Semester One 2022

Unit One Biology Exam

<insert date and time>

Student Name: _____

Subject Teacher: (please circle) **DJD ACC EWG**

Reading Time: 10 minutes **Writing Time:** 90 minutes

Structure of Booklet:

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	25	25	25
B	8	8	50
			Total 75

Directions to Students:

- 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
- **At the end of the examination p**lace the answer sheet for multiple-choice questions inside the front cover of this book.

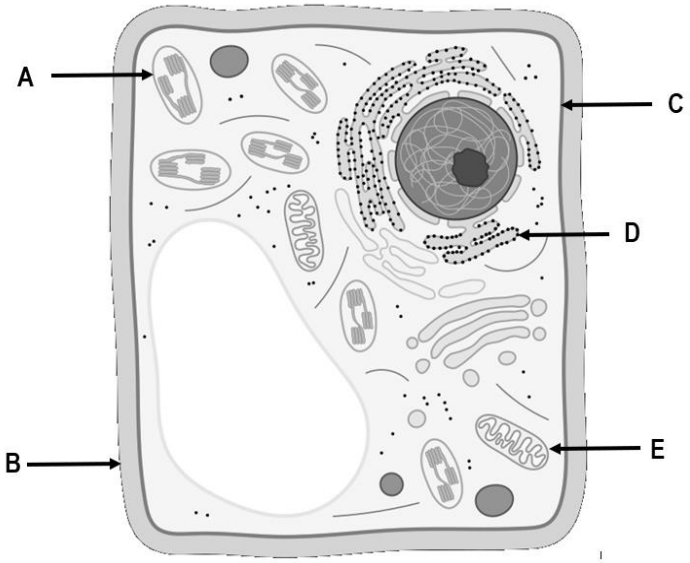
Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

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 book are **not** drawn to scale.

Use the following information to answer Questions 1 - 3.



Source: https://commons.wikimedia.org/w/index.php?title=File:Simple_plant_and_animal_cell.svg&oldid=459718588

Question .
Which of the following structures can be found in both prokaryotic and eukaryotic cells?

A. A
B. E
C. C
D. D

Question .
Which of the following statements about structures A and E is true?

A. structure A is primarily responsible for the conversion of light energy into chemical energy, while structure E is primarily responsible for the synthesis of proteins
B. structure A is primarily responsible for the conversion of light energy into chemical energy, while structure E is primarily responsible for the production of ATP
C. structure A is primarily responsible for the production of ATP, while structure E is primarily responsible for the conversion of light energy into chemical energy
D. structure A is primarily responsible for the storage of materials, which structure E is primarily responsible for the synthesis of proteins

Question .
Identify the name of structure D.

A. rough endoplasmic reticulum
B. golgi apparatus
C. nucleus
D. mitochondria

Question .

Elephant ears are known for being large and thin, however the thickness of their ears changes across their shape. These ears can be described as

A. increasing in surface area to volume ratio as the thickness of the ears increases.
B. decreasing in surface area to volume ratio as the ears become thinner.
C. increasing in surface area to volume ratio as the ears become thinner.
D. maintaining low surface area to volume ratio.

Question .

Which of the following statements is the most accurate regarding the passage of water through the cell membrane?

A. water moves from a low concentration of water to a high concentration of water without the use of energy
B. water primarily uses protein channels to move through the cell membrane
C. water cannot pass directly through the cell membrane
D. water moves from a high concentration of free water to a low concentration of free water without the use of energy

Question .

Which process is used to move glucose from an area of low concentration to an area of high concentration?

A. osmosis
B. diffusion
C. facilitated diffusion
D. active transport

Question .

Which of the following statements regarding hydrophobic and hydrophilic substances is true?

