

## AS 90717

### Describe processes and patterns of evolution

#### Level 3, 3 Credits

This achievement standard involves the description of processes and patterns of evolution.

Achievement	Achievement with Merit	Achievement with Excellence
Describe processes and patterns of evolution.	Describe processes and explain patterns of evolution.	Describe processes and discuss patterns of evolution.

**Processes of evolution** are limited to

- ways in which speciation (process of forming new biological species occurs)
  - sympatric (e.g. penguins could undergo speciation in the same place by occupying different niches/habitats)
  - allopatric (e.g. penguins could undergo speciation in different geographical areas)
  - instant speciation (polyploidy)
- isolating mechanisms that contribute to speciation (pre zygotic, post zygotic and others)
  - geographical boundaries (e.g. different islands, uplifting causing formation of mountain ranges)
  - ecological (habitat) (e.g. different, genetic differences to cope with different ecological habitats i.e. temperature & humidity)
  - temporal (e.g. different breeding time)
  - behavioural (e.g. different mating rituals)
  - structural barriers (e.g. incompatibility in anatomy)
  - polyploidy (e.g. different numbers of chromosomes so even if gametes fuse / pollen fertilises other species the embryo cannot develop to maturity)
  - post zygotic isolating mechanisms
    - hybrid sterility
    - hybrid inviability
    - hybrid breakdown
- the role of natural selection
  - best suited individuals have greater chance of reproductive success
  - survival of species is promoted
  - individuals with more suited / better adapted phenotypes will compete more favourably than others and are more likely to reproduce, passing on their favourable alleles
  - favourable alleles increase in frequency within the population

**Patterns of evolution** will be selected from

- convergent evolution
  - where similar selection pressures result in similar adaptations in species from different ancestors
- divergent evolution including adaptive radiation
  - individuals with slightly different adaptations fill a variety of available niches, leading to adaptive radiation
  - geological changes
  - climatic changes

- co-evolution
  - species evolving in response to each other, mutualistic relationship
- punctuated equilibrium
  - long periods of stasis with sudden speciation/periods of evolution leading to genetic change
- gradualism
  - slow genetic change over a long period of time.

### Some Key Words

**adaptive radiation** - when a large number of species form to occupy different ecological niches

**allopatry** - speciation as a result of geographical isolation

**co-evolution** - when one species or group changes its genetic composition in response to a genetic change in another

**convergent evolution** - when different species living in the same environment come to look similar

**divergent evolution** - when one species branches to form two or three species

**gradualism** - slow changes between populations that occur as a result of different selection pressures

**isolating mechanism** - any mechanism that prevents interbreeding of hybrids

**polyploidy** - when cells have more than  $2n$  chromosomes; common in plants

**punctuated equilibrium** - where evolution consists of long periods of stability, followed by short rapid changes as a result of critical selection pressures

**selection pressure** - the environmental factors that favour certain phenotypes

**speciation** - a mechanism by which new species are formed

**species** - a group of individuals with common features and ancestry, which will interbreed

**sympatry** - speciation within the same area by natural selection; there are a number of niches and groups move into the niches best suited to them

### Terms

Describe requires the student to define, use annotated diagrams, give characteristics of, or an account of.

Explain requires the student to provide a reason as to how or why something occurs.

Discuss requires the student to show understanding by linking biological ideas. It may involve students in justifying, relating, evaluating, comparing and contrasting, and analysing.