

- 1 The blood of a fetus does not mix with the blood of its mother, but substances are exchanged across the placenta.
- (a) Table 3.1 shows five substances that cross the placenta, their direction of movement and the reason for the movement.

Complete Table 3.1. The second row has been completed for you.

Table 3.1

substance	direction of movement	reason
amino acids		
carbon dioxide	from fetus	waste gas from respiration
glucose		
oxygen		
urea		

[4]

- (b) During pregnancy, women are often given dietary advice.

Explain why pregnant women require more iron and vitamin D in their diet.

iron

vitamin D [2]

(c) Mothers may be encouraged to breast-feed their newborn babies. The first milk that a mother secretes is called colostrum and contains antibodies.

(i) Name the cells that produce antibodies.

..... [1]

(ii) Explain why it is important for newborn babies to have antibodies.

.....
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.....
.....
.....
.....
..... [3]

(iii) Some mothers bottle-feed their newborn babies with formula milk rather than breast-feed. Describe **four advantages** of breast-feeding, **other than** providing antibodies.

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.....
..... [4]

[Total: 14]

(b) Fig. 4.2 shows the total cross-sectional area of the blood vessels in the systemic circulation. It also shows the changes that occur in blood pressure and the speed (velocity) of blood in the different blood vessels.

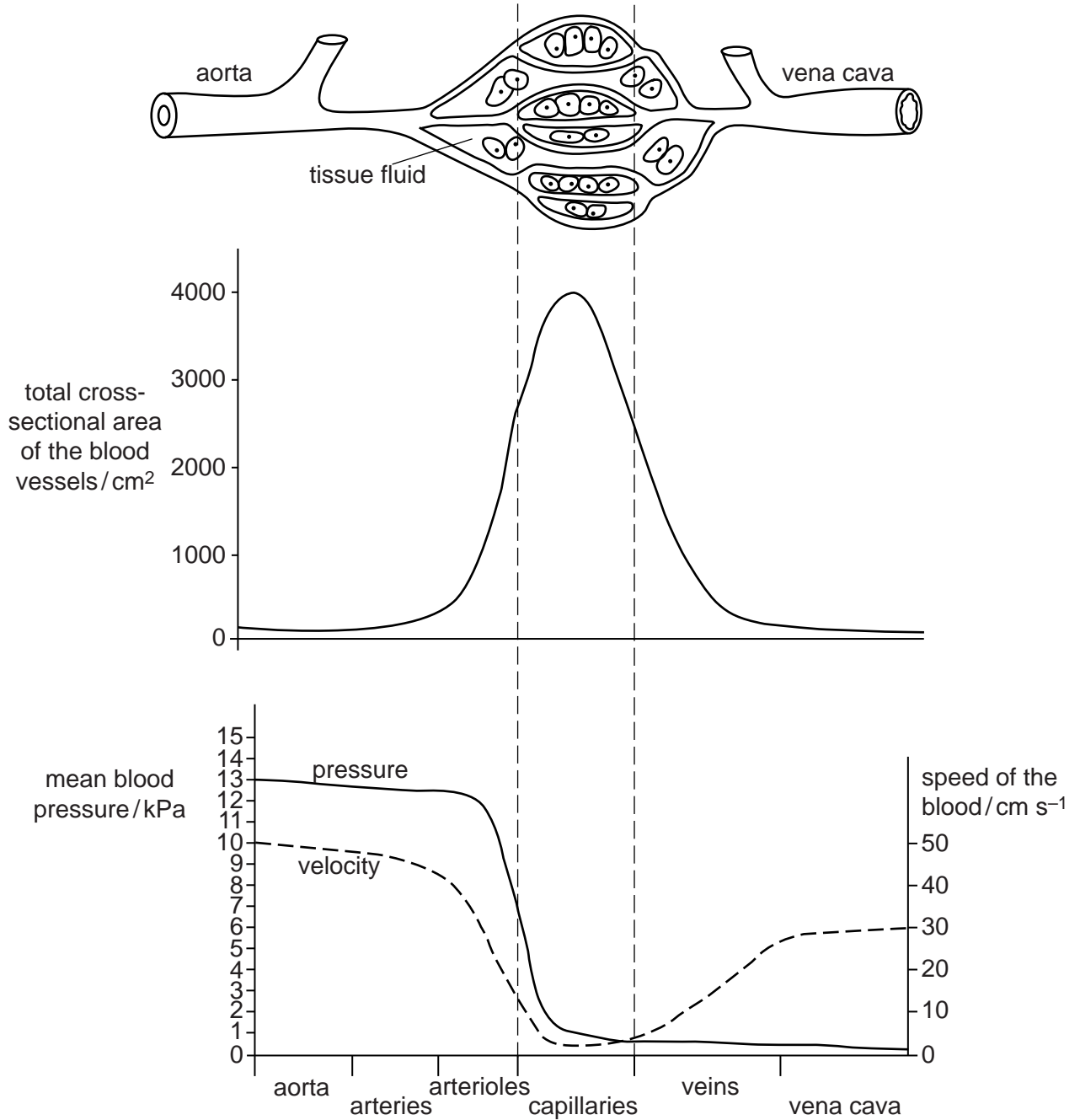


Fig. 4.2

(i) State the maximum mean blood pressure in the aorta.

.....[1]

(ii) Describe how mean blood pressure and speed of blood change with cross-sectional area of blood vessels, as shown in Fig. 4.2.

blood pressure

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.....

.....

speed of blood

.....

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.....[3]

(c) Describe how substances move from the blood in the capillaries into the tissue fluid.

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.....[3]

(d) Blood flows from arteries into arterioles before entering capillaries.

Explain the role of the arterioles in the skin when a person is very cold.

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.....[3]

[Total: 14]

- 3 Blood is distributed through the body of a mammal in blood vessels. The blood supply to muscles changes considerably at the start and at the end of exercise.

Fig. 4.1 shows a cross section of a blood vessel as seen with an electron microscope.

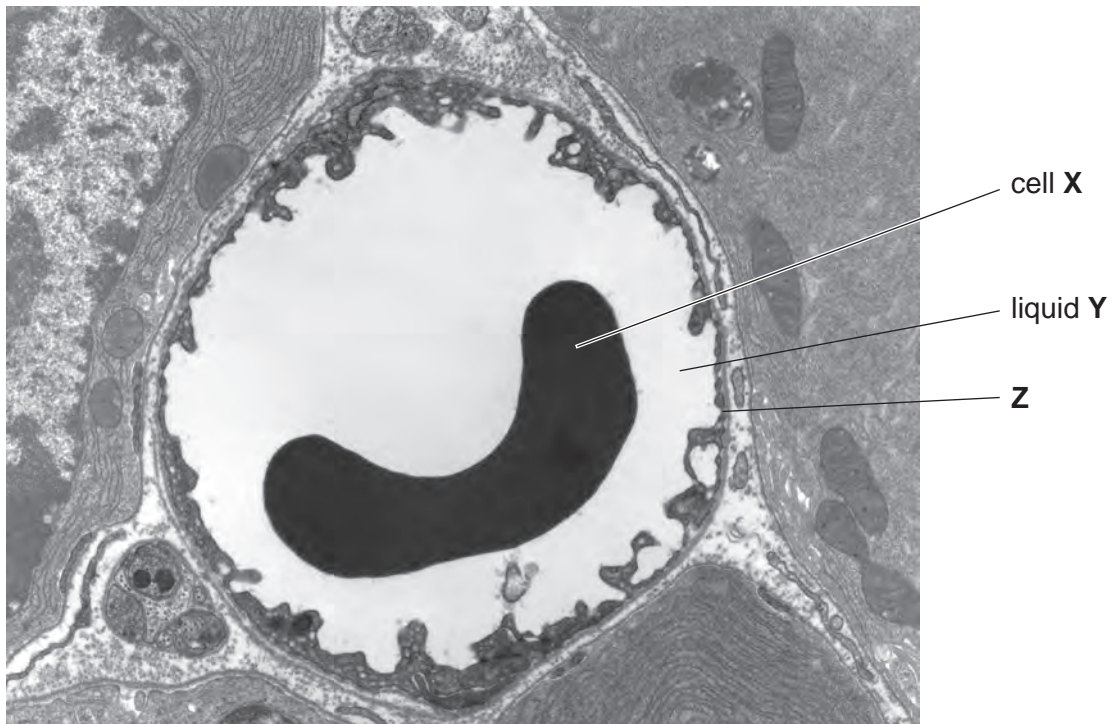


Fig. 4.1

(a) Name:

