SCIENCE TEACHERS ASSOCIATION VICTORIA 2023

TRIAL EXAMINATION

SOLUTIONS BOOK

BIOLOGY

UNIT 3

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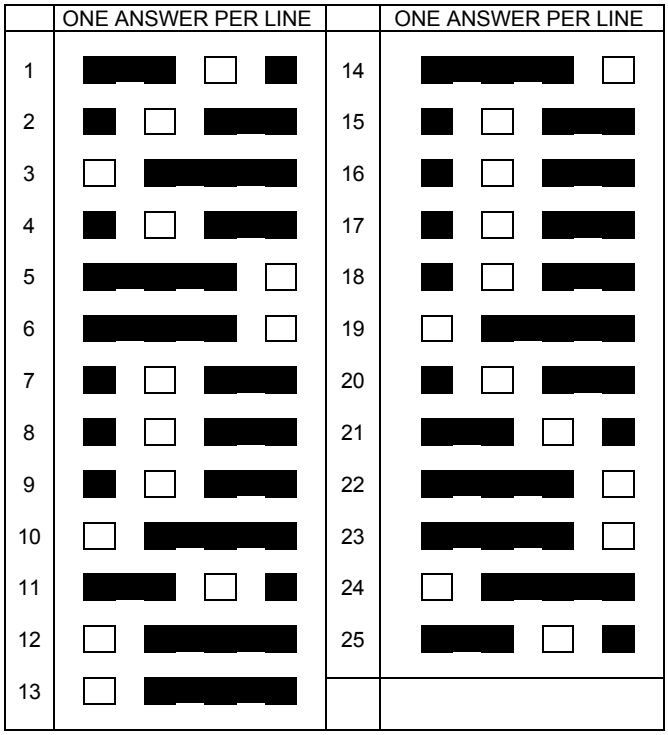
Use this page as an overlay for marking the multiple choice answer sheets. Simply photocopy the page onto an overhead projector sheet. The correct answers are open boxes below. Students should have shaded their answers. Therefore, any open box with shading inside it is correct and scores 1 mark.



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: 25 marks)

1	*C*	**14**	*D*
2	*B*	**15**	*B*
3	*A*	**16**	*B*
4	*B*	**17**	*B*
5	*D*	**18**	*B*
6	*D*	**19**	*A*
7	*B*	**20**	*B*
8	*B*	**21**	*C*
9	*B*	**22**	*D*
10	*A*	**23**	*D*
11	*C*	**24**	*A*
12	*A*	**25**	*C*
13	*A*		

SECTION B

Question 1

a *The top strand contains introns and exons (1) whereas the bottom strand contains only exons, as they are the coding regions (1).* *2 marks*

b *Addition of a methyl cap / guanine cap to the 5' end (1) and a poly A tail to the 3' end (1). This is to protect the strand from degradation by enzymes when it leaves the nucleus (1).* *3 marks*

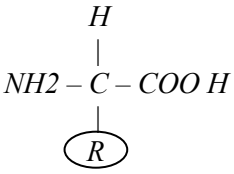
c Any two of:
Prokaryotes do not undergo RNA processing whereas eukaryotes do (1).
Prokaryotes do not have introns whereas eukaryotes do (1).
Prokaryotes undergo transcription and translation at the same time whereas eukaryotes undergo transcription, then translation (1). *2 marks*

d *tRNA (1) carries the specific amino acid / contains an anticodon complementary to the codon on mRNA (1).*
rRNA (1) forms part of the structural component of the ribosome (1). *4 marks*

Total Question 1: 11 marks

Question 2

a



correct chemical composition (1), identification of R group (1) *2 marks*

b *The repressor gene always produces the repressor protein (1) which is always activated by Trp binding to it allowing it to bind to the operator region, preventing transcription from occurring (1).* *2 marks*

c *The same endonuclease is used to cut the plasmid and the insulin gene, creating sticky ends (1). This enables complementary base pairing to bond the nucleotides (1) with DNA ligase added to restore the phosphodiester bonds in the sugar-phosphate backbone (1).* *3 marks*

