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BIOLOGY

THE CONTROL OF GENE EXPRESSION

Level & Board	AQA (A-LEVEL)
TOPIC:	GENETICS
PAPER TYPE:	SOLUTION - 2
TOTAL QUESTIONS	6
TOTAL MARKS	32

Genetic - 2

1.

(a) Restriction enzymes cut at specific sequences so the same restriction enzyme must be used because it will produce fragments with the same complementary sticky ends, making it possible for bonds to form between them. There are certain compatible restriction sites that can be used together.

OR

Cut DNA at same base sequence

So get fragments with required gene

2.

(a)

Each has a specific base sequence

That is complementary to allele r

(b)

Fragments L from parent rr, because all longer fragments

Fragments N from parent RR, because all shorter fragments

M from offspring heterozygous Rr, so have both long and short base pair fragments.

(c)

For cells in mitosis chromosomes are visible;

So can see which chromosome DNA probe is attached to

3.

(a)

For comparison with resistant flies

To see death rate in non-resistant flies

(b) PM must be involved because:

- Few resistant flies die

- More inhibited flies die than resistant flies

- Inhibited flies die faster

Other factors must be involved as:

- Some resistant flies die

- But still have greater resistance so die slower than non-resistant flies.

4.

(a)

Negative correlation

Wide range

Graph suggests that other factors may be involved

(b)

Age of onset can be high

Individuals have already passed on the allele

5.

(a)

The extraction of DNA

Using enzymes to cut it into fragments some of which will contain minisatellites

Separating the fragments according to size

Treating the fragments with a radioactive probe which identifies shared motifs and can be captured on X-ray film

The result will be a pattern of more than 30 stripes, resembling a 'bar code'

(b) Unlike a conventional fingerprint that occurs only on the fingertips and can be altered by surgery, a DNA fingerprint is the same for every cell, tissue, and organ of a person. It cannot be altered by any known treatment.

(c) Some of its applications include: In forensic science, it is used to identify prospective criminal suspects. To prove paternity and establish familial ties. To identify and protect the commercial crop and livestock types.

6.

(a) Genetic fingerprinting can be used to compare DNA at a crime scene to potential suspects. DNA is sampled from a crime scene and a fingerprint is produced using gel electrophoresis. The DNA from the scene can be used to find an individual with a closely matched genetic fingerprint.

(b) DNA fingerprinting was first used in forensic science in 1986 when police in the UK requested Dr. Alec J. Jeffreys, of University of Leicester, to verify a suspect's confession that he was responsible for two rape-murders. Tests proved that the suspect had not committed the crimes.

(c) Gel electrophoresis is a technique used to separate DNA fragments according to their size. DNA samples are loaded into wells (indentations) at one end of a gel, and an electric current is applied to pull them through the gel. DNA fragments are negatively charged, so they move towards the positive electrode.

(d) These satellite DNAs show polymorphism and this polymorphism is the basis of DNA fingerprinting. The repeat regions can be divided into two groups based on the size of the repeat - variable number tandem repeats (VNTRs) and short tandem repeats.

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