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Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

COMMON TEST

JUNE 2016

NATIONAL SENIOR CERTIFICATE

GRADE 11

MARKS: 150

TIME: 2½ hours

N.B. This question paper consists of 12 pages.

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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. Write neatly and legibly.
6. If answers are NOT presented according to the instructions of each question, learners will lose marks.
7. ALL drawings should be done in pencil and labelled in blue or black ink.
8. Draw diagrams or flow charts only when requested to do so.
9. The diagrams in this question paper may NOT necessarily be drawn to scale.
10. The use of graph paper is NOT permitted.
11. Non-programmable calculators, protractors and compasses may be used.

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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 – 1.1.9), for example 1.1.10 A

1.1.1 Which ONE of the following substances is usually used to extract chlorophyll from leaves?

A Iodine solution
B Benedict's solution/Fehling's solutions A and B
C Alcohol
D Millons reagent

1.1.2 The following processes occur during cellular respiration:

(i) Release of carbon dioxide
(ii) Formation of pyruvic acid
(iii) Phosphorylation of glucose
(iv) Formation of water

In what order do these processes occur?

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

1.1.3 Angiosperms are classified as spermatophytes because they ...

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

1.1.4 A function of bile in the human alimentary canal is to ...

A convert glycogen into glucose.
B create an acidic environment for enzyme action.
C hydrolyse sucrose into glucose and fructose.
D create an alkaline environment for enzyme action.

1.1.5 ALL viruses contain ...

A RNA, DNA and a protein coat.
B RNA and a protein coat.
C DNA and a protein coat.
D a nucleic acid and a protein coat.

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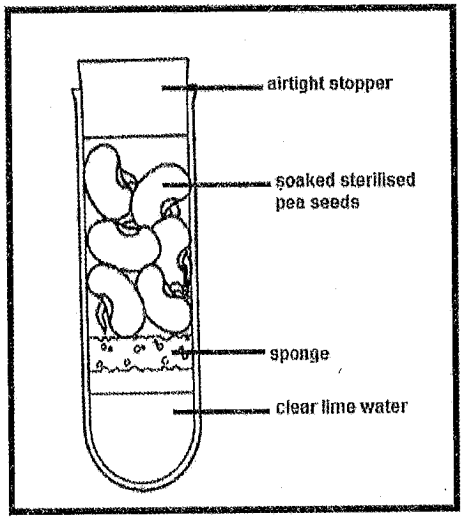
1.1.6 The apparatus illustrated below is used to show that carbon dioxide is given off during respiration.



A suitable control for this investigation would be to ...

A leave out the stopper.
B use boiled pea seeds.
C use bean seeds instead of pea seeds.
D use boiled pea seeds which have been sterilised.

1.1.7 An example of triploblastic animals that lack a through-gut and coelom is ...

A cnidarians.
B flatworms.
C annelids.
D arthropods.

1.1.8 Which ONE of the following is a phase in cellular respiration?

A Glycolysis
B Dark phase
C Light independent phase
D Light phase

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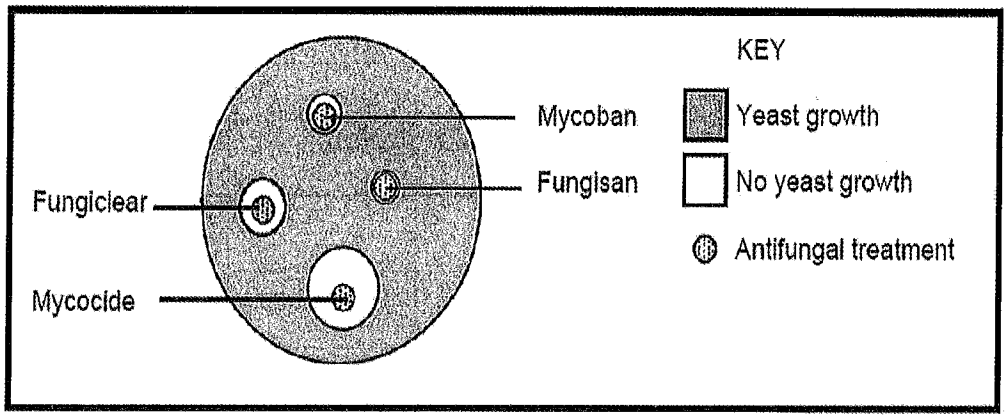
1.1.9 An investigation was carried out to test the effectiveness of four antifungal treatments on preventing the growth of yeast. The results are shown in the diagram below.



