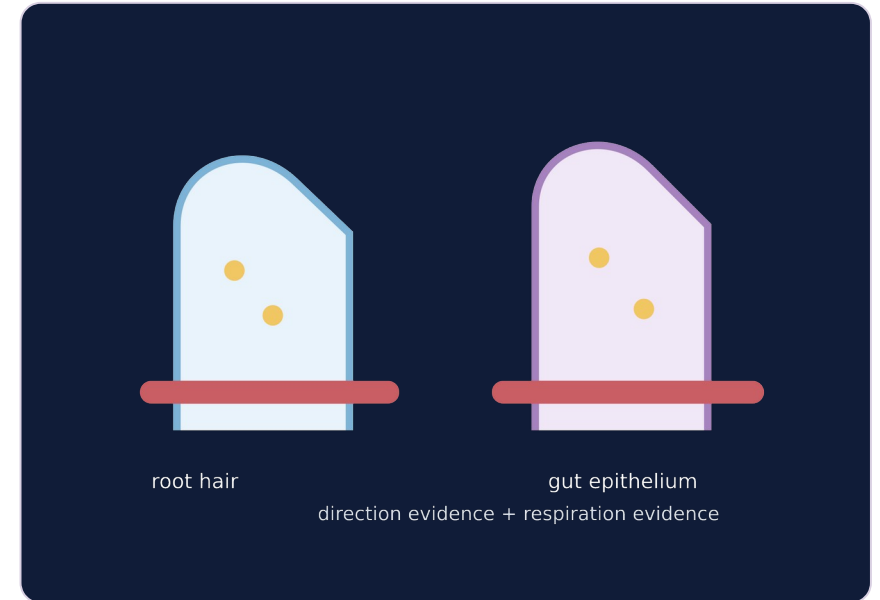


Root hairs and the gut

I can use concentration and respiration evidence to decide when diffusion alone cannot explain uptake.

Notice. Recall. Be ready to explain.

- 1 Why can root hairs need active transport?
- 2 What does a larger surface area allow?



Retrieval answers

Make a prediction

Mineral uptake falls when root cells receive less oxygen. Which explanation should be investigated first?

A Oxygen provides colour

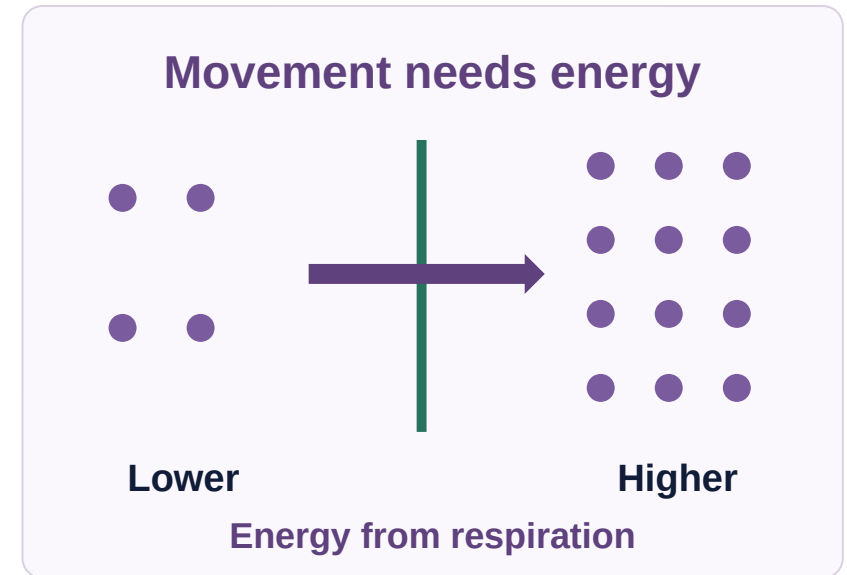
B Less respiration means less energy for active transport

C Diffusion always speeds up without oxygen

Commit, then check

Watch the model

- 1 Root hair cells contact soil water across a large surface area and may take up mineral ions against a gradient.
- 2 Small-intestine cells absorb digested food. Diffusion can help, but active transport can keep uptake going against the gradient.
- 3 Evidence that uptake falls when respiration is inhibited supports an energy-dependent mechanism.



[View labelled diagram](#)

[Optional video](#)

Choose and justify

Which evidence most strongly supports active transport rather than diffusion alone?

A Uptake occurs only when outside concentration is higher

B Uptake continues against the gradient and falls when respiration is inhibited

C The cell has a membrane

D The substance is small

Give the deciding clue before checking.

Check the reasoning

Connect the science

- 1 Evidence 1: direction against the concentration gradient.
- 2 Evidence 2: uptake changes when respiration or energy supply changes.
- 3 Large surface area and many transport proteins allow more uptake. Energy released by respiration supports active uptake.

Inward uptake: compare the same substance

Outside: 2 → Inside: 8

Lower → higher: against the gradient

Transport proteins + energy from respiration

Use two clues

Model values use the same concentration units. Uptake is inwards.

