Neap

Trial Examination 2021

VCE Biology Unit 1

Written Examination

Question and Answer Booklet

Reading time: 15 minutes
Writing time: 1 hour 30 minutes

Student's Name: _____

Teacher's Name: _____

Structure of booklet

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	25	25	25
B	6	6	50
			Total 75

Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.

Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

No calculator is allowed in this examination.

Materials supplied

Question and answer booklet of 20 pages

Answer sheet for multiple-choice questions

Instructions

Write your **name** and your **teacher's name** in the space provided above on this page, and on the answer sheet for multiple-choice questions.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale

All written responses must be in English.

At the end of the examination

Place the answer sheet for multiple-choice questions inside the front cover of this booklet.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – MULTIPLE CHOICE QUESTIONS

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** or that **best answers** the question.
A correct answer scores 1; an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.
Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Question 1

A tetanus bacterium is classified as a prokaryote, as it has

A. a cell wall.
B. many ribosomes.
C. a plasma membrane.
D. no distinct nucleus.

Question 2

Which row correctly compares the structure of a chloroplast with the structure of a mitochondrion?

	Chloroplast	Mitochondrion
A.	double outer membrane	single outer membrane
B.	pigment inside stacked membranes	pigment attached to folded inner membrane
C.	outer-membrane made of phospholipid and cholesterol	outer membrane made of phospholipid and protein
D.	absence of ribosomes	presence of small ribosomes

Use the following information to answer Questions 3 and 4.

Some cells contain membrane-bound compartments in the cell cytosol.

Question 3

The general term for a membrane-bound compartment is

A. cytoplasm.
B. vesicle.
C. lysosome.
D. nucleolus.

Question 4

The advantage of this compartmentalisation in cells is to

A. keep the nucleus isolated from the cytosol.
B. control the exchange of some substances.
C. provide a structural network that helps to support the cell.
D. provide a variety of intracellular environments in the cell.

Question 5

In order to carry out its function as a semi-permeable boundary, the plasma membrane has

A. protein channels to allow large protein molecules to pass in and out of the cell.

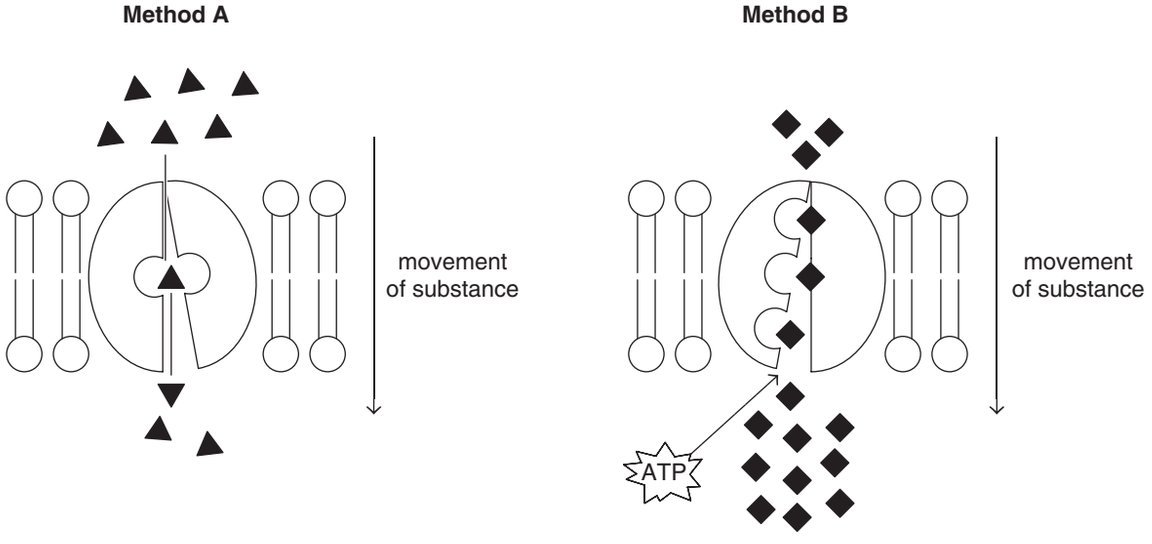
B. a phospholipid bilayer to allow lipid-soluble molecules such as alcohol to pass through.

C. spaces in the phospholipid bilayer that allow small ions to pass through.

D. cholesterol to maintain stability so the membrane does not move around.

Use the following information to answer Questions 6 and 7.

