1. (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.

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(2)

(Total 4 marks)

2. (a) Describe and explain how water moves via the apoplastic and symplastic pathways from the soil to the xylem in a root.

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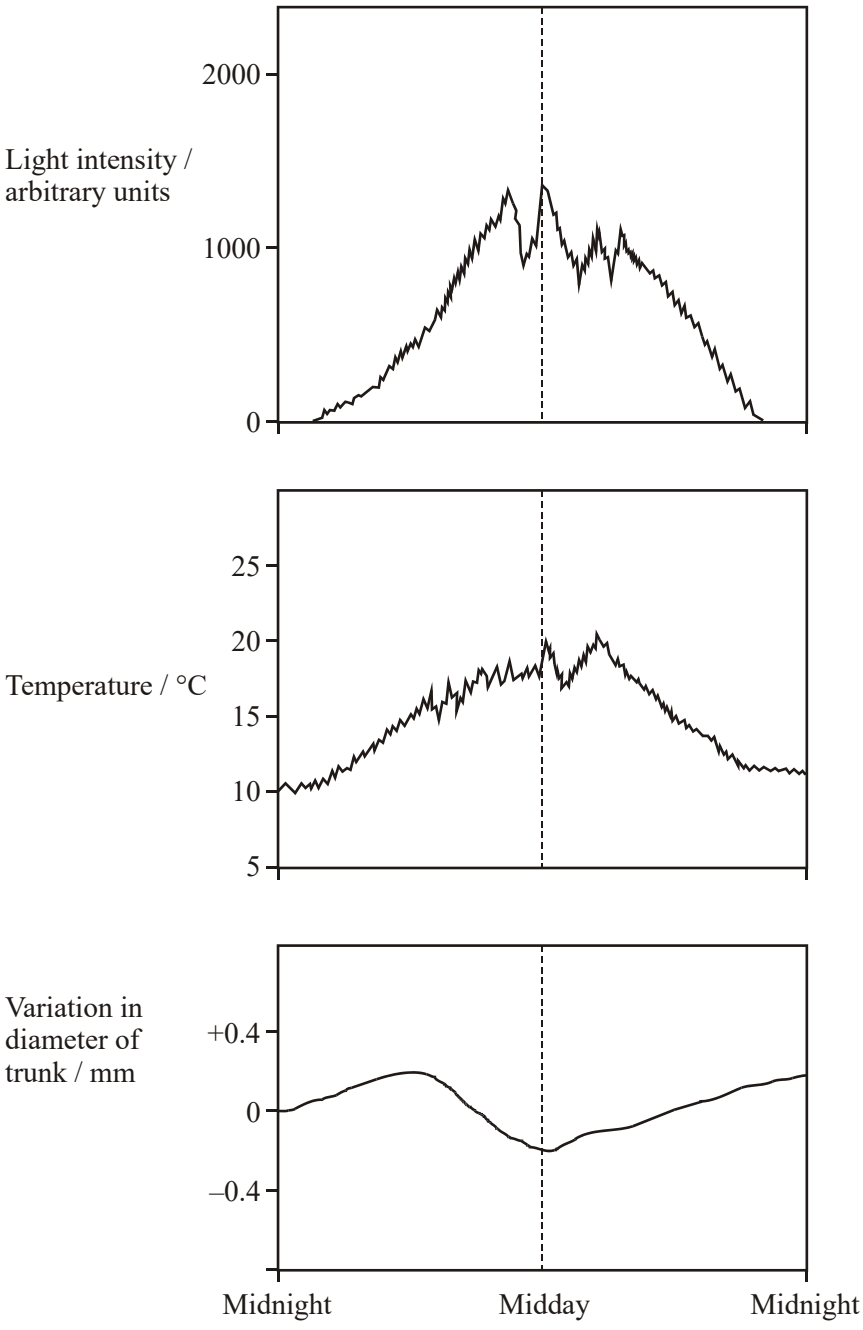
(6)

(b) The graphs show the daily changes in environmental temperature and light intensity, and changes in the diameter of the trunk of a pine tree.



Use information from the graphs, and your knowledge of the cohesion-tension theory of water movement through a plant, to explain why the diameter of the trunk is smallest at midday.

