PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



EXAM QUESTION PACK

TOPIC 4: NATURAL SELECTION AND GENETIC MODIFICATION (PACK 3)

SCORE	PERCENTAGE
/58	%

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Q1.

Yeast cells can be genetically modified to produce a painkiller.

This painkiller is usually obtained from opium poppies.

One method for genetically modifying a yeast cell uses a plasmid containing the desired gene.

(i) Explain how a gene can be inserted into a plasmid.

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(ii) Discuss the possible benefits and risks of producing painkillers from genetically modified yeast cells rather than extracting the painkillers from poppies.

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(Total for question = 5 marks)

Q2.

* MRSA is a bacterium that has evolved to become resistant to antibiotics.

With reference to Darwin's theory of evolution by natural selection, explain how MRSA bacteria have evolved to become resistant to antibiotics.

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(Total for question = 6 marks)

Q3.

Figure 5 shows a great tit on a bird feeder.



© taviphoto/Shutterstock

Figure 5

Scientists have found that great tits living now have longer beaks than great tits living 50 years ago.

Genetic analysis shows changes in the sequence of the bird's DNA.

Scientists think that great tits living now have longer beaks because of the increased use of bird feeders during the last 50 years.

Explain how natural selection could have caused an increase in beak length because of the use of bird feeders.

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(Total for question = 4 marks)

Q4.

Scientists think that great tits living now have longer beaks because of the increased use of bird feeders during the last 50 years.

Explain how natural selection could have caused an increase in beak length because of the use of bird feeders.

(4)

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(Total for question = 4 marks)

Q5.

Figure 8 shows a plasmid containing the human insulin gene.

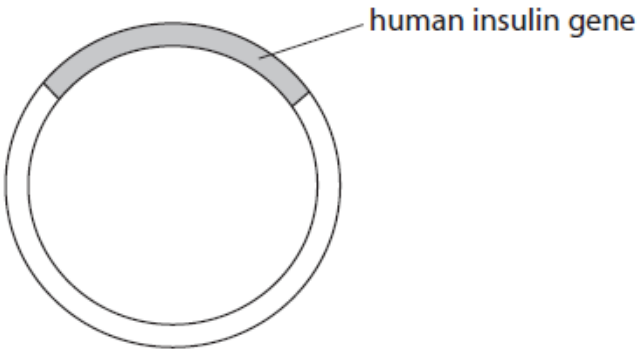


Figure 8

Explain how the human insulin gene can be inserted into a plasmid.

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(Total for question = 3 marks)

Q6.

Figure 3 shows a plasmid containing the human insulin gene.

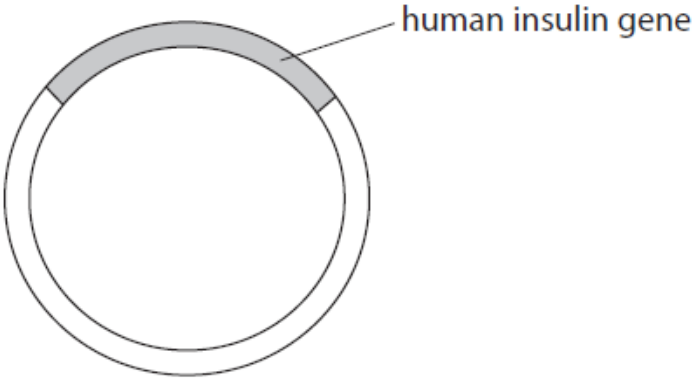


Figure 3

Explain how the human insulin gene can be inserted into a plasmid.

(3)

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(Total for question = 3 marks)

Q7.

Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

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(Total for question = 4 marks)

Q8.

Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

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(Total for question = 4 marks)

Q9.

Chymosin can be produced by genetically modified bacteria.

Figure 12 shows a bacterial cell.

