

Lesson 14: B7.14 – Genetic engineering

Connection

Q1. Give 3x reason plants are bred selectively

Q2. What is the concern with selective breeding?

Q3. Why is selective breeding expensive?

Activation

LI: Describe the importance of genetic engineering in crops and insulin production

<https://www.youtube.com/watch?v=CfTnVx31pr0>

1. Make a note of the title and the LI
2. Subheading connection and answer revision questions
3. Read pages 300-301
4. List key words – define those you don't know
5. Draw and label fig 7.41



Consolidation

Complete and self assess the relevant past paper question for this topic -
From the B7 DIP file



Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Demonstration

Attempt questions 1-6

In 10 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

- Green questions to GCSE Level 3
- Blue questions to GCSE Level 6
- Purple questions to GCSE Level 9



Answers: B7.14 – Genetic engineering

Connection

1 Any 3 from:

- Disease resistance
- Increased yield
- Improve crop quality
- Grow and mature more quickly
- Distinctive taste
- Long shelf life, store well or can be frozen

2 if they are genetically similar with little variation any environmental change can result in the whole crop being lost.

3 it takes a very long time

Demonstration

1 Taking specific genes from one organism and introducing them into the genome of another.

2 *Escherichia coli (E. coli)*; yeast (*Saccharomyces cerevisiae*).

3 increase resistance to disease; increase yields; bigger and better fruit.

4 fungi; viruses.

Note that bacteria cause far fewer diseases in plants; they are more likely to cause disease in animals.

5 an enzyme.

6 using a vector, which is often a plasmid (or a gene gun).

Lesson 15: B7.15 – Genetically modified crops

Connection

- Q1. What is genetic modification?
- Q2. Give 3 reasons why it is desirable to create a GMO crop
- Q3. List the 6 steps of genetic engineering

Activation

LI: Explain the benefits, concerns and ethics that surround genetic modification

<https://www.youtube.com/watch?v=7TmcXYp8xu4>

1. Make a note of the title and the LI
2. Read pages 302-303
3. List key words – define those you don't know



Consolidation

Complete and self assess the relevant past paper question for this topic -
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Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Demonstration

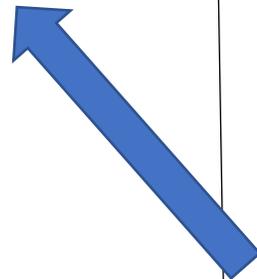
Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

- Green questions to GCSE Level 3
- Blue questions to GCSE Level 6
- Purple questions to GCSE Level 9



Answers: B7.15 – Genetically modified crops

Connection

1 Transfer of specific genes from one organism to another

2

- Increased yield
- Increased disease resistance
- Fruit that is improved in taste, size and appearance

3 Genetic engineering

- Cut the gene of interest eg insulin out of the chromosome using an enzyme
- Use the same enzyme to cut a plasmid
- Insert the gen into the plasmid
- Put the plasmid back into a bacterial cell
- Culture/grow the bacteria
- Process the protein that is made by the bacteria due to the presence of the genetically engineered gene.

Demonstration

1 crops could grow in poor soils and other harsh environments.

2 crops could be fortified with extra nutrients.

3 weeds will compete with crops for light, water and nutrients (and can also encourage fungal growth); spraying a field of a herbicide-tolerant crop with the herbicide will kill weeds but not the crop; there will be no loss of yield resulting from weed growth .

4 because of mutation, genes/alleles making the insect resistant to insecticide will arise; other insects killed; because of reproductive rate, resistant gene/allele will spread quickly throughout the population.

5 seed carried by wind/other agents; may crosspollinate with a wild or a cultivated relative of the GM crop.

6 possible effects on non-target organisms/studies have suggested that pollen *may* be toxic to nontarget organisms, e.g. the monarch butterfly.

7 Issues with safety may include:

- Cross pollination of GM crops with wild or cultivated relative of the crop
- Studies have shown GM crops can swap manmade genes.
- Pollen of GM crops can be carried by wind and may be toxic to other insects that are essential pollinators of crops and other plants (although evidence suggests pollen levels of GM crops are not high enough to be toxic)

Lesson 16: B7.16 – Is genetic modification safe?

Connection

- Q1. What is global food security?
- Q2. How does making a crop herbicide or insecticide resistant increase the yield?
- Q3. What are the ecological concerns regarding GM crops?

