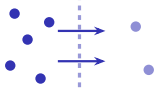
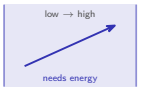
Movement Into & Out of Cells

IGCSE Biology ▪ Topic 3

IGCSE Biology



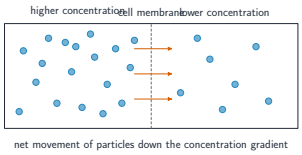
What we will cover



active transport

1 Passive movement

Diffusion

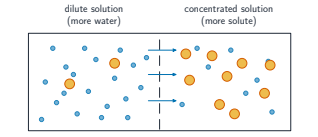


net movement of particles down the concentration gradient

The particles spread out because of their own **random movement** 随机运动.

> The **energy** 能量 for diffusion comes from the **kinetic energy** 动能 of the random movement of **molecules** 分子 and **ions** 离子 – so diffusion needs **no** extra energy.

Osmosis

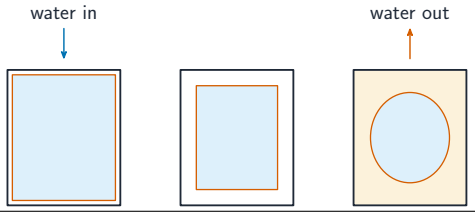


water moves by osmosis to the concentrated side; solute is too big to cross

- In **pure water or a dilute solution**, water moves **into** the cells. The cells swell and become firm, or **turgid** 膨胀. The...
- In a **concentrated solution**, water moves **out** of the cells. The cells lose their firmness and become soft, or **flaccid** 松软.
- **(Supplement)** If even more water leaves, the cell membrane pulls away from the cell wall. This is **plasmolysis** 质壁分离.

Osmosis and plant cells

- water in → **turgid** 膨胀 (firm; supports the plant)
- water out → **flaccid** 松软 (soft)
- more out → **plasmolysis** 质壁分离

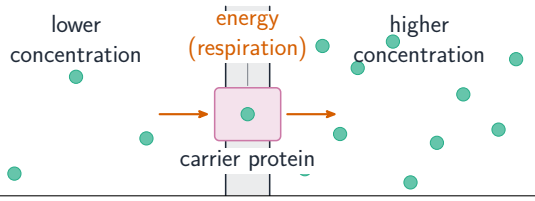


2 Active transport

Active transport

Active transport 主动运输 moves particles against the gradient (low → high).

> It needs energy from **respiration** 呼吸作用 & a **carrier protein** 载体蛋白 – e.g. root hairs take up minerals.



Comparing the three

diffusion – high → low; no energy; particles, gases, solutes

osmosis – high → low water potential; no energy; water only

active transport – low → high (against); needs energy; ions & molecules

3 Recap

Worked example – percentage change in mass

A potato cylinder is $5.0\,\mathrm{g}$ before soaking and $5.6\,\mathrm{g}$ after. Find the percentage change.

- Change in mass $= 5.6 - 5.0 = 0.6\,\mathrm{g}$ (a gain).
- % change $= \dfrac{\text{change}}{\text{starting mass}} \times 100$
- $= \dfrac{0.6}{5.0} \times 100 = +12\%$
- It gained water, so the solution was more dilute than the cell sap.

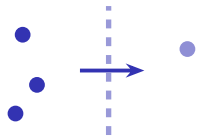
> Always divide by the starting mass, and keep the $+$ or $-$ sign. Gain ⇒ water moved in by osmosis ⇒ the outside was more dilute.

Topic 3 – key takeaways

1. **Diffusion** – down the gradient; no energy
2. **Osmosis** – water only, partially permeable membrane
3. **Plant cells** – turgid, flaccid or plasmolysed
4. **Active transport** – against the gradient; needs energy

Check yourself

1. Which way do particles diffuse along a gradient?
2. What substance moves in osmosis?
3. What does a plant cell become in pure water?
4. Which process needs energy from respiration?



Answers **1.** high to low concentration **2.** water **3.** turgid (firm) **4.** active transport