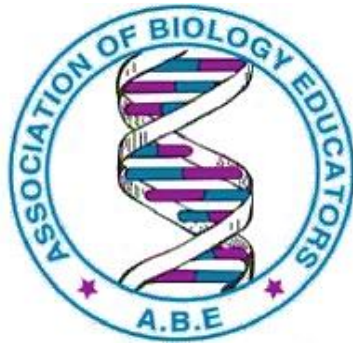


Association of Biology Educators (ABE)



**2023 EDITION 'O' LEVEL NATIONAL SEMINAR-SERIE No: 9
HELD AT ROCK HIGH SCHOOL, TORORO (U) ON THE
SUNDAY 01ST OCTOBER, 2023**

This write up is a university link, and has been epically designed as part of ABE National seminar series of the 2023. The Association of Biology Educators (ABE) team has curated sample questions to ease your revision, using expert guidance. i) Senior 5 and 6 topics (according to NCDC syllabus); ii) Plant and Animal biology; iii) 4 themes, i.e., Cell Biology topics, Ecology, Maintenance of life topics & Continuity of life topics.

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. FOREWORD

Biology revision can be a daunting task, but it doesn't have to be. The **Association of Biology Educators (ABE)** has simplified Biology revision through seminars, where expert guidance, as well as sample questions and answers are discussed.

Biology Revision Tips

Whether you are a student preparing for exams or an adult looking to brush up on your skills, this work can help you achieve your Biology goal.

- First, set your Biology goal. What distinction or credit do you aim to score in Biology? Do you know the marks needed to score each distinction or credit?
- Next, create a revision plan. During which hours will you be revising Biology per day or in a week? Manage your time effectively - draw a revision time table with Biology placed in favorable hours when your brain is fresh. Strictly follow your Biology reading time table, no matter what!
- Then, collect materials, read them, answer questions and mark yourself using the answers. Balance all topics, from **S.1** to **4**. Sources of questions include textbooks, newspapers and past exam papers.
- Beware that marks from two papers make your final grade. For paper 1 (553/1), spend more time practicing Section **B** and **C** questions. For practical (paper 2/ 3), pay special attention to drawings, food tests and features for classification, including biological keys.
- Lastly, where you find difficulty, discuss with classmates or approach your teachers for further guidance.

How to use this work

You can read this work from cover to cover, or you can dip in and out of the different topics as needed. If you are a student preparing for exams, I recommend that you first read your notes to understand the key concepts. Once you have understood the basics in a given topic, start answering questions. In this work, questions are arranged in a sequence following the Uganda Biology syllabus. Therefore, you can quickly locate the topics where you need to focus your revision.

Note that whereas this work covers all the key concepts and principles, it does not exhaust all the possible questions in each topic. Accordingly, use it alongside your notes, textbooks and any other materials recommended by your teachers.

I hope that you find this work helpful. Good luck with your exams!

Frederick Dongo-Shema. President, ABE

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CLASS: S.1 TOPIC 1: DIVERSITY OF LIVING THINGS

1.1 Classification

1.1.1 The figure below shows different organs found in different plant species.

(a) (i) State three similarities between specimen A and D.

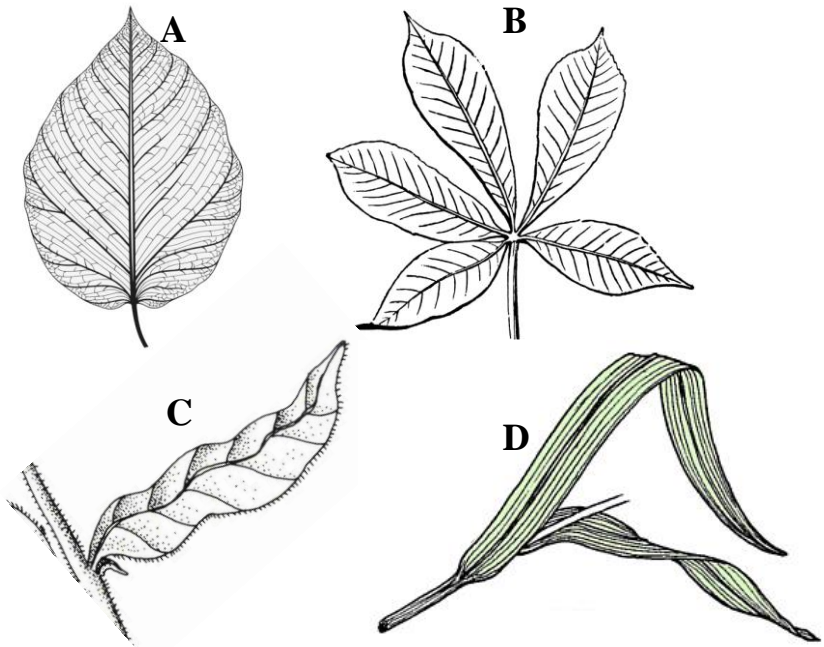
(ii) State the differences between A and D.

(iii) How is specimen B adapted to perform its functions?

(b) Construct a dichotomous key to identify the specimen above.

1.1.2 (a) Describe the key characteristics that distinguish bacteria from fungi from plants.

(b) What structural adaptations of plants enable them to thrive on land.



1.2 Flowering plant structures

1.2.1 (a) Explain the concept of modified stems, roots, and leaves in plants,

(b) Provide examples of each type of modification and discuss their functions in the plant's survival and growth.

1.2.2 (a) Compare and contrast the functions of leaves and roots in a plant.

(b) How do the structures and adaptations of leaves and roots reflect their specific roles within the plant?