The diagram below shows two methods of movement through the plasma membrane.



Question 6

Which statement about the diagrams above is correct?

A. Both methods A and B require energy.

B. Method A does not require a carrier and method B does require a carrier.

C. Method A involves a substance moving through a protein channel and method B involves a substance moving through the phospholipid bilayer.

D. Method A occurs along the concentration gradient and method B occurs against the concentration gradient.

Question 7

Method B would be used in the

A. absorption of water into the roots of a plant.

B. movement of water vapour out of the leaves of a plant.

C. absorption of glucose from the small intestine.

D. movement of protein hormones out of cells.

Question 8

In the process of photosynthesis,

A. carbon is fixed into a carbohydrate using chemical energy.

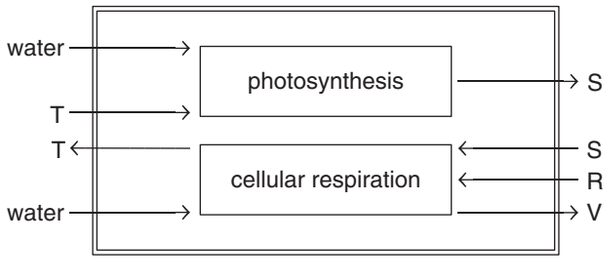
B. oxygen is produced as a waste product, as it is no longer needed by the cell.

C. solar energy is converted into light energy to be used in carbohydrate synthesis.

D. energy is absorbed by chlorophyll and is released as oxygen when the process is complete.

Use the following information to answer Questions 9–11.

The following diagram shows two of the important chemical reactions occurring in a plant cell.



Question 9

Which row gives correct chemical symbols or names for the chemicals in the diagram above?

	R	S	T	V
A.	ATP	CO_2	O_2	ADP
B.	ADP	O_2	CO_2	ATP
C.	ADP	CO_2	O_2	ATP
D.	ATP	O_2	CO_2	ADP

Question 10

This plant cell could be

A. a root hair cell.

B. a xylem vessel cell.

C. a mesophyll leaf cell.

D. an inner stem storage cell.

Question 11

There are many examples of biomimicry, including climbing pads capable of supporting human weight that mimic gecko feet, silent high-speed trains inspired by the streamlined beaks of kingfishers and the technology used in wind turbines that was inspired by the ridges on the fins of humpback whales.

Biomimicry is about

A. harvesting or domesticating products from nature.

B. taking advantage of nature and using it for human benefit.

C. identically copying structures or functions from nature and using them in technology.

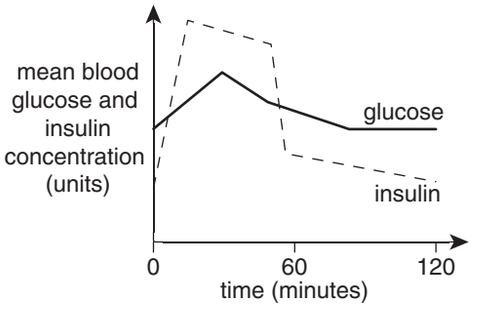
D. valuing nature for what we can learn from it to solve human design challenges.

Question 12

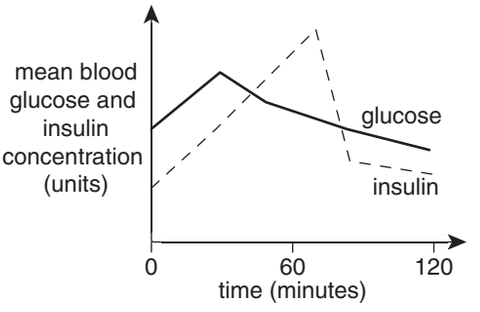
An experiment was carried out to investigate the relationship between the concentrations of glucose and insulin in the blood of healthy people. At the start of the experiment, 20 volunteers drank a syrup containing 50 g of glucose after fasting for 8 hours. The concentrations of glucose and insulin were measured in blood samples at intervals over the next 2 hours.

Which one of the following graphs shows the correct mean results for the volunteers?

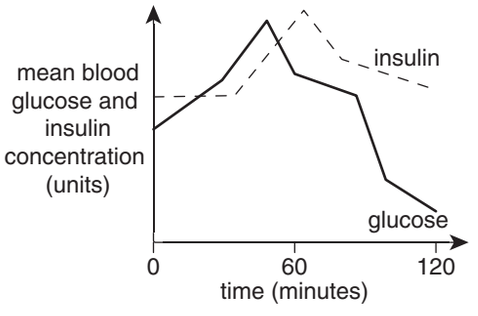
A.



