

# B5: Similarities and Differences

OCR Gateway · GCSE Biology · Revision Notes  
Specification reference: B5a–B5c

**Note:** Sections marked ★ HIGHER TIER ONLY are for Higher tier students only. Foundation tier students should focus on the unmarked sections.

## B5a Genetics

Genes are sections of DNA that code for proteins. Different forms of a gene are called alleles. Dominant alleles are expressed even with one copy; recessive alleles are only expressed with two copies.

- **Homozygous** — two identical alleles (BB or bb).
- **Heterozygous** — two different alleles (Bb).
- **Genotype** — genetic makeup (e.g. Bb).
- **Phenotype** — physical appearance (e.g. brown eyes).

Sex is determined by X and Y chromosomes: females = XX, males = XY.

**Required Practical None:** Use Punnett squares to predict the probability of offspring genotypes and phenotypes.

## B5b Inheritance

Inherited disorders are caused by faulty alleles.

- **Cystic fibrosis** — recessive; thick sticky mucus in lungs; both parents must carry the allele.
- **Polydactyly** — dominant; extra fingers or toes; only one parent needs to carry the allele.
- **Sickle cell anaemia** — recessive; misshapen red blood cells; reduces oxygen transport.

### ★ HIGHER TIER ONLY — DNA and Protein Synthesis

- DNA double helix with complementary base pairs: A-T and C-G.
- Transcription: mRNA copied from DNA in nucleus.
- Translation: ribosomes read mRNA codons and assemble amino acid chain.
- Mutations: random changes in base sequence — can change protein structure.

**Exam Tip:** A carrier has one dominant and one recessive allele (e.g. Ff). They do NOT show the disease but can pass it to their children.

## B5c Natural Selection and Evolution

Evolution is the gradual change in species over many generations through natural selection.

1. Variation exists within a population (due to mutations and sexual reproduction).
2. Individuals compete for limited resources.
3. Those best adapted survive and reproduce (survival of the fittest).
4. Advantageous alleles are passed to offspring.

- 5. Over time, the population changes — a new species may form (speciation).
- **Evidence for evolution:** fossil record, DNA similarities, antibiotic resistance.
- **Selective breeding:** humans select individuals with desired traits to breed (e.g. high-yield crops).
- **Genetic modification:** genes from one organism inserted into another (e.g. insulin gene into bacteria).
- **Classification:** organisms grouped by evolutionary relationships using phylogenetic trees.

### Key Terms

**Speciation:** Formation of a new species when populations become reproductively isolated

**Natural selection:** Process by which better-adapted individuals survive and reproduce more