1.3 Insect Features, Life Cycles and Economic Importance

1.3.1 The figure below shows different organisms that are important for human survival.

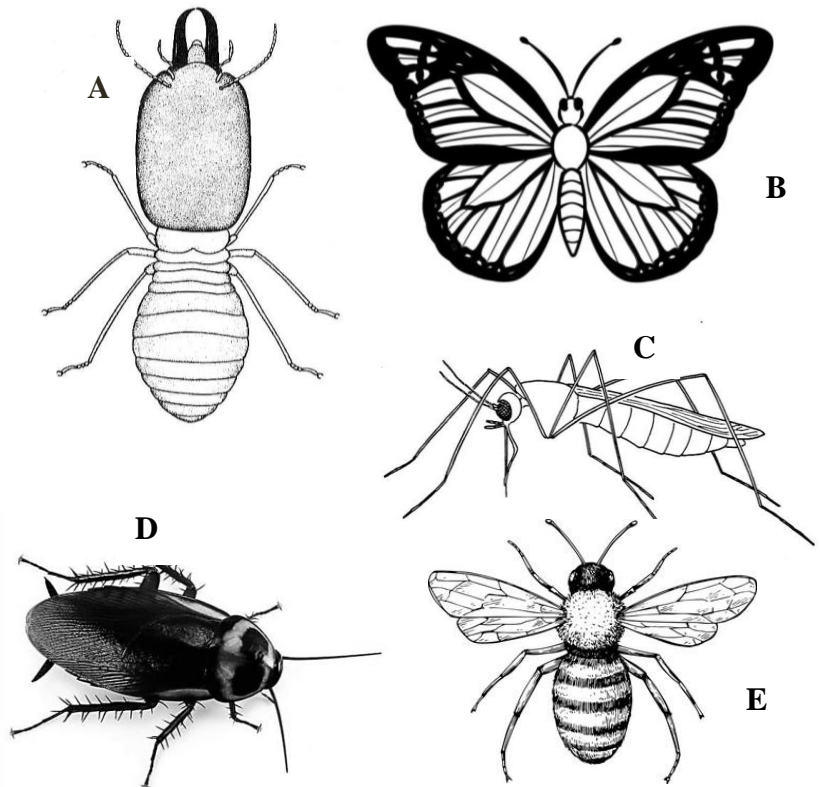
(a) (i) How is specimen E adapted to its mode of life?

(ii) How is specimen C adapted to the spread of disease-causing germs?

(b) (i) State any three similarities between specimen B and specimen D.

(ii) How is specimen B different from specimen D?

(c) Using the specimens shown, construct a dichotomous key to identify the organisms.



- 1.3.2 (a) Compare the life cycles of a cockroach and a butterfly.
 (b) What are the ecological implications of the life cycles in (a) above?

CLASS: S.2 TOPIC 2: SOIL

2.1 Soil Fertility

2.1.1 a) What are the physical characteristics of each soil component?

b) Describe an experiment that can be performed in the school laboratory to show the proportion of each soil component.

2.2 C, N, Water cycles

2.2.1 The figure below shows how important elements are required for human survival are recycled.

(a) (i) What name is given to process labelled Z?

(ii) Name the categories of bacteria represented by letters Z, Y and X.

(b)(i) Name examples of bacterial represented by letters X and Z.

(ii) What is the significance of the above cycle to the ecosystem?

(ii) Describe the different ways, human activities can affect the above cycle.

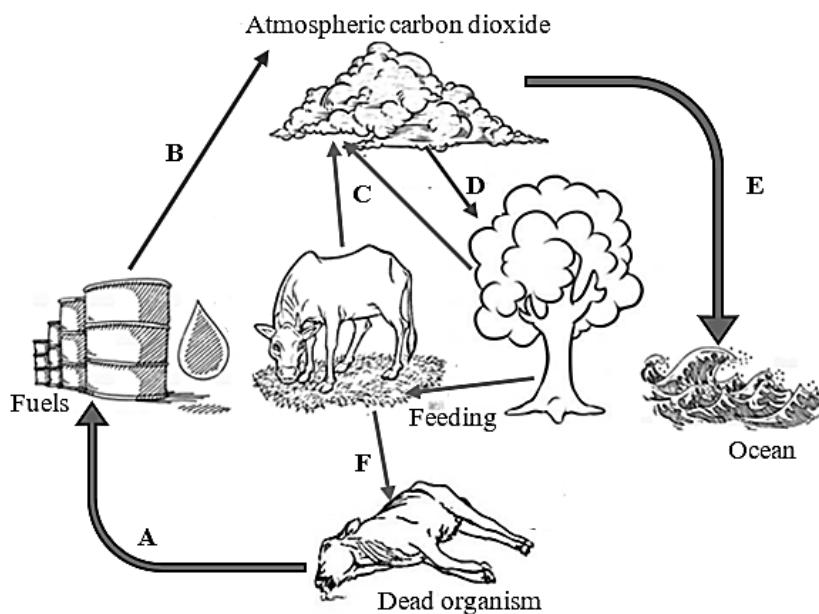
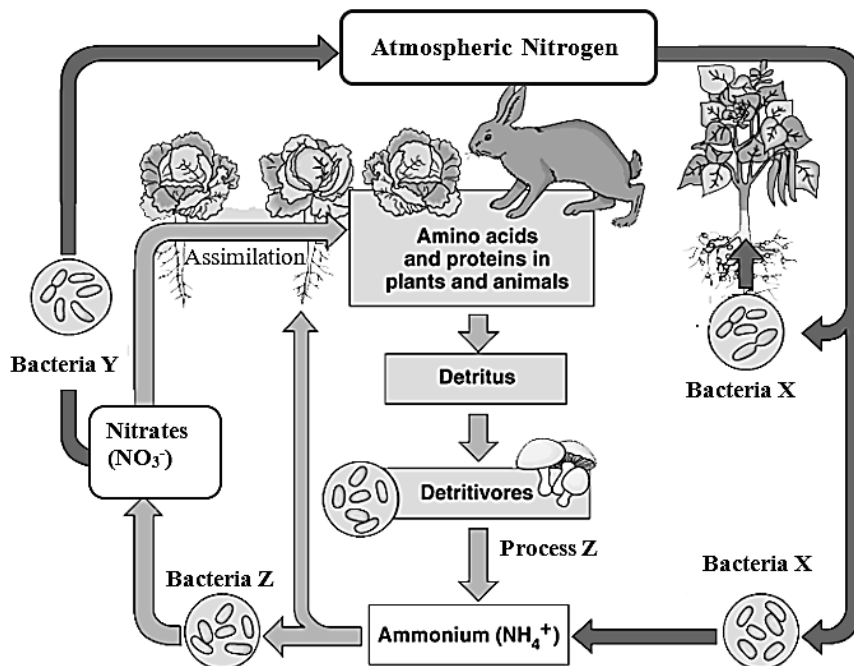
2.2.2 The figure below shows how important elements are required for human survival are recycled.