A. hydrophobic substances such as carbon dioxide can passively diffuse across the cell membrane whilst hydrophilic substances such as glucose cannot
B. water is both a hydrophilic and hydrophobic substance which can passively diffuse across the cell membrane
C. hydrophilic substances such as carbon dioxide can passively diffuse across the cell membrane whilst hydrophobic substances such as glucose cannot
D. both hydrophilic and hydrophobic substances require the use of protein channels to move through the membrane

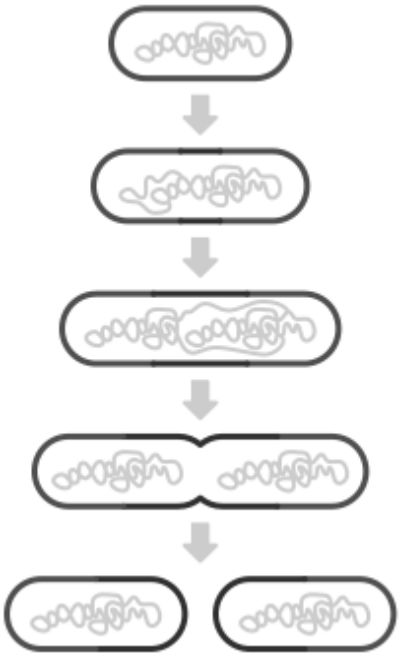
Question .

The cell membrane is made up of a phospholipid bilayer. An individual phospholipid consists of

A. a hydrophilic head and two polar tails.
B. a hydrophobic head and two fatty acid tails.
C. a hydrophilic head and two hydrophobic tails.
D. a fatty acid head and two phosphate tails.

Use the following information to answer Questions 9 and 10.

The diagram below shows a simplified version of the process of reproduction in bacteria such as *Bacillus subtilis.*



Source: https://commons.wikimedia.org/wiki/File:Bacilli_diagram.svg

Question .

The process that is seen in the diagram involves

A. the duplication and even distribution of mitochondria.
B. the replication of DNA to make identical copies.
C. the assortment of linear chromosomes into two cells.
D. the breakdown of the nuclear membrane.

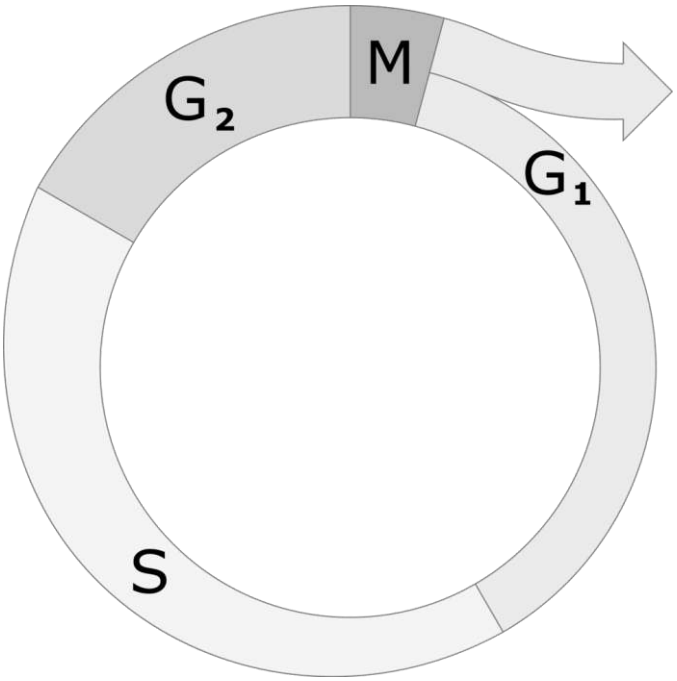
Question .

The process of reproduction in bacteria is known as

A. sexual reproduction.
B. binary fission.
C. cytokinesis.
D. mitosis.

Use the following information to answer Questions 11 and 12.

The diagram below is a simplified depiction of the cell cycle, a controlled system that seeks to ensure no abnormalities in cell reproduction occur.



Source: https://commons.wikimedia.org/wiki/File:Cell_cycle_diagram.svg

Question .

What is occurring during stage S?

A. the replication of organelles such as chloroplasts and mitochondria
B. chromosomes condense and become visible
C. the most significant increase in cell size during the cell cycle
D. the replication of DNA

Question .

