Chapter 3

Movement in and out of cells

01.0610_s16_qp_41 Q: 4

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.

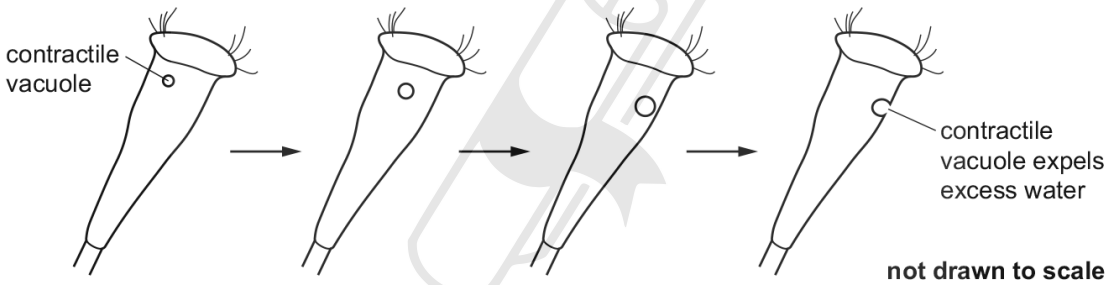

Fig. 4.1

(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.

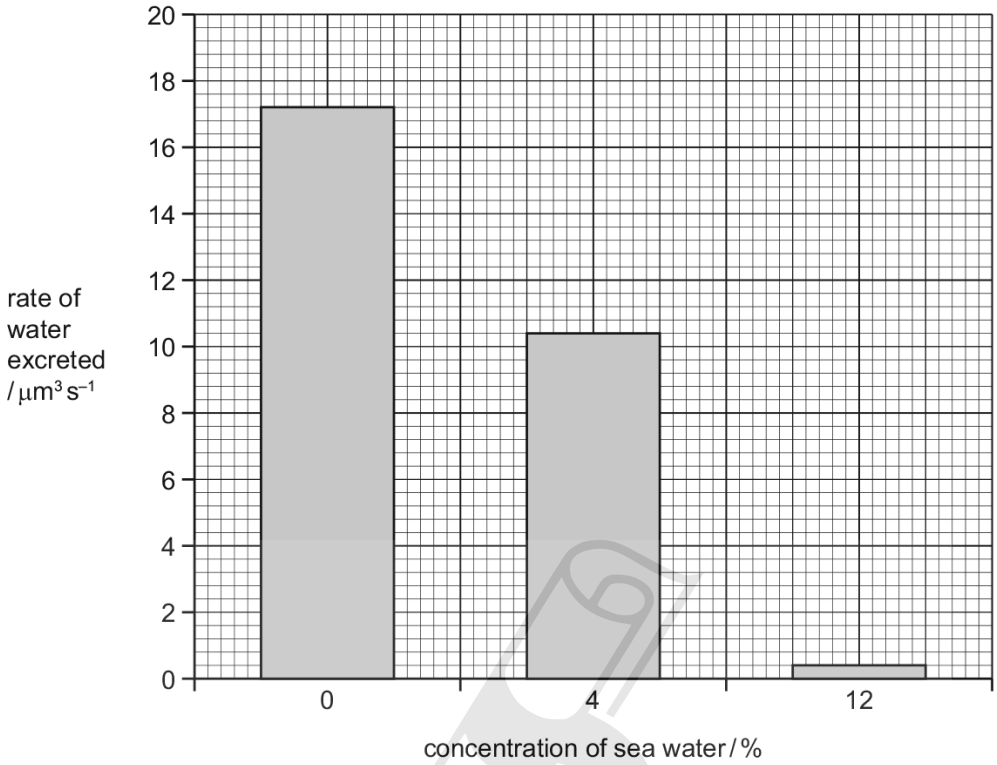

Fig. 4.2

(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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[Total: 12]

Some students investigated osmosis in raw potato sticks.

(a) Define the term *osmosis*.

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..... [3]

(b) The students measured the mass of four of the potato sticks using an electronic balance.

Fig. 4.1 shows an electronic balance.

Fig. 4.1

The students left each potato stick in one of four different liquids for 5 hours:

- distilled water
- 0.1 mol per dm^3 sodium chloride solution
- 0.5 mol per dm^3 sodium chloride solution
- 1.0 mol per dm^3 sodium chloride solution.

After 5 hours they measured the mass again and calculated the change in mass.

(i) Predict which of the liquids would cause the largest decrease in mass of a potato stick.

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(ii) The students dried the potato sticks with paper towels before putting them on the electronic balance.

Suggest why.

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..... [1]

(c) After the experiment the students noticed that the potato stick with the lowest mass was soft and floppy.

Explain why the potato stick had become soft and floppy.

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..... [3]

(d) The students followed the same experimental procedure with boiled potato sticks and found no overall change in mass in any of the solutions.

Suggest why the mass of the boiled potato sticks remained the same.

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..... [2]

[Total: 10]

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	Answer	Mark	Partial Marks
(a)	carbon dioxide / CO_2 ; (aerobic) respiration ; (simple) diffusion ;	[3]	**A** excretion **I** gas exchange
(b)	water enters by osmosis ; down a water potential gradient / high(er) to low(er) water potential ; through partially permeable membrane ; needs to remove water to prevent bursting ;	[max 3]	**R** water concentration **A** semi- / selectively / differentially
(c)	as concentration of sea water increases the removal of water decreases ; as concentration of sea water increases the water potential gradient decreases ; therefore less water enters at higher concentrations of sea water ; less excess water ;	[max 3]	**A** 0% to 12%
(d)	cell walls, inelastic / do not stretch / rigid / inflexible / keep shape of cell ; cells, are turgid / have high turgor pressure ; resist any increase in, volume / pressure ; these cells do not absorb excess water ; the cells will not burst ;	[max 3]	**I** strong / tough / don't break **A** (very) little water enters
		[Total: 12]	

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	Answer	Mark	Partial Marks
(a)	movement / diffusion, of water (molecules) ; from high water potential to low water potential / down water potential gradient ; across a partially permeable membrane ;	[3]	
(b) (i)	1.0 (mol dm^{-3} sodium chloride solution) ;	[1]	
(ii)	(to remove) excess / surface / AW, water / AW, on potato sticks ; to measure the mass of the potato (stick) only ;	[max 1]	**I** inaccurate unqualified **R** dry mass
(c)	cells / potato sticks, have lost water (by osmosis) ; from high water potential to low water potential / down water potential gradient ; (cells / tissue / potato) were, plasmolysed / flaccid ; loss of turgor (pressure) ; not enough pressure of water pushing on cell walls ;	[max 3]	**I** water concentration **I** incipient (plasmolysis) **A** reduced turgidity / description
(d)	protein denatured (when cooked) ; cell membrane, damaged / destroyed (when cooked) ; no osmosis will occur ;	[max 2]	**R** killed proteins **I** killed / denatured, cells **I** damaged cell wall
		[Total: 10]	