2017 VCE Biology (NHT) examination report

General comments

This was the first Biology examination sat on the Northern Hemisphere Timetable and was the final examination for the *VCE Biology Study Design 2013–2016*.

Students should be aware that spelling is not directly assessed; however, if a word has a possible different meaning or the word is not identifiable, then the student will not gain any marks. Students should feel confident to use suitable abbreviations such as DNA, ATP and NADH, and chemical symbols such as O_2. If students wish to use an abbreviation and are not sure of its appropriateness, they should write out the word or term in full.

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

Section A – Multiple-choice questions

Question	Answer
1	D
2	C
3	B
4	B
5	C
6	D
7	B
8	B
9	D
10	A
11	B
12	C
13	B
14	A
15	C
16	D
17	D
18	C
19	B
20	D
21	A
22	D
23	C
24	D

Question	Answer
25	D
26	C
27	A
28	B
29	B
30	D
31	A
32	C
33	D
34	B
35	C
36	A
37	A
38	A
39	B
40	D

Section B – Short-answer questions

Question 1a.

Proteins/polypeptides

Question 1b.

Both:

- changing primary structure (or a description of this)
- affects folding/secondary/tertiary structure (shape) of molecule or the quaternary structure may be affected as haemoglobin is made up of more than one sub-unit.

Question 1c.

	DNA	**RNA**
Names of nucleotide bases present	• adenine • thymine • guanine • cytosine	• adenine • uracil • guanine • cytosine
Functions 1 and 2	• DNA carries the 'instructions' required to assemble proteins from amino acid sub-units within cells • passed on/replicated in cell division	Any two of: • RNA molecules play major roles in the manufacture of proteins • mRNA is used for the translation of proteins • tRNA carries amino acids for protein synthesis • rRNA forms part of the ribosome machinery that is essential for protein synthesis.

Question 2a.

Rough endoplasmic reticulum

Question 2b.

- Secretory molecules made in rough endoplasmic reticulum are transported to the Golgi apparatus.
- Secretory molecules are packaged in the Golgi apparatus into vesicles.
- Vesicles move to the cell surface, vesicle membrane fuses with the cell membrane or secretory molecules are released from the cell by exocytosis.

Question 3ai.

Breakdown of glucose or breakdown of lipids, or breakdown of polypeptides

Question 3aii.

Formation of smaller products or these reactions release energy

Question 3bi.

	Type of cellular reaction	
	Catabolic	**Anabolic**
Rate of cellular reaction	increases	decreases

Question 3bii.

Catabolic reactions release energy. If ATP within a cell falls then more ATP will be required; the rate of catabolic reactions must increase so that the level of ATP remains optimal.

The rate of anabolic reactions will be slowed as these reactions require energy; less ATP is available.

Question 4a.

Stage	**Inputs**	**Outputs**
glycolysis	glucose ADP + P_i $NAD^+ + H^+$	pyruvate ATP NADH
Krebs cycle	pyruvate or acetyl CoA ADP + P_i $NAD^+ + H^+$ $FAD + 2H^+$	CO_2 ATP NADH $FADH_2$
electron transport chain	oxygen ADP + P_i NADH $FADH_2$	water ATP $NAD^+ + H^+$ $FAD + 2H^+$

Question 4b.

Due to low oxygen or anaerobic conditions/respiration

Question 4c.

- may bind to the active site or bind to the enzyme away from the active site
- changes the enzyme's molecular shape, so changing the shape of the active site

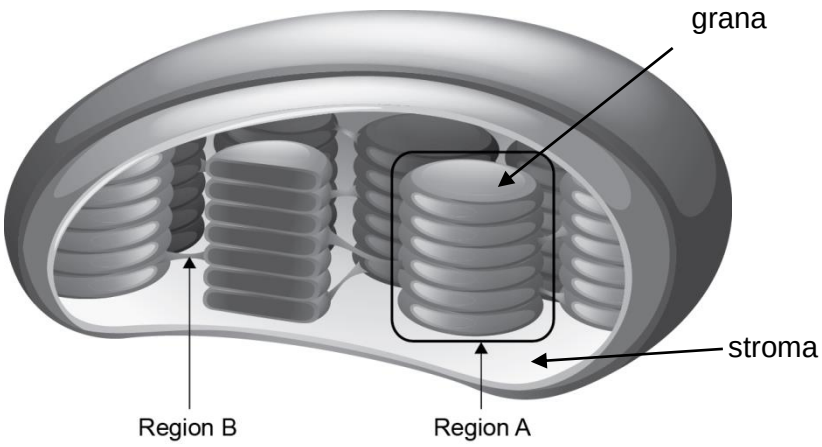
or

- by changing it in such a way that it cannot bind to its substrate

Question 4d.

