

BIOLOGY

UNITS 3 & 4



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Use this page as an overlay for marking the multiple choice answer sheets. Simply photocopy the page onto an overhead projector sheet. The correct answers are open boxes below. Students should have shaded their answers. Therefore, any open box with shading inside it is correct and scores 1 mark.

	ONE ANSWER PER LINE		ONE ANSWER PER LINE		ONE ANSWER PER LINE
1	☐ [shaded] [shaded]	15	[shaded] ☐ [shaded]	28	[shaded] ☐ [shaded]
2	[shaded] ☐ [shaded]	16	[shaded] ☐ [shaded]	29	[shaded] ☐ [shaded]
3	[shaded] ☐ [shaded]	17	[shaded] ☐ [shaded]	30	☐ [shaded] [shaded]
4	[shaded] ☐ [shaded]	18	[shaded] ☐ [shaded]	31	[shaded] ☐ [shaded]
5	☐ [shaded] [shaded]	19	☐ [shaded] [shaded]	32	[shaded] [shaded] ☐
6	☐ [shaded] [shaded]	20	[shaded] ☐ [shaded]	33	[shaded] [shaded] ☐
7	[shaded] [shaded] ☐	21	[shaded] [shaded] ☐	34	☐ [shaded] [shaded]
8	[shaded] [shaded] ☐	22	[shaded] ☐ [shaded]	35	☐ [shaded] [shaded]
9	[shaded] ☐ [shaded]	23	[shaded] [shaded] ☐	36	[shaded] ☐ [shaded]
10	☐ [shaded] [shaded]	24	☐ [shaded] [shaded]	37	[shaded] ☐ [shaded]
11	☐ [shaded] [shaded]	25	[shaded] ☐ [shaded]	38	[shaded] [shaded] ☐
12	☐ [shaded] [shaded]	26	[shaded] ☐ [shaded]	39	[shaded] [shaded] ☐
13	[shaded] ☐ [shaded]	27	[shaded] [shaded] ☐	40	[shaded] ☐ [shaded]
14	☐ [shaded] [shaded]				

TEACHERS, PLEASE NOTE:

In marking the Trial Exam, teachers should keep in mind that the language used in the suggested answers is sometimes more sophisticated than a student would offer, since these answers are written for teachers' information in their correction of the Trial Exam.

*The answers suggested here might not be the only correct responses possible. Teachers must use their professional judgement in awarding marks for other answers offered. However, in accordance with the VCAA practice, students who give a correct response, and then offer a contradictory incorrect response within the same part of the question, should **not** be awarded any marks for the correct part of the response. Also in accordance with the VCAA practice, no half marks should be given.*

SECTION A - MULTIPLE CHOICE QUESTIONS (1 mark each: 40 marks)

1	A	15	B	28	C
2	C	16	B	29	B
3	D	17	D	30	A
4	D	18	B	31	B
5	A	19	A	32	D
6	A	20	B	33	D
7	D	21	D	34	A
8	D	22	C	35	A
9	C	23	D	36	B
10	A	24	A	37	C
11	A	25	C	38	D
12	A	26	C	39	D
13	C	27	D	40	C
14	A				

SECTION B**Question 1**

- a** alpha helix 1 mark
- b** 50 – 60°C 1 mark
- c** 10°C is too low temperature, molecules move slower decreasing collisions between enzyme and substrate (1), slowing the rate of ethanol production (1). 2 marks
- d** inputs: glucose + ADP + Pi (1)
outputs: ethanol, CO₂, 2 ATP (1) 2 marks
- e** NAD or ADP 1 mark
- f** the age of the yeast 1 mark
- g** ethanol yield OR flocculation potential 1 mark
- h** Several batches of hops (1).
Divide into two groups: older yeast & younger yeast (1)
Controls: any 2 of: temperature, water, hops quality, time brewing etc (1)
Measure the ethanol yield (1). 4 marks

Total Question 1: 13 marks

Question 2**a** One of the following for 3 marks:

Tryptophan molecules present binds to repressor protein (1). Activated repressor protein / tryptophan complex binds to the operator region of gene (1) preventing the RNA polymerase from binding, preventing transcription (1).

OR

Attenuation: High tryptophan allows leader sequence to be transcribed / not paused at trp codons (1). A hairpin loop forms between segments 3 and 4 (1). Ribosome detaches from short mRNA sequence (1), stopping transcription from being completed.

3 marks

b mRNA: messenger RNA provides the template for protein production (1) (not carries the information out of the nucleus).

tRNA: transport RNA carries a specific amino acid to the mRNA codon (1).

rRNA: ribosomal RNA reads the codon on the mRNA and bonds the specific amino acids together in the correct order (1).

3 marks

Total Question 2: 6 marks**Question 3****a** Two or more polypeptides bound together to form a functional protein.

1 mark

b i C₃ plants open their stomata according to water levels of the guard cells, compared with CAM plants that only open the stomata at night allowing CO₂ to enter and be fixed to compounds other than rubisco (1).

