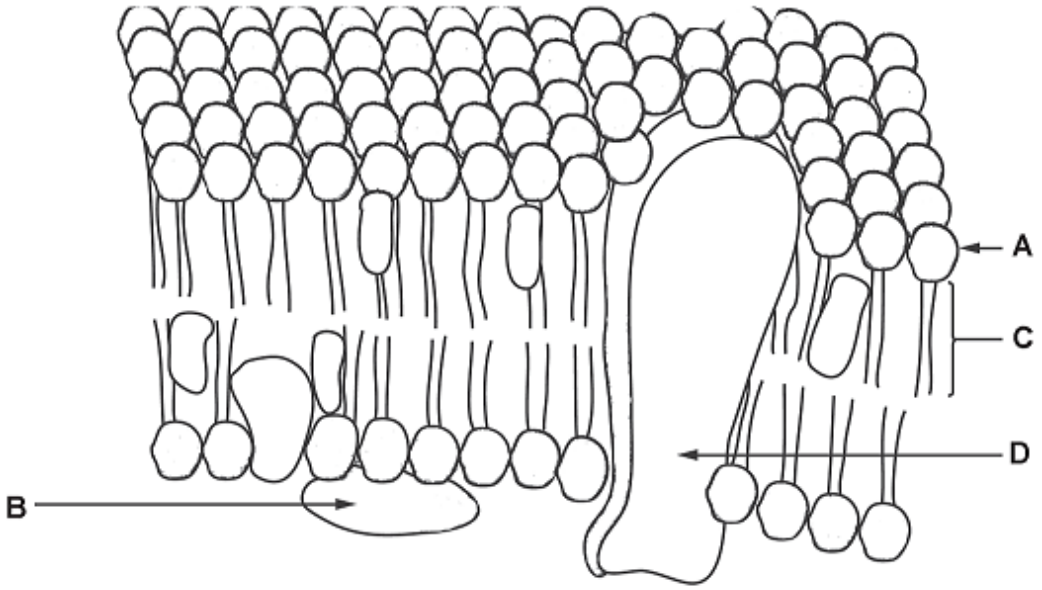
WJEC (Eduqas) Biology A-level 1.3: Cell Membranes and Transport Questions by Topic

1. The diagram below shows part of the plasma membrane from an animal cell.



(a) Complete the table below to identify the structures **A**-**D** shown in the diagram. [4]

Structure	Name
A	
B	
C	
D	

(b) Describe how structure **D** would transport a molecule against a concentration gradient. [2]

