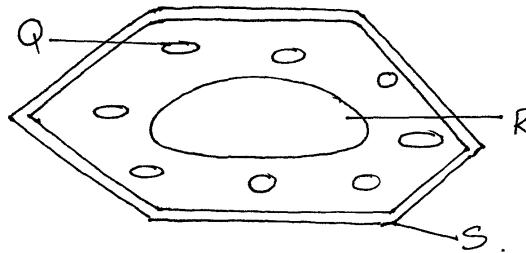


CEKENAS END OF TERM ONE EXAM-2023

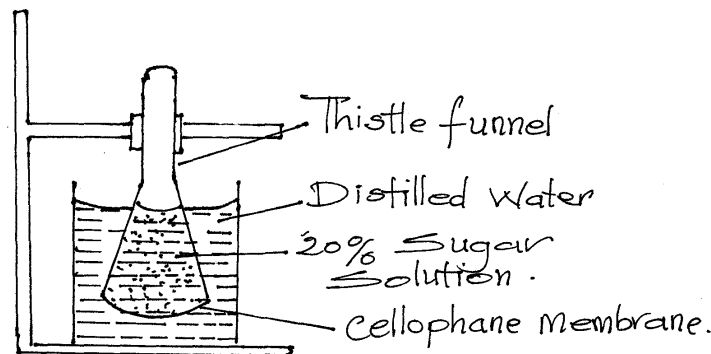
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BIOLOGY PAPER 1

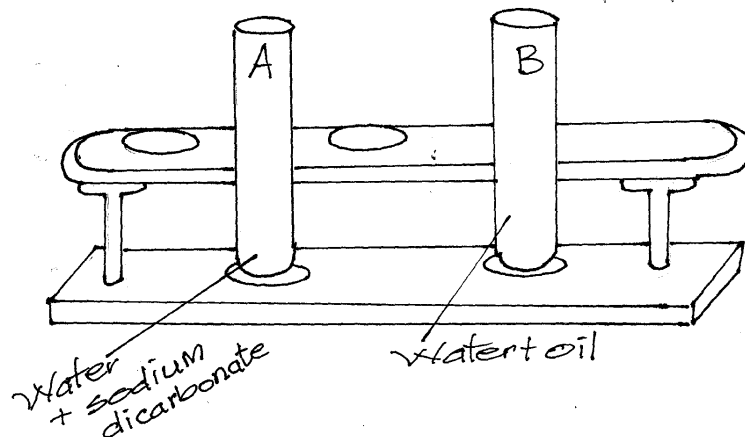
1. State the characteristics of living organisms exhibited by the following
 - a) A mango tree producing flowers. (1mk)
 - b) A man sneezing. (1mk)
2. a) Form one students went to collect tiny ants from a tree trunk. State the most suitable instrument to use. (1mk)
- b) Calculate the magnification if the actual length of an ant was 5mm and the drawing length was 2cm. Show your working (2mks)
3. The diagram below represents a plant cell



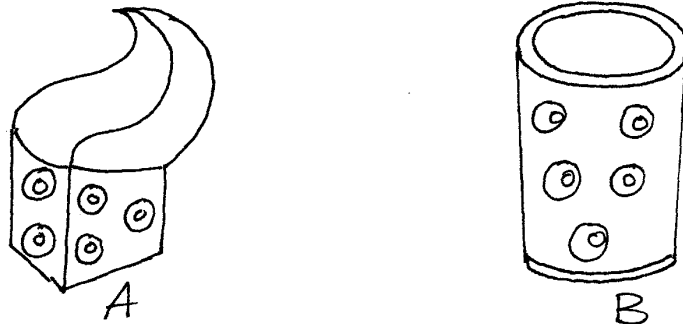
- a) Identify the part labeled S. (1mk)
- b) State two functions of the part labeled R. (2mks)
- c) Name one cell organelle present in a plant cell and absent in an animal cell. (1mk)
4. The diagram below shows a set-up for an experiment to demonstrate a certain physiological process.



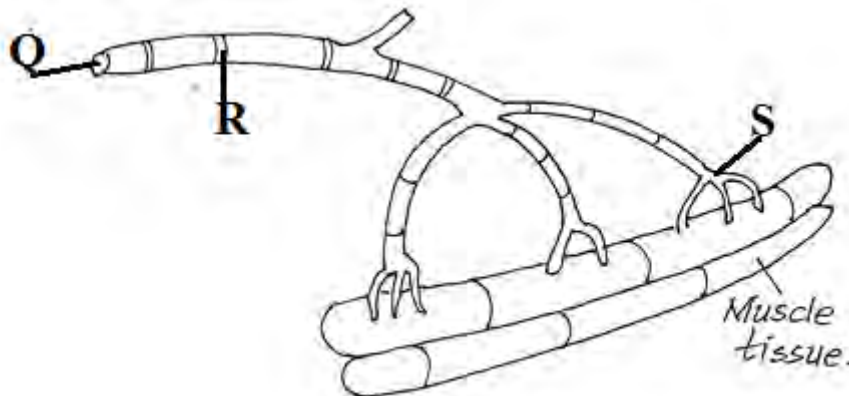
- a) What nature of solution is represented in 20% sugar solution. (1mk)
- b) Explain the observation made on the set-up after one hour. (1mk)
5. The diagram below illustrates a physiological process occurs when lipid are mixed with salts. Some oil was put in a test tube A and sodium bicarbonate was added.



- a) Name
- The process being investigated. (1mk)
 - Part of the alimentary canal where it occurs. (1mk)
 - An equivalent of sodium bicarbonate in the human digestive system (1mk)
- b) State the biological significance of the process named in (a)(i) above (1mk)
6. The oxidation of a certain substrate is represented by the chemical equation show below.
- $$C_{57}H_{104}O_6 + 80O_2 \rightarrow 57CO_2 + 52H_2O + Energy$$
- Calculate the respiratory quotient (RQ) of the substrate. (1mk)
 - What is the significance of the RQ. (2mks)
7. Name two kingdoms whose members reproduce by means of spores. (2mks)
8. The diagram below show two conducting element of the xylem tissues.



- Identify. A & B (2mks)
 - What makes the cellulose side of both A and B to fail to collapse. (1mk)
 - Name one structural adaptation of the structure labeled B to its function. (1mk)
9.
 - Name one protein secreted by blood platelets necessary for blood clotting. (1mk)
 - Name the vitamin involved in blood clotting. (1mk)
 - A blood clot does not occur in the blood vessel. Explain. (1mk)
10. The diagram below shows the gaseous exchange system of locust.



