

B8 Revision

Connection

Q1. Define extinct.

Q2. Give 3x reasons that can cause a species to become extinct

Q3. List 4 factors that may contribute to the next mass extinction

Activation

LI: Create a topic summary sheet

1. Fold an A3 sheet so it is divided into 8 sections
2. Look back over you lessons and group them into 8 main headings
3. Summarise the key points into each section, use keywords and diagrams and symbols rather than sentences



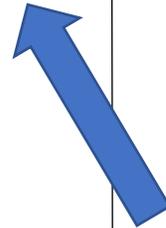
Consolidation

Look though the relevant past paper questions for this topic - From the B7 DIP file – see if you can complete any additional questions



Extension

Make a list of anything that you would like to ask your teacher to go over again



Demonstration

Test yourself by working with the person sitting next to you by talking though each box on your summary sheet and seeing how many key facts you can remember



Answers: B7.Revision

Connection

1 no organisms exist

2 predators/ disease/ competition for food

3 Landscape transformation/
overexploitation of a species/ pollution/
introduction of alien species

DART B7: Genetic Modification

"Gene Editing is GM", says European Court

The European Court of Justice has ruled that altering living things using the relatively new technique of genome editing counts as genetic engineering. Until now, gene editing, involving the precise replacement of one DNA sequence with another, has been a grey area. Traditional genetic engineering involves the less precise insertion of foreign DNA into an organism.

It would mean any novel food developed with the help of gene editing would need to be labelled as GM. But **the ruling** would also apply to a range of burgeoning areas, such as the treatment of genetic disease in humans and to genetically altered animals.

In a statement, the **Court of Justice (ECJ)** said it "takes the view, first of all, that organisms obtained by mutagenesis are GMOs [genetically modified organisms] within the meaning of the GMO Directive".

In the opinion of ECJ Advocate General Michal **Bobek**, "mutagenesis" covers any alteration to a genome - effectively the instruction booklet for life. The ECJ statement added: "It follows that those organisms come, in principle, within the scope of the GMO Directive and are subject to the obligations laid down by that directive."

The ruling contains an exemption for older techniques with a "long safety record". This is believed to refer to methods used since the 1950s (pre-dating regulations on GMOs) in which plants are exposed to radiation or particular chemicals that induce random mutations (changes) in the organism's DNA. These mutant plants can then be used to breed new varieties.

The best-known genome editing technique, known as Crispr-Cas9, involves cutting strands of DNA with molecular "scissors". When the organism's natural repair systems kick in to repair the break, it presents scientists with the opportunity to insert the DNA sequence of their choosing - essentially rewriting the blueprint for life.

Scientists hope this emerging technology could be used, for example, to develop crop varieties that are resistant to pests, or that produce large yields under challenging climatic conditions. They also aim to use it to "correct" genetic disease in humans.

Unlike traditional genetic engineering techniques, genome editing does not involve the introduction of DNA from another organism. It is also nearly impossible to detect whether a living thing's DNA has been edited or not - the changes are indistinguishable from naturally occurring mutations. The ruling came about because of a legal action brought by the French agricultural union **Confédération paysanne**, which had argued that herbicide-resistant seed varieties posed a risk to the environment however they were made. Scientists who work in the areas of gene editing and genetic modification warned that the ruling would hold back cutting-edge research and innovation.

"This will potentially impose highly onerous burdens on the use of genome editing both in agriculture and even in medicine, where the method has recently shown great promise for improving human health and well being," said Prof Murphy.

Prof Johnathan Napier, from the crop science institute **Rothamsted Research in Harpenden, UK**, called the decision "a very disappointing outcome".

He said: "The classification of genome-edited organisms as falling under the GMO Directive could slam the door shut on this revolutionary technology. This is a backward step, not progress."

Unusually, the ECJ decision appears to have partially ignored the legal opinion of Mr **Bobek**, laid out formally in January. In the Advocate General's view, new targeted editing technologies were to have been placed in the same category as the older techniques that produced random mutations in plants via radiation or chemicals.

Prof Nigel Halford, from **Rothamsted**, said the ruling had also ignored "scientific advice and the pleas of multiple agricultural biotech organisations". He added that the ECJ had "taken a decision to keep the NGOs sweet".

"If adopted by the Council and Parliament the decision could set agbiotech in Europe back another 20 years. We are already a generation behind. Young scientists interested in agbiotech are likely to move to places where common sense and scientific evidence prevail," Prof Halford explained.

The group's director Liz O'Neill said: "This case was portrayed by industry as an argument about definition, but the court has seen sense and made it clear that what actually matters is how we regulate emerging technologies that have the potential to permanently alter the ecosystem."

Reference: BBC News article, 25th July 2018

QUESTIONS:

- 1a) What does gene editing involve?
 - b) What do GM and DNA stand for? Use your textbook if you need to.
 - c) What are GMOs
- 2a) Explain the meaning of "mutagenesis".
 - b) Describe how the Crispr-Cas9 technique works.
 - c) Give 3 reasons why scientists are developing this new technology.
- 3a) Explain how genome editing is different from earlier GM methods.
 - b) Why was Professor Johnathan Napier disappointed.
 - c) Discuss the benefits and concerns of gene editing. Give your opinion.

Answers to B7 (Gene Editing)

1a. Involves the precise replacement of one DNA sequence with another.

- b. **Genetically modified**; **Deoxyribonucleic acid**.
- c. Genetically modified organisms.

2a. Any alteration to a genome - the "instruction booklet for life".

- b. Involves cutting strands of an organism's DNA with molecular "scissors". When the organism's natural repair system starts to repair the break, it presents scientists with the opportunity to insert the DNA sequence of their choosing.
- c. i) To develop crop varieties that are resistant to pests; ii) to produce large yields under challenging climatic conditions; iii) in the future to "correct" genetic disease in humans.

3a. Unlike traditional genetic engineering techniques, genome editing does not involve the introduction of DNA from another organism. It is also nearly impossible to detect whether a living thing's DNA has been edited or not - the changes are indistinguishable from naturally occurring mutations.

- b. Too much "red tape". "The classification of genome-edited organisms as falling under the GMO Directive could slam the door shut on this revolutionary technology. This is a backward step, not progress."
- c. Benefits – as per Q2c. Concerns – changing/altering/interfering with nature. Discussion on different opinions

Attainment Band :	B7 Variation and evolution (AQA) Knowledge and Understanding
Yellow plus/	<p>Understand the mechanism of genetic variation.</p> <p>Explain how environmental change operating with natural selection leads to the evolution of a new species.</p> <p>Explain how the scientific work of many scientists contributed to the gene theory.</p> <p>Explain how microscopic examination, fossils and biochemistry have led to modern evolutionary trees.</p> <p>Evaluate circumstances that may lead to another mass extinction.</p>
Yellow	
	<p>Describe how variation contributes to an organism's survival.</p> <p>Describe how natural selection leads to a struggle for existence.</p> <p>Identify the reasons why genetics and evolution were not linked until the twentieth century.</p> <p>Explain the features used to develop evolutionary trees.</p> <p>Describe how new species, predators and competitors can lead to extinction.</p>
Blue	<p>Distinguish between variation caused by genes and by the environment.</p>
Green	<p>Recall that the theory of evolution was developed independently by Darwin and Wallace.</p> <p>Identify reasons why evolution was not, to begin with, accepted.</p> <p>Recall and use the classification system developed by Linnaeus.</p> <p>Identify the causes of extinction.</p>
White	<p>Some elements of the above have been achieved</p>