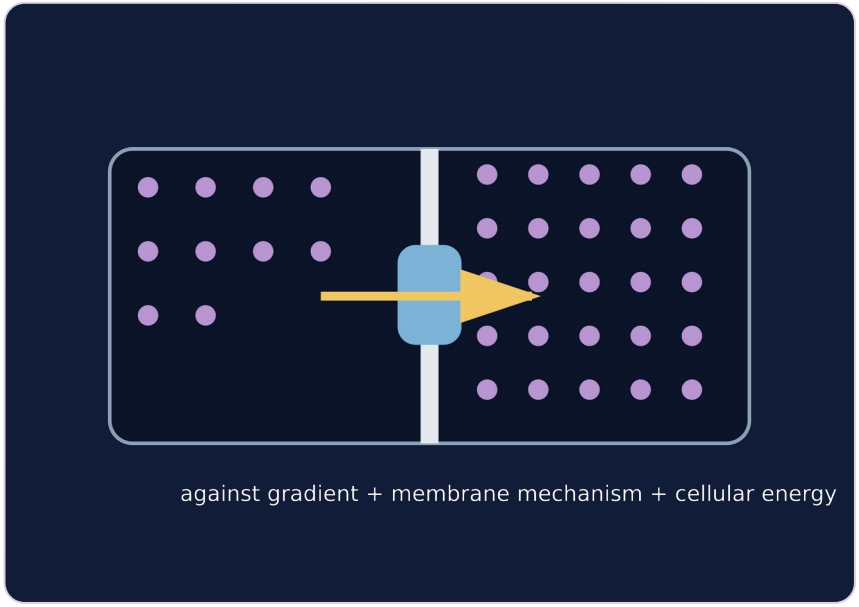
Active transport

I can explain how active transport moves substances against a concentration gradient and needs energy from respiration.

Notice. Recall. Be ready to explain.

1 What does ‘down a concentration gradient’ mean?

2 What substance moves in osmosis?



Retrieval answers

Make a prediction

Mineral ions enter a root hair cell even when their concentration is already higher inside. Can diffusion alone explain this?

A Yes — diffusion can move against any gradient

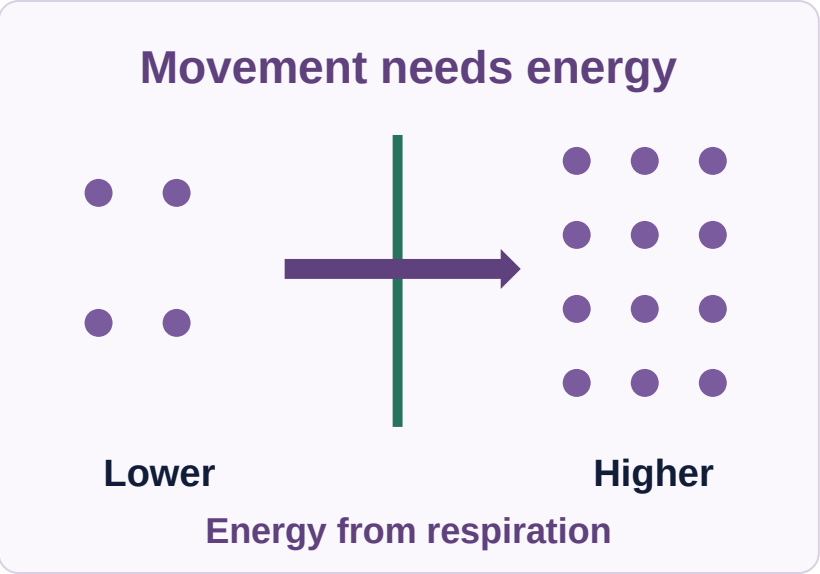
B No — movement against the gradient needs another mechanism

C Only water can explain it

Commit, then check

Watch the model

1. The observed movement is from lower concentration outside to higher concentration inside.
2. That direction is against the concentration gradient, so diffusion cannot be the full explanation.
3. Membrane proteins use energy from respiration to move the substance.



View labelled diagram

Optional video

Choose and justify

Which combination identifies active transport?

A Water only, down a gradient, no energy

B Any particles, random movement, no membrane

C A substance moved against its concentration gradient and needed energy

D All fast movement across a membrane

Give the deciding clue before checking.

Check the reasoning

Connect the science

1. Diffusion: net particle movement is down a concentration gradient. It does not need energy from respiration.
2. Osmosis: water moves through a partially permeable membrane. It does not need energy from respiration.
3. Active transport: a substance moves against its concentration gradient using energy from respiration.

Inward uptake: compare the same substance

Outside: 2 → Inside: 8

Lower → higher: against the gradient

Transport proteins + energy from respiration

Predict the energy effect

Equal-volume regions: 2 nitrate ions outside, 8 inside. Net movement of nitrate ions is inwards.

1 Which way is movement relative to the gradient?

2 What does the membrane transport protein need?

3 Predict what happens if respiration is reduced.

Reveal shared reasoning

Independent Task · 10 min

Your independent evidence

A cell keeps taking in nitrate ions when their concentration is lower outside than inside. Explain why active transport is needed. Predict what happens if respiration falls.

Optional support

Compare the concentration outside and inside. Add an inward arrow. Start: “The ions move from ___ to ___. This needs…”

Make one precise correction to the same work after feedback.

Open worksheet pages

Model after first attempt

Exit · 3 min

What changed in your thinking?