- Name the structure labeled Q. (1mk)
 - State the function of the part labeled R. (1mk)
 - How is part S structurally adapted to its function. (1mk)
11. Name the excretory products of plants which are used to perform the following
- Plants and animal breeding. (1mk)
 - Manufacture of stimulants and insecticides. (1mk)
12. What are importance of sebum in the human skin. (2mks)
13. A goat weighing 20kgs requires 216kgs while a mouse weighing 54gms require 2830kgs per day. Explain. (2mks)

14. In a prolonged drought period forage was scarce. It made animals reach out for higher forage and this way giraffes got the stretched long necks.
- a) What is the term used for a characteristic such as the long necks outlined. (1mk)
 - b) What is the name given to the theory that describes the evolution of such structure like long necks. (1mk)
 - c) State and explain the limitation of the theory you named in (b) above. (2mks)
15. The table below shows the approximate numbers of organisms in an ecosystem.

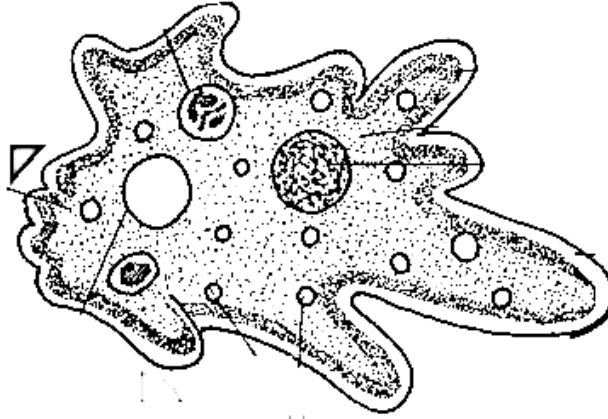
Type of organism	Numbers
Grasshoppers	340
Snakes	30
Green plant	1200
Lizards	120

- Using the information above, draw a pyramid of number. (3mks)
16. Name the tissue in plants responsible for.
- i) Primary growth. (1mk)
 - ii) Secondary growth. (1mk)
17. How does carboxyhemoglobin lead to death. (2mks)
18. a) Given a sample of urine, name one test you would carry out to determine if it was collected from a person suffering from diabetes mellitus. (1mk)
- b) What results are expected if one is diabetic. (2mks)
19. a) Explain why removal of ovary after 4 months of pregnancy does not terminate pregnancy. (1mks)
- b) Explain why hormone testosterone still exerts its influence even when vas deferens has been cut. (1mk)
20. The following are the short messages on cell-phone communication. They can be used as analogies to show gene mutations

Intended message	Actual message
1. Yesterday was my shopping day	Yesterday was my hoping day
2. My skit was stolen	My shirt was stolen

- a) For each of the following message, identify the type of gene mutation. (2mks)
 - 1.....
 - 2.....
 - b) State one example of a chromosomal mutation that lead to.
 - i) Change in chromosomal structure. (1mk)
 - ii) Change in chromosomal number. (1mk)
- 21.a) Name the type of skeleton that makes up the body of a locust. (1mk)
- b) State two functions of the skeleton in locusts. (2mk)
22. a) State the function of cilia in organisms. (1mk)
- b) Name two parts of the human body which have cilia. (2mks)
23. Explain why some desert animals excrete uric Acid rather than ammonia. (2mks)
24. a) Give any two characteristics of meristematic cells. (2mks)
- b) Explain the function of epicotyl during seed germination. (1mk)
25. a) What is the role of the pollen tube in plant fertilization. (1mk)
- b) Name the part of the flower that develops into each of the following.
 - i) Seed coat. (1mk)
 - ii) Seed. (1mk)

26. Study the diagram below,



- a) Suggest the kingdom to which it belongs. (1mk)
- b) Identify the organism. (1mk)
- c) Give an example of a disease caused by organism. (1mk)

27. Below is a dental formula of a mammal

$$i \frac{0}{4} C \frac{0}{0} P m \frac{3}{3} m \frac{2}{3}$$

- a) What is the total number of teeth. (1mk)
 - b) What is the mode of feeding in the mammal (1mk)
 - c) Give one reason for your answer above. (1mk)
28. Name the disease caused by the following causative agent in human. (2mks)
- i) *Salmonella typhi*
 - ii) *Plasmodium falciparum*
29. Name two feature that increases surface area of small intestines. (2mks)

CEKENAS END OF TERM ONE EXAM-2023

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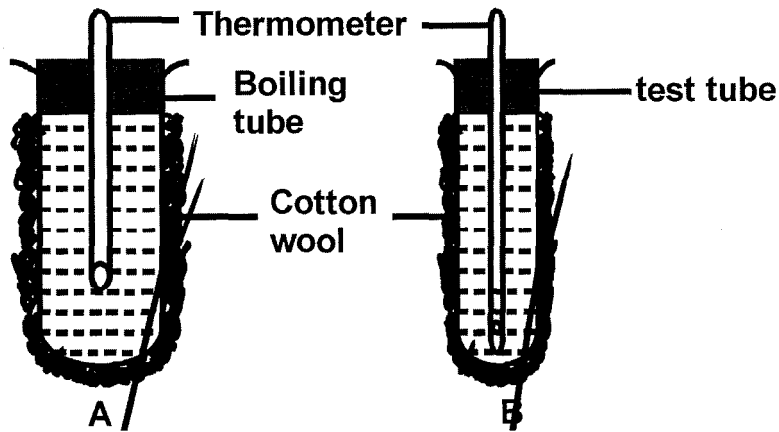
BIOLOGY PAPER 2**SECTION A (40 MARKS)**

1. a) In human, premature baldness is controlled by a gene on the Y chromosome. Using letter B to represent the gene for baldness, work out a cross between a bald-headed man and his wife. (4mks)
- b) What is the probability of their daughters being bald-headed? Explain. (2mks)
- c) State two advantages of genetic engineering in wheat. (2mks)
2. a) The table below shows results of a study of three plants C,D and E growing in different habitats.

