



The Victorian
Institute of
Learning

VCE Unit 3 & 4 Biology

Trial Examination 2019

Suggested Solutions

Section A – Multiple Choice

Question 1

C

Question 2

B

Question 3

A

Question 4

C

Question 5

D

Question 6

D

Question 7

C.

Question 8

B

Question 9

C

Question 10

A

Question 11

C

Question 12

C

Question 13

B

Question 14

A

Question 15

D

Question 16

A

Question 17

D

Question 18

A

Question 19

B

Question 20

D

Question 21

B

Question 22

A

Question 23

D.

Question 24

C

Question 25

A

Question 26

A

Question 27

D

Question 28

C

Question 29

A

Question 30

C

Question 31

A

Question 32

D

Question 33

C

Question 34

C

Question 35

A

Question 36

C

Question 37

B

Question 38

D

Question 39

B

Question 40

D

Section B – Short answer

Question 1

- a) Ribosomes
- b) Enzymes such as helicase break the hydrogen bonds between complementary nucleotides. (1 mark) Single-stranded RNA (where U replaces T) nucleotides are placed on the template strand so that the mRNA is formed in the 5'–3' direction. (RNA polymerase is the catalyst for this process) (1 mark)
- c)

| Normal DNA | |
|--------------|---------------------|
| DNA template | T T G A T G C A C |
| mRNA | A A C U A C G U G |
| amino acid | asn tyr val |

| Mutated DNA | |
|-------------|-------------------|
| one change | T T T A T G C A C |
| mRNA | A A A U A C G U G |
| amino acid | lys tyr val |

Note: There are other changes that would give a correct answer but they could only be the first or second nucleotide.

d)

| | |
|-------------|-----------------|
| stop signal | T T G A T C A C |
| peptide | asn stop |

Note: This nucleotide is the only one that could be deleted to code for a stop signal.

- e) The stop signal is more likely to cause more disruption. The single base change is likely to change one amino acid. However, the stop interrupted the protein's formation near the start of the polypeptide and so no more amino acids would be placed onto the growing amino acid chains.

Note: The other mutation types may or may not code for a stop.

Question 2

- a) α helix or alpha helix.
- b) The tertiary structure determines the three-dimensional shape (conformation) of the protein molecule (1) and so determines the (three-dimensional) shape of the active site or the specificity of the enzyme (1).

- c) It will alter the three-dimensional shape of the active site preventing it from binding with the triglyceride (1), thus preventing lipase from functioning (1).

Question 3

- a) A variety of ethylene concentrations were used OR many apples used per test.
- b) Tasting only involved two apples OR tasting was open to opinion.
- c) 150 ppm ethylene (1) at 20 degrees Celsius (1) (not 500 ppm ethylene as 150 provides the same result and so would be cheaper).
- d) The data is of low accuracy (1) as the apples were judged as ripe by taste and colour which is a very subjective measure making it difficult to determine how close it is to the true value (1) it is also difficult to be sure that results are consistent [1] so precision is also low (1)

Question 4

- a) Protein coat [1]
nucleic acid core [1]
attachment sites [1]
- b) Different nucleic acid codes for different amino acid sequences and hence proteins. [1] This means the protein coats will be different (1).
- c) The percentage of mortality has decreased.
- d) A vaccine retains the antigen but through various methods, the nucleic acid core is removed OR changed.
- e) Memory cells recognise antigens on the virus (1) and clone into plasma cells (1) that produce large quantities of antibodies (1). This leads to the eradication of the virus.

Question 5

- a) Components (protein) on transplanted cells or the blood within transplanted tissue that would be recognized by the recipient's immune system as non-self.
- b) Person 2, as their blood type is the same and this is more important according to the information.
- c) There are only eight factors used to determine compatibility, so other antigens may exist in the transplanted tissue that were not accounted for when determining compatibility (1) thus there is a risk of rejection as the immune system will be stimulated to act against the other antigens (1).
- d) Since rejection involves an immune response against the transplanted organ, a measure to be taken would be to suppress the immune system by taking some kind of medication (1) that stops the immune system working OR give the person immunosuppressant medication. A substance found on the surface of red blood cells and other transplanted tissues that is capable of causing a human to produce antibodies.

