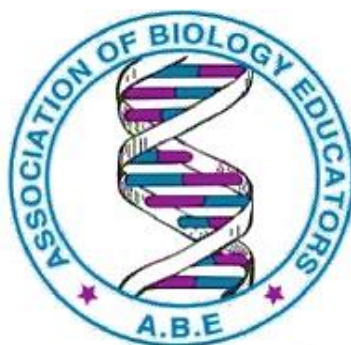


Association of Biology Educators (ABE)



**2023 EDITION 'O' LEVEL NATIONAL SEMINAR-SERIE No: 7
HELD AT SACRED HEART S.S, GULU (U) ON THE SATURDAY
23RD SEPTEMBER, 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. **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.*

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2023 EDITION 'O' LEVEL NATIONAL SEMINAR-SERIE No: 7
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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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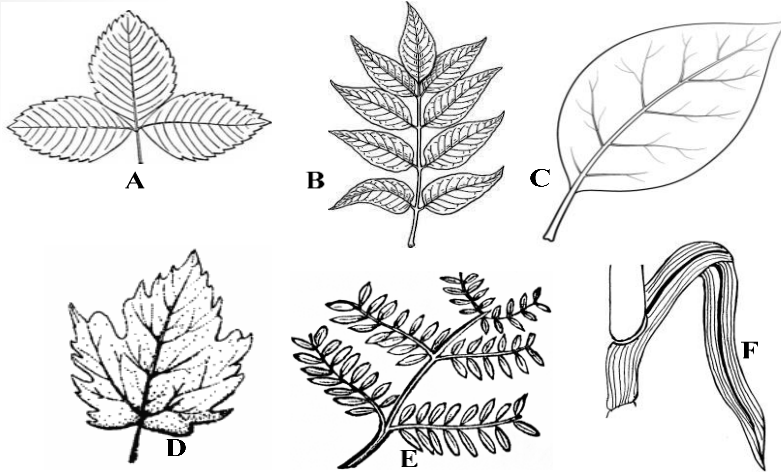
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CLASS: S.1 TOPIC 1: DIVERSITY OF LIVING THINGS

1.1 CLASSIFICATION.

1.1.1 The figure below shows different specimen obtained from a plant.



- (a) (i) State three similarities between specimen D and E.
(ii) State the differences between D and E.
(iii) How is specimen B adapted to perform its functions?
(b) Construct a dichotomous key to identify the specimen.

1.1.2 A student came across an

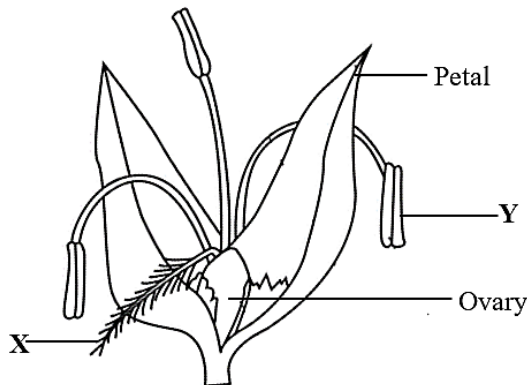
organism with an exoskeleton, segmented body, four pairs of jointed legs, with several simple eyes.

- (a) Classify the organism into the following taxonomic units
(i) Phylum. Give three reasons for the answer.
(ii) Class. Give two reasons for the answer.
(b) (i) State the functions of the exoskeleton.
(ii) Name any three animals that belong to the same phylum named in (a)(i) above
(iii) State any four ecological significances of the organism described above.

1.1.3 (i) Explain the concept of tissues, organs, and systems in animals and plants. Provide examples of these structures in both plants and animals.
(ii) State the specific functions of the named tissues and organs in a(i) above.

1.2 FLOWERING PLANT STRUCTURES

1.2.1 The figure below is a representation of wind-pollinated flower



- (a) Name the parts labelled X and Y.
(b) How the flower above adapted for pollination.
(c) How is the flower above different from the insect pollinated flower?

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

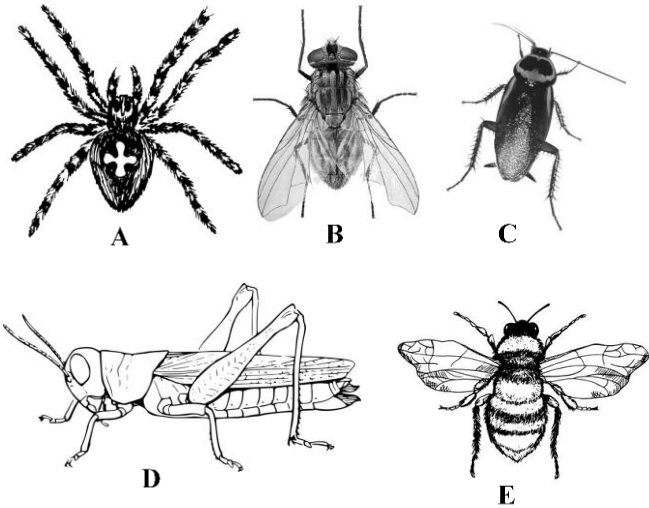
(b) How is fertilization in a flowering plant different from man?

