

Selective Breeding and Genetic Engineering 2

Q:1 Scientists have produced many different types of GM (genetically modified) food crops.

(a) Use words from the box to complete the sentence about genetic engineering.

clones	chromosomes	embryos	genes
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GM crops are produced by cutting _____ out of the _____ of one plant and inserting them into the cells of a crop plant.

(2 marks)

(b) Read the information about GM food crops.

- Herbicide-resistant GM crops produce higher yields.
- Scientists are uncertain about how eating GM food affects our health.
- Insect-resistant GM crops reduce the total use of pesticides.
- GM crops might breed naturally with wild plants.
- Seeds for a GM crop can only be bought from one manufacturer.
- The numbers of bees will fall in areas where GM crops are grown.

Use this information to answer these questions.

(b) (i) Give two reasons why some farmers are in favour of growing GM crops.

- 1 _____

- 2 _____

(2 marks)

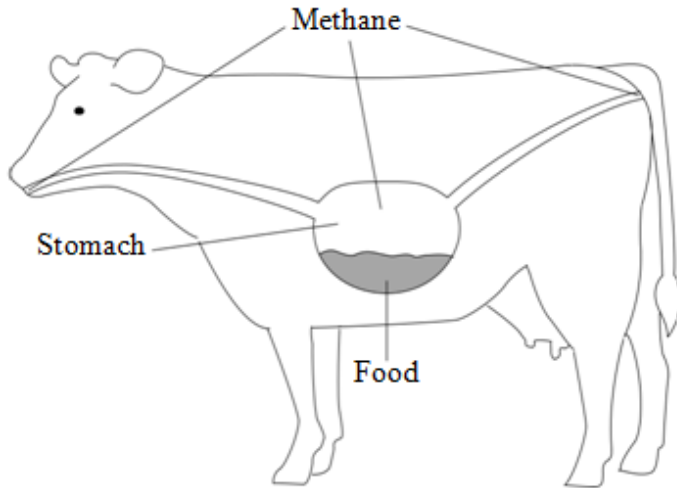
(b) (ii) Give two reasons why many people are against the growing of GM crops.

- 1 _____

2 _____

(2 marks)

Q:2 Scientists are investigating how to reduce methane emissions from cattle. Most of this methane is emitted by the cows belching.



Scientists have found that less methane is belched if the cows eat high-sugar rye grass.

This rye grass has been produced by genetic engineering.

(b)(i) Suggest how the high-sugar rye grass might have been produced by genetic engineering.

(3 marks)

(b)(ii) Some people might object to the growing of genetically-engineered, high-sugar rye grass for feeding cattle.

Give two reasons why.

1 _____

2 _____

(2 marks)

Q:3 Insecticides are chemicals which kill insects.

Insecticides may be sprayed onto crops to increase crop yield.

(a) Killing insects on crops increases crop yield.

Suggest why.

(1 mark)

(b) A microorganism contains a gene which causes the production of an insect poison.