What is the correct order of the sub-phases of the stage that is labelled M?

A. telophase, anaphase, metaphase, prophase
B. metaphase, anaphase, prophase, telophase
C. prophase, metaphase, anaphase, telophase
D. prophase, metaphase, telophase, anaphase

Question .

Which of the following is not a reason for a cell to undergo apoptosis?

A. the cell has sustained mitochondrial damage
B. the cell is infected by a virus
C. the cell is needed to perform a function
D. the removal of unnecessary cells

Question .

Which of the following processes occur during apoptosis?

A. the breakdown of the cytoplasm
B. release of cytochrome c from the nucleus
C. cell expansion
D. the plasma membrane releases cell contents

Question .

Without strict regulation, the cell cycle can malfunction and result in cancer. Cancer can form due to

A. insufficient apoptosis.
B. the apoptosis of healthy cells.
C. too much apoptosis.
D. the destruction of apoptotic bodies.

Question .

Stem cells are important for the specialisation and renewal of cells. Which of the following identifies the type of stem cell that can give rise to any cell type in a human body, including placental cells?

A. multipotent stem cells
B. unipotent stem cells
C. pluripotent stem cells
D. totipotent stem cells

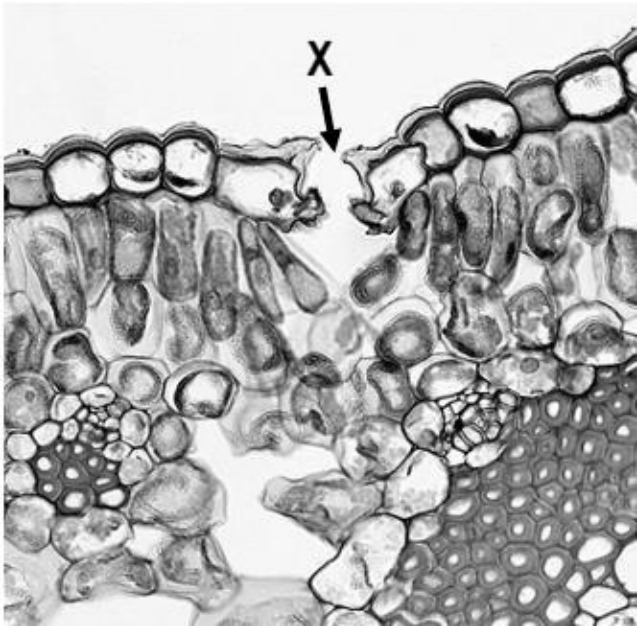
Question .

Vascular plants have specialised structures for the movement, intake and loss of water. Which of the following rows identifies and describes the plant tissue that is responsible for the transport of water?

	Name of tissue	Description
A.	xylem	a system of living cells that are hollow
B.	phloem	a system of living cells comprised of sieve tubes and companion cells
C.	xylem	a system of dead cells that are hollow
D.	phloem	a system of both living and dead cells called companion cells and sieve tubes

Question .

The following image is a cross section of a leaf of the yucca plant, which is typically found in regions of low water.



Source: https://commons.wikimedia.org/wiki/File:Angiosperm_Morphology_Starch_Sheaths_of_Vascular_Bundles_in_Yucca_(37046636601).jpg

The area labelled X is known as a/an

A. spongy mesophyll.
B. waxy cuticle.
C. epidermal layer.
D. stomata.

Question .

Which of following is not an appropriate regulatory action in response to high body temperatures?

A. increased production of sweat
B. vasoconstriction of blood vessels
C. removal of clothing
D. vasodilation of blood vessels

Question .

The regulation of body systems requires multiple structures and feedback loops. When a negative feedback loop is activated

A. the stimulus is increased and the response is increased.
B. the response is to increase the stimulus.
C. a body system may be initiated to counteract the initial stimulus.
D. an effector receives a signal and a receptor responds.