Total Question 2: 7 marks

Question 3

a *C4* *1 mark*

b *In C4 plants, PEP carboxylase is the initial enzyme; whereas in C3 plants, Rubisco is the enzyme responsible for carbon fixation.* *1 mark*

c *Isolate the gene of interest (1). Create an sgRNA target strand (1) and introduce into the Cas9 enzyme complex (1). Cas9 targets and binds to the PAM site and unzips the double stranded DNA (1). sgRNA binds – Cas9 moves 3 nucleotides upstream and cleaves the double strands, allowing the new genetic information to be inserted into the original DNA sequence (1).* *5 marks*

d Any two of:
Beneficence (1) – do more people benefit from the GMO crop? (1)
Respect (1) – are organisms in the ecosystem affected by GMO crops also being considered? (1)
Non-maleficence (1) – has potential harm been considered and minimized? (1)
Integrity (1) – is the data on GMO crops being accurately reported? (1)
Justice (1) – do all people have equal access to the technology? (1)
(Justifications may vary) *4 marks*

Total Question 3: 11 marks

Question 4

a *An enzyme that cleaves the phosphodiester bonds in DNA at a specific recognition sequence.* *1 mark*

b *8* *1 mark*

c *Blunt ends (no mark) as sticky ends may allow for the hydrogen bonds between the complementary base pairs to reform (1) causing fewer bands on the gel / less reliable results (1).* *2 marks*

d *XhoI and EcoRI would produce fragments of the size 5.5, 0.75 and 9.15 kbp (1). Ladder A has a fragment of 10 bp which is the largest, whereas the next largest fragment is in ladder B (1).*
(Note – the plasmid has kbp, whereas the standard ladders have bp) *2 marks*

e *A highly viscous gel would slow the fragments and they would be closer to the negative terminal / wells (1). A less viscous gel would allow the fragments to travel further, they would be closer to the positive terminal / further from the well (1).* *2 marks*

Total Question 4: 8 marks

Question 5

a *Lignocellulosic biomass has stored energy of glucose polymers (1) whereas biodiesel uses lipids as the initial energy source (1).* *2 marks*

b Any one of:
both contain energy stored in bonds (1)
second generation biofuels are more abundant than first generation biofuels (1)
first generation biofuel is usually made from food biomass, second generation is not (1)
or any other suitable comparison *1 mark*

c Any one of:
Integrity (1) – honest reporting of bioethanol production (1)
Justice (1) – fair access to land to grow crops/ethanol produced from crops (1)
Beneficence (1) – is land being used to grow biomass being taken from people/encroaching on natural habitats and ecosystems? (1)
Non-maleficence (1) – how are the ecosystems being balanced with monoculture? (1)
Respect (1) – consideration of the traditional owners of the land being used to produce biomass (1)
(Justifications may vary) *2 marks*

Total Question 5: 5 marks

Question 6

a *The rate would be lower than the yeast exposed to the pH of 4 (1) as the enzymes may have denatured, therefore the substrate and active site are no longer complementary (1).* *2 marks*

b Any one of:
No volume of yeast / solutions provided (1) – use a set volume (1).
No mention of initial rate of CO_2 being measured (1) – measure initial CO_2 (1).
Only one trial (1) – complete at least 2 additional trials (1).
No control (1) – have a solution not exposed to any pH treatment (1).
Or any other suitable limitation and improvement. *2 marks*

c *The control would be a yeast & glucose solution, not exposed to a pH treatment (1).*
As the solution was heated the enzymes have denatured (1). When cooled again, the Enzyme's active site has still undergone a conformational change in shape (1) and the reaction would be minimal (1). *4 marks*

Total Question 6: 8 marks

END OF SUGGESTED SOLUTIONS