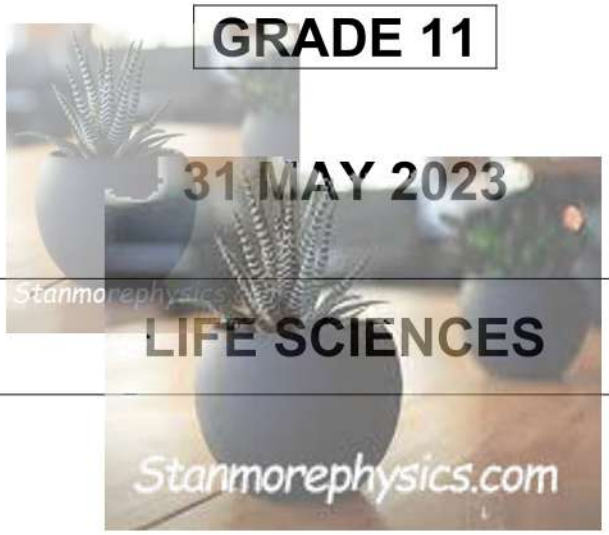
Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

31 MAY 2023



LIFE SCIENCES

MARKS: 150

TIME: 2½ hours

This question paper consists of 17 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answer to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 *E.coli* bacteria living in the colon of the human digestive system is an example of...

A parasitism
B commensalism
C mutualism
D competition

1.1.2 The characteristic which makes the leaf suitable for photosynthesis is the...

A spongy mesophyll is elongated.
B leaf has many stomata for gaseous exchange in the lower epidermis.
C upper epidermis has a white cuticle.
D xylem is present to carry the products of photosynthesis.

1.1.3 Study the list of processes associated with the human digestive system:

(i) Detoxification
(ii) Deamination
(iii) Emulsification
(iv) Peristalsis

Which one of the following combinations describes the digestive function of a human liver?

A (i), (ii), (iii) and (iv)
B (i), and (ii)
C (i), (ii) and (iii)
D (i), (iii) and (iv)

1.1.4 A feature of an insect pollinated flower

A Petals are large and brightly coloured
B Large anthers with filaments
C Small, light and smooth pollen
D Stigmas are large and feathery

1.1.5 Which of the following combination of answers is correct for anaerobic respiration

	Amount of energy released per glucose molecule	Chemical reaction	Releases carbon dioxide
A	high	always the same	sometimes
B	low	different in different organisms	sometimes
C	high	different in different organisms	always
D	low	always the same	always

1.1.6 The difference between seeds and spores is that...

A spores can withstand dehydration while seeds cannot
B only spores can be unicellular
C spores are diploid and seeds are haploid
D spores are gametes while seeds give rise to new plants

1.1.7 *Dicrocoelium dendriticum* is a flatworm parasite of grazing vertebrates such as sheep and cattle. Which combination correctly shows the phyla to which the parasite and host species belong?

A Annelida and Chordata
B Platyhelminthes and Arthropoda
C Annelida and Arthropoda
D Platyhelminthes and Chordata

1.1.8 The disadvantage of an exoskeleton is that it...

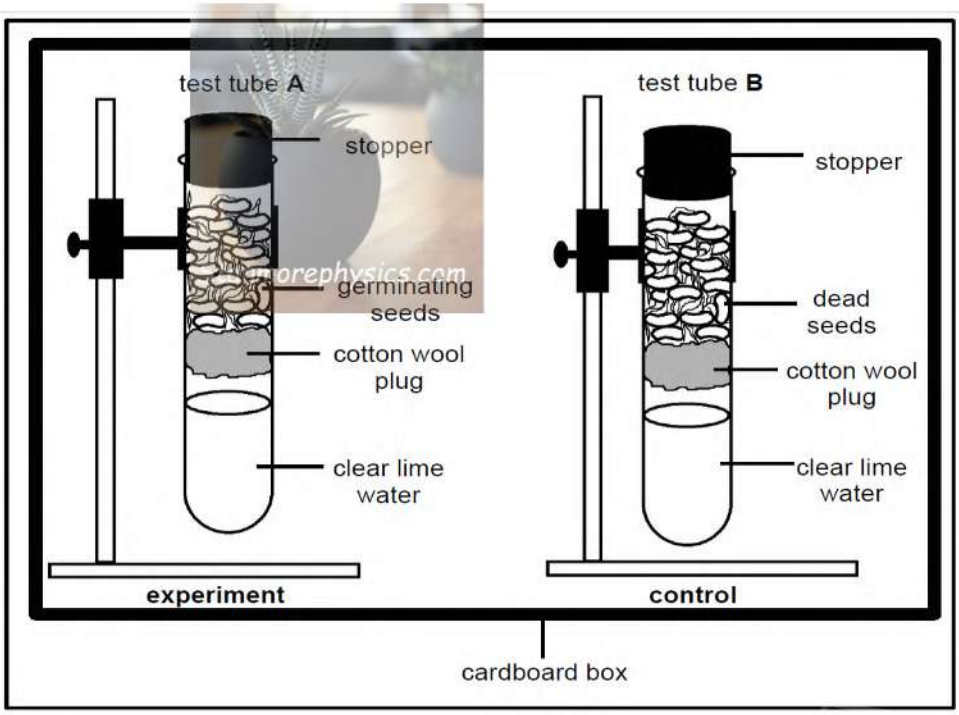
A is permeable
B limits the size of an animal
C provides points of attachment for muscles
D is soft

