Basic Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

COMMON TEST

JUNE 2015

NATIONAL SENIOR CERTIFICATE

GRADE 11

MARKS: 150

TIME: 2½ hours

N.B. This question paper consists of 15 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. Answer ALL the questions.
2. Write ALL the answers in the 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. ALL drawings should be done in pencil and labelled in blue or black ink.
8. Draw diagrams, flow charts or tables only when asked to do so.
9. The diagrams in this question paper are NOT necessarily drawn to scale.
10. Do NOT use graph paper.
11. You must use a non-programmable calculator, protractor and a compass where necessary.
12. Write neatly and legibly.

SECTION A

QUESTION 1

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

1.1.1 A scientist designed an experiment to test the effect of temperature on bacterial growth. He grew three different cultures of the bacterium *E. coli* under three heat lamps at different temperatures.

What was the independent variable in this experiment?

A Length of the experiment
B Number of bacteria
C Reproduction rate
D Temperature

1.1.2 Angiosperms are classified as spermatophytes because they ...

A produce flowers.
B produce seeds.
C have seeds enclosed in fruit.
D produce cones.

1.1.3 When testing a leaf for starch the leaf is placed in boiling alcohol to ...

A dissolve the cytoplasm.
B remove the starch.
C absorb the chlorophyll.
D stop metabolic processes.

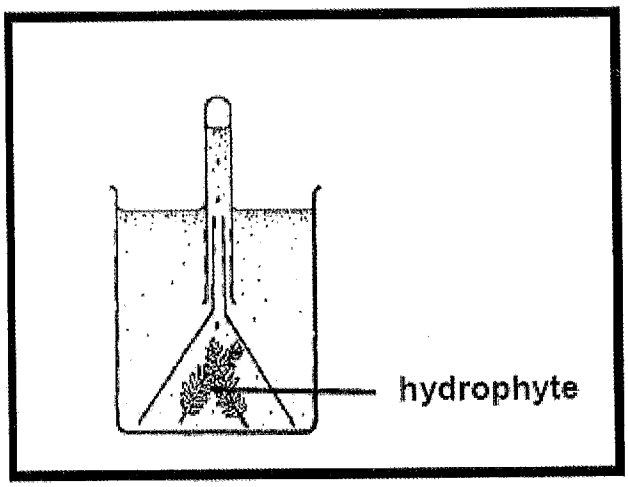
1.1.4 A high carbohydrate diet lacking in proteins is a characteristic of a nutritional disorder called ...

A marasmus.
B kwashiorkor.
C anorexia.
D bulimia.

1.1.5 Which ONE of the following is a function of the mitochondria?

A Deamination
B Production of oxygen
C Storage of glucose
D Release of energy

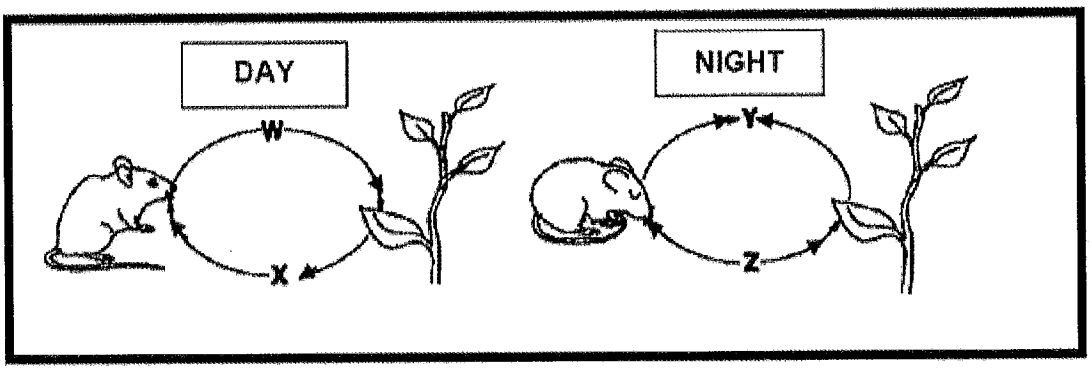
1.1.6 In the investigation below, sodium bicarbonate is added to the water in the beaker.



Which ONE of the following is the reason for adding sodium bicarbonate to the water?

A It helps to maintain a constant pH level
B It absorbs all carbon dioxide
C It produces a large amount of oxygen for photosynthesis
D It provides carbon dioxide necessary for photosynthesis

1.1.7 The diagram below shows the possible movement of two gases during the day and during the night.



Which letters represent carbon dioxide?

A W and Y
B W and Z
C X and Y
D X and Z

1.1.8 During anaerobic respiration in yeast cells ...

A free oxygen is produced.
B a large amount of energy is formed.
C lactic acid is produced.
D alcohol is formed.

1.1.9 A jellyfish belongs to the phylum Cnidaria because it has ...

A an exoskeleton made of chitin.
B a fluid-filled coelom that forms a hydrostatic skeleton.
C a fluid-filled gut that forms a hydrostatic skeleton.
D no skeleton.