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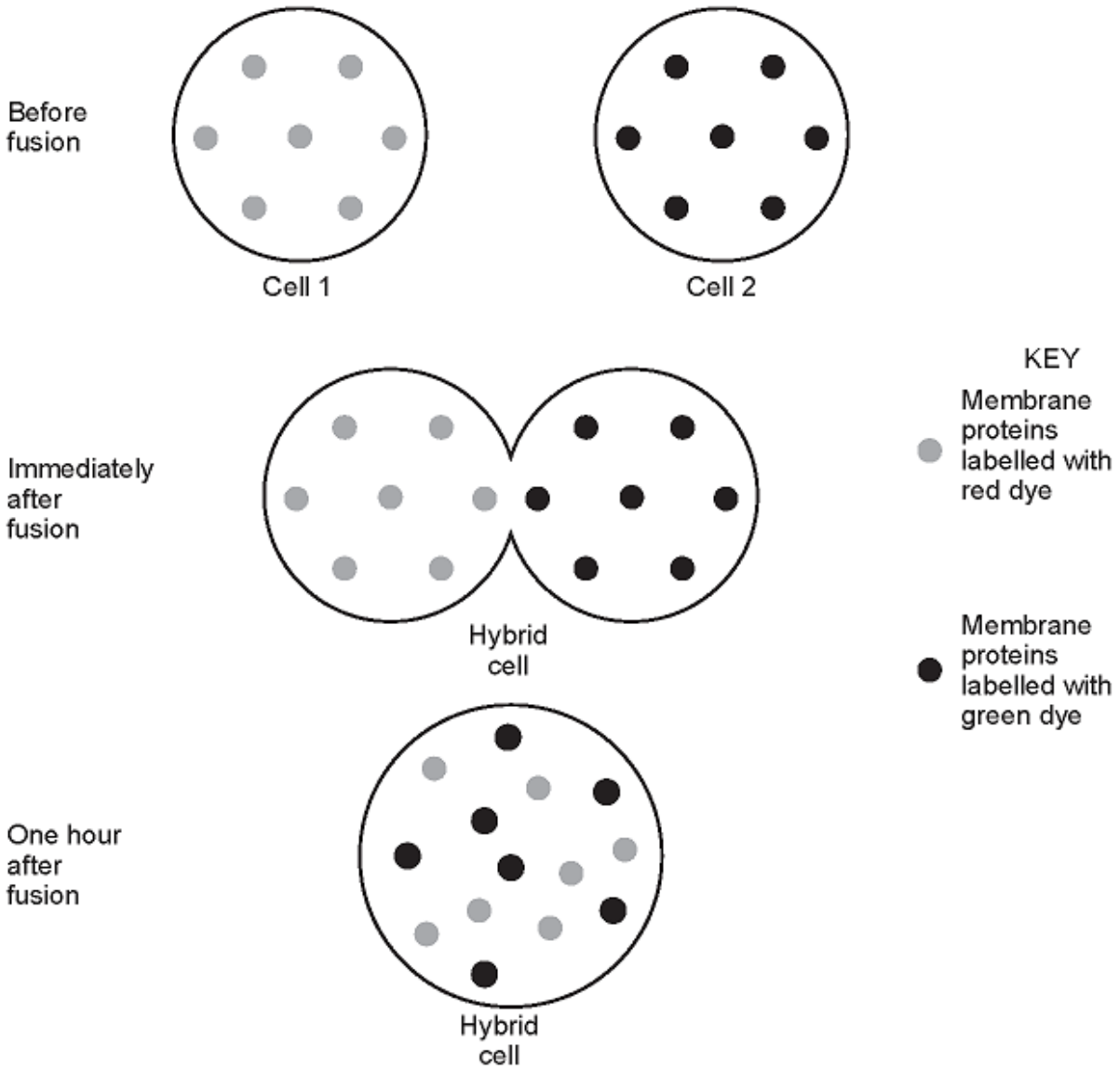
(c) In an experiment to determine the structure of the plasma membrane, scientists labelled the membrane proteins from two different cells using coloured dyes. One cell had its membrane proteins labelled with a red dye, whilst a second had its membrane proteins labelled with a green dye. The two cells were then fused to become a hybrid cell. This cell was viewed immediately after fusion and again after one hour. The results are shown below.



Use your knowledge of the structure and properties of plasma membranes to explain the results seen one hour after fusion. [3]

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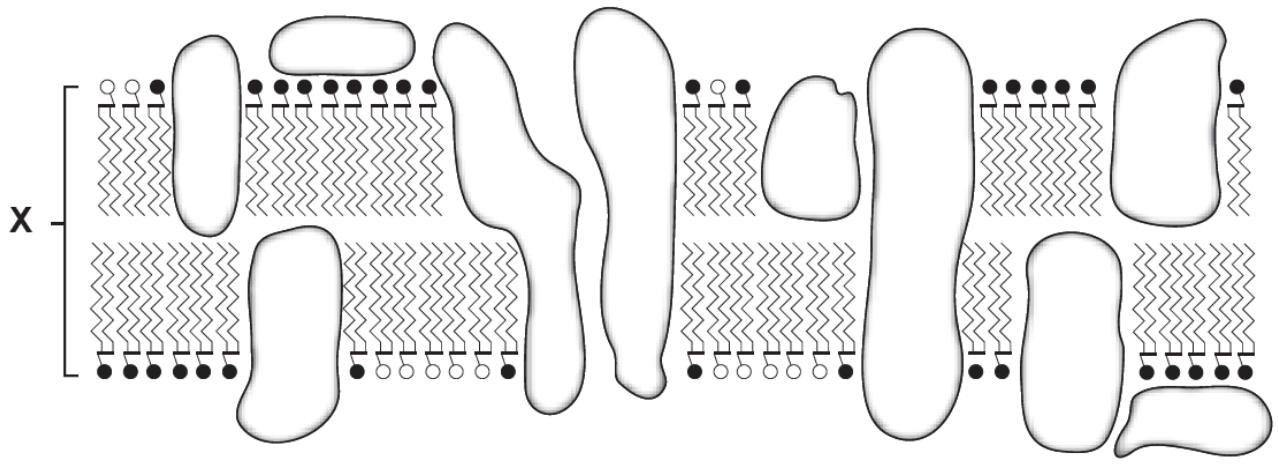
2. The diagram below shows the fluid mosaic model proposed by Singer and Nicolson in 1972