Questions 1.1.9 and 1.1.10 are based on the following investigation.

An investigation was conducted to determine which gas was released during cellular respiration.

The procedure was as follows:

- 120 seeds of the same species were germinated
- 60 of them were separated and placed in boiling water for 30 minutes
- The other germinating seeds were placed in test tube **A**, while the seeds from the hot water were placed in test tube **B** after cooling
- Both sets of apparatus were rinsed with formalin to remove any micro-organisms which might have been present
- Both sets of apparatus were set up as shown in the diagram below



1.1.9 The variables in this investigation are....

	INDEPENDENT	DEPENDENT	CONTROLLED
A	Cellular respiration	Gas released	60 seeds of same species in each test tube
B	Gas released	Cellular respiration	120 seeds of same species in each test tube
C	Cellular respiration	Gas released	120 seeds of same species in each test tube
D	Gas released	Cellular respiration	60 seeds of same species in each test tube

1.1.10 To increase the reliability of the results the investigator must...

A use a rubber block to separate the germinating seeds from the lime water
B use more than two sets of apparatus
C boil all the 120 seeds
D use tap water instead of clear lime water

(10 x 2) (20)

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.8) in the ANSWER BOOK.

1.2.1 The blood vessel that transports absorbed nutrients from the small intestine to the liver

1.2.2 State of being resistant to a particular infectious disease

1.2.3 Concentration of the sense organs in the anterior end of an organism to form a "head" region

1.2.4 The process by which food is moved along in the alimentary canal of humans

1.2.5 Plant that lacks true roots, stem and leaves

1.2.6 All seed-bearing plants

1.2.7 The ejection of solid wastes from the body

1.2.8 Type of asexual reproduction in which bacteria splits into two

(8 x 1) (8)

1.3 Indicate whether each of the descriptions in **COLUMN I** apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in **COLUMN II**. Write **A only**, **B only, both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Requires water to undergo sexual reproduction	A. Angiosperms B. Pteridophytes
1.3.2	Enzyme secreted by pancreas	A. Proteases B. Carbohydrases
1.3.3	Produce/s spores in fungi	A. Sporangiophores B. Sporangia

(3 x 2) (6)

1.4 The following diagrams represent organisms from different phyla.

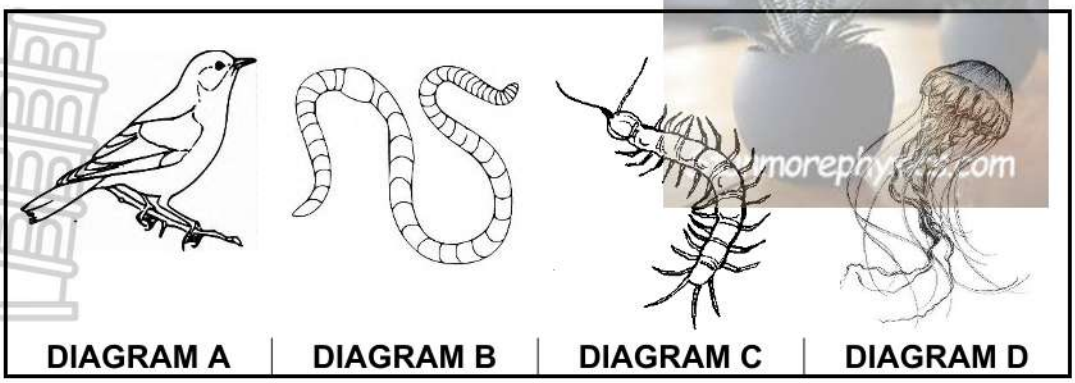


DIAGRAM A	DIAGRAM B	DIAGRAM C	DIAGRAM D

1.4.1 Which diagram (**A, B, C and D**) represents an organism:

(a) with an exoskeleton (1)

(b) that is diploblastic (1)