1.1.10 A characteristic of the Chordata is that they ...

A have bilateral symmetry.
B have mammary glands.
C are diploblastic.
D have no coelom. (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 – 1.2.10) in the ANSWER BOOK.

1.2.1 Arrangement of body structures in relation to some axis of the body

1.2.2 Animals that remain attached to a substrate for most of their lives

1.2.3 A type of reproduction that involves only one parent

1.2.4 The ability to produce antibodies to fight disease

1.2.5 Photosynthetic tissue in the leaf consisting of elongated cells

1.2.6 Small quantities of a micro-organism injected into the body to produce antibodies

1.2.7 A micro-organism used in the manufacturing of beer and bread

1.2.8 The group of organisms such as bacteria and fungi that recycle nutrients in dead plants and animals

1.2.9 The dominant generation in flowering plants

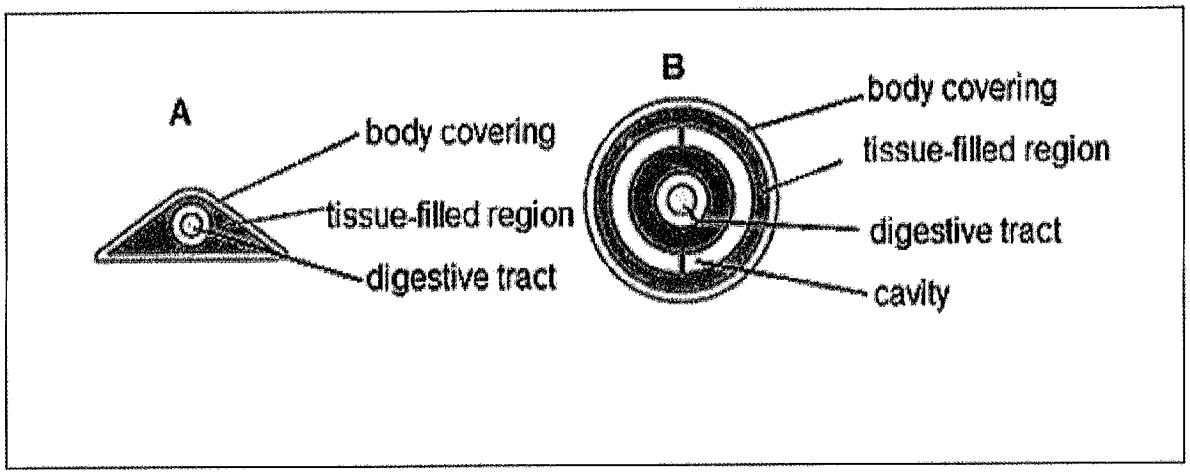
1.2.10 A group of sporangia on the pinna of a fern frond (10 x 1) **(10)**

1.3 Indicate whether each of the statements in COLUMN I, applies 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 1.3.6) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Triploblastic organisms	A: Platyhelminthes B: Annelida
1.3.2 Plants that have naked seeds	A: Pteridophytes B: Bryophytes
1.3.3 The layer of cells in the embryo that will develop into the epidermis and nervous system	A: Ectoderm B: Endoderm
1.3.4 The digestive juice that enters the duodenum through a duct	A: Pancreatic juice B: Gastric juice
1.3.5 Disease caused by a virus	A: Malaria B: Cholera
1.3.6 Root-like structures in moss plants	A: Thallus B: Rhizoids

(6 x 2) **(12)**

1.4 The diagrams below show the body plans of two types of animals.



1.4.1 Write the LETTER only of the diagram that represents:

(a) An acoelomate

(b) A coelomate (2)

1.4.2 State TWO phyla that are represented by body plan **B**. (2)

1.4.3 From which embryonic layer does the tissue-filled layer develop? (1)

1.4.4 State the type of symmetry characteristic of organism **B**. (1)

1.4.5 Give TWO advantages of an exoskeleton in arthropods. (2)

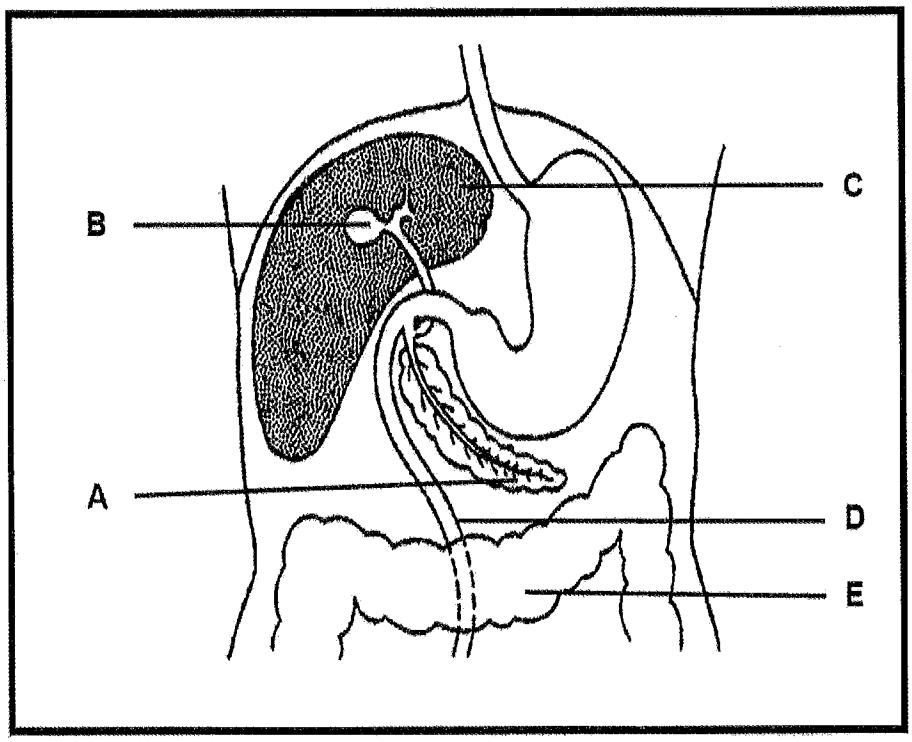
(8)