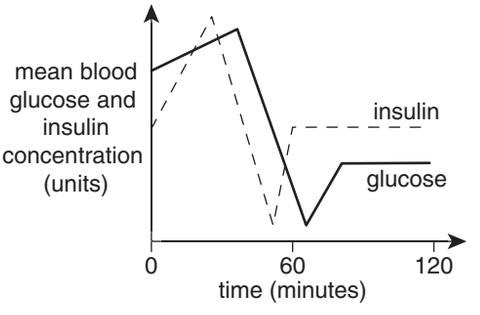
B.



C.



D.



Question 13

The onset of type 1 diabetes occurs most frequently in people under 30 years of age, and about 10–15% of all cases of diabetes are type 1.

Type 1 diabetes results from a malfunction in the

A. kidney, and is caused by excess sugar in the diet.

B. pancreas, and is caused by blockage of the insulin duct.

C. liver, and is caused by the body carrying too much weight.

D. pancreas, and is caused by the breakdown of beta cells.

Question 14

A person with type 1 diabetes produces

A. too little or no insulin.

B. too much glucagon.

C. spasmodic amounts of insulin.

D. high levels of ADH.

Question 15

Symptoms of type 1 diabetes include excessive urination, thirst, hunger and fatigue, with an overly fast heart rate and weight loss also sometimes presenting. These symptoms show that a failure in one body system, such as the endocrine system, may affect the digestive, circulatory and excretory systems.

This is because

A. each body system is a group of organs that work together to perform a certain job.

B. each part of the body has a specific task to carry out.

C. body systems are interdependent and need each other to function.

D. some body systems share a common organ that performs more than one job.

Use the following information to answer Questions 16 and 17.

A group of explorers found a community of organisms in a pond in a completely dark cave.

Question 16

It is most likely that

A. photosynthesis occurs somewhere in the cave.

B. no animals move in and out of the cave.

C. the plants in the pond are green and healthy.

D. food is coming in from outside the cave by some means.

Question 17

The organisms in the pond in the cave are mostly

A. chemosynthetic autotrophs.

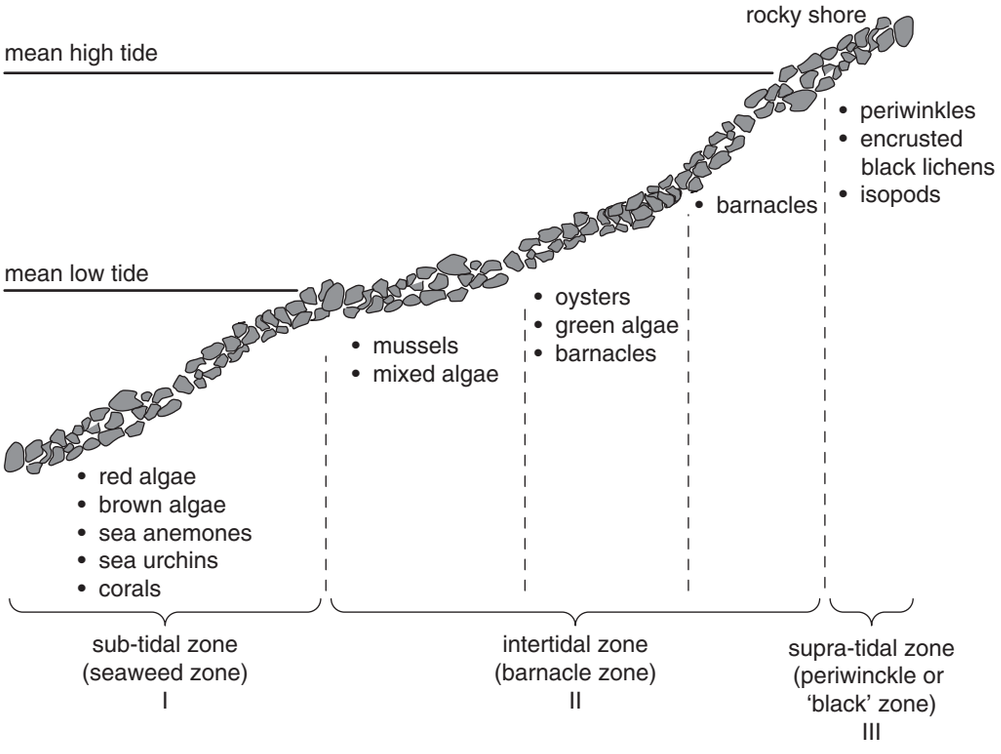
B. photosynthetic autotrophs.

