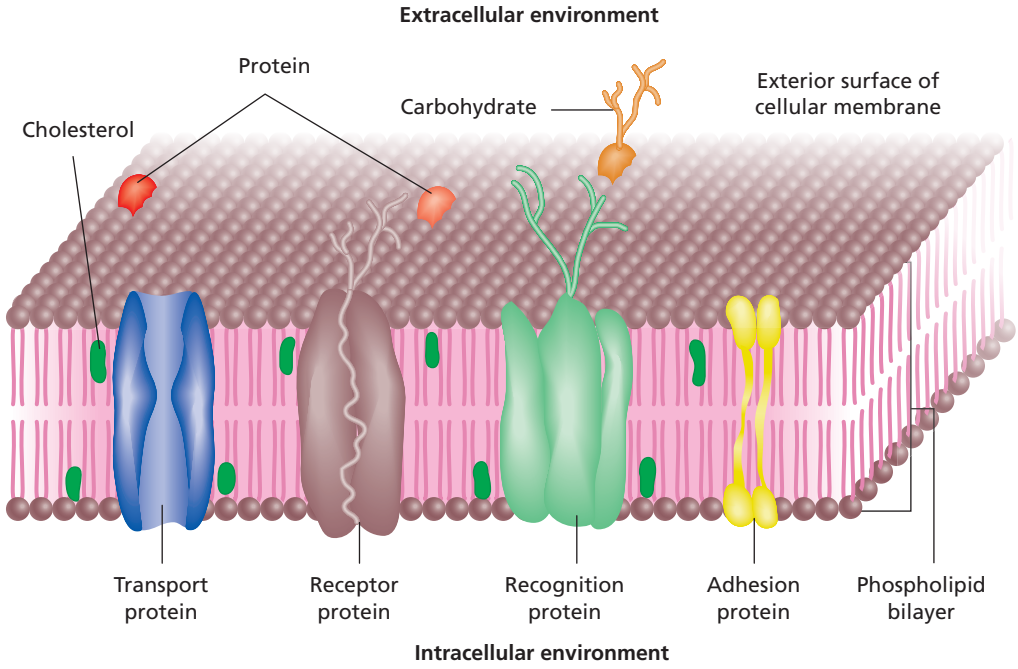
ACTIVITY SHEET ANSWERS

Chapter 8 Suggested answers

8.1 Cell membrane



8.2 Movement across the plasma membrane

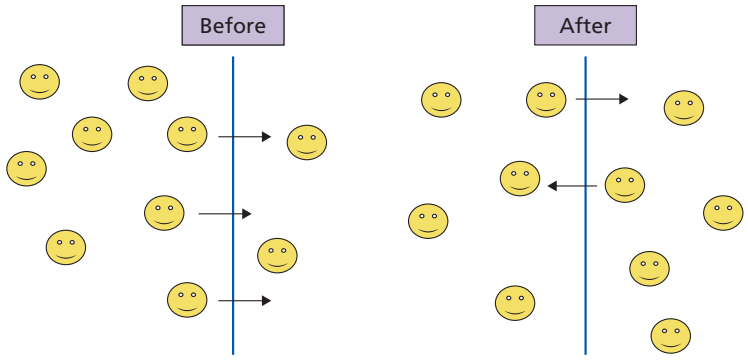
1 Osmosis: the net movement of water across the plasma membrane from a region of high concentration to a region of low concentration, without the use of energy, to create a state of equilibrium.

Diffusion: the passive (without energy) movement of small molecules across the plasma membrane from a region of high concentration to a region of low concentration of that molecule to create a state of equilibrium.

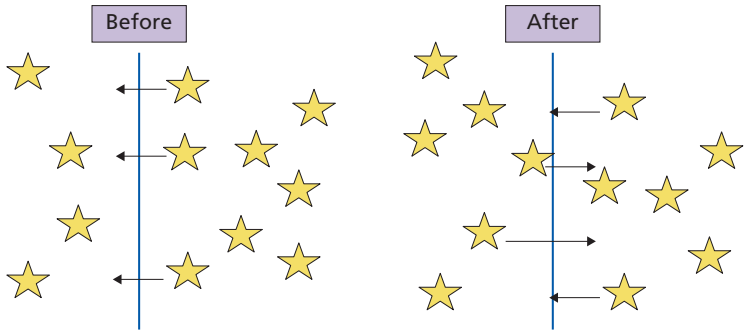
Facilitated diffusion: the passive (without energy) movement of larger molecules across the plasma membrane from a region of high concentration to a region of low concentration of that molecule with the aid of a carrier protein and protein channel to create a state of equilibrium.

Active transport: the active (requires energy) movement of molecules across the plasma membrane from a region of low concentration to a region of high concentration of that molecule.