(a) The width of the membrane as shown by **X** has been measured using transmission electron microscopes. Membrane width does not vary greatly between different organisms. State a value for this width.

[1]

Membrane width = ...

(b) Glucose is water soluble. Vitamin A is lipid soluble. Describe and explain how each molecule crosses the membrane shown above.

[4]

Vitamin A

Glucose

(c) Beetroot vacuoles contain a red pigment called betacyanin. When beetroot discs are cut with a borer and immersed in a solution of 70% ethanol (an organic solvent) at 15°C, the red pigment begins to leak out of the cells into the ethanol turning it red.

(i) Using your knowledge of the structure of cell membranes, explain why this leakage of pigment occurs.

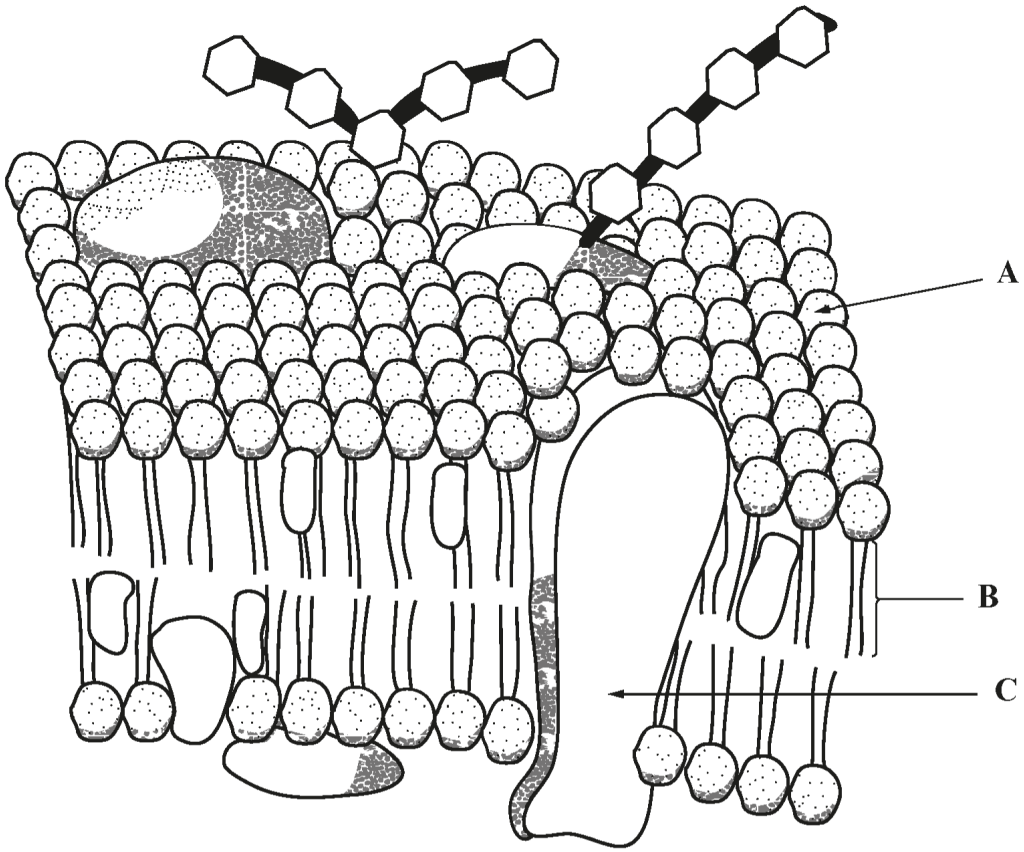
[2]