C. heterotrophs.

D. decomposers.

Use the following information to answer Questions 18–20.

The following diagram shows the distribution of organisms on a rocky shore with the mean low tide and high tide marked.



Question 18

This diagram is an illustration of

A. a community.

B. an ecosystem.

C. a population.

D. a biosphere.

Question 19

Organisms in zone II are mainly

A. mobile so that they stay covered with water during tide changes.

B. able to resist dehydration because of hard outer-coverings.

C. adapted to absorb oxygen directly from the air.

D. producers, as they are exposed to sunlight during low tide.

Question 20

The red and brown algae in zone I would not provide food for the barnacles and oysters, as these algae

A. cannot carry out photosynthesis.

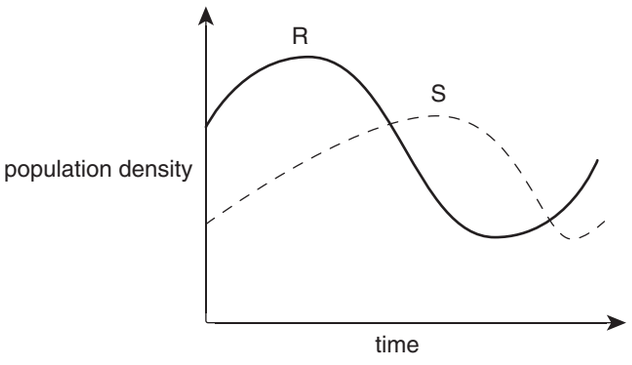
B. are fixed in position and so cannot be reached by the barnacles and oysters.

C. are not located in the intertidal zone.

D. are only available during low tide.

Question 21

The following graph shows the changes in the density of the populations of two different species (R and S) over time.



This graph represents the

A. density of population R being held in check due to predation by population S.

B. density of the two populations changing due to competition between the two species.

C. density of population R suffering from an epidemic of a disease caused by species S.

D. populations of the two species living in a close symbiotic relationship.

Question 22

Which one of the following is an abiotic factor affecting the distribution pattern of a species?

A. pathogen infection

B. interspecific competition

C. chemical environmental conditions

D. predator density

Use the following information to answer Questions 23–25.

Bushfires destroy many plants and, subsequently, food, shelter and breeding sites used by animals. This was seen in the devastation left from the 2019–20 bushfires in Victoria, South Australia and New South Wales. However, in communities subjected to repeated bushfires, many of the species have characteristics that assist them to survive and regenerate from bushfires.

Question 23

Characteristics in plants that assist the species to survive bushfires include

A. smooth shiny bark to reflect the heat.

B. long cylindrical leaves with a reduced surface area to volume ratio.

C. horizontal stems running along the surface of the soil.

D. buds beneath the surface of the bark.

Question 24

Before these bushfires, koalas were already classified as vulnerable, as the species faced major threats.

Which one of the following would **not** be considered one of these threats?

A. habitat loss due to urbanisation

B. competition with wombats

C. motor vehicle accidents

D. infection from bacterial diseases

Question 25

Many koalas have been found to be infected with contagious *Chlamydia* bacteria that can result in death. In early 2019, a large, isolated population of koalas was found on Kangaroo Island that, unlike other populations on the island, were not infected. Unfortunately, a significant proportion of the uninfected population was lost in the fires.