(i) cell **X**;

..... [1]

(ii) liquid **Y**;

..... [1]

(iii) the type of blood vessel shown in Fig. 4.1.

..... [1]

(b) State **three** substances that move across the wall of the blood vessel at **Z**.

1

2

3 [3]

(c) Table 4.1 shows the distribution of blood to different organs at rest and during exercise.

Table 4.1

regions of the body	blood flow / cm ³ per minute		percentage change / %
	at rest	during strenuous exercise	
heart muscle	250	750	200
kidneys	200	600	-5
skeletal muscles	1 000	12 500	
skin		1 900	375
liver and alimentary canal	1 400	600	-5
brain		750	0
others		400	-3
total	5 600	17 500	213

(i) Calculate the percentage change in the blood supply to the skeletal muscles.

Show your working.

Write your answer in Table 4.1.

[1]

4 Fig. 4.1 shows a vertical section of a human heart.

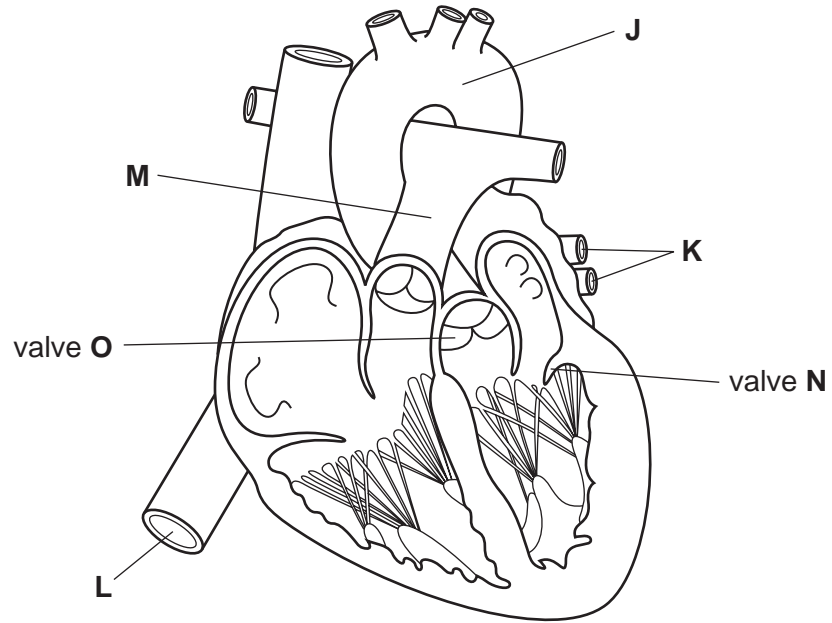


Fig. 4.1

(a) Identify the blood vessels labelled J to M.

- J
- K
- L
- M [4]

- (b) Sensors that detect changes in blood pressure were placed into the blood vessels surrounding the heart. Recordings were taken at the times when the ventricles contracted and when they relaxed.

The blood pressures recorded are shown in Table 4.1.

Table 4.1

blood vessel	blood pressure / kPa	
	contraction of the ventricles	relaxation of the ventricles
J	16.0	
K	0.3	0.3
L	0.3	0.3
M	2.0	0.5

- (i) Explain why the pressure in blood vessel **J** is greater than the pressure in blood vessel **M**.

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..... [2]

- (ii) Explain why the pressure in blood vessels **K** and **L** is much less than the pressure in blood vessels **J** and **M**.

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..... [2]