Activation

LI: Explain the concerns that people have regarding genetic modification

<https://www.youtube.com/watch?v=7TmcXYp8xu4>

1. Make a note of the title and the LI
2. Read pages 304-306
3. List key words – define those you don't know



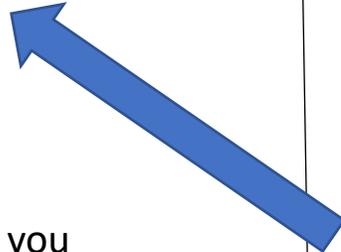
Consolidation

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Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Demonstration

Attempt questions 1-6 pages 304-305

Attempt questions 1-5 page 306

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



Answers: B7.16 – Is genetic modification safe?

Connection

- 1 all people have access to a consistent supply of food sufficient to meet their needs
- 2 Herbicide resistant means crop can be sprayed with weed killer to kill weed but not the crop = more space for crop to grow
Insecticide resistant means that insects eating the crop die = less crop is eaten
- 3 Concern is that pollen from GM crop escapes into the wild and cross pollinate with wild species

Demonstration

- 1 *E. coli* lives in the human gut, so an escaped GM version could colonise it; yeast lives on the surface of fruit, so the GM version could be transferred to humans through fruit.
- 2 deactivate the genes involved in infection.
- 3 the marker is needed to so that any cells not having taken up the gene are killed/isolate cells having taken up the gene successfully.
- 4 kanamycin is an antibiotic that is no longer used, so the effectiveness of antibiotics will not be affected by an organism developing antibiotic resistance to this antibiotic.
- 5 most scientists have no found no evidence that GM crops are harmful; no evidence that they cause allergies; some studies have suggested that they may cause cancer, but these are controversial.
- 6 evidence of correlation between glyphosate use and an increase in a number of conditions ranging from autism to cancer (though this does not mean cause).

Lesson 17: B7.17 – Ethically wrong, or essential?

Connection

Q1. Producing GMO insulin uses a virus. Why is this a problem?

Q2. What is the antibiotic marker Kanamycin used for in genetic medication? Why is this a problem?

Q3. List 3x concerns regarding GMO products

Activation

LI: Explain the ethical issues of genetic engineering in agriculture and medicine

1. Make a note of the title and the LI
2. Read pages 306-307
3. List key words – define those you don't know

<https://www.youtube.com/watch?v=GbJasFgJkLg>

4. Draw and label fig 7.49

Consolidation

Complete and self assess the relevant past paper question for this topic -
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Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Demonstration

Attempt questions 1-8

In 10 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

Answers: B7.17 – Ethically wrong or essential?

Connection

- 1 Why do some people not believe in Genetic modification?
- 2 Describe 2 problems with GM products
- 3 What is genetic engineering and what are its issues?

Demonstration

- 1 increasing food supply/security/quality for world's populations.
- 2 it cannot be justified to change the genome of another organism/other reasonable answer.
- 3 (if cross-pollinated/cross-fertilised,) it will not breed true/have different characteristics.
- 4 so that the public know that it would be a GM food that they're eating and can make a decision as to whether to buy/eat it, or not.
- 5 DNA analysis.
- 6 they caused leukaemia, probably because of the viral vector used.
- 7 if successful, would improve the life of the patient, but the defective gene/allele would still be passed on to offspring (unless the germline was modified).
 - Patients have died from massive immune responses or died from leukaemia in early trials of gene therapy. It could be argued that it is unethical to continue conducting gene therapy trials on humans due to this risk.
 - Some people might also argue that altering genes goes against nature or god.
 - It might save lives but we don't know the long term outcomes.

Lesson 18: B7.18 – Cloning (Triple)

Connection

- Q1. Why are some people against genetic modification?
- Q2. What is the antibiotic marker Kanamycin used for in genetic medication? Why is this a problem?
- Q3. List 3x concerns regarding GMO products

Activation

LI: Describe the process for cloning plants and animals

<https://www.youtube.com/watch?v=QekStThHD2M>

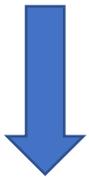
<https://www.youtube.com/watch?v=hNq-y2Kg5CE>

1. Make a note of the title and the LI
2. Read pages 308-309
3. List key words – define those you don't know
4. Draw and label fig 7.51 and 7.52



Consolidation

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Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Demonstration

Attempt questions 1-6

In 10 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



Answers: B7.18 – Cloning (Triple)

Connection

1 religious teachings suggest that it is wrong to change organisms that exist as God has created them

2 GM plants are sterile and seeds for each seasons crop must be purchased from the supplier - Expensive for farmers in poor areas. Unclear labelling - GM products must be labelled so that consumers can make an informed choice.

3 Using a virus to integrate a normal huma gene into an individuals cells – issues with immune response/cancer - leukaemia

Demonstration

1 tissue culture.

2 (taking) cuttings.

3 so that animals identical genetically to those having desirable characteristics, e.g. producing high milk yields or quality beef, can be produced.

4 a developing embryo is removed from a pregnant female early in pregnancy; the unspecialised cells are separated, grown in culture, then transplanted into a host mother.