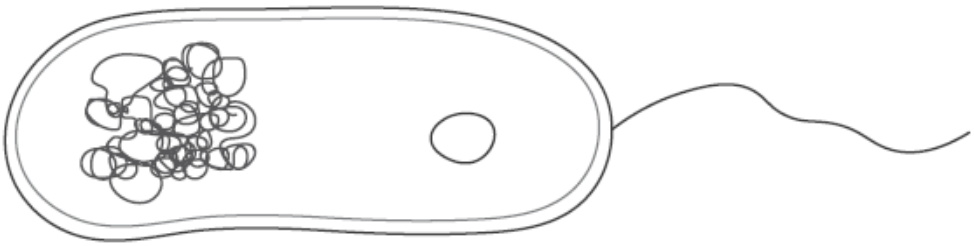


Figure 12

Explain how to genetically modify a bacterial cell to produce chymosin.

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(Total for question = 3 marks)

Q10.

Chymosin can be produced by genetically modified bacteria.

Figure 8 shows a bacterial cell.

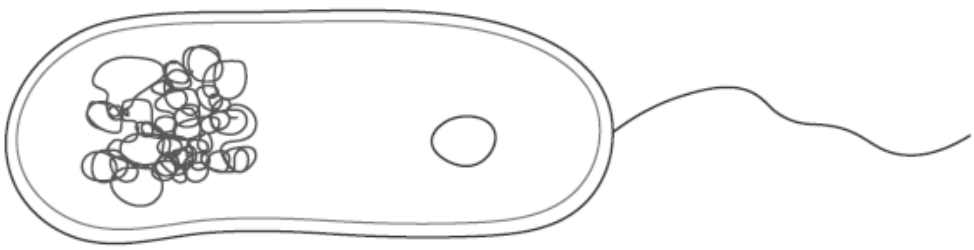


Figure 8

Explain how to genetically modify a bacterial cell to produce chymosin.

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(Total for question = 3 marks)

Q11.

Alfred Russel Wallace travelled around Malaysia during the 1800s and wrote to Charles Darwin about the animal species he studied.

His main conclusions were very similar to those of Charles Darwin and they both contributed to the current understanding of evolution.

Wallace and Darwin did not always agree.

Darwin believed that male birds have feathers that are brightly coloured to make them more attractive to female birds.

Wallace thought that female birds have feathers that are less brightly coloured so they are more likely to survive.

(i) Explain why having feathers that are less brightly coloured increases the survival rate of females.

(2)

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(ii) Suggest why it is more important for the survival of the species that the survival rate is higher in female birds than in male birds.

(2)

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(Total for question = 4 marks)

Q12.

Corn is one of the world's most important crop plants.

Native Americans grew an early form of corn called teosinte.
Modern corn has been developed by selective breeding of teosinte plants.

Explain why restriction enzymes are used in the process of genetic engineering.

(2)

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(Total for question = 2 marks)

Q13.

The dodo was a flightless bird which is now extinct.

The photograph shows the skeleton of a dodo.



The dodo lived on the small island of Mauritius. It became extinct in 1681.

Using your knowledge of natural selection, suggest why the dodo may have become extinct.

(3)

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Q14.

The dodo was a flightless bird which is now extinct.

The photograph shows the skeleton of a dodo.



The dodo lived on the small island of Mauritius. It became extinct in 1681.

Using your knowledge of natural selection, suggest why the dodo may have become extinct.

(3)

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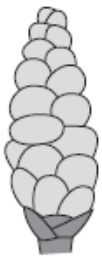
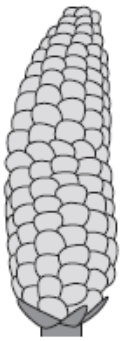
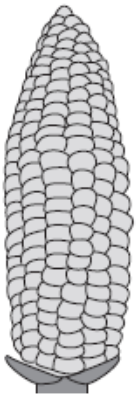
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Q15.

The diagram shows the development of maize cobs over the last 1000 years of cultivation.

maize cobs				
mean mass of cob /g	15	45	70	90
date	1000 years ago →			Present

Describe how scientists can use plant breeding programmes to produce maize plants with larger

cobs.

