LESSON PLAN

Cell Transport / Osmosis

Biology · Year 12 · 60 min

CURRICULUM ALIGNMENT

Aligns to NCEA Level 2 Biology, Achievement Standard 91153 (2.3): Demonstrate understanding of the responses of plants and animals to their external environment — note: the specific standard for cell biology and osmosis (91156, 2.6: Demonstrate understanding of life processes at the cellular level) should be confirmed by the teacher; this lesson addresses solute concentration, water potential, and osmosis as core cellular processes at NCEA Level 2.

Te Mātaiaho: Science

LEARNING INTENTION

Explain osmosis in terms of water potential gradients and predict the movement of water across partially permeable membranes

SUCCESS CRITERIA

- I can define osmosis using the terms water potential, solute concentration, and partially permeable membrane.
- I can explain the relationship between solute concentration and water potential.
- I can predict the net movement of water between two solutions separated by a partially permeable membrane.
- I can describe the effect of osmosis on animal and plant cells placed in hypotonic, isotonic, and hypertonic solutions.
- I can justify my predictions using water potential gradient as the mechanism.

Lesson Structure

HOOK

- Two potato cylinders: one in distilled water, one in concentrated salt solution. Which changed? Why?
- Turgid vs. flaccid. What do these states tell us about the cell's environment?
- What single mechanism explains both observations?

TEACHING

- Water potential (ψ) measures the tendency of water to move. Pure water $\psi = 0$.
- Adding solutes lowers ψ. Higher solute concentration means more negative ψ.
- Water moves by osmosis from less negative ψ to more negative ψ.
- Animal cells lyse or crenate; plant cells become turgid or plasmolysed. Mechanism is the same.

PRACTICE

- Diagram: two solutions separated by a membrane. Which direction does water move?
- Students write a prediction, then justify using ψ values. No justification = incomplete.
- Swap with a partner. Does their justification name the gradient and the membrane?

CLOSURE

- Which solution had the more negative water potential today?
- State the direction of net water movement in one sentence.
- Where would your answer sit at Achievement vs. Merit level?

Task Details

TASK

- Osmosis worksheet: four scenarios with ψ values labelled.
- Write a prediction for each, then justify using the gradient.
- Label diagrams: turgid, flaccid, plasmolysed, lysed, crenated.

MATERIALS

Osmosis worksheet (one per student, 25 copies), printed membrane diagrams with ψ values labelled (one per student, 25 copies), blue and red coloured pencils for annotating water movement direction (one set per student)

TEACHER ROLE

- Circulate for 20 min. Check justifications name the gradient.
- Prompt incomplete answers: where is ψ more negative?
- Collect worksheets as written evidence against all five criteria.

ASSESSMENT NOTES

- Criterion 1: definition names water potential, solute concentration, and membrane.
- Criterion 2: student states higher solute concentration gives more negative ψ.
- Criterion 3: arrow on diagram points from less negative to more negative ψ.
- Criterion 4: correct cell state named for all three solution types.
- Criterion 5: justification cites ψ gradient explicitly, not just concentration.

RESOURCES

YouTube cell transport osmosis video

Pinterest cell transport osmosis activities

RELIEF TEACHER NOTES

- Worksheets and membrane diagrams are in the labelled Biology Y12 folder.
- Students work independently and silently for the first 20 minutes.
- Collect all worksheets at the end. Leave them on the teacher's desk.
- Students who finish early: write a Merit-level justification for scenario 4.