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

Diffusion is the movement of particles from an area of high concentration to an area of low concentration. It is a passive process — no energy is needed.

- Diffusion is the NET movement of particles (not all particles) from HIGH concentration to LOW concentration — down the concentration gradient.
- It is PASSIVE — no energy (ATP) is required.
- Examples: O■ diffuses from alveoli into blood; CO■ diffuses from blood into alveoli; glucose diffuses from small intestine into blood; urea diffuses from cells into blood.
- Rate of diffusion increases with: steeper concentration gradient, higher temperature, larger surface area, thinner membrane.

★ **HT** Fick's Law: rate of diffusion ∝ (surface area × concentration difference) ÷ thickness of membrane.

- Cells/organisms are adapted to maximise diffusion: alveoli (large SA, thin walls, moist, good blood supply), villi in small intestine (large SA, thin walls, capillaries).
- Simple organisms (e.g. amoeba) rely entirely on diffusion — their small size gives a large surface area : volume ratio.

★ **HT** As organisms get larger, SA:V ratio decreases — specialised exchange surfaces needed.

Key Terms

Diffusion	Net movement of particles from HIGH to LOW concentration — passive, no energy
Concentration gradient	Difference in concentration between two areas — steeper = faster diffusion
Surface area to volume ratio	Ratio that determines how efficiently an organism can exchange substances by diffusion
Fick's Law	Rate of diffusion = (surface area × concentration difference) ÷ membrane thickness

■ **Exam Tip:** Diffusion is always from HIGH to LOW — particles move "downhill". Common exam error: stating diffusion requires energy — it does NOT. Only active transport requires energy.