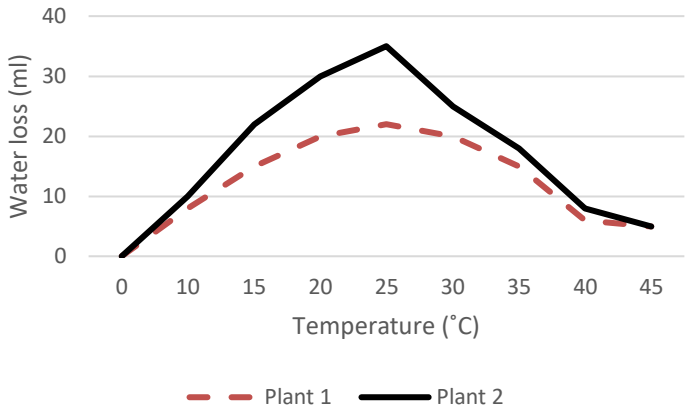
Question 21

Which of the following rows identifies the correct hormone and response caused by the pancreas in the regulation of blood glucose?

	Hormone	Response
A.	insulin	the liver converts glycogen into glucose, increasing blood sugar.
B.	glucagon	the liver converts glucose into glycogen, decreasing blood sugar.
C.	insulin	the liver converts glucose into glycogen, decreasing blood sugar.
D.	glucagon	the liver converts glycogen into glucose, decreasing blood sugar.

Use the following information to answer Questions 22 – 25.

Two biology students, Jeremy and Leila, investigated the water loss of two different plants under changing temperature conditions. Both plants were otherwise kept in the same environmental conditions and given the same amount of water, light and fertiliser. The graph below represents data they collected from their experiment.



Question 22

Which of the following is the dependent variable of this experiment?

A. type of plant
B. temperature (˚C)
C. water loss (ml)
D. environmental conditions

Question 23

Which of the following is a suitable conclusion to make from this experiment?

A. Plant 2 has a lower concentration of water in its tissue, leading to greater water loss
B. both Plant 1 and Plant 2 lose an equal amount of water at 37 ˚C
C. no conclusions can be made about the two plants
D. Plant 1 lost less water at each of the temperatures which were measured, than Plant 2

Question 24

Jeremy and Leila were arguing about the design of their experiment. Jeremy claimed that the experiment lacked validity, whilst Leila claimed the experiment lacked repeatability. Which student has the more correct claim and why?

A. Leila, as the experiment did not include multiple trials
B. Jeremy, as the experiment included multiple trials
C. Leila, because the experiment only measured temperature in ˚C rather than ˚F
D. Jeremy, because the experiment was appropriately controlled

Question 25

When generating data from an investigation, Jeremy and Leila had to choose between gathering qualitative data and quantitative data. Which of the following options may have helped them to choose which type of data to gather?

A. quantitative data is subjective and cannot be easily replicated by others
B. qualitative data is objective, making it easier for others to repeat the experiment and gain the same results
C. qualitative data is subjective, making it the most appropriate way to measure water loss
D. quantitative data is more suitable to measure water loss than qualitative data and it can be used to make objective judgements

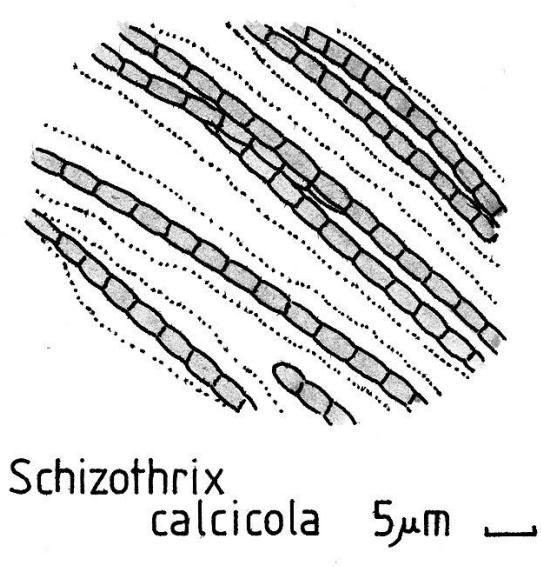
SECTION B

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 (4 marks)

Schizothrix calcicola is an aquatic organism found in pools and streams. A simplified diagram of this organism is provided below.