Feature	Plant C	Plant D	Plant E
Number of stomata on upper surface of leaf per square area	4	20	6
Number of stomata on lower surface of leaf per square area	6	0	8
Thickness of leaf cuticle (mm)	0.4	0.1	0.2
Surface area of roots (cm) ³	2000	1000	1200

- i) Which one of the plant C, D and E grow in area of relatively low water availability? (1mk)
- ii) Explain your answer in (i) above. (2mks)
- b) i) A Rhinoceros in a game park was found to be infested with ticks. State the trophic level occupied by ticks. (1mk)
- ii) Why would the carrying capacity of wild animals in woodland grassland be higher than that of cattle. (1mk)
- c) Name the main pollutant involved in causing 'global warming'. (1mk)
- d) Why does primary productivity decrease with increase in depth in an aquatic ecosystem. (2mks)
3. a) Give an example of vestigial structure in humans. (1mk)
- b) State three evidences of organic evolution. (3mks)
- c) The peppered moth (*Biston betularia*) exists in many parts of England. It normally rests on barks of tree. It exists in two major forms; a normal or wild type which is speckled white and a mutant variety which is darker (melanic form). Before industrialization almost all the peppered moth in England were of white variety. After 1840s the population of the melanic form increased rapidly especially around the industrial cities. The white form dominated in the rural (non polluted) areas.
- i) Discuss why the lighter (non melanic) form was dominant in rural (non-polluted) areas. (1mk)
- ii) What factors could have led to the differences in population size of the two variety in the two areas. (1mk)
- d) Distinguish between homologous and analogous structures. (2mks)

4. a) In an experiment to investigate a certain physiological process, a boiling tube labeled A and a test-tube labeled B were covered with cotton wool. The two tubes were simultaneously filled with hot water and fitted with thermometer. The experiment was as in the diagrams below.

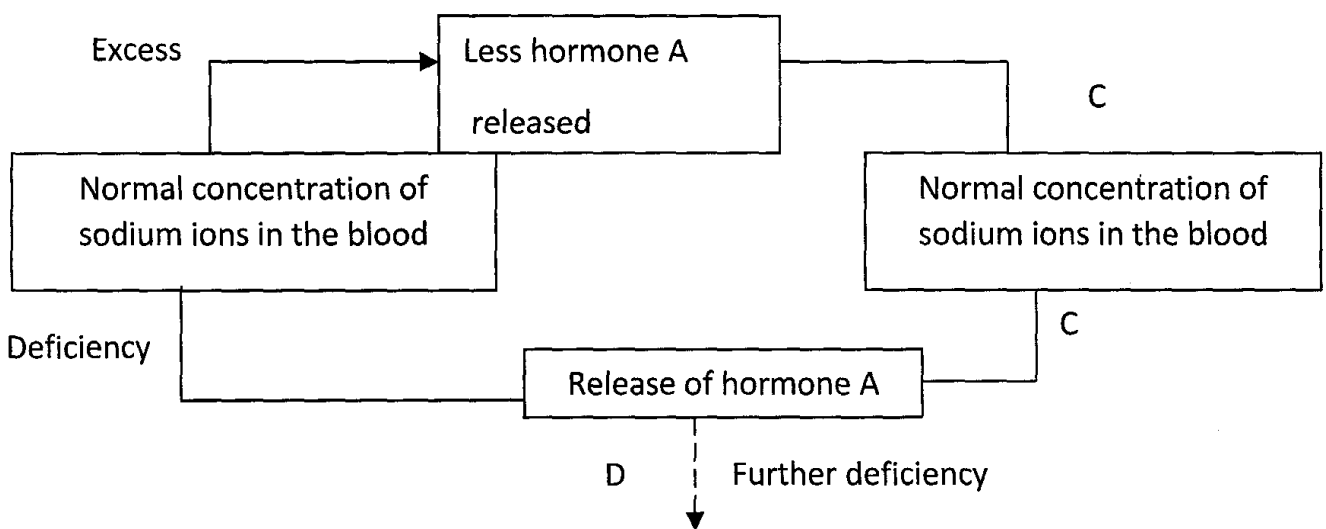


Temperature readings were taken at the start and after every two minutes for twenty minutes. The results were as shown below

Time (minute)	Temperature (°C)	
	Boiling tube A	Test-tube B
0	60	60
8	53	43
16	48	33

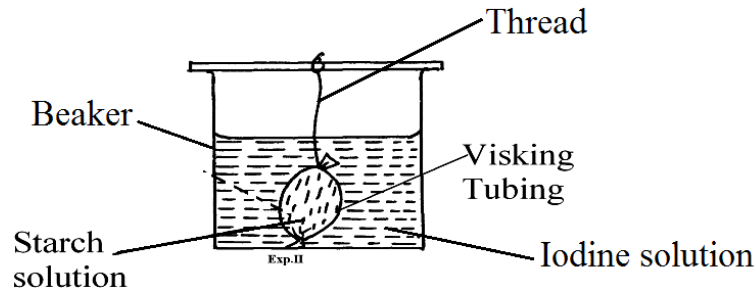
- Work out the rate of heat loss in boiling tube labeled A and test tube labeled B between the 8th and 16th minutes. (2mks)
- Account for the answers in (b) above. (2mks)
- Name a structure in mammals that play the same role as that played by the cotton wool in the above experiment. (1mk)

- b) Study the homeostatic scheme below:



- Identify the hormone labeled A. (1mk)
- Identify the feedback labeled D. (1mk)

- c) Why is it necessary for blood from the gut to pass through the liver before joining general body circulation? (1mk)
5. Form one students of Namanga Secondary school set up the experiment below to investigate a certain physiological process.



- a) State the physiological process that was being investigated. (1mk)
- b) Account for the observation after 30 minutes. (3mks)
- c) Give two roles of the process being investigated in plants. (2mks)
- d) Explain how low temperature slow down the rate of active transport. (2mks)

SECTION B

Answer question 6 (compulsory) and either question 7 or 8

6. In an experiment 900 viable seeds of a certain plant species were divided into groups of 100 seeds each. Each group of seed was placed at different temperatures but same conditions of air and moisture. The percentage germination was determined after 10 days. The table below show percent germination at various temperatures.

Temp°C	0	5	10	15	20	25	30	35	40
Percentage germination	0	0	2	5	16	50	84	30	2

- a) Using a suitable scale, draw a graph of percentage germination against temperature. (6mks)
- b) Account for percentage germination at.
- 5°C (2mks)
 - 30°C (2mks)
 - 40°C (2mks)
- c) State three roles of water in the germination of seeds. (3mks)
- d) How can dormancy be broken in wattle seeds? (2mks)
- e) Name the type of growth exhibited by arthropods. (1mks)
- f) Give the two types of germination in plants. (2mks)
7. Describe how the various parts of the human digestive system are adapted to their functions. (20mks)
8. a) How significant is transpiration to a plant? (3mks)
- b) Discuss the environmental factors that affect the rate of transpiration. (17mks)

CEKENAS END OF TERM ONE EXAM-2023**231/3****BIOLOGY****PAPER 3 PRACTICAL**

1. You are provided with the following substances
 - Three test tube on a rack
 - Dilute egg albumen labelled E
 - (Access to) dilute hydrochloric acid with a dropper
 - (Access to) dilute hydrochloric acid with a dropper
 - Solution P
 - Two droppers
 - Three 10 ml measuring cylinders
 - A stop watch/access to a wall clock
 - Access to water bath maintained at 50°C to 60°C

PROCEDURE

1. Label test-tube A,B,C

Using a measuring cylinder, measure and place 2 cm³ of the egg albumen suspension into each the three test tube labeled A, B,C.

