WJEC (Eduqas) Biology A-level

Topic 2.6 - Variation and Evolution

Definitions and Concepts

Allele frequency - The number of times an allele appears at a particular locus in a population, expressed as a proportion or a percentage.

Allopatric speciation - A form of speciation that occurs when two populations become geographically isolated.

Behavioural isolation - The reproductive isolation of two populations due to differences in their behaviour, e.g. different mating rituals.

Continuous variation - A type of variation that cannot be categorised e.g. skin colour, height. It produces a continuous range in which a characteristic can take any value. Multiple genes influence continuous variation and it is often significantly affected by environmental factors.

Discontinuous variation - A type of variation that can be categorised e.g. blood group. A characteristic can only appear in discrete values. One or two genes influence discontinuous variation and environmental factors have little effect.

Evolution - The gradual change in the allele frequencies within a population over time. Occurs due to natural selection.

Founder effect - A type of genetic drift in which a few individuals of a species break off from the population and form a new colony. This results in smaller gene pools and an increased frequency of rare alleles.

Gene pool - All of the different versions of genes (alleles) in the individuals that make up a population.

Genetic drift - Variations in allele frequencies in small populations due to chance.

Geographical isolation - A physical barrier (such as a river or mountain) separates two populations of the same species.

Hardy-Weinberg principle - A model that predicts that the ratio of dominant and recessive alleles in a population will remain constant between generations if the following five conditions are met: no new mutations; no natural selection; no migration; large population; and random mating. It provides a formula for calculating the frequencies of alleles:

$$p^2 + 2pq + q^2 = 1.0$$

where p is the frequency of the dominant allele and q is the frequency of the recessive allele.

Heritable variation - Genetic differences between individuals.

Hybrid fertility - The formation of fertile hybrid offspring (e.g. wheat) due to hybridisation combined with polyploidy which doubles the chromosome number, enabling meiosis.

Hybrid sterility - The formation of sterile hybrid offspring (e.g. the mule) from the reproduction of individuals of different species; the chromosome sets from each parent differ so are unable to pair up during meiosis.

Interspecific competition - A type of competition that takes place between members of different species.

Intraspecific competition - A type of competition that takes place between members of the same species.

Morphological isolation - The reproductive isolation of two populations due to the incompatibility of their reproductive systems.

Natural selection - The process by which the frequency of beneficial alleles gradually increases in a population's gene pool over time. This theory was developed by Charles Darwin.

Non-heritable variation - Acquired differences in the phenotypes of individuals that cannot be inherited.

Reproductive isolation - The inability of two populations of the same species to interbreed due to behavioural, morphological or seasonal barriers.

Seasonal isolation - The reproductive isolation of two populations due to differences in their breeding seasons.

Selection pressures - Environmental factors that drive evolution by natural selection and limit population sizes e.g. competition, predation and disease. They can change the frequency of alleles in a population.

Speciation - The formation of new species due to the evolution of two reproductively separated populations. Two forms: allopatric and sympatric speciation.

Species - A group of similar organisms that are able to breed with one another to produce living, fertile offspring.

Student's t-test - A statistical test used to determine whether there is a statistically significant difference between the means of two data sets that show normal distribution.

Sympatric speciation - A form of speciation that occurs when two populations within the same area become reproductively isolated.

Variation - The differences between individuals due to genes, the environment or a combination of both.