1.3 INSECT FEATURES, LIFE CYCLES AND ECONOMIC IMPORTANCE

1.3.1 Houseflies are one of the most common insects in the environments surrounding man.

- (a) What adaptations makes houseflies one of the most successful insects.
(b) Describe the effect of reduced numbers of bees to man.

1.3.2



- (a) Using the specimens shown, construct a dichotomous key to identify the organisms.
- (b) (i) How is specimen B adapted to its mode of life?
(ii) How is specimen B adapted to the spread of disease-causing germs?
- (c) (i) State any three similarities between specimen A and specimen B.
(ii) How is specimen A different from specimen B?

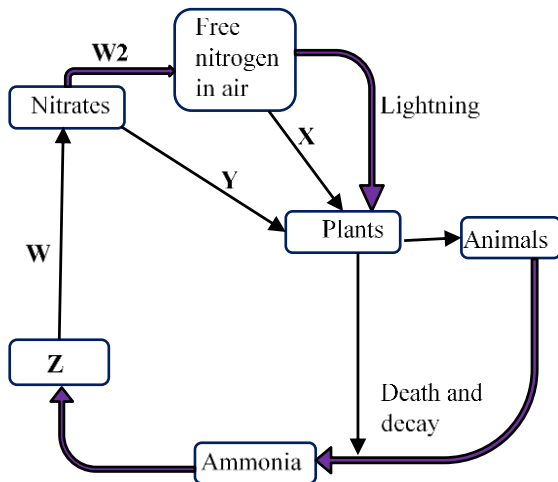
CLASS: S.2 TOPIC 2: SOIL

2.1 SOIL FERTILITY

- (a) What strategies are employed by desert countries with sand soils to improve soil fertility for food production?
- (b) Describe the effects of water lodging to soil fertility.
- (c) What strategies are employed by some plants to survive in water lodged areas like swamps.

2.2 C, N, O CYCLES

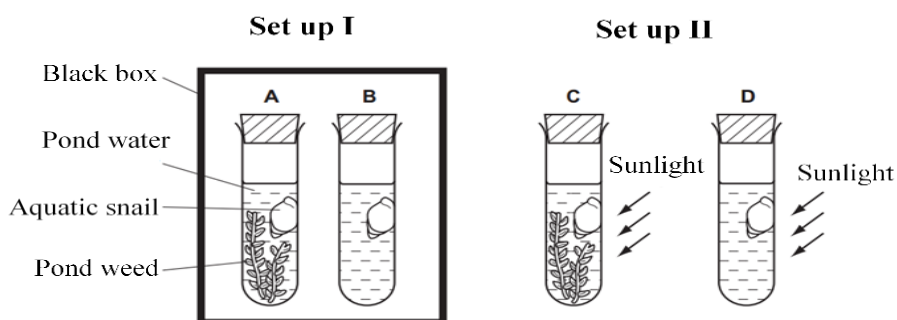
The diagram below represents the nitrogen cycle.



- (a) Name the process labelled W, X, Y and W2.
- (b) (i) Name the compound Z.
- (c) (i) Name the group of organisms that carry out process W and X.
(ii) Name the part of the plant where process X take place.
(iii) What type of relationship is found between the group of organisms that carry out process X and the plant?
- (d) How do human activities affect the cycle shown in the diagram above?

CLASS: S.2 TOPIC 3: NUTRITION

3.1 An experiment was carried out to find out the role of light in the survival of aquatic living organisms. The experiment was set up as shown below using pond water.



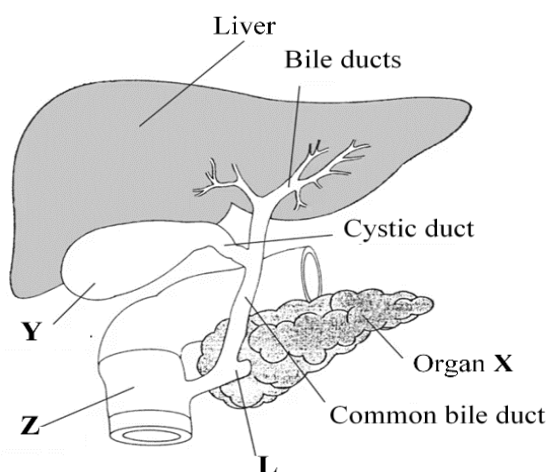
(a) Give a reason as to why the following were specifically used in the experiment.

- (i) Black box
- (ii) Pond water
- (iii) Aquatic snail
- (iv) Pond weed
- (b) (i) State what was

observed in test tubes A and B in set up I after two days.