(a) (i) Name the process represented by letters from A to E.

(ii) Describe the ecological significance of process D

(b)(i) Describe the role played mushrooms in the process labelled F.

(ii) How can human activities affect the above cycle.



CLASS: S.2 TOPIC 3: NUTRITION

3.1 The graph below shows the effect of variations in leaf temperature on the rate of photosynthesis at different carbon dioxide concentrations

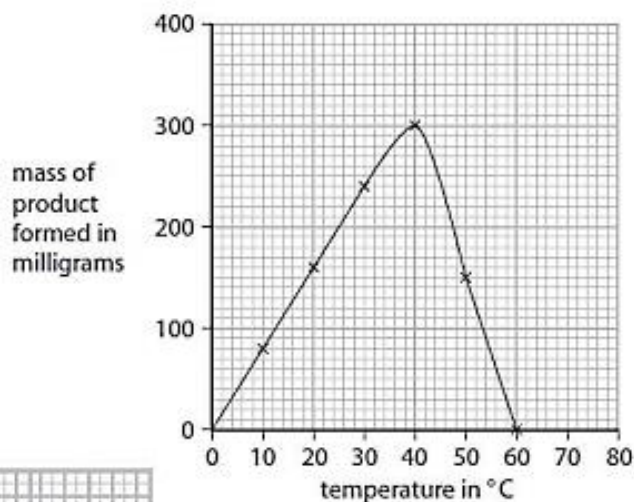
Leaf temperature/ °C	Rate of photosynthesis (a.u)	
	In air with 0.04% CO ₂	In the air with 0.19% CO ₂
10	8.0	8.0
15	12.3	16.8
20	15.0	24.4
25	16	30.0
30	16	34.0
35	16	34.0
40	0	0
45	0	0

- (a) Represent the above information on a graph
- (b) (i) State and explain the effect of changing the carbon dioxide percentage from 0.04 to 0.19 on the rate of photosynthesis.
- (ii) Explain the variations in the rate of photosynthesis with the changes in leaf temperature at 0.04% carbon dioxide.
- (c) (i) State any other two factors that can affect the rate of photosynthesis.
- (ii) State the ecological significance of photosynthesis
- (d) (i) State any three ways how the rate of photosynthesis can be measured.
- (ii) Explain why the above three methods in (d)(i) do not give the correct rate of photosynthesis.

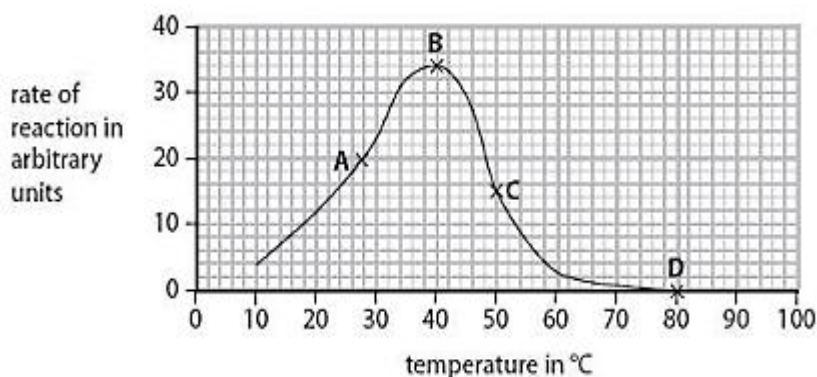
3.2 A student investigated the activity of a human enzyme at different temperatures. The student measured the mass of product formed after 10 minutes at different temperatures. The Figure provided shows the results of this investigation.

- (a) Describe the trends shown in Figure.
- (b) Explain the results obtained for the range of temperatures shown.

(c) The Figure provided shows the rate of reaction for the enzyme pepsin at different temperatures.



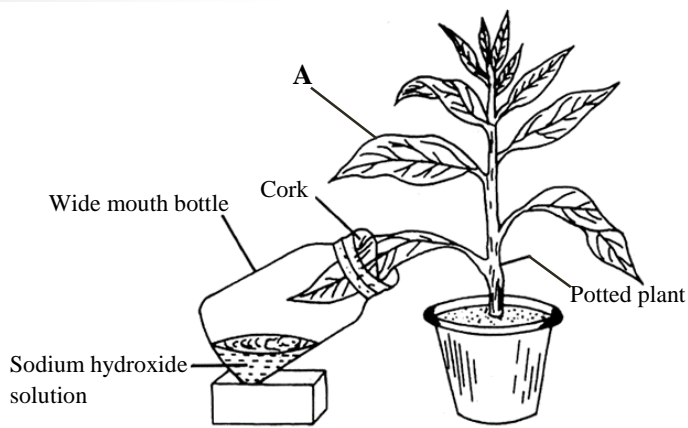
Explain why the rate of reaction is different at points A, B, C and D.



3.3 (a) Describe an experiment that can be performed to investigate the effect of pH on the breakdown of starch by amylase.

(b) What are the functions of carbohydrates to plant and animal bodies?

3.4 The experiment was set up to investigate conditions necessary for photosynthesis. The plant was placed in the dark for 24 hours. Immediately some leaves were removed and tested for starch. One leaf was then put in a bottle with sodium hydroxide solution. The experiment was then put in light for 12 hours.



(a) (i) Why was the plant placed in the dark for 24 hours?

(ii) Why was sodium hydroxide solution used in the experiment?

(b) Why were the leaves tested for starch after 24 hours in the dark? What was observed?

(c) What was observed when the following were tested for starch after the experiment?

(i) Leaf A

(ii) Leaf in the bottle

(d) Explain your answers in (c)(i) and (ii) above.