Total Marks: 50

SECTION B

QUESTION 2

2.1 Study the diagram below that shows a part of the human digestive system and answer the questions that follow.



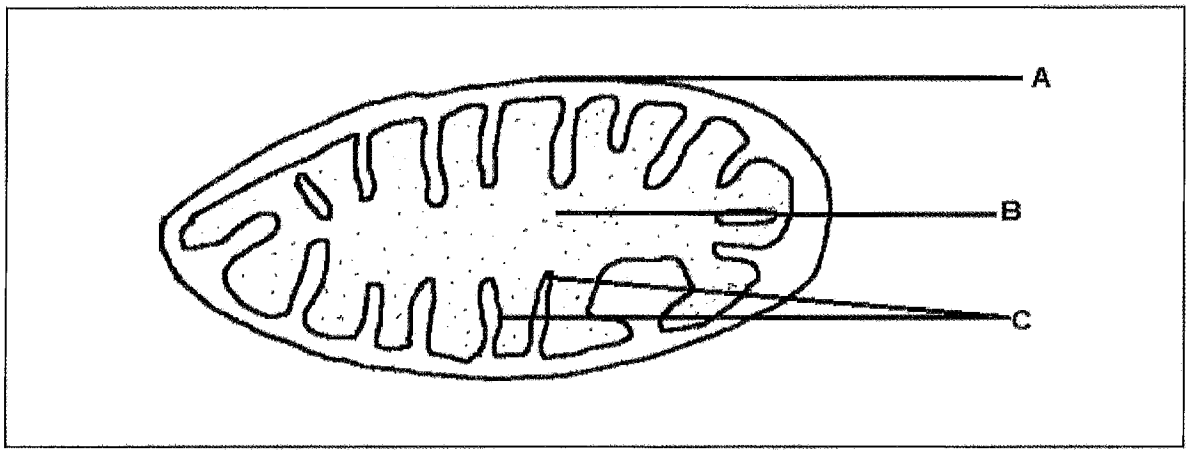
2.1.1 Identify parts **A**, **B** and **E**. (3)

2.1.2 State TWO functions of the juice secreted by **B**. (2)

2.1.3 Explain the significance of mechanical digestion taking place before chemical digestion. (2)

2.1.4 Describe how part **C** plays a role after a person consumes a meal rich in carbohydrates. (3)
(10)

2.2 The questions that follow are based on the drawing of a cell organelle.



2.2.1 Identify the cell organelle. (1)

2.2.2 Give labels for parts **A** and **B**. (2)

2.2.3 Explain the significance of the folded nature of part **C**. (2)

2.2.4 When cells of living organisms carry out aerobic respiration without taking in or producing food, the organism loses mass.

(a) Will a person who is not eating lose weight quicker if she/he is *resting* or *doing exercise*? (1)

(b) Explain your answer in QUESTION 2.2.4 (a) (2)
(8)

2.3 A boy runs up a small hill at 12km/h and lactic acid accumulates in the blood and muscles while the boy is running. When the boy stops running, most of the lactic acid is removed from the blood and muscles and is eventually converted into various other substances.

Various Substances	**Amount of converted lactic acid %**
Glycogen	20
Carbon dioxide	60
Glucose	4
Protein	8

