

## 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