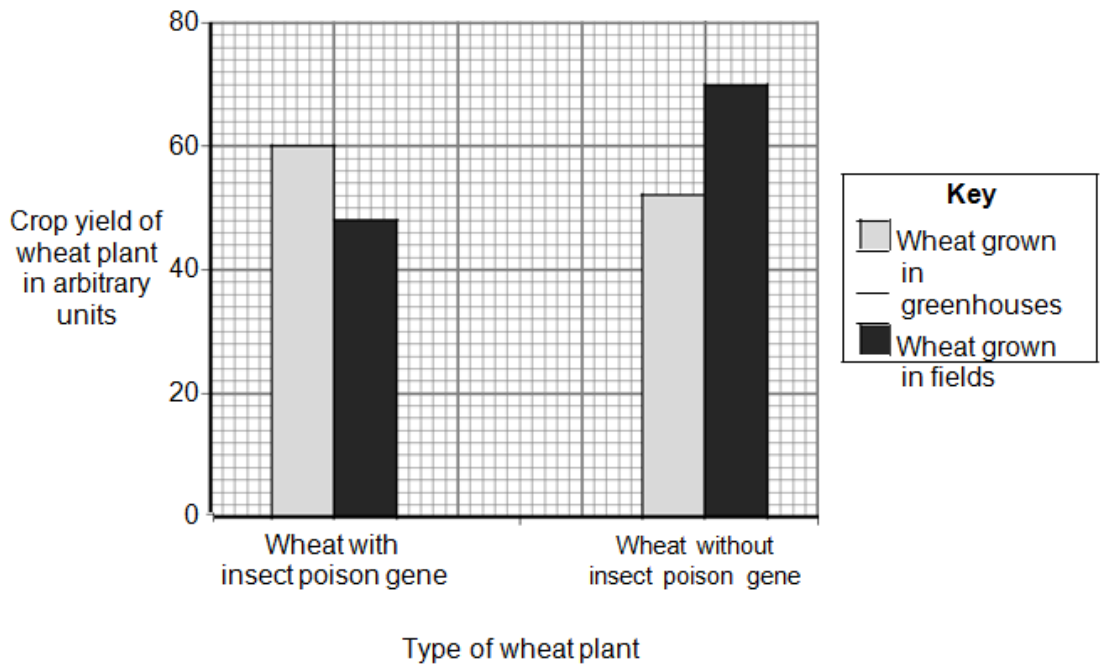
Scientists transferred the gene for production of the insect poison into wheat plants.

This makes genetically modified (GM) wheat.

The scientists:

- grew wheat plants with the insect poison gene in fields and in greenhouses
- grew wheat plants without the insect poison gene in fields and in greenhouses
- measured the crop yield of the wheat plants.

The bar chart shows the results.



(b) (i) What was the yield of the wheat with the insect poison gene grown in greenhouses?

_____ arbitrary units

(1 mark)

(b) (ii) The yield from wheat without the insect poison gene grown in greenhouses was different from the yield you gave in (b)(i).

Describe this difference in yield.

(2 marks)

(b) (iii) Look again at the bar chart.

What advice would you give to a farmer about the type of wheat to grow in fields?

Give a reason for your answer.

(2 marks)

(c) Some people are concerned about the use of GM crops.

Why?

(2 marks)

Q:4 The picture shows a zebra fish.



Zebra fish are small freshwater fish that usually have black and silver stripes.

Zebra fish can tolerate a wide range of environmental conditions.

(a) Scientists have genetically modified zebra fish to act as pollution indicators.

The genetically modified zebra fish have a gene transferred from a jellyfish.

The gene allows the stripes of the zebra fish to change colour.

Describe how the scientists produced the genetically modified zebra fish.

(3 marks)

(b) Some scientists are worried about the production of genetically modified zebra fish.

Suggest reasons why.

(2 marks)

Q:5 Read the information.

Insects can be both useful and harmful to crop plants.

Insects such as bees pollinate the flowers of some crop plants. Pollination is needed for successful sexual reproduction of crop plants.

Some insects eat crops and other insects eat the insects that eat crops.

Corn borers are insects that eat maize plants.

A toxin produced by the bacterium *Bacillus thuringiensis* kills insects.

Scientists grow *Bacillus thuringiensis* in large containers. The toxin is collected from the containers and is sprayed over maize crops to kill corn borers.

A company has developed genetically modified (GM) maize plants. GM maize plants contain a gene from *Bacillus thuringiensis*. This gene changes the GM maize plants so that they produce the toxin.

(a) Describe how scientists can transfer the gene from *Bacillus thuringiensis* to maize plants.

[3 marks]

(b) Would you advise farmers to grow GM maize plants?

Justify your answer by giving advantages and disadvantages of growing GM maize plants.

Use the information from the box and your own knowledge to help you.
