

SCIENCE AS 90948

Demonstrate understanding of biological ideas relating to genetic variation Level 1, 4 Credits

This achievement standard involves demonstrating understanding of biological ideas relating to genetic variation.

- ☐ Structure of DNA
 - double helix; phosphate, sugar and bases; complementary base pairing
 - relationship between DNA, alleles, genes, and chromosomes
 - gene - specific section of DNA that codes for a particular feature /protein
 - allele - an alternative form of the gene
 - chromosomes exist as pairs so that individuals inherit two copies of each gene
 - alleles
 - dominant and recessive
 - homozygous and heterozygous

- ☐ Role of DNA
 - carrying instructions to the next generation; the inheritable nature of DNA
 - genotype
 - phenotype
 - how genotype determines phenotype; how the base sequence on DNA determines a particular feature & variations of that feature

- ☐ Variation
 - define genetic variation
 - inheritable and non-inheritable variations within a group of living organisms
 - link between DNA and variation in phenotypes
 - the significance of an allele as an alternative version of a gene
 - variation in phenotypes as adaptive features
 - mutations
 - definition
 - role of mutation in forming new alleles
 - which mutations may be inherited and which cannot

- ☐ Cell division
 - mitosis - for growth and repair (in brief)
 - meiosis - for generating gametes (names of stages of meiosis are not required)
 - half the number of chromosomes
 - alleles separated
 - how sexual reproduction leads to a new mix of alleles (inherited variation is constantly being generated through the reshuffling of alleles)
 - examples of gametes (plant and animal)
 - production of gametes
 - role of gametes
 - zygote
 - the advantages and disadvantages of sexual reproduction

Patterns of Inheritance

- simple monohybrid inheritance (examples showing complete dominance)
 - Punnett Square
 - pedigree chart (“family tree”)
 - pure breeding
- genotype ratios (as ratio, fraction and %)
- phenotype ratios (as ratio, fraction and %)
- why genotype and phenotype ratios may not be the same
- that actual ratios may not match probabilities due to random fertilisation of eggs by sperm
- that ratios are usually closer to probabilities when the number of offspring is quite large
- sex determination

Adaptive features

- how survival (rates) may depend on phenotype
- importance of variation within populations (population and species survival) in a changing environment, allowing individuals to survive and to pass on the ability to their offspring
 - pest infestation
 - disease
 - drought
 - flood

You must be familiar with the following genetic language and conventions:

- gene
- allele
- mutation
- genotype
- phenotype
- gamete
- zygote
- dominant
- recessive
- homozygous
- heterozygous
- pure breeding
- Punnett square
- pedigree chart