

B1: Cell-Level Systems

OCR Gateway · GCSE Biology · Revision Notes
Specification reference: B1a–B1d

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

B1a Cell Structures

All living things are made of cells. Animal and plant cells are eukaryotic; bacterial cells are prokaryotic.

- Both animal and plant cells have: nucleus, cell membrane, cytoplasm, mitochondria, ribosomes.
- Plant cells also have: cell wall (cellulose), chloroplasts, permanent vacuole.
- Bacterial cells have: cell wall, cell membrane, cytoplasm, ribosomes, circular DNA (no nucleus), sometimes plasmids and flagella.

Cells become specialised for their function during differentiation. Examples: red blood cells (no nucleus, biconcave), sperm cells (flagellum, acrosome), nerve cells (long axon, myelin sheath).

Key Terms

Eukaryotic: Cell with membrane-bound nucleus

Prokaryotic: Cell without a nucleus — DNA is free in the cytoplasm (e.g. bacteria)

Required Practical 1: Preparing and observing cells using a light microscope.

B1b What Happens in Cells

Chemical reactions inside cells are controlled by enzymes. Diffusion, osmosis and active transport move substances across cell membranes.

- **Diffusion** — passive movement from high to low concentration.
- **Osmosis** — diffusion of water through a partially permeable membrane (high water potential to low).
- **Active transport** — against concentration gradient, using energy (ATP).

Exam Tip: Remember: osmosis only applies to water. Other substances move by diffusion or active transport.

★ HIGHER TIER ONLY — Protein Synthesis

- DNA in the nucleus carries the instructions for making proteins.
- mRNA is made in the nucleus (transcription) and carries the code to the ribosomes.
- Ribosomes read the mRNA code and assemble amino acids into a protein chain (translation).
- Mutations are changes in the DNA base sequence that can change the protein produced.

B1c Respiration

Respiration releases energy from glucose. All organisms respire. There are two types.

Aerobic: glucose + oxygen → carbon dioxide + water (+energy)

Anaerobic (animals): glucose → lactic acid (+small amount of energy)

Anaerobic (yeast/plants): glucose → ethanol + carbon dioxide (+small amount of energy)

Exam Tip: Aerobic respiration releases FAR more energy than anaerobic — always preferred when oxygen is available.

B1d Photosynthesis

Photosynthesis converts light energy into chemical energy (glucose) in chloroplasts.

Equation: carbon dioxide + water → glucose + oxygen (light energy required)

- Limiting factors: light intensity, CO₂ concentration, temperature.
- Glucose used for: respiration, making starch (storage), cellulose, proteins, fats.

Required Practical 2: Investigating the effect of light intensity on the rate of photosynthesis.

Cell division: **Mitosis** produces 2 identical cells for growth/repair. **Meiosis** produces 4 non-identical gametes for sexual reproduction.