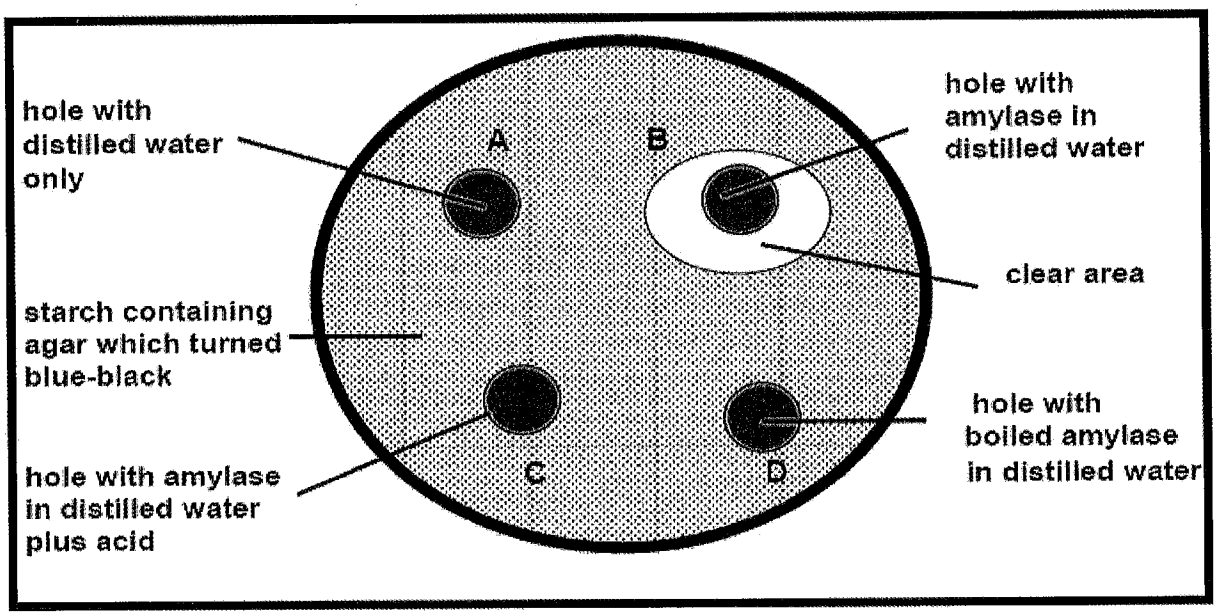
Draw a bar graph to represent the data shown in the table. **(6)**

2.4 In an investigation to determine the action of the enzyme amylase on starch, a group of learners used a shallow dish with agar (a jelly-like growth medium), which contained starch.

Four holes were cut into the agar and each was filled with a different liquid as indicated in the diagram below. The dish was covered and incubated at 37 °C for 24 hours.

After 24 hours, iodine solution was poured over the surface of the agar.

The results are indicated below.



2.4.1 Explain the purpose of set-up **A**? (2)

2.4.2 Explain the results at:

(a) **B** (3)

(b) **C** (3)

(c) **D** (3)

2.4.3 List TWO factors that learners needed to keep the same in order to make a valid comparison. (2)

2.4.4 Explain why the incubating dish was kept at 37 °C? (2)

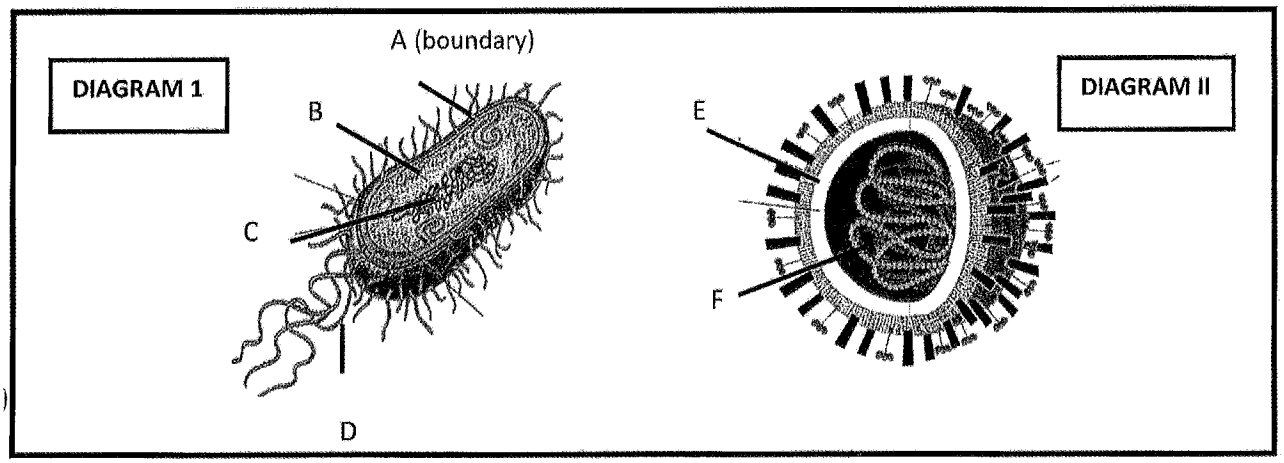
2.4.5 State ONE way in which the learners could increase the reliability of their results. (1)

(16)

Total Question 2: [40]

QUESTION 3

3.1 Study the diagram showing two micro-organisms and answer the questions that follow.



3.1.1 Write the LETTER only of the part representing the:

(a) DNA material

(b) Protein coat (2)