1 mark

ii C₃ plants allow CO₂ to enter cell during day and bind to rubisco. C₄ plants use more energy OR allow CO₂ to enter cell during day and binds to another molecule (PEP carboxylase) before rubisco.

1 mark

c Spacer: segments of DNA cut from invading viruses used to recognise same virus in the future.

1 mark

d The protospacer adjacent sequence is a nucleotide sequence between the spacers that is used to identify bacterial-DNA from non-self viral DNA.

1 mark

e Decreasing KNR2 increases the number of kernel rows (1). This increases the number of kernels (1) increasing kernel productivity.

2 marks

Total Question 3: 7 marks**Question 4****a** Any two of the following for 1 mark each:

Virus: protein coat, no membrane bound organelles, DNA or RNA genetic material unable to replicate alone (1)

Bacteria: membrane, circular DNA, replicate through binary fission (1)

2 marks

b The DNA unwinds (1). RNA polymerase binds to the gene (1). Complementary copy of nucleotides in the DNA template is formed as mRNA (1).

3 marks

c The virus binds to a molecule on the surface of the skin cell (1). The genetic material / virus enters the cell (1) and is able to use the host skin cell's ribosomes / organelles to replicate in the skin cells (1).

3 marks

d Viral particles move into lymphatic fluid around cells (1). Lymph fluid drains through lymph vessels to lymph node (1). B lymphocytes undergo clonal proliferation (1), increasing the number of cells and causing the lymph node to swell (1).

4 marks

e artificial active

1 mark

f AIDS – acquired immunodeficiency syndrome causes a reduction in T-helper cells (1). This affects the immune system's ability to activate cytotoxic T cells and B cells (1). Limiting the immune system's ability to control a live virus vaccine and could affect the health of a HIV / AIDS patient (1).

3 marks

g It existed in a monkey population (1). Close contact between humans and monkeys allowed the virus to pass from monkeys to humans (1). The virus mutated to live more easily in humans (1).

3 marks

h Any two of the following for 1 mark each:

vaccination, awareness for diagnosis, isolation / physical distancing (not masks)

2 marks

- i** Most people are vaccinated against the disease (1). High vaccination rates reduce the number of susceptible hosts (1). High vaccination rates reduce the chance of the virus spreading (1).

3 marks

Total Question 4: 24 marks**Question 5**

- a** Kangaroo Island 1 mark
- b** The other populations have no gene flow from outside (1) and therefore they contain an inbred population (1). Kangaroo Island has a mixture of genetic populations from Tasmania and Victoria (1). 3 marks
- c** The population was isolated from other populations at least 10 000 years ago (1). This restricted gene flow (1). Mutations accumulate (1) making them genetically distinct. 3 marks
- d** Limited genetic diversity means all organisms are vulnerable to the same genetic diseases or predators (1). This can lead to the whole population becoming extinct (1). 2 marks
- e** Allopatric speciation involves the formation of a new species due to isolation through a permanent barrier (1). The platypuses from different populations were able to reproduce on Kangaroo Island (1). They are not different species. 2 marks
- f** opossum OR other mammals 1 mark
- g** any 2 of the following for 1 mark each: hair, feed young milk, maintain constant body temperature, any other identifying characteristic unique to all mammals. 2 marks
- NOTE: if the characteristic is unique to primates and **not** other mammals – no mark.

Total Question 5: 14 marks**Question 6**

- a** The two species shared a recent common ancestor 1 million years ago. 1 mark
- b** *Homo erectus* (1)
Homo sapiens (1) 2 marks
- c** Any of the following for 1 mark: dated cave paintings, fossils, genetic clock, optically stimulated luminescence 1 mark
- d** Radiocarbon dating: test the proportion of ^{14}C present in the sample (1). Use the known half-life to determine how much time has passed since the animal was alive (1). 2 marks
- e** Bone is more likely to decompose or be disturbed by scavengers than other artifacts. 1 mark

Total Question 6: 7 marks**Question 7**

- a** Consequence based approach (1). The consequence of the actions (gain new information, restore ecosystems) outweighs the potential drawback of how it may impact the environment (1). 2 marks
- b** The company must accurately report the success and failure of all trials to create a woolly mammoth / elephant hybrid. 1 mark
- c** political: any of the following for 1 mark
Does the habitat cross international borders?
Who is responsible for the monitoring the population?
Do any laws exist for the creation of hybrid species?
Or any other suitable response.
economical: any of the following for 1 mark
Who owns the genome – can they sell it?
Will people lose their homes as habitat is required for the mammoths?
Could the money be better spent?
Or any other suitable response. 2 marks
- d** Amino acid sequence as silent mutations will not have an effect on the proteins produced. 1 mark
- e** CRISPR Cas9 allows for sgDNA to be created that can cut at any sequence (1) whereas endonucleases have specific recognition sequences (1). 2 marks

- f** *Any of the following for 1 mark:*
Do not allow humans to live in areas with direct contact with woolly mammoth hybrid
OR wash hands / sanitise following contact with animal
OR any other suitable response.

1 mark

Total Question 7: 9 marks

Total Section B: 80 marks

Total Trial Examination: 120 marks

END OF SUGGESTED SOLUTIONS