

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

## 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]

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

[4 marks]

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## The Nervous System and Brain (2.5–2.9)

*Specification reference: 2.5*

**Q3. Explain how an impulse crosses a synapse.**

[3 marks]

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

[3 marks]

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★ HIGHER TIER

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

**[3 marks]**

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**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 O<sub>2</sub>/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]