Question 6

- a)

- i. Cells involved in the specific immune response include the Tc cell, the memory cell and the plasma cell. [1 mark for one of these] The function of the cell needs to be a sentence such as: 'The memory cell (a B lymphocyte) stores information about the specific immune response needed to combat a particular pathogen that the organism has previously encountered, and is stored in the bone marrow'. [1]
 - ii. Cells involved in the non-specific immune response include the phagocyte, the neutrophil and the megakaryocyte. [1 for any of these] Explanation: The phagocyte engulfs and destroys unwanted materials and pathogens.
 - iii. T killer cell, or T helper cell [1]
- b)
- i. An autoimmune disease is one in which the body detects 'self' cells as 'non-self' and destroys them. [1]
 - ii. Antibodies are present in the blood of a person with the autoimmune disease that bind to the antigens on the self-cell and cause a specific immune response. [1]
 - iii. The top two ends of the antigen should be circled. [1]
- c)
- i. Active immunity is acquired through development of a specific response to a pathogen through exposure to that pathogen, whereas passive immunity is acquired through ingesting or being given the specific antibodies to a particular antigen from another organism that has formed them. [1]
 - ii. Passive
Active
Passive

Question 7

- a) There are 64 possible combinations of nitrogenous bases coding for amino acids and only 20 amino acids. [1]
- b) RNA polymerase is an enzyme involved in transcription [1]. It catalyses the production of the messenger RNA strand. [1]
- c) The process is called transcription. [1] RNA polymerase unzips the template strand of DNA from the coding strand [1] and complementary RNA nucleotides are added [1] to create messenger RNA, which undergoes post transcriptional modification and exits the nucleus via the nuclear pores.
- d) The process is called translation. [1] Transfer RNA anticodons align with messenger RNA codons at the ribosome to align amino acids in a polypeptide sequence. [1] Peptide bonds form between these polypeptides until a STOP sequence is reached. [1]
- e) The codes represented in the table are for RNA. [1] The letter U (short for the nitrogenous base uracil, which only occurs in RNA, not DNA) is found in the table. [1]
- f) Mutation A is a point mutation or a substitution. [1]
Mutation B is an addition or frameshift mutation. [1]

- g) An individual with mutation B. is more likely to suffer serious consequences [1], because the addition mutation shifts the whole sequence of amino acids after it, most likely changing every codon that follows with potentially disastrous effects including never reaching a stop codon or prematurely reaching one. [1]

Question 8

- a) Answers may vary; other responses may be acceptable.
- The microbiological response [1]
 - Warm temperature maintained by homeostasis. [1]
 - Constant provision of digested or readily digestible food particles. [1]
- b) A range of responses are acceptable.
Below is an example of a high-scoring response:
Hooks at top of body [1] enable the tapeworm to cling to the sides of the intestine and not be pushed out by peristaltic movements. [1]
- c) Answers may vary; other responses may be acceptable.
- There were different tapeworms [1]
 - Tapeworms with hooks survived better in pig intestines than those without (they were hence fitter). [1]
 - Therefore, they had more opportunity for reproduction. [1]
 - This enabled genes for hooked tops to be passed onto future generations and over time resulted in all *Taenia Solium* tapeworms possessing the hooks due to a gradual increase in allele frequency coding for the hooks. [1]

Question 9

- a) The pitch or frequency of the frog mating call
- b) Length of time each call is played and length of time between calls needs to be the same [1], this could be done by setting up a playlist that is automatically timed [1]
Location needs to be the same [1] Peter could leave the frog speaker there throughout the experiment or place a marker so that it goes back in the same place [1]
Any other appropriate answer
- c) The number of frogs responding to the mating calls both visually and vocally decreased over time [1], this could be due to the frogs receiving no response or interaction from the model [1]
There were always more frogs responding vocally rather than approaching the model [1], this could indicate that the frogs usually meet closer to the water or it's the males responsibility to seek out the female [1]
Any other appropriate answer
- d) Answers will vary