- (ii) Give the reasons for the observation in test tubes A and B in set up I after two days.
- (c) (i) State what was observed in test tubes C and D in set up II after two days.
- (ii) Give the reasons for the observation in test tubes C and D in set up II after two days.
- (d) (i) What experiment was being investigated?
- (ii) What conclusion can be made from the experiment?

3.2 The figure below shows the structures and organs that form part of the alimentary canal.



- (a) Name the parts labelled Y, Z, and L.
- (b) Describe the role played by the organ X during
 - (i) Digestion
 - (ii) Stability of glucose levels in the blood
- (c) State the role played by the liver during the digestion of food substances.

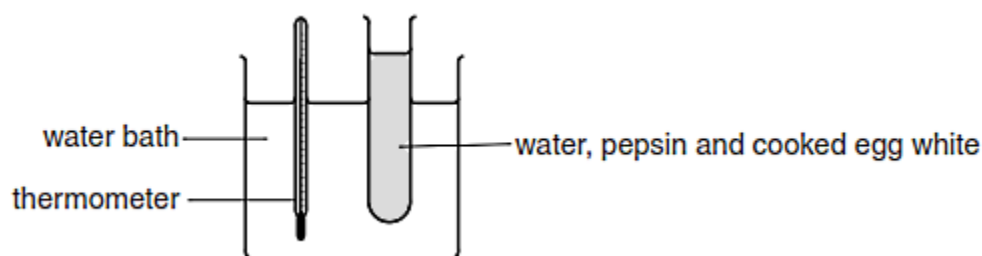
3.3 (a) State the role played by the following during digestion of food.

- (i) Pancreases
- (ii) Bile salts
- (iii) Teeth

(c) Describe how the digested food substances are absorbed and transported to other parts of the body.

(b) Why do people that suffer from recurrent fever grow thin?

3.4 A student investigated how a protein-digesting enzyme, called pepsin, breaks down cooked egg white.



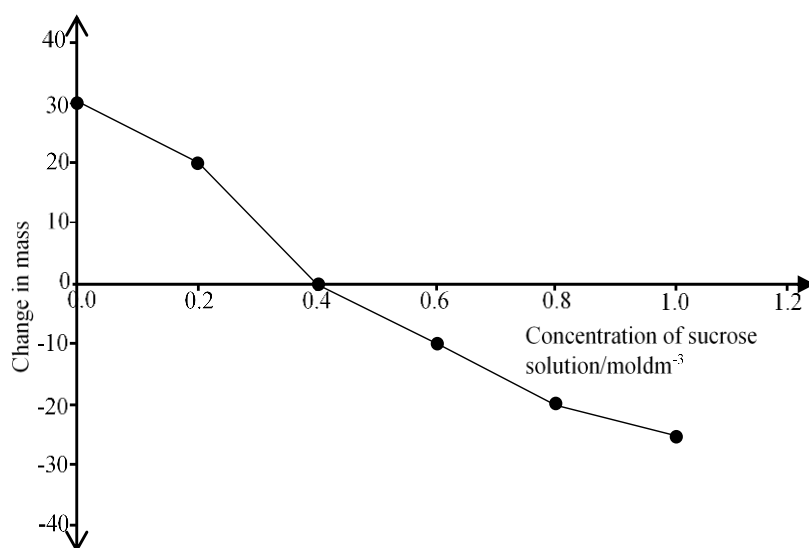
As the pepsin breaks down the cooked egg white, the mixture in the test tube changes from white to colourless. The time it takes for the mixture to go colourless at different temperatures was recorded as shown in the table.

Temperature in °C	Time for mixture to go colourless in minutes
20	14
25	9
30	6
35	3
40	3
45	6

- Plot a graph to represent the results.
- Explain the results from this experiment.
- From the graph, state the optimum temperature for pepsin, with a reason.
- State the role of proteins in the human body.
- Suggest what would happen to the results of this experiment as the temperature increases above 45 °C.

CLASS: S.2 TOPIC 4: TRANSPORT

4.1 A student experimented to investigate the percentage change in mass of potato tuber tissue when placed in different concentrations of sucrose solution. The potato tuber tissue was cut into cubes of the same size.



(a) Describe the effect of the changes in the sucrose concentration on the mass of potato cubes

(b) Explain the observed changes in the mass of the potato cubes

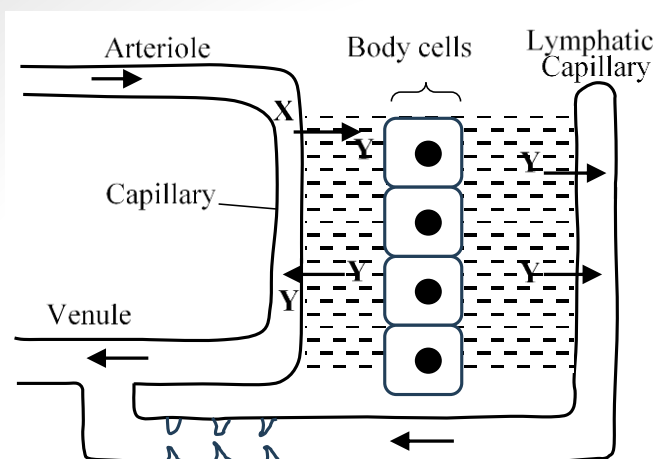
(i) From 0.0 mol dm⁻³ to 0.4 mol dm⁻³ sucrose solution

(ii) From 0.4 mol dm⁻³ to 1.0 mol dm⁻³ sucrose solution.