The best way to increase the population of these disease-free koalas would be to

A. transfer some to the mainland and breed them in captivity.

B. breed them with koalas from other populations on the island.

C. leave them in their original burnt-out area so that they can breed naturally.

D. breed a combination of island koala populations with mainland koala populations.

SECTION B

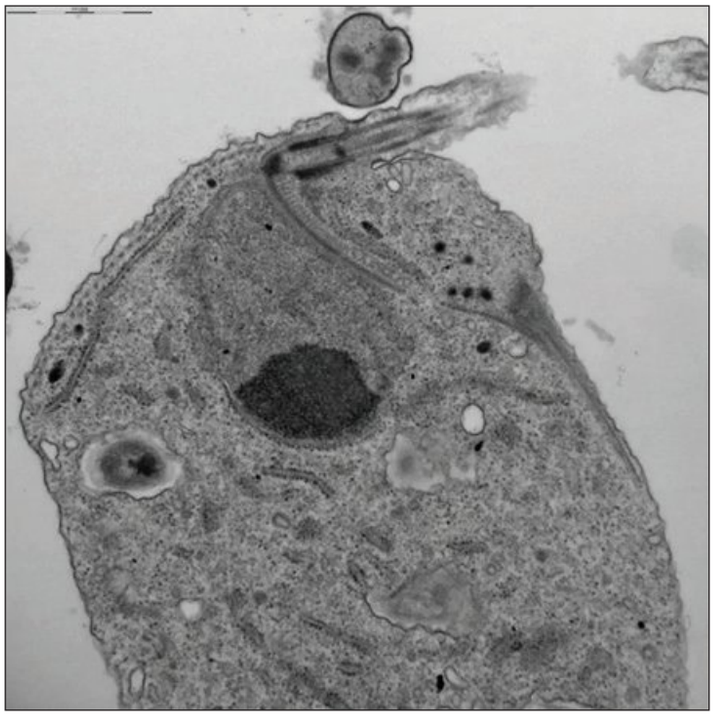
Instructions for Section B

Answer **all** questions in the spaces provided.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (10 marks)

In 2016, it was reported that the evolutionary biologist Anna Karnkowska had found a eukaryotic single-celled organism related to the Giardia parasite that had no mitochondria. It was the first eukaryotic cell to be discovered that lacked a mitochondrion. The cell lives in the gut of a small rodent and is called *Monocercomonoides*. The following image is an electron micrograph of part of the cell.



Source: Reproduced with permission, Dr Naoji Yubuki (2016).

A teacher brought a copy of this electron micrograph into the classroom and showed it to their student Jack. Jack stated that if it has no mitochondria, it must be a prokaryote. The teacher told him to look more closely at the photo, as he may want to reconsider.

a. After further examination, Jack decided to reclassify the organism.

Identify the correct classification of the organism. Justify your response. 2 marks

b. On the image on the previous page, circle and number **two** specific, visible structures that would support your answer to **part a.** Name the chosen structures and outline their function in the table below. 4 marks

Number	Name	Function
I		
II		

Karnkowska and her colleagues searched for mitochondrial presence in several ways other than electron microscopy. They found no trace of the proteins required for mitochondrial functioning and, when they sequenced the organism's genome, there were no genes associated with mitochondria or their functions.

c. **i.** What is the main function of mitochondria? 1 mark

ii. Why were the scientists surprised that the *Monocercomonoides* cells contained no mitochondria? 1 mark

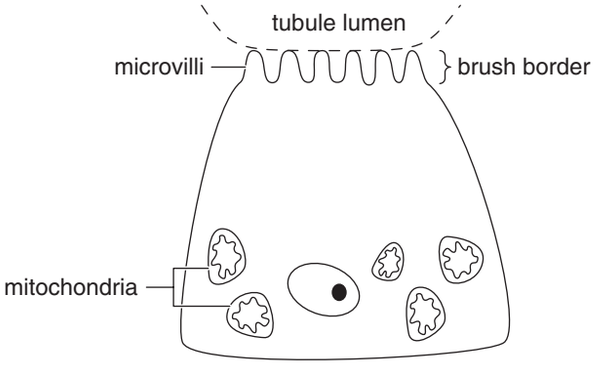
Mitochondria also serve an important function in constructing special iron–sulfur proteins needed to catalyse reactions. To overcome the loss of the mitochondria, the scientists discovered that the *Monocercomonoides* cells swallowed bacteria that had their own mechanism for iron–sulfur protein synthesis, then borrowed their genes for the pathway.

d. **i.** What is this type of relationship called? 1 mark

ii. What type of adaptation is shown by the *Monocercomonoides* cells' use of the bacterial genes? 1 mark

Question 2 (7 marks)

The proximal tubule is a segment of the kidney tubule found in the many tiny filtering units within the kidney called nephrons. The most distinctive feature of this proximal tubule is its 'brush border'. Like the small intestine, the surface facing into the centre of the tube, the lumen, is covered with densely packed microvilli as shown in the following diagram.



