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

Nervous System and Reflexes (B3a)

Specification reference: B3a

Q1. Describe the pathway of a reflex arc from stimulus to response when touching a sharp pin.

[4 marks]

Q2. Explain how synapses ensure signals travel in only one direction.

[2 marks]

Blood Glucose and Hormones (B3b)

Specification reference: B3b

Q3. Explain how blood glucose concentration is controlled after a meal rich in carbohydrates.

[4 marks]

Q4. Compare Type 1 and Type 2 diabetes.

[3 marks]

Q5. ★ Explain why blood glucose control is described as a negative feedback system.

[2 marks]

Digestion (B3a)

Specification reference: B3a.2

Q6. Name the three classes of food molecule that are chemically digested. State the products of digesting each.

[3 marks]

Q7. Explain why bile is important for the digestion of fats.

[3 marks]

Total: 21 marks

Nervous System and Reflexes (B3a)

Q1 (4 marks)

Describe the pathway of a reflex arc from stimulus to response when touching a s…

- Stimulus (pain) detected by receptors in skin [1]
- Sensory neurone carries impulse to spinal cord [1]
- Relay neurone carries impulse across spinal cord [1]
- Motor neurone carries impulse to effector muscle → hand withdraws [1]

Q2 (2 marks)

Explain how synapses ensure signals travel in only one direction.

- Neurotransmitters are released only from the pre-synaptic membrane [1]
- Receptors are only present on the post-synaptic membrane — so the signal can only travel one way [1]

Blood Glucose and Hormones (B3b)

Q3 (4 marks)

Explain how blood glucose concentration is controlled after a meal rich in carbo…

- Glucose absorbed from intestine → blood glucose rises above normal [1]
- Pancreas detects this and releases insulin [1]
- Insulin causes cells to take up glucose and liver to convert glucose to glycogen [1]
- Blood glucose falls back to normal — insulin release decreases [1]

Q4 (3 marks)

Compare Type 1 and Type 2 diabetes.

- Type 1: autoimmune, no insulin produced, requires injections [1]
- Type 2: cells resistant to insulin, still produced, managed with diet/exercise [1]
- Both result in elevated blood glucose but through different mechanisms [1]

Q5 (2 marks) [★ HT]

★ Explain why blood glucose control is described as a negative feedback system.

- Any change in blood glucose triggers a hormonal response (insulin or glucagon) [1]
- The response opposes the original change and returns blood glucose to the set point [1]

Digestion (B3a)

Q6 (3 marks)

Name the three classes of food molecule that are chemically digested. State the …

- Starch → sugars/glucose (by amylase) [1]
- Proteins → amino acids (by proteases) [1]
- Lipids/fats → fatty acids + glycerol (by lipase) [1]

Q7 (3 marks)

Explain why bile is important for the digestion of fats.

- Bile emulsifies fats — breaks large fat globules into tiny droplets [1]
- This greatly increases the surface area of fat exposed to lipase [1]
- Lipase can digest fats faster — more rapid conversion to fatty acids and glycerol [1]