



THE SCHOOL FOR EXCELLENCE (TSFX)

VCE BIOLOGY UNITS 3 & 4

WRITTEN EXAMINATION 2018

Reading Time: 15 minutes
Writing Time: 2 hours 30 minutes

QUESTION AND ANSWER BOOK

Student
Number:

Letter

Structure of Book

Section	Number of questions	Number of questions to be answered	Number of marks
A	40	40	40
B	9	9	80
			Total 120

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.
- No calculator is allowed in this examination.

Materials Supplied

- Question and answer book of 30 pages.
- Answer sheet for multiple choice questions.

Instructions

- Write your **student number** in the space provided above on this page.
- All written responses must be in English.

At the End of the Examination

Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are **NOT** permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple Choice Questions

Instructions for Section A

Answer all questions in pencil on the answer sheet provided for multiple choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

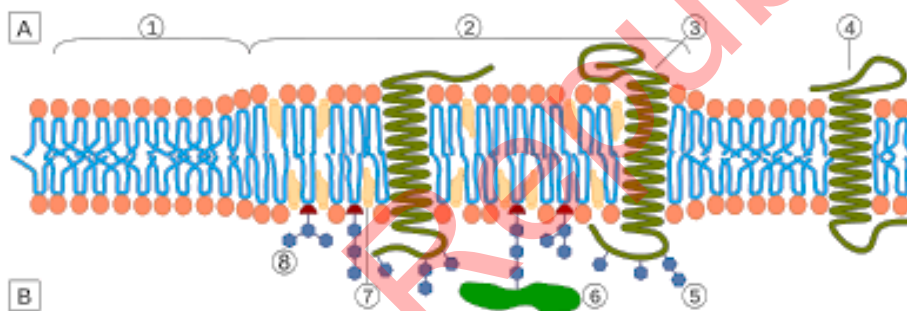
Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Use the following information to answer Questions 1 and 2.

Consider the following diagram of the plasma membrane.



QUESTION 1

Region A represents the extra cellular environment and region B represents the intra cellular environment. A signal transduction pathway involving a hydrophobic molecule would commence at

- A. Regions 1, 3 and 4
- B. Region 6
- C. Regions 2, 3 and 7
- D. Regions 4

QUESTION 2

A molecule containing many amino acids will likely pass through a plasma membrane

- A. by dissolving through the phospholipid heads from region A to region B.
- B. in the spaces between the phospholipid tails.
- C. through structures 3 or 4.
- D. using a lipid raft at structure 6.

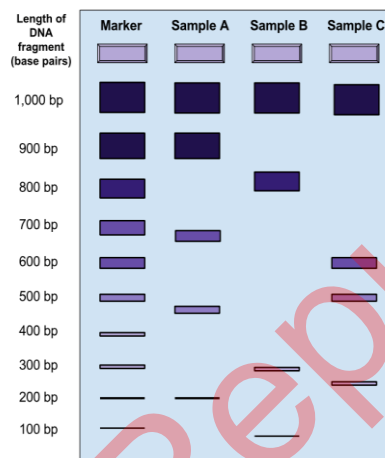
QUESTION 25

Mitochondrial DNA

- A. is found in all cells.
- B. contains uracil.
- C. is always linear.
- D. is inherited only from the female parent.

QUESTION 26

The diagram below shows gels of a shared restriction fragment length polymorphism (RFLP) allele at a particular RFLP locus from three different hominin fossils species discovered from three separate locations.



These results show evidence of

- A. gene flow between the three species.
- B. genetic drift between Samples A and B.
- C. random mutations within the three different species.
- D. in breeding between the three species.

QUESTION 27

The three main steps in PCR include in order

- A. extension, annealing and cooling
- B. cooling, denaturation and extension
- C. heating, annealing, extension
- D. denaturation, extension and annealing

