

BIOLOGY

Units 3 & 4

Trial Examination

SOLUTIONS BOOK

Published by STAV Publishing. STAV House, 5 Munro Street, Coburg VIC 3058 Australia.

Phone: 61 + 3 9385 3999 • Fax: 61 + 3 9386 6722 • Email: stav@stav.vic.edu.au Website: <http://www.sciencevictoria.com.au/stavpublishing/>

© STAV Publishing June 2018

ABN 61 527 110 823

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.

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

TEACHERS, PLEASE NOTE:

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

SECTION B – Short Answer Questions**Question 1**

- a The phospholipid molecules have hydrophilic heads and hydrophobic tails (1).
The phospholipids organise themselves in a bilayer to enclose their hydrophobic tails and expose their hydrophilic heads to a watery environment on the outside and the inside of the cell (1). 2 marks
- b Protein channel. 1 mark
- c The function of X is to allow the movement of water and small polar molecules across the membrane. 1 mark
- d The protein structure extends across the cell membrane between the external environment and the internal environment (1). The channel has a hydrophilic passage made up of hydrophilic amino acids that help in the transfer of polar molecules (1). The channel has a hydrophobic outer layer of amino acids that enables the channel to be attracted to the hydrophobic tails of the phospholipid bilayer (1). 3 marks
- e Molecule X, being protein, is synthesised at the ribosomes (1) on the endoplasmic reticulum. It moves from there to the golgi apparatus, from there to the cell membrane (1). 2 marks
- f The general trend is the higher the ethanol concentration the higher the absorbance indicating the more leakage of the pigment out of the cells. 1 mark
- g Temperature 1 mark
- h If the temperature was not kept constant for the different concentrations of ethanol it can affect the permeability of the cell membrane (1). As the temperature increases the phospholipid molecules have more kinetic energy and move faster leaving gaps in the membrane so the beetroot pigment can move through it (1). 2 marks

Total Question 1: 13 marks

Question 2

- a Cytokines. 1 mark
- b Cytokines are chemical messengers that can stimulate cell movement to sites of inflammation and infection. 1 mark
- c The second line of defence. 1 mark
- d TNF is a protein and not hydrophobic so it is not able to enter the cell and therefore its receptor will be on the surface of the cell membrane. 1 mark
- e The binding of TNF triggers two different receptors to activate different signal transduction pathways resulting in different outcomes. 1 mark
- f Apoptosis. 1 mark
- g Monoclonal antibodies are specially designed antibodies that bind to the same part of a specific antigen. 1 mark
- h Monoclonal antibodies, by specifically targeting the TNF molecule and binding to it, will prevent the TNF from bringing about the inflammatory response (1). The inflammatory response leads to the autoimmune disease of rheumatoid arthritis so the use of monoclonal antibodies will alleviate the symptoms of rheumatoid arthritis (1). 2 marks

Total Question 2: 9 marks**Question 3**

- a The membranes of the chloroplast provide a large surface area for light absorption. 1 mark
- b NADPH is a reduced hydrogen carrier molecule and is needed in the light-independent reaction for the reduction of CO₂ (1).
ATP provides the energy in the light-independent reaction for the formation of glucose from CO₂ (1). 2 marks
- c If the electron transport chain is blocked ATP and NADPH will not form (1) as shown in the diagram and won't be available for the light-independent reaction. As a result, the weed will not be able to produce glucose for respiration and will die (1). 2 marks

Total Question 3: 5 marks**Question 4**

- a By immunising both girls and boys a reservoir for the virus is reduced and so is its subsequent spread and incidence of infection. 1 mark
- b The antigen from the vaccine is taken up by antigen presenting cells (1).
Specific T helper cells detect the antigen on the antigen presenting cells and activate specific B cells (1).
B cells differentiate into plasma cells that produce antibodies (1).
B cells form B memory cells that can be activated in future contact with the virus thereby giving lasting immunity (1). 4 marks
- c The evidence from the graph shows that there is a higher level of antibodies reached after a two dose course than a three dose course. 1 mark
- d B memory cells require 4 – 6 months to mature and differentiate so 6 months between the two doses allows the B memory cells to be activated giving lasting immunity. 1 mark

Total Question 4: 7 marks**Question 5**

- a A predictive genetic test is a test on an individual to detect genetic diseases that appear after birth or later on in life. 1 mark
- b The rights of the father not to know his genetic status as this will automatically be apparent if the foetus tests positive (1).
The right of the unborn child not to inherit HD and be burdened with this disease in later life (1).
The right of the mother to be informed of the genetic status of her unborn child and her partner (1). 3 marks

Total Question 5: 4 marks

Question 6

- a Convergent evolution. 1 mark
- b The disappearance of the thylacine and the devil coincided with the arrival of the dingo in mainland Australia (1).
The thylacine survived in Tasmania until very recent times and the devil still survives there but the dingo never occupied Tasmania (1). 2 marks
- c The hunting strategies of the Australian aborigines became more elaborate and efficient (1).
The aboriginal people became less nomadic and their population more than trebled before the arrival of Europeans (1). 2 marks
- d With increasing population and better hunting skills the Australian aborigines were better able to hunt the prey of the thylacine and the devil (1). This would reduce the number of prey available and would lead to a decline in the thylacine and devil numbers to the point of extinction leaving the dingo to become the top predator (1). 2 marks