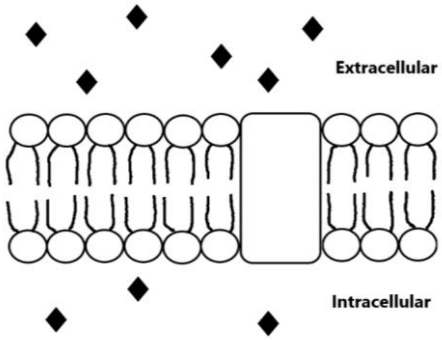
Source: https://upload.wikimedia.org/wikipedia/commons/thumb/a/a8/_Schizothrix_c.jpg

a. Based on the diagram of *Schizothrix calcicola* provided, is this organism eukaryotic or prokaryotic? Justify your response. 2 marks

b. Explain how being small may benefit *Schizothrix calcicola*. 2 marks

Question 2 (9 marks)

The plasma membrane is an important feature of many cells. This diagram shows the plasma membrane of an animal cell surrounded by sodium ions.



a. Which component of the plasma membrane is not shown in the diagram above, yet is important to the fluidity of the membrane? Explain how it functions in hot and cold conditions. 2 marks

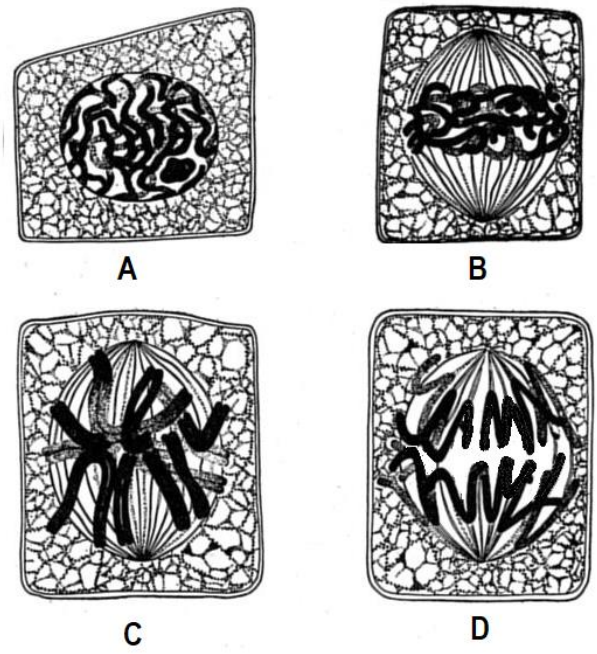
b. Identify and describe the process through which large particles are transported in bulk out of the cell. 2 marks

c. On the diagram of the plasma membrane above, draw the direction of movement of water molecules required to achieve equilibrium. 2 marks

d. Identify and explain the process by which sodium ions would move into the cell in the diagram above. 3 marks

Question 3 (5 marks)

The following diagram shows a plant cell undergoing cell division.



Source: https://commons.wikimedia.org/wiki/File:Critique_of_the_Theory_of_Evolution_Fig_046.jpg

a. What is the function of the type of cell division in the diagram? 1 mark

b. Identify and describe the cell division sub-phase that is occurring in image D. 2 marks

c. Name the feature in these images that can be used to distinguish a plant cell from an animal cell and explain its function in a plant cell. 2 marks

Question 4 (5 marks)

The immune system is a complex system of cells that defend our body against infection. Immune cells recognise foreign cells by markers on their plasma membranes, then release chemicals which cause the foreign cell to undergo apoptosis.