(c) that is classified as a vertebrate (1)

(d) with jointed appendages (1)

1.4.2 To which phylum does the organism in DIAGRAM **B** belong? (1)

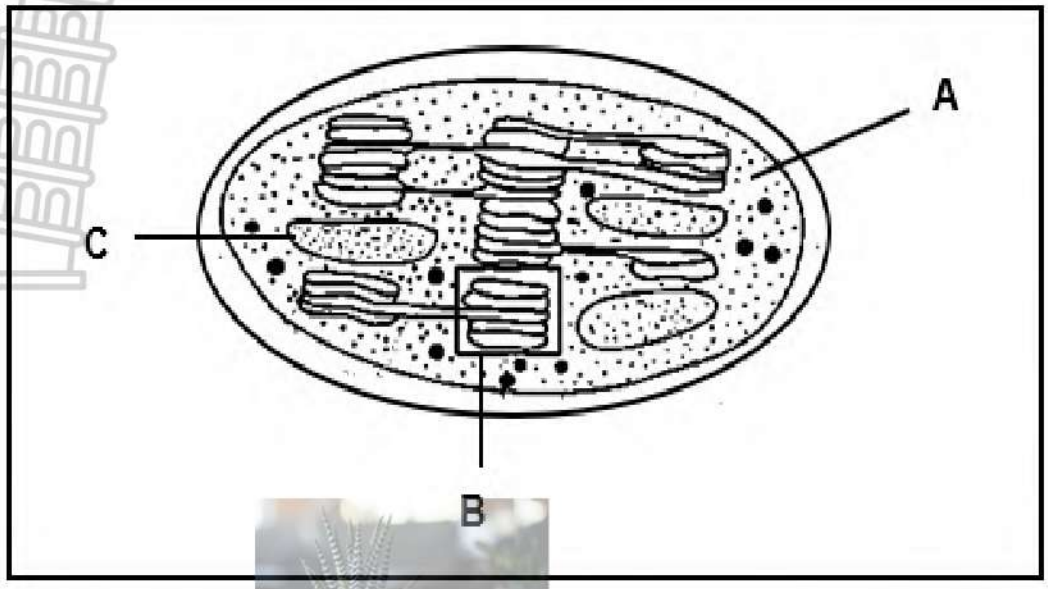
1.4.3 What type of symmetry does the phylum given in QUESTION 1.4.2 have? (1)

1.4.4 Name ONE major advantage of the symmetry given in QUESTION 1.4.3. (1)

1.4.5 Give the correct sequence of the diagrams **A** to **D** representing organisms from the least to the most advanced phylum. (2)

1.4.6 State ONE role played by the organism in DIAGRAM **B** in maintaining 'healthy' soil for plants to grow in. (1)
(10)

1.5 The diagram below represents an organelle found in a plant cell.



1.5.1 Identify the organelle. (1)

1.5.2 Give the LETTER and the NAME of the part where the:

(a) Light Phase occurs (2)

(b) Dark Phase occurs (2)

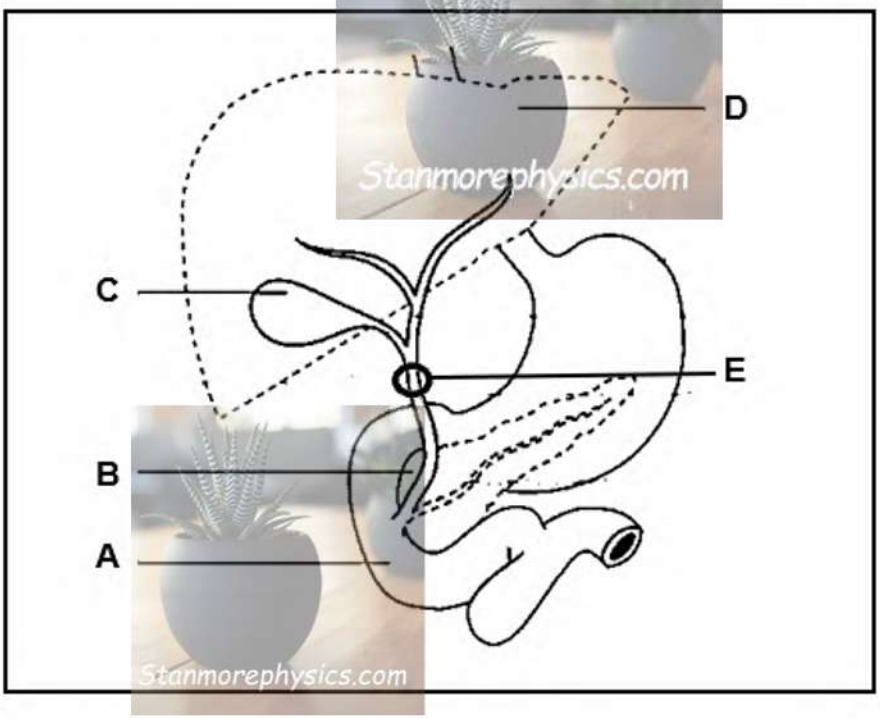
1.5.3 State ONE way in which the process that takes place in the above organelle is important. (1)