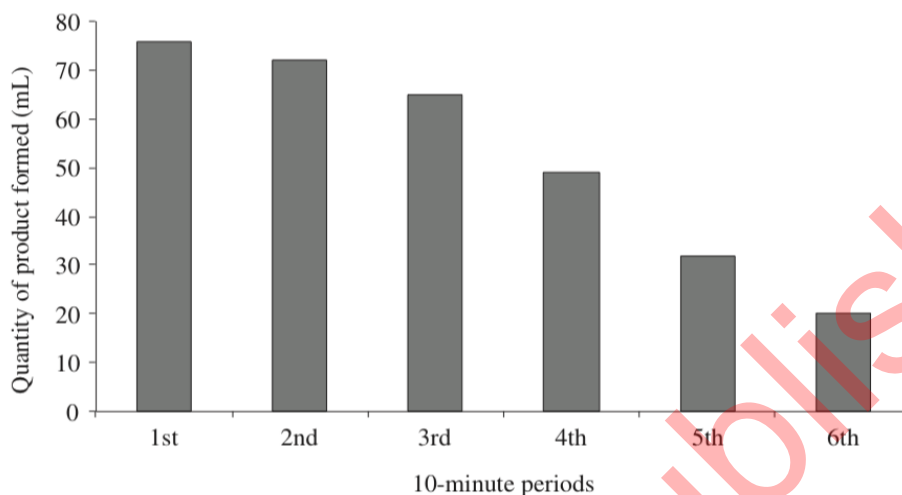
QUESTION 28

Genetic modification always involves

- A. a change to an organism's DNA.
- B. gel electrophoresis.
- C. a plasmid vector.
- D. a new gene inserted into an organism.

Use the following information to answer Questions 38 – 40.

A student performed an enzyme-substrate experiment. At the end of each 10-minute period, the quantity of the product formed was collected and measured. The graph shows the results of this experiment.



Source: <http://educationstandards.nsw.edu.au>

QUESTION 38

Which of the following would explain the trend shown in the graph?

- A. The rate of enzyme activity is decreasing.
- B. The concentration of the product is decreasing.
- C. The concentration of the enzyme is decreasing.
- D. The concentration of the substrate is decreasing.

QUESTION 39

If the method used to measure the amount of gas collected was by observing the height of bubbles in a test tube, which type of error could result?

- A. systematic
- B. non directional
- C. precision
- D. directional

QUESTION 40

This type of error could be corrected by

- A. repeating the experiment a number of times.
- B. using more accurate equipment to measure the quantity of product.
- C. including more levels of the independent variable.
- D. including a control set up.

END OF SECTION A

QUESTION 8 (10 marks)

Tasmanian Devils are evolving rapidly to fight their deadly cancer

For the past 20 years, an infectious cancer has been killing wild Tasmanian devils, creating a massive challenge for conservationists. But new research, published today in Nature Communications, suggests that devils are evolving rapidly in response to their highly lethal transmissible cancer and that they could ultimately save themselves.

Andrew Storfer at Washington State University and Paul Hohenlohe at the University of Idaho compared the frequency of genes in devils in regions before DFTD arrived to devils 8-16 years after DFTD arrived.

We identified significant changes in two small regions in the DNA samples of devils from regions with DFTD. Five of seven genes in the two regions were related to cancer or immune function in other mammals, suggesting that Tasmanian devils are indeed evolving resistance to DFTD. Evolution is often thought of as a slow process, but these changes have occurred in as few as 4–8 generations of devils since disease outbreak. Devils are surviving at our long-term sites, despite models that predicted extinction. Previously, studies have shown that devils with lower rates of DFTD showed specific changes in their immune response.

New infectious diseases put strong pressure on their hosts to evolve, leading to rapid changes in resistance or tolerance. Rapid evolution requires pre-existing genetic variation. Our results are surprising because Tasmanian devils have low levels of genetic diversity.

Source: extract adapted from M.E. Jones (University of Tasmania), A. Storfer (Washington State University), H. McCallum (Griffith University), P. Hohenlohe (University of Idaho), R. Hamede (University of Tasmania), 'Tasmanian Devils are evolving rapidly to fight their deadly cancer', The Conversation Website, 31 August 2016, <<https://theconversation.com/au>>

- a. Identify two pieces of evidence in the text that supports the theory that the Tasmanian Devils are evolving resistance to the disease. Justify how each piece of evidence can be used to support the rapid evolution theory.

4 marks

The **Tasmanian devil** was once native to mainland Australia and is now found in the wild only on the island state of Tasmania. Its genome was sequenced in 2010 and found to have very low genetic diversity consistent with **genetic drift** and possibly a **founder effect**.

- b. Explain the meaning of each of these terms with reference to allele frequencies of the Tasmanian Devils

2 marks

- c. Explain how the combination of low genetic diversity and new infectious diseases in the population of Devils impacts the survival of the species.

2 marks

At Lake Nitchie in western New South Wales in 1970, a male human skeleton wearing a necklace of 178 teeth from 49 different devils was found. The skeleton is estimated to be 7000 years old, and the necklace is believed to be much older than the skeleton.

- d. How would the scientists accurately determine the different ages of the skeleton and the necklace?

2 marks