3.5 (a) Describe the structural adaptations of a typical plant that enable it to efficiently capture light and perform photosynthesis.

(b) How do leaf arrangement and types of leaves play a role in this?

CLASS: S.2 TOPIC 4: TRANSPORT

4.1 (a) Explain how the structure of root hair cells is essential for efficient water and mineral absorption by plants.

(b) How can gardeners and farmers use this knowledge to improve crop yields and conserve water resources in agriculture?

4.2 (a) Explain how the accumulation of tissue fluid and lymph fluid is related to the development of elephantiasis.

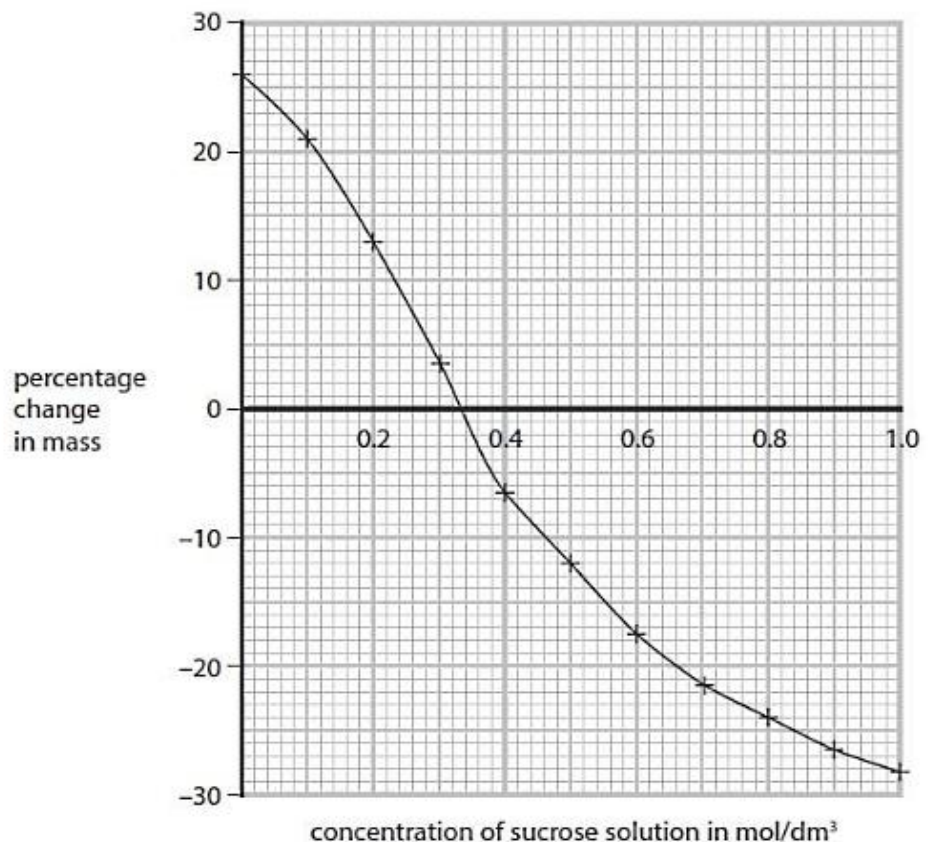
(b) What lifestyle practices can individuals adopt to reduce the risk of elephantiasis in regions where it is prevalent?

4.3 A student investigated the percentage change in mass of potato cylinders placed in sucrose solutions of different concentrations. The figure below shows the results of the student's investigation.

a) State two conclusions that can be made from these results.

b) Explain the effect of changing the sucrose concentration on percentage change in mass of potato cylinders.

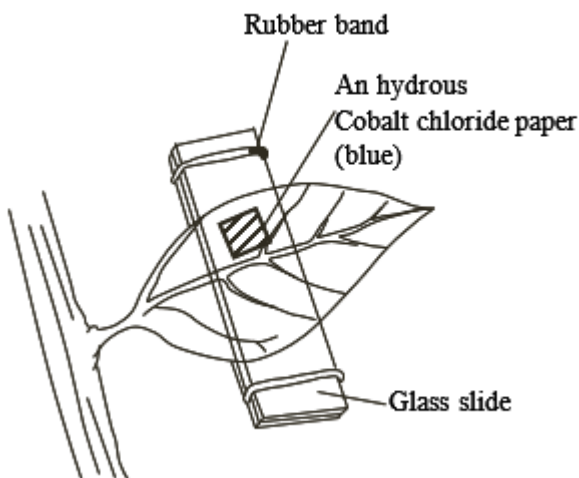
c) (i) Suggest the sucrose concentration that is equivalent to the solute concentration in the cell sap.



(ii) Explain your answer in (c) (i) above.

d) What would have happened to red blood cells if subjected to the same conditions in this experiment?

4.4 Senior two students set up an apparatus as shown below to investigate a certain phenomenon. Cobalt chloride papers were placed on the upper and lower sides of the leaf.

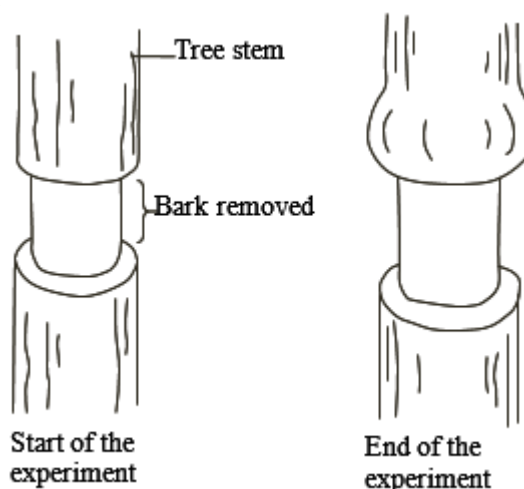


(a) What was the objective of the experiment?

(b)(i) State the expected observation after some minutes.

(ii) Account for the results in b(i) above.

(c) Study the diagrams below and answer the questions that follow



(i) What was the aim of the experiment?

(ii) Account for the results observed.

(iii) Does the setup shown in the experiment above affect the flow of water up the plant?

