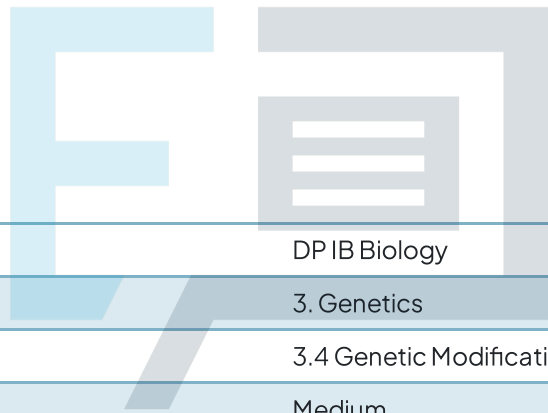




3.4 Genetic Modification & Biotechnology

Mark Schemes



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

Exam Papers Practice

To be used by all students preparing for DP IB Biology SL
Students of other boards may also find this useful

1

The correct answer is **B** because the anode is the positively charged electrode so negative molecules, in this case proteins, will be attracted towards the anode leading to separation. Note that this also applies when separating DNA molecules.

A is incorrect because it doesn't explain the separation of the fragments.

C is incorrect because DNA is negatively charged.

D is incorrect because smaller molecules travel further through the gel.

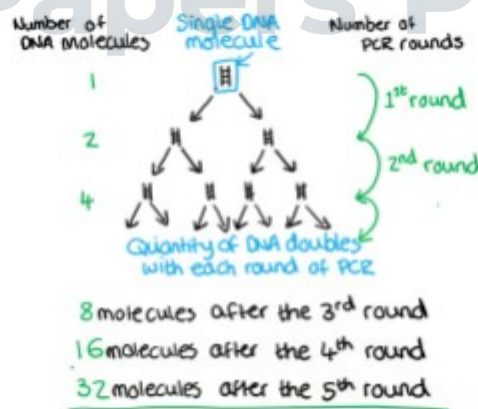
2

The correct answer is **B** because DNA strands are broken apart in **denaturation**, primers are **annealed** and then the strand **elongates** using the primers as a starting point.

3

The correct answer is **C**

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4

The correct answer is **B**; the same bases coding for the same amino acids across all organisms mean that the code can be transcribed and translated by different species in the same way.

Having 2 strands, as described in **A**, makes it possible to create exact copies of a template using complementary base pairing. While this may assist with making copies of genes ready for transfer, it does not specifically aid gene transfer **between species**.

Degeneracy in **C** refers to the fact that there is more than one triplet of bases that code for each amino acid.

PCR in **D** is a process that can be used to produce the fragment of DNA required for gene transfer, but it is not a key feature of the genetic code.

5

The correct answer is **D**; reverse transcriptase builds double stranded DNA using single stranded RNA as a template.

A, **B** and **C** are also enzymes involved in biotechnology:

- **A** is used to stick target DNA into plasmid vector DNA.
- **B** is used to cut out the target DNA sequence at a specific location.
- **C** is a thermostable enzyme used to amplify DNA during PCR



6

The correct answer is **B**. The profiles show that parents 1 and 2 are the parents of both child 3 and 5, but there is not enough information to indicate that the children are twins.

A can be concluded because none of the bands match up with each other.

C can be concluded because some of the bands on child 4 match up with parent 1 but the remaining bands do not match up with parent 2.

D can be concluded because child 6 has no bands that match up with anyone else in the profile and therefore we can conclude that they are unrelated.

7

The correct answer is **D**; The cells in the early embryo are identical as they have divided from the zygote by mitosis. They are said to be pluripotent, meaning they can become any type of cell found in an adult organism.

The other options are incorrect because the cells have not yet differentiated and they are diploid as they are formed after fertilisation.

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8

The correct answer is **C**. If antibiotic resistant genes used as marker genes in the GM process escape and spread this could cause issues with antibiotic resistance in harmful bacteria.

A is incorrect; herbicide resistance is considered to be a positive factor which allows farmers to spray herbicides (weed killers) without harming the crops.

B is incorrect because the production of unpleasant-tasting toxins is a deterrent for insect pests.

D is incorrect because it is vague and unlikely; there are concerns about the effect of GM technology on biodiversity due to the growth of monocultures, but while this may reduce local biodiversity and could cause species numbers to decline, it is unlikely to lead to 'wiping out' of any one species in its entirety. Any extinctions would likely be over a long period of time and due to multiple factors.

9

The correct answer is **D** because it provides the most appropriate way to provide an answer to the original question. The independent variable is the variable to be tested; in this case the location on the stem at which the cutting is taken. The dependent variable is the variable to be measured; in this case the ability of the cutting to grow roots is measured in root mass. The control variable is any variable that might influence the results other than the independent variable; here this is plant species, but there are many other correct examples.

A is not correct because the independent and dependent variables are the wrong way around.

B is incorrect because the dependent variable is wrong.

C is incorrect because the independent variable is not relevant to the question being asked about the position of the cutting on the stem.

10

The correct answer is **A**; the difference in total water loss can be read from the graph as 17 cm^3 for the GM maize compared to 25 cm^3 for the original maize at 80 minutes.

B is incorrect because the data only tells us about maize plants and not other species of crop plants.

C is incorrect because there has been no statistical test to confirm the significance of the differences in data.

D is incorrect because this graph alone does not provide us with enough information. We would need to know about the statistical significance of the results, as well as other issues that might affect the growth of maize in dry conditions, such as root growth, mineral requirements, and pest/disease resistance.

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