

PEARSON EDEXCEL A-LEVEL BIOLOGY B • 9B10

BIOLOGY



EXAM QUESTION PACK

TOPIC 4: EXCHANGE AND TRANSPORT

TRANSFER OF MATERIALS BETWEEN THE CIRCULATORY SYSTEM AND CELLS

SCORE

/22

PERCENTAGE

%

STEMUP

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Q1.

Water is the major component of tissue fluid in mammals.

In humans, left side heart failure can cause symptoms such as breathlessness, palpitations and a rapid pulse.

The table shows the mean blood pressure in the lung capillaries of patients with left side heart failure compared with healthy individuals.

Group	Mean blood pressure in the lung capillaries / arbitrary units
Healthy individuals	0.90
Left side heart failure	2.75

(i) Calculate the percentage increase in the mean blood pressure in the lung capillaries due to left side heart failure.

(1)

Answer %

(ii) This increased blood pressure in the capillary will cause more tissue fluid to be formed.

Analyse this information to explain the symptom of breathlessness.

(2)

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(iii) In healthy individuals, only 80% of excess tissue fluid is reabsorbed directly into the blood stream.

Describe how the remaining 20% is reabsorbed.

(2)

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Q2.

The table shows two differences between blood plasma and tissue fluid.

Blood plasma	Tissue fluid
Has a higher protein content	Has a lower protein content
Contains more dissolved oxygen	Contains less dissolved oxygen

Explain the differences between blood plasma and tissue fluids shown in the table.

(2)

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(Total for question = 2 marks)

Q3.

The table shows two differences between blood plasma and tissue fluid.

Blood plasma	Tissue fluid
Has a higher protein content	Has a lower protein content
Contains more dissolved oxygen	Contains less dissolved oxygen

State how tissue fluid is formed.

(1)

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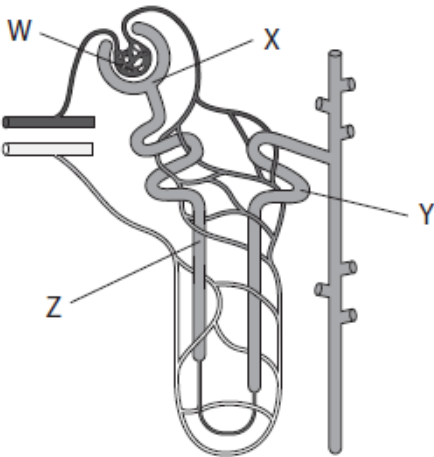
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(Total for question = 1 mark)

Q4.

The diagram shows a nephron.



Oedema is an accumulation of tissue fluid. This is due to less tissue fluid being returned to the blood capillaries.

(i) Explain how tissue fluid is returned to capillaries.

(3)

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(ii) Furosemides are drugs that are used to reduce oedema. They are diuretics that increase urine production.

Furosemides reduce the active transport of sodium ions by the loop of Henle.

Explain how furosemides cause an increase in urine production.

(4)

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(Total for question = 7 marks)

Q5.

The table shows two differences between blood plasma and tissue fluid.

Blood plasma	Tissue fluid
Has a higher protein content	Has a lower protein content
Contains more dissolved oxygen	Contains less dissolved oxygen

Some of the tissue fluid is not reabsorbed into the blood capillary.

Describe what happens to the tissue fluid that is not reabsorbed into the blood capillary.

(2)

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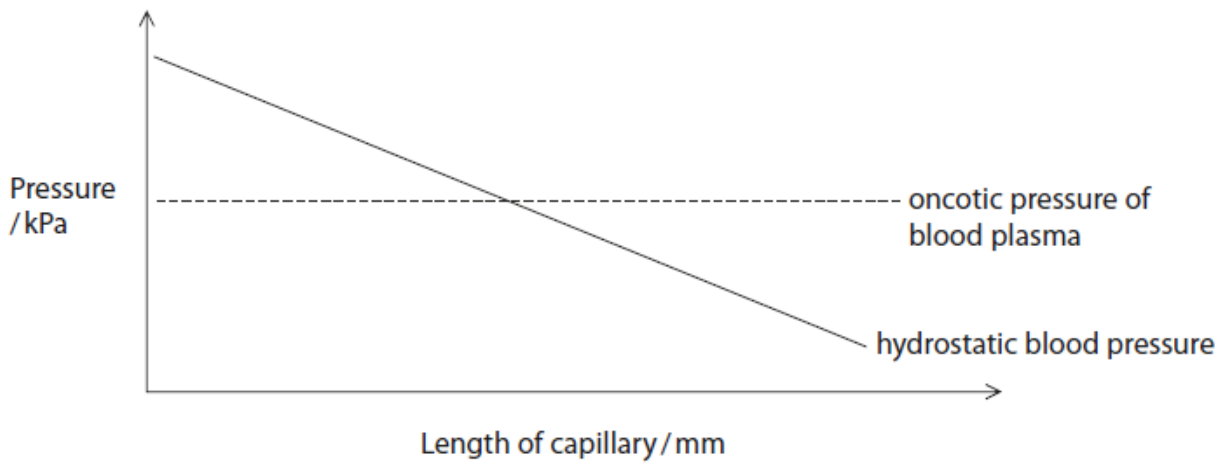
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(Total for question = 2 marks)