(ii) When the experiment was repeated at 30°C, the time taken for the ethanol to turn red decreased. Explain why.

[2]

3.

The diagram shows the plasma membrane of an animal cell.



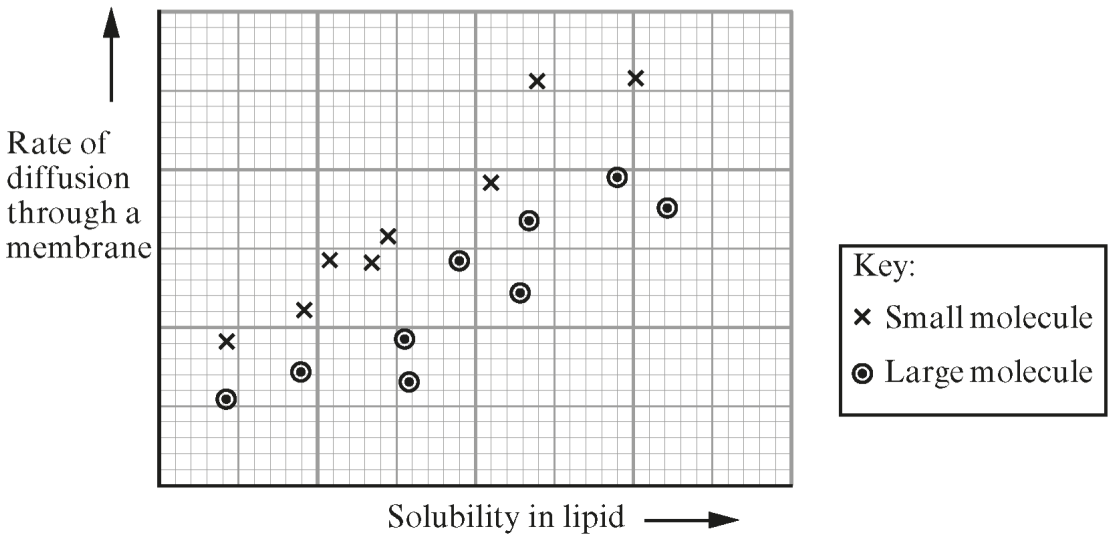
(a) State the names of the structures labelled **A**, **B** and **C**. [3]

A .....

B .....

C .....

(b) The graph shows the effect of molecule size and solubility in lipid on the rate of diffusion of substances through a cell surface membrane.



(i) State with an explanation how the solubility in lipid affects the rate of diffusion through a membrane. [2]

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(ii) Describe how molecular size affects the rate of diffusion.
Suggest an explanation for your answer. [2]

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(c) Name **two** factors which affect the rate of facilitated diffusion of a substance through a membrane. [2]

1. .....

2. .....

(d) Vitamins B_1 and K enter cells by crossing the plasma membrane. As vitamin B_1 is water soluble while vitamin K is fat soluble they take different routes across the membrane. Explain how the different routes taken by these vitamins into a cell, is determined by the structure of the plasma membrane. [4]

vitamin B_1 .....

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vitamin K .....

