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

Natural Selection and Speciation (4.1–4.4)

Specification reference: 4.1

Q1. Describe how natural selection can lead to a new species forming. Use the terms variation, isolation, selection and reproduction.

[5 marks]

Q2. State THREE pieces of evidence that support Darwin's theory of evolution by natural selection.

[3 marks]

Genetic Engineering (4.5–4.7)

Specification reference: 4.5

★ HIGHER TIER

Q3. ★ Describe the steps in genetic engineering to produce herbicide-resistant crop plants. Name the enzymes used.

[4 marks]

Q4. Evaluate the use of GM crops.

[4 marks]

Total: 16 marks

atural Selection and Genetic cation

Edexcel · Higher Tier

Natural Selection and Speciation (4.1–4.4)

Q1 (5 marks)

Describe how natural selection can lead to a new species forming. Use the terms …

- Variation exists in a population due to mutations [1]
- A barrier (geographic isolation) divides the population — two groups cannot interbreed [1]
- Each population faces different environmental conditions → different selection pressures [1]
- Different alleles selected for in each group → populations diverge genetically [1]
- After many generations, so different they can no longer interbreed even if reunited → new species (speciation) [1]

Q2 (3 marks)

State THREE pieces of evidence that support Darwin's theory of evolution by natu…

- Fossil record — shows gradual change in organisms over millions of years [1]
- DNA evidence — closely related species share more similar DNA sequences [1]
- Antibiotic resistance in bacteria — direct observation of natural selection occurring today [1] — accept: comparative anatomy

Genetic Engineering (4.5–4.7)

Q3 (4 marks) [★ HT]

★ Describe the steps in genetic engineering to produce herbicide-resistant crop …

- Herbicide resistance gene identified and cut from donor organism using restriction enzymes [1]
- Gene inserted into plasmid vector using ligase to seal joins [1]
- Recombinant plasmid introduced into plant cells (e.g. via Agrobacterium) [1]
- Plants regenerated from transformed cells — all cells carry resistance gene [1]

Q4 (4 marks)

Evaluate the use of GM crops.

- Benefit: herbicide-resistant/pest-resistant crops need fewer pesticides → less environmental pollution [1]
- Benefit: can improve nutritional value (e.g. golden rice with vitamin A) [1]
- Concern: GM genes might transfer to wild plants → environmental consequences [1]
- Concern: ethical objections / large companies controlling seed supply [1]