Answers to SAQs

Chapter 7

1 Pencil is not sharp.
Lines are not clear and continuous.
Individual cells are drawn in a low power plan.
Tissues not completely enclosed by lines.
Ruler not used for label lines.
Label lines cross.

2 This is a way of conserving water. The upper epidermis is more exposed to sunlight, so loss of water by transpiration would be greater from this surface.

3 a Increased wind speed moves water vapour away from the leaf more rapidly, thus maintaining a steeper water potential gradient between the air spaces of the leaf and the surrounding air.

b A rise in temperature increases the rate of evaporation from the cell walls into the air spaces. This is because the kinetic energy of water molecules increases, making them move, and therefore diffuse, more rapidly. High temperatures may also decrease the humidity of the air (as warm air can hold more water), so increasing the diffusion gradient.

4 Mammals use the evaporation of water in sweat for cooling purposes; the water evaporates from the skin surface, absorbing heat energy. Thus the transcription cooling mechanism and the main cooling mechanism of mammals are very similar.

5 It is 'necessary' because stomata must be open for gas exchange, and if stomata are open, it is inevitable that water will escape by diffusion. It may be described as an 'evil' because the plant can suffer harmful water stress, even wilting, if transpiration occurs.

6 a Possible variables are: total leaf area; temperature; light intensity; air movement; humidity.

b The reservoir could be calibrated so that the volume could be measured when re-setting the meniscus at the end of the experiment. The reservoir could be substituted with a graduated syringe to make this easier. Alternatively the diameter of the capillary tube opening could be measured and the volume calculated from the distance travelled by the meniscus.

7

Xerophytic feature of leaves	How it helps to conserve water	Example (name of plant)
thick cuticle	waxy cuticle is impermeable to water	marram grass, Sitka spruce
leaf rolling	see Figure 7.21a and Figure 7.22	marram grass
hairy	see Figure 7.21d	marram grass, *Phlomis italica*
sunken stomata (in pits or grooves)	see Figure 7.21c and Figure 7.22	marram grass, Sitka spruce
reduced surface area : volume ratio/ spiny or small	see Figure 7.21b and e	*Opuntia*, cardon, Sitka spruce
outer (lower) epidermis has few or no stomata	see Figure 7.22	marram grass

8 a In plants, osmosis is involved in the uptake of water from soil into the root hair. It may also be involved in movement of water from cell to cell across the root, but only if the water moves through the cell surface membranes of the cells. If it travels by the apoplast pathway or via plasmodesmata between cells, then osmosis is not involved. Movement across the root endodermis does involve crossing cell surface membranes, so osmosis is again involved here. In the leaf, osmosis is involved if water moves into the cytoplasm of a cell across the cell surface membrane, but not if it moves by the apoplast pathway or

plasmodesmata, as in the root.

b In plants, mass flow is involved in the movement of water up the xylem vessels.

9 **a** The total lack of cell contents provides an uninterrupted pathway for the flow of water.

b The lack of end walls also provides an uninterrupted pathway for the flow of water.

c The wider the diameter, the more water can be moved up through a xylem vessel per unit time. However, if the vessels are too wide, there is an increased tendency for the water column to break. The diameter of xylem vessels is a compromise between these two requirements.

d The lignified walls provide support, preventing the vessels from collapsing inwards.

e Pits in the walls of the vessels allow water to move into and out of them.

10 **a** examples include proteins, amino acids, nucleic acids (RNA and DNA), chlorophyll, NAD, NADP

b RNA, DNA, ATP, ADP, NADP, phospholipids

c the amino acids cysteine and methionine

11 sucrose, amino acids, ATP and plant growth substances

12 **a** sink (nectary)

b sink (developing fruit)

c source (sprouting potato tuber)

d sink (developing potato tuber)

13 All the required contents of this comparison table are in the Coursebook on pages 151–152. Care should be taken that equivalent points are kept opposite each other.