B3: Organism-Level Systems

OCR Gateway · GCSE Biology · Revision Notes

Specification reference: B3a–B3c

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

B3a Coordination and Control — the Nervous System

The nervous system allows rapid responses to changes in the environment.

- CNS (brain and spinal cord) — coordinates responses.
- Sensory neurones — carry signals from receptors to CNS.
- Relay neurones — carry signals within the CNS.
- Motor neurones — carry signals from CNS to effectors.
- Reflexes — fast, automatic responses; the arc goes through the spinal cord not the brain.

Key Terms

Stimulus: A change in the environment detected by a receptor

Synapse: Gap between neurones — signal carried by neurotransmitters

Exam Tip: Reflex arcs are faster than voluntary actions because they do not involve the brain.

B3b Hormonal Coordination

Hormones are chemical messengers carried in the blood from endocrine glands to target organs. They work more slowly than the nervous system but have longer-lasting effects.

- **Insulin and glucagon** (pancreas) — control blood glucose level.
- **Adrenaline** (adrenal glands) — prepares body for fight or flight.
- **Oestrogen and progesterone** (ovaries) — control menstrual cycle.
- **Testosterone** (testes) — male sex characteristics.
- **FSH and LH** (pituitary gland) — stimulate egg maturation and ovulation.

Blood glucose control: high glucose → insulin released → glucose taken up by cells/liver (stored as glycogen). Low glucose → glucagon released → glycogen converted back to glucose.

- Type 1 diabetes: no insulin produced — treated with insulin injections.
- Type 2 diabetes: cells resistant to insulin — linked to obesity; treated with diet and exercise.

B3c Reproduction

Sexual reproduction produces genetically varied offspring. Gametes (sperm and eggs) are produced by meiosis.

- The menstrual cycle is controlled by FSH, LH, oestrogen and progesterone.

- Ovulation is triggered by a surge in LH.
- Contraception: hormonal (pill, implant) prevents ovulation; barrier (condom) prevents sperm meeting egg.

★ HIGHER TIER ONLY — Fertility Treatments

- IVF: eggs collected, fertilised outside the body, embryo implanted in uterus.
- Fertility drugs stimulate ovulation using FSH.
- Issues: multiple births, ethical concerns, high cost, low success rate.