(c) (i) Predict the change in the mass of a cube of potato tissue placed in 1.2 mol dm⁻³ sucrose solution

(ii) At what sucrose concentration is the concentration of solutes equal to the solutes inside potato cubes? Give a reason for your answer.

4.2 The figure below shows the formation of fluids important during the transportation of materials in the body. Fluid X moves from blood to form fluid Y.

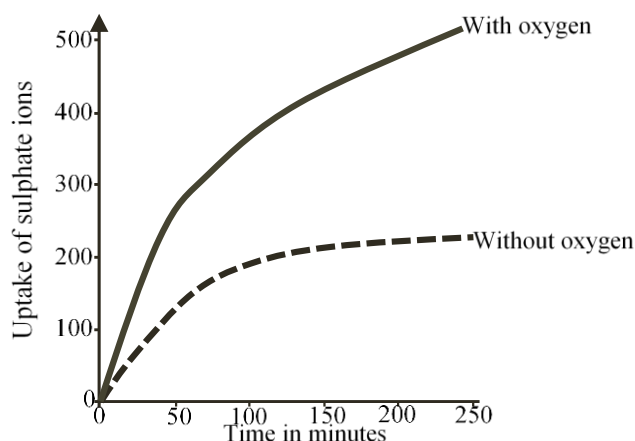


- (a) (i) Name the fluid represented by the letters X and Y.
(ii) How is fluid Y formed?
(iii) What is the importance of fluid Y.
(b) What name is given to fluid Y during its transportation via the lymphatic system?
(c) State any three functions of the lymphatic system
(d) How is the blood circulatory system different from the lymphatic system?

4.3 (a) An investigation was carried out on the uptake of potassium ions by root tissue. The root was cut into four discs of uniform size and each disc was added to an equal volume of a solution containing a fixed potassium ion concentration. The experiment was carried out in different oxygen concentrations and the results are shown in the table below.

Oxygen concentration (a.u)	Rate of potassium ion /a.u
0	7
4	27
11	92
20	100

- (i) What is the main method by which potassium ions are taken into the root?
(ii) Using the information in the table, explain why the uptake of ions increased with increase in oxygen concentration.
(iii) State the rate of uptake you would expect if a drop of cyanide solution had been added to each of the four solutions. Explain your answer.
(b) Some scientists investigated the amounts of sulphate ions taken up by barley roots in the presence of oxygen and when no oxygen was present. The graph below shows the results.



- (i) Compare the uptake of ions with and without oxygen.
(ii) Explain the difference in the uptake of ions.
(c) Using the information obtained from the table and graph, what would be the effect of flooding on the growth of plants.

- 4.4 (a)** Describe the two main types of immunity,
(i) Innate and
(ii) Adaptive immunity.

(b) With examples, how do the types of immunity in (a) above differ in their mechanisms and response times to pathogens?

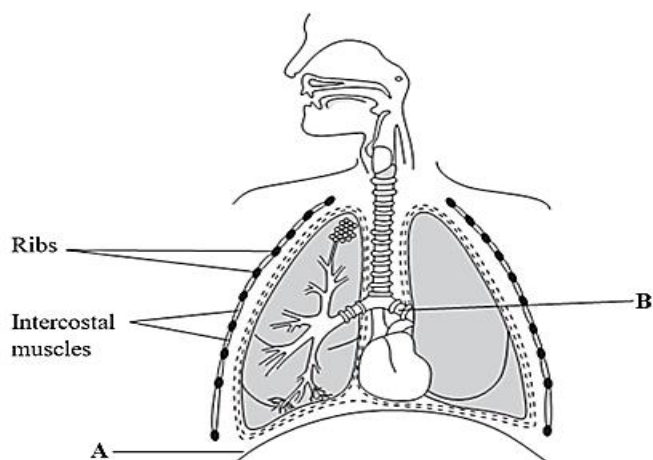
4.5 The table below shows the rate of transpiration, in the wind and another in still air when the stomata were open to varying extends

Size of stomatal opening (μm)	Transpiration rate in wind (mm/min)	Transpiration rate in still air (mm/min)
1	40	0
2	63	6
3	74	12
4	86	19
5	94	19
6	110	23
7	124	27

- Draw a graph of the transpiration rate against the size of the stomatal opening.
- What is the difference between rates of transpiration in the wind and still air?
- Explain the differences above.
- What is the size of the stomatal opening when the rate of transpiration in still air is 25 mm/min?
- How does the size of the stomatal opening affect the rate of transpiration in
 - Still air
 - Wind air?