2. Add 1cm³ of solution P to each of the three test tube A, B,C.
3. To the contents of test tube A add three drops of the 2M Hydrochloric acids, to B add three drops of distilled water and to C add three drops of the 2M sodium hydroxide solution.
4. Incubate the test tube for 10 minutes in a water bath kept 50°C to 60°C.
5. Examine the test tube every two minute noting the cloudiness of contents. After 10minute, remove the test tube from the water bath and place them in a test tube rack.
 - a) i) State the observation made in the test tube A, and C.

Test tube A	(1mk)
Test tube C	(1mk)
 - ii) Account for the observation made in the test tube A and C in a (i) above.

Test tube A	(2mks)
Test tube C	(3mks)
 - b) Explain why the investigation was carried out at the specified temperature range. (1mk)
 - c) State the purpose of Experiment B. (1mk)
 - d) i) With a reason, identify solution P. (2mks)
 - ii) Name the likely part of the human alimentary canal where the process in this experiment occurs. (1mk)
 - iii) Give a reason for your answer in e (ii) above (1mk)
 - e) Which aspect of enzyme properties does the experiment investigate? (1mk)

2. Below are photographs of specimens obtained from plants. Examine the photographs.



a) i) In the table below, name the mode of dispersal and the feature the adapt the specimen, to the mode of dispersal. (6mks)

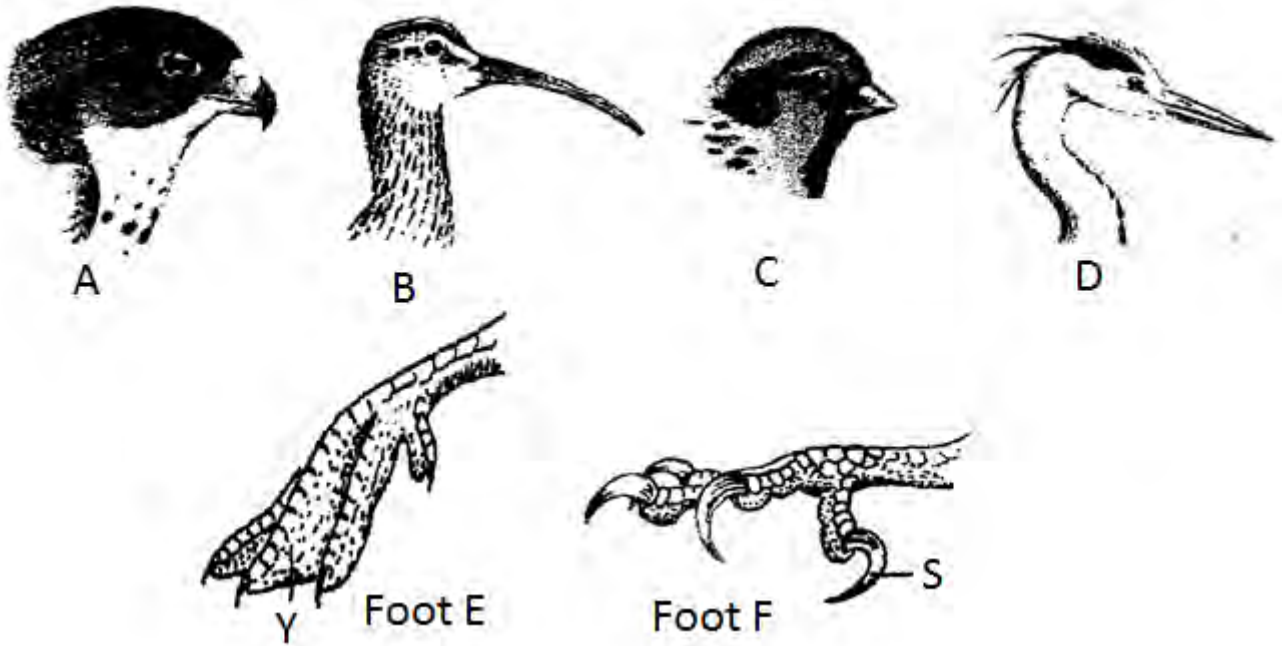
Specimen	Mode of dispersal	Adaptive feature
U		
W		
X		

ii) State the type of placentation in specimen Y and Z. (2mks)

b) Draw and label one member of specimens show in photograph V. (3mks)

c) Explain how fruits shown in photograph X are dispersed. (2mks)

3. The diagrams below show the beaks and feet of various birds.



a) i) In the table below write down the type of food each beak is adapted for.

Beak	Type of food
A	
B	
C	
D	

ii). Beak and feet are adapted to the kind o food the birds feed on . Match the feet shown above with the corresponding beaks.

Food	Beak
E	
F	

- b. i) Name structure Y in foot E. (1mk)
 ii) Structure Y is an adaptation of the birds' habitat. Explain. (2mks)
- c) Which type of evolution is shown by the beaks above. (1mk)
 ii) State the type of structure leading to the evolution above. (1mk)
 iii) How can the above structures be used as an evidence of evolution. (2mks)

CEKENAS END OF TERM ONE EXAM-2022

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BIOLOGY PAPER 3**CONFIDENTIAL****INSTRUCTION TO CANDIDATES***Each student should be provided with the following:*

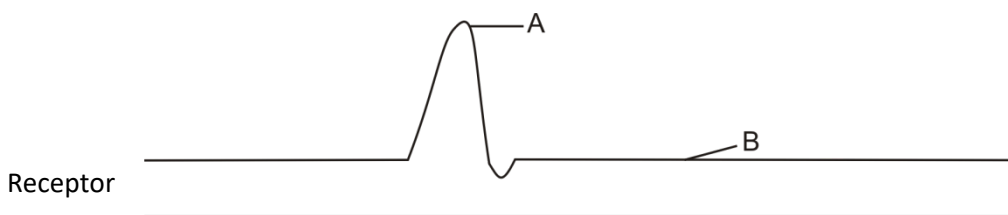
- Three test tubes on a test tube rack
- 10 ml Dilute egg albumen labelled E in a boiling tube (20% albumen – 10g of album in 100ml of water)
- Wash bottle with distilled water/water labelled distilled water with a dropper
- (Access to) dilute hydrochloric acid with a dropper
- (Access to) sodium hydroxide solution with a dropper
- 5ml Solution P-Enzyme Trypsin in a test tube (1% Trypsin — 1g in 100ml of water)
- Two droppers
- Three 10 ml measuring cylinders (one can work if appropriately cleaned)
- A stop watch/access to a wall clock
- Access to water bath maintained at 50⁰ to 60⁰
- Thermometer
- Three labels

