A-Level Biology

Tissue Fluid Formation

Question Paper

Time available: 58 minutes
Marks available: 48 marks

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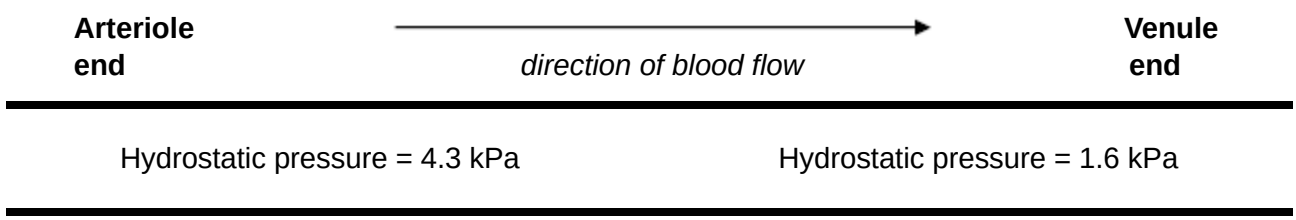
1. The figure below represents a capillary surrounded by tissue fluid.
The values of the hydrostatic pressure are shown.



(a) Use the information in the figure above to explain how tissue fluid is formed.

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(2)

(b) The hydrostatic pressure falls from the arteriole end of the capillary to the venule end of the capillary. Explain why.

_____

_____

(1)

(c) High blood pressure leads to an accumulation of tissue fluid. Explain how.

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(3)

(d) The water potential of the blood plasma is more negative at the venule end of the capillary than at the arteriole end of the capillary. Explain why.

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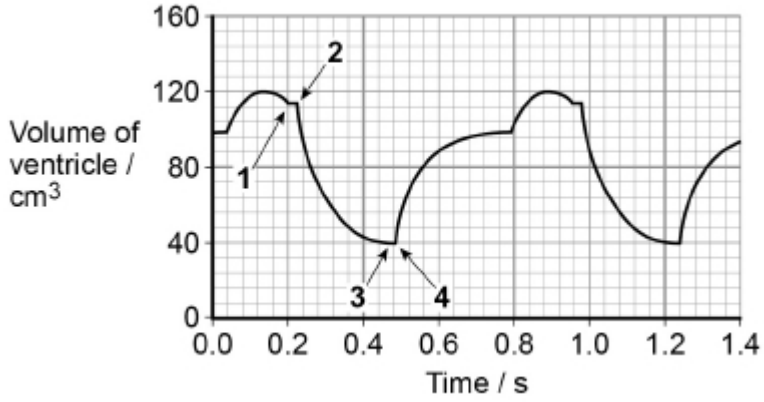
_____

(3)

(Total 9 marks)

2. The graph shows the volume changes in the left ventricle of a human heart during two cardiac cycles. The numbers **1**, **2**, **3** and **4** represent times when heart valves open or close.



(a) Use information from the graph to complete the table in part (a). Place the number **1**, **2**, **3** or **4** in the appropriate box.

	Valve opens	**Valve closes**
Semi-lunar valve		
Atrioventricular valve		

(2)

(b) Use the diagram above to calculate the volume of blood pumped per minute by the left ventricle.

Answer = _____ $cm^3\ min^{-1}$

(2)

(c) Explain the role of the heart in the formation of tissue fluid.

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(2)

(d) Lymphoedema is a swelling in the legs which may be caused by a blockage in the lymphatic system.

Suggest how a blockage in the lymphatic system could cause lymphoedema.

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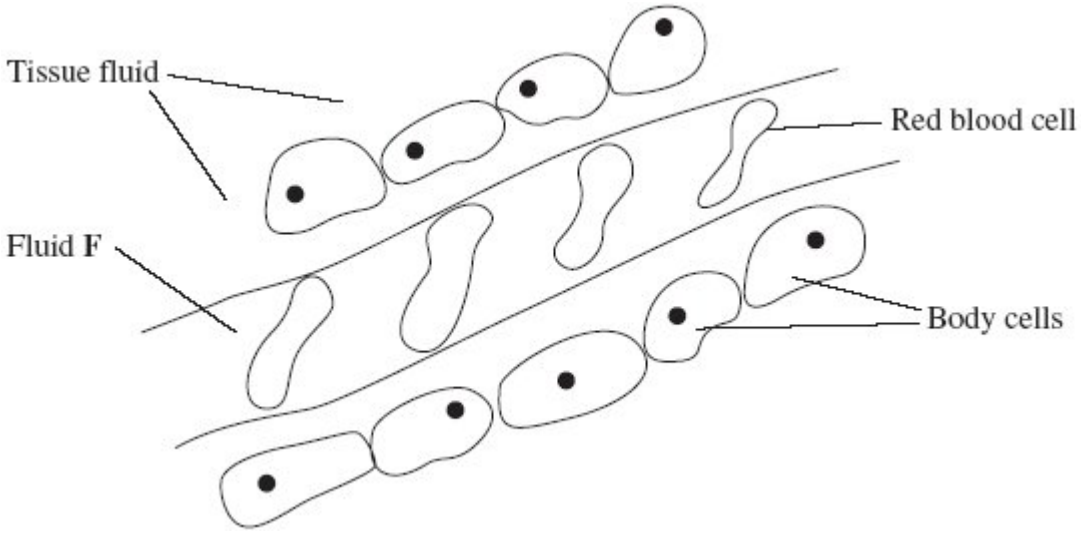
(1)

(Total 7 marks)

3. 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.