Which ONE of the following conclusions can be made from the results?

A All the antifungal treatments are equally effective
B All the antifungal treatments are ineffective
C Mycocide is most effective and Fungisan is least effective
D Fungisan is most effective and Mycocide is least effective

(9 x 2) (18)

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 A disease in which the hormonal control of glucose is defective because of a deficiency of insulin

1.2.2 A 6-carbon molecule that is broken down during cellular respiration to provide energy in a living cell

1.2.3 A type of reproduction that does not involves the fusion of male and female gametes

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

1.2.5 The flap-like structure which prevents food from entering the trachea

1.2.6 The process by which small quantities of a micro-organism or toxin is injected into the body to produce antibodies

1.2.7 A group of sporangia on the pinna of a fern plant

1.2.8 An evolutionary trend in the animal kingdom toward centralisation of neural and sensory organs in the anterior region of the body

1.2.9 A group of plants that have seeds enclosed in an ovary

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

(10 x 1) (10)

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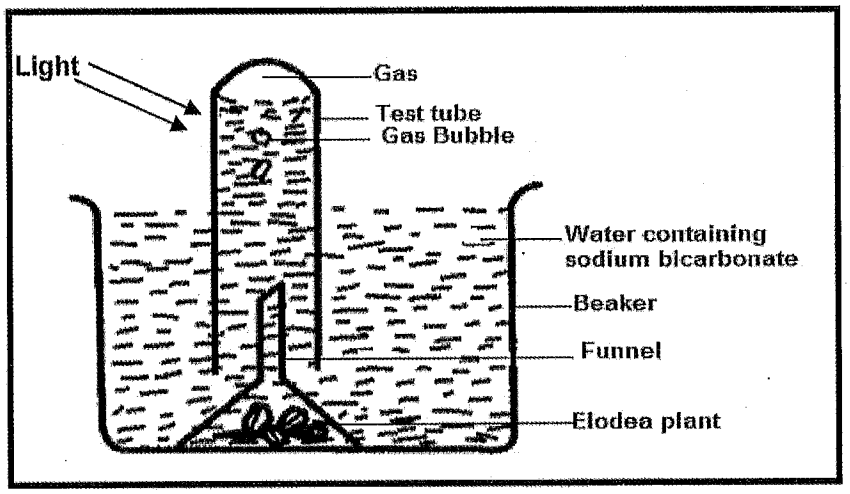
1.3 Indicate whether each of the descriptions in COLUMN I, applies to A ONLY, **B ONLY, BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number **(1.3.1 to 1.3.7)** **in the ANSWER BOOK.**

	COLUMN I	COLUMN II
1.3.1	A division of plants with a vascular system, seeds, and no flowers	A: Gymnospermae B: Angiospermae
1.3.2	Triploblastic	A: Platyhelminthes B: Annelida
1.3.3	The type of symbiotic relationship displayed by *E. coli* living in the human intestines	A: Commensalism B: Mutualism
1.3.4	A fluid-filled body cavity lined by mesoderm	A: Gut B: Coelom
1.3.5	Some are autotrophic while others are heterotrophic	A: Bacteria B: Protists
1.3.6	Transports end products of digested food from the intestine to the liver	A: Hepatic portal vein B: Hepatic vein
1.3.7	Root-like structures in moss plants	A: Thallus B: Rhizoids

(7 x 2) (14)

1.4 Study the diagram that illustrates bubbles of gas being released during an investigation and answer the questions that follow.



