1 *Rhabdostyla* is a single-celled organism that has no cell wall and no chlorophyll.

(a) Gases are exchanged across the cell membrane of *Rhabdostyla*.

Name:

the gas produced by *Rhabdostyla* ....

the process that produces the gas ....

the method of removal of the gas ....

[3]

Rhabdostyla lives in freshwater habitats, such as ponds, lakes and rivers.

Freshwater has a very low concentration of solutes.

Rhabdostyla has a contractile vacuole that fills with water and empties at intervals as shown in Fig. 4.1. The contractile vacuole removes excess water.

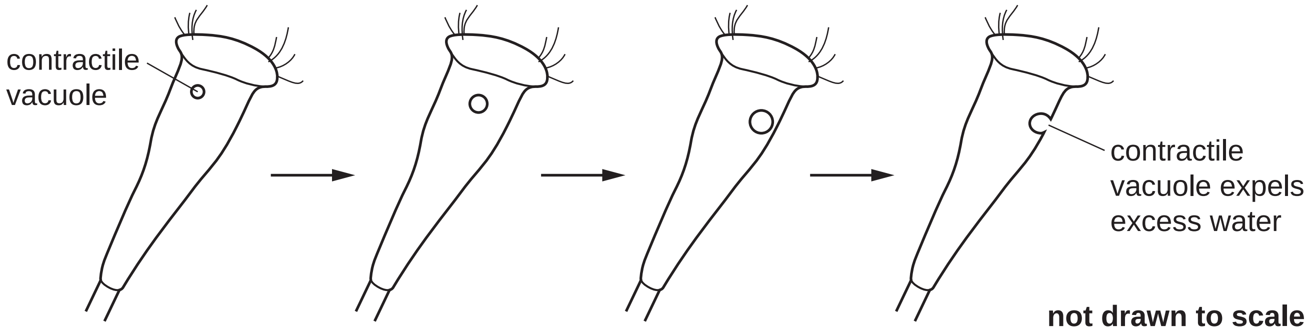

Fig. 4.1

(b) Explain, using the term **water potential**, why *Rhabdostyla* needs to remove excess water.

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....

.... [3]

In an investigation, individual *Rhabdostyla* were placed into different concentrations of sea water. The rate of water excreted by the contractile vacuole of each organism was determined. The results are shown in Fig. 4.2.

