*This is the **Higher Combined** version — includes Higher Tier content. Some Separate-only details are omitted.*

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 = (final – initial) / initial × 100. Positive = gained water. Negative = lost water. Where % change = 0 is the isotonic point.
- ★ **HT** Water potential (Ψ): pure water has the highest water potential (0 kPa). Adding solutes lowers water potential (more negative value).

Key Terms

Osmosis	Net movement of WATER through a partially permeable membrane from HIGH to LOW water potential
Partially permeable membrane	Membrane allowing water and small molecules through but not large molecules
Turgid	Plant cell that has absorbed water — firm because vacuole presses against cell wall
Plasmolysed	Plant cell that has lost water — membrane pulled away from cell wall
Isotonic	Solution with same water potential as the cell — no net osmosis
Water potential	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.