Q6.

The graph shows the hydrostatic pressure and oncotic pressure of the blood along a capillary.



(i) Explain how tissue fluid is formed by the capillary. Use the information in the graph to help your answer.

(3)

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(ii) Kwashiorkor is a condition caused by a lack of dietary protein. One symptom is accumulation of tissue fluid.

Explain why children suffering from kwashiorkor often suffer from an excess of tissue fluid. Use the graph to support your answer.

(2)

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(Total for question = 5 marks)

Mark Scheme

Q1.

Question Number	Acceptable Answer	Additional guidance	Mark
(i)	An answer that makes reference to the following: percentage increase calculated (1)	<u>Example of calculation</u> $\% \text{ increase} = 1.85 \times 100 / 0.9$ $= 205.555\%$ $= 206\%$	(1)

Question Number	Acceptable Answer	Additional guidance	Mark
(ii)	An explanation that makes reference to the following: • because tissue fluid accumulates and prevents gas exchange (1) • therefore less oxygen uptake and carbon dioxide removal makes patient feel breathless (1)		(2)

Question Number	Acceptable Answer	Additional guidance	Mark
(iii)	A description that makes reference to the following: • excess tissue fluid is absorbed by the lymphatic system (1) • lymphatic system drains into the veins (1)		(2)

Q2.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • blood plasma has higher protein content as the {plasma proteins / named plasma protein / some proteins} are too large to pass out of {capillary / blood} (1) • tissue fluid has less (dissolved) oxygen as it has {diffused into / respired by} the {cells / tissues} (1)	ACCEPT converse for tissue fluid ACCEPT converse for plasma	(2)

Q3.

Question Number	Answer	Additional Guidance	Mark
	• (high) hydrostatic pressure forces {fluid / plasma} out of the capillaries (at the arteriole end) (1)		(1)

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to three of the following points: • there is more protein in plasma than tissue fluid (1) • because plasma proteins are too large to pass out of the capillary (1) • and oncotic pressure generated by (plasma) proteins (1) • (so fluid moves in) as {oncotic / osmotic} pressure is greater than hydrostatic pressure (1)	Accept converse Accept converse	3 exp

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to four of the following points: - sodium ions are not removed from the ascending limb (1) - so the water potential of medullary fluid is higher (1) - therefore less water is removed from the descending limb (1) - and less water is removed from the {collecting duct / distal tubule} (1) (a higher volume of) {dilute / low concentration} urine is produced (1)	Accept less negative water potential Accept water potential gradient is lower Accept osmotic gradient is lower	4 exp

Q5.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to the following: - tissue fluid enters the lymphatic (vessels / system) (1) - lymph returns to {the (subclavian) veins / blood} (1)		(2)

Q6.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to three of the following: - tissue fluid leaves the capillary through pores (1) - because the hydrostatic pressure is greater than the oncotic pressure (1) - plasma proteins are present in the blood but not in tissue fluid / more protein in blood plasma (1) - plasma proteins are too large to leave capillary (1)	Allow fenestrations / other terms for pore Allow oncotic pressure is lower than hydrostatic pressure	3
(ii)	An explanation that makes reference to two from: - there is less protein in the blood plasma (1) - so that less tissue {fluid / water} enters blood (1) - because the oncotic pressure is less / there is less capillary length where oncotic pressure is greater than hydrostatic pressure (1)	Allow more fluid leaves than enters	2