(iv) What would you expect to eventually happen to the tree that had a complete ring of the bark removed? Give reasons.

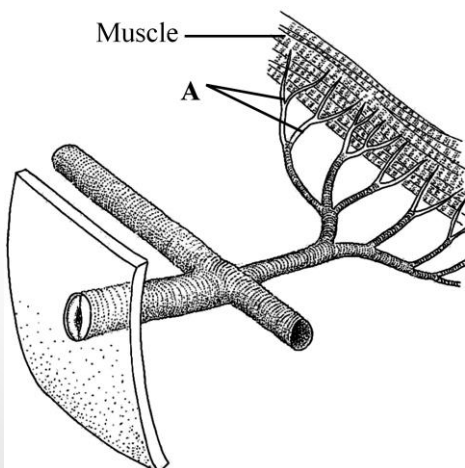
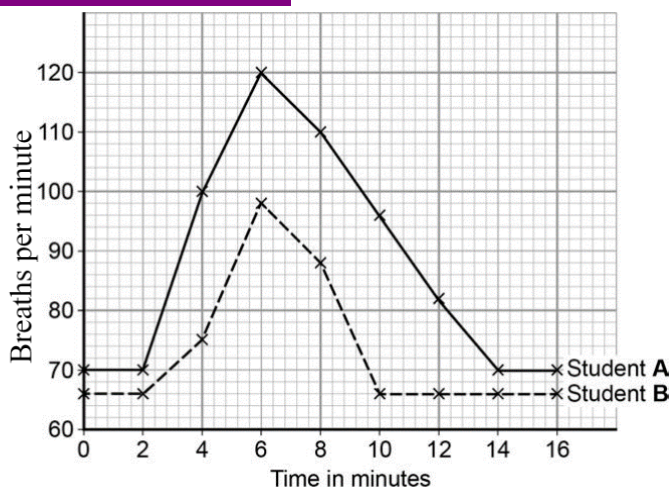
CLASS: S.3 TOPIC 5: RESPIRATION & GASEOUS EXCHANGE

5.1 The graph below shows the effect of exercise on the rate of breathing rate. Two students A and B were allowed to sprint for a period of 4 minutes.

(a) (i) At what time did they start running? Give a reason for your answer.

(ii) Explain the changes in the breathing rate in student B.

(b) (i) One of the students is an athlete, using the



information from the graph, which student is an athlete?

(ii) Explain your answer in b (i).

(c) With a reason, which student is more likely to suffer from muscle cramps during the course of running?

5.2 The following diagram shows a section of the respiratory system of a small animal.

(a) Briefly describe the role played by abdominal muscles to allow air into the part labeled A.

- (b) (i) Describe the adaptations of part A to perform its functions
(ii) How is the above structural arrangement different from the respiratory system in man?
(c) State any two reasons why plants lack such sophisticated respiratory systems.

5.3 (a) How is gaseous exchange in insects different from that in fish?

(b) Describe how the following processes occur in insects

- (i) Inhalation
(ii) Exhalation

(c) Insects lack gas transport pigments, describe the structural strategies for efficient movement of oxygen to respiring tissues.

CLASS: S.3 TOPIC 6: HOMEOSTASIS-(TEMPERATURE REGULATION, OSMOREGULATION & EXCRETION)

6.1 The graph shows the level of anti-diuretic hormone (ADH) in the blood and the rate at which urine is formed

(a) (i) What is the normal rate of urine production?

(ii) What is the highest rate of urine production?

(b) (i) What effect does a change in the level of ADH have on the rate of urine

(ii) Explain how ADH controls the changes in the volume of urine as represented by the graph.

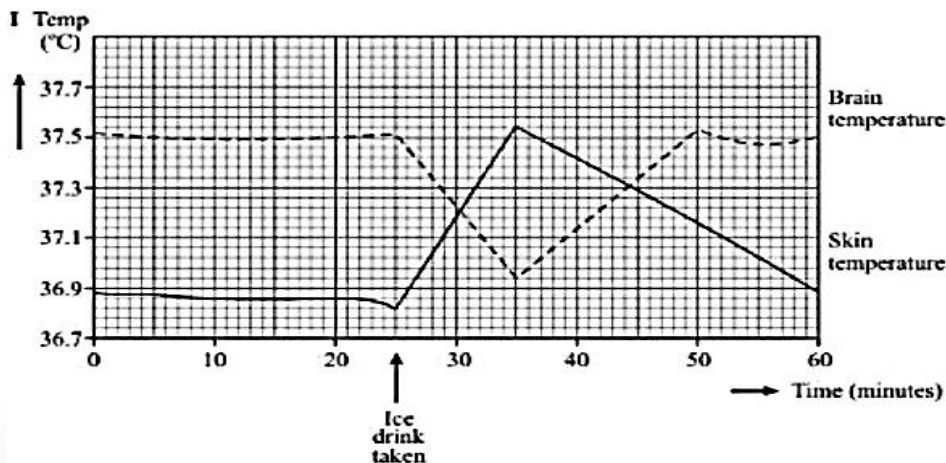
6.2(a) Describe what happens in the following regions during excretion;

- (i) Bowman's Capsule
(ii) Proximal convoluted tubules
(iii) Collecting ducts

(b) (i) Under what circumstances can the body produce more concentrated urine than the normal.

(ii) Why is it important to take a lot of water when on medication?

6.3 The figure below shows the changes in the student's body on a hot day after taking an iced drink.



(a) State the difference in the changes in brain and skin temperature after an iced drink is taken.

(b) Give reasons for the above difference (s).

(c) Describe the roles of different parts of the skin in temperature regulation.

