

Water potential · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; current subject brief acquired; full Biology guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Water Potential · 1.1

Reasoning

A plant cell can stop gaining net water even while its contents contain solute. The cell wall permits pressure to build, altering the water-potential balance. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Water Potential · 2.1

Reasoning

Water potential describes the tendency of water to move relative to a chosen reference, with pressure units. In the simplified cell model, water potential equals solute potential plus pressure potential. Dissolved solute lowers solute potential; positive pressure can raise water potential. Net water movement through a water-permeable membrane is from higher to lower water potential.

water potential: A pressure-equivalent measure of the tendency of water to move relative to a reference;
pressure potential: The pressure contribution to water potential in the stated model.

Water Potential · 3.1

Reasoning

Compare the complete water potentials of the two sides rather than solute concentrations alone. A turgid cell can have the same total water potential as its surroundings despite unequal solute potential. At equilibrium there is no net transfer, but water molecules can continue moving in both directions. Use provided potential values and labelled plant-cell models. State the reference and units before adding components. For school tissue investigations, control temperature, tissue dimensions, time and blotting, and estimate a zero-change point from repeated measurements. Do not claim the mass method separately measures cell pressure without further evidence.

Water Potential · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: a cell has solute potential -0.8 MPa and pressure potential $+0.3$ MPa, so total potential is -0.5 MPa. Surrounding solution is -0.2 MPa. Water tends to enter the cell because -0.2 is higher than -0.5 . If the cell components change to -0.8 and $+0.6$ MPa, its total is -0.2 MPa, matching the surroundings in this simplified model.

Water Potential · 4.2

Reasoning

Solute potential is -0.7 MPa and pressure potential is $+0.4$ MPa. Find total water potential. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Water Potential · 5.1

Reasoning

More negative is lower, not higher. The additive cell model has stated boundaries and does not require pretending that every real tissue has one uniform value. Loss of turgor and cell-wall support differ from a rigid wall directly controlling solute concentration. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Water Potential · 5.2

Reasoning

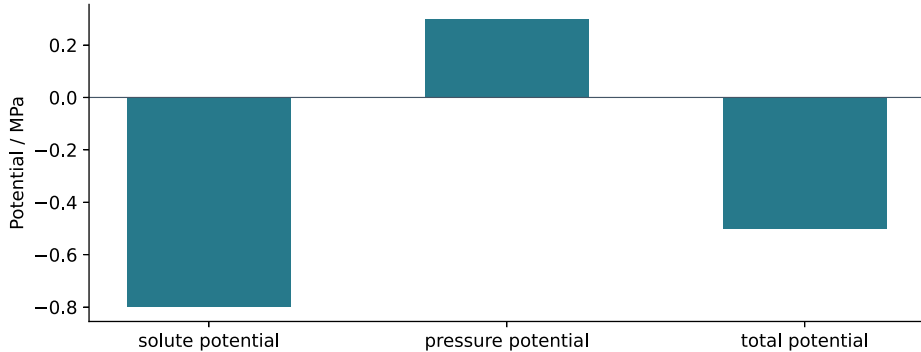
Solute concentration alone always determines water movement in a turgid plant cell. This claim is false: More negative is lower, not higher. The additive cell model has stated boundaries and does not require pretending that every real tissue has one uniform value. Loss of turgor and cell-wall support differ from a rigid wall directly controlling solute concentration.

Water Potential · 5.3

Reasoning

Water potential: include solute and pressure effects: Compare the complete water potentials of the two sides rather than solute concentrations alone. A turgid cell can have the same total water potential as its surroundings despite unequal solute potential. At equilibrium there is no net transfer, but water molecules can continue moving in both directions.

Water Potential · diagram



- Original teaching diagram: Water potential : include solute and pressure effects
- Use the labels and the stated model together.

Water Potential · original transfer

Your turn

A model cell has solute potential -0.9 MPa and pressure potential $+0.2$ MPa; its surroundings are -0.4 MPa. Predict initial net water movement and pressure potential at balance if solute potential stays fixed.

Water Potential · transfer reasoning

Method and interpretation

Cell total -0.7 MPa; water enters from higher -0.4 . At balance
pressure $= -0.4 - (-0.9) = +0.5$ MPa. The fixed-solute assumption is a simplification.

Check yourself

- Explain water potential using the stated model.
- Explain pressure potential using the stated model.
- Change one value in the original transfer; explain which assumption still matters.