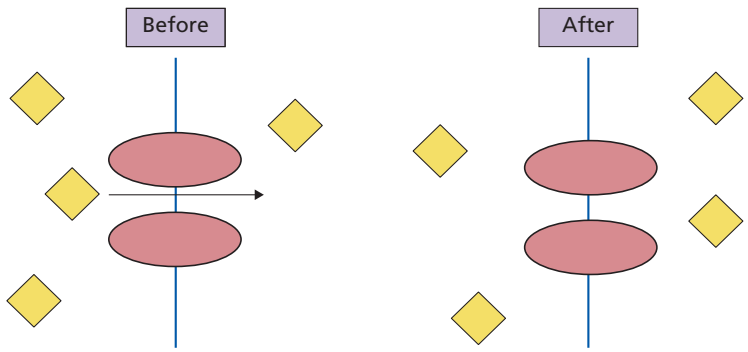
2 a Osmosis



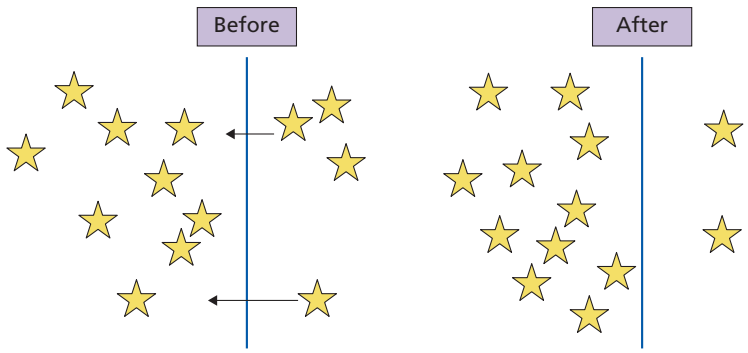
b Diffusion



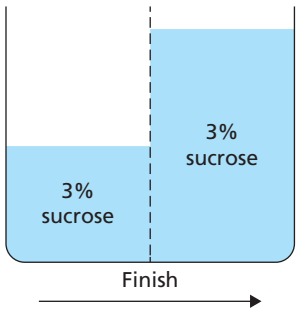
c Facilitated diffusion



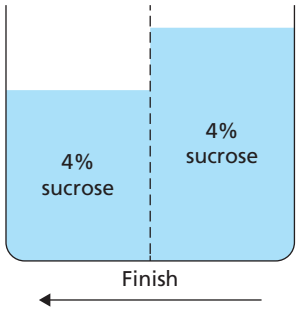
d Active transport



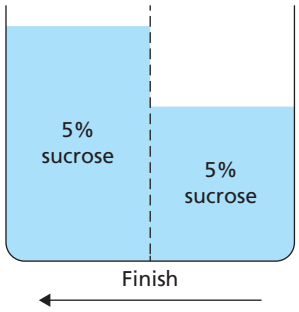
3 a



b



c



8.3 Investigating osmosis

Aim

To investigate the effect of temperature on the rate of osmosis across a semi-permeable membrane

Hypothesis

The rate of osmosis will increase with an increase in temperature.

Safety

Risk	Risk prevention
Hot water	Hot water can burn; pour carefully. If hot water comes in contact with the skin, run under cold water for 5 minutes.
Knife	Use knife carefully when cutting potato. If a cut occurs apply pressure to the wound and have a teacher assess whether it requires a bandaid or stitches.

Method

1 Cut four cubes of potato, each 3 cm × 3 cm.

2 Cut a well in each cube, taking care not to cut all the way through.

3 Place one cube in a dish of water at 5°C until it is roughly level with the bottom of the well.

4 Place one cube in a dish of water at 15°C until it is roughly level with the bottom of the well.

5 Place one cube in a dish of water at 25°C until it is roughly level with the bottom of the well.

6 Place one cube in a dish of water at 35°C until it is roughly level with the bottom of the well.

7 Place 2 g of honey into each of the wells.

8 Keeping each temperature constant, record results every 30 minutes for 2 hours.

9 Record results.

8.4 Surface area to volume ratio

1 a 2 cm × 2 cm × 2 cm

$$\begin{aligned} \text{Surface area} &= 2 \times 2 \times 6 \\ &= 24 \text{ cm}^2 \\ \text{Volume} &= 2 \times 2 \times 2 \\ &= 8 \text{ cm}^3 \\ \text{SA:V} &= 24:8 \\ &= 3:1 \\ &= 3 \end{aligned}$$