3.1.2 Explain the role played part by **F** in the reproduction of the organism in Diagram **II**. (2)

3.1.3 State the type of reproduction that takes place in the organism in Diagram **I**. (1)

3.1.4 List TWO ways in which the organism in Diagram **II** differs from living cells. (2)

3.1.5 Which Diagram **(I or II)** shows an organism that could cause tuberculosis? (1)

3.1.6 Name the type of medication that is used to destroy organisms represented by Diagram **I** in the human body. (1)

3.1.7 Medication mentioned in QUESTION 3.1.6 is ineffective against diseases caused by the organisms in Diagram **II**.

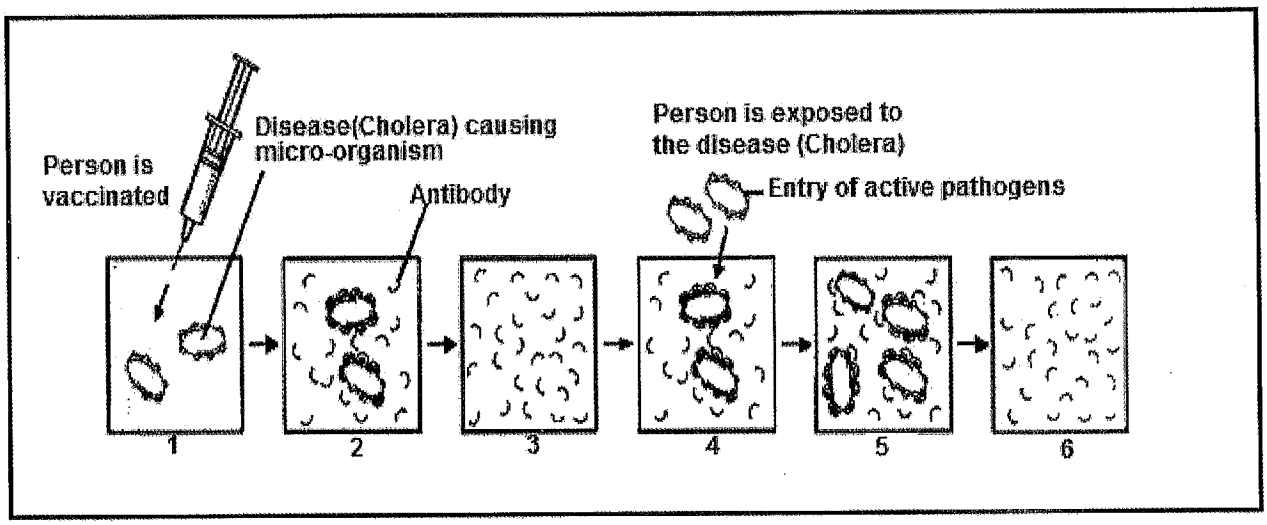
Explain why this medication is still given to people suffering from diseases caused by organisms in Diagram **II**. (2)

3.1.8 List TWO ways in which the government could improve public health and prevent deaths due to diseases like tuberculosis. (2)

(13)

3.2 Cholera is caused by exposure to water that is contaminated by pollutants such as sewage.

The following diagrams show how the cholera vaccine works in the human body.



3.2.1 What is contained in the vaccine that is injected into the human body? (1)

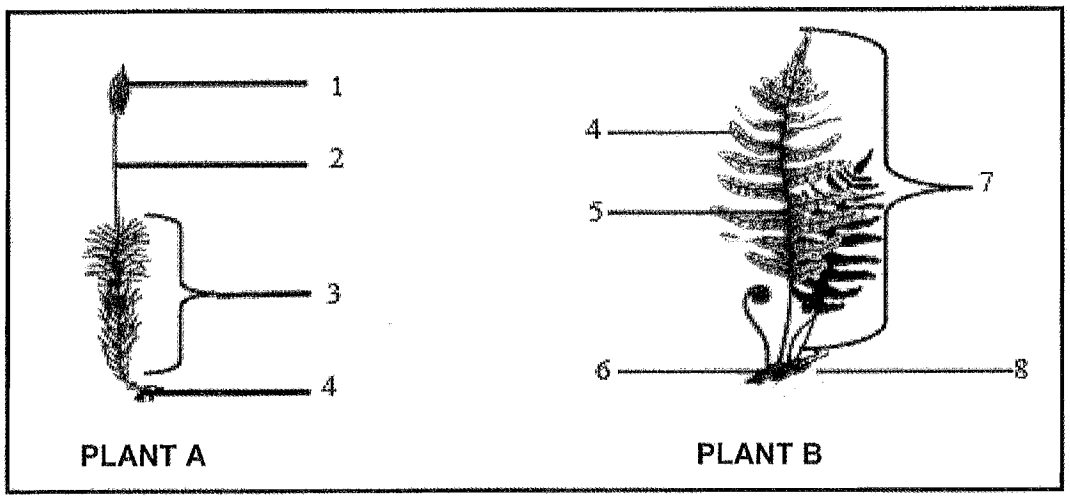
3.2.2 Explain the significance of the process shown in Diagram **2**. (2)