MECS CLUSTER JOINT EXAMINATION

231/1

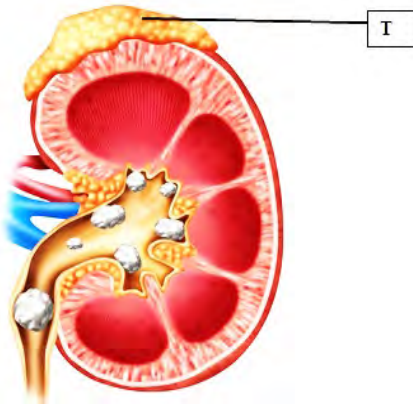
BIOLOGY PAPER 1

1. Name the hormone that is responsible for the development of a deep voice in humans. (1 mark)
2. a) Name the bacteria found in the root nodules of leguminous plants. (1 mark)
- b) What relationship is shown by the bacteria and the leguminous plant. (1 mark)
3. Study the diagram below and answer the questions that follow

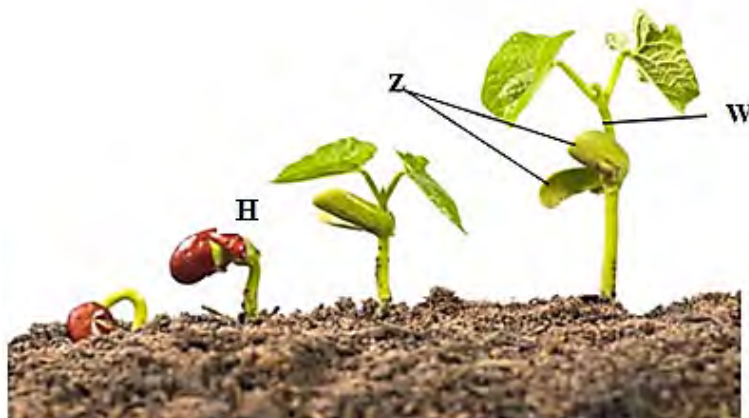


- (a) On the diagram show the direction of impulse transmission (1mark)
- (b) State the potential at which parts A and B are: (2marks)
4. Fats produce high amount of energy on oxidation yet they are not the main respiratory substrate. Explain. (2marks)
5. Distinguish between members of class Monocotyledonae and Dicotyledonae under the following headings
 - (i) Leaf petiole (1mark)
 - (ii) Floral parts (1mark)
6. (a) Define continental drift as used in evolution (2marks)
- (b) What is meant by the term homologous structure (1mark)

7. Name the gamete cells that are produced by ovaries. (1 mark)
8. Give the importance of mosaic leaf arrangement. (1 mark)
9. Identify the genetic disorders in man, characterized by the symptoms described in (a) and (b) below.
 - (a) Inability to distinguish between blue and green colour and various shades of red. (1 mark)
 - (b) Blood takes an abnormally long time to clot (1 mark)
10. Name the fins that prevent the following movements of fish during swimming. (3marks)
 - i) Yawing.....
 - ii) Pitching.....
 - iii) Rolling.....
11. A protein has 100 amino acids. Calculate the number of nitrogenous bases in the gene for this protein (2marks)
12. An investigation was carried out on a mammalian kidney.

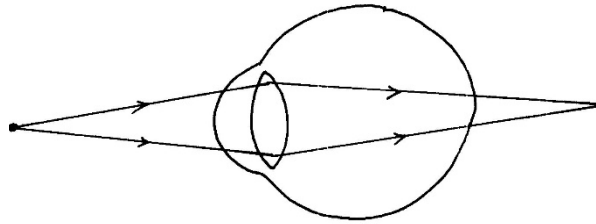


- i. Name the structure labeled **T**. (1mark)
- ii. What is the function of the structure named in (i) above in the kidney? (1mark)
- iii. Identify the disease shown in the kidney above. (1mark)
13. a) Name the part of the eye where image is formed. (1mark)
- b) State **two** characteristics of the image formed on the retina. (2marks)
14. Name:
 - a) A cell in the human body that lacks mitochondria..... (1mark)
 - b) A kingdom whose members lack mitochondria..... (1mark)
15. Below is a photograph illustrating a germinating seedling.



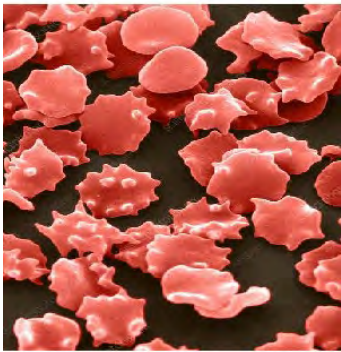
- a) Identify the type of germination. (1mark)
- b) Give **two** functions of the structure labeled **Z**? (2marks)
- c) What name is given to the part labeled **W**? (1mark)
16. Name the cell structures that synthesize the following cell organelles
 - i) Ribosomes..... (1mark)
 - ii) Lysosomes..... (1mark)

17. A solution of sugarcane was boiled with hydrochloric acid then cooled. Sodium carbonate was added then Benedict's solution. The solution was boiled and an orange precipitate was formed.
- (a) Why was the solution boiled with hydrochloric acid? (1mark)
- (b) To which class of carbohydrates does sugarcane belong? (1mark)
- (c) Name the type of reaction that takes place when:
- (i) Simple sugars combine to form complex sugars (1mark)
- (ii) A complex sugar is broken down into simple sugars (1mark)
18. Name the most appropriate apparatus used to collect the following organisms (2 marks)
- a) Mosquitoes.....
- b) Millipede.....
19. a) Name a chemical that can be used to preserve specimens in the laboratory. (1mark)
- b) Identify two scientific skill acquired through the study of biology (2mark)
20. Explain why petals and sepals are referred to as the accessory parts of a flower (1marks)
21. The diagram below shows the position of an image formed in a defective eye.



- (a) Name the defect. (1mark)
- (b) Explain how the defect named in (a) above can be corrected. (2marks)
22. Describe photolysis (2marks)
23. Name **two** instruments used in the laboratory for magnification. (2marks)
24. Give reasons why microscopic sections require to be: (2marks)
- (a) Very thin
- (b) Kept wet during processing.....
25. State **two** sites for gaseous exchange in submerged aquatic plants (2marks)
26. Explain why a person can catch a cold several times in an year but only catches measles once in his/her lifetime. (3marks)
27. (a) Name the structure for gaseous exchange in insects (1mark)
- (b) Explain the role of chitin ring found in the tracheal system of insects (1mark)
- (c) Why does the blood of insects lack haemoglobin? (1mark)
28. Under what conditions do animals use tissue proteins for respiration? (1mark)
29. Name **three** processes in the human body in which homeostasis is involved (3marks)
30. Name **two** classes of animals that excrete their nitrogenous waste products mainly in the form of uric acid. (2marks)
31. State **three** adaptations of the gazelle that prevents them from being preyed upon (3marks)
32. In rice field, weeds are normally removed by hand when rice plants are still young. One common weed in rice fields is a species of barnyard grass which has a close resemblance to young rice plants. Unlike most other weeds, this species spreads very fast wherever it is newly introduced.
- (a) What adaptive variation confers a selective advantage to this species of barnyard grass? (1mark)
- (b) Explain why the weed spreads very fast. (2marks)

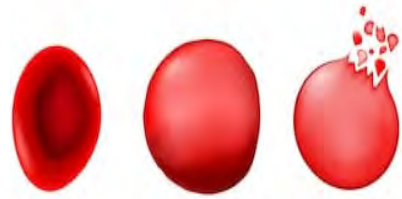
33. The photograph below shows red blood cells that have been put in different solutions. Examine them and answer the questions that follow.