(3)

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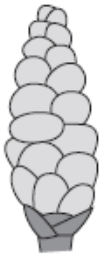
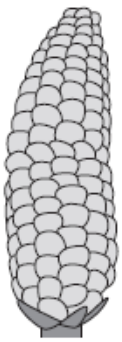
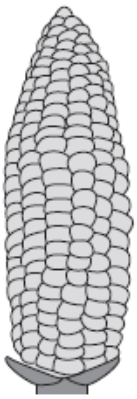
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Q16.

The diagram shows the development of maize cobs over the last 1000 years of cultivation.

maize cobs				
mean mass of cob /g	15	45	70	90
date	1000 years ago →			Present

Describe how scientists can use plant breeding programmes to produce maize plants with larger cobs.

(3)

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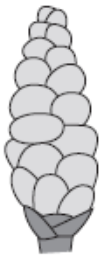
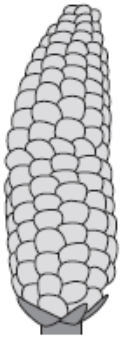
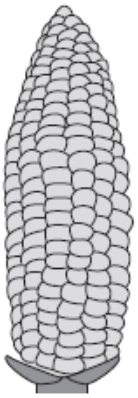
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Q17.

The diagram shows the development of maize cobs over the last 1000 years of cultivation.

maize cobs				
mean mass of cob /g	15	45	70	90
date	1000 years ago →			Present

There has been an increase in the use of pesticides during the last 1000 years.

Explain how the use of pesticides may benefit maize production.

(2)

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Q18.

In 2005, a scientist claimed to have found red blood cells in the fossilised bones of a *Tyrannosaurus rex* that lived 68 million years ago.



© history.com

Explain why fossils of dinosaurs are often incomplete.

(3)

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Q19.

Fossils can provide evidence for evolution.

Explain why the fossil record is incomplete.

(2)

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Q20.

Genetic engineering can be used to produce plants that are resistant to herbicide.

One herbicide works by preventing the activity of an enzyme.

Some bacteria have a form of this enzyme that is not affected by the herbicide.

Suggest how genetic engineering can be used to produce plants resistant to this herbicide.

(3)

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Q21.

In 2011, South Korean scientists genetically engineered a cell from a beagle.

They then cloned this cell to create a beagle.

They called this beagle Tegon.

Tegon glows in the dark when UV light is shone on him.



© Dentistry Today

Cloning involves cells that divide by mitosis.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

When a cell divides by mitosis it produces

(1)

☒ **A** two cells that are genetically different

☒ **B** two cells that are genetically identical

☒ **C** four cells that are genetically different

☒ **D** four cells that are genetically identical

(b) To genetically engineer the original cell so that it would glow, the scientists had to obtain a suitable gene.

(i) Describe the stages that a scientist would complete to obtain this gene.

(2)

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*(ii) Describe the stages used in the laboratory to clone and produce Tegon from the genetically engineered cell.

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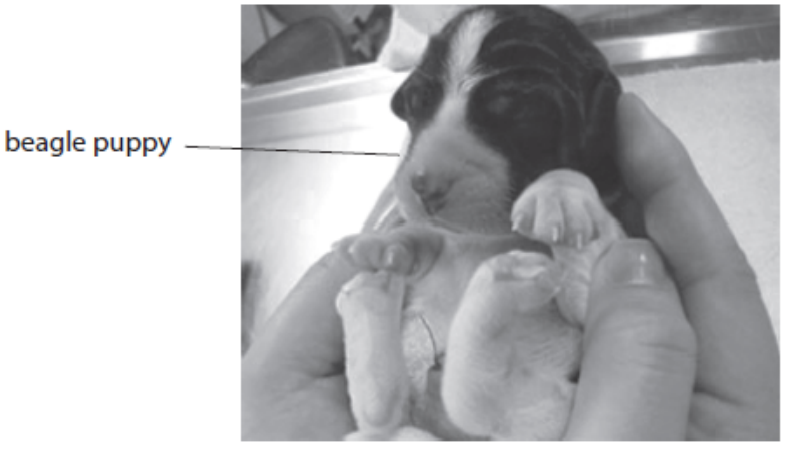
Q22.

In 2011, South Korean scientists genetically engineered a cell from a beagle.