1.4.1 Name the process that is being investigated in this experiment. (1)

1.4.2 Identify the gas that accumulates in the test tube. (1)

1.4.3 Describe the procedure used to test for the gas referred to in Question 1.4.2. (2)

1.4.4 Explain why sodium bicarbonate was added to the water in this investigation. (2)

1.4.5 Explain how a control can be set up for this experiment. (2)

(8)

Total Question 1: [50]

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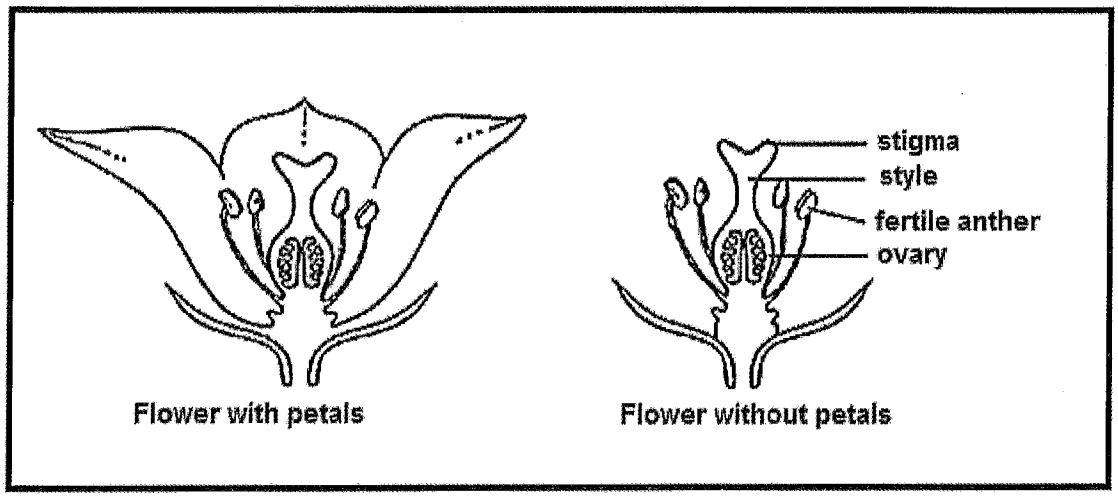
SECTION B

QUESTION 2

2.1 An investigation was done to determine the role of petals in insect pollination in apple flowers. When flowers are self-pollinated, the pollen tube grows only a little into the stigma and style and fertilisation does not take place.

- 10 flowers with petals and 10 flowers without petals were used.
- After two days the flowers were prevented from further pollination.
- After seven days the extent of pollination and fertilisation was recorded.

The diagrams below show the appearance of the flowers with and without petals.



The results are shown in the table below.

	NUMBER	
	Flower with petals	**Flower without petals**
Pollen on stigma	158	25
Pollen tubes in the style	86	8
Ovules fertilized	38	4

2.1.1 Give an explanation for the presence of more pollen on the stigmas of the flowers with petals than on the flowers without petals. (2)

2.1.2 Explain why there are more pollen tubes present in the style of both types of flowers than the number of ovules fertilised. (2)

2.1.3 State THREE ways in which the validity of this investigation can be ensured. (3)

2.1.4 State TWO ways in which the angiosperms are better adapted to terrestrial life than bryophytes. (2)
(9)

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2.2 Read the extract below and answer questions that follow.

> Aerobic and anaerobic respiration are used to supply energy during exercise. During certain types of exercise, for example, athletic events such as 100m, 200m, 1500m and 3000m, the muscles are unable to obtain sufficient oxygen for the removal of large quantities of lactic acid from their cells. When sprinting, an athlete cannot possibly inhale more than the fraction of the oxygen required, and the body goes into 'oxygen debt'. 'Oxygen debt' can be defined as the extra oxygen needed to normalize the process after strenuous exercise. This debt can only be repaid by rapid breathing after the sprint ends.

2.2.1 Name TWO end products of aerobic respiration in muscle cells. (2)

2.2.2 Which athletic event relies the most on anaerobic respiration? (1)

2.2.3 Explain your answer to QUESTION 2.2.2. (2)

2.2.4 Which TWO athletic events would give rise to a high 'oxygen debt'? (2)

2.2.5 Describe what happens to the energized hydrogen atoms released during aerobic respiration. (5)

2.2.6 Tabulate TWO differences between aerobic and anaerobic respiration. (5)
(17)

2.3 Malaria is a parasitic disease that is transmitted in humans through the bite of a female mosquito of the *Anopheles* species, which is a vector for the parasite. The most effective way of managing malaria is to destroy its vector. An insecticide that has been successful to date is DDT.