E



F



G

- (a) i) Identify the type of solution in which F was placed. (1mark)
ii) State the process which the red blood cells underwent in illustration G. (1mark)
Account for the appearance of the red blood cells in illustration E. (3marks)

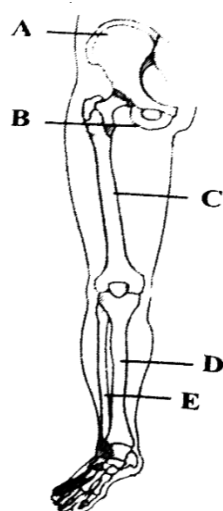
MECS CLUSTER JOINT EXAMINATION
231/2
BIOLOGY PAPER 2
TERM TWO 2023

SECTION A (40 MARKS)

- In a breeding experiment a pure breed black mouse was crossed with a pure white one. All F₁ offsprings were grey in color. Using letter **B** to represent the gene for black color and **W** to represent the gene for white color:
 - Give the parental genotypes. (1 mark)
 - If F₁ offsprings were selfed, use a genetic cross to show the phenotypic ratio of F₂ generation. (5marks)
 - Explain the presence of the grey color from the cross between a black and white mouse. (1marks)
 - Give **one** disadvantage of inbreeding in animal breeding. (1 mark)
- The diagram below represents an organ from a bony fish. Study it and answer the questions that follow.

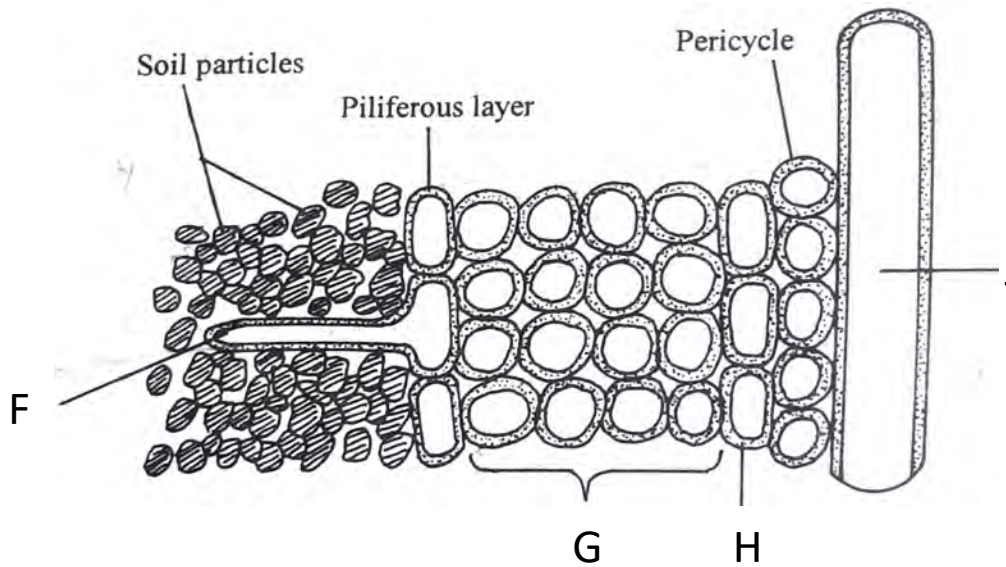


- Identify the organ. (1 mark)
 - Name the part labelled **R** and **S**. (2 marks)
 - State **two** ways in which the structures labelled **Q** are adapted to their function. (2 marks)
 - Name the structure that is found covering the organ shown above. (1 mark)
 - Blood in the capillaries of the gill filaments and water flow in opposite direction. Explain the significance of this. (2marks)
- The diagram below shows the bones in a human leg. Study it and answer the questions that follow.



- Name the bone **B** and **C**. (2 marks)
- Name the joint that is formed at the proximal end of bone **C**. (1 mark)
- State the function of the structure labelled **A**. (1 mark)
- Name the bones that articulates with bone **C** at its distal end. (2 marks)

- e) Distinguish between a tendon and a ligament. (2 marks)
4. The diagram below shows part of a longitudinal section of a young root.



- a) Name the structure **G** and **H**. (2 marks)
- b) State **two** ways in which structure **F** is adapted to its function. (2 marks)
- c) Describe how water from the soil reaches structure **J**. (4marks)
5. a) A person had an accident that damaged some part of the brain. Name the part of the brain that was damaged that resulted in the following symptoms:
- Inability to regulate body temperature (1 mark)
 - Loss of memory (1 mark)
- b) State **two** differences between simple reflex and conditioned reflex (2 marks)
- c) State the role played by the following substances during nerve impulse transmission
- Acetylcholine (1 mark)
 - Cholinesterase (1 mark)
- d) Give **two** differences between a motor neuron and relay neuron. (2 marks)

SECTION B (40 MARKS)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. An experiment was set up to investigate how body temperature of a student vary with different temperature conditions of the environment. The data was tabulated as shown below.