They then cloned this cell to create a beagle.

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© Dentistry Today

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(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

When a cell divides by mitosis it produces

(1)

☒ **A** two cells that are genetically different

☒ **B** two cells that are genetically identical

☒ **C** four cells that are genetically different

☒ **D** four cells that are genetically identical

(b) To genetically engineer the original cell so that it would glow, the scientists had to obtain a suitable gene.

(i) Describe the stages that a scientist would complete to obtain this gene.

(2)

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*(ii) Describe the stages used in the laboratory to clone and produce Tegon from the genetically engineered cell.

(6)

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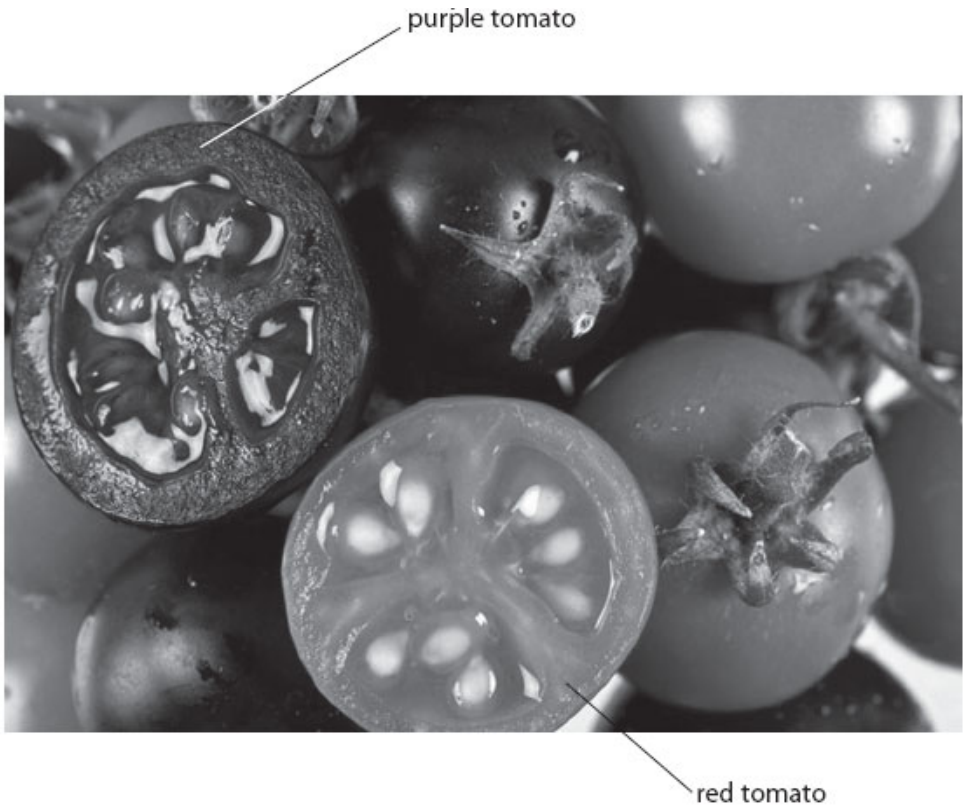
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Q23.

(a) Purple tomatoes are transgenic plants that have been produced by genetic engineering.



(i) As a result of genetic modification, these tomatoes produce a new substance which has health benefits and turns the tomatoes purple.

Name this substance.

(1)

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(ii) What is inserted into the DNA of another plant to make it transgenic?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** a gene from another species

☒ **B** a gene from the same species

☒ **C** chromosomes from the same species

☒ **D** proteins from another species

*(b) Describe how *Agrobacterium tumefaciens* can be used to create transgenic plants.

(6)

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(c) *Bacillus thuringiensis* contains a gene that codes for a toxin.

Explain **one** advantage and **one** disadvantage of introducing this gene into crop plants.

(4)

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(Total for Question = 12 marks)

Q24.

Corn is one of the world's most important crop plants.

Native Americans grew an early form of corn called teosinte.
Modern corn has been developed by selective breeding of teosinte plants.