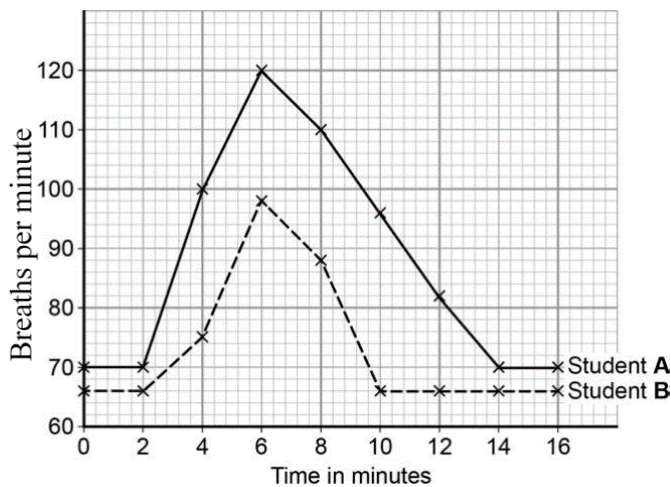
CLASS: S.3 TOPIC 5: RESPIRATION & GASEOUS EXCHANGE

5.1 The figure below shows the human respiratory system



- Describe the role played by the following parts during exhalation.
 - A
 - Intercostal muscles.
- Name the structure B.
 - Using the structures shown in the figure, how is the respiratory system adapted to perform its function?

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



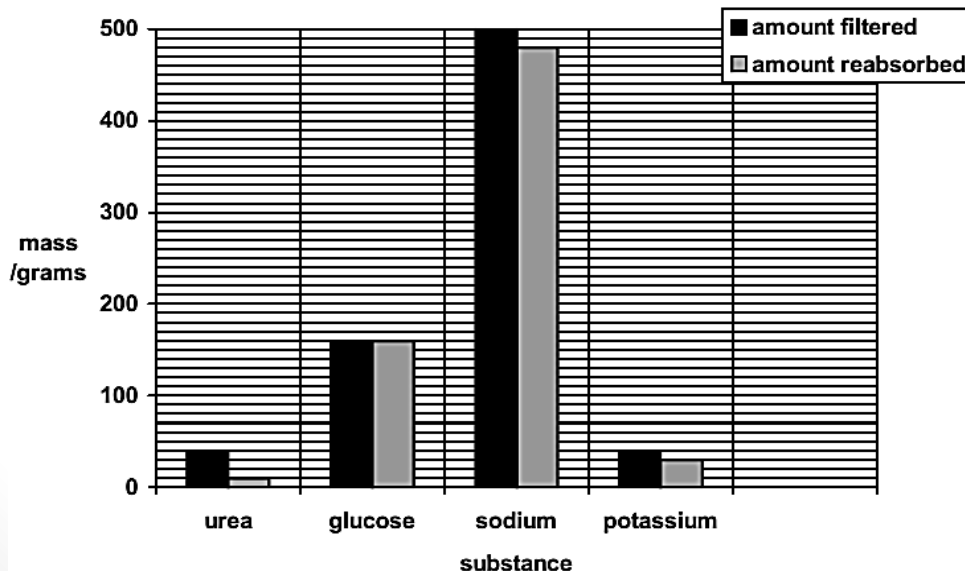
- (a) (i) At what time did they start running?
Give a reason for your answer.
(ii) Explain the changes in the breathing rate in student B.
(b) (i) One of the students is an athlete, using the information from the graph, which student is an athlete?
(ii) Explain your answer in b (i).
(c) With a reason, which students is more like to suffer from muscle cramps during the course of running?

- 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(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?

6.2 The bar chart shows the amounts of various substances filtered and reabsorbed by the kidneys each day



- (a) Which substance is completely reabsorbed? Give a reason for your answer.
(b) Calculate the percentage of sodium that is reabsorbed. Show your work.
(c) (i) The volume of water filtered by the kidneys is approximately 160 litres per day. Of this 1.6 litres is excreted. What is the percentage of water reabsorbed?

- (ii) Name the hormone which controls the amount of water reabsorbed by the kidneys.
(d) Which of the substances in the chart would be excreted in larger amounts

- (i) by a diabetic?
- (ii) by a bodybuilder using a high-protein diet?

