

Questions

Q1.

The polymerase chain reaction (PCR) and gel electrophoresis are used to produce DNA profiles.

The diagram shows DNA profiles, from an adult female, an adult male and each of four children.



Explain why PCR is used before gel electrophoresis to produce these DNA profiles.

(2)

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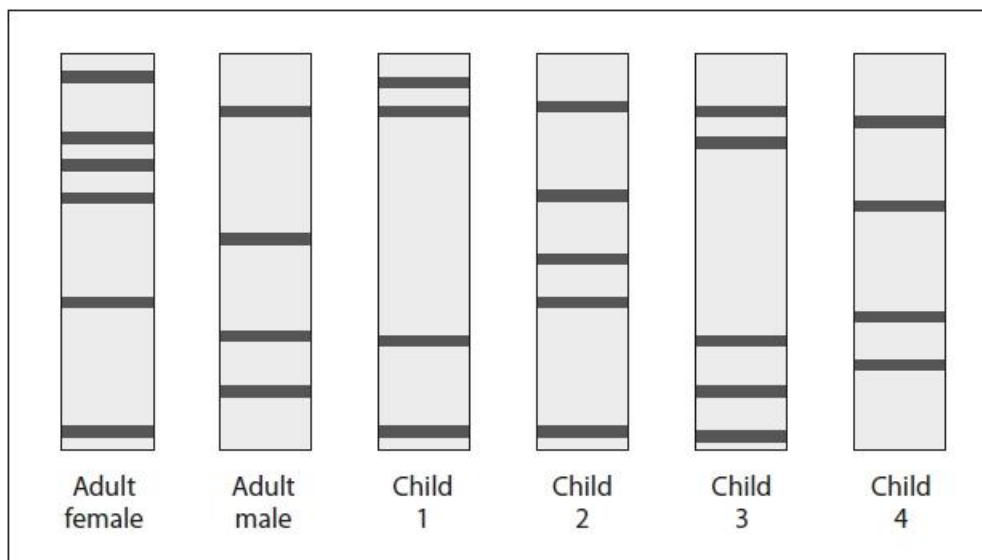
(Total for question = 2 marks)

Q2.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

The polymerase chain reaction (PCR) and gel electrophoresis are used to produce DNA profiles.

The diagram shows DNA profiles, from an adult female, an adult male and each of four children.



Which of the children have both of these adults as their parents?

(1)

- A child 1 and child 2
- B child 1 and child 3
- C child 2 and child 3
- D child 2 and child 4

(Total for question = 1 mark)

Q3.

Prothrombin is involved in the blood clotting process.

The *F2* gene codes for the synthesis of prothrombin.

A mutation of the *F2* gene causes thrombophilia, a condition that results in the production of excess prothrombin.

A genetic test can be used to find out if a person has thrombophilia.

The test involves using a restriction endonuclease to obtain genetic material from white blood cells.

This genetic material is then used in the polymerase chain reaction (PCR).

(i) State the role of a restriction endonuclease.

(1)

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(ii) Describe the process of PCR.

(3)

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(Total for question = 4 marks)

Mark Scheme

Q1.

| Question Number | Answer | Additional Guidance | Mark |
|-----------------|---|---------------------|------|
| | <p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> • because DNA needs to be {amplified / replicated} (1) • as only small samples are taken / to produce enough DNA (1) • all copies of the DNA need to be identical (to the original sample)(1) | | (2) |

Q2.

| Question Number | Answer | Additional Guidance | Mark |
|-----------------|--|---------------------|------|
| | <p>The only correct answer is B</p> <p>A is incorrect because child 2 has no matching bands with the father C is incorrect because child 2 has no matching bands with the father D is incorrect because child 4 has no matching bands with either adult</p> | | (1) |

Q3.

| Question Number | Answer | Additional Guidance | Mark |
|-----------------|---|---|------|
| (i) | cut DNA to produce {short sections of DNA / short tandem repeats / mini satellites} (1) | Accept cut DNA into fragments / cut DNA to give sticky ends | (1) |

| Question Number | Answer | Additional Guidance | Mark |
|-----------------|---|---------------------|------|
| (ii) | <p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none">• use (DNA) primers / nucleotides (1)• use {high temperature / 95 °C} for 30 seconds (to separate DNA strands) (1)• use {lower temperature / 55 °C} for 20 seconds (to bind primers) (1)• heat to 72°C with polymerase (to replicate DNA) (1)• repeat process (to obtain many copies of DNA) (1) | | (3) |