2 Five potato cylinders each measuring 40 mm were placed in concentrated salt solution for 24 hours. When they were re-measured their average length was 37 mm. Explain this result. *[3]*

Typical answer

2 Three of the four following points for 3 marks.

- *There was more water in the cells of the potato than in the concentrated salt solution. You could also say that the salt solution is more concentrated than the potatoes.* *[3]*
- *Water moved from the potato into the concentrated salt solution.*
- *By osmosis.*
- *Through a partially permeable membrane.*

Note: This time you would get 1 mark for using the word 'osmosis'.

How osmosis affects living organisms

In plants:

- osmosis allows cells to take in enough water to become rigid and provide support – this is called **turgor**
- the **cell wall** is very important because it stops the cell taking in too much water and bursting
- if there is a shortage of water the plant will **wilt** because the cells are not turgid and if the plant loses water (as opposed to not getting enough) the cells may even become **plasmolysed** – the cells lose so much water that the membrane pulls away from the cell wall.

In animals:

- the cells are usually in carefully controlled conditions and they do not take in or lose too much water
- for example a **red blood cell** will shrivel up if it is put in a strong sugar solution and will burst if it is placed in pure water (in the blood it is in a carefully controlled solution and so it normally does not take in or lose too much water).

Active transport

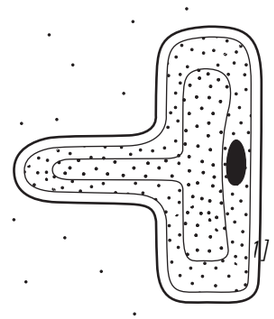
In **active transport**, minerals (or other substances) are moved from where they are **less concentrated** to where they are **more concentrated** – they move **against** the concentration gradient. To do this **respiration** is needed to produce **energy**. **Oxygen** is needed for respiration.

Active transport therefore differs from osmosis in two main ways:

- it moves substances against the concentration gradient
- it requires energy.

Question

1 The diagram shows the concentration of nitrate ions in a root hair cell and in the surrounding soil water.



- **a** Name the process in which nitrate ions are taken into the cell. *[1]*
- **b** Explain why the roots must be well aerated for the process to work effectively. *[2]*

Typical answer

1 a *Active transport.*

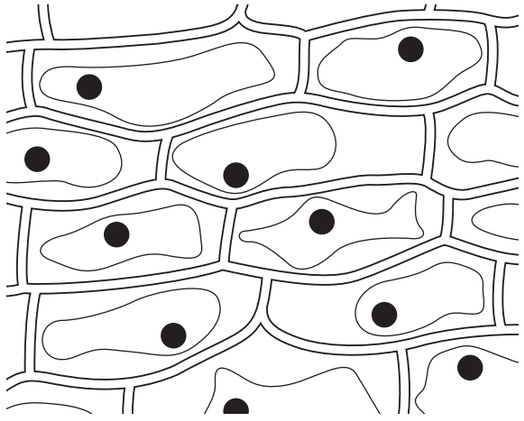
Note: The process must have been active transport as you can see from the diagram that there are more nitrate ions inside the cell than outside it.

b Two of the following three points for 2 marks. *[2]*

- *To have access to oxygen.*
- *For respiration/energy.*
- *To move the ions against the concentration gradient.*

Exam questions

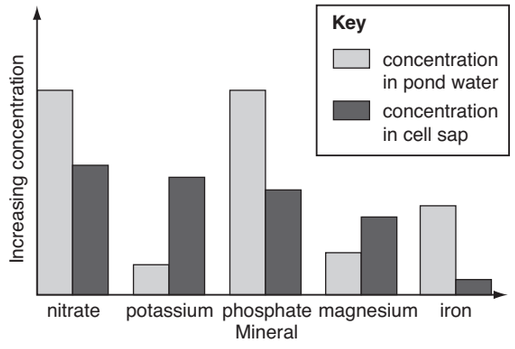
1 The diagram shows a strip of onion tissue placed in a strong sugar solution.



Explain what has happened to cause the changes seen in these onion cells. *[4]*

Biology Paper 2 Foundation
June 2006 (amended)

2 Study the bar chart showing the relative amounts of various minerals in pond water and in the cytoplasm of a microscopic green alga (water plant).



- **a** Which mineral(s) must have been absorbed by active transport? Explain your answer. *[2]*
- **b** Explain why the rate of active transport increases when the water temperature increases in summer. *[2]*

Double Award (Modular) Module A Higher
May 2006