Diffusion, osmosis and active transport

Student activity • observation and reasoning

YEAR 10 / LESSON 15 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

What distinguishes passive movement from active transport?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Student booklet, paper models, pencil and ruler

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared Biology / Double Award: 2.15. Movement into and out of cells.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Draw two compartments with a concentration difference. Show random particle movement both ways and a larger net movement down the concentration gradient.

2. At equal concentrations, show continued random movement but no net change. Explain why equilibrium does not mean particles stop.

3. Draw a partially permeable membrane that allows water but not a selected solute through. Predict net water movement from the more dilute side to the more concentrated side.

4. Model active transport of mineral ions into a root cell against their concentration gradient, using membrane transport proteins and energy from respiration.

5. Classify oxygen entry down its gradient, water movement across a membrane, and ion uptake against a gradient; give a reason for each classification.

6. List the limits of the particle model: it is not to scale and omits molecular interactions, transport proteins and many conditions affecting real cells.

Cleanup

- Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Diffusion is net particle movement down a concentration gradient due to random motion. Osmosis is net water movement through a partially permeable membrane from higher to lower water potential (in comparable simple solutions, dilute to more concentrated). Active transport moves substances against a concentration gradient using energy supplied by respiration and membrane transport proteins.

Example / trial	Observation / evidence	Explanation / limit
Diffusion and equilibrium		
Osmosis across a membrane		
Active transport against a gradient		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Does diffusion require energy supplied by respiration?

2. Do particles stop at diffusion equilibrium?

3. What two conditions are essential to describe osmosis?

4. Predict net water movement from dilute to concentrated solution across a suitable membrane.

5. Why is uptake against an ion gradient active transport?

6. Give one limitation of your model.