The cytoplasm of the cells is densely packed with mitochondria. This area of the tubule reabsorbs many of the essential sodium ions from the lower concentration in the filtrate back into the higher concentration in the blood. Water moves along the water concentration gradient caused by the reabsorption of sodium.

a. i. What type of adaptation are the microvilli of the 'brush border'? 1 mark

ii. In what way are the microvilli beneficial in this region of the kidney tubule? 1 mark

b. i. From the information given, identify how the sodium ions are moving from the lumen of the tubule into the surrounding blood capillaries. 1 mark

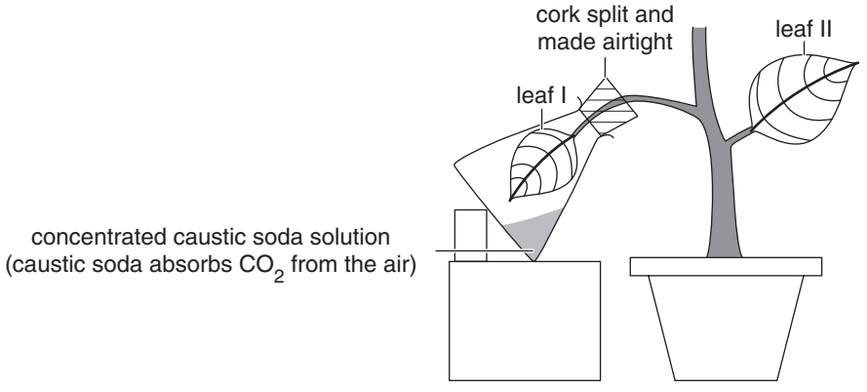
ii. Justify your answer to **part b.i.** using the information given. 2 marks

c. i. From the information given, identify the method by which water is reabsorbed. 1 mark

ii. Is the water reabsorption passive or active? Justify your answer. 1 mark

Question 3 (6 marks)

A group of students set up an experiment. The students first placed a plant in the dark for several days in order to de-starch the leaves. The plant was then placed in bright sunlight for 8 hours with the leaves exposed to the differing conditions shown in the following diagram.



Each of the leaves was then tested for starch using the iodine test. If starch was present, the yellow-brown iodine would turn blue-black; if starch was absent, the iodine would stay yellow-brown.

a. **i.** During the days when the plant was kept in the dark, what process involving energy transformation would have occurred in the leaf cells after the starch had broken down? 1 mark

_____

ii. Suggest the hypothesis the students were testing by setting up this experiment. 1 mark

_____

_____

b. **i.** Kim suggested that, to save time, they only needed to test leaf I. Lee disagreed and said it was essential that they tested both leaf I and leaf II.

Outline why Lee was correct. 1 mark

_____

_____

ii. Identify the dependent variable in this experiment. 1 mark

_____

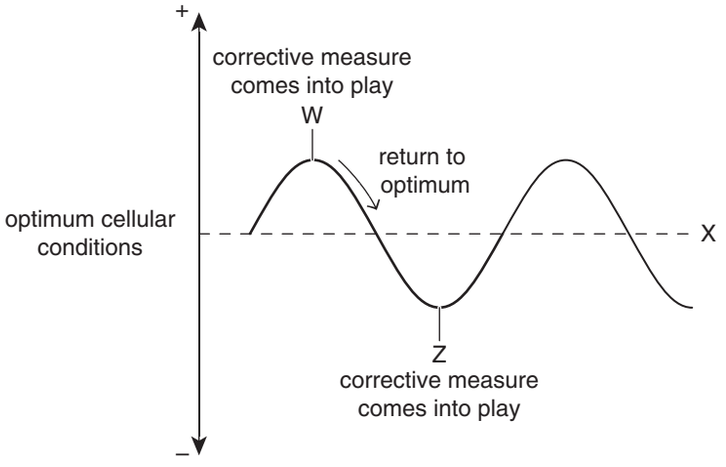
c. **i.** Write a balanced chemical equation for the main process of energy transformation occurring in the experiment. 1 mark

ii. Sujen commented that the process summarised by the equation in **part c.i.** would be the only energy transformation process happening in bright sunlight.

Do you agree? Justify your choice. 1 mark

Question 4 (8 marks)

The following diagram shows the result of a change in an important factor in the human internal environment.