(6)

TOTAL SECTION A: 50

QUESTION 2

2.1 The diagram below represents a certain section of the human alimentary canal (digestive canal).

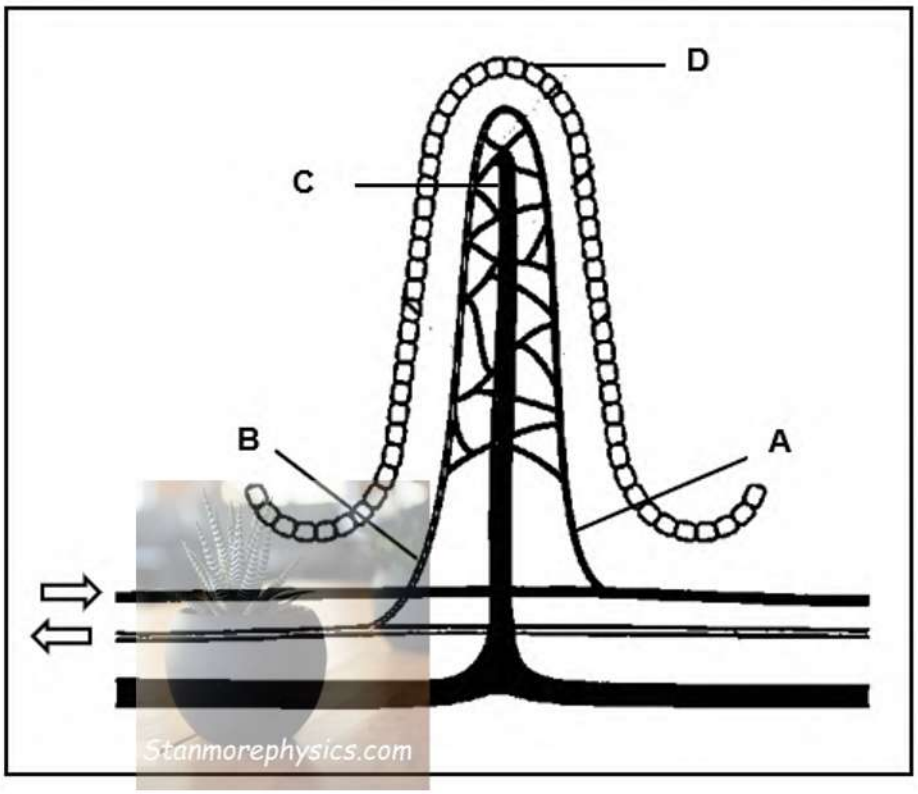


2.1.1 Identify part **C.** (1)

2.1.2 State TWO ways in which part labelled **A** is structurally suited for the efficient absorption of digested nutrients. (2)

2.1.3 Explain how fat digestion would be affected if the duct labelled **E** were blocked. (3)

2.1.4 The diagram below represents a structure found in the inner lining of part **A**.



(a) Identify the structure shown in the diagram above. (1)

(b) Name the labelled part **C** which is responsible for the absorption of fatty acids and glycerol. (1)

(c) State ONE difference between the blood carried by blood vessels **A** and **B**. (2)

(d) Celiac disease is a disorder that makes human bodies react to gluten (a protein found in wheat, rye, barley and grains). The response by the immune system eventually damages the structures illustrated in the diagram above.

Explain the effects of this disease in the human body. (2)
(12)

2.2 The table below represents the lactic acid levels in the blood of a long-distance runner **before, during the race** that lasted for 20 minutes and **after the race**.