b 5 cm × 5 cm × 5 cm

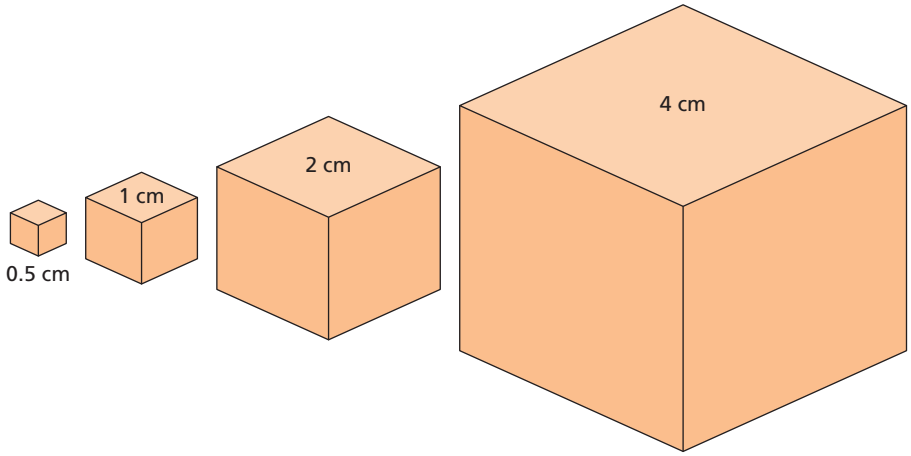
$$\begin{aligned} \text{Surface area} &= 5 \times 5 \times 6 \\ &= 150 \text{ cm}^2 \\ \text{Volume} &= 5 \times 5 \times 5 \\ &= 125 \text{ cm}^3 \\ \text{SA:V} &= 150:125 \\ &= 6:5 \\ &= 1.2 \end{aligned}$$

c 0.3 cm × 0.3 cm × 0.3 cm

Convert to appropriate scale − 3 mm × 3 mm × 3 mm

$$\begin{aligned} \text{Surface area} &= 3 \times 3 \times 6 \\ &= 54 \text{ mm}^2 \\ \text{Volume} &= 3 \times 3 \times 3 \\ &= 27 \text{ mm}^3 \\ \text{SA:V} &= 54:27 \\ &= 2:1 \\ &= 2 \end{aligned}$$

2 a



b

Cube	SA	V	SA:V
0.5	1.5	0.125	12:1
1	6	1	6:1
2	24	8	3:1
4	96	64	1.5:1

c As the side dimension of the cube doubles the SA:V ratio decreases by half.

d Nutrients and wastes must enter and exit through the plasma membrane. With a low SA:V ratio, substances would not enter or exit the cell quick enough to meet the cells demands, thus cells require a high SA:V.

3 a

Rectangle	Length	Width	Height	SA	V	SA:V
1	32	16	1	1120	512	2.2
2	16	16	2	640	512	1.3
3	8	16	4	448	512	0.88
4	8	8	8	384	512	0.75

b As the height of the rectangular object increased the surface area decreased. The volume remained constant.

c The surface area to volume ratio decreased as the height of the rectangular box increased.