5 the nucleus is removed from a body cell and inserted into an egg cell that has had its nucleus removed; the egg cell is stimulated to divide; the embryo, once it has divided to produce a ball of cells, is transplanted into the animal.

6 the embryo is implanted into a ‘mother’ in adult cell cloning.

Connection: B7.19 – Tree of life

Connection – questions (Triple only)

Q1. 2 processes used to make a new plant

Q2. How does embryo transplant produce clones?

Q3. List 6x steps to adult cloning?

Connection: B7.19 – Tree of life

Connection – answers Triple only

A1 tissue culture – to select for genetically modified plants and taking cuttings from a parent
– to expand the number of identical plants

A2 an IVF embryo is split up into sections and transplanted back into multiple surrogate mothers who all produce genetically identical offspring

A3 egg cell & remove nucleus/ insert nucleus from adult skin cell (46) chromosomes/ electric shock/ embryo develops/ implant into surrogate mother/ clone has identical DNA to the donor of the skin cell

Lesson 19: B7.19 – Tree of Life

Connection

- Q1. Why are some people against genetic modification?
- Q2. What is the antibiotic marker Kanamycin used for in genetic medication? Why is this a problem?
- Q3. List 3x concerns regarding GMO products

Activation

LI: Explain how living things have been classified into groups

<https://www.youtube.com/watch?v=HLnaIJm5wM4>

1. Make a note of the title and the LI
2. Read pages 310-311
3. List key words – define those you don't know
4. Draw and label fig 7.53

Consolidation

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Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Demonstration

Attempt questions 1-6

In 10 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

- Green questions to GCSE Level 3
- Blue questions to GCSE Level 6
- Purple questions to GCSE Level 9

Answers: B7.19 – Tree of life

Connection

1 religious teachings suggest that it is wrong to change organisms that exist as God has created them

2 Used as a marker. Not an issue as Kanamycin not used in medicine these days

3 Using a virus to integrate a normal human gene into an individuals cells – issues with immune response/cancer - leukaemia

Demonstration

1 Carl Linnaeus.

2 binomial system.

3 microscopical examination has improved our understanding of the physical characteristics, and therefore relationships of organisms; understanding of the biochemistry and biochemical processes of an organism has helped us to understand relationships.

4 Archaea. Bacteria, Eukaryota (see pages 10-11).

5 comparing the base sequences of DNA/structures of other chemicals, e.g. proteins, from organisms.

6
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Lesson 20: B7.20 – Extinction or survival

Connection

Q1. Name Linnaeus's groups of classification starting from kingdom.

Q2. What 2 developments have helped improve the current version of the evolutionary tree

Q3. How does DNA contribute to a more final version of the tree of life?

Activation

LI: Explain how living things have been classified into groups

<https://www.youtube.com/watch?v=jphrpR9ffKA>

<https://www.youtube.com/watch?v=nW9k5nH83MM>

1. Make a note of the title and the LI
2. Read pages 312-313
3. List key words – define those you don't know

Consolidation

Complete and self assess the relevant past paper question for this topic -
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Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Demonstration

Attempt questions 1-7

In 10 mins answer as many questions as you can.

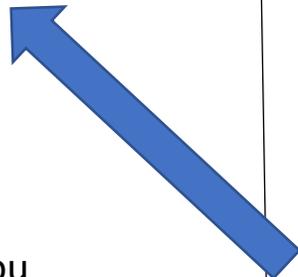
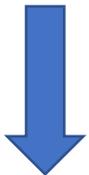
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



Answers: B7.20 – Extinction or survival

Connection

1 kingdom/ phylum/ class/ order/
family/ genus/ species

2 improved microscopes allow the
physical characteristics to be better
described/ understanding of
biochemical processes and DNA

3 Sequences of DNA are compared by
computers which show where
organisms have similarity. An equation
determines how similar the DNA
sequences are.

Demonstration

1 Carl Linnaeus.

2 binomial system.

3 microscopical examination has improved our understanding of the physical characteristics, and therefore relationships of organisms; understanding of the biochemistry and biochemical processes of an organism has helped us to understand relationships.

4 Archaea. Bacteria, Eukaryota (see pages 10-11).

5 comparing the base sequences of DNA/structures of other chemicals, e.g. proteins, from organisms.

6 1 and 3: distance value =
$$\frac{\text{number of changes}}{\text{length}} = \frac{4}{20} = 0.2$$

2 and 4: distance value =
$$\frac{\text{number of changes}}{\text{length}} = \frac{4}{20} = 0.2$$

1 and 4: distance value =
$$\frac{\text{number of changes}}{\text{length}} = \frac{3}{20} = 0.15$$