Scientists investigated the resistance of mosquitos to DDT. The following steps were followed:

- A sample of mosquitos was captured from the environment
- The mosquitos were then exposed to a standard dose of DDT (4% DDT for 1 hour) in the laboratory.
- The number of mosquitos that died was counted and the percentage of mortality was determined.
- Those that survived were left to reproduce.
- A sample was taken from this population every two months and the same procedure was followed for a period of 16 months.

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The results are shown in the table below.

TIME (IN MONTHS)	MORTALITY OF MOSQUITOES (%)
0	95
2	87
4	80
6	69
8	60
10	54
12	35
14	27
16	22

2.3.1 Identify the:

(a) Independent variable (1)
(b) Dependent variable (1)

2.3.2 Formulate a hypothesis for this investigation. (2)

2.3.3 Using the information from the table, write a suitable conclusion regarding the effect of DDT on mosquitos. (2)

2.3.4 State TWO ways in which the scientists could improve the reliability of their results. (2)

2.3.5 Draw a line graph to show how the mortality of mosquitos changed over the period of investigation due to the application of DDT. (6)

(14)

Total Question 2: [40]

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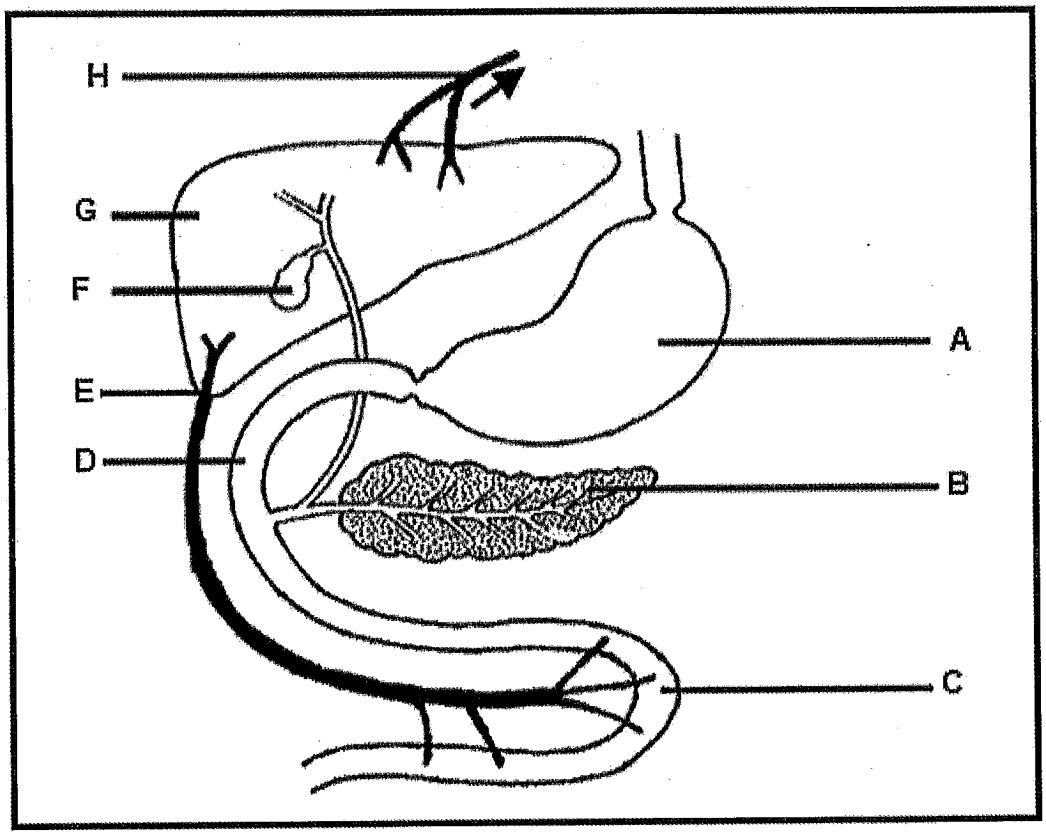
QUESTION 3

3.1 The diagram below shows part of the human digestive system.



3.1.1 Identify organ **B**. (1)

3.1.2 Name:

(a) TWO substances that can be stored in **G**. (2)

