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: protects DNA; mRNA can be modified before translation; transcription and translation kept apart / controlled

2.2

cold: slows enzymes that would digest organelles; isotonic: no water moves in or out by osmosis, so organelles do not burst or shrink; buffered: keeps the pH constant so proteins are not denatured

2.3

lysosomes hold digestive enzymes inside a membrane; this keeps them from digesting the cell's own contents; enzymes are concentrated with their substrate / kept at their best pH, so digestion is efficient

2.4

cristae give a large area for the electron transport chain / ATP synthase; the matrix holds the enzymes of the link reaction and Krebs cycle

2.5

free ribosomes make proteins used inside the cell (in the cytoplasm); ribosomes on the rough ER make proteins for secretion / membranes / lysosomes

3.1

(a) P: nuclei; Q: ribosomes

(b) nuclei are the largest / densest organelles; so they sink first, at the lowest speed

(c) an organelle is a separate structure inside the cell; the cell wall is outside the plasma membrane

3.2

(a) transcription: in the nucleus; translation: at ribosomes in the cytoplasm / on the rough ER

(b) translation can start while the mRNA is still being made; so proteins are made quickly in response to change

(c) the bacterium is kept inside a membrane, separate from the cytoplasm; enzymes / toxic chemicals can be added to the vacuole without harming the cell