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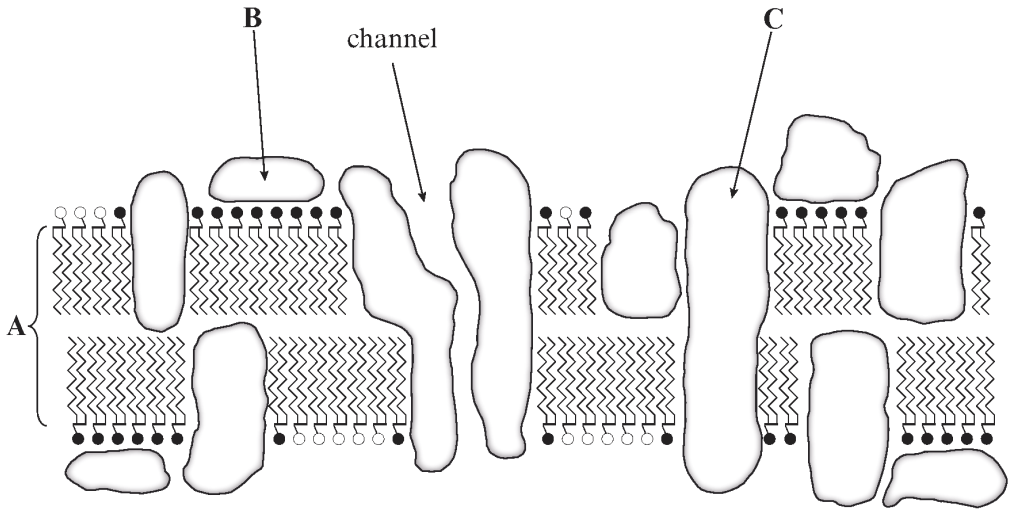
(Total 13 marks)

4. *(a)* The diagram below is of a model of a section through a cell surface membrane, as proposed by Singer and Nicholson.



(i) State the name given to this model and give reasons why it is so-called. [3]

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(ii) Name the structures labelled **A**, **B** and **C**. [3]

A .....

B .....

C .....

(iii) Describe the function of the channel shown in the diagram. [1]

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(b) Some molecules are transported across the membrane by active transport. Explain what is meant by the term *active transport*. [2]

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(c) Suggest **two** reasons why transport across the membrane is vital to the cell. [2]

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(Total 11 Marks)

5. • Doxorubicin (DOX) and idarubicin (IDA) are antibiotics.

• They are widely used in human cancer treatment.

• DOX causes rapid changes in red blood cell membranes following injection.

• These changes are

- decreased fluidity of the hydrophobic parts of the lipid bilayer

- the membrane proteins change shape.

• IDA is considered to be less toxic to cancer patients than DOX.

5. (a) (i) Explain what is meant by the term 'lipid bilayer'. [1]

(ii) Name the 'hydrophobic parts' referred to in the information above. [1]

(iii) State **two** functions of membrane proteins. [2]

(b) Use the information above to suggest why the changes in red blood cell membranes caused by **DOX** make it more toxic than **IDA**.

[2]

5. • Doxorubicin (DOX) and idarubicin (IDA) are antibiotics.

• They are widely used in human cancer treatment.

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(a) (i) Explain what is meant by the term 'lipid bilayer'. [1]

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(ii) Name the 'hydrophobic parts' referred to in the information above. [1]

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(iii) State **two** functions of membrane proteins. [2]

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(b) Use the information above to suggest why the changes in red blood cell membranes caused by **DOX** make it more toxic than **IDA**. [2]

