## Solutions

Each answer shows the steps, then the **result**.

**2.1**

- letting in carbon dioxide for photosynthesis; limiting water loss by transpiration

**2.2**

- abscisic acid (ABA)

**2.3**

- the stomata **open**

**2.4**

- the inner wall is thicker (or cellulose fibres are arranged radially), so the cells bend apart as they swell

**3.1 B**

- Gaining ions lowers the water potential, water enters by osmosis, and the turgid guard cells open the pore

**3.2 B**

- Calcium ions act as a second messenger inside the guard cells

**3.3**

- guard cells actively pump in ions, lowering their water potential; water enters by osmosis, so they become turgid; the unevenly thickened walls make them bend apart, opening the pore

**3.4**

(a)

- closing the stomata reduces water loss by transpiration, conserving the limited water

(b)

- less carbon dioxide can enter, so the rate of photosynthesis falls / less food is made

**3.5**

- ABA binds to receptors on the guard cell membranes
- this causes calcium ions to enter the cytoplasm, which act as a second messenger and cause ions (for example $K^+$) to leave the guard cells
- the water potential of the guard cells rises, so water leaves by osmosis, the cells become flaccid and the stoma closes

**3.6**

- in the day, open stomata let carbon dioxide in for photosynthesis while light is available
- at night there is no photosynthesis, so closing the stomata reduces water loss by transpiration