(b) The chemical substance which creates an acidic pH in **A**. (1)

3.1.3 List TWO structural features of part **A** which makes it suitable for its function. (2)

3.1.4 During a long distance race an athlete uses a high amount of glucose from his blood. Explain how the glucose level is brought back to normal. (5)

3.1.5 Describe what happens to excess amino acids in the body. (4)

(15)

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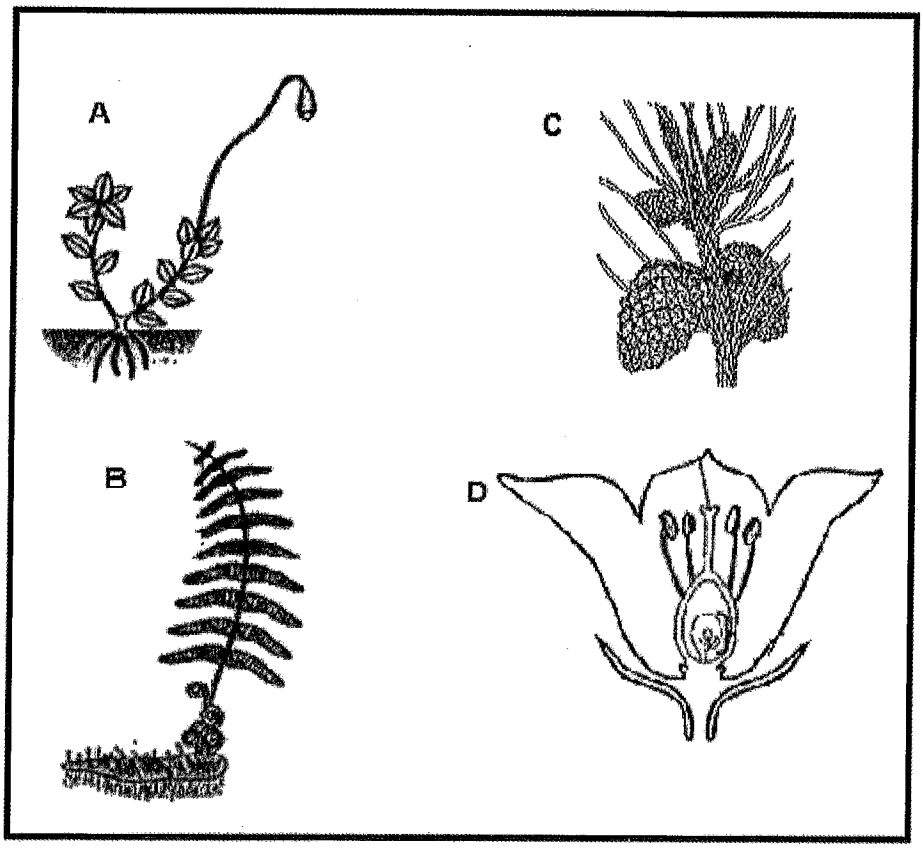
3.2 Study the diagrams that illustrate different plants and answer the questions that follow.



3.2.1 Identify the group to which **A** and **B** belong. (2)

3.2.2 Which of the four groups **(A, B, C or D)**:

(a) Are dependent on water for fertilisation (2)
(b) Produce seeds for reproduction (2)

3.2.3 Explain how the dependency on water for reproduction is reduced in the group represented by **C**. (3)

3.2.4 State TWO advantages of seeds over spores. (2)

3.2.5 List THREE similar structural features of the prothallus in ferns and the gametophyte in mosses, which make both to be poorly adapted to a terrestrial life. (3)

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

(16)