3.2.3 Explain what happens when a person is later exposed to cholera bacteria as shown in Diagram **4**. (2)

3.2.4 Name the type of immunity obtained through vaccination. (1)

3.2.5 Suggest THREE strategies to prevent a cholera outbreak in rural villages of our country. (3)
(9)

3.3 Study the two plants **A** and **B** from different groups and answer the questions that follow.



3.3.1 Identify the groups to which each of the plants **A** and **B** belong. (2)

3.3.2 Name the reproductive structures formed inside the part numbered **1**. (1)

3.3.3 Is the gametophyte generation of these plants haploid or diploid? (1)

3.3.4 Which plant (**A** or **B**) is a thallus? (1)

3.3.5 Explain why the plant identified in QUESTION 3.3.4 is a thallus. (1)

(6)

3.4 Evolution of seeds is one of the most important events in the rise of seed plants.

3.4.1 Explain how each of the following features of seeds is important for the plant's survival:

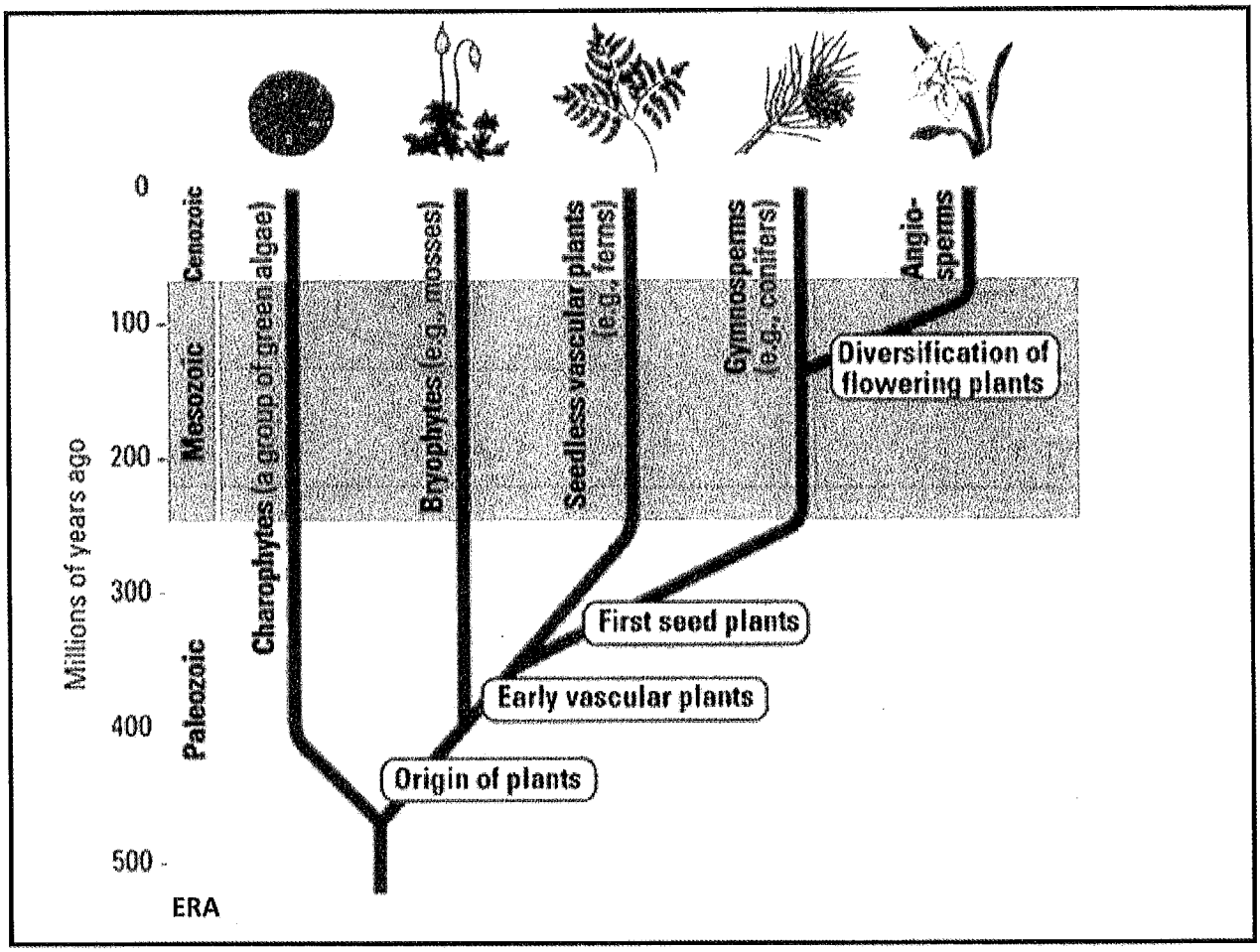
(a) Seeds can remain dormant for long periods of time (2)

(b) Some seeds contain endosperm tissue (2)

3.4.2 State ONE reason why seed banks are important. (1)

(5)

3.5 Study the phylogenetic tree below and answer the questions that follow.



3.5.1 In which era did the first land plants appear? (1)

3.5.2 According to the diagram, what characteristic is shared by the ferns and conifers but not by the mosses? (2)

3.5.3 How long after the appearance of the bryophytes did the flowering plants appear? (2)

3.5.4 Explain how the presence of flowers have allowed for greater diversity and abundance of angiosperms. (2)
(7)

Total Question 3: 40

SECTION C

QUESTION 4

Describe the process of photosynthesis and explain how this process may be influenced by temperature.

