

B14 Variation and evolution

Lessons TBAT	Key Knowledge	Practical	Assessment
<p>Explain why everyone in your family is different</p> <p>Describe how evolution occurs via natural selection</p> <p>Evaluate the benefits and risks of selective breeding</p> <p>Evaluate the benefits and risks of genetic engineering in</p>	<p>Students should be able to describe simply how the genome and its interaction with the environment influence the development of the phenotype of an organism.</p> <p>Differences in the characteristics of individuals in a population is called variation and may be due to differences in:</p> <ul style="list-style-type: none"> • the genes they have inherited (genetic causes) • the conditions in which they have developed (environmental causes) • a combination of genes and the environment. <p>Students should be able to:</p> <ul style="list-style-type: none"> • state that there is usually extensive genetic variation within a population of a species • recall that all variants arise from mutations and that: most have no effect on the phenotype; some influence phenotype; very few determine phenotype. 	<p>N/A</p>	<p>End of unit test</p> <hr/> <p>Maths Skills</p> <p>Interpret information about genetic engineering techniques and to make informed judgements about issues concerning cloning and genetic engineering, including GM crops.</p>

<p>agriculture and medicine</p>	<p>Mutations occur continuously. Very rarely a mutation will lead to a new phenotype. If the new phenotype is suited to an environmental change it can lead to a relatively rapid change in the species.</p> <p>Students should be able to describe evolution as a change in the inherited characteristics of a population over time through a process of natural selection which may result in the formation of a new species.</p> <p>The theory of evolution by natural selection states that all species of living things have evolved from simple life forms that first developed more than three billion years ago. Students should be able to explain how evolution occurs through natural selection of variants that give rise to phenotypes best suited to their environment.</p> <p>If two populations of one species become so different in phenotype that they can no longer interbreed to produce fertile offspring they have formed two new species.</p> <p>Students should be able to explain the impact of selective breeding of food plants and domesticated animals.</p> <p>Selective breeding (artificial selection) is the process by which humans breed plants and animals for particular genetic characteristics. Humans have been doing this for thousands of years since they first bred food crops from wild plants and domesticated animals.</p> <p>Selective breeding involves choosing parents with the desired characteristic from a mixed population. They are bred together. From the offspring those with the desired characteristic are bred</p>	<p>Key stage 3</p> <p>Inheritance, chromosomes, DNA and genes</p> <ul style="list-style-type: none"> • heredity as the process by which genetic information is transmitted from one generation to the next • a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model • differences between species • the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation • the variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection • changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material <p>Relationships in an ecosystem</p> <ul style="list-style-type: none"> • the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • the importance of plant reproduction through insect pollination in human food security • how organisms affect, and are affected by, their environment, including the accumulation of toxic materials
---------------------------------	--	--

B14 Variation and evolution

	<p>together. This continues over many generations until all the offspring show the desired characteristic. The characteristic can be chosen for usefulness or appearance:</p> <ul style="list-style-type: none">• Disease resistance in food crops.• Animals which produce more meat or milk.• Domestic dogs with a gentle nature.• Large or unusual flowers. Selective breeding can lead to 'inbreeding' where some breeds are particularly prone to disease or inherited defects. <p>Students should be able to describe genetic engineering as a process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic. Plant crops have been genetically engineered to be resistant to diseases or to produce bigger better fruits.</p> <p>Students should be able to explain the potential benefits and risks of genetic engineering in agriculture and in medicine and that some people have objections. In genetic engineering, genes from the chromosomes of humans and other organisms can be 'cut out' and transferred to cells of other organisms.</p> <p>Crops that have had their genes modified in this way are called genetically modified (GM) crops. GM crops include ones that are resistant to insect attack or to herbicides. GM crops generally show increased yields.</p> <p>Concerns about GM crops include the effect on populations of wild flowers and insects. Some people feel the effects of eating GM crops on human health have not been fully explored. Modern medical research is exploring the possibility of genetic modification to overcome some inherited disorders.</p>	
--	---	--

B14 Variation and evolution

	<p>(HT only) Students should be able to describe the main steps in the process of genetic engineering.</p> <p>(HT only) In genetic engineering:</p> <ul style="list-style-type: none">• enzymes are used to isolate the required gene; this gene is inserted into a vector, usually a bacterial plasmid or a virus• the vector is used to insert the gene into the required cells• genes are transferred to the cells of animals, plants or microorganisms at an early stage in their development so that they develop with desired characteristics.	
--	--	--

B14 Variation and evolution