Time (minutes)	0	10	20	30	40	50	60
Concentration of lactic acid in blood (arbitrary units)	18	18	50	90	45	20	18

2.2.1 Name the type of respiration that takes place in the cells of the runner after 10 minutes into the race. (1)

2.2.2 How long did the lactic acid concentration continue to increase after the end of the race? (1)

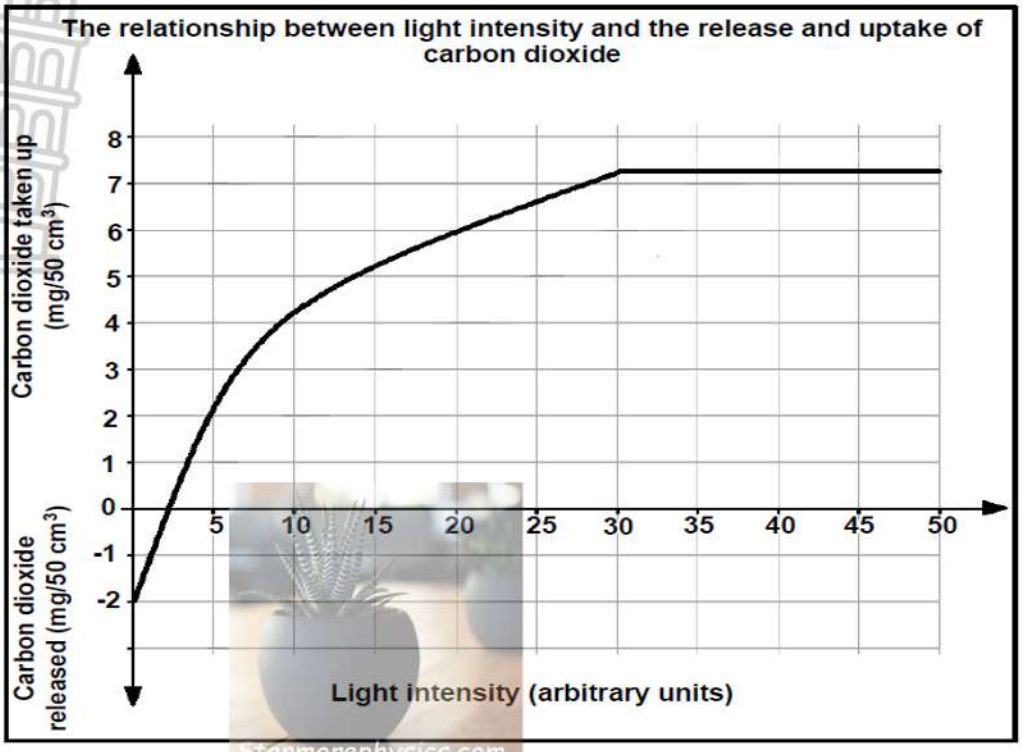
2.2.3 Calculate the percentage decrease in lactic acid concentration between 30 and 50 minutes. (3)

2.2.4 Draw a line graph to illustrate the levels of lactic acid in the blood of the runner. (6)

2.2.5 State ONE difference between the type of respiration named in QUESTION 2.2.1 and the other type that occurred before the race started. (2)

(13)

2.3 The graph below shows the relationship between light intensity and the release and uptake of carbon dioxide by the leaves of a plant.



2.3.1 How much carbon dioxide is taken up by leaves at a light intensity of 5 units? (2)

2.3.2 Why is most carbon dioxide released when the light intensity is zero units? (2)

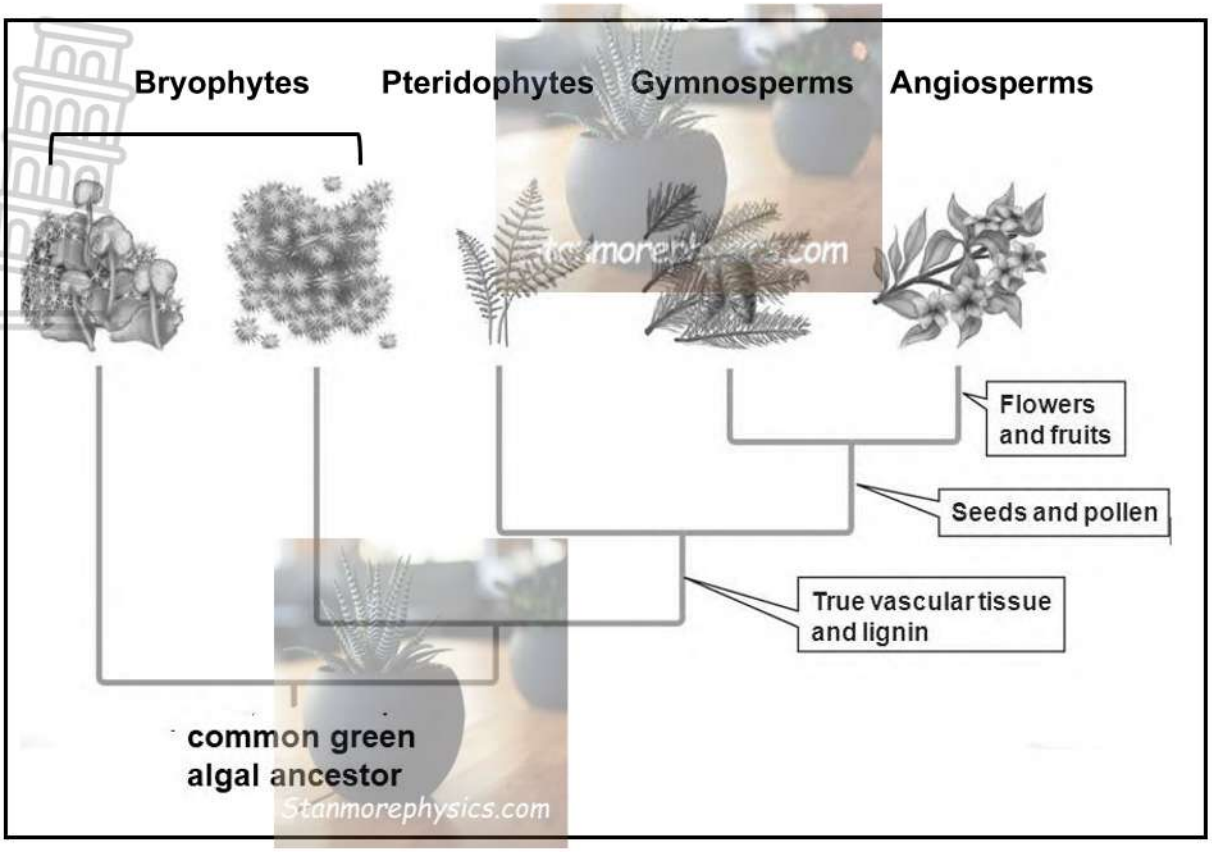
2.3.3 Describe the relationship between the light intensity and the uptake of carbon dioxide by the leaves of a plant as illustrated in the graph above. (3)