6.3 (a) State the role played by the following in the regulation constant body temperature

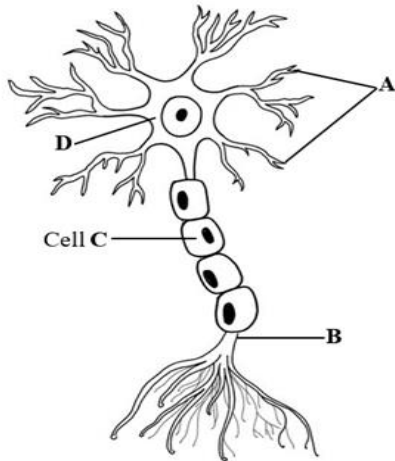
- (i) Blood vessels
- (ii) Hairs on the body
- (iii) Sweat glands
- (iv) Subcutaneous fat layer.

(b) (i) State any two permanent structural adaptations for organisms to live in cold conditions

(ii) Why do large mammals that live in cold conditions do not hibernate?

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

7.1 The figure below shows one of the cells that make up the nervous system.



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

(ii) What is the function of cell C?

(b) (i) What is the function of the cell shown in the figure above?

(ii) Using an arrow on the drawing, show the direction for the movement of information.

(iii) State any two structural differences between the cell above and the relay neuron.

7.2 (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.

7.3 (a) How are nastic responses different from tropic responses?

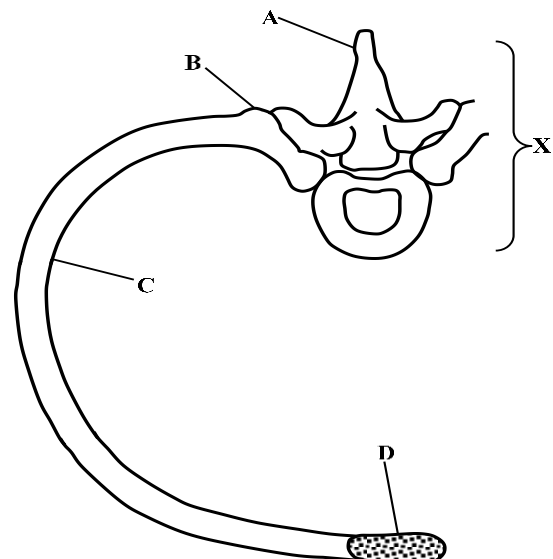
(b) How does the unequal distribution of auxins affect the growth of roots and shoots?

(c) Compare auxins and gibberellins.

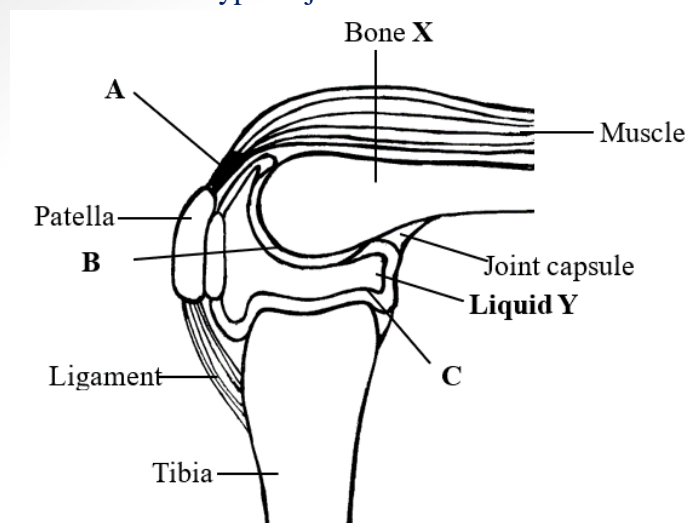
CLASS S.3 TOPIC 8: LOCOMOTION

8.1 The figure below shows the attachment of a rib to a vertebra X.

- (a) (i) Name the vertebra X
- (ii) How is the vertebra X adapted to function in the region where it is located?
- (b) (i) Name the parts labelled A, B, C, and D.
- (ii) Describe the role of the rib above during inhalation.



8.2 Below is a type of joint in the fore limb of a mammal.



- (a) (i) Name the bone labeled X.
(ii) Name the parts labeled A, B, and C.
- (b) (i) State the symptoms of reduced liquid Y in the joint.
(ii) What is the function of part C?
- (c) (i) State the type of synovial joint shown above.
(ii) State the effects of carrying heavy loads on the efficiency and functioning of a joint.

