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3.4 Genetic Modification & Biotechnology

Hard

BIOLOGY

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3.4 Genetic Modification & Biotechnology

Question Paper

Course	DP IB Biology
Section	3. Genetics
Topic	3.4 Genetic Modification & Biotechnology
Difficulty	Hard

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Time allowed: 10

Score: /5

Percentage: /100

Question 1

Some scientists wanted to show the quantity of mRNA that was transcribed from a specific allele of a gene in a sample of cells. The statements explain some of the procedures that the scientists followed to show the presence of the mRNA quantitatively.

I. Gene probe was added with a coloured dye attached
II. Reverse transcriptase was added
III. PCR was carried out to amplify the material
IV. Intensity of colour was studied

Which option gives the correct order for the method followed by the scientists?

A. I → II → IV → III

B. II → III → I → IV

C. I → III → II → IV

D. III → II → I → IV

[1 mark]

Question 2

DNA samples were taken from five individuals and analysed using gel electrophoresis to produce a DNA profile. The DNA profile shows the results for a single gene.

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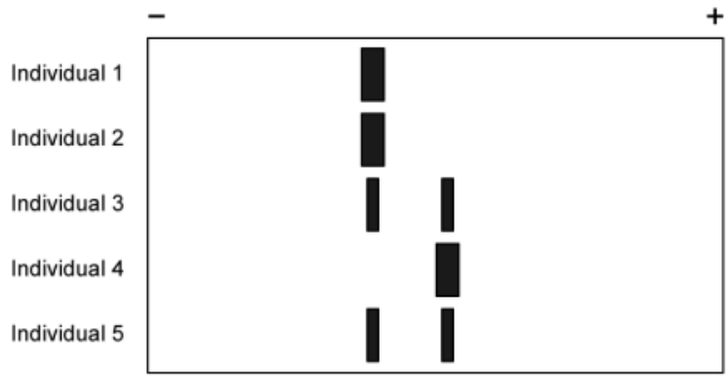
What conclusions can be made from the profile shown in the image?



A. There are equal frequencies of two alleles

B. There are 3 different alleles for the gene

C. There are two alleles and the frequency of one allele is about 75%.

D. There are three homozygous individuals in the population

[1 mark]

Question 3

In 1989 a company called AquaBounty Technologies genetically engineered (GE) Atlantic salmon to contain a growth hormone-regulating gene which had been extracted from another species of salmon (the Pacific Chinook salmon).

The modification resulted in an increased rate of growth without impacting any other health qualities. Fully grown GE salmon were the same size as the unmodified salmon, however, it took less time for them to reach full size.

Identify which of the following options would not be considered a risk for GE salmon.

A. There may be changes to the biodiversity of the natural environment

B. Presence of the new gene may influence the expression of other genes in the genome

C. There may be a lot of negative publicity surrounding the integration of GE salmon into the human food chain

D. GE fish may outcompete natural fish stocks

[1 mark]

Question 4

Which row correctly describes the different cloning mechanisms?

A	Monozygotic twins are formed from two eggs and two sperm	Embryo twinning is a form of asexual reproduction	Parthenogenesis is advantageous to lizards looking to invade a new territory	Poplar trees grow suckers that allow vegetative propagation
B	Monozygotic twins are formed from an embryo which splits into two	Rhizomes are natural clones used in cookery	Pluripotent embryonic cells can be used to overcome the likelihood of rejection	Parthenogenesis is advantageous to lizards looking to invade a new territory
C	Totipotent embryonic cells can be used to clone organisms for organ harvesting	Parthenogenesis is advantageous to lizards looking to invade a new territory	Poplar trees grow suckers that allow vegetative propagation	Dizygotic twins are formed when an embryo splits into two
D	Embryo twinning is a form of asexual reproduction	Poplar trees grow suckers that allow vegetative propagation	Rhizomes are natural clones used in cookery	An enucleated egg cell is required in all artificial cloning processes

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Question 5

Some scientists were investigating the allele frequencies in a population of flies for a gene responsible for insecticide resistance.

They obtained DNA samples from a representative group in the population and then carried out PCR to amplify the DNA.

Scientists used the same restriction endonuclease on each sample before undertaking PCR, explain why.

A. To separate the DNA template strands

B. To isolate the required gene sequence

C. To produce smaller DNA fragments

D. To allow RNA polymerase to bind to the promotor region

[1 mark]

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