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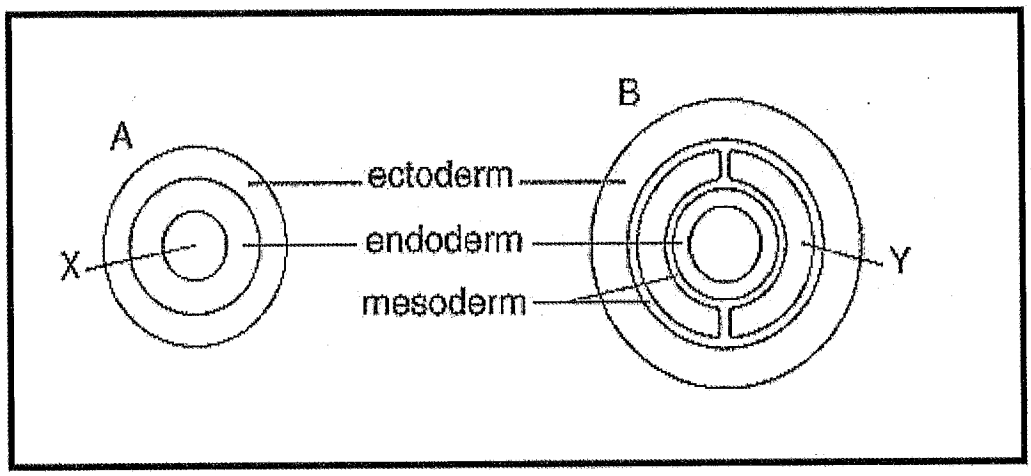
3.3 Study the diagram, which represent the body plans of two animals and answer the questions that follow.



3.3.1 Provide labels for **X** and **Y**. (2)

3.3.2 Which body plan **(A or B)** represents an organism with radial symmetry? (1)

3.3.3 State whether body plan B represents a **diploblastic** or **triploblastic** animal. (1)

3.3.4 Give a reason for your answer to QUESTION 3.3.3. (1)

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

3.3.6 Explain ONE advantage of the development of part **Y** to organisms with body plan **B**. (2)

(9)

Total Question 3: [40]

SECTION C

QUESTION 4

Photosynthesis takes place within the chloroplasts of green plants. Explain THREE structural adaptations of chloroplasts and describe the process of photosynthesis.

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

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

GRAND TOTAL [150]

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Basic Education

KwaZulu-Natal Department of Basic Education

REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

GRADE 11

MEMORANDUM

JUNE 2016

NATIONAL SENIOR CERTIFICATE

GRADE 11

MARKS : 150

TIME : 2½ hours

This memorandum consists of 8 pages.

SECTION A

QUESTION 1

1.1
1.1.1 C ✓✓
1.1.2 C✓✓
1.1.3 B✓✓
1.1.4 D✓✓
1.1.5 D✓✓
1.1.6 D✓✓
1.1.7 B✓✓
1.1.8 A✓✓
1.1.9 C✓✓

(9 x 2) (18)

1.2
1.2.1 Diabetes✓
1.2.2 Glucose✓
1.2.3 Asexual✓
1.2.4 Fungus/Yeast✓
1.2.5 Epiglottis✓
1.2.6 Vaccinations✓
1.2.7 Sorus✓
1.2.8 Cephalisation✓
1.2.9 Angiosperms✓
1.2.10 Symmetry✓

(10 x 1) (10)

1.3
1.3.1 A only✓✓
1.3.2 Both A and B✓✓
1.3.3 B only✓✓
1.3.4 B only✓✓
1.3.5 Both A and B✓✓
1.3.6 A only✓✓
1.3.7 B only ✓✓

(7 x 2) (14)

1.4
1.4.1 Photosynthesis✓ (1)

1.4.2 Oxygen✓ (1)

1.4.3
- Insert a glowing splinter into the test tube✓
- If the splinter catches alight✓ it indicates the presence of oxygen (2)

1.4.4
- To increase the supply of carbon dioxide ✓
- needed for photosynthesis ✓ (2)

1.4.5
- Set up the apparatus as in the experiment ✓
- but place it in the dark ✓ (2)

(8)

Total Question 1: [50]

SECTION B

QUESTION 2

2.1

2.1.1
- The flowers with petals attracted more insects✓✓
- The flowers without petals may not have attracted insects✓✓
- Presence of petals prevent the wind from blowing away most of the pollen✓✓
- The absence of petals will allow the wind to blow most of the pollen away✓✓

Any (1 x 2) (2)

2.1.2
- Some of the pollen tubes that developed were from the same flower✓
- and with self-pollination there is little growth of the tube into the style✓

(2)

2.1.3
- Use the same size flowers✓
- Use the same colour flowers✓
- Use flowers of the same apple tree✓
- Ensure that all the flowers are pollen-free at the beginning of the investigation✓