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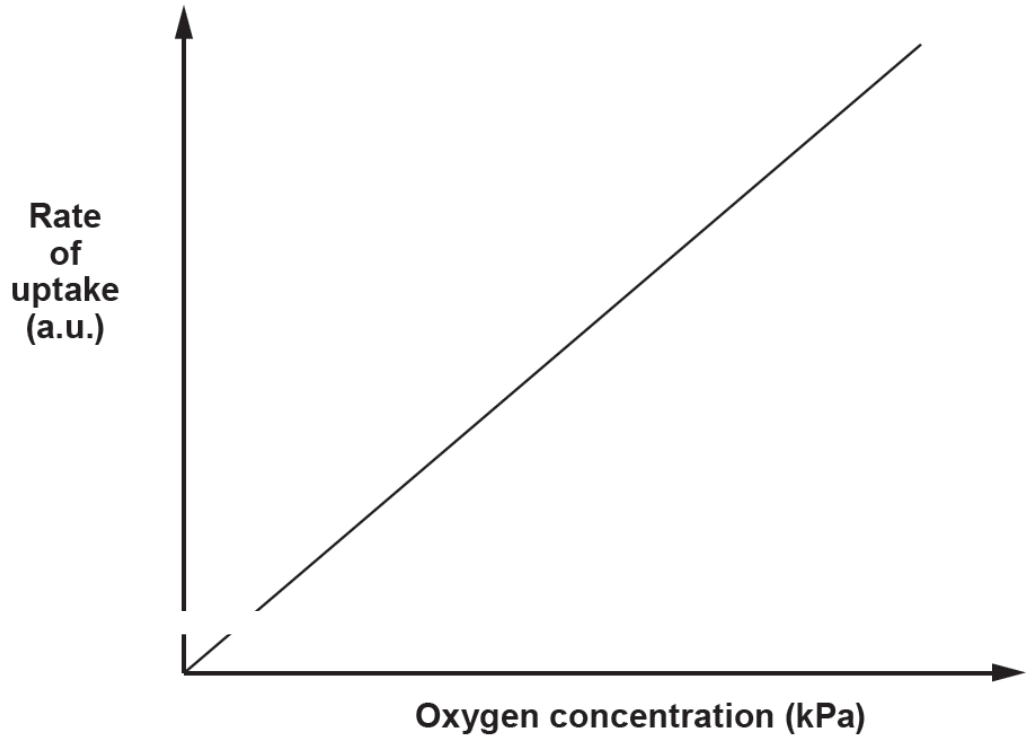
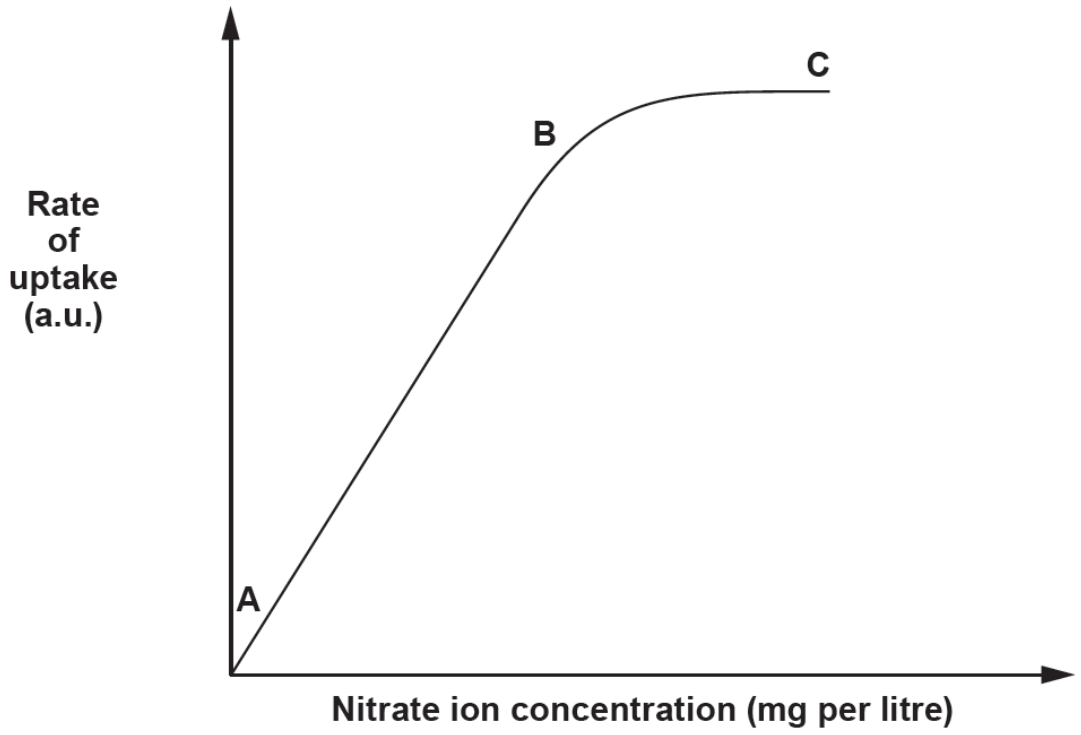
6. The graphs below show the uptake of different molecules into the roots of plants.

