This paper covers the **full Higher Separate** specification. Higher Tier questions are marked ★. Separate-only questions are marked ◆.

The Nervous System and Reflex Arc (4.5.2)

Specification reference: 4.5.2

Q1. Name the THREE types of neurone in the nervous system and state the function of each.

[3 marks]

Q2. Describe the sequence of events in a reflex arc when a person's hand touches a hot object.

[4 marks]

Q3. Explain why reflex actions are faster than voluntary actions.

[2 marks]

★ HIGHER TIER

Q4. ★ Explain how signals cross a synapse.

[3 marks]

Blood Glucose Control (4.5.3.2)

Specification reference: 4.5.3.2

Q5. Explain how the body responds when blood glucose concentration rises above normal after eating a meal.

[4 marks]

Q6. Compare Type 1 and Type 2 diabetes in terms of cause, mechanism and treatment.

[4 marks]

★ HIGHER TIER

Q7. ★ Explain why blood glucose homeostasis is an example of negative feedback.

[3 marks]

Hormonal Control of Reproduction (4.5.3.4–5)

Specification reference: 4.5.3.4

Q8. Describe the roles of FSH, LH, oestrogen and progesterone in the menstrual cycle.

[4 marks]

Q9. Explain how the contraceptive pill prevents pregnancy.

[3 marks]

★ HIGHER TIER

Q10. ★ Describe the process of IVF and evaluate its use as a fertility treatment.

[4 marks]

Plant Hormones (4.5.4)

Specification reference: 4.5.4

★ HIGHER TIER

Q11. ★ Explain how auxin causes a shoot to bend towards a light source (positive phototropism).

[4 marks]

★ HIGHER TIER

Q12. ★ Give TWO commercial uses of plant hormones and explain the benefit of each.

[3 marks]

Total: 41 marks

The Nervous System and Reflex Arc (4.5.2)

Q1 (3 marks)

Name the THREE types of neurone in the nervous system and state the function of …

• Sensory neurone: carries impulses from receptors to the CNS [1]
• Relay neurone: carries impulses within the CNS [1]
• Motor neurone: carries impulses from CNS to effectors (muscles/glands) [1]

Q2 (4 marks)

Describe the sequence of events in a reflex arc when a person's hand touches a h…

• Stimulus (heat) detected by thermoreceptors in skin [1]
• Impulse travels along sensory neurone to spinal cord [1]
• Signal crosses relay neurone in spinal cord [1]
• Impulse travels along motor neurone to effector (muscle) → hand withdraws [1]

Q3 (2 marks)

Explain why reflex actions are faster than voluntary actions.

• Reflex arcs do not involve the brain — signal goes through the spinal cord only [1]
• Shorter nerve pathway / fewer synapses → faster response time [1]

Q4 (3 marks) [★ HT]

★ Explain how signals cross a synapse.

• When an electrical impulse reaches the pre-synaptic terminal, it causes release of neurotransmitters from vesicles [1]
• Neurotransmitters diffuse across the synaptic cleft [1]
• They bind to specific receptors on the post-synaptic membrane, generating a new electrical impulse [1]

Blood Glucose Control (4.5.3.2)

Q5 (4 marks)

Explain how the body responds when blood glucose concentration rises above norma…

• Beta cells in the pancreas detect the rise in blood glucose [1]
• Insulin is secreted into the blood [1]
• Insulin causes body cells to take up glucose from the blood [1]
• Liver converts excess glucose to glycogen (glycogenesis) — blood glucose falls back to normal [1]

Q6 (4 marks)

Compare Type 1 and Type 2 diabetes in terms of cause, mechanism and treatment.

• Type 1: autoimmune destruction of beta cells → no insulin produced [1] — treated with insulin injections [1]
• Type 2: body cells become resistant to insulin (still produced) [1] — managed with diet, exercise, weight loss (medication if needed) [1]

Q7 (3 marks) [★ HT]

★ Explain why blood glucose homeostasis is an example of negative feedback.

• A change in blood glucose triggers a hormonal response (insulin or glucagon) [1]
• The response opposes the original change — high glucose → insulin lowers it; low glucose → glucagon raises it [1]
• The response brings blood glucose back to the set point — restoring normal conditions [1]

Hormonal Control of Reproduction (4.5.3.4–5)

Q8 (4 marks)

Describe the roles of FSH, LH, oestrogen and progesterone in the menstrual cycle…

• FSH: stimulates egg maturation in ovary and oestrogen production [1]

• Oestrogen: repairs/thickens uterus lining; at high levels triggers LH release [1]
• LH surge (day ~14): triggers ovulation (release of mature egg) [1]
• Progesterone: maintains uterus lining after ovulation; falls if no pregnancy → menstruation [1]

Q9 (3 marks)

Explain how the contraceptive pill prevents pregnancy.

• Pill contains oestrogen and/or progesterone [1]
• These inhibit FSH release from the pituitary [1]
• Without FSH, no egg matures → ovulation does not occur → pregnancy impossible [1]

Q10 (4 marks) [★ HT]

★ *Describe the process of IVF and evaluate its use as a fertility treatment.*

• FSH given to stimulate multiple egg production → eggs collected → fertilised by sperm in laboratory → embryo cultured → implanted in uterus [2]
• Benefit: allows couples with infertility to have biological children [1]
• Limitation: low success rate (~25-30%); multiple births possible; expensive; ethical concerns about unused embryos [1]

Plant Hormones (4.5.4)

Q11 (4 marks) [★ HT]

★ *Explain how auxin causes a shoot to bend towards a light source (positive phot…*

• Auxin is produced at the tip of the shoot [1]
• Light causes auxin to migrate to the shaded side of the shoot [1]
• Higher auxin concentration on the shaded side causes those cells to elongate more [1]
• Differential elongation causes the shoot to curve/grow towards the light source [1]

Q12 (3 marks) [★ HT]

★ *Give TWO commercial uses of plant hormones and explain the benefit of each.*

• Auxin as rooting powder: applied to cuttings stimulates root growth → faster plant propagation [1]
• Auxin as selective weedkiller: broadleaf weeds absorb more → overstimulated growth → die; narrow-leaf crops unaffected [1]
• Ethene: used to ripen bananas after transport → controlled, commercially timed ripening [1] — accept: gibberellins for seedless fruit/larger fruit