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

Genetics and Inheritance (B5a–B5b)

Specification reference: B5a

Q1. Define: (a) allele, (b) dominant, (c) recessive, (d) carrier.

[4 marks]

Q2. Two parents who are both carriers of cystic fibrosis (Ff) have a child. Use a Punnett square to calculate the probability the child has cystic fibrosis.

[3 marks]

★ HIGHER TIER

Q3. ★ Explain what is meant by co-dominance using the example of sickle cell trait.

[3 marks]

Evolution and Natural Selection (B5c)

Specification reference: B5c

Q4. Explain, with an example, how natural selection leads to evolution.

[5 marks]

Q5. State THREE types of evidence that support the theory of evolution by natural selection.

[3 marks]

Total: 18 marks

Genetics and Inheritance (B5a–B5b)

Q1 (4 marks)

Define: (a) allele, (b) dominant, (c) recessive, (d) carrier.

- (a) A version of a gene [1]
- (b) Allele expressed with only one copy — masks recessive [1]
- (c) Allele expressed only when two copies present [1]
- (d) Heterozygous individual carrying a recessive allele but not showing the condition [1]

Q2 (3 marks)

Two parents who are both carriers of cystic fibrosis (Ff) have a child. Use a Pu…

- Punnett square: FF, Ff, Ff, ff [1]
- 1 in 4 / 25% probability of cystic fibrosis (ff genotype) [1]
- 50% probability of being a carrier (Ff) [1]

Q3 (3 marks) [★ HT]

★ Explain what is meant by co-dominance using the example of sickle cell trait.

- Co-dominance: both alleles are expressed in the heterozygote — neither dominates [1]
- Sickle cell: H■ allele causes sickle haemoglobin; H allele causes normal haemoglobin [1]
- Heterozygote (HH■) has BOTH normal and sickle haemoglobin — sickle cell trait (partial symptoms, some resistance to malaria) [1]

Evolution and Natural Selection (B5c)

Q4 (5 marks)

Explain, with an example, how natural selection leads to evolution.

- Variation exists due to mutations [1]
- Competition for resources [1]
- Better-adapted individuals survive and reproduce more [1]
- Advantageous alleles passed to offspring [1]
- Example: antibiotic resistance — resistant bacteria survive antibiotic, reproduce, population becomes resistant [1]

Q5 (3 marks)

State THREE types of evidence that support the theory of evolution by natural se…

- Fossil record shows gradual changes in species over time [1]
- DNA comparisons — closely related species have more similar DNA sequences [1]
- Observable examples of natural selection (e.g. antibiotic resistance, pesticide resistance in insects) [1] — accept: comparative anatomy