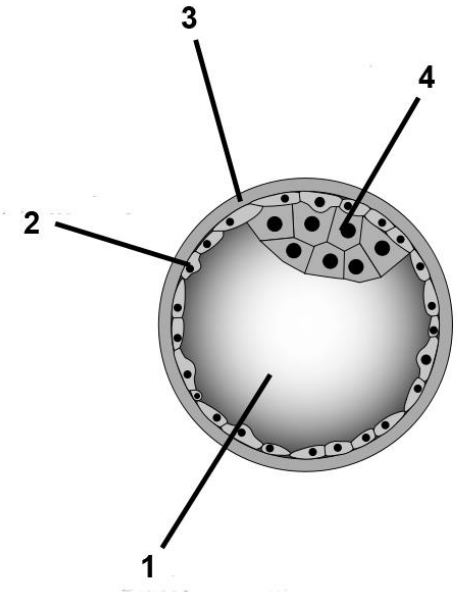
a. Is the information provided an example of the death-receptor pathway or the mitochondrial pathway for apoptosis? Justify your choice. 2 marks

b. Identify two changes that would occur within a cell once it has commenced apoptosis. 2 marks

c. Some mutagens can cause apoptosis to malfunction. Name a mutagen that can cause deviant cell behaviour. 1 mark

Question 5 (5 marks)

The following diagram shows the different sections of a blastocyst.



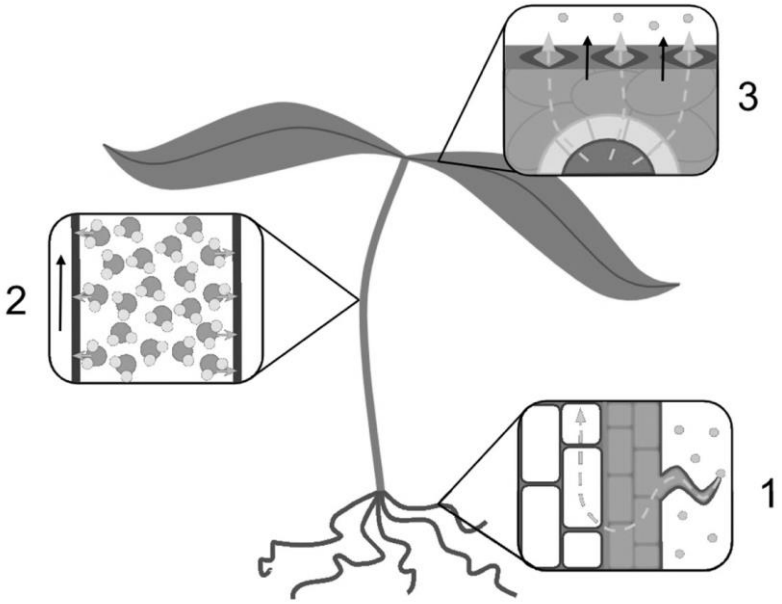
Source: https://commons.wikimedia.org/wiki/File:Blastocyste.png

a. Identify (1, 2, 3, or 4) and name the section of a blastocyst where stem cells are collected, and which will eventually form the embryo. 2 marks

b. Using an example, explain how two properties of embryonic stem cells can be used in the field of medicine. 3 marks

Question 6 (6 marks)

The diagram below shows the process by which water moves into, though, and out of a vascular plant.



Source: https://commons.wikimedia.org/wiki/File:Transpiration_Overview.svg

a. Name, compare and contrast the two processes that assist the movement of molecules in stage 2. 3 marks

bi. Name the overall process occurring in the plant across stages 1 - 3. 1 mark

bii. Describe two ways a plant may regulate water balance. 2 marks

Question 7 (8 marks)
Many animals have specialised systems that perform functions in their body.

a. Identify a specialised structure in the digestive system and describe its function. 2 marks

b. The stimulus response model is an important regulatory mechanism of water balance within the body. Draw a simple stimulus response model that demonstrates the role of the excretory system in response to low water levels within the body. 3 marks

c. Homeostasis is an important regulatory process within the body. Unfortunately, malfunctions in homeostasis do occur. Describe the process of homeostasis, and outline how it may malfunction and result in hyperthyroidism. 3 marks

Question 8 (8 marks)

Radon, specifically the 222Rn isotope and its alpha-emitting progeny, have been shown to be carcinogenic at high doses. This has been confirmed by the observation of increased rates of lung cancer among miners exposed to excessive amounts of radon gas that has become trapped and concentrated in underground mines. Several studies have investigated the relationship between mutations in the TP53 gene, which can cause cancer, and radon exposure.