Figure 3 shows some stages in the development of modern corn.

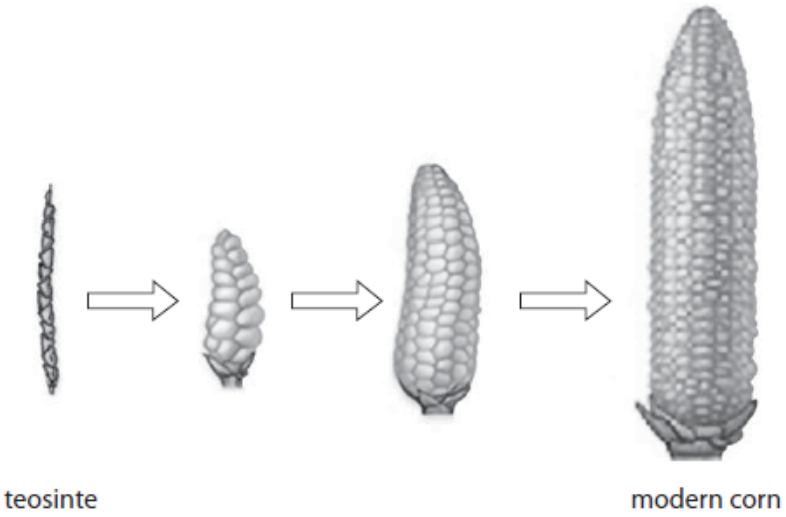


Figure 3

Give reasons why native Americans selectively bred teosinte.

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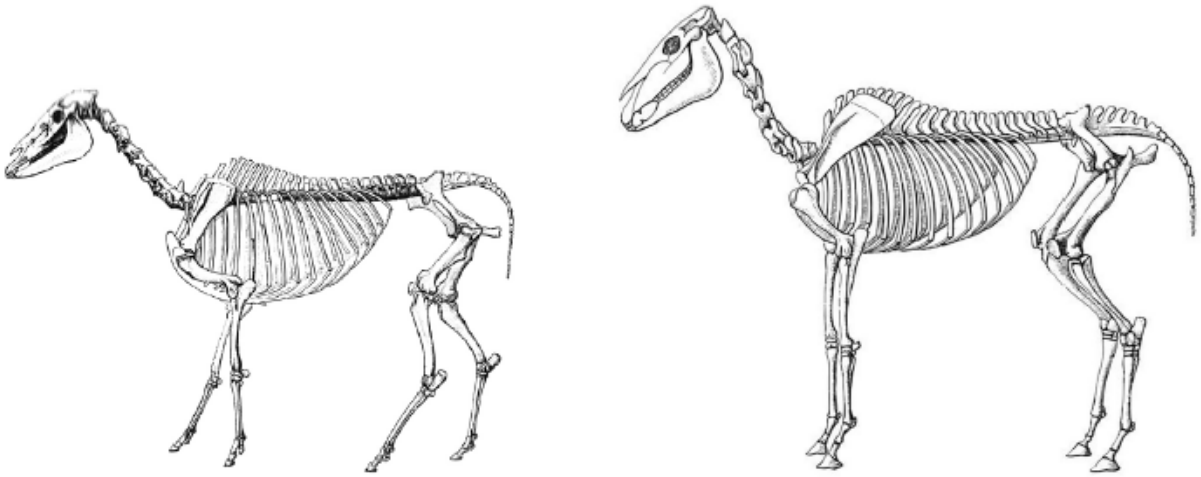
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(Total for question = 2 marks)

Q25.

Hipparion is an extinct genus of horse that lived between approximately 20 million and 0.8 million years ago.

Figure 10 shows the skeletons of a *Hipparion* and a modern horse.



Hipparion modern horse

(Sources: © Morphart Creation/Shutterstock and © Hein Nouwens/Shutterstock)

Figure 10

(i) Give **one** method that can be used to date a fossil of a Hipparion.

(1)

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(ii) Give **one** reason why scientists have concluded that the modern horse has evolved from *Hipparion*.

(1)

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(Total for question = 2 marks)

Q26.

