

This is the **Higher Combined Science** version. Higher Tier questions (★) are included. Some Separate-only content has been omitted.

Mitosis and Stem Cells (2.1–2.4)

Specification reference: 2.1

Q1. Explain why cancer can result from errors in the cell cycle.

[3 marks]

Q2. Compare embryonic and adult stem cells. Evaluate the use of embryonic stem cells in treating disease.

[4 marks]

The Nervous System and Brain (2.5–2.9)

Specification reference: 2.5

Q3. Explain how an impulse crosses a synapse.

[3 marks]

Q4. Name THREE regions of the brain and state the function of each.

[3 marks]

★ HIGHER TIER

Q5. ★ Describe how scientists investigate the functions of different brain regions.

[3 marks]

Total: 16 marks

Mitosis and Stem Cells (2.1–2.4)

Q1 (3 marks)

Explain why cancer can result from errors in the cell cycle.

- The cell cycle has checkpoints that normally prevent damaged DNA from being copied [1]
- Mutations in checkpoint genes mean cells no longer respond to stop signals [1]
- Uncontrolled cell division → tumour formation [1]

Q2 (4 marks)

Compare embryonic and adult stem cells. Evaluate the use of embryonic stem cells...

- Embryonic: totipotent (any cell type); adult: limited range of cell types [1]
- Embryonic stem cells: could treat wide range of diseases (Parkinson's, diabetes, spinal injury) [1]
- Ethical concern: obtaining embryonic stem cells destroys a human embryo [1]
- Risk: immune rejection / possible tumour formation from stem cells [1]

The Nervous System and Brain (2.5–2.9)

Q3 (3 marks)

Explain how an impulse crosses a synapse.

- Electrical impulse reaches pre-synaptic terminal → neurotransmitters released from vesicles [1]
- Neurotransmitters diffuse across the synaptic cleft [1]
- Bind to receptors on post-synaptic membrane → new electrical impulse generated [1]

Q4 (3 marks)

Name THREE regions of the brain and state the function of each.

- Cerebral cortex: conscious thought, memory, language, personality [1]
- Cerebellum: coordination and balance — precise muscle control [1]
- Medulla oblongata: automatic functions — breathing rate and heart rate [1]

Q5 (3 marks) [★ HT]

★ Describe how scientists investigate the functions of different brain regions.

- MRI scanning: images brain activity in real time — active regions use more O₂/blood flow [1]
- Studying patients with brain damage: linking damage to specific area with loss of specific function [1]
- Electrical stimulation during surgery: stimulating a brain area and observing the patient's response [1]