21. Biotechnology and genetic modification

21.3 Genetic modification

Paper 1 and 2

Question Paper

Paper 1

Questions are applicable for both core and extended candidates unless indicated in the question

1 A gene is added to the genetic material of an avocado plant.

This gene makes the avocado fruits stay ripe for longer before they start to decompose.

What is this process an example of?

1 adaptation
2 genetic modification
3 selective breeding

A 1, 2 and 3 **B** 1 and 3 only **C** 2 only **D** 3 only

2 Which statement about genetic modification is correct?

A It involves choosing which individual organisms are used for breeding.
B It is always done using genes from the same species.
C It produces a new combination of genes.
D It produces exact copies of individual organisms.

3 Which process makes use of a genetically engineered organism?

A using bacteria to produce insulin
B using enzymes in biological washing powders
C using pectinase in fruit juice production
D using yeast to produce ethanol

4 A crop plant has been genetically modified to make it resistant to herbicides.

Which is a possible disadvantage of introducing this new crop plant? **(extended only)**

A Loss of weeds reduces competition.

B Some weeds might become resistant to the herbicide.

C The crop plant is unharmed and produces a higher yield.

D The new gene will appear in new generations of the crop.

5 Which process makes use of a genetically engineered organism?

A using bacteria to produce insulin

B using enzymes in biological washing powders

C using pectinase in fruit juice production

D using yeast to produce ethanol

6 What is an example of genetic engineering?

A inserting genes into bacteria

B inserting insulin into bacteria

C spraying plants with herbicides

D using biological washing powders

7 What is a description of genetic engineering?

A cross breeding individuals with different important characteristics

B cross breeding individuals with recessive alleles

C inserting a gene from one organism into another

D selecting random mutations to produce new varieties

8 What is an example of genetic engineering?

A using enzymes to make washing powders

B using pectinase to make fruit juice

C producing plants that have been given genes for resistance to insect pests

D using yeast to make bread

Paper 2

Questions are applicable for both core and extended candidates unless indicated in the question

9 Which types of organisms are used in genetic modification because they have plasmids?

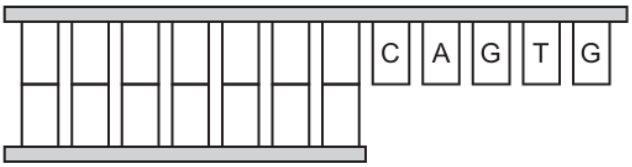
A arachnids

B bacteria

C myriapods

D ferns

10 The diagram shows the sticky end of the DNA of a plasmid that has been cut by a restriction enzyme. The unpaired bases are labelled.



What is the correct sequence of the missing bases? **(extended only)**

A CAGTG **B** GTGAC **C** GTCAC **D** CACTG

11 What is an example of the use of genetic modification in agriculture?

A choosing cattle to breed so that alleles for high milk yield will be passed on to their offspring

B increasing food production by using insecticides to improve quality and yield

C inserting genes into crop plants to improve the nutritional qualities of the plant

D selecting crop plants with desirable characteristics and crossing these to produce the next generation

12 Bacteria can be genetically modified to produce a human protein.

What is the first step in this process? **(extended only)**

A insertion of human DNA into bacterial plasmid DNA

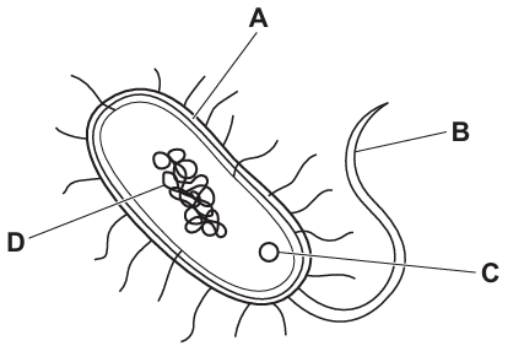
B insertion of recombinant plasmids into bacteria

C isolation of the DNA making up the human gene

D expression of the human gene in bacteria

13 The diagram shows a bacterial cell that is used in genetic modification.

Which labelled structure makes the bacterium useful for genetic modification?



14 The stages describe how genetic modification can be used to produce human insulin from bacteria.

1 Cut bacterial plasmid DNA with restriction enzymes.

2 Extract the gene for insulin from human DNA with restriction enzymes.

3 Insert the recombinant plasmids into bacteria.

4 Join human DNA to bacterial plasmid DNA using DNA ligase.

5 Replicate bacteria containing recombinant plasmids.

Which sequence will lead to the production of human insulin by bacteria? **(extended only)**