Genetic engineering can be used to produce plants that are resistant to herbicide.

One herbicide works by preventing the activity of an enzyme.

Some bacteria have a form of this enzyme that is not affected by the herbicide.

(a) Suggest how genetic engineering can be used to produce plants resistant to this herbicide.

(3)

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(b) This herbicide is sprayed onto the leaves of plants.

Suggest which vessel could transport the herbicide from the leaf to other parts of the plant.

(1)

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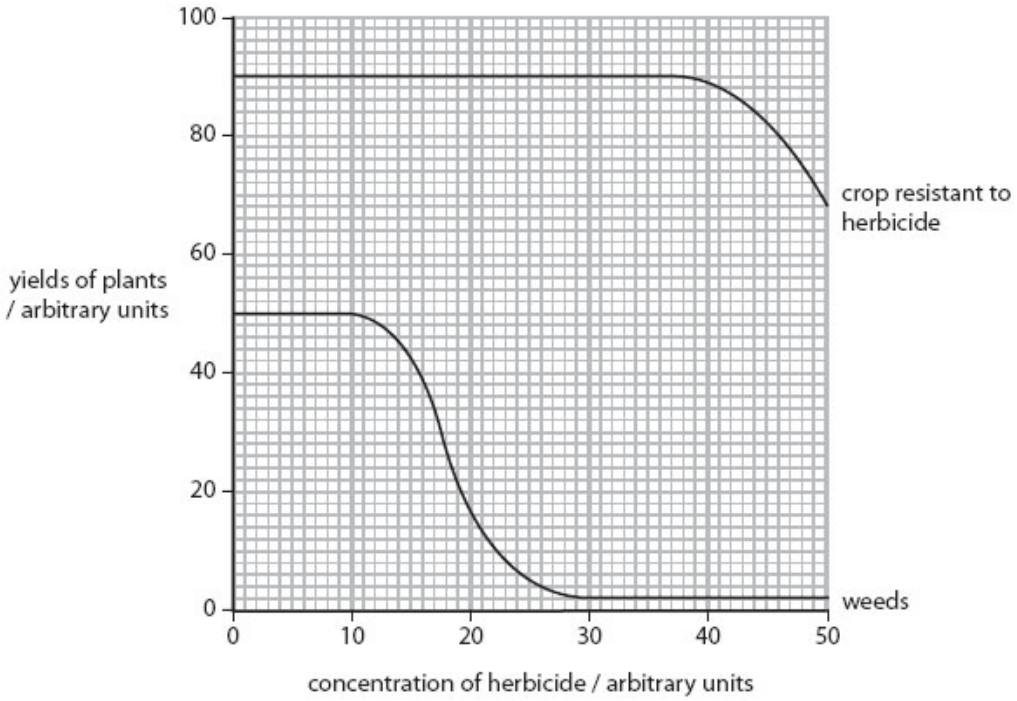
(c) Fields of crops have weeds growing in them.

In an investigation, crops resistant to a herbicide were grown in different fields.

The crops were sprayed with different concentrations of the herbicide.

The mass of the crops and weeds were recorded.

The graph shows the results of this investigation.



(i) Describe the effects of the herbicide on the yield of weeds.

(2)

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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The most appropriate concentration of herbicide to use is

(1)

☒ **A** 10 arbitrary units

☒ **B** 30 arbitrary units

☒ **C** 40 arbitrary units

☒ **D** 50 arbitrary units

(d) The table shows the number of species of weeds resistant to this herbicide from 1996 to 2004.

	Year				
	1996	**1998**	**2000**	**2002**	**2004**
Number of species of weeds resistant to this herbicide	1	2	3	5	8

(i) Describe the trend shown in the data.

(1)

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(ii) Suggest reasons for this trend.

(2)

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(Total for Question is 10 marks)

Q27.

Genetic engineering can be used to produce plants that are resistant to herbicide.

One herbicide works by preventing the activity of an enzyme.

Some bacteria have a form of this enzyme that is not affected by the herbicide.

(a) Suggest how genetic engineering can be used to produce plants resistant to this herbicide.