Why is ‘active transport is fast diffusion’ scientifically wrong?

1. Point to one improvement in your work.
2. Choose what you want to revisit.
3. Tell your teacher; agree the next step together.

Retrieval and prediction check

1 Net movement from higher to lower concentration of that substance.

2 Water.

No — movement against the gradient needs another mechanism

Return to Starter

Check the deciding clue

A substance moved against its concentration gradient and needed energy

Correct. Now state that respiration supplies the energy.

Compare your reason. Correct one step if needed.

Return to We Do

Our shared reasoning

Inward movement is lower → higher: against the gradient. Active transport needs energy released by respiration. Less available energy reduces uptake. An instant on/off model simplifies a real cell.

Return to shared task

Compare after your first attempt

Nitrate ions move from a lower concentration outside the cell to a higher concentration inside, which is against the concentration gradient. Active transport is therefore required and uses energy supplied by respiration through membrane transport proteins. If respiration is strongly reduced, less energy is available and nitrate uptake will slow or stop.

Use the model to improve your explanation in your own words.

Return to independent task

Your lesson resources

Worksheet pages are stored inside this PowerPoint.

Worksheet · page 1

Worksheet · page 2

Standard PDF

Supported PDF

Depth PDF

Editable Word worksheet

Open online lesson / model

Named files are in this week’s folder. Online lesson and video need internet.

Optional concept video

Worksheet · page 1

Use your printed copy.
Keep the first attempt.

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W6L1 | Carrier and energy model

Monday | 09:30–10:10 | Introduce | Editable pupil sheet

Name: _____ Date: _____

Core first. Write, speak, point or dictate your own words. Keep the first attempt so you can improve it.

Optional support: Compare the concentration outside and inside. Add an inward arrow. Start: “The ions move from ___ to ___. This needs…”

Work together

Draw two equal-volume regions: 2 nitrate-ion counters outside and 8 inside, separated by a membrane.

Your labelled sketch / arrows:

1. **Which way is nitrate moving relative to its concentration gradient?**

2. **Name the mechanism and its energy source.**

Return to task

Worksheet · page 2

Continuation is optional.
Improve the same work.

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W6L1 | Continue and improve

Use after the core questions when directed

3. **If respiration is greatly reduced, predict the effect on nitrate uptake and explain.**

Optional transfer

Does a large surface area alone prove active transport?

Depth: name an assumption or limit, then say what evidence would strengthen your answer.

Improve the same work

One correction I made, and why:

My request for next time: _____

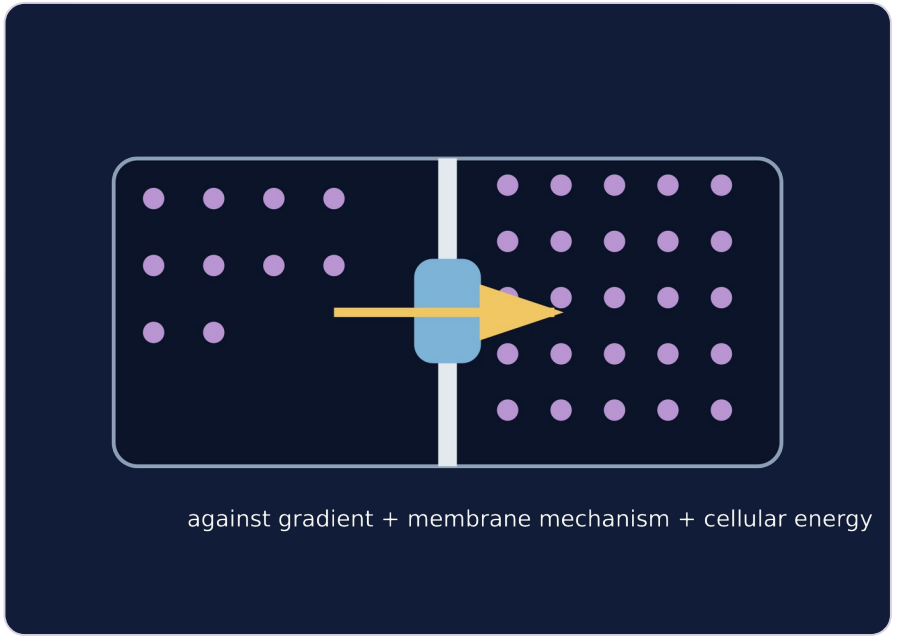
Return to task

Watch, pause and explain

Active transport

What two clues distinguish active transport from diffusion?

Play freesciencelessons video

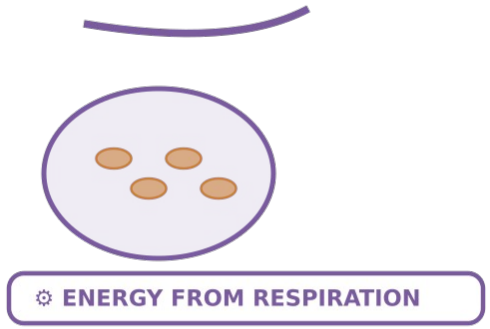


No connection? Use the still model and explain the same question.

Look closely at the model

Three processes, three questions

	↓ DIFFUSION	↓ OSMOSIS	↑ ACTIVE
direction	down	down	**UP**
respiration energy?	no	no	**YES**
what moves	any particle	water only	dissolved
membrane required?	no	yes	yes



A model illustration: use the stated data for calculations.

Return to I Do