Context	Outside	Inside	Normal uptake	Inhibited uptake
Root nitrate	2	8	100	15
Gut glucose	3	9	100	20

Use direction and energy evidence. Does the cell’s location alone prove the mechanism?

Reveal shared reasoning

Your independent evidence

Glucose concentration in the small intestine becomes lower than in an epithelial cell, but glucose uptake continues. Uptake falls when respiration is inhibited. Explain the mechanism and link one cell adaptation to its function.

Optional support

Use two clues: direction compared with the gradient, and what happens when respiration is reduced.
Start: "This suggests ____ because..."

Make one precise correction to the same work after feedback.

[Open worksheet pages](#)[Model after first attempt](#)

What changed in your thinking?

Why is 'root hair cells have a large surface area' incomplete without a function link?

- 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 To take up mineral ions when their concentration is lower outside than inside.
- 2 More membrane area for exchange/uptake at the same time.

Less respiration means less energy for active transport

[Return to Starter](#)

Check the deciding clue

Uptake continues against the gradient and falls when respiration is inhibited

Correct: both direction and energy dependence support active transport.

Compare your reason. Correct one step if needed.

[Return to We Do](#)

Our shared reasoning

Both movements are against the gradient; uptake falls when respiration is inhibited. Together these support active transport. Root hair or gut alone does not determine every transport mechanism.

[Return to shared task](#)

Compare after your first attempt

Glucose is moving from a lower concentration in the intestine to a higher concentration inside the epithelial cell, so diffusion alone cannot explain continued uptake. The fall when respiration is inhibited shows that the process needs cellular energy, supporting active transport. A large folded surface and membrane transport proteins increase opportunities for uptake; mitochondria support the energy demand.

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.

MADE BY MATT / LAUNCH SCIENCE

W6L2 | Two-clue uptake investigation

Wednesday | 09:30–10:10 | Explore | 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: Use two clues: direction compared with the gradient, and what happens when respiration is reduced. Start: “This suggests ___ because...”

Work together

Read the concentration evidence. The numbers are model values in the same units.

Illustrative model/sample data; not measurements made by this class.

Context	Outside	Inside	Normal uptake index	Inhibited index
Root nitrate	2	8	100	15
Gut glucose	3	9	100	20

1. For each context, identify the gradient direction of inward uptake.

2. Explain why the two clues support active transport.

Return to task

Worksheet · page 2

Continuation is optional.
Improve the same work.

MADE BY MATT / LAUNCH SCIENCE

W6L2 | Continue and improve

Use after the core questions when directed

3. Link a root-hair adaptation and a gut-cell adaptation to their functions.

Optional transfer

What extra check would help show that the inhibitor did not simply kill the cells?

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?

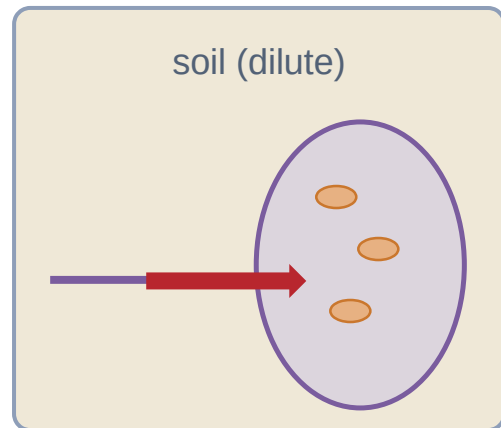
[Play freesciencelessons video](#)



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

Look closely at the model

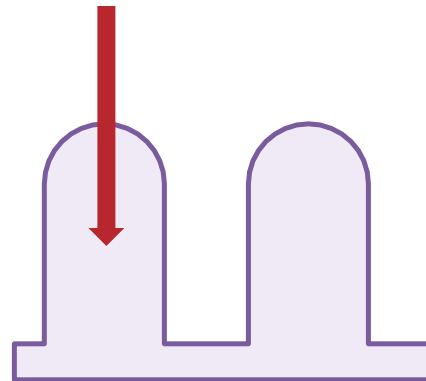
Root hair



↑ **AGAINST THE GRADIENT**

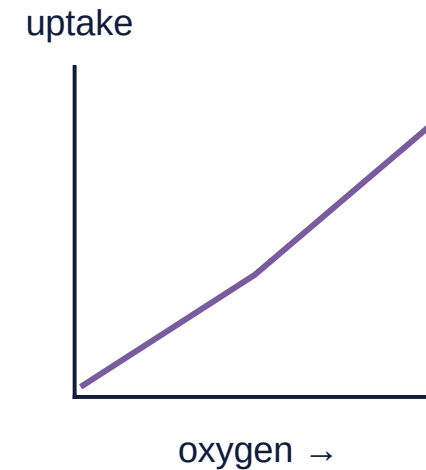
MANY MITOCHONDRIA

Gut villi



↓ **GLUCOSE IN**

uptake vs O₂



A model illustration: use the stated data for calculations.

[Return to I Do](#)