Contents

Physics

* Only available in the CD-ROM version of the book.

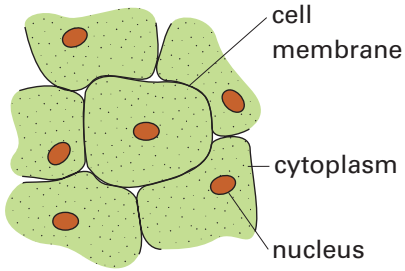
Cells

- **All cells have some common features but plant cells have some extra features.**
- **Many cells are specialised to carry out particular functions.**

A Animal cells

>> key fact **Human cells and other animal cells have these parts:**

part	function
cell membrane	controls the movement of substances into and out of the cell
nucleus	contains the cell's genetic material and controls the activities of the cell
cytoplasm	the site of most of the cell's chemical reactions, which are controlled by enzymes
mitochondria	release energy by respiration
ribosomes	where proteins are made (protein synthesis)



Animal cells. Plant cells also have these features.

exam tip >>

Take care not to describe the nucleus as the brain of the cell.

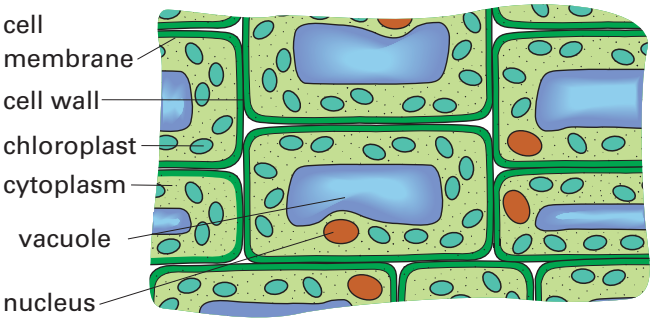
B Plant cells

1 **key fact** **Plant cells have the same parts as animal cells, but they also have a cell wall. This gives the cell its shape and strengthens the cell.**

2 **key fact** **Plant cells also may have:**

- **Chloroplasts. These contain chlorophyll, a green protein that absorbs light energy to make food by photosynthesis.**

- **A permanent vacuole. This is filled with a watery cell sap. When the vacuole is filled, it pushes the cytoplasm against the cell wall. This helps the cell keep its shape.**



Plant cells. Note their regular shape compared to the animal cells.

C Structure and function

key fact **Cells may look different because different types of cell have different functions. Their structure helps them carry out their functions efficiently.**

Here are some examples:

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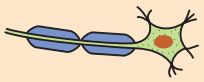
You may be given some information, such as a diagram, to help you explain how the structure of a cell is related to its function.

type of cell	structure	function	
nerve cell	long and thin	carries nerve impulses from one part of the body to another	
sperm	long tail	allows the sperm to move towards an egg cell	
root hair cell	large surface area	absorbs water and dissolved minerals	
leaf cell	box shape with many chloroplasts	absorbs light energy for photosynthesis	

>> practice questions

1 **List:**

a) the feature common to all cells,

b) the features found only in plant cells.

2 **Suggest why a plant wilts (becomes floppy) when it is short of water.**

3 **What substances control chemical reactions in the cytoplasm?**

Diffusion and osmosis

Diffusion and osmosis are processes that allow dissolved substances to move into and out of cells.

A Diffusion

1 **key fact** **Diffusion is the movement of a substance from a region where it is more concentrated to a region where it is less concentrated.**

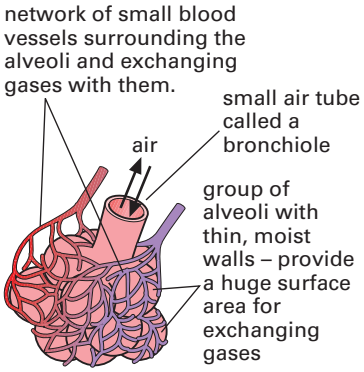
2 **key fact** **The diffusing substance moves down a concentration gradient. The greater the difference in concentration, the faster the rate of diffusion.**

3 **key fact** **Diffusion works for gases and substances in solution.**

4 Dissolved substances can move into and out of cells because of diffusion.

5 Gases are exchanged at the surface of the lungs because of diffusion:

- oxygen moves from the air into the blood because it is at a higher concentration in the air
- carbon dioxide moves from the blood into the air in the lungs because it is at a higher concentration in the blood.



The alveoli in the lungs have a large surface area and thin walls to allow efficient diffusion of oxygen and carbon dioxide.

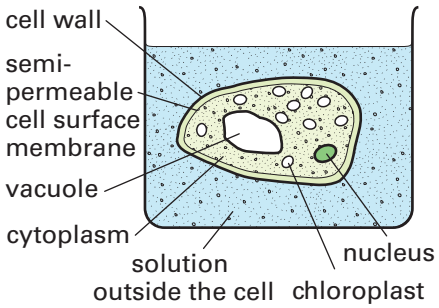
B Osmosis

1 **key fact** **Osmosis is the diffusion of water from a dilute solution to a more concentrated solution through a partially permeable membrane.**

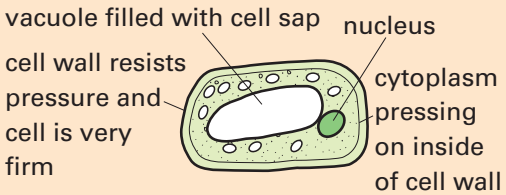
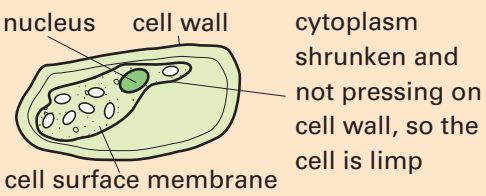
2 **key fact** **A partially permeable membrane allows small molecules like water to pass across, but not large molecules such as starch and proteins. The cell membrane is partially permeable.**

3 Water can move into and out of a cell if the concentration outside is different from the concentration inside the cell.

4 For example, in an experiment some pieces of potato are put into solutions with different sugar concentrations.



Here are the results of the experiment:

Potato in dilute sugar solution	Potato in concentrated sugar solution
	
This cell has gained water by osmosis.	This cell has lost water by osmosis.

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When the concentration outside a cell is the same as the concentration inside it, there is no net movement of water by osmosis.

>> practice questions

1 What is diffusion?

2 Some cut fruit is sprinkled with sugar. After a while the fruit has shrunk a little and the sugar has formed a sweet-tasting syrup. Explain, in terms of osmosis, what has happened.