_____

_____

(1)

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

_____

_____

(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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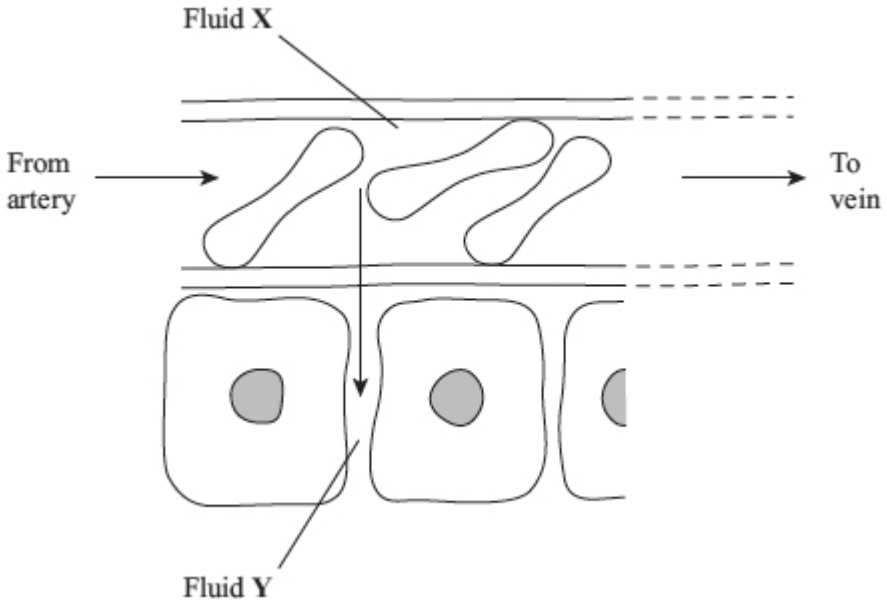
(3)

(Total 7 marks)

4. The diagram shows part of a capillary and some of the cells surrounding it.



(a) Name

(i) fluid **X**,

_____

(1)

(ii) fluid **Y**

_____

(1)

(b) Describe and explain **one** way in which the composition of fluid **Y** differs from that of fluid **X**.

_____

_____

_____

_____

(2)

(c) Explain how fluid leaves the capillary at the arterial end.

_____

_____

_____

_____

(2)

(Total 6 marks)

5. (a) Tissue fluid is formed from blood plasma. Complete the table to show substances present in tissue fluid and blood plasma. Use a tick if the substance is present and a cross if it is absent.

	Substance		
	Glucose	**Sodium ions**	**Haemoglobin**
Tissue fluid			
Blood plasma			

(2)

(b) The hydrostatic pressure of the blood at the arteriole end of the capillary helps to form tissue fluid. Explain how.

_____

_____

_____

_____

(2)

(Total 4 marks)

6. This question should be answered in continuous prose.

Quality of Written Communication will be assessed in these answers.

(a) Describe and explain **four** ways in which the structure of a capillary adapts it for the exchange of substances between blood and the surrounding tissue.

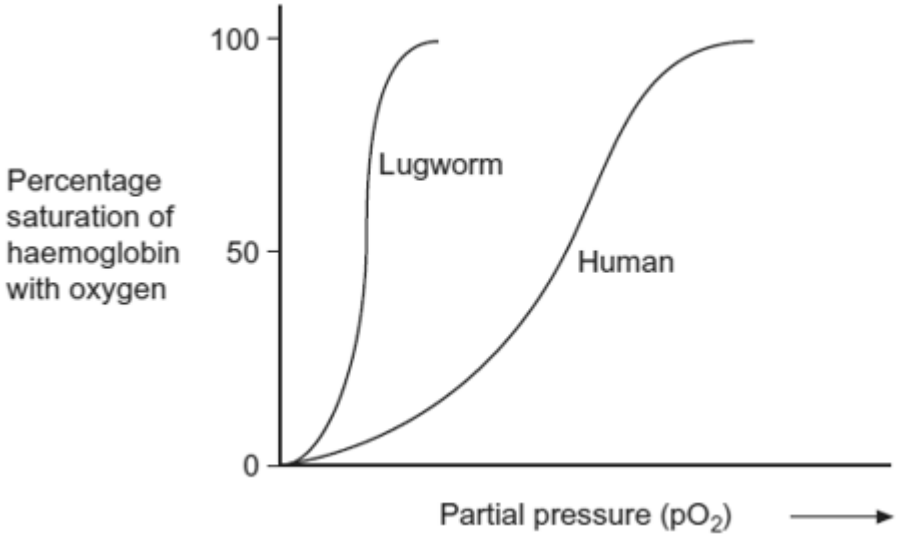
(4)

(b) Explain how tissue fluid is formed and how it may be returned to the circulatory system.

(6)

(Total 10 marks)

7. Lugworms live in mud where the partial pressure of oxygen is low. The graph shows oxygen dissociation curves for a lugworm and for a human.



(a) Explain the advantage to the lugworm of having haemoglobin with a dissociation curve in the position shown.

(2)

(b) In humans, substances move out of the capillaries to form tissue fluid. Describe how this tissue fluid is returned to the circulatory system.

(3)

(Total 5 marks)