In a Biology class, Casey wrote that one important component of the human internal environment was the contents of the digestive tract, as it provides essential carbohydrates, proteins, lipids and vitamins needed by the cells of the body. Jess disagreed with part of this statement.

a. Identify which student was correct. Justify your response. 1 mark

Assume that the diagram shows thermoregulation in the human body.

b. Which specific part of the body would detect a change in the optimum internal temperature? 1 mark

c. **i.** State **and** explain **one** corrective mechanism that could occur at W. 2 marks

ii. State **and** explain **one** corrective mechanism that could occur at Z. 2 marks

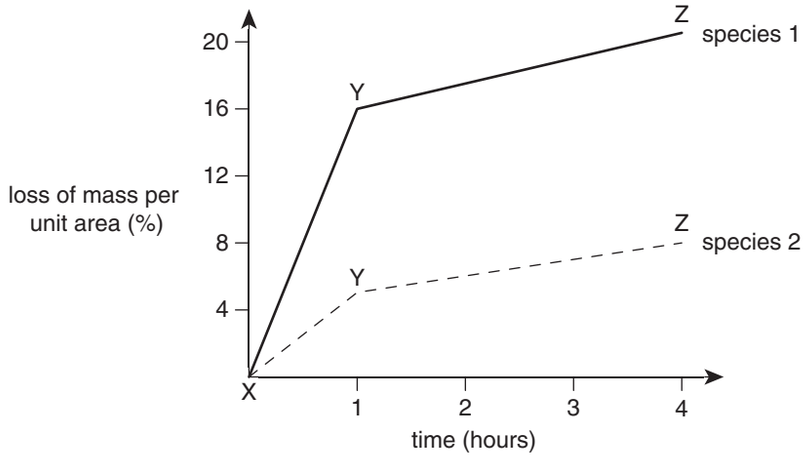
d. The teacher in the Biology class said there was part of the diagram that was not correct and should be modified. The teacher commented that the graph line was too perfect and regular.

On the graph on the previous page, draw a modified graph line to correct the graph. Give **one** reason to support how you have drawn the line. 2 marks

Question 5 (8 marks)

Both plants and animals lose water by different means, and so it is essential that both have mechanisms to regulate and control water loss and gain.

Two different species of plants were used in an investigation into water loss from leaves detached from the plants: *Phaseolus*, which has hairless leaves with a thin cuticle, and *Pelargonium*, which has hairy leaves with a thicker cuticle. The leaves were placed in identical conditions. The change in mass of the detached leaves was measured over several hours and plotted on the following graph.

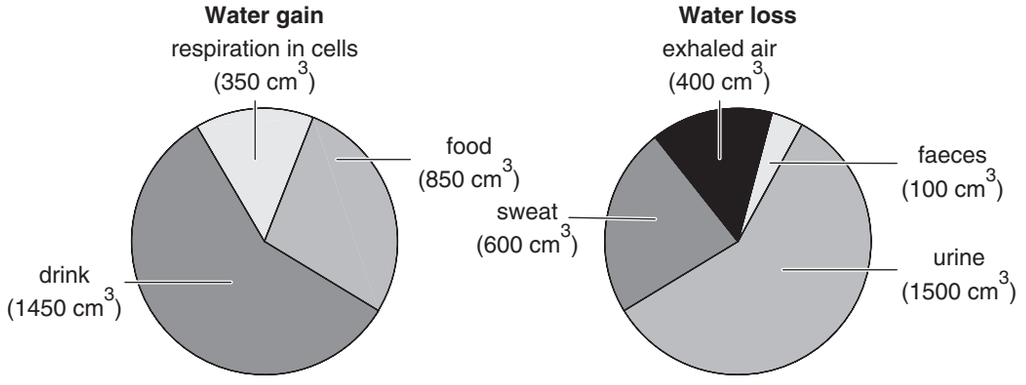


a. **i.** Outline the pathway for the main method of water loss from the leaves. 1 mark

ii. Suggest a reason for the decrease in the rate of mass loss in both plants between points Y and Z. 1 mark

iii. From the graph, determine which species was the *Pelargonium*. Explain your choice. 2 marks

Osmoregulation is the homeostatic control of body water. Humans and many other mammals have mechanisms to balance water intake with water loss. Examine the following pie charts of suggested values for water gain and water loss in a human.



b. A person was playing tennis on a hot dry day and did not stop to have a drink of water during the match.

i. Suggest **one** change that may happen in the water loss pie chart of this person. 1 mark

ii. How would the kidneys of this person be involved in the changes suggested in **part b.i.**? 1 mark

The following data tables show water gain and loss in a kangaroo rat, a desert animal that is nocturnal and stays in a burrow during the day. Little or no water is available for drinking, so the kangaroo rat gains most of its water from the metabolism of dry food, which produces water as a by-product. The data shows that the total water gain is equal to the total water loss.