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

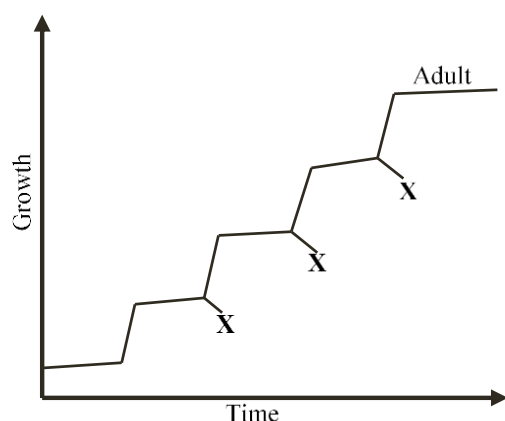
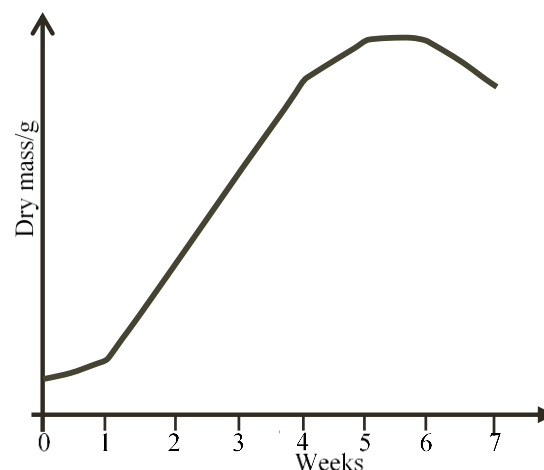
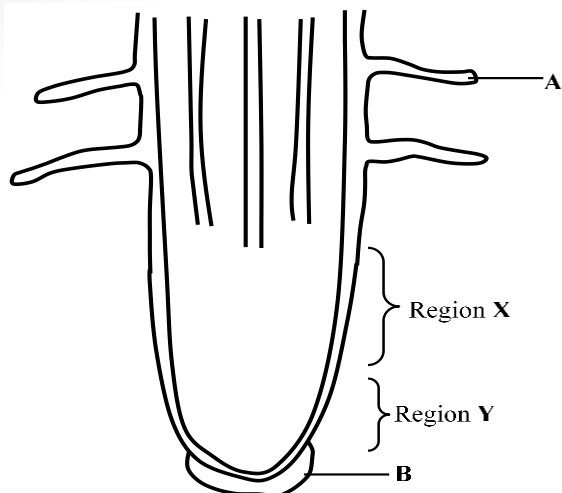


Figure II



- (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?
- (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?

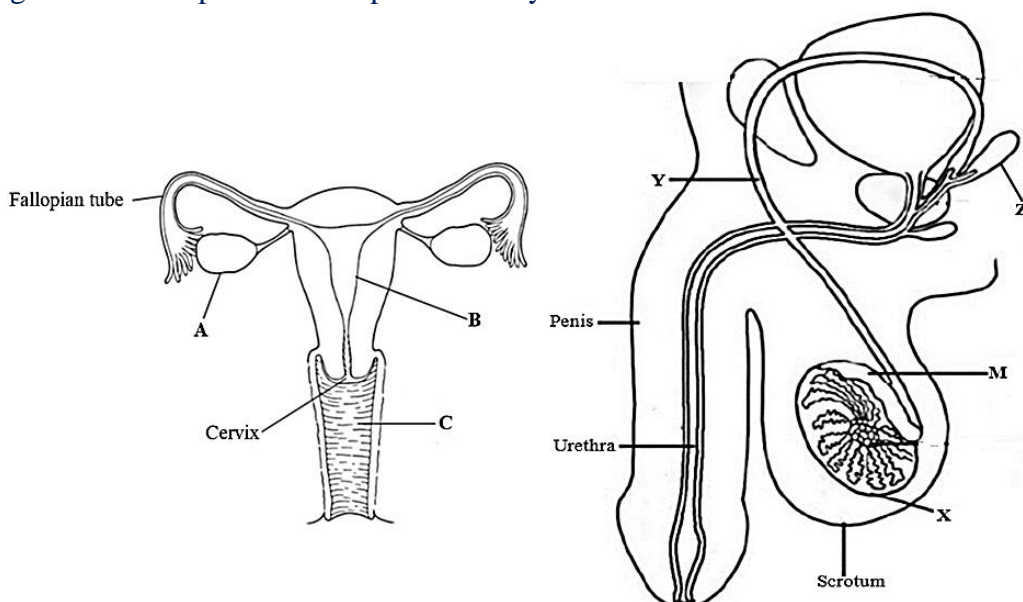
9.2 The figure below represents the tip of the tip of a young dicot root.



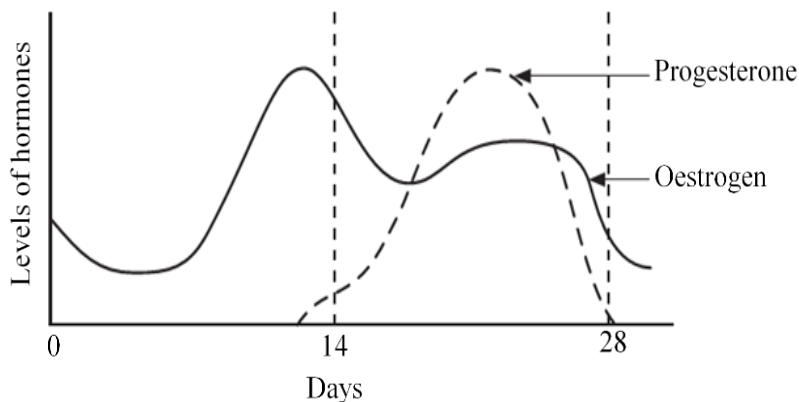
- (a) (i) Name the structures labelled A and B
- (ii) How is structure A adapted to perform its functions.
- (b) Describe the events that go on in the regions
 - (i) X
 - (ii) Y
- (c) (i) Describe the process of primary growth in plants.
- (ii) How is primary growth different from secondary growth?