Environmental temperature (°C)	0	5	10	15	20	25	30	35	40	45
Frog's body temperature (°C)	5	5	10	15	20	25	30	35	40	43
Student's body temperature (°C)	37	38	37	38	37	38	37	38	38	37

- a) Using the same axis, draw graphs of the body temperature of student and frog against environmental temperature. (7 marks)
- b) At what temperature was the body temperature of the student and frog the same? (1 mark)
- c) Account for the shape of the graph for:
- The frog (2 marks)
 - The student (2 marks)
- d) State **three** changes that take place in the skin of the student as the environmental temperature rises. (3 marks)

- e) State **two** ways in which the frog regulates its body temperature when the environmental temperature is low. (2 marks)
- f) Give **two** advantages the student has over the frog. (2 marks)
- g) Name the part of the body that detects the internal temperature of the body. (1 mark)
- 7. a) Describe the digestion and absorption of a starchy food (15 marks)
- b) Describe adaptations of hydrophytes to their habitats. (5 marks)
- 8. a) Describe the structure and function of the male reproductive system. (15 marks)
- b) Explain the role of water in germination. (5 marks)

MECS CLUSTER JOINT EXAMINATION

231/3

BIOLOGY PAPER 3

PRACTICAL

- 1. (a) You are provided with:
 - ❖ Specimen **P**,
 - ❖ Solution **Y**,
 - ❖ DCPIP,
 - ❖ 0.1 percent Ascorbic acid.
- i) To 1 cm³ of DCPIP in a test tube, add 0.1 percent solution of Ascorbic acid dropwise; shake the test tube after addition of each drop until color of DCPIP disappears. Record the number of drops used in the table below.
- ii) Repeat the procedure using solution **Y** and record the number of drops used in the table below.
- iii) Squeeze out the juice from specimen **P** into a beaker, decant, and discard the residue. To another 1cm³ of DCPIP, add the juice from specimen **P** drop by drop until the color of DCPIP disappears. Record the number of drops used. Spare the remaining juice of Specimen **P** for procedure (c) below.

Substance	Number of drops
Ascorbic acid	
Solution Y	
Specimen P	

- iv) From the results obtained in a (i) and (iii) above, calculate the percentage of ascorbic acid in the juice obtained from specimen P. Show your working. (3marks)
- v) State two factors that would influence the accuracy of the results (2 marks)
- vi) Suggest the expected results if the juice from specimen P was boiled for 40 min, cooled and added drop by drop to DCPIP solution. (1 mark)
- vii) Explain the expected results in (vi) above (2 marks)
- (b). Between Specimen P and solution Y, which do you recommend for treatment of scurvy. Give a reason for your answer. (2marks)
- (c). i) Using the reagents provided carry out food test to determine other food present in juice of **P** besides Ascorbic acid. (6marks)

Food substances	Procedure	Observations	Conclusion
Proteins			

Reducing sugars			
-----------------	--	--	--

ii) In which regions of alimentary canal will juice of specimen P be absorbed. (2marks)

2. You are provided with specimen **D** and **E** that are specimens of the same plant

a) Using observable features group the specimen into

i) Division..... (1mark)

Reason..... (1mark)

ii) Class..... (1mark)

Reason..... (1mark)

b) Press the stem of specimen **D** hard with a finger repeatedly until the stem is crushed. Record the observation.

i) Observation (1mark)

ii) Name the type of stem in specimen D (1mark)

c) Specimen **D** is the same plant as specimen **E**. E has been exposed to sunlight for 24hrs.

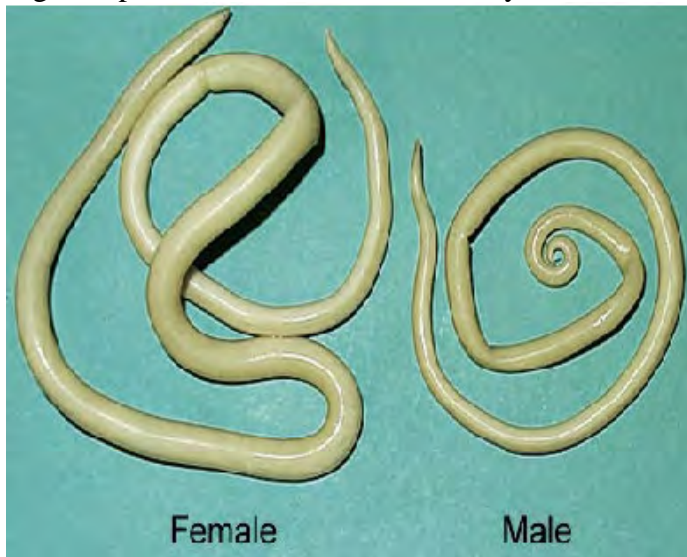
i) Name the phenomenon in exhibited by **E** (1mark)

ii) Explain how the phenomenon occurred. (2marks)

iii) Name the support tissue in the specimens D and E (1mark)

iv) Other than the support tissue mentioned in (iii) above, how else do plants with this type of stem obtain mechanical support. (1mark)

3. Below are images of parasite that infest human body. Use it to answer the question that follow.



i) Name the parasite and give a reason. (2marks)

ii) Which part of alimentary canal does the mature parasite infest? (1mark)

iii) State two effects of the above parasite infestation to humans. (2marks)

iv) How is the parasite adapted to the parasitic mode of nutrition? (3marks)

v) Name any other parasitic worm in human beings (1mark)

MURANG'A EXTRA-COUNTY SCHOOLS JOINT EXAMS-2023
231/3
BIOLOGY PAPER 3
PRACTICAL
July 2023

INSTRUCTIONS TO SCHOOL (CONFIDENTIAL)

Each student shall be provided with the following

- ❖ Specimen P: A quarter piece of ripe medium size pineapple
- ❖ 10ml of Solution Y: Commercially prepared pineapple juice diluted with water at the ratio of 1:2 (e.g. quencher, highlands or any other)
- ❖ Specimen D and E: Are from the same Dicotyledonous plant with herbaceous stem and roots ;Specimen D is fresh while E should have been uprooted and exposed to sunlight for at least 24hrs to wilt.
- ❖ 10ml measuring cylinder
- ❖ A filter paper
- ❖ A filter funnel
- ❖ 5 test tubes in a rack
- ❖ A 50ml empty beaker
- ❖ 3 droppers
- ❖ Test tube holder

Access to the following:

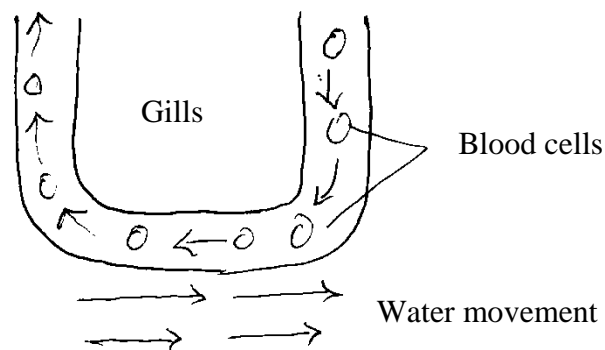
- ❖ Benedict's solution
- ❖ 1% copper (II) Sulphate solution with dropper
- ❖ 10% Sodium Hydroxide solution with dropper
- ❖ 0.01% DCPIP solution with dropper
- ❖ 0.1 % Ascorbic acid
- ❖ Distilled water in a wash bottle
- ❖ Source of heat

IMENTI SOUTH
231/1
BIOLOGY PAPER 1
(THEORY)