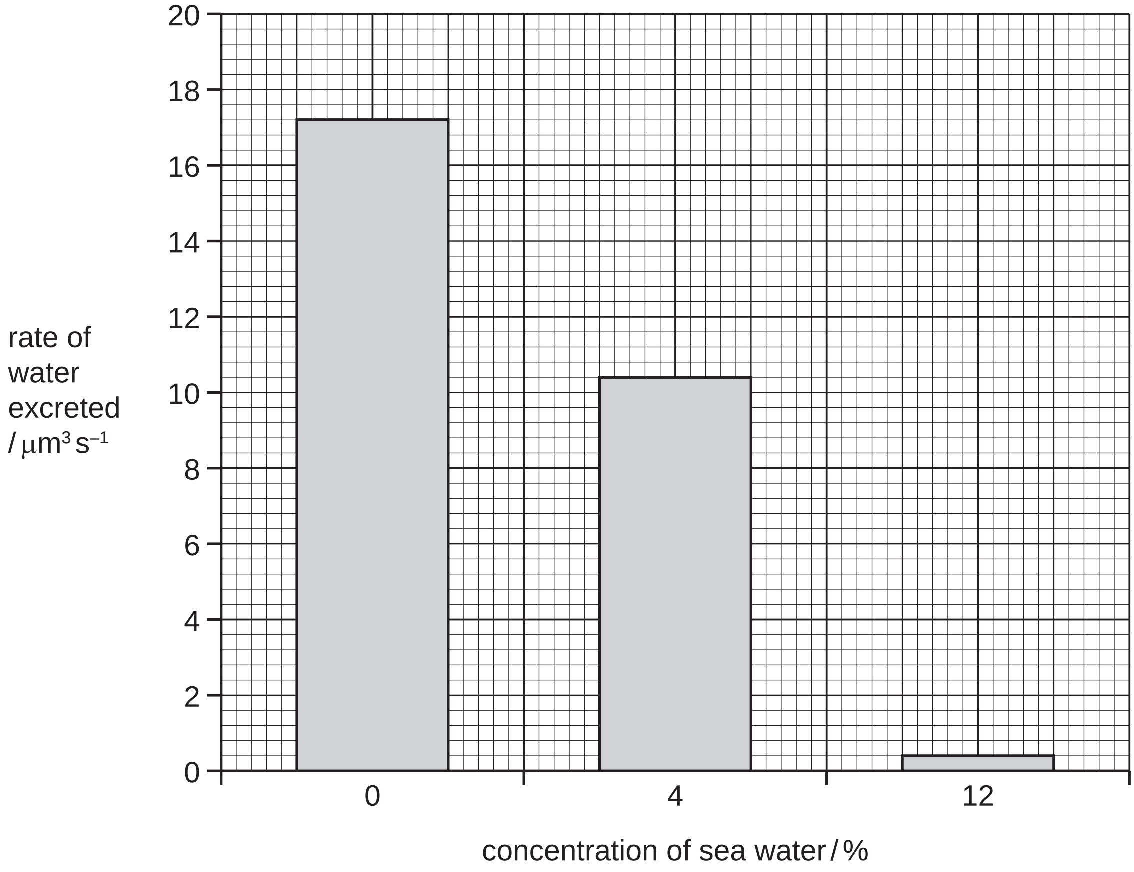

Fig. 4.2

(c) Explain the results shown in Fig. 4.2.

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.... [3]

(d) Single-celled organisms with cell walls do not have contractile vacuoles. Suggest why.

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.... [3]

[Total: 12]

2 Water moves into plants from the soil and exits through the leaves.

(a) Explain how water moves from the soil into the root.

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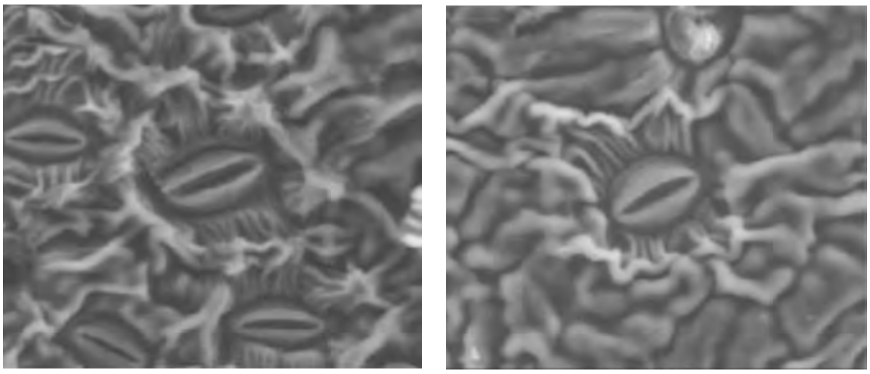
....[4]

Water reaches the leaves from the roots through the xylem. Fig. 4.1 shows images of stomata on the lower surfaces of leaves of two varieties of olive plant, **A** and **B**. Both are shown at the same magnification.



A **B**

Fig. 4.1

(b) **(i)** Describe the function of stomata.

....

....

....

....

....[2]

(ii) Compare the density of stomata between the two varieties of olive plant, **A** and **B**, shown in Fig. 4.1.

....

....

....

....

....[2]

(iii) Under identical environmental conditions the rate of water uptake in plant **A** is higher than plant **B**.

Explain why.

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....

....[3]

(c) The density of stomata is an example of a leaf adaptation to the environmental conditions.

State **two** other adaptations of leaves for survival in a **dry** environment.

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....[2]

(d) Water lost from the leaves enters the atmosphere.

Describe how water is recycled from the atmosphere back to the roots.

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....[2]

[Total: 15]

3 Ecologists study plants and animals in their natural environment.
Some ecologists inserted probes into the water-conducting tissue in trees, as shown in Fig. 4.1.
The ecologists measured the time taken for water to move up from probe 1 to probe 2.

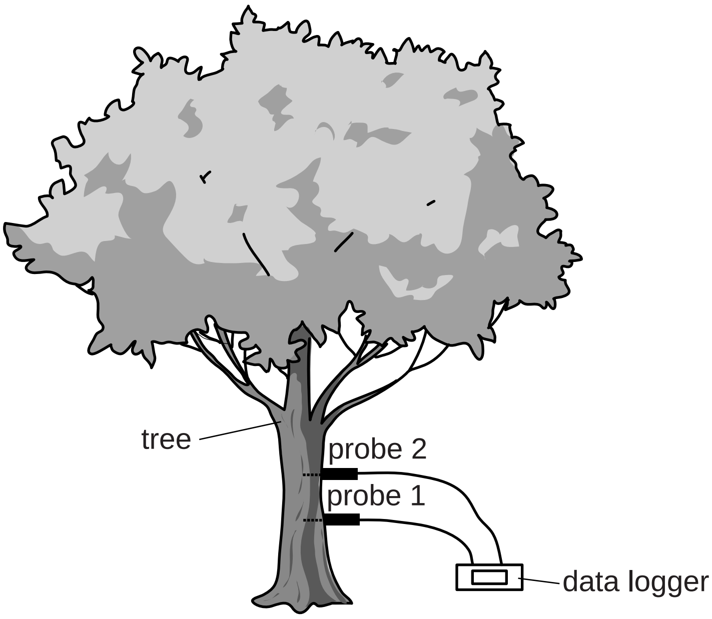

Fig. 4.1

(a) **(i)** Name the water-conducting tissue into which the two probes were inserted.

