21. Biotechnology and genetic modification

21.3 Genetic modification

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

1 **(d)** The box on the left contains the beginning of a sentence.

The boxes on the right show some sentence endings.

Draw **two** lines to make two correct sentences.

	can only be done in plants.
	changes the genetic material of an organism.
Genetic modification	inserts, changes or removes genes.
	involves sexual reproduction.
	is used in active transport.

[2]

2 **(a)** **(i)** Define the term genetic engineering.

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.....

.....

.....

..... [2]

(ii) State **one** example of genetic engineering.

.....

.....

..... [1]

3 Complete the sentences about genetic engineering.

Use words from the list.

Each word may be used once, more than once, or not at all.

adding **bacteria** **crops** **family** **insects**

minerals **organism** **removing** **viruses**

vitamin **weeds**

In genetic engineering the genetic material of an ..... is changed by ..... , changing or inserting individual genes.

An example of this is inserting a human gene into ..... so that they produce human insulin.

Crop plants have genes inserted into them to make them resistant to herbicides.

Herbicides kill ..... .

Crop plants can also be genetically engineered by inserting a gene so that they produce a ..... which is a nutrient needed by humans in very small amounts.

[5]

Paper 4

Questions are applicable for extended candidates only

4 **(e)** Fig. 3.2 shows a field of cassava, *Manihot esculenta*, which is a crop plant grown in parts of Africa and Asia. **(extended only)**

Fig. 3.2

The plants store starch in their roots, which form a large part of the diet for many people. Cassava does not provide many vitamins or mineral ions.

Genetic engineers have modified cassava to increase its iron content. They have done this by incorporating a gene for a membrane protein from the plant *Arabidopsis thaliana*.

(i) State the name of the enzyme that is used to cut out the gene from the DNA of *A. thaliana*. **(extended only)**

..... [1]

(ii) Describe how the gene from *A. thaliana* and the DNA from cassava form recombinant DNA. **(extended only)**

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..... [2]

5 **(d)** A gene is responsible for the production of lycopene in fruits. Geneticists have recently produced genetically modified pink pineapples using the gene associated with the production of lycopene.

(i) Genes are found at specific locations on an important biological molecule.

State the name of this biological molecule. **(extended only)**

..... [1]

(ii) Describe the disadvantages of genetically modifying crops. **(extended only)**

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..... [2]

6 **(c)** Some people are concerned that genetically modified plants might cross-pollinate with wild varieties of plants.

(i) Suggest how farmers could prevent cross-pollination between genetically modified plants and wild varieties of plants. **(extended only)**

.....

.....

..... [1]

(ii) State **two** advantages of genetically modified crops. **(extended only)**

1 .....

2 .....

[2]

7 TPAs can be produced by genetically-engineered bacteria. **(extended only)**

Fig. 5.1 shows some of the stages involved in genetically engineering a bacterium to make a TPA.

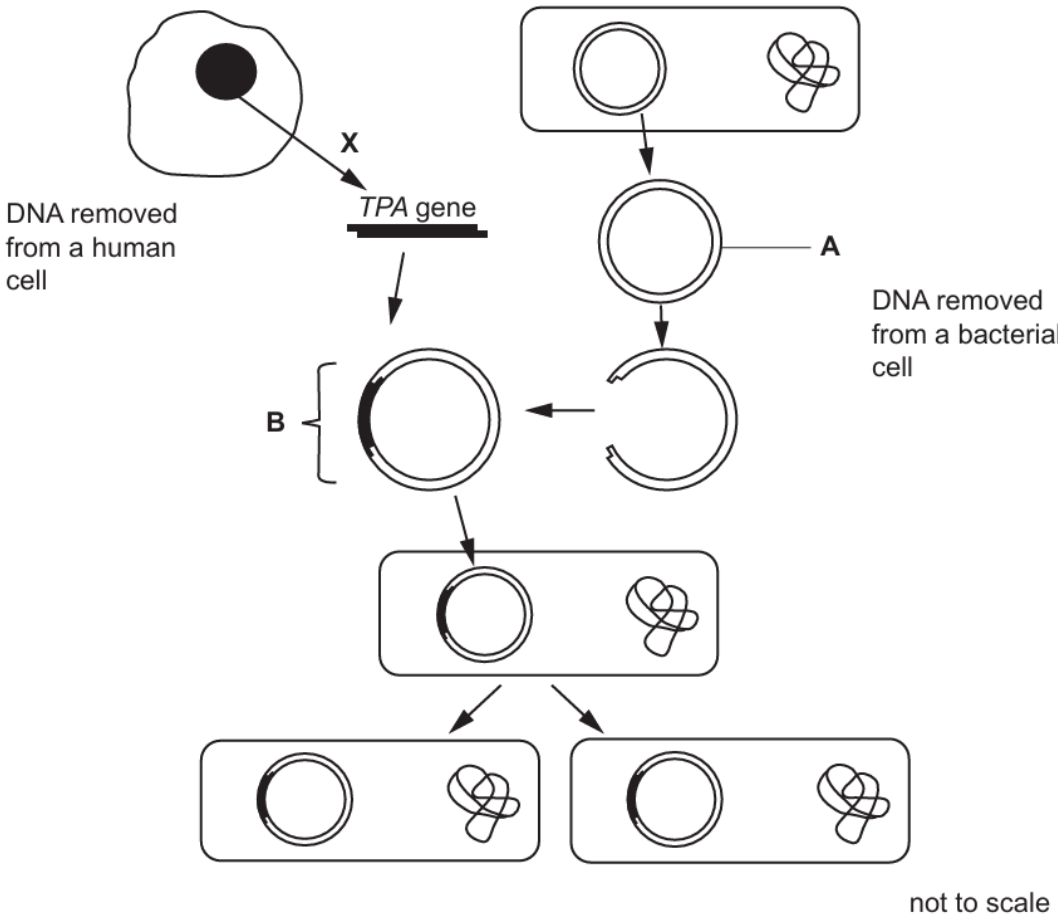

Fig. 5.1

(b) (i) State the name of structure **A** in Fig. 5.1.

..... [1]

(ii) In the flow chart, **X** represents the action of an enzyme on a molecule of DNA.

State the name of this enzyme.

..... [1]

(iii) The *TPA* gene is inserted into structure **A**.

Explain how the gene is inserted into structure **A** to form structure **B** as shown in Fig. 5.1.

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.....

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..... [3]

(iv) Before TPA was made by genetically-engineered bacteria it was only available from blood donated by people.

Suggest **one** advantage of producing TPA by genetically-engineered bacteria.

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..... [1]

8 **(e)** Crop plants can also be genetically modified.

Describe the advantages of genetically modifying crops. **(extended only)**

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..... [4]