**Topic 18. Variation & Selection**

**18.1 Variation**

**Define *variation*** - differences between individuals of the same species

**Distinguish between phenotypic variation and genetic variation**

**State that phenotypic variation is caused by both genetic and environmental factors**

**State that continuous variation results in a range of phenotypes between two extremes, e.g. height in humans**

**State that discontinuous variation results in a limited number of phenotypes with no intermediates, e.g. tongue rolling**

**State that discontinuous variation is mostly caused by genes alone, e.g. A, B, AB and O blood groups in humans**

**Record and present the results of investigations into continuous and discontinuous variation**

**Define *mutation*** - genetic change

**Define *gene mutation*** - a change in the base sequence of DNA

**State that mutation is the way in which new alleles are formed**

**State that ionising radiation and some chemicals increase the rate of mutation**

**Describe the symptoms of sickle-cell anaemia**

**Explain how a change in the base sequence of the gene for haemoglobin results in abnormal haemoglobin and sickle-shaped red blood cells**

**Use genetic diagrams to show how sickle-cell anaemia is inherited**

**State that people who are heterozygous (HbS HbA) for the sickle-cell allele have a resistance to malaria**

**Explain the distribution of the sickle-cell allele in human populations with reference to the distribution of malaria**

**18.2 Adaptive features**

**Define *adaptive feature*** - an inherited feature that helps an organism to survive and reproduce in its environment (core)

**Define *adaptive feature*** - the inherited functional features of an organism that increase its fitness (supplement)

**Interpret images or other information about a species to describe its adaptive features**

**Define *fitness*** - the probability of an organism surviving and reproducing in the environment in which it is found

**Explain the adaptive features of hydrophytes and xerophytes to their environments**

**18.3 Selection**

**Describe natural selection with reference to:**

* + **variation within populations**
  + **production of many offspring**
  + **competition for resources**
  + **struggle for survival**
  + **reproduction by individuals that are better adapted to the environment than others**
  + **passing on of their alleles to the next generation**

**Describe evolution as the change in adaptive features of a population over time as the result of natural selection**

**Define the process of *adaptation*** - the process, resulting from natural selection, by which populations become more suited to their environment over many generations

**Describe the development of strains of antibiotic resistant bacteria as an example of evolution by natural selection**

**Describe selective breeding with reference to:**

**– selection by humans of individuals with desirable features**

**– crossing these individuals to produce the next generation**

**– selection of offspring showing the desirable features**

**State the differences between natural and artificial selection**

**Outline how selective breeding by artificial selection is carried out over many generations to improve crop plants and domesticated anima**