E will not be produced.

Question 5a.



Question 5bi.

Oxygen concentration

Question 5bii.

Two of the following:

- temperature (of setup)
- amount of water
- mass of the thylakoid membranes
- volume of solution
- concentration of solution.

Question 5biii.

- this may be explained by B having more chlorophyll to trap light
- this may be explained by region B membranes containing a higher concentration of enzymes, which would lead to a greater rate of reaction.

Question 6a.

Acts as a physical barrier/prevents entry of pathogens

Question 6b.

Either:

- APC are phagocytic cells. They engulf the proteins from pathogens, or they present antigens on the surface to other immune cells to prompt a response.
- Presents to T_h cells. T_h cells activate B cells.

Question 6c.

One of:

- adaptive immune system
- cell-mediated response
- specific immune system

Question 6di.

If *S.epidermidis* has a protective role then pathogenic fungus will not grow on the skin.

Question 6dii.

Group 2 served as a 'control' group as pathogenic fungus was applied to both groups of mice but *S.epidermidis* was applied only to Group 1 (experimental group).

Thus Group 1 was being compared to Group 2, which was the control.

Question 6diii.

The experimental mice (Group 1) that had *S.epidermidis* applied to their skin did not show growth of pathogenic fungus as the bacteria were acting as a protective layer.

This could be because the higher levels of APC and Tc cells helped to control the spread or growth of the pathogenic fungus.

Question 7a.

Specific order of nucleotide bases or amino acid sequence

Question 7b.

Both:

- at high temperature the hydrogen bonds binding the two DNA strands break or DNA is denatured
- single-stranded DNA is produced.

Question 7c.

Primers anneal/join to each end of the DNA single strand.

Question 7d.

All of:

- the temperature was lowered to 55 °C so that the DNA primers can attach to the single-stranded DNA molecules
- the temperature was raised to 72 °C as at this temperature the activity of the Taq polymerase enzyme is at its highest or optimum
- complementary nucleotides would bind to the single-stranded DNA.

Question 7e.

Due to contamination of the mixture

Question 8ai.

- generation 1 : I-3
- generation 3 : III-3

Question 8aii.

- II-4 will have inherited the trait from his mother (I-3) as the trait is X-linked dominant.
- II-4 must pass the trait to all his daughters (III-3).

Question 8bi.

Autosomal recessive

Question 8bii.

Both:

- recessive, as the trait is not in generation I but appears in generation II
- autosomal, as mother (II-3) with the trait has not passed the trait to her son (III-1), or daughter II-3 does not have an affected father (I-1).

Question 8biii.

Chance is one out of two.

Correct working was required. An example of working could have been similar to: Mother is heterozygous and father is homozygous; for example, Aa X aa.

Punnett square

	A	a
a	Aa	aa
a	Aa	aa

If the student made an error in identifying the parents' genotype, then they could have received one mark for this question as long as their working was consistent with the parents' genotype.

Question 9a.

Variation in original population

Individuals with resistance will survive if exposed to insecticide and reproduce; individuals with allele type 2 will die if exposed to insecticide.

The frequency of allele type 1 has increased in the population.

Question 9b.

The gene pool of the population has not been changed.

Both alleles are still present; the gene pool would only change if a new allele appeared or one allele disappeared.

Question 10a.

- The individuals within a species would be able to breed with each other **and** produce fertile offspring.
- Anatomical features **and** the individuals within a species would have more characteristics in common with each other than with those of a different species.

Question 10b.

Evolutionary relationships between different species are shown.

Question 10c.

The following is an example of a possible response.

Species W and X

These two species have been separated for the least time period **and** have had less time to accumulate changes in their DNA.

Question 10d.

Initially a population (or populations) of the same species becomes isolated by a geographical barrier.

Over time the isolated population(s) is exposed to different selective pressures **and** accumulates sufficient differences to the original population so that it forms a new species.

Question 11a.

Scientists would choose suitable corals to breed together to produce offspring that are more likely to survive in the changing environment. These offspring would be reintroduced into the reef.

Question 11bi.

The following is an example of a possible response.

Induce new mutations and so may have new alleles that may give the single-celled algae increased resistance to environment stress such as the increase in temperature.

Question 11bii.

One of the following:

- introduction of the genetically modified individuals may have unexpected and unintended effects on the coral reef systems
- cross breeding with wild type might cause expression of detrimental characteristics
- loss of variation.

Students could also have named a biological consequence such as change the evolution of the species.