(Mark first THREE only) Any (3)

2.1.4
- It has a well-developed vascular system✓
- Sexual reproduction is independent of water✓
- Fertilisation occurs by means of pollinators✓
- Have true roots stem and leaves✓
- Sporophyte is the dominant generation✓
- It produces seeds✓

(Mark first TWO only) Any (2)

(9)

2.2 2.2.1
- Carbon dioxide✓/CO_2,
- Water✓
- Energy✓/ATP

Any (2)

2.2.2 100 m✓ (1)

2.2.3
- Due to sudden burst of activity, the body needs quick supply of energy✓
- Hence cells engage in anaerobic respiration✓ to compensate for shortage of oxygen supply. (2)

2.2.4 100 m✓
200 m ✓ (2)

2.2.5
- Energised hydrogen combines with a co-enzyme✓
- During oxidative phosphorylation✓
- in the mitochondrion✓
- the hydrogen is transferred from one co-enzyme to the next✓
- At each transfer energy is released✓
- and trapped as ATP✓
- The hydrogen finally combines with oxygen✓
- to form water✓

Any (5)

2.2.6

AEROBIC RESPIRATION	ANAEROBIC RESPIRATION
Requires oxygen✓	Independent of oxygen✓
Takes place in the cytosol and mitochondria✓	Takes place in the cytosol only✓
By-products are carbon dioxide and water✓	By-products are carbon dioxide and ethanol in plants/ and lactic acid in animals✓
Releases large amounts of energy✓	Little energy released✓

Any 2 x 2 + 1 for table (5)
(17)

2.3

2.3.1 (a) Time ✓/Months (1)
(b) Mortality of Mosquitoes✓ (1)

2.3.2
- Mosquito mortality due to DDT will decrease over time✓✓

OR

- Mosquito mortality due to DDT will increase over time ✓✓

OR

- Mosquito mortality due to DDT will remain the same over time✓✓ (2)

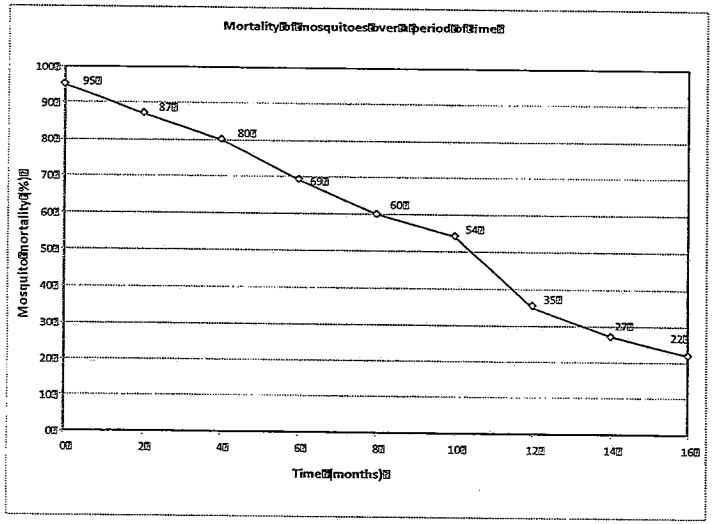
2.3.3
- Initially DDT was effective in killing mosquitos✓
- but with an increase in time the mosquitos became resistant to DDT✓/ there was a decrease in the mortality rate (2)

2.3.4
- Increase the sample size of mosquitos ✓
- Take many samples each time and calculate the average mortality✓
- Repeat the investigation using the same procedure✓

(Mark first TWO only) Any (2)

2.3.5

Mark allocation for the graph



Criterion	Elaboration	Mark
Type of graph	Line graph drawn	1
Caption	Includes both variables (percentage mortality of mosquitos and Time	1
Scale	Appropriate scale for X-axis AND Y-axis	1
Labelling of Axis	Correct label and units for X-axis AND Y- axis (%)	1
Plotting of points	1- 8 points plotted correctly -1 mark All 9 points plotted correctly – 2 marks	2

(6)
(14)

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

Total Question 2:[40]

QUESTION 3

3.1

3.1.1 Pancreas✓ (1)

3.1.2 (a)
- Glycogen✓
- Fats✓
- Vitamins✓
- Iron✓

(Mark first TWO only) Any (2)

