Solutions

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

2.1

- e.g. lignified walls
- give strength/support and waterproofing; *or* no end walls/empty
- continuous open tube for fast water flow

2.2

- any two: companion cell keeps its nucleus (sieve tube loses it); companion cell has many mitochondria; companion cell retains most cytoplasm

3.1 C

- Only xylem vessels have lignified walls and no living contents

3.2 B

- In the root, xylem is central, often star-shaped

3.3

(a)

- 40 mm = 40 000 µm; magnification $= \dfrac{40\,000}{50} = \times 800$

(b)

- no contents and no end walls make one continuous open tube, so water flows quickly with little resistance

3.4

- sieve tubes have sieve plates with pores so sap flows through; they lose most contents/nucleus to leave room for flow; companion cells keep a nucleus and many mitochondria to provide ATP and load sugars into the sieve tube

3.5

(a) any **two**:

- draw the outlines of the **tissues** only, with no individual cells
- use clear, continuous, sharp lines with no shading
- keep the tissues in their correct relative proportions
- label with ruled lines that do not cross, and draw large enough to use most of the space

(b)

- in the stem the vascular bundles are arranged in a **ring** near the outside, with xylem towards the centre and phloem towards the outside
- in the root the xylem is at the **centre** (often star-shaped), with phloem between its arms

3.6 any **two**:

- a companion cell has a **nucleus**; a mature sieve tube element has none
- a companion cell has dense cytoplasm with many **mitochondria** and ribosomes; a sieve tube element has only a thin layer of cytoplasm
- a sieve tube element has **sieve plates** at its end walls; a companion cell does not