



HOW WELL DO YOU KNOW YOUR COURSE MATERIALS?

*These questions (and many others) will be addressed in detail in the TSFX
“Unit 4 – VCE Exam Revision Lectures” in September & October 2020.*

UNIT 4 BIOLOGY

QUESTION 1

The emergence of antibiotic-resistant diseases in humans means that

- A. antibiotics are causing resistance mutations in bacteria.
- B. some bacteria are less sensitive to antibiotics.
- C. viruses are becoming resistant to antibiotics.
- D. humans are less sensitive to antibiotics.

QUESTION 2

Charles Darwin and Alfred Wallace proposed a theory of evolution in the late 1850s. One observation made by Darwin that helped formulate the theory was:

- A. the environment remaining constant during the lifetime of an organism.
- B. individual organisms losing a trait that was not in use.
- C. individual organisms evolving in their own lifetime.
- D. inherited variation existing within a population.

QUESTION 3

In populations:

- A. genetic drift will have less effect in a large population compared to a small population.
- B. bottlenecks enable a population to become better equipped for future changes in the environment.
- C. some organisms develop mutations in order to better suit them to their environment compared to other members of the population.
- D. allele frequencies remain constant if the number of individuals leaving the population equals the number of individuals entering it.

QUESTION 4

In 1954, copper waste in the Finniss River killed numerous fish. This caused various species in the area to die out. However, one species, the black-banded rainbow fish, increased in numbers. The black-banded rainbow fish have modified gills that enable the fish to filter and remove the copper before it enters their body.

With respect to the black-banded rainbow fish it is reasonable to conclude that:

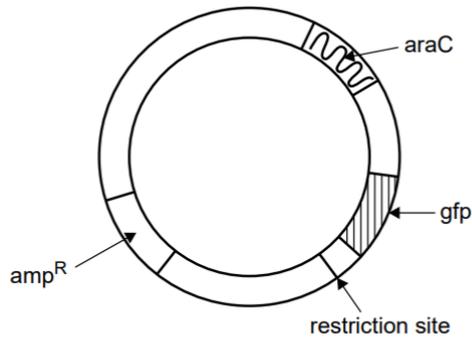
- A. a mutation occurred in their population in 1954.
- B. the ability of their gills to remove copper already existed in 1954.
- C. the high levels of copper in the water changed the structure of their modified gills.
- D. their genomes are identical with those of the other species of fish that existed in 1954.

QUESTION 5

To clone a gene of interest, the following four steps are performed:

1. A plasmid is cut with a specific restriction enzyme.
2. The gene of interest is ligated into the plasmid.
3. Plasmids are transferred to bacteria.
4. Bacteria are grown on four nutrient agar plates (labelled W, X, Y and Z) that are coated with or without ampicillin and arabinose.

An example of a plasmid used in cloning is shown below.



This plasmid contains a restriction site and the following three genes:

- amp^R – confers resistance to the antibacterial agent ampicillin
- gfp – encodes the green fluorescent protein (GFP), which fluoresces under UV light
- araC – encodes a protein required to promote the expression of gfp when arabinose is present

The results from a bacterial transformation experiment are shown in the table below.

Plate	W untransformed bacteria only	X untransformed bacteria only	Y transformed bacteria	Z transformed bacteria
Diagram of plate				
Added to plate	nutrient agar only	nutrient agar and ampicillin	nutrient agar, ampicillin and arabinose	nutrient agar and ampicillin
Description of result	lawn of bacteria	no growth	bacterial colonies present	bacterial colonies present

Bacteria are used in gene cloning because they

- A. contain restriction enzymes that randomly cut chromosomes into fragments of varying size.
- B. can replicate non-bacterial sequences of DNA in a short time.
- C. replicate exponentially by undergoing mitotic divisions.
- D. allow the entry of foreign DNA into their nuclei.

QUESTION 6

In India, a group of scientists was studying fossils from a coal deposit formed during the Permian period (290–245 million years ago). They found three fossil species from the same genus in different levels (strata) of the coal. When radiocarbon dating on these fossils was performed, it showed exactly the same levels of carbon-14 in all three fossil species. The data is summarised in the table below.

Fossil species	Depth at which fossil was found in the coal deposit (m)	Proportion of carbon-14 (%)
<i>Gangamopteris major</i>	6.2	0.0001
<i>Gangamopteris obliqua</i>	8.1	0.0001
<i>Gangamopteris clarkeana</i>	4.7	0.0001

Which one of the following is the correct conclusion to draw from these findings?

- A. There is no evolutionary relationship between these three fossil species.
- B. *G. clarkeana* is the common evolutionary ancestor of *G. major* and *G. obliqua*.
- C. As carbon dating is a more reliable dating technique than analysis of strata in coal deposits, the fossils of *G. major*, *G. obliqua* and *G. clarkeana* are all of the same age.
- D. An analysis of strata in coal deposits is a more reliable dating technique than carbon dating for Permian fossils; the fossil of *G. major* is younger than the fossil of *G. obliqua*.

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Dates: Saturday 19 September – Sunday 4 October 2020

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ANSWERS

- 1. B
- 2. D
- 3. A
- 4. B
- 5. B
- 6. D