy diet can reduce the risk of coronary heart disease.

Give **one** other lifestyle improvement patients can make that can reduce the risk of coronary heart disease.

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(ii) Sometimes surgery is required to treat coronary heart disease.

Describe **one** named example of surgery that can treat coronary heart disease.

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..... [2]

[Total: 14]

3 Mammals have a double circulation system.

(a) Explain what is meant by a double circulation system.

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(b) Table 5.1 shows some of the main organs in a mammal and the vessels that deliver blood and take it away.

Complete the table.

Table 5.1

| organ | blood vessel | |
|--------|------------------|------------------|
| | delivers blood | takes blood away |
| heart | 1 | 1 aorta |
| | 2 vein | 2 artery |
| lungs | pulmonary artery | |
| liver | 1 hepatic artery | hepatic vein |
| | 2 | |
| kidney | artery | vein |

[5]

(c) Table 5.2 shows the blood pressure in the different blood vessels that supply and drain a muscle in the leg.

Table 5.2

| blood vessel | mean blood pressure/kPa |
|------------------------------|-------------------------|
| aorta | 13 |
| femoral artery | 12 |
| distributing/muscular artery | 9 |
| arteriole in muscle | 6 |
| capillary in muscle | 4–1.3 |
| venule in muscle | 1.1 |
| femoral vein | < 1.0 |

(i) The table shows that the mean blood pressure decreases from 13kPa in the aorta to 6kPa in the arterioles.

Explain why blood pressure must decrease in the arterioles before entering the capillaries.

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(ii) Explain how blood returns to the heart in the femoral vein against the pull of gravity.

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(d) Fig. 5.1 shows a section across part of an artery.

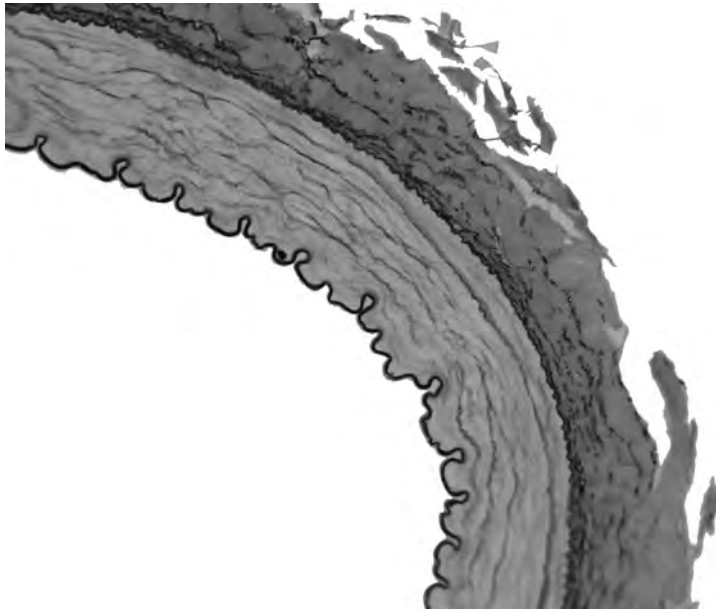


Fig. 5.1

With reference to Fig. 5.1, explain how the structure of an artery is related to its function.

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[3]

[Total: 14]

4 Table 4.1 shows the composition of blood plasma.

Table 4.1

| component | concentration in the plasma |
|---|-----------------------------|
| adrenaline / ng dm^{-3} | 10 – 100 |
| fibrinogen / g dm^{-3} | 1.7 – 4.0 |
| glucose / mg dm^{-3} | 700 – 1000 |
| hydrogencarbonate ions / g dm^{-3} | 1.1 – 1.4 |
| insulin / $\mu\text{g dm}^{-3}$ | 0.33 – 0.40 |
| lactic acid / mg dm^{-3} | 50 – 200 |
| sodium ions / g dm^{-3} | 3.1 – 3.4 |
| urea / mg dm^{-3} | 70 – 200 |

(a) From Table 4.1, name:

(i) an excretory product

..... [1]

(ii) a plasma protein.

..... [1]

(b) (i) State what could cause the lactic acid concentration in the blood to increase to 200 mg dm^{-3} .

..... [1]

(ii) State the function of fibrinogen.

..... [1]

(iii) State **two** effects that a concentration of adrenaline of 100 ng dm^{-3} might have on the body.

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..... [2]

(c) Table 4.1 shows that the glucose concentration varies between 700 and 1000 mg dm^{-3} . Describe the role of the liver in regulating the concentration of glucose in the body.

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(d) Lymphocytes and phagocytes are white blood cells.

A woman had some blood tests taken before and during a bacterial infection.

Table 4.2 shows the number of white blood cells in the two blood samples.

Table 4.2

| white blood cells | mean number of cells per mm ³ of blood | |
|-------------------|---|------------------|
| | before infection | during infection |
| lymphocytes | 1300 | 3500 |
| phagocytes | 2000 | 7500 |

(i) Calculate the percentage increase in lymphocytes that occurred during the bacterial infection.

Show your working and give your answer to the **nearest whole number**.

answer% [2]

(ii) Describe the role of phagocytes in defence against disease.

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(iii) Describe the roles of white blood cells in tissue rejection.

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[Total: 17]