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(6)

(c) Describe and explain **three** ways in which the leaves of xerophytic plants may be adapted to reduce water loss.

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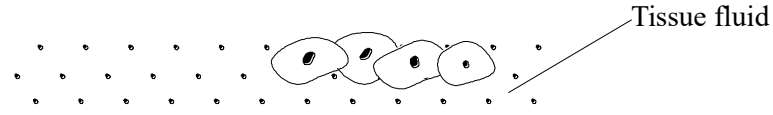
(3)

(Total 15 marks)

3. The diagram shows how tissue fluid is formed at the arteriole end of a capillary.

Tissue fluid hydrostatic pressure = +0.45kPa
Tissue fluid water potential = –0.35kPa



Blood hydrostatic pressure = +5.2 kPa
Blood water potential = –3.15kPa

Arteriole end of capillary	Venule end of capillary

(a) Calculate the pressure which leads to the formation of tissue fluid. Show your working.

Answer =.....

(2)

(b) (i) How is the high blood hydrostatic pressure at the arteriole end of the capillary produced?

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(1)

(ii) Explain what causes the blood hydrostatic pressure to decrease from one end of the capillary to the other.

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(2)

(c) More tissue fluid is passed out of the capillaries than is reabsorbed. Explain how this excess tissue fluid is returned to the blood.

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(2)
(Total 7 marks)

4. The table shows the relative rate of diffusion of oxygen through three different media.

Medium	Relative rate of diffusion
Air	11.0
Water	3.4×10^{-5}
Muscle tissue	1.4×10^{-5}

(a) The measurements in the table were all made at the same temperature. Explain how an increase in temperature affects the rate of diffusion.

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(2)

(b) The lung alveoli have a moist surface.

(i) It is sometimes suggested that this moist surface makes gas exchange more efficient. Use the information in the table to explain why this suggestion is incorrect.

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(1)

(ii) Explain how diffusion results in the alveoli having a moist surface.

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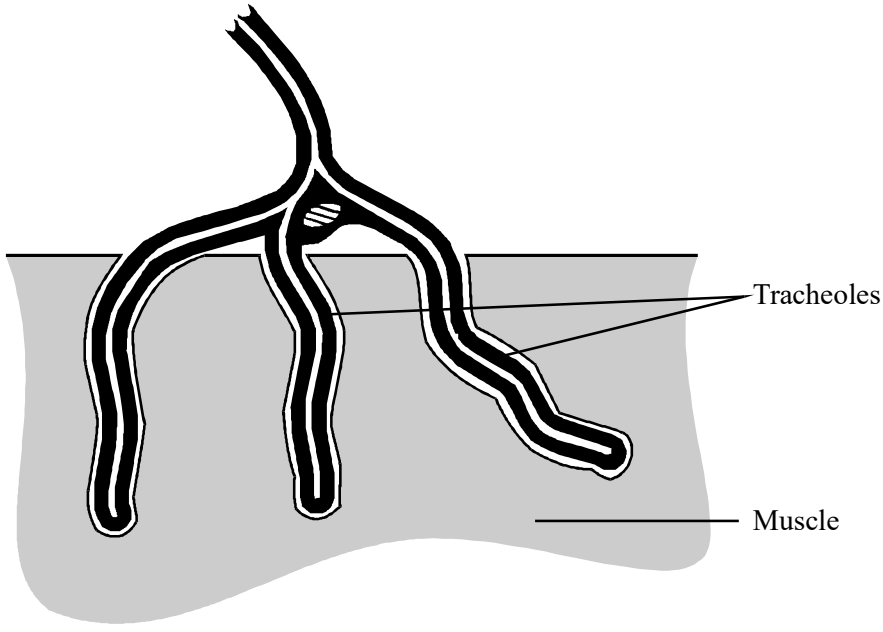
(2)

(c) The diagram shows the position of the tracheoles which supply oxygen to the muscles of an insect.



This insect has more than 1.5 million tracheoles. The distance between the ends of the tracheoles in the muscle is approximately 4 pm. Explain how these features allow efficient oxygen supply.

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(3)

(Total 8 marks)