(3)

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(b) This herbicide is sprayed onto the leaves of plants.

Suggest which vessel could transport the herbicide from the leaf to other parts of the plant.

(1)

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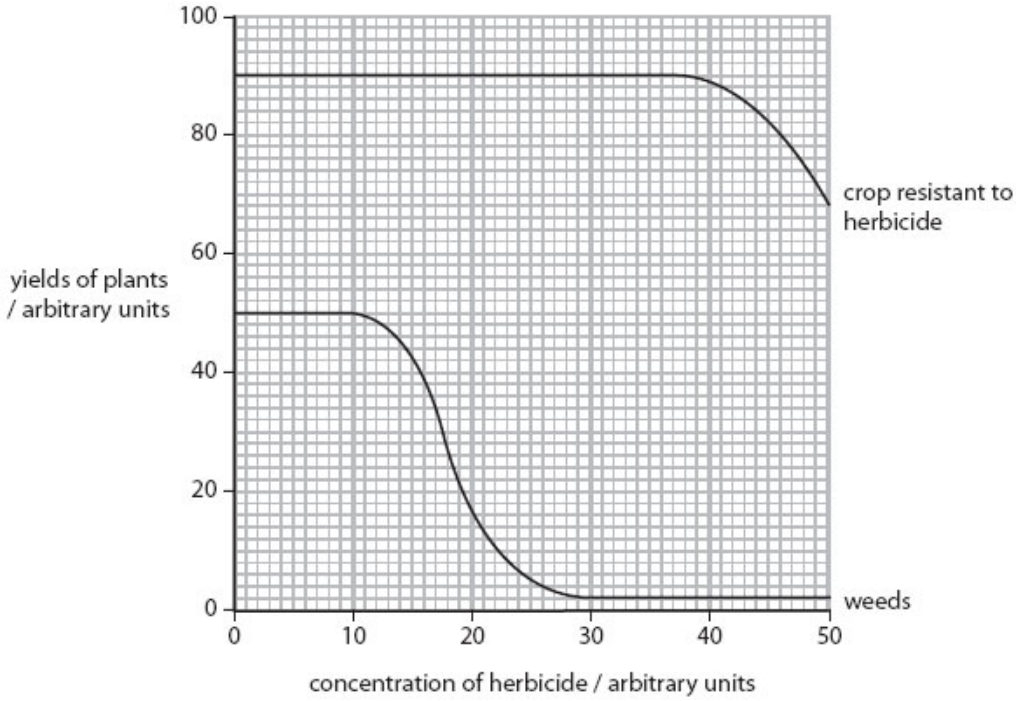
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In an investigation, crops resistant to a herbicide were grown in different fields.

The crops were sprayed with different concentrations of the herbicide.

The mass of the crops and weeds were recorded.

The graph shows the results of this investigation.



(i) Describe the effects of the herbicide on the yield of weeds.

(2)

.....

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.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The most appropriate concentration of herbicide to use is

(1)

☒ **A** 10 arbitrary units

☒ **B** 30 arbitrary units

☒ **C** 40 arbitrary units

☒ **D** 50 arbitrary units

(d) The table shows the number of species of weeds resistant to this herbicide from 1996 to 2004.

	Year				
	1996	**1998**	**2000**	**2002**	**2004**
Number of	1	2	3	5	8

species of weeds resistant to this herbicide					

(i) Describe the trend shown in the data.

(1)

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(ii) Suggest reasons for this trend.

(2)

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(Total for Question is 10 marks)

Q28.

Figure 15 shows a Petri dish containing *E. coli* bacteria. The bacteria have been genetically modified to contain a phosphorescent gene so they glow in the dark.