CLASS: S.3 TOPIC 7: COORDINATION IN PLANTS AND ANIMALS

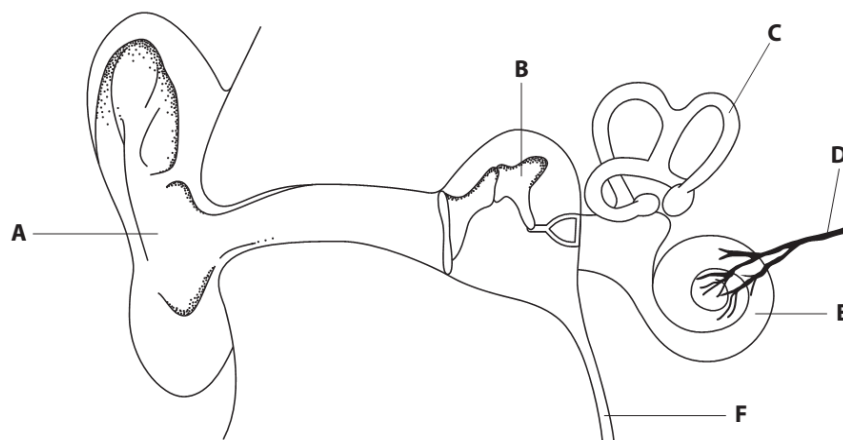
7.1 The diagram shows the structure of the human ear.

(a) (i) Name the parts labelled A, B, C, D, E and F.

(ii) State the two main functions of the ear.

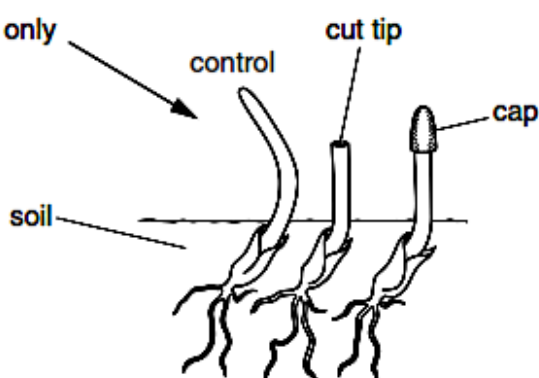
(b) (i) State any three adaptations of part C to perform its function.

(ii) What is the function of F and D?



7.2 From an experiment investigating how light affects seedlings, the results are shown in the figure.

light from this direction only

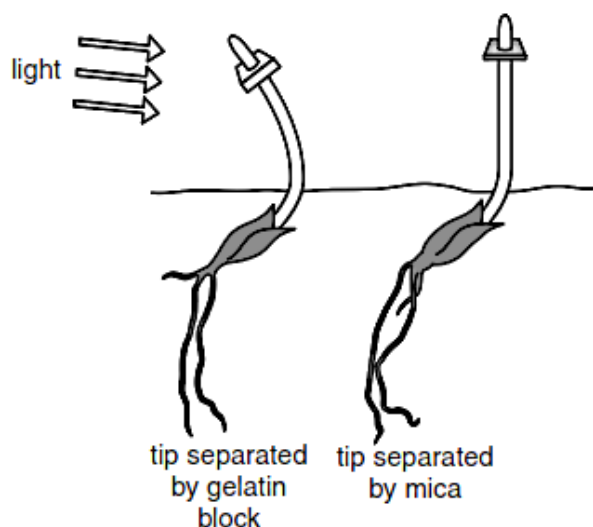


a) (i) What is meant by control experiment?

ii) State the type of response observed from the results.

b) Explain the observed responses in the figure above.

From further investigation, the diagram shows the results.



c) Explain the observed responses in the figure above.

7.3 (a) A student was going to school, he saw a fierce dog, and numerous events took place in his body and run away.

(i) How was the image of the dog formed in his eyes?

(ii) Describe the role played by the nervous system during the response.

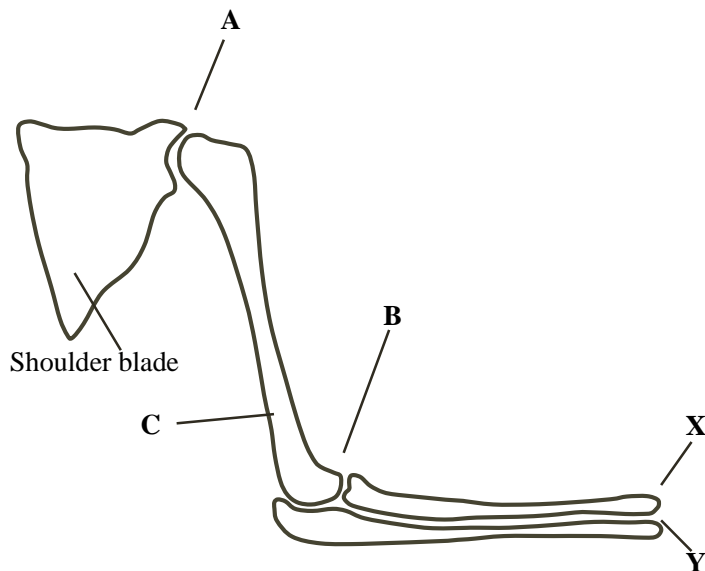
(b) The body produced hormones to during the event,

(i) Name most likely hormone secreted by the body.

(ii) Describe the effect of the hormone name in (b) (i) above to the body of the boy.

CLASS S.3 TOPIC 8: LOCOMOTION

8.1 The diagram shows the bones and joints of the human arm.



(a) (i) Name the types of synovial joint labelled A and B.

(ii) Name the bone labelled C, X and Y.

(b) The bones of the lower arm are raised by the action of the biceps muscle.

(i) On the diagram, draw the biceps muscle showing how it is attached to the bones.

(ii) Explain how the biceps muscle causes the lower arm to be raised.

(c) Exposure to sunlight is said to be of benefit in the formation of bones.

(i) Name the mineral that forms most of the bone.

(ii) Explain how exposure to sunlight can be of benefit in bone formation.

8.2 (a) How are the hind limbs of a cockroach adapted for locomotion?

(b) How is flight in insects different from flight in birds?

8.3 (a) What are the three main types of skeletons found in the animal kingdom, and how do they differ in their functions.

(b) Explain the role of the mammalian skeleton in providing support and protection to vital organs.

CLASS S.4 TOPIC 9: GROWTH AND DEVELOPMENT

9.1 The graph I below represents a growth curve of an animal. Graph II shows the change in the dry mass of bean seedlings that were grown and planted in presence of sunlight for a period of 7 seven weeks.