2.3.4 When the light intensity is approximately 2 units, there is no net change in the concentration of carbon dioxide surrounding the plant.

Give an explanation for this. (2)

2.3.5 At light intensities above 30 units, the amount of carbon dioxide taken up remains the same. Suggest an explanation for this observation. (4)
(13)

2.4 Study the diagram of plant groups and answer the questions that follow.



2.4.1 Provide the name for this type of diagram. (1)

2.4.2 Identify the ancestor of all these plant groups. (1)

2.4.3 Which plant group is least suited to life on land? (1)

2.4.4 Provide ONE reason for your answer to QUESTION 2.4.3 (1)

2.4.5 The Gymnosperms are more advanced than Bryophytes.

State TWO facts (evidence) from the diagram that support this statement. (2)

2.4.6 Use the diagram above to identify TWO groups that produce seeds. (2)

2.4.7 In what way are the seeds of Gymnosperms different from those of the Angiosperms (2)

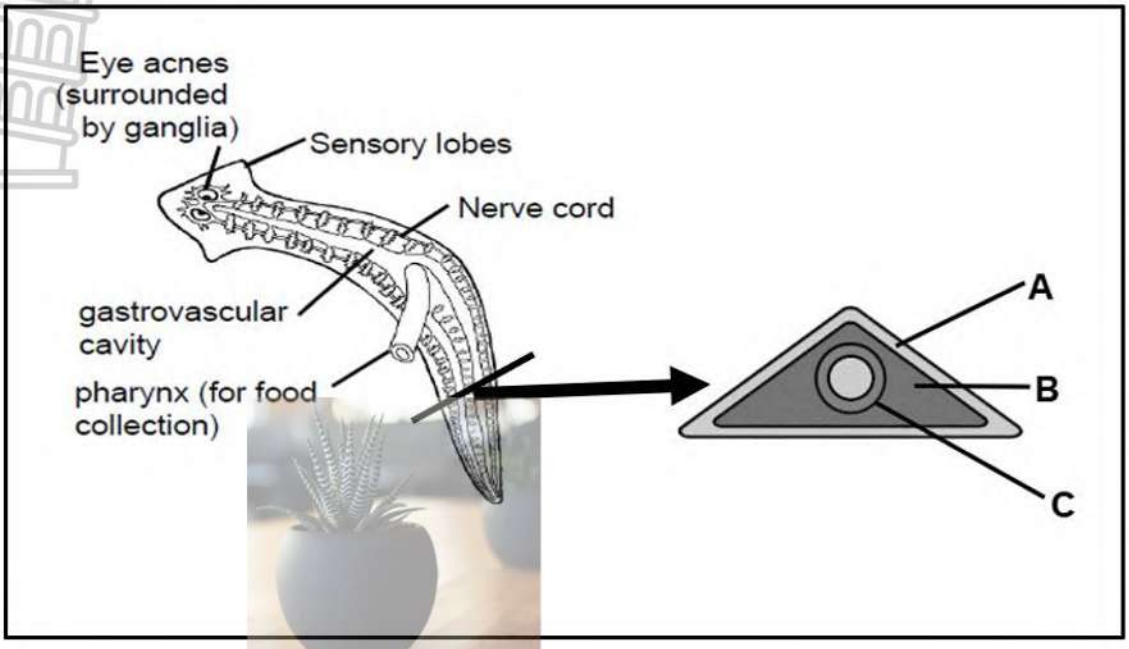
2.4.8 Explain why the Gymnosperms and Angiosperms are able to grow taller than the Bryophytes. (2)