NOTE: No marks will be awarded for answers in the form of flow charts, diagrams or tables.

Content: (17)
Synthesis: (03)
(20)

GRAND TOTAL: [150]

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MEMORANDUM

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GRADE 11

MARKS : 150

TIME : 2½ hr

This memorandum consists of 08 pages.

SECTION A

QUESTION 1

1.1

1.1.1 D ✓✓
1.1.2 B✓✓
1.1.3 C✓✓
1.1.4 B✓✓
1.1.5 D✓✓
1.1.6 D✓✓
1.1.7 A✓✓
1.1.8 D✓✓
1.1.9 C✓✓
1.1.10 A✓✓

(10 x 2) **(20)**

1.2

1.2.1 Symmetry✓
1.2.2 Sessile/Sedentary✓
1.2.3 Asexual✓
1.2.4 Immunity✓
1.2.5 Palisade mesophyll✓
1.2.6 Vaccinations✓/Vaccine
1.2.7 Yeast✓
1.2.8 Decomposers✓
1.2.9 Sporophyte ✓
1.2.10 Sorus ✓

(10 x 1) **(10)**

1.3

1.3.1 Both A and B✓✓
1.3.2 None✓✓
1.3.3 A only✓✓
1.3.4 A only✓✓
1.3.5 None✓✓
1.3.6 B only✓✓

(6 x 2) **(12)**

1.4

1.4.1
(a) A✓
(b) B✓ (2)

1.4.2 Annelida✓;Arthropoda✓; Chordata✓ Any (2)
(Mark first TWO only)

1.4.3 Mesoderm✓ (1)
1.4.4 Bilateral symmetry✓ (1)

1.4.5
- It protects the animal against mechanical injury.✓
- It provides points of attachment for muscles. ✓ (2)

(Mark first TWO only)

(8)

TOTAL MARKS: 50

SECTION B
QUESTION 2

2.1
2.1.1
(a) A - Pancreas✓
B - Gall bladder✓
E - Colon✓/Large intestine (3)

2.1.2
- Slightly antiseptic✓ / helps counteract decomposition process in small intestine
- Assists in absorption of fat soluble vitamins✓/vitamins A, D, E and K
- Bile emulsifies fats✓
- Bile neutralises acid chyme✓
- Bile salts reduce the fluidity of chyme✓ Any (2)

(*Mark first TWO only*)

2.1.3 - It enlarges the surface area of food molecules✓ which allows for faster enzyme action✓ (2)

2.1.4
- As blood passes the liver✓
- excess glucose is converted into glycogen✓
- under the influence of insulin✓
- which is stored in the liver✓
- thus reducing glucose level in the blood✓ Any (3)

(10)

2.2
2.2.1 Mitochondrion✓ (1)

2.2.2 A - Outer Membrane✓/ Membrane

B - Matrix✓/ Lumen (2)

2.2.3
- It increases the surface area ✓
- for attachment of enzymes/respiration✓ (2)

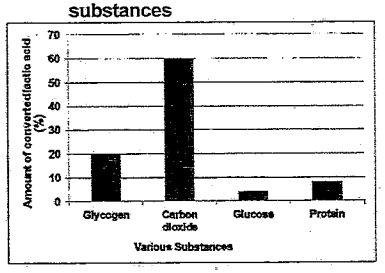
2.2.4 (a) Doing exercise✓ (1)

(b)
- Exercising use a lot more energy✓
- so the rate of aerobic respiration increases✓
- using up more glucose or glycogen✓
- thus increasing the loss of mass✓ Any (2)

(8)

2.3.

Graph showing the amount of lactic acid converted into various substances



Criterion	Elaboration	Mark
Type of graph	Bar graph drawn	1
Caption	Includes both variables: ' various substances and % of converted lactic acid'	1
X-axis	Equal width of bars AND correct label (various substances)	1
Y-axis	Appropriate scale AND Correct label and units for Y- axis %	1
Plotting of points	1 – 3 bars plotted correctly -1 mark All 4 bars plotted correctly – 2 marks	2

Mark allocation for the graph

NOTE: If axes are transposed:
Marks will be lost for labelling of 'X- axis and Y – axis' **(6)**

2.4

2.4.1
- **A** serves as a control✓,
- to verify that it is amylase that digested the starch in **B**✓ (2)

2.4.2

(a)
- The clear area✓/absence of starch around **B**
- indicates that starch was digested✓
- since amylase/ the enzyme had optimum conditions✓ (3)

(b)
- The blue-black colour✓/presence of starch around **C**
- indicates that no digestion of starch took place✓
- since amylase/the enzyme was inactive in the acid medium✓ (3)

(c)
- The blue-black colour✓/presence of starch around **D**
- indicates that no digestion of starch took place✓
- since amylase/the enzyme was denatured by boiling✓/high temperature (3)

