Solutions

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

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

2.1

Any two (1 mark each):

- cell wall
- chloroplasts
- a large permanent vacuole

2.2

- add iodine solution
- it turns from orange-brown to blue-black

2.3

- fatty acids
- glycerol

3.1

- the enzyme is denatured: the shape of its active site changes
- the substrate no longer fits the active site
- so no enzyme-substrate complexes form and the reaction stops

3.2

- add Benedict's solution to the food in water
- heat in a boiling water bath for a few minutes
- the colour changes from blue to green, yellow or brick red

3.3

(a) $1 \div 50 = 0.020\ \text{s}^{-1}$; $1 \div 150 = 0.0067\ \text{s}^{-1}$; **3** times faster

(b) 40 °C is near the optimum temperature; above it the active site changes shape and the enzyme starts to denature, so the rate falls at 50 °C; at 60 °C the enzyme is fully denatured, so the starch is never digested

(c) points to include:

- put starch solution and amylase in separate tubes in a water bath at the chosen temperature for a few minutes before mixing (K)
- mix and start the timer; every 10 s put one drop into iodine on the spotting tile (K)
- record the time when the iodine no longer turns blue-black (K)
- keep the same volume and concentration of starch and amylase (App)
- keep the pH the same with a buffer solution (App)
- repeat each temperature and calculate a mean (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.