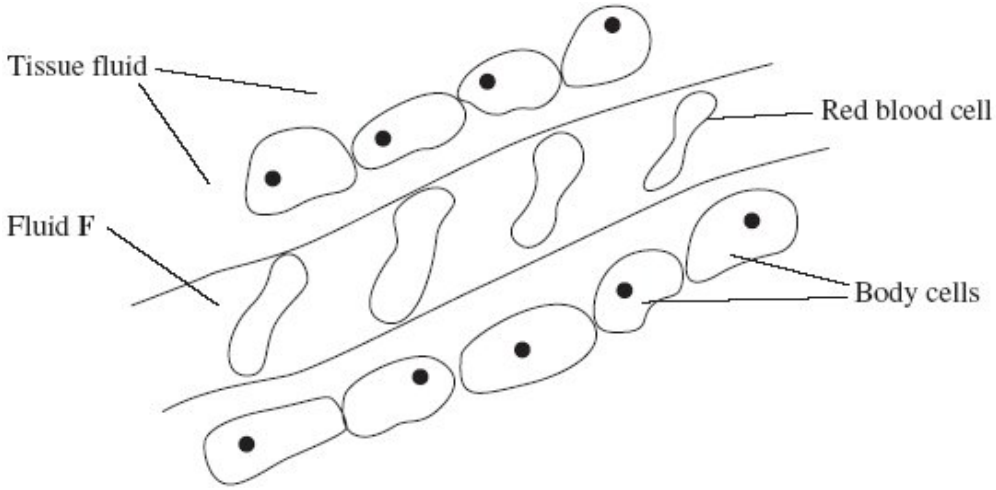
# L6: Transport in mammals

36 minutes

31 marks

**Q1.** The diagram shows tissue fluid and cells surrounding a capillary.




(a) Name fluid **F**.

.....

**(1)**

(b) Give **one** way in which fluid **F** is different from tissue fluid.

.....

**(1)**

(c) (i) The blood pressure is high at the start of the capillary. Explain how the left ventricle causes the blood to be at high pressure.

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.....

**(1)**

(ii) The blood pressure decreases along the length of the capillary. What causes this decrease in pressure?

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**(1)**

(d) In children, some diets may result in a low concentration of protein in fluid **F**. This can cause the accumulation of tissue fluid. Explain the link between a low concentration of protein in fluid **F** and the accumulation of tissue fluid.

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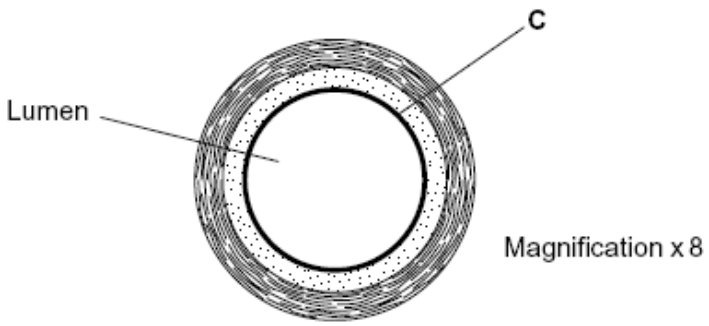
**(3)**
**(Total 7 marks)**

**Q2.** The diagram shows a cross-section of a blood vessel.




(a) Name layer **C**.

.....

**(1)**

(b) Calculate the actual diameter of the lumen of this blood vessel in millimetres. Show your working.

Answer ..... mm

**(2)**

(c) The aorta has many elastic fibres in its wall. An arteriole has many muscle fibres in its wall.

(i) Explain the importance of elastic fibres in the wall of the aorta.

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**(2)**

(ii) Explain the importance of muscle fibres in the wall of an arteriole.