(12)

(50)

QUESTION 3

3.1 The diagram below shows various views for the body plan of an animal belonging to the phylum Platyhelminthes.



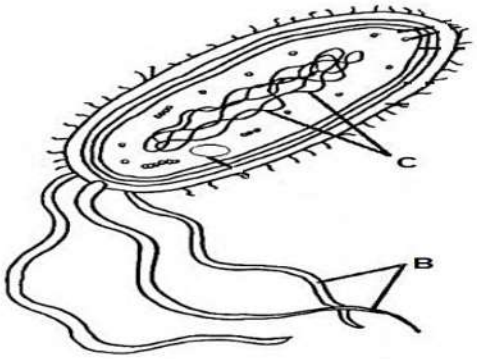
3.1.1 Provide labels for germ layers **A, B** and **C**. (3)

3.1.2 Why is the blood system not necessary in the animal shown above? (2)

3.1.3 Explain TWO ways in which this animal's body plan is suited for its mode of life. (4)

3.1.4 Tabulate TWO differences in the number of tissue layers and type of symmetry in the phylum Platyhelminthes and phylum Cnidaria. (5)
(14)

3.2 Study the diagram and read the passage below.



SOUTH AFRICA PERSPECTIVE: TUBERCULOSIS

Tuberculosis (TB) is caused by the bacterium *Mycobacterium tuberculosis* and is a serious public health issue in South Africa. About 450,000 people develop the disease every year, and 270 000 of those are also living with HIV. TB is South Africa's leading cause of death. About 89 000 people die from it every year, that's ten people every hour.

HIV infection is a key factor in the TB epidemic. HIV sufferers have a higher risk of contracting TB and a greater chance of dying as they have a weaker immune system.

A vaccine, called the BCG (bacilli Calmette-Guerin) is used to prevent TB. It is more effective in children and its efficacy in adults is inconsistent.

[Adapted from http://www.copenhagenconsensus.com.South Africa Perspective: Tuberculosis]

3.2.1 Identify structures **B** and **C**. (2)

3.2.2 Is a bacterium classified as prokaryotic or eukaryotic? Give a reason for your answer. (2)

3.2.3 According to the passage above, what percentage of people that develop tuberculosis has HIV? Show your calculation. (3)

3.2.4 Explain how BCG would give immunity. (4)

3.2.5 Explain why HIV patients have a higher risk of contracting TB and dying. (2)

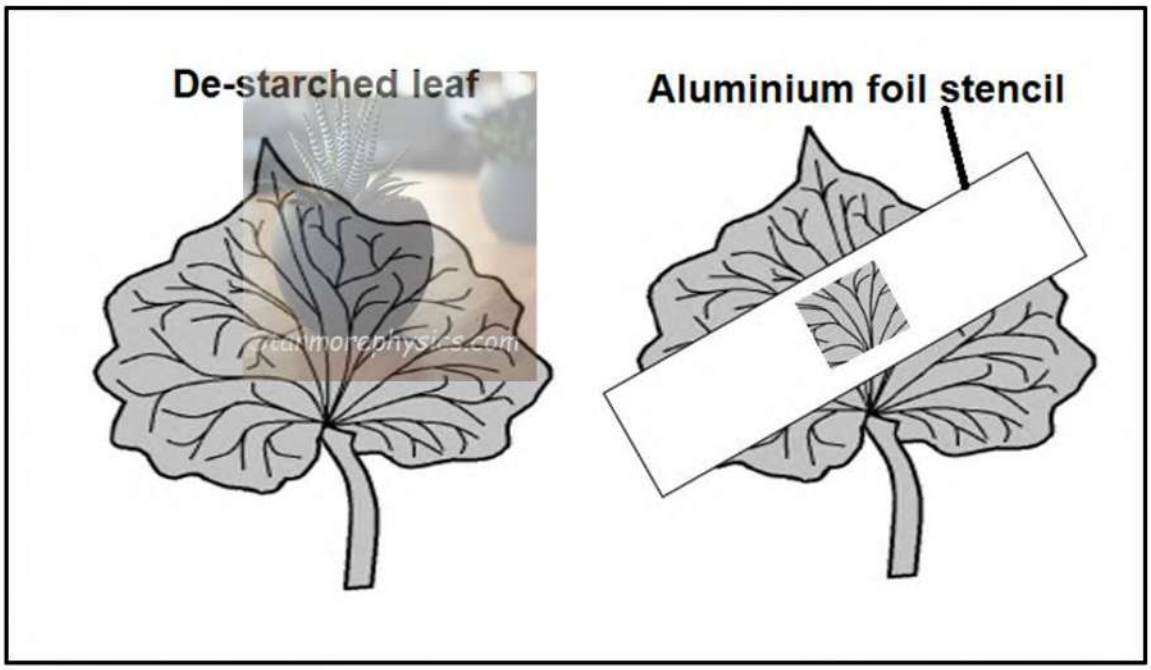
3.2.6 Tabulate TWO differences between bacteria and viruses. (Exclude the characteristic mentioned in QUESTION 3.2.2). (5)

