

# AQA Biology 1b - Evolution and Environment

11.5 What determines where particular species live and how many of them there are? Animals and plants are well adapted to survive in their normal environment.

Their population depends on many factors including:

- competition for the things they need
- being eaten for food
- being infected by disease.

You should be able to:

- suggest how organisms are adapted to the conditions in which they live
- suggest the factors for which organisms are competing in a given habitat
- suggest reasons for the distribution of animals or plants in a particular habitat.

Know that:

- To survive, organisms require a supply of materials from their surroundings and from the other living organisms there.
- Plants often compete with each other for light and for water and nutrients from the soil.
- Animals often compete with each other for food, mates and territory.
- Organisms have features (adaptations) which enable them to survive in the conditions in which they normally live.
- Animals and plants may be adapted for survival in the conditions where they normally live eg deserts, the Arctic.
- Animals and plants may be adapted to cope with specific features of their environment eg thorns, poisons and warning colours to deter predators.

11.6 Why are individuals of the same species different from each other? What new methods do we have for producing plants and animals with the characteristics we prefer?

There are not only differences between different species of plants and animals but also between individuals of the same species. These differences are due partly to the information in the cells they have inherited from their parents and partly to the different environments in which the individuals live and grow. Non-sexual reproduction can be used to produce individuals exactly like their parents. Scientists can now add, remove or change genes to produce the plants and animals they want.

You should be able to:

- interpret information about cloning techniques and genetic engineering techniques
- make informed judgements about the economic, social and ethical issues concerning cloning and genetic engineering, including GM crops.

Know that:

- The information that results in plants and animals having similar characteristics to their parents is carried by genes which are passed on in the sex cells (gametes) from which the offspring develop.
- Different genes control the development of different characteristics.
- The nucleus of a cell contains chromosomes. Chromosomes carry genes that control the characteristics of the body.
- There are two forms of reproduction:
  - sexual reproduction – the joining (fusion) of male and female gametes. The mixture of the genetic information from two parents leads to variety in the offspring

- asexual reproduction – no fusion of gametes and only one individual is needed as the parent. There is no mixing of genetic information and so no variation in the offspring. These genetically identical individuals are known as clones.
- New plants can be produced quickly and cheaply by taking cuttings from older plants. These new plants are genetically identical to the parent plant.
- Modern cloning techniques include:
  - tissue culture – using small groups of cells from part of a plant
  - embryo transplants – splitting apart cells from a developing animal embryo before they become specialised, then transplanting the identical embryos into host mothers
  - fusion cell and adult cell cloning.
- In genetic engineering, genes from the chromosomes of humans and other organisms can be ‘cut out’ using enzymes and transferred to cells of other organisms.
- Genes can also be transferred to the cells of animals or plants at an early stage in their development so that they develop with desired characteristics.

### 11.7 Why have some species of plants and animals died out? How do new species of plants and animals develop?

Changes in the environment of plants and animals may cause them to die out. Particular genes or accidental changes in the genes of plants or animals may give them characteristics which enable them to survive better. Over time this may result in entirely new species.

You should be able to:

- suggest reasons why scientists cannot be certain about how life began on Earth
- interpret evidence relating to evolutionary theory
- suggest reasons why Darwin’s theory of natural selection was only gradually accepted
- identify the differences between Darwin’s theory of evolution and conflicting theories
- suggest reasons for the different theories.

Know that:

- Fossils provide evidence of how much (or how little) different organisms have changed since life developed on Earth.
- The theory of evolution states that all species of living things have evolved from simple life-forms which first developed more than three billion years ago.
- Studying the similarities and differences between species helps us to understand evolutionary and ecological relationships.
- Extinction may be caused by: changes to the environment
  - new predators
  - new diseases
  - new competitors.
- Evolution occurs via natural selection:
  - individual organisms within a particular species may show a wide range of variation because of differences in their genes
  - individuals with characteristics most suited to the environment are more likely to survive to breed successfully
  - the genes which have enabled these individuals to survive are then passed on to the next generation.
- Where new forms of a gene result from mutation there may be more rapid change in a species.

### 11.8 How do humans affect the environment?

Humans often upset the balance of different populations in natural ecosystems, or change the environment so that some species find it difficult to survive. With so many people in the world, there is a

serious danger of causing permanent damage not just to local environments but also to the global environment.

You should be able to:

- analyse and interpret scientific data concerning environmental issues
- weigh evidence and form balanced judgements about some of the major environmental issues facing society, including the importance of sustainable development
- evaluate methods used to collect environmental data and consider their validity and reliability as evidence for environmental change.

Know that:

- Rapid growth in the human population and an increase in the standard of living means that:
  - –raw materials, including non-renewable energy resources, are rapidly being used up
  - –increasingly more waste is produced
  - –unless waste is properly handled more pollution will be caused.
- Humans reduce the amount of land available for other animals and plants by building, quarrying, farming and dumping waste.
- More waste is being produced which, unless properly handled, may pollute:
  - water – with sewage, fertiliser or toxic chemicals
  - air – with smoke and gases such as sulfur dioxide which contribute to acid rain
  - land – with toxic chemicals, such as pesticides and herbicides, which may be washed from land into water.
- Living organisms can be used as indicators of pollution:
  - –lichens can be used as air pollution indicators
  - –invertebrate animals can be used as water pollution indicators.
- Large scale deforestation in tropical areas, for timber and to provide land for agriculture, has:
  - increased the release of carbon dioxide into the atmosphere (because of burning and the activities of microorganisms)
  - –reduced the rate at which carbon dioxide is removed from the atmosphere and ‘locked-up’ for many years as wood.
- Loss of forest leads to reduction in biodiversity. Some of the organisms that are lost may have been of future use.
- Increases in the numbers of cattle and rice fields have increased the amount of methane released into the atmosphere.
- Carbon dioxide and methane in the atmosphere absorb most of the energy radiated by the Earth. Some of this energy is reradiated back to the Earth and so keeps the Earth warmer than it would otherwise be. Increasing levels of these gases may be causing global warming by increasing the ‘greenhouse effect’. An increase in the Earth’s temperature of only a few degrees Celsius:
  - may cause quite big changes in the Earth’s climate
  - may cause a rise in sea level.
- Improving the quality of life without compromising future generations is known as sustainable development. Planning is needed at local, regional and global levels to manage sustainability.

adaption  
habitat

social and ethical issues concerning cloning and genetic engineering  
sexual reproduction  
asexual reproduction  
gametes  
Plant cuttings  
tissue culture  
embryo transplants  
fusion cell cloning  
adult cell cloning.  
genetic engineering  
chromosomes

Darwin's theory of evolution  
conflicting theories of evolution  
Evolution  
natural selection:  
genes  
mutation

non-renewable energy resources  
fertiliser  
sulfur dioxide  
acid rain  
toxic chemicals  
pesticides  
herbicides  
air pollution indicators  
water pollution indicators.  
deforestation  
biodiversity  
methane  
greenhouse effect'  
sustainable development.