28.1 Water movement: compare potential and net change

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS water potential • turgor

Objective

Water movement: compare potential and net change. Original classroom practice for IB SL; not an official IB paper.

1 Key knowledge and worked examples

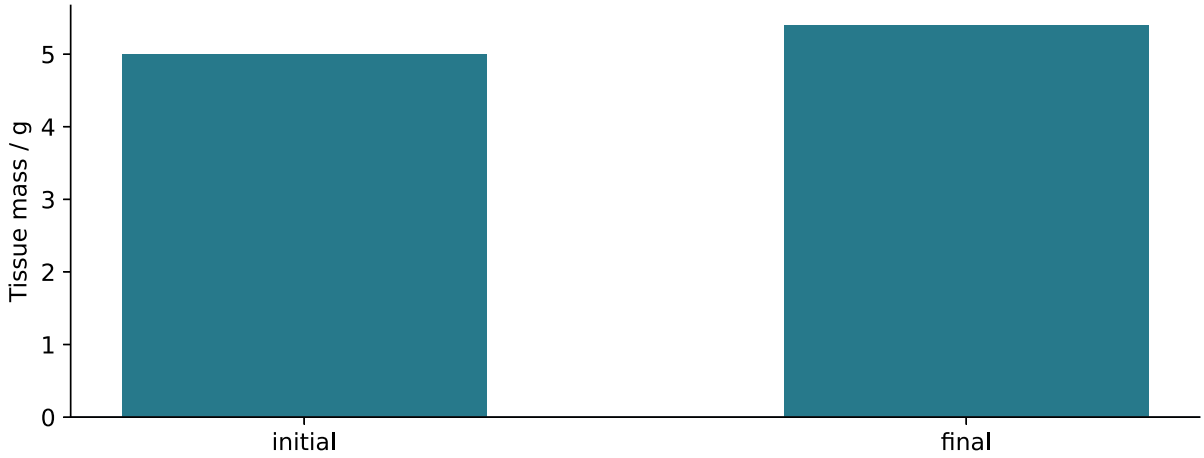
What would explain this observation?

- Plant tissue can gain or lose mass in different solutions. The direction of net water movement depends on the **water-potential** difference, not on whether water molecules move at all.

Build the model

- Water moves through a water-permeable membrane from higher toward lower water potential.
- Dissolved solute lowers the tendency of water to leave a solution relative to the chosen reference.
- A plant cell wall allows pressure to develop as water enters; tissue behaviour cannot always be explained by solute concentration alone.
- water potential: A measure used to compare the tendency of water to move between systems.
- **turgor** : Pressure of plant-cell contents against the cell wall.

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Choose evidence that can test it

- A zero mass change suggests no net transfer over the measured interval under the experimental conditions.
- It does not imply that every individual cell has the same potential or that molecular exchange stops.
- Compare percentage change when initial sample masses differ.

In the lab: Use repeated equal-sized plant samples in teacher-approved solutions. Keep tissue source, temperature, volume and time consistent; blot consistently before weighing. Record initial/final mass and plot percentage change against solution concentration, retaining variation and the uncertainty of any interpolated zero-change point.

Work from known quantities

- Known: a 5.00 g tissue sample becomes 5.40 g.
- Percentage mass change = $(5.40-5.00)/5.00\times100 = +8\%$.
- This supports net water entry under the measured conditions.
- A separate sample with zero change is consistent with balanced net transfer, but this mass method does not independently measure cell pressure.

Your turn: A tissue sample changes from 4.00 g to 4.20 g. Calculate percentage mass change.

Check the conclusion and its limits

- This SL preparation focus uses qualitative water-potential reasoning and mass-change evidence.
- Quantitative solute/pressure equations are kept in the separate HL preparation case pending exact guide review.
- Blotting variation or tissue damage can change the observed result.

Not true: A zero net mass change proves that all movement of water molecules has stopped. Zero NET change is a balance of two continuing flows. Water molecules never

stop moving; equal rates in both directions produce no net change.

Key:

- Water moves through a water-permeable membrane from higher toward lower water potential.
- A zero mass change suggests no net transfer over the measured interval under the experimental conditions.
- Watch for: this SL preparation focus uses qualitative water-potential reasoning and mass-change evidence.

■ **Write from a gain of 12 percent**

- A tissue sample changes from 3.00 g to 3.36 g.
- Find the percentage mass change. A zero net change does not mean water molecules have stopped moving.

2 Practice

2.1 What does a zero percentage mass change support in this experiment? Choose one answer.

- **A** No water molecules cross a membrane
- **B** Every cell has identical contents
- **C** No net mass transfer over the measured interval [1]

2.2 A tissue sample changes from 4.00 g to 4.20 g. Calculate percentage mass change. Show the relation, substitution and units. [2]

2.3 Decide whether this claim is true and justify: Zero NET change is a balance of two continuing flows. [2]

2.4 A measure used to compare the tendency of water to move between systems: write the technical term. [1]

3 Exam-style questions

3.1 Fictional tissue gains 6% in solutionA and loses 3% inB. What does each result support, and why is neither an independent measurement of cell pressure? [4]

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Solutions

2.1 C Zero percentage mass change means gains and losses balanced over the interval - no NET transfer. Molecules still cross in both directions, and the cells need not be identical inside.

2.2 percentage change=$(4.20-4.00)/4.00\times100=+5\%$.

2.3 True. True. Zero NET change is a balance of two continuing flows. Water molecules never stop moving; equal rates in both directions produce no net change.

2.4 water potential. water potential means A measure used to compare the tendency of water to move between systems.

3.1 A supports net water entry andB net loss under comparable conditions. Mass change combines tissue responses; it does not separately determine pressure. Use repeats and a zero-change series without importing HL pressure calculations.