Figure I

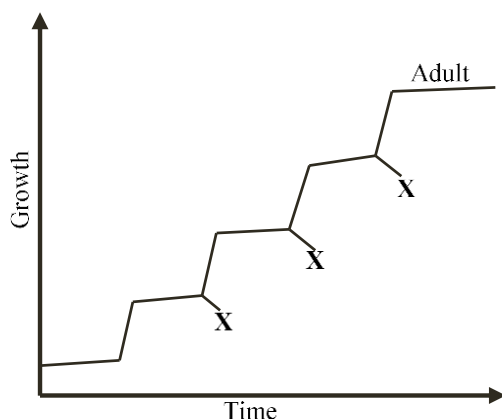
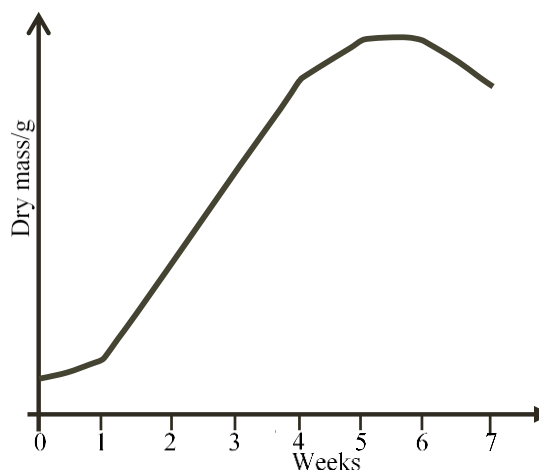


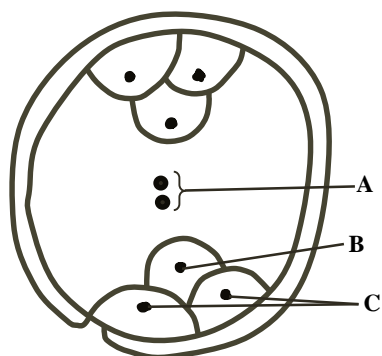
Figure II



- (a) (i) State any three characteristics of the animal whose growth curve is represented by figure I.
 (ii) What event takes place at points marked X?
 (iii) Name the hormone responsible for the process that takes place at X.
- (b) (i) Describe the variations in the dry mass of the bean seedlings during the seven weeks.

- (ii) Explain the changes in the dry mass of the seedlings.
- (iii) Why were the seedlings germinated in the presence of light?
- (c) (i) State the role of water during germination.
- (ii) Under what circumstances may a seed fail to germinate?
- (iii) Water is necessary for germination, why are seeds germinated in water for three weeks fail to grow, instead rot?

9.2 Study the following structure that develops within the ovule of a flowering plant

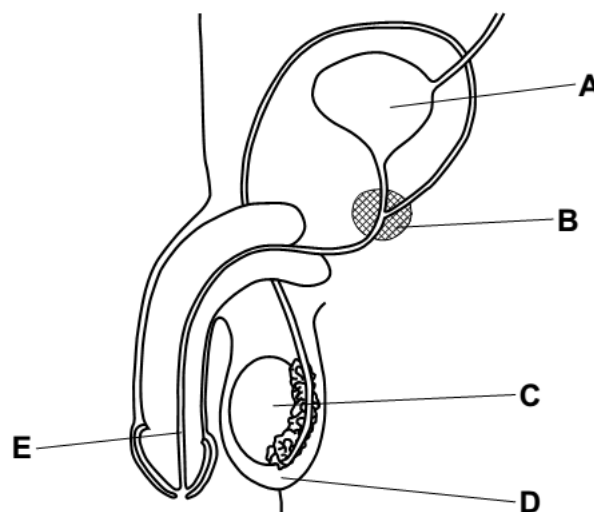


- (a) Name the structure labelled A, B and C.
- (b) (i) Describe the fate of structures A and B after fertilization.
- (ii) What does the structure above develop into after fertilization?
- (c) (i) Name the process that leads to the formation of cell B.
- (ii) If a plant cell from which the structure above is obtained has 16 chromosomes, state the number of chromosomes in A and B.

CLASS S.4 TOPIC 10: REPRODUCTION

10.1 The figure below shows a diagram of part of the male reproductive system.

- (a) Name the parts labelled A, C, D and E.
- (b) The term benign prostate hyperplasia is used to mean the enlargement of part labelled B. What would be the effect of this condition on both the fertility and urinary function of a male?
- (c) (i) Describe the role played by main hormone secreted by part labelled C.
- (ii) What is the health benefit of circumcision?
- (d) (i) Sperm must pass through different structures in the female reproductive system to reach an egg cell. State the names of three of these structures.
- (ii) State three ways that sperm are adapted for their function.



10.2 (a) Describe the different strategies employed by flowering plants to increase the chances of successful fertilization.

- (b) How is fertilization in a flowering plant different from man?

10.3 (a) Discuss the various birth control methods available to individuals and their effectiveness.

- (b) What are the potential side effects associated with different birth control options?
- (c) How can individuals make informed choices about the most suitable method for their needs and preferences?

10.4 The human menstrual cycle is controlled by four hormones. Figure below is a diagram that shows the site of production and the target organs of these hormones.

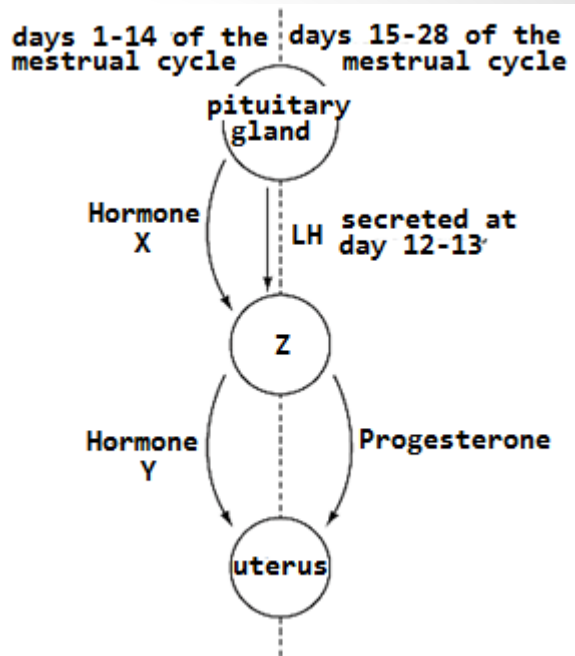
(a) (i) Name hormones **X** and **Y**.