A 2 → 1 → 4 → 3 → 5

B 2 → 5 → 1 → 3 → 4

C 4 → 2 → 3 → 1 → 5

D 4 → 3 → 5 → 1 → 2

15 Some ways in which humans make use of organisms are listed.

1 using yeast to produce ethanol

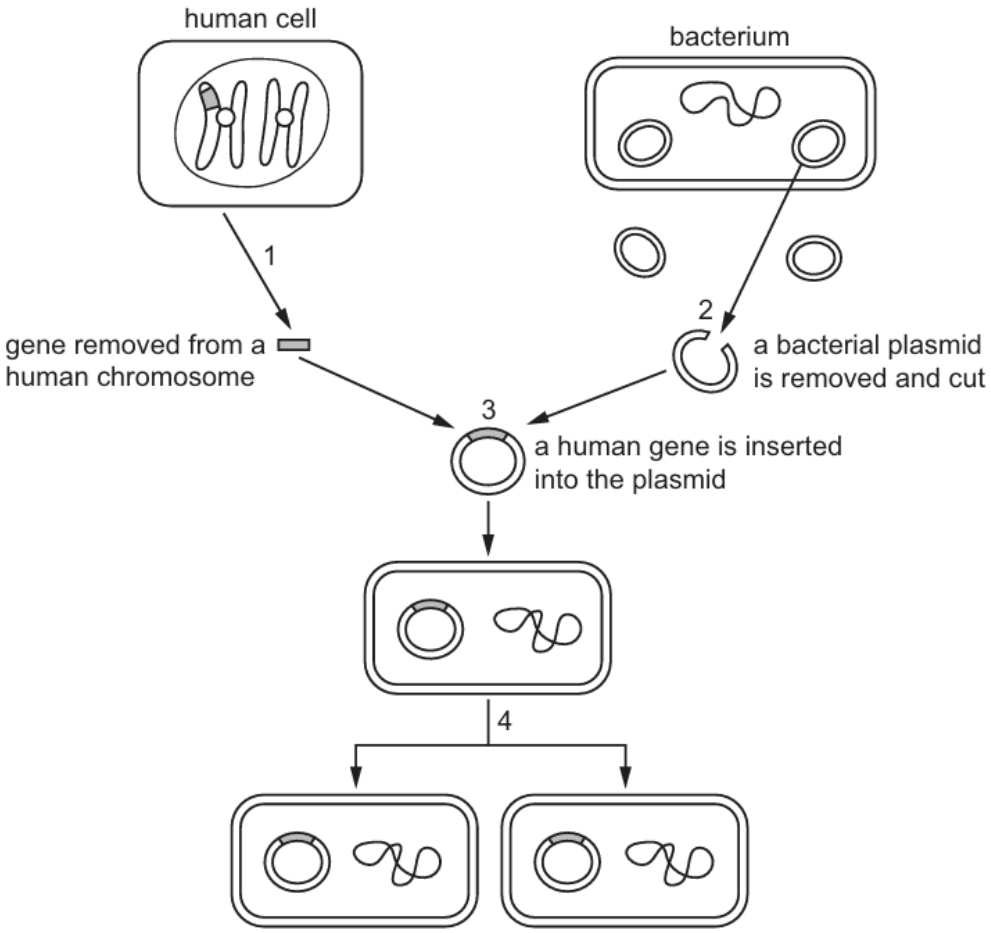
2 artificial selection of sheep with thick wool

3 using bacteria to produce human substances

What are examples of genetic modification?

A 1 and 3 **B** 1 only **C** 2 and 3 **D** 3 only

16 The diagram shows how a human gene can be inserted into a bacterium. **(extended only)**

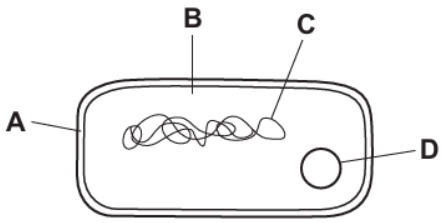


Which row shows the correct processes at 1, 2, 3 and 4? **(extended only)**

	using restriction enzymes	using ligase enzymes	multiplication of bacteria
A	1	2	3
B	1 and 2	3	4
C	1 and 3	2	4
D	4	1 and 2	3

17 The diagram shows a bacterial cell.

Which part is useful in genetic modification?



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19 Bacteria can be genetically engineered to produce human protein.

What happens during this process? **(extended only)**

A The human plasmids are isolated using restriction enzymes.

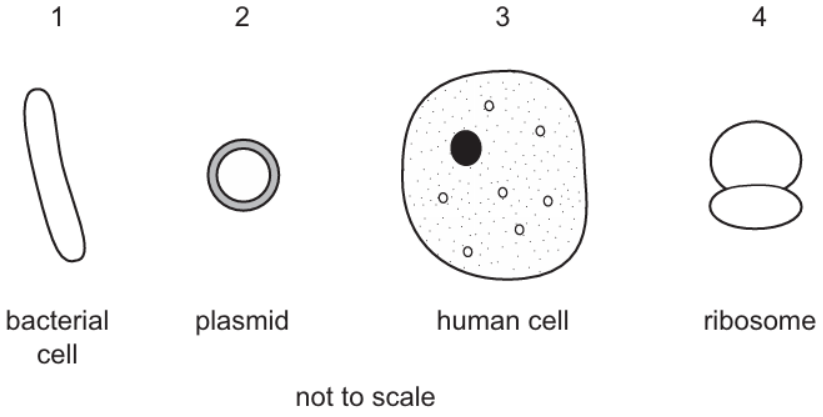
B Ligase is used to create sticky ends in bacterial plasmids.

C Restriction enzymes are used to create sticky ends in human DNA.

D Human DNA is isolated using ligase.

20 Human insulin is a protein that can be made by genetically engineered bacteria. This involves the transfer of genetic information to bacteria.

The diagrams show cells and parts of cells involved in this process.



What is the correct order of transfer of genetic information? **(extended only)**

A 3 → 2 → 1 → 4

B 1 → 2 → 4 → 3

C 3 → 4 → 2 → 1

D 1 → 2 → 3 → 4

21 Bacteria can be used to make human proteins.

Which statement explains why this is possible when a human gene is placed in a bacterial cell?

A Bacteria are able to reproduce rapidly.

B Bacteria are very small organisms.

C Bacteria contain genetic material in plasmids.

D Bacteria have the same genetic code as humans.

22 The stages describe how genetic engineering can be used to produce human insulin from bacteria.

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2 extract gene for insulin from human DNA with restriction enzymes

3 insert recombinant plasmid into bacteria

4 join human DNA to bacterial plasmid DNA using DNA ligase

5 replicate bacteria containing recombinant plasmid

Which sequence will lead to the production of human insulin by bacteria? **(extended only)**

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D The new gene will appear in new generations of the crop.

24 The diagram shows a bacterial cell.

Which part of its structure is particularly useful in genetic engineering?