2.4.3
- Temperature✓
- Amount/ concentration of enzyme/amylase✓
- Size of the holes✓
- Time/duration✓
(Mark first TWO only) Any (2)

2.4.4 - To simulate human body temperature✓
- for optimum for enzyme action✓ (2)

2.4.5 - Repeat the investigation✓
- Use more than one hole for each liquid✓
- Set up many dishes✓/have many replications
- Allow more time for the investigation✓
(Mark first ONE only) Any (1)
(16)

Total Question 2: [40]

QUESTION 3

3.1
3.1.1 (a) C✓
(b) E✓ (2)

3.1.2 - RNA/ DNA✓
- will be duplicated inside the host cell✓
- to form more virus particles✓ Any (2)

3.1.3 Binary fission✓/asexual reproduction (1)

3.1.4 - They have only one type of nucleic acid (DNA or RNA) ✓
- They are unable to reproduce independently✓
- No respiration✓/nutrition/excretion Any (2)

3.1.5 Diagram I✓ (1)

3.1.6 Antibiotics ✓ (1)

3.1.7 - Viral diseases lower body's immune system✓
- allowing bacteria to attack ✓ (2)

3.1.8
- Vaccination✓
- Education programmes like posters / TV✓
- Free booster injections ✓
- Free public health / medicines if sick✓
- Isolate sick patients from public✓
- Assistance at home for sick mothers ✓ Any (2)
(Mark first TWO only)
(13)

3.2
3.2.1 A weakened form of disease causing organism✓/cholera (1)

3.2.2
- The body starts producing antibodies✓
- offering protection against the disease✓ (2)

3.2.3
- Disease causing bacteria are completely destroyed✓
- by antibodies that exist✓ in response to the vaccination (2)

3.2.4 Acquired immunity✓ (1)

3.2.5
- Improve sanitation✓
- Improve quality of water sources✓/drinking water
- Maintain and monitor sewage systems on regular basis✓
- Educate people✓
- Introduce penalties✓/ fines for dumping waste in water sources Any (3)
(Mark first THREE only)
(9)

3.3
3.3.1 Plant A - Bryophyta✓
Plant B - Pteridophyta ✓ (2)
3.3.2 Spores✓ (1)
3.3.3 Haploid✓ (1)
3.3.4 A ✓ (1)

3.3.5 It does not have true roots, stems and leaves✓ (1)
(6)

3.4
3.4.1
(a) - Seeds can withstand unfavourable conditions✓
- When conditions are favourable they will germinate ✓ (2)

(b) - Endosperm forms additional nutritive tissue ✓
- ensuring survival of embryo ✓ (2)

3.4.2 Conserve rare or endangered species✓ (1)
(Mark first ONE only)

(5)

3.5
3.5.1 Paleozoic✓ (1)

3.5.2 Conducting✓✓/vascular tissue (2)

3.5.3 400 million years – 140/150 million years
Accept answer between 350 – 360 million years✓✓ (2)

3.5.4
- Flowers are specialized to attract different pollinating agents✓
- and thus pollination can occur all year round✓
- and the chances of pollen reaching other flowers are greater✓ Any (2)

(7)

Total Question 3: 40

SECTION C

QUESTION 4

Process of photosynthesis

The Light Phase ✓

- It takes place in the grana ✓/thylakoids of the chloroplast
- Radiant energy is absorbed ✓
- by chlorophyll molecules✓and
- Some energy is used to form ATP✓
- Some energy is used to split water molecules✓
- into hydrogen and oxygen✓
- Oxygen is released✓to the atmosphere
- and the energy-rich hydrogen combines with a co-enzyme/NADP✓

The Dark Phase ✓/ Calvin Cycle/Light-independent phase

- It takes place in the stroma✓ of the chloroplast
- Carbon dioxide✓from the atmosphere
- combines with hydrogen✓from the light phase
- using energy from ATP✓
- to form carbohydrates✓/glucose/starch
- The reactions are controlled by enzymes✓ Any (12)

Effect of temperature on photosynthesis

- An increase in temperature✓
- causes an increase in the rate of photosynthesis✓
- until it reaches a maximum rate✓
- The rate of photosynthesis may level off✓
- because there may be other limiting factors✓/shortage of carbon dioxide/water
- If the temperature increases greatly✓
- it may cause a decrease in the rate of photosynthesis✓
- since the high temperature denatures the enzymes✓ of photosynthesis

Any (5)
Content: 17
Synthesis: 03

ASSESSING THE PRESENTATION OF THE ESSAY

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the topic	Ideas are arranged in a logical/cause-effect sequence	All aspects required by the essay have been sufficiently addressed
In this essay	Only information relating to the process of photosynthesis and the influence of temperature is included (There is no irrelevant information)	Each of the following is presented in a logical sequence: □ Process of photosynthesis □ The effect of temperature	Includes sufficient information on each of the following: □ Process of photosynthesis (min **8/12**) □ The effect of temperature (min **3/5**)
Mark	1	1	1

TOTAL SECTION C: (20)
GRAND TOTAL: [150]