

TRIAL EXAMINATION

SOLUTIONS BOOK

BIOLOGY

UNITS 3 & 4



Published by STAV
© STAV August 2024

STAV House, 5 Munro Street,
Coburg VIC 3058 Australia

PHONE: 61 + 3 9385 3999
EMAIL: admin@stav.vic.edu.au
ABN: 59 004 145 329

All rights reserved. Except under the conditions described in the Copyright Act 1968 of Australia and subsequent amendments, no part of this publication may be reprinted, reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any other information storage or retrieval system, without permission in writing from the publisher.

stav.org.au

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.*

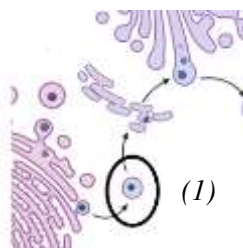
SECTION A – Multiple-choice questions (40 marks)

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

SECTION B (80 marks)**Question 1 (7 marks)**

- a. *Organelle A – rough endoplasmic reticulum (RER not accepted) – site of protein synthesis and / or folding of protein (1).
Organelle B – Golgi complex / bodies / apparatus – site of further modification and preparation for export of the protein from the cell (1).* 2 marks

b.



1 mark

- c. *Prokaryotic cells: can use repression (1) where a repressor protein binds to the operator region, preventing transcription from occurring (1). OR Use attenuation (1) where a terminator hairpin loop forms after transcribing the leader region (1).*

Eukaryotic cells: transcription factors can bind to the operator region (1) preventing RNA polymerase from binding to the promoter region (1). OR RNA processing does not occur (1) preventing the formation of mature mRNA that can leave the nucleus (1).

4 marks

Question 2 (4 marks)

- a. *Following the injection of the viral DNA, the Cas enzyme cuts a segment of the T4 genome (1) and stores it as a spacer in the crDNA (1).* 2 marks
- b. *If Cas9 only cuts one strand, the second strand would be able to act as a template (1) and the viral genome would then be able to produce viral proteins (1).* 2 marks

Question 3 (10 marks)

- a. *C3 – Rubisco, C4 – PEP carboxylase* 1 mark
- b. *At 10°C, C3 plants are more efficient as temperatures are lower and the C3 pathway is faster than C4 (1). At 35°C, C3 plants are prone to photorespiration (1), where oxygen binds to Rubisco – slowing the rate of photosynthesis (1). C4 plants convert CO₂ into malate and undergo the Calvin cycle in the bundle sheath, making photosynthesis at higher temperatures more efficient (1).* 4 marks
- c. *When water is abundant, CAM plants revert to the C3 pathway (1). As the C3 pathway is more efficient than the CAM pathway, the rate of photosynthesis would increase (1).* 2 marks
- d. *Co-enzymes unload their H⁺ / protons which move through the inner membrane and accumulate in the inter-membrane space (1). The concentration gradient moves H⁺ / protons through ATP synthase, making it spin (1). The kinetic energy converts ADP + Pi into ATP (1).* 3 marks

Question 4 (8 marks)

- a. *To act as a baseline / control to show that the drug caused the reduction in symptoms, not another factor.* 1 mark
- b. *Release of histamine from mast cells (1) causes capillaries to become leaky / more permeable (1). The increased volume of fluid causes swelling in the area which presses against the nerves, causing pain (1).* 3 marks
- c. *The low pH of the stomach could destroy the bacteria before it was able to cause an inflammatory response (1). An injection allows the bacteria to directly enter the bloodstream and elicit a response (1).* 2 marks
- d. *Non maleficence (1): intentionally infecting people with bacteria (1).* 2 marks

Question 5 (12 marks)

- a. *An epidemic is a localized outbreak of a disease whereas a pandemic spreads across multiple regions of the world.* 1 mark
- b. (i) *interferon* 1 mark
- (ii) *Any two of the following
reduce permeability (1)
induce apoptosis (1)
stop protein synthesis (1)
OR any other suitable response* 2 marks

