

Ingenious Genes Curriculum Links for OCR Twenty First Century Science Biology B (J257)

B1.1 What is the genome and what does it do?

B1.2 How is genetic information inherited?

B1.3 How can and should gene technology be used?

B2.5 How can lifestyle, genes and the environment affect health?

B4.3 How do organisms grow and develop?

B6.1 How was the theory of evolution developed?

B1.1 What is the genome and what does it do?

1. a) explain how the nucleus and genetic material of eukaryotic cells (plants and animals) and the genetic material, including plasmids, of prokaryotic cells are related to cell functions

2. describe the genome as the entire genetic material of an organism

3. describe DNA as a polymer made up of nucleotides, forming two strands in a double helix

4. describe simply how the genome and its interaction with the environment influence the development of the phenotype of an organism, including the idea that most characteristics depend on instructions in the genome and are modified by interaction of the organism with its environment

5. explain the terms chromosome, gene, allele, variant, genotype and phenotype

6. explain the importance of amino acids in the synthesis of proteins, including the genome as instructions for the polymerisation of amino acids to make proteins

7. describe DNA as a polymer made from four different nucleotides, each nucleotide consisting of a common sugar and phosphate group with one of four different bases attached to the sugar (separate science only)

8. explain simply how the sequence of bases in DNA codes for the proteins made in protein synthesis, including the idea that each set of three nucleotides is the code for an amino acid (separate science only)

9. recall a simple description of protein synthesis, in which:

- a copy of a gene is made from messenger RNA (mRNA)
- the mRNA travels to a ribosome in the cytoplasm
- the ribosome joins amino acids together in an order determined by the mRNA

10. recall that all genetic variants arise from mutations (separate science only)

11. describe how genetic variants in coding DNA may influence phenotype by altering the activity of a protein (separate science only)

12. describe how genetic variants in non-coding DNA may influence phenotype by altering how genes are expressed (separate science only)

B1.2 How is genetic information inherited?

1. explain the terms gamete, homozygous, heterozygous, dominant and recessive

2. explain single gene inheritance, including dominant and recessive alleles and use of genetic diagrams

3. predict the results of single gene crosses

4. use direct proportions and simple ratios in genetic crosses

5. use the concept of probability in predicting the outcome of genetic crosses

6. recall that most phenotypic features are the result of multiple genes rather than single gene inheritance

8. describe sex determination in humans

B1.3 How can and should gene technology be used?

1. discuss the potential importance for medicine of our increasing understanding of the human genome, including the discovery of alleles associated with diseases and the genetic testing of individuals to inform family planning and healthcare

B2.5 How can lifestyle, genes and the environment affect health?

1. a) describe how the interaction of genetic and lifestyle factors can increase or decrease the risk of developing non-communicable human diseases, including cardiovascular diseases, many forms of cancer, some lung and liver diseases and diseases influenced by nutrition, including type 2 diabetes

B4.3 How do organisms grow and develop?

3. explain the role of meiotic cell division in halving the chromosome number to form gametes, including the stages of interphase and two meiotic divisions

B6.1 How was the theory of evolution developed?

2. recall that genetic variants arise from mutations, and that most have no effect on the phenotype, some influence phenotype and a very few determine phenotype
3. explain how evolution occurs through natural selection of variants that give rise to phenotypes better suited to their environment