I. Oxygen



II. Nitrate ions



(a) Using graph **I**, name the process by which oxygen is absorbed by the roots, giving a reason for your answer.

[2]

(b) Explain why the rate of uptake of nitrate ions increases between points **A** and **B** shown on graph **II**.

[1]

(c) In the presence of a respiratory inhibitor such as cyanide, the rate of nitrate uptake falls to zero. Name the process by which nitrate ions are taken up.

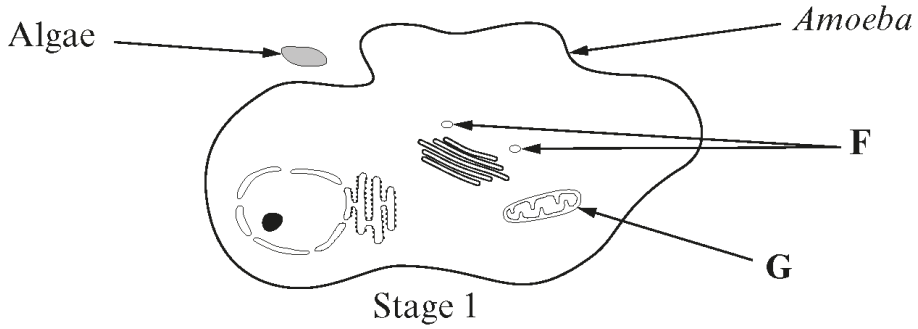
[1]

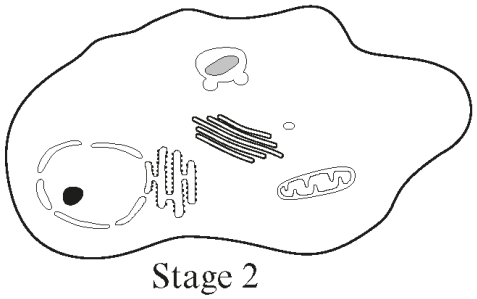
(d) Water enters root hair cells by osmosis. Calculate the solute potential (Ψ_S) of the root hair cell, when there is no net movement of water, the water potential of the soil water is –100 kPa and the pressure potential (Ψ_P) inside the root hair cell is +200 kPa. Use the formula $\Psi = \Psi_S + \Psi_P$.

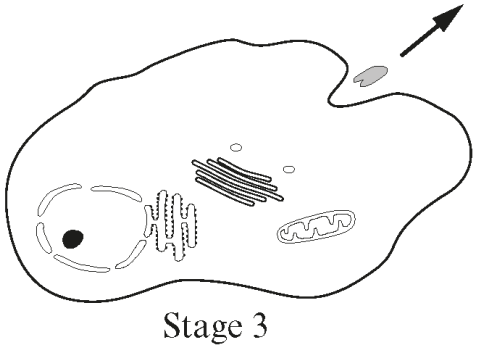
Show your working and units. [2]

Answer .....

7. *Amoeba proteus* is a single celled eukaryotic organism that can be found living in shallow freshwater ponds and streams. *Amoeba proteus* feeds on algae and other unicellular organisms. The diagrams below show the sequence of events during feeding.







(a) (i) Name and describe the process that has occurred between stages 1 and 2 on the diagram opposite. [2]

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(ii) Structures **F** on the diagram opposite are involved in the digestion of the *Amoeba's* food.
Name the organelle where Structures **F** are formed. [1]

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(iii) State the name of the process occurring at stage 3 on the diagram o posite. [1]

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