



ANSWER BOOK

Active transport, co-transport and moving things in bulk

Membranes and transport across cells · Unit B04

AQA 3.2.3, 3.3.3 · OCR A 2.1.5 (g)–(h) · Edexcel A Topic 4.7 · CAIE 4.2

5 questions · 18 marks

NAVY EDITION

SECTION A · Short, 1 to 2 marks

- A1** **B1** three sodium ions are moved out of the cell per ATP hydrolysed. **B1** two potassium ions are moved into the cell per ATP hydrolysed. [2]
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SECTION B · Standard, 3 to 5 marks

- B1** **B1** the substance binds to a specific binding site on the carrier protein, on the side it is starting from. **B1** ATP binds to the protein and is hydrolysed to ADP and inorganic phosphate. **B1** the phosphate group attaches to the protein and changes its tertiary structure, so the binding site now faces the other side of the membrane. **B1** the substance is released, the phosphate detaches, and the protein returns to its original shape ready to repeat the cycle. [4]
- B2** **B1** glucose is moved into the epithelial cell against its own concentration gradient, which diffusion alone could never achieve. **B1** sodium-potassium pumps in the membrane facing the blood hydrolyse ATP to move sodium ions out of the cell, keeping the concentration of sodium inside the cell low. **B1** sodium ions then diffuse in from the lumen down the gradient this creates, through the co-transporter protein, which carries glucose at the same time. **B1** the ATP was therefore spent earlier, at a different protein and on a different ion; the energy is held in the sodium gradient rather than used at the co-transporter. [4]
- B3** **B1** in endocytosis material is brought into the cell, whereas in exocytosis material is released out of the cell. **B1** in endocytosis the cell surface membrane invaginates around the material and pinches off to form a vesicle, whereas in exocytosis a vesicle fuses with the cell surface membrane. **B1** both move material in bulk, with no channel or carrier protein involved. **B1** both require ATP, for moving the vesicle along the cytoskeleton and for the pinching off or fusion of the membrane. [4]
- B4** **B1** X is taken up by active transport, because its uptake depends on ATP from aerobic respiration. **B1** the inhibitor stops ATP being produced, so the carrier proteins cannot be phosphorylated and the shape change that carries X across cannot happen. **B1** Y crosses by a passive process, simple or facilitated diffusion, because it requires no ATP and is therefore unaffected by the inhibitor. **B1** any one supporting observation: X accumulating inside the cell to a higher concentration than outside, or uptake of X falling when the oxygen concentration or the temperature is lowered. [4]
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