3.2.7 Which one of the two diseases (TB or HIV infection) could be treated using antibiotics? Provide a reason for your answer. (2)

(20)

3.3 An experiment was conducted by grade 11 learners to determine whether light is necessary for photosynthesis. The procedure followed was given below:

- A geranium potted-plant was de-starched
- A square light-slit was cut out on an aluminium foil
- The aluminium foil stencil was then pasted on to one of the de-starched leaves as shown in the diagram below
- The potted plant was exposed to bright sunlight for 4–5 hours
- After 5 hours, the aluminium foil stencil was removed and the leaf was tested for starch



3.3.1 How was the plant de-starched? (2)

3.3.2 What was the independent variable in the experiment? (1)

3.3.3 Draw a labelled diagram of the leaf showing the result of the investigation.

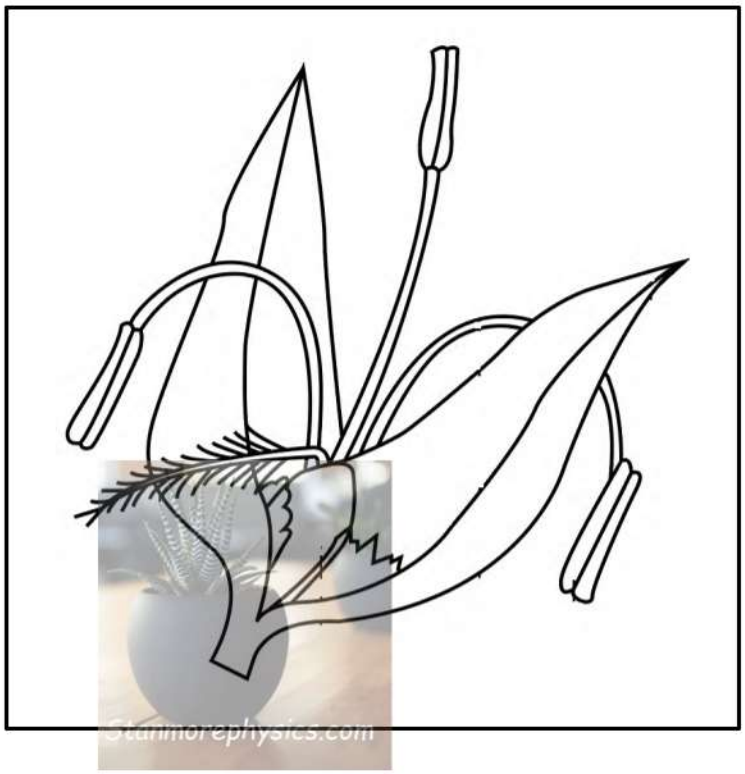
Use a lead pencil and shade the parts which tested positive for starch. (3)

3.3.4 Grade 11 learners repeated the experiment two weeks later.

(a) What was the purpose of repeating the experiment? (1)

(b) How would the results differ if the whole leaf was covered with aluminium foil before the plant was exposed to bright sunlight? (1)
(8)

3.4 Flowers are reproductive structures used for sexual reproduction in angiosperm plants. Study the diagram below and answer the questions that follow.



3.4.1 Is this flower insect, wind or bird pollinated? (1)

3.4.2 Give THREE visible characteristics of this flower that makes it well adapted to the pollinator given in QUESTION 3.4.1 (3)

3.4.3 Other plants reproduce asexually through budding, vegetative propagation and through other types.

(a) Give ONE advantage and ONE disadvantage of asexual reproduction. (2)

(b) Give ONE advantage and ONE disadvantage of sexual reproduction (2)

(8)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150