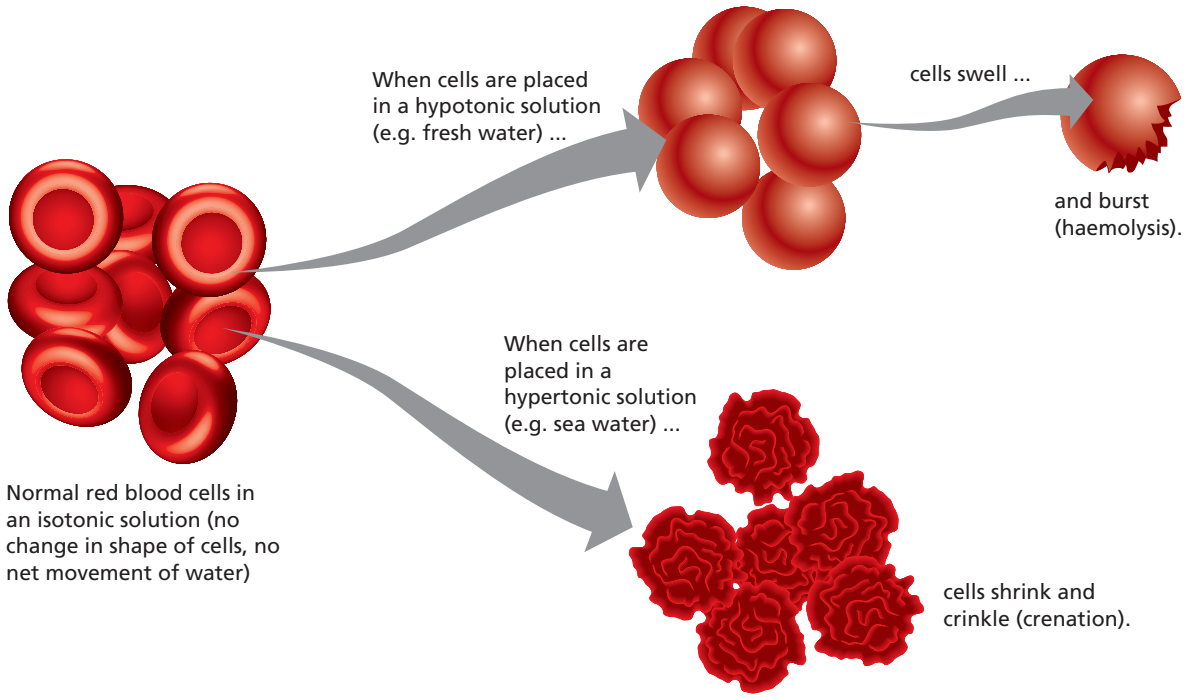
d Rectangle 1, $32 \times 16 \times 1$

e Leaves are long and flat to give the highest surface area exposed to the sun for photosynthesis. They are thin so that diffusion of gases (CO_2 and O_2) to the cells can occur efficiently.

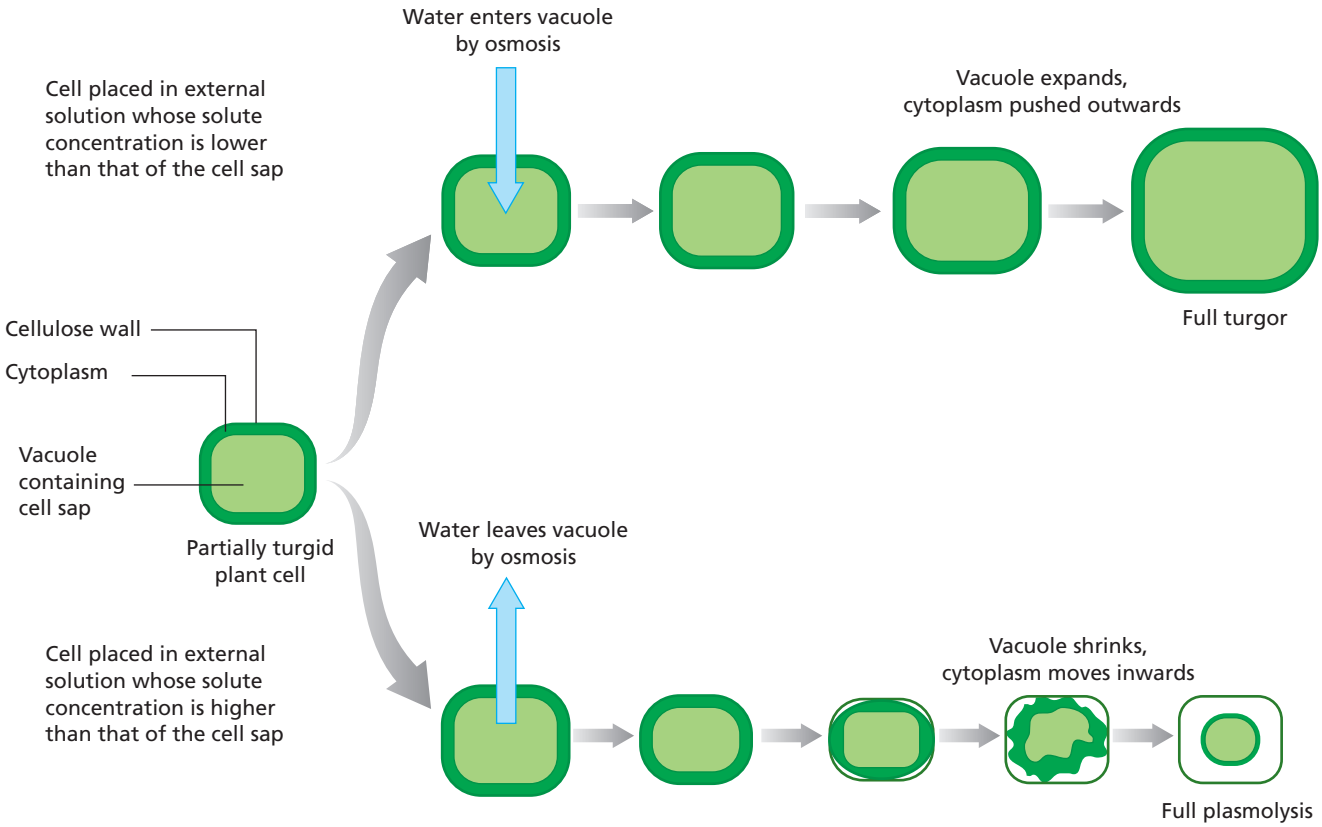
8.5 Vocabulary

1 a Students' responses will vary. Students are recommended to show their paragraph to their teacher for correction.

b Flow chart 1



Flow chart 2



2 Students' responses will vary.