In one study from Japan, investigators measured blood levels of the p53 protein, a product of the TP53 gene, in residents aged between 40 and 60 living in a district with high radon exposure, versus a control district. Males in the high-exposure district were found to have a mean p53 level that was twice as high as males in the control district.

Source: Thompson R. E. (2010). Epidemiological Evidence for Possible Radiation Hormesis from Radon Exposure: A Case-Control Study Conducted in Worcester, MA. Dose-response : a publication of International Hormesis Society, 9(1), 59–75. https://doi.org/10.2203/dose-response.10-026.Thompson

a. Write a hypothesis that may have been used for this investigation. 1 mark

_____

_____

b. Identify the independent variable for this investigation. 1 mark

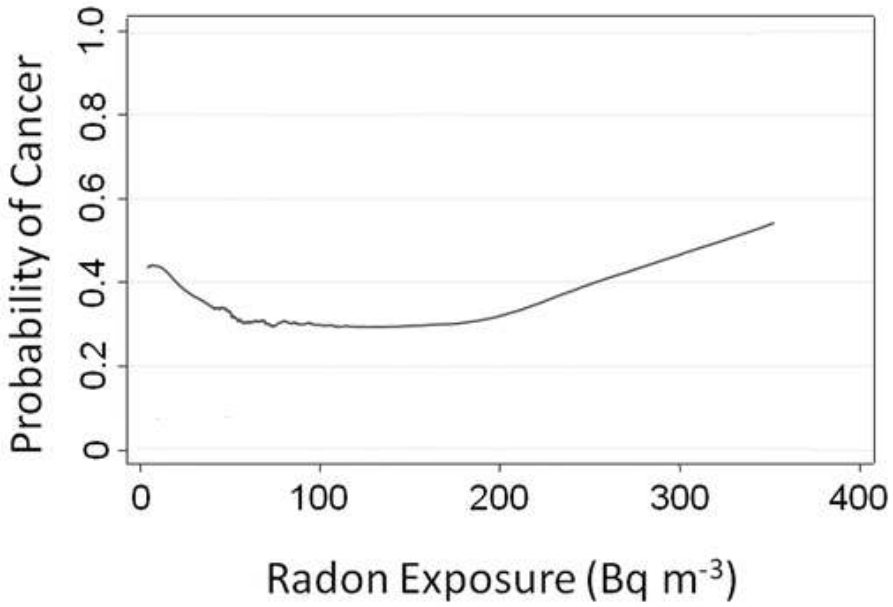
_____

c. Identify the most important condition that would have been required for the control district. 1 mark

_____

_____

d. The results for the experiment are provided in the graph below. 3 marks



Source: Thompson R. E. (2010). Epidemiological Evidence for Possible Radiation Hormesis from Radon Exposure: A Case-Control Study Conducted in Worcester, MA. Dose-response : a publication of International Hormesis Society, 9(1), 59–75. https://doi.org/10.2203/dose-response.10-026.Thompson

Using data, analyse the results and outline what can be concluded about optimal radon exposure.

e. The investigators concluded that their investigation into radon exposure was applicable to all people. Upon review, the journal to which they applied could not publish this paper due to bias. What is bias and how might it have occurred in this investigation? 2 marks

END OF QUESTION AND ANSWER BOOK

Extra space for responses

Clearly number all responses in this space.

VCE BIOLOGY

Written Examination

ANSWER SHEET – 2022

Student name:	

Use a **PENCIL** for **ALL** entries. For each question, shade the box which indicates your answer.

Marks will **NOT** be deducted for incorrect answers.

NO MARK will be given if more than **ONE** answer is completed for any question.

If you make a mistake, **ERASE** the incorrect answer – **DO NOT** cross it out.

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