(ii) Name organ **Z**.

(b) Describe the role of progesterone during the menstrual cycle and during pregnancy.

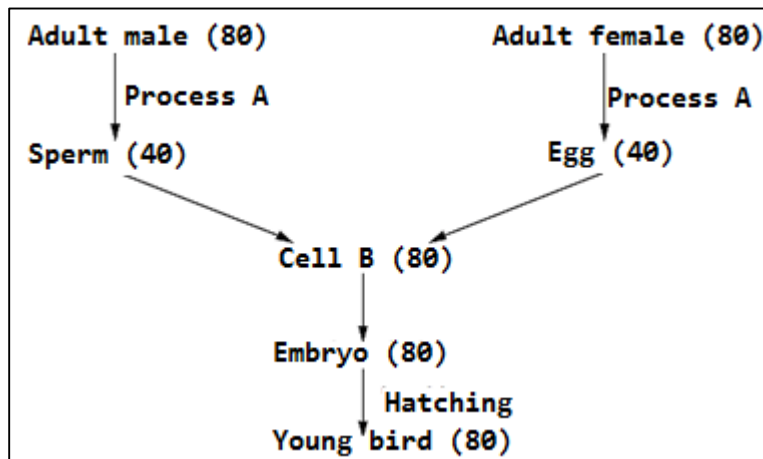
(c) Describe the role of hormone **X** in the menstrual cycle.

(d) Other than those in the diagram, state the role of any other two hormones secreted by the pituitary gland.



CLASS S.4TOPIC:11 GENETICS AND EVOLUTION

11.1 Figure below shows the events that occur during sexual reproduction in birds. The numbers in brackets indicate the number of chromosomes in the nuclei of the cells of the common dove.



(a) Name process **A** and cell **B**.

(b) State why cell **B** is described as a diploid cell.

(c) The embryo of the bird develops from cell **B**. State what is meant by the term *development*.

(d) Sexual reproduction usually leads to variation.

(i) Briefly describe how sexual reproduction leads to variation.

(ii) Explain why variation is an advantage for a species such as the common dove.

11.2 (a) Explain the existence of co-dominance in blood groups and sickle cell anaemia.

(b) The gene for the abnormal production of haemoglobin is co-dominant with the gene for the normal production of haemoglobin. A carrier man married a normal woman. What is the probability that the first child will be normal?

(c) Why is genetic screening important for couples before marriage?

11.3 During hybridization in animals, a white bull was crossed with a black cow, and the calves produced had both white and black patches.

(i) State the name given to the gene interaction above.

(ii) Using a genetic cross, what is the probability that the first offspring between one calf and a black cow will be black?

(iii) State any two advantages of cross-breeding in animal husbandry.

TOPIC 12: ECOLOGY- ENERGY FLOW, INTER-RELATIONSHIP &HUMAN IMPACT

12.1 Mycorrhiza is an association between plant roots and fungi. A study was carried out to find out the effect of concentration of fungus on plant roots with plant growth. In another experiment, the effect of weeds on plant growth.

Figure I

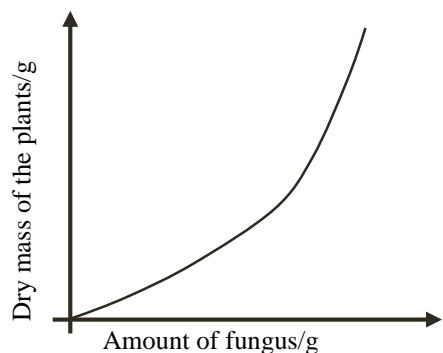
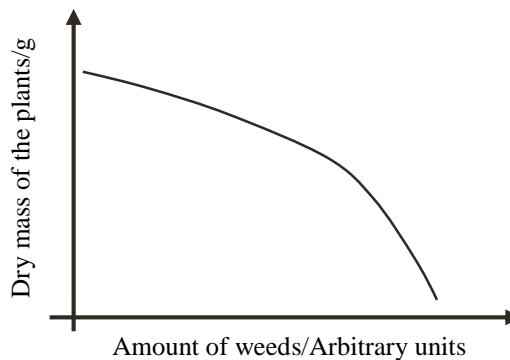


Figure II



- (a) Describe the effect of,
- Fungus on roots, on the dry mass of the plants
 - Amount of weeds on the dry mass of plants.
- (b) Explain the changes as observed in

- Graph Figure I
 - Graph Figure II
- (c) Describe any other form of mutualistic relationship in plants that can improve plant growth.
- (d) State any other three factors that can affect the increase in dry mass of plants in crop husbandry.

12.2 Malaria and trypanosomiasis are protozoan infections.

- Nam the parasites that cause malaria and trypanosomiasis
- State any five symptoms of malaria.
- Outline measures to control the spread of malaria.

12.3 A farmer caught 900 slugs in the field, marked and released them. Beetles that eat slugs were released into the field. Upon repeating the experiment several weeks later, the following results were obtained.

Number of slugs in 1st sample	Number of slugs in 2nd sample	Number of marked slugs in 2nd sample
50	45	5

- Calculate the estimated population size of slugs in the field.
 - What assumptions were made when estimating the number of slugs in the field?
- Using the results observed in this experiment, suggest the following in using beetles to control the population of slugs.
 - Strengths.
 - Weaknesses.

DISCLAIMER.

These questions are built in a similar style to that presented within the previous exam board's sample assessment materials. There can be no guarantee of the extent to which these questions will reflect the actual examination questions students will sit. We hope that schools and students find these questions useful in the exam preparations for this year. However, we take no responsibility for the relevance of this document to actual examinations sat.

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