Osmotic water transport and cell volume — review sheet

Use this after attempting the worked examples and practice. Explain each claim in words before calculating.

Key ideas

- Amount n, volume V and concentration n/V are distinct.
- Under equal hydrostatic pressure, ideal net water flow points toward higher impermeant-particle concentration.
- With positive L, equilibrium volume is n/c_out; conductance sets response speed.
- The external concentration is fixed because the outside is modeled as a large reservoir.
- Conservation, numerical accuracy and biological validation require different checks.

Common errors and repairs

Assuming concentration cannot change unless solute crosses. Water movement changes V and therefore n/V even with fixed n.

Using the initial flow unchanged for every later step. Recompute inside concentration and flow from the current volume.

Reading a stable numerical volume as proof of cell survival. The model has no mechanics, rupture or viability process.

Retrieve without your notes

- For n = 300 fmol and c_out = 200 mM, what is V_eq when $L > 0$?
- If volume halves with fixed amount, what happens to concentration?
- Why must the special case $L = 0$ be treated separately?

Readiness check

- Distinguish trapped solute amount, water volume and concentration.
- Predict inward or outward water flow under the stated osmotic assumptions.
- Compute a short volume update with consistent units.
- Derive an equilibrium volume and separate it from the speed of approach.
- Check conserved solute, positive volume and numerical refinement without inferring cell survival.