- c.** *Antigen presenting cell (APC) would engulf and digest the antigen and present antigenic fragment on MHCII to the T helper cell (1).
The T helper cell binds to APC and releases cytokines to activate naïve B cell (1).
Naïve B cell undergoes clonal expansion, rapidly differentiating into B plasma and Memory cells (1).
B plasma cells release free antibodies to agglutinate the pathogen (1).
Memory cells continue to circulate for a stronger and faster response upon reinfection (1).* 5 marks
- d.** Any one of the following:
*isolate people that are unwell (1)
wear face masks / PPE (1)
socially distance (1)*
OR any other suitable response 1 mark
- e.** *The body identifies the mouse proteins as non-self, stimulating an adaptive immune response (1). Memory cells rapidly differentiate into plasma cells upon the second exposure, reducing the efficacy of the treatment (1).* 2 marks

Question 6 (8 marks)

- a.** Any correct data points can be used to support the trend, for example:
*In 2005, approximately 2% of the population was resistant to antibiotics (1) against ESCR-E. coli (pink line on the diagram).
In 2023, there is now 13% of the population resistant to antibiotics (1).* 2 marks
- b.** *Natural selection (1). Variation existed in the ESCR-E. coli population, with some bacteria susceptible to antibiotics, some were resistant (1). When exposed to antibiotics, resistant bacteria could survive and reproduce (1) whereas those susceptible died (1). Overtime, the resistant bacteria became the prevalent phenotype in the population and when exposed to antibiotics, can survive (1).* 5 marks
- c.** *Bacteria lack hard parts that can fossilize.* 1 mark

Question 7 (13 marks)

- a.** *Scientists measured the amount of C14 in the fossil and compared it to the ratio of C12 (1). The time it takes for half of the C14 to decay is 5730 years (1). The number of half-lives completed are multiplied by 5730 to determine the absolute age (1).* 3 marks
- b.** *Either DNA or amino acid sequences are compared (1), with a high degree of similarity found between the hair in Juukan Gorge and the modern day PKKP peoples (1).* 2 marks
- c.** *Respect is considering the cultural heritage of the individual and collective (1). Rio Tinto disregarded this as they destroyed ancient artefacts of cultural significance to the PKKP peoples (1).* 2 marks
- d.** *Country is an area traditionally owned and looked after by an Aboriginal group (1). As Rio Tinto destroyed the Gorge and its contents, this area was not preserved (1) and as such, the connection is now more spiritual than physical (1).* 3 marks
- e.** *Songlines trace the journey of ancestors of Aboriginal peoples (1). The destruction of the Gorge removed an area that would be referred to as it held cultural importance (1). Songlines would need to be modified / altered, potentially preventing future generations from learning about their ancestors (1).* 3 marks

Question 8 (9 marks)

- a. *sympatric* 1 mark
- b. *Pre-zygotic barriers (1), as the birds can breed together successfully / are genetically very similar (1). Differences in plumage and song prevent interbreeding from occurring (1).* 3 marks
- c. *Similar morphology can be due to similar selection pressures (1). Genetic analysis provides stronger evidence as it is transferred between generations and is independent of environmental conditions (1).* 2 marks
- d. Any three of the following:
do not give birth to live young (1)
are not covered in fur / hair (1)
do not produce milk / have mammary glands (1)
do not have three inner ear bones (1)
OR *any other suitable characteristic that they lack* 3 marks

Question 9 (9 marks)

- a. *Anaerobic respiration / fermentation (1); producing ethanol, carbon dioxide and ATP (1)* 2 marks
- b. *Yes (no mark) as there is only one IV (type of apple) (1) with all other factors being controlled (1).* 2 marks
- c. *Gala at 20 mins (1) OR Gala at 30 mins (1).*
Personal error (human error not accepted) (1).
Repeating the experiment should eliminate the effect of the error (1). 3 marks
- d. *Student 2 is correct (no mark).*
The data is continuous; therefore, a line graph is most suitable (1).
Discrete / categorically data is displayed in bar graphs – despite the apples being discrete, the measurements are of the change in CO₂ concentration (1). 2 marks

END OF SUGGESTED SOLUTIONS