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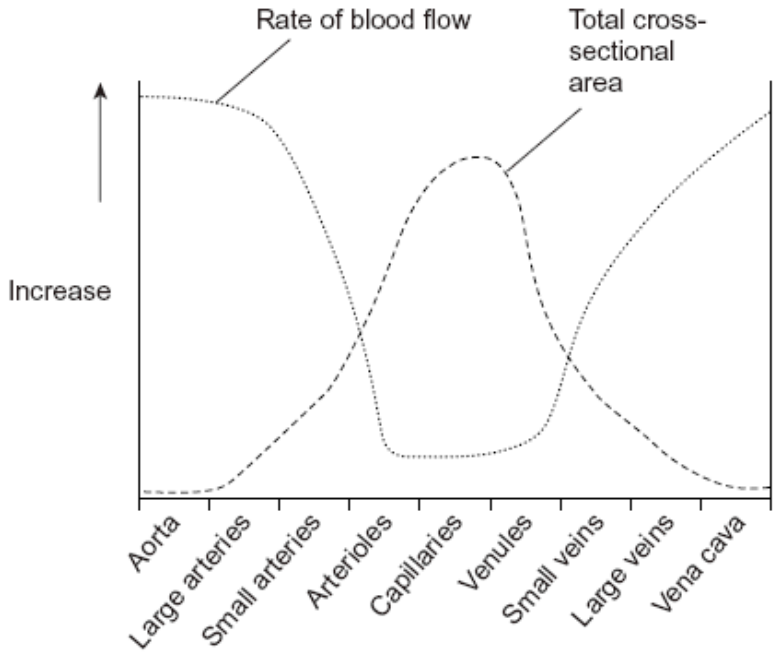
**(2)**

(d) The graph shows the rate of blood flow in different blood vessels. It also shows the total cross-sectional area of these blood vessels.




(i) The rate of blood flow decreases from the aorta to the capillaries. Use information from the graph to explain why.

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.....

.....

**(1)**

(ii) Efficient exchange of substances in the capillaries is linked to the rate of blood flow. Explain how.

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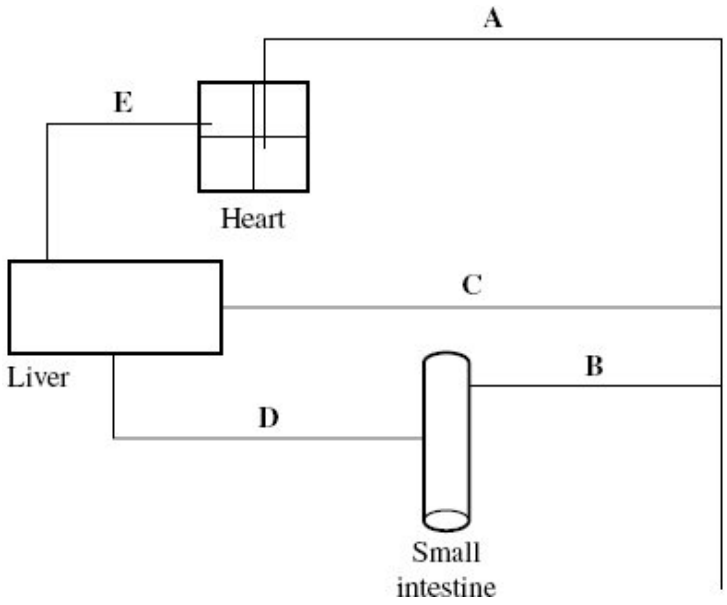
**(1)**

**(Total 9 marks)**

**Q3.** The diagram shows some of the large blood vessels in a mammal.




(a) Add arrows to the diagram to show the direction of blood flow in each of the blood vessels **A** to **E**.

**(1)**

(b) (i) Which of blood vessels **A** to **E** is the hepatic portal vein?

**(1)**

(ii) Which of blood vessels **A** to **E** contains blood at the lowest pressure?

**(1)**

(c) Complete the table to show **two** differences between the structure of vessel **C** and the structure of vessel **E**.

| Structural feature | Vessel C | Vessel E |
|---|---|---|
| | | |
| | | |

**(2)**

(d) Blood vessel **B** contains smooth muscle in its walls. Explain how this muscle may reduce the blood flow to the small intestine.

.....

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.....

.....

**(2)**

(e) Elastic tissue in the walls of blood vessel **A** helps to even out the pressure of blood through this vessel. Explain how.

.....

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.....

.....

**(2)**
**(Total 9 marks)**

**Q4.** The table shows the relative thickness of layers in the walls of an artery and a vein.

| Layer in wall | Thickness / µm | |
|---|---|---|
| | **Artery** | **Vein** |
| Endothelium | 20 | 20 |
| Smooth muscle | 490 | 240 |
| Elastic tissue | 370 | 240 |
| Connective tissue | 120 | 120 |

(a) Explain why a vein may be described as an organ.

