Topic 1: Key Concepts in Biology

Edexcel · GCSE Biology · Revision Notes

Specification reference: 1.1–1.10

Note: Sections marked ★ HIGHER TIER ONLY are for Higher tier students only. Foundation tier students should focus on the unmarked sections.

1.1–1.3 Cell Structure and Specialisation

Cells are the basic unit of life. Eukaryotic cells (animals, plants, fungi) have a nucleus. Prokaryotic cells (bacteria) do not.

- Animal cell organelles: nucleus, cell membrane, cytoplasm, mitochondria, ribosomes.
- Plant cell additions: cell wall, chloroplasts, permanent vacuole.
- Bacterial cells: circular DNA, cell wall, plasmids, flagella (no nucleus).
- Cell specialisation: cells differentiate to perform specific functions (e.g. muscle cells, nerve cells, sperm cells, root hair cells).

Required Practical 1: Using a light microscope to observe, measure and draw cells.

1.4–1.6 Enzymes

Enzymes are protein catalysts that speed up chemical reactions inside and outside cells. The substrate fits into the active site (induced fit model — the active site changes shape slightly to fit the substrate).

- Temperature: increases rate up to optimum (~37°C in humans); higher temperature denatures enzyme.
- pH: each enzyme has an optimum pH (e.g. pepsin works best at pH 2 in stomach; amylase at pH 7 in mouth).

Key Terms

Active site: The region of the enzyme where the substrate binds

Denaturation: Irreversible change in enzyme shape — can no longer catalyse reactions

Required Practical 2: Investigating the effect of pH on enzyme activity.

1.7–1.10 Transport Across Membranes

- **Diffusion** — passive; from high to low concentration; no energy needed.
- **Osmosis** — diffusion of water across a partially permeable membrane; from high water potential to low.
- **Active transport** — against concentration gradient; requires energy (ATP) and carrier proteins.

Factors affecting surface area to volume ratio: smaller cells have a larger SA:V ratio, allowing faster diffusion. As organisms grow larger, exchange surfaces (gills, lungs, villi) are needed.

Exam Tip: Surface area : volume ratio decreases as size increases — this is why large organisms need specialised exchange surfaces.