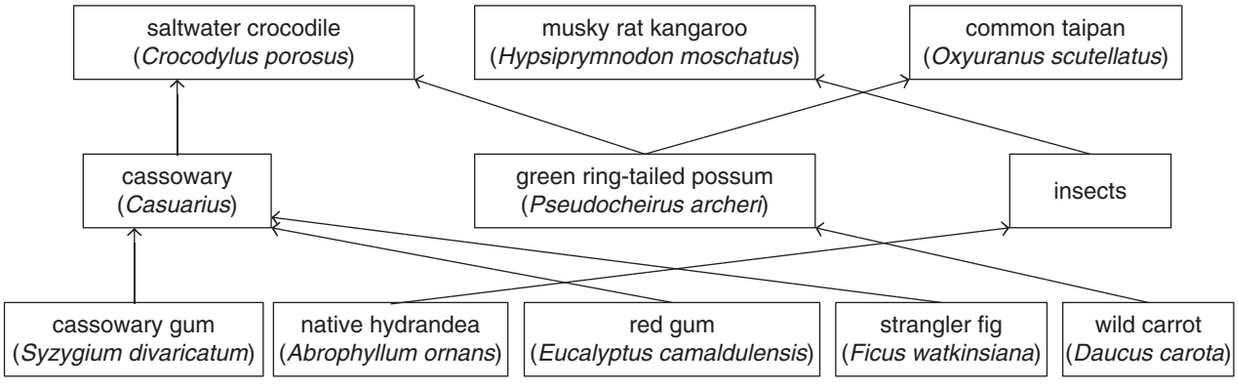
Water gain (cm^3)	
metabolic water	54.0
water in dried food	6.0
total water gain	60.0

Water loss (cm^3)	
urine	13.5
faeces	2.6
evaporation (mainly breath)	43.9
total water loss	60.0

c. Using data from the tables above, explain why water loss for the kangaroo rat is different to a human. 2 marks

Question 6 (11 marks)

The following diagram shows a food web for the Daintree Rainforest in Northern Queensland, giving the common name for the organisms alongside their scientific name under the binomial system of nomenclature.



During the discussion about this food web in a Biology class, some students said the arrows should always point upwards, and others said they should always point towards the organism doing the eating. However, there is a more meaningful way of presenting this information, as light energy is the original source of energy for the food web.

a. **i.** In terms of energy, what do the arrows show in a food web? 1 mark

ii. Suggest a link in the food web above that would place the taipan at the fourth trophic level. 1 mark

Cassowary birds eat parts of the cassowary gum, red gum and strangler fig, and the fruits of many tropical plants. The seeds pass out in the birds' faeces, and are deposited in a pile of dung perfect for germination and distribution over a large area.

b. **i.** What is the relationship between the cassowary and the fruit trees? 1 mark

ii. Outline the impact of relationship on the fruit trees. 1 mark

Although the cassowary is not the top-order consumer, it is considered a keystone species in this food web.

c. **i.** What is the meaning of the term 'keystone species'? 1 mark

ii. Why would cassowaries be considered a keystone species in the Daintree Rainforest? 1 mark

The territories of adult cassowaries can be more than 100 hectares. However, the loss of their habitats due to farming and subdivision of the land into smaller areas for homes is having a major impact on the species.

d. **i.** What impact would the loss of habitat have on the cassowary species? 1 mark

ii. How will the loss of habitat for the cassowary affect the rainforest? 1 mark

Cassowary gums and red gums are both commonly called gum trees. However, their scientific names are completely different from one another. Both gum trees have two words in their scientific name, with the first word being the genus.

e. **i.** What is the second word in a scientific name called? Use the red gum as an example in your answer. 1 mark

ii. If the two types of trees are both called 'gum trees', why do they **not** have the same genus name? 1 mark

iii. Outline **one** of the main benefits of having a scientific naming system such as the binomial system of nomenclature. 1 mark

END OF QUESTION AND ANSWER BOOKLET

Neap

Trial Examination 2021

VCE Biology Unit 1

Written Examination

Multiple-choice Answer Sheet

Student's Name: _____

Teacher's Name: _____

Instructions

Use a **pencil** for **all** entries. If you make a mistake, **erase** the incorrect answer – **do not** cross it out. Marks will **not** be deducted for incorrect answers.
No mark will be given if more than **one** answer is completed for any question.

All answers must be completed like this example: **A** B C D

Use pencil only

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D

14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D