Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

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

2.1

- the left ventricle pumps blood all round the body; the right pumps only to the lungs
- it needs more muscle to make a higher pressure

2.2

Any two (1 mark each): carbon dioxide, glucose, amino acids, urea, hormones, heat

2.3

- water: xylem
- sucrose: phloem

2.4

- phagocytes engulf and digest pathogens (phagocytosis)
- lymphocytes make antibodies

3.1

- arteries have thick, muscular, elastic walls, to withstand high pressure
- veins have thin walls and a wide lumen, as the pressure is low
- veins have valves to stop blood flowing backwards

3.2

- the muscles respire faster, so they need more oxygen and glucose
- more carbon dioxide must be removed
- the heart beats faster to pump more blood to the muscles (adrenaline also raises the rate)

3.3

(a) still air: $15 \div 5 = \mathbf{3.0}$ mm/min; fan: $40 \div 5 = \mathbf{8.0}$ mm/min

(b) the fan blows away water vapour near the leaf, so the concentration gradient between the leaf and the air is steeper and water vapour diffuses out of the stomata faster; the bag traps water vapour, so the air becomes humid and the gradient is shallower, so transpiration slows

(c) $\pi \times 0.5^2 \times 15 = \pi \times 0.25 \times 15 = \mathbf{11.8}$ mm^3

(d) points to include:

- in the dark most stomata close, so less water vapour escapes (K)
- water evaporates from the cells inside the leaf and diffuses out through the stomata (K)
- this pulls water up the xylem in a continuous column (the transpiration stream) (An)
- water enters root hair cells from the soil by osmosis (K)
- it moves across the root to the xylem, which carries it up the stem (K)
- the potometer measures uptake, which is close to the rate of transpiration (An)

Levels: **5–6** a full, logical answer with correct biology and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.