

This is the **Higher Separate** version — includes all Higher Tier content (marked ★) and all Separate Science content.

Osmosis is a special case of diffusion involving only water molecules, moving through a partially permeable membrane.

**Required Practical: Investigating osmosis in plant tissue — potato cylinders placed in sucrose solutions of different concentrations, % mass change calculated and graphed.**

- Osmosis: movement of WATER molecules from a region of HIGH water potential (dilute solution) to LOW water potential (concentrated solution) through a partially permeable membrane.
  - A partially permeable membrane lets water and small molecules through but NOT large molecules (e.g. sucrose, proteins).
  - Turgid plant cell: water enters by osmosis → vacuole swells → presses on cell wall → cell becomes firm/rigid. This supports the plant.
  - Plasmolysed plant cell: water leaves by osmosis into a concentrated external solution → membrane pulls away from cell wall → cell is limp. Plant wilts.
  - Animal cell in dilute solution: water enters → cell swells and may burst (lyse) — animal cells have no cell wall.
  - Animal cell in concentrated solution: water leaves → cell shrinks (crenates).
  - Isotonic solution: same concentration as cell — no net movement of water. Cells keep their normal shape.
  - In osmosis investigation (potato cylinders): % mass change =  $(\text{final} - \text{initial}) / \text{initial} \times 100$ . Positive = gained water. Negative = lost water. Where % change = 0 is the isotonic point.
- ★ **HT Water potential ( $\Psi$ ):** pure water has the highest water potential (0 kPa). Adding solutes lowers water potential (more negative value).

### Key Terms

<b>Osmosis</b>	Net movement of WATER through a partially permeable membrane from HIGH to LOW water potential
<b>Partially permeable membrane</b>	Membrane allowing water and small molecules through but not large molecules
<b>Turgid</b>	Plant cell that has absorbed water — firm because vacuole presses against cell wall
<b>Plasmolysed</b>	Plant cell that has lost water — membrane pulled away from cell wall
<b>Isotonic</b>	Solution with same water potential as the cell — no net osmosis
<b>Water potential</b>	A measure of the tendency of water to move — pure water = 0, solutions have lower (more negative) values

■ **Exam Tip:** Osmosis is ONLY water. Osmosis goes from dilute (high water potential) to concentrated (low water potential). A common error is saying "water moves to where there is more solute" — technically correct but examiners prefer: water moves from HIGH to LOW water potential.