.....

.....

**(1)**

(b) (i) Use information from the table to suggest the thickness of a capillary wall. Give the reason for your answer.

.....

.....

**(1)**

(ii) The diameter of the artery was 4 mm. Calculate the diameter of the lumen of this artery. Show your working.

Answer .....

**(2)**

(c) Explain how the elastic tissue in the wall helps to even out the pressure of blood flowing through the artery.

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.....

.....

**(2)**

**(Total 6 marks)**

**M1.** (a) (Blood) plasma;

**1**

(b) More/larger proteins/less urea/carbon dioxide/more glucose/amino acids/fatty acids/oxygen/high(hydrostatic) pressure;

***Q** Reference to blood cells/water potential = neutral*
***Q** <u>No</u> Protein should not be credited*

**1**

(c) (i) <u>Contracts</u>;

***Q** Do not accept pumping of heart/heart beating*

**1**

(ii) Loss of fluid/volume;

Friction/resistance (of capillary wall);

***Q** Reference to a narrow lumen is not sufficient to gain a mark unless friction or resistance is mentioned.*

**1 max**

(d) <u>Water potential</u> (in capillary) not as low/is higher/less negative/water potential gradient is reduced;

More tissue fluid formed (at arteriole end);

Less/no <u>water</u> absorbed (into blood capillary);

by <u>osmosis</u>; (into blood capillary);

***Q** The last two marking points must be in context of movement into the blood capillary*

**3 max**

**[7]**

**M2.** (a) Endothelium/epithelium;

*Allow endothelial/epithelial*
*Reject: epidermis/endodermis*

**1**

(b) Measurement divided by 8;

**1**

Allow answer in range of 3-3.3 for two marks;

*Correct answer gains 2 marks.*

**1**

(c) (i) Stretches/'expands' under high pressure/when ventricle contracts/systole;

Recoils/'springs back' under low pressure/when ventricle relaxes/diastole;

***Q*** *References to aorta contracting or relaxing negates marks for stretch and recoil.*

Smooths blood flow/maintains blood pressure/reduces pressure surges;

*Stretch and recoil without reference to blood pressure etc. = one mark.*

*Stretch and recoil to smooth blood flow etc. = two marks*

*Ignore references to aorta withstanding blood pressure or not being damaged.*

**2 max**

(ii) (Muscle) contracts;

*'It' in answer = muscle*

**1**

(Arteriole) constricts/narrows/alters size of lumen/reduces/regulates blood flow (to capillaries);

*Allow converse (muscle) relaxes and (arteriole) dilates etc/increase blood flow etc.*

*Ignore references to pressure*

**1**

(d) (i) Large/increase in (total) cross sectional area/friction/resistance;

**1**

(ii) (More) time for exchange of substances;

**1**

**[9]**

**M3.** (a) Arrows on all five vessels in correct direction;

**1**

(b) (i) D;

**1**

(ii) E;

**1**

(c)

| Feature | Vessel C | Vessel E |
|---|---|---|
| Valves | Absent | Present |
| (Relative) thickness of walls | Thicker | Thinner |
| Elastin/elastic tissue/fibres | More | Less |
| Muscle | More | Less |
| Lumen | Narrow | Wide |

*Two marks for two correct rows*

*Accept any pair of contrasting terms with same meaning as those used.*

**2 max**

(d) Contracts;

(Causing) vasoconstriction/narrows lumen;

**2**

(e) (Elastic tissue) stretches when pressure is high;

Springs back/recoils/returns to normal;

***Q*** *Do not credit references to contracting, relaxing or expanding*

**2 max**

**[9]**

**M4.** (a) made of (different) tissues/specified tissues;

**1**

(b) (i) 20 µm as it consists of endothelium only/does not contain muscle, connective tissues and elastic tissue;

*(consider other answers and credit understanding.)*

**1**

(ii) 1 mark calculation derived from diameter - (2 × wall thickness)/ answer of 3mm;
2 marks 2mm/2000µm;

**2**

(c) stretches as a result of high pressure/surge of blood;
then recoils;

**2**

**[6]**