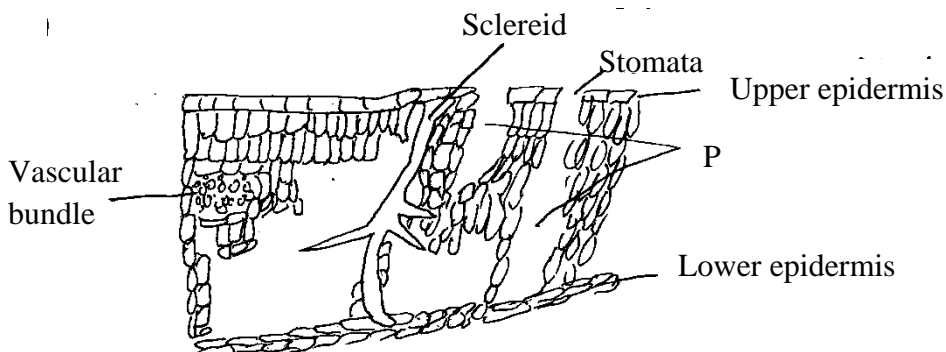
1. A form two girl observed a bird laying eggs in a nest which later hatched into chicks. Name **two** characteristics of living organisms that she concluded from observation. (2 marks)
2. An investigation was carried out to study the effects of the concentration of sucrose solutions on pieces of Aloe vera leaf 40mm in length. The pieces were placed in different concentrations of sucrose solutions and measured after two hours of immersion. The results are shown in the table below.

Sucrose concentration (moles per litre)	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Length after 2 hours (mm)	46	44	42	40	38	38	38

- a) Use the information from the table, to predict the concentration of a sucrose solution isotonic to the cells in the aloe vera leaf. (1 mark)
- b) Draw the apparatus of a cell from the aloe vera leaf after immersion in a solution with sucrose concentration 0.7 moles per litre. (2 marks)
- c) State **one** role of the process being investigated in the plants. (1 mark)
- d) Give the term which would be used to describe the cells in the aloe vera leaf after immersion to a solution with glucose concentration of 0.7 moles per litre. (1 mark)
3. The diagram below shows how gaseous exchange occurs across the gills in fish.



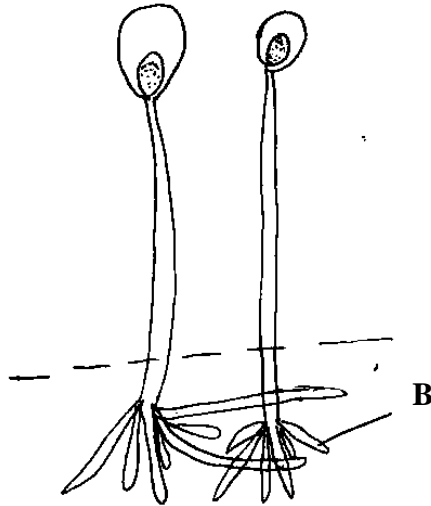
- a) i) Name the type of flow shown above. (1 mark)
- ii) Explain the advantages of the above flow named in (a) (i) above. (1 mark)
- b) If the fish is removed from water it dies immediately. Explain. (2 marks)
4. The diagram below represents vertical section through a certain plant organ.



- a) Identify the organ. (1 mark)
- b) Name the part labelled P. (1 mark)
- c) What is the significance of the large air spaces? (1 mark)

5. The elephants in Tsavo National Park was found to be infested with a lot of ticks. State the trophic level occupied by the following organisms.
- a) Elephants _____ (1 mark)
- b) Ticks _____ (1 mark)
- c) Sketch a pyramid of numbers to represent the above feeding relationship. (1 mark)
- d) What is the importance of the following in an ecosystem?
- (a) Bacteria and fungi (1 mark)
- (b) Predators (1 mark)
6. a) A person of blood group B heterozygous marries another person with blood group B heterozygous. State the possible blood groups of their children. (2 marks)
- b) Why are women less colour blind? (1 mark)
7. A person of a DNA stand has the following base sequence CTAGG. Write down the base sequence of
- i) M – RNA transcribed by this portion of DNA. (1 mark)
- ii) The DNA complementary strand. (1 mark)
8. State the function of the following cell organelles.
- a) Ribosomes (1 mark)
- b) Lysosomes (1 mark)
9. Give reasons for carrying out the following procedures when preparing temporary wet mounts of plant tissues.
- a) Making thin plant sections. (1 mark)
- b) Adding water on the plant sections. (1 mark)
10. Name the organelle that would be found in large numbers in cells of a _____ (2 marks)
- i) Rapidly respiring tissue _____
- ii) Secretory gland _____
11. State **two** ways in which the root hairs are adapted to their function. (2 marks)
12. Explain **two** protective functions of mammalian blood. (2 marks)
13. State **one** way in which HIV / AIDs is transmitted from mother to child. (1 mark)
14. Name **two** materials excreted by both skin and kidneys. (2 marks)
15. i) A person was found to pass out large volumes of dilute urine frequently. Name (2 marks)
- a) Disease the person was suffering from
- b) Hormone that was deficient
- ii) State **one** use of each of the following excretory products of plants (2 marks)
- i) Tannin
- ii) Quinine
16. Explain why:
- a) Mammalian testes are located to hang outside the body. (2 marks)
- b) Four months after fertilization, ovaries can be removed from a human female, without terminating pregnancy. (2 marks)
17. Name hormone responsible for the development of secondary sexual characteristics in human males. (1 mark)
18. State **two** disadvantages of self-pollination. (2 marks)
19. State **three** evidences in support of organic evolution. (3 marks)
20. State **two** advantages of natural selection to organisms. (2 marks)
21. A millipede, grasshopper and crayfish all belong to phylum Arthropoda. Mention **three** major characteristics that they have in common. (3 marks)

22. The diagram below shows a Rhizopus.



- a) Giving reason, name kingdom in which the organism belongs.
- i) Kingdom (1 mark)
 - ii) Reason (2 marks)
- b) i) State the function of the part labelled B. (1 mark)
- ii) Name the phylum whose members possess a notochord. (1 mark)
23. a) State the role of light in the process of photosynthesis. (2 marks)
- b) Explain the fate of the glucose formed during photosynthesis. (3 marks)
24. Name **two** reasons why accumulation of lactic acid during vigorous exercise lead to increase in heartbeat. (2 marks)
25. A dog weighing 15.2kg requires 216 KJ while a mouse weighing 50g requires 2736KJ per day. Explain. (3 marks)
26. Name **two** environmental factors that cause seed dormancy. (2 marks)
27. Pruning increases coffee productivity. Explain. (2 marks)
28. State advantages of metamorphosis to the life of insects. (1 mark)
29. Name the type of germination exhibited by a germinating bean seedling. