# 3.4 Genetic Modification & Biotechnology

## Question Paper

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|---|---|
| Course | DP IB Biology |
| Section | 3. Genetics |
| Topic | 3.4 Genetic Modification & Biotechnology |
| Difficulty | Medium |

**Time allowed:** 20

**Score:** /10

**Percentage:** /100

## Question 1

Which of the following statements explains the separation of molecules in electrophoresis?

**A** DNA molecules from eukaryotes are broken up into smaller fragments.

**B** Negatively charged proteins travel towards the anode.

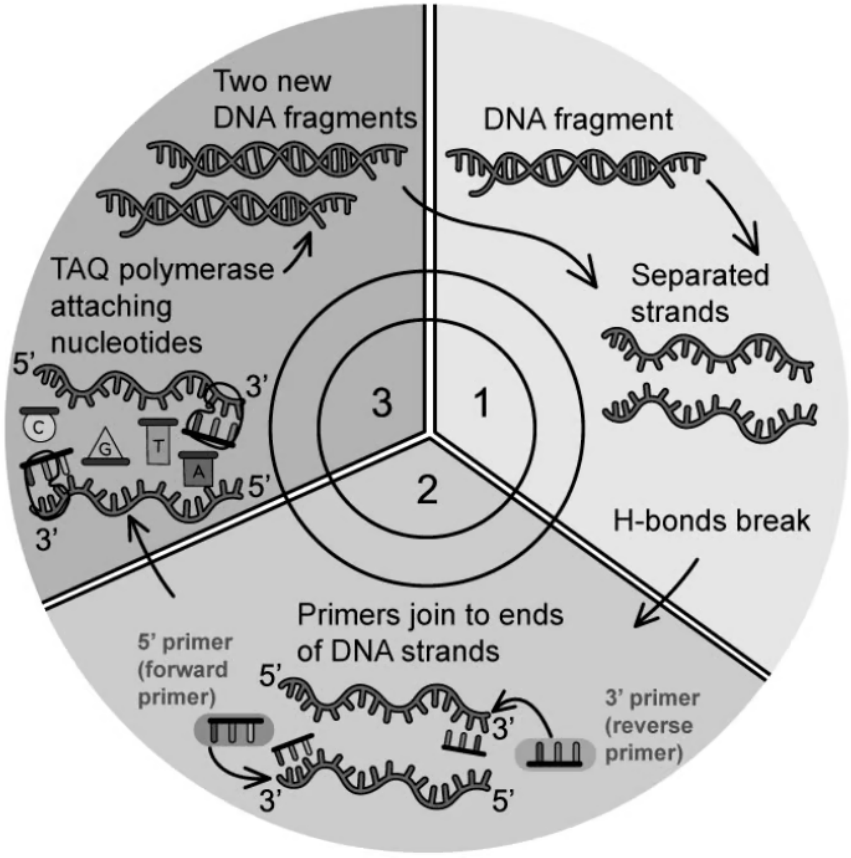
**C** Positively charged DNA molecules travel towards the cathode.

**D** The larger the molecule, the further it travels through the gel.

**[1 mark]**

## Question 2

What is the correct order of events for the stages of PCR shown in the diagram?




| | 1 | 2 | 3 |
|---|---|---|---|
| **A** | Annealing | Elongation | Denaturation |
| **B** | Denaturation | Annealing | Elongation |
| **C** | Denaturation | Elongation | Annealing |
| **D** | Elongation | Annealing | Denaturation |

**[1 mark]**

## Question 3

If one molecule of DNA goes through 5 PCR cycles in the thermocycler, how many copies of that molecule of DNA will be produced?

**A** 16

**B** 6

**C** 32

**D** 64

**[1 mark]**

## Question 4

What key feature of the genetic code makes it possible to transfer genes between species?

**A** It has 2 strands.

**B** It is universal.

**C** The code is degenerate.

**D** It can be amplified using PCR.

**[1 mark]**

## Question 5

Which enzyme is required by geneticists to produce sections of DNA from single-stranded RNA for the production of genetically modified organisms?

**A** Ligase

**B** Restriction endonuclease

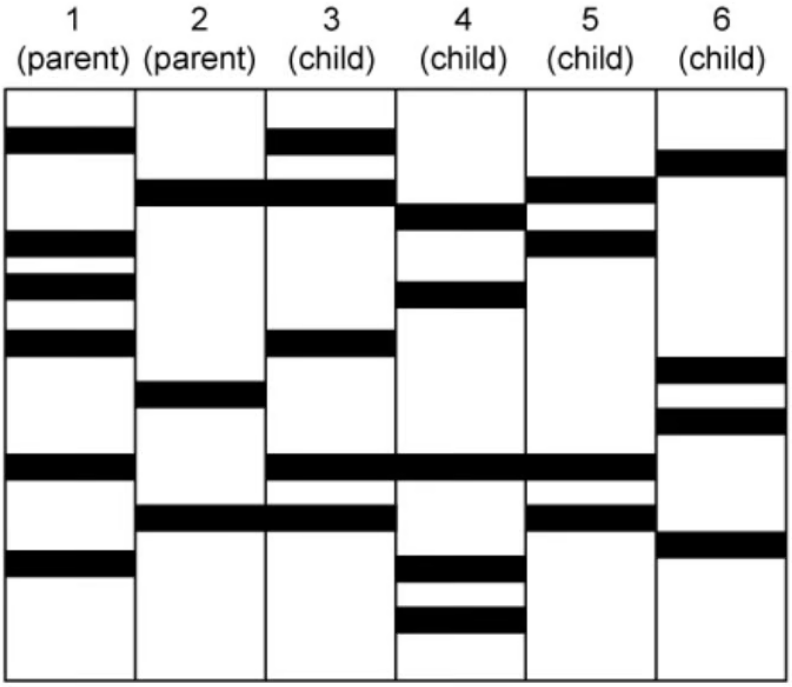
**C** Taq polymerase

**D** Reverse transcriptase

**[1 mark]**

## Question 6

Which statement can **not** be concluded from the DNA profile shown?




**A** Parent 1 and parent 2 are profiles of unrelated individuals.

**B** Children 3 and 5 are non-identical twins.

**C** Child 4 is related to parent 1 but not parent 2.

**D** Child 6 is unrelated to any of the other individuals.

**[1 mark]**

## Question 7

Cloning can be carried out at the embryo stage. Which statements are true about the cells in the embryo during the embryo splitting process?

I. The cells are pluripotent.
II. The cells are differentiated.
III. The cells were created by mitosis.
IV. The cells are haploid.

**A** I, II and III are correct.

**B** I and IV are correct.

**C** II and III are correct.

**D** I and III are correct.

**[1 mark]**

## Question 8

Why might scientists need to consider the risks associated with GM crops?

**A** Crops could become herbicide resistant.

**B** GM crops that are grown may contain unpleasant-tasting toxins.

**C** Pathogenic bacteria may increase their resistance to antibiotics.

**D** Some wild species may be wiped out.

**[1 mark]**

## Question 9

A possible research question on plant cloning could be:

'Does the position on the stem at which a cutting is taken affect its ability to form roots?'

Which variables would allow a valid investigation into this question?

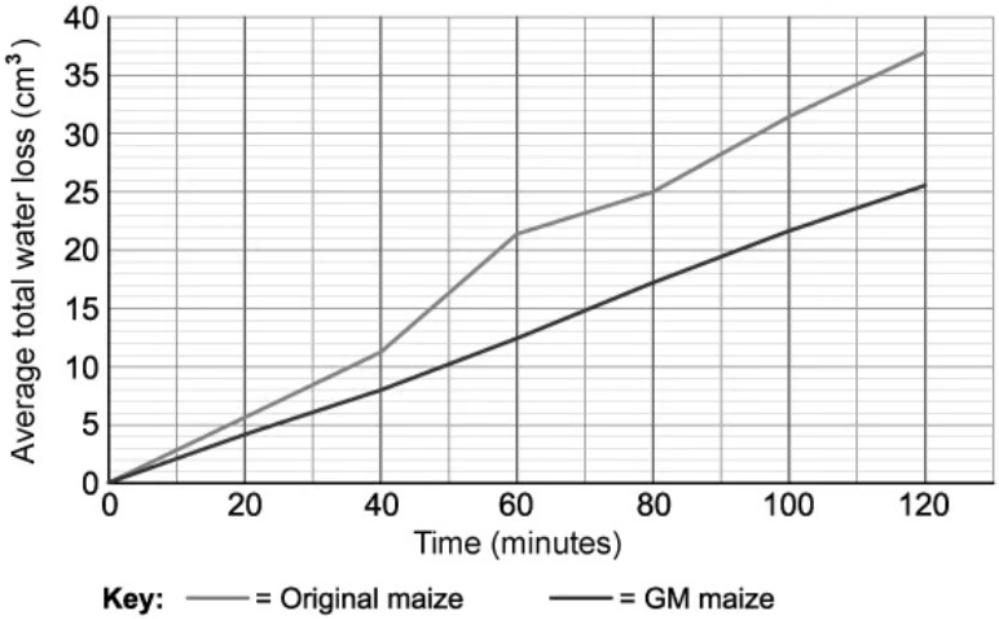
| | Independent variable | Dependent variable | A control variable |
|---|---|---|---|
| **A** | The mass of roots formed | Whether the cutting is taken from above or below the node | Use the same species of plant in each repeat |
| **B** | Whether the cutting is taken from above or below the node | The mass of leaves formed | Provide the same volume of water for each plant |
| **C** | Different lengths of the cutting | The mass of roots formed | Provide the same volume of water for each plant |
| **D** | Whether the cutting is taken from above or below the node | The mass of roots formed | Use the same species of plant in each repeat |

**[1 mark]**

## Question 10

A technique was developed to genetically modify a species of maize to be more resistant to drought by reducing the rate of water loss through transpiration.

A comparison was made between the new GM maize and the original maize in order to establish how effective the modification process had been in reducing the rate of transpiration.




What can you conclude from these results?

**A** The average total water loss for the GM maize after 80 minutes is 8 $cm^3$ lower than for the original maize.

**B** Crop plants should be genetically modified in order to improve drought resistance.

**C** Genetic modification made a significant difference to the transpiration rate in the species of maize.

**D** GM maize will survive better in dry conditions than original maize.

**[1 mark]**