.... [1]

(ii) Describe how the structure of this water-conducting tissue is adapted to its function.

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.... [2]

(b) Explain the mechanism of water movement from the roots up the tree to the leaves.

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.... [4]

(c) Fig. 4.2 shows the rate of water conduction up three different trees in a forest over 24 hours.

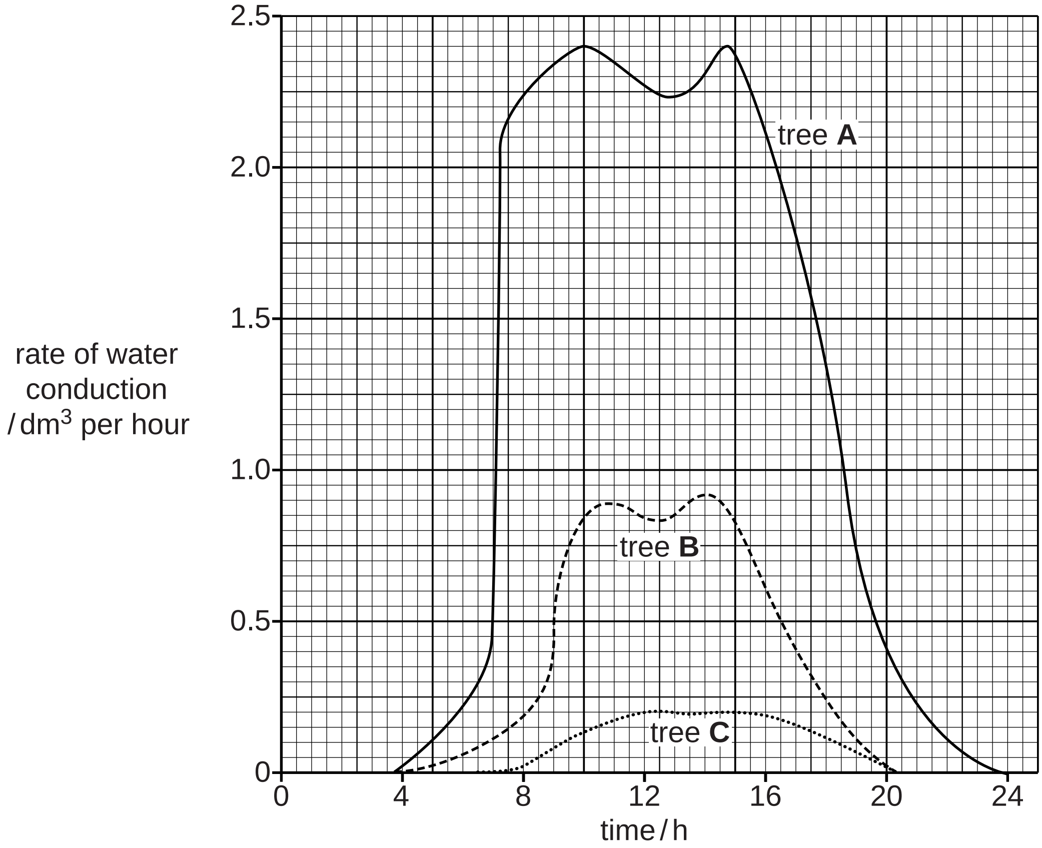

Fig. 4.2

(i) Describe the rate of water conduction in tree **A**, during this 24 hour period.

You will gain credit for using the data in Fig. 4.2 to support your answer.

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.... [3]

(ii) Suggest how the ecologists used the data in Fig. 4.2 to calculate the total volume of water used by a tree in 24 hours.

....

.... [1]

(iii) In Fig. 4.2, tree **A** is a tall tree, tree **B** is a medium-height tree and tree **C** is a short tree.

Suggest reasons for the different rates of water conduction in the three trees.

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.... [3]

(d) Loggers often cut down the tall trees in a forest.

Describe the effects on the forest ecosystem of cutting down trees.

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.... [4]

[Total: 18]