(b) Hydrochloric acid✓/HCl (1)

3.1.3
- It is sac-like/has folds - can stretch✓
- Has thick muscular walls✓
- Contains glands✓
- There are sphincters ✓/valves

(Mark first TWO only) Any (2)

3.1.4
- During the race the glucose level drops✓
- and therefore stored glycogen✓
- will be converted to glucose✓
- by glucagon✓
- to increase the blood glucose level✓ (5)

3.1.5
- Deamination✓occurs
- in the liver✓
- resulting in the formation of glucose ✓
- and urea ✓ (4)

(15)

3.2 3.2.1 A - Bryophyta✓/bryophytes✓/moss plant ✓
B - Pteridophyta✓pteridophytes✓/ fern plant✓ (2)

3.2.2 (a) A✓and B✓ (2)
(b) C✓ and D✓ (2)

3.2.3
- Pollen grains are carried by wind or pollinator from male to female cone✓
- After pollination a pollen tube✓ is developed
- This allows male gamete to be carried directly to the egg cell✓in the ovule (3)

3.2.4
- Seeds have tough coat✓which prevents drying out
- Seeds have food reserves✓for the developing embryo
- Seeds have fully developed embryo✓to immediately start growing when conditions become favourable
- Seeds have a longer lifespan✓ than spores
- Seeds can remain dormant (and viable) ✓ compared to spores

(Mark first TWO only) (2)

3.2.5
- No true root, stem or leaves/ have rhizoids✓
- No conducting tissue✓
- No stomata✓
- No cuticle✓

(Mark first THREE only) Any (3)

3.2.6
- Flowers enable angiosperms to attract pollinators✓
- thus increasing success of pollination✓/ fertilisation Any (2)

(16)

3.3 3.3.1 X - Gut ✓
Y - Coelom ✓ (2)

3.3.2 A✓ (1)

3.3.3 Triploblastic ✓ (1)

3.3.4 B shows three germ layers/ectoderm, mesoderm and endoderm✓

3.3.5 Annelida✓ and Arthropoda✓ (2)
(Mark first TWO only)

3.3.6
- Provides space✓
- for development of organs ✓
  OR
- Contains fluid✓
- which acts as hydrostatic skeleton✓

(Mark first ONE only) (2)

(9)

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Structural adaptation of chloroplasts for photosynthesis
- The double membrane is selectively permeable✓ allowing water and carbon dioxide to enter easily ✓
- The grana contain chlorophyll ✓ to trap sunlight ✓
- The grana are made up of thin flat discs called lamellae ✓that present a large surface area for absorption of sunlight✓
- The stroma contains enzymes ✓ for the reactions of the dark phase✓
- Ribosomes in the stroma✓ synthesize enzymes for photosynthesis✓
- Starch granules ✓are present to temporarily store starch that is produced✓ Any (3 x 2) (6)

The light phase ✓
- It takes place in the grana ✓ of the chloroplast
- Radiant energy ✓is absorbed by chlorophyll molecules✓and
- converted into potential chemical energy ✓
- Some energy is used to split water ✓/photolysis into hydrogen and oxygen
- Some energy is used to form ATP✓
- Oxygen is released✓into the atmosphere
- and the energy-rich hydrogen combines with a co-enzyme/NADP/ forms NADPH✓

(Any 6) (6)

The Dark Phase ✓/ Calvin Cycle/Light-independent phase
- It takes place in the stroma✓
- Carbon dioxide✓from the atmosphere
- combines with hydrogen✓ from the light phase
- using energy from ATP✓
- to form carbohydrates✓, such as
- glucose✓/fructose/sucrose/starch/ $C_6H_{12}O_6$

(Any 5) (5)
Content (17)
Synthesis (3)
(20)

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 in Q4.1	Only information relating to the structural adaptation of chloroplast for photosynthesis and the process of light and dark phase is included (There is no irrelevant information)	All structures are related to their respective function. Events in the light and dark phase are presented in a logical sequence.	Includes sufficient information on structural adaptation of chloroplast and the two processes i.e. structural adaptation **(min 4/6**; light phase **(min 4/6)** and dark phase**(min 3/5)**
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: [150]