CLASS S.4 TOPIC 10: REPRODUCTION

10.1 The figures below represent the reproductive systems of the female and male humans.



- (a) (i) State the function of the hormones secreted by the organ A.
 - (ii) State any three functions of the structure labelled C.
 - (iii) How is the structure B adapted to perform its function?
 - (b) (i) Name the structures labelled Y, X, and M plus the function for each.
 - (ii) What name is given to the fluid secreted by Z.? What is the function of the fluid?
 - (iii) State the effects of the hormone secreted by part labelled X.
 - (c) What permanent structural changes can be made to the above systems to control birth?
- 10.2** The figure below shows the changes in hormones during the menstruation cycle.



- (a) Name the organ that produces the above hormones.
- (b) What causes the observed changes in the hormones?
 - (i) On the 14th day
 - (ii) Decrease in both hormones towards the end of the cycle.
- (c) How are the above hormones responsible for fertility in females?
- (d) How are the above hormones used to control birth in females?

- 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?

CLASS S.4; TOPIC: 11 GENETICS AND EVOLUTION

- 11.1** (a) State the organs in mammals where meiosis occurs.
 (b) How is meiosis different from mitosis?
 (c) Describe the evolutionary advantage of meiosis over mitosis in living organisms.
- 11.2** (a) A man with type AB blood is married to a woman with type O blood. They have two natural children and one adopted child. Jane has type A blood, Jordan has type B blood, and Marlin has type O blood. Using genetic crosses, which child was adopted?
 (b) A woman with type A blood is claiming that a man with type AB blood is the father of her child who is type B. Using all the possible crosses.
- (i) Could this man be the father of the child? How?
 - (ii) Assuming that he is the father, what must the mother's genotype be?
 - (iii) Discuss the validity of the results obtained on (i) and (ii), plus alternative means.

- 11.3** (a) State the differences between autosomes and sex chromosomes

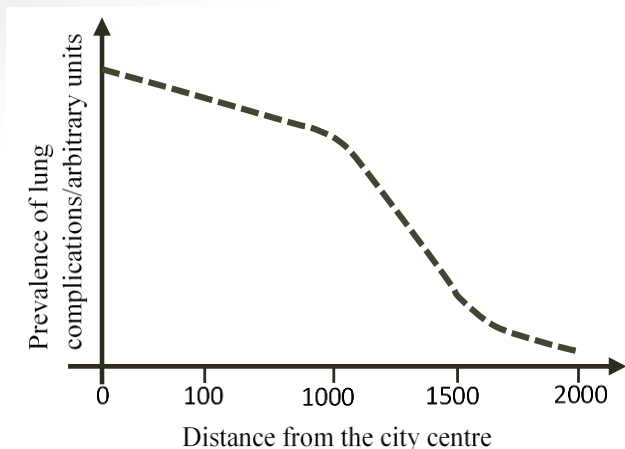
- (b) (i) Name the organs in mammals and flowering plants that produce haploid cells.
- (ii) How is the 50:50 ratio of male to female population brought about?

- (c) Premature baldness is a sex-linked trait. It is determined by a recessive gene. A carrier woman married and a premature bald man.

- (i) What is premature baldness?
- (ii) Using a genetic cross, find out the probability of giving birth to a premature bald boy.

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

- 12.1** An investigation was carried out to find out the effect of pollution on the prevalence of lung infections and complications in the human population. Sampled individuals included those in city centres and some individuals from the city centre. The information is shown in the graph below.



(a) (i) Describe the changes in the prevalence of lung infections as the distance increases from the city.

(ii) Explain the variations in lung complications distance away from the city.

(b) (i) Lung infections and complications are usually caused by air pollution and micro-living organisms. State any four sources of air pollution in cities.

(ii) How does air pollution affect gaseous exchange in the lungs?

(iii) Suggest any four measures to control air pollution in cities.

12.2 (a) Describe the effects that may arise as a result of the destruction of natural resources.

(b) How can natural resources be conserved?

12.3 (a) To study the population growth of organisms in an ecosystem, numerous methods are used to estimate populations. Describe how the following methods can be used to estimate the population of organisms.

(i) Capture-mark recapture method

(ii) Quadrat method.

(b) A pond is regarded as an ecosystem. Explain what is meant by an ecosystem and how organisms in the pond form an ecosystem.

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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