All questions are for both separate science and combined science students

1 Plants can be genetically modified (GM) to make them resistant to pests.

Describe an investigation that could be carried out to find out if GM plants produce a better yield than normal plants.

Your answer should include experimental details and be written in full sentences.

(6)

(Total for Question = 6 marks)

2 Human insulin can be made by genetically modified bacteria.

(a) (i) Name the small circle of DNA that is genetically modified in bacteria.

(1)

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(ii) Name two enzymes that are used to genetically modify the DNA of the bacteria.

(2)

1 .....

2 .....

(b) To produce large amounts of human insulin the genetically modified bacteria are grown in a fermenter.

Describe an investigation to find out if temperature affects the amount of insulin made by genetically modified bacteria.

Your answer should include experimental details and be written in full sentences and paragraphs.

(6)

(Total for Question = 9 marks)

3 Describe the stages by which a bacterium can be genetically modified to produce large amounts of a named human protein.

(5)

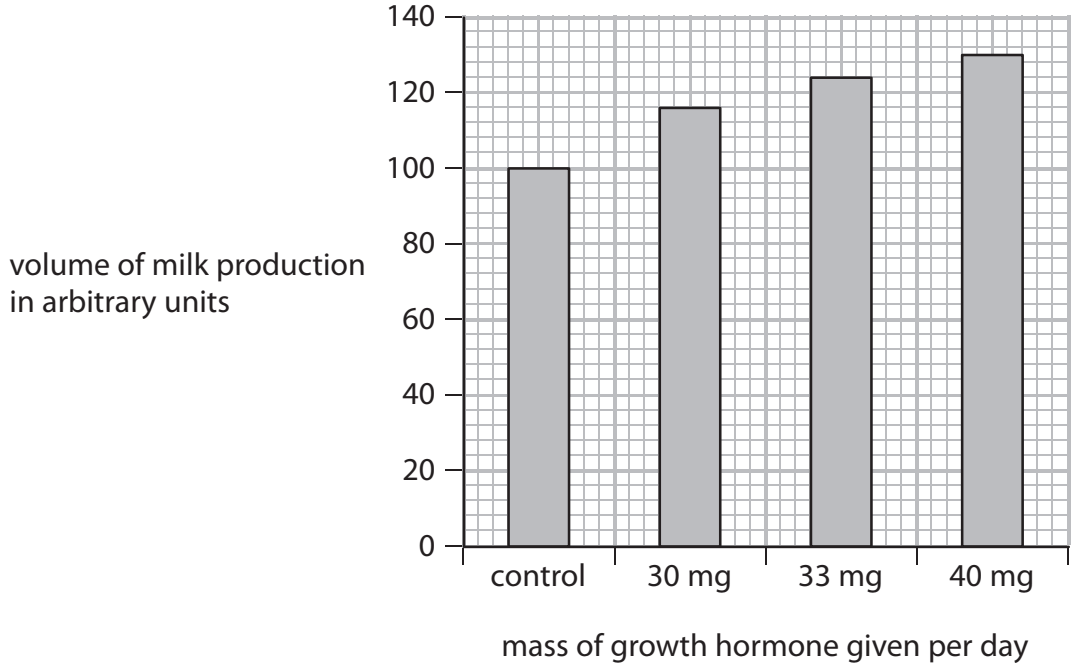
(Total for Question = 5 marks)

4 An investigation was carried out to find out the effect of a growth hormone on milk production.

Groups of cows were given different masses of a growth hormone.

The volume of milk the cows produced was then measured.

The graph shows the results.



(a) (i) How much growth hormone should have been given to the control group?

(1)

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(ii) Describe the effect of growth hormone on milk production.

(1)

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(b) Farmers want to make reliable comparisons about the effect of different doses of growth hormone.

(i) What was done in this investigation to make the results reliable?

(1)

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(ii) Many variables that affect milk production need to be kept the same for each group of cows. This allows a valid comparison to be made between each group.

Give two variables that need to be kept the same.

(2)

1 .....

2 .....

(c) Growth hormone is a protein.

It might be present in the milk produced by the cows and then be consumed by humans.

Some people are worried that this may harm humans.

Other people say that this is not a problem for two reasons.

Firstly, the milk is pasteurised (heated to high temperatures).

Secondly, the growth hormone is destroyed in the human stomach.

(i) Suggest what happens to the growth hormone when milk is pasteurised.

(1)

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(ii) Describe how the growth hormone could be destroyed in the stomach.

(3)

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(d) The growth hormone used in this investigation was obtained from genetically modified bacteria.

Describe how bacteria can be genetically modified and used to produce growth hormone.

(4)

(Total for Question = 13 marks)