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

- a With artificial selection humans select the traits that they desire whereas natural selection is the selection of traits due to selection pressures in the natural environment resulting in organisms best able to survive and reproduce in that environment. 1 mark
- b The strong selection by humans for desired traits has probably eliminated undesirable alleles leaving the species with less genetic diversity than those found in the wild. 1 mark
- c These harmful genes could be inherited with the selected genes because they are linked on the same chromosome (1) or the selected gene may influence different phenotypes in different tissues of the same organism (1). 2 marks

Total Question 7: 4 marks**Question 8**

- a genus *Australopithecus* (1) and genus *Paranthropus* (1). 2 marks
- b That *Homo sapiens* could have migrated out of Africa earlier than currently believed. 1 mark
- c (Any one of the following for one mark)
- Cranium lacks a pronounced occipital bun or protrusion in the back of the skull.
 - Reduced brow ridge.
 - Skull has a short base and high brain case.
 - More vertical face.
 - Limb bones are thinner and less robust. 1 mark
- d Only having part of a jaw and teeth and no other skeletal remains is not enough as other *Homo* species have shown mixtures of modern and archaic traits. 1 mark

Total Question 8: 5 marks**Question 9**

- a C T T A A G
 ↑ 1 mark
- b In order to form complementary sticky ends so that the DNA pieces will stick together they need to be cut with the same restriction enzyme. 1 mark
- c DNA ligase 1 mark
- d Bacteria after treatment are plated on a medium that contains both ampicillin and Xgal (1).
Bacteria that have taken up a plasmid will be able to grow as they have the ampicillin resistant gene (1).
Colonies that are blue can produce β galactosidase but they do not contain the foreign DNA (1).
White colonies are not able to produce β galactosidase to break down Xgal to a blue colour so they must contain the foreign DNA as it is inserted within the LacZ gene thus preventing production of β galactosidase (1). 4 marks
- e One use of recombinant bacterial plasmids is to use them to carry a gene into bacteria. These bacteria will express this gene and produce the protein of interest. 1 mark

Total Question 9: 8 marks

Question 10

a (All of the following correct for 2 marks, any two correct for 1 mark)

alanine → proline

valine → alanine

isoleucine → valine

2 marks

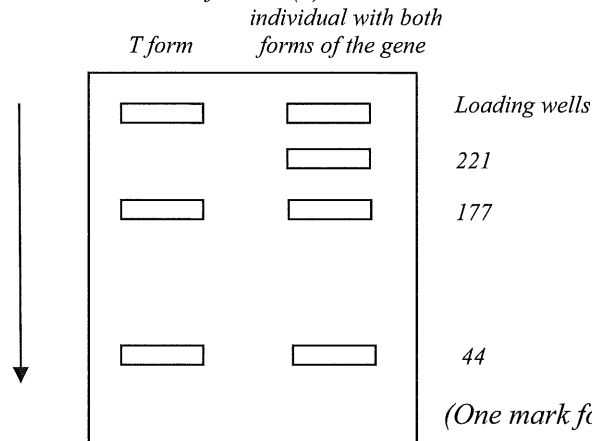
b Polymerase chain reaction.

1 mark

c Primers are short complementary pieces of DNA that define the ends of the DNA to be amplified, in this case the TAS2R38 gene (1). They are needed so that the DNA polymerase can start to add the new strand of DNA (1).

2 marks

d



3 marks

e Possibly similar bitter tasting chemicals exist in nature that could bind to the PTC receptors enabling tasters to be able to detect food that could be toxic (1) therefore this trait would have been selected for. The non-tasters may be able to taste other chemicals that tasters cannot taste and this trait would have also been selected for (1).

2 marks

Total Question 10: 10 marks

Question 11

a Increased exposure to UV light increases the mutation rate in the bacteria *Serratia marcescens*.

1 mark

b Dependent variable: mutation rate (1) (shown by the no. of colonies that changed colour)
Independent variable: length of time of exposure to UV light (1)

2 marks

c As a control to ensure that exposure to UV light did not change the media so that it could bring about changes in the bacteria.

1 mark

d The UV light has a sterilising effect and longer exposure results in more cell deaths.

1 mark

e The unexposed inoculated plate acted as a control. As it only had one colony that changed this demonstrated that this mutation can occur spontaneously in these bacteria (1). The plates that were inoculated after UV light exposure were also controls that demonstrated that the UV light did not alter the media in any way that would cause mutations in the bacteria (1). Therefore, the conclusion is that increased UV light exposure causes an increased rate of mutations in the bacteria *Serratia marcescens* as measured by a change in colony colour (1).

3 marks

Total Question 11: 8 marks

Total Section B: 80 marks

Total Trial examination: 120 marks

END OF SUGGESTED SOLUTIONS