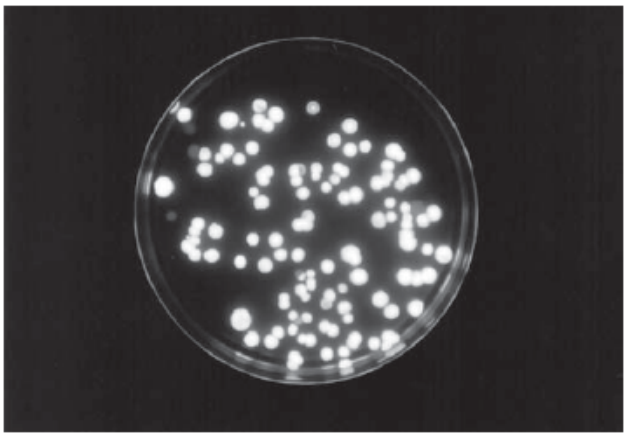


Figure 15

Explain how a bacterial cell can be genetically modified to glow in the dark.

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(Total for question = 4 marks)

Q29.

Corn is one of the world's most important crop plants.

Native Americans grew an early form of corn called teosinte.
Modern corn has been developed by selective breeding of teosinte plants.

Figure 3 shows some stages in the development of modern corn.

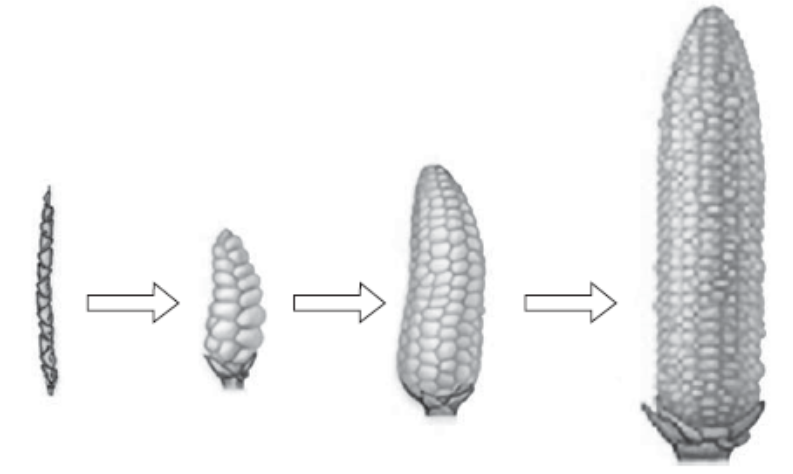


Figure 3

Genetic engineering can also be used to produce a new variety of modern corn.

Describe how the genome of this new variety of corn is different from the genome of corn that has not been genetically engineered.

(2)

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(Total for question = 2 marks)

Q30.

Corn is one of the world's most important crop plants.

Native Americans grew an early form of corn called teosinte.
Modern corn has been developed by selective breeding of teosinte plants.

Figure 3 shows some stages in the development of modern corn.

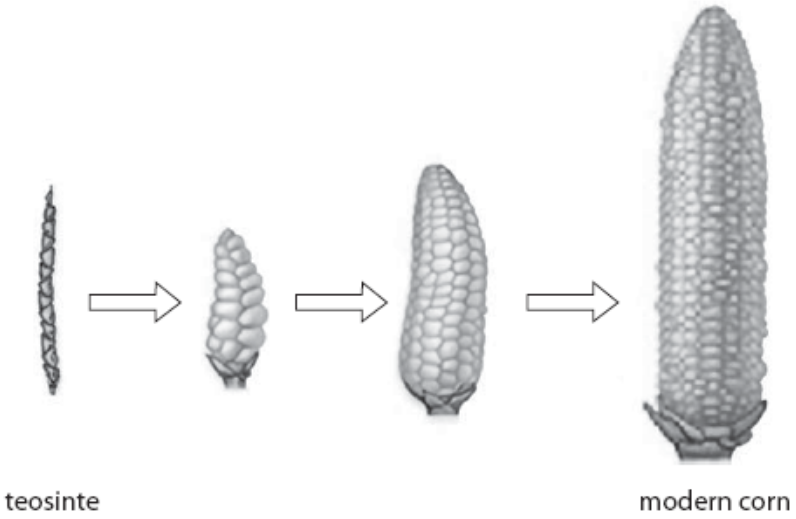


Figure 3

Describe how selective breeding has produced modern corn.

(3)

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(Total for question = 3 marks)