Water uptake by root hair cells

Student activity • observation and reasoning

YEAR 10 / LESSON 38 / BIOLOGY ONLY

The question

Why can water enter a root hair cell from moist soil?

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: Biology only: 2.55B. Root water absorption.

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 a root hair cell touching the water film around soil particles. Label wall, membrane, cytoplasm and vacuole.

2. Identify the partially permeable membrane; distinguish it from the freely permeable cellulose wall.

3. Show net water movement from higher water potential in the soil solution to lower water potential in the cell under suitable conditions.

4. Explain how the long root-hair extension increases the area in contact with the soil water.

5. Predict what could happen if the external solution becomes very concentrated, as with excessive fertiliser or salt.

6. Distinguish water movement by osmosis from mineral-ion transport, which may require active transport against a gradient.

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

Water moves down a water-potential gradient across a partially permeable membrane. In comparable simple solutions, more dissolved solute lowers water potential. Net uptake depends on the actual gradient; it is not guaranteed under all soil conditions. Root hairs are cellular extensions, not separate tiny roots.

Example / trial	Observation / evidence	Explanation / limit
Labelled cell		
Gradient and direction		
Concentrated-soil scenario		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What process brings water across the membrane?

2. Which barrier is partially permeable?

3. How does the root hair's shape help uptake?

4. Does water always move into a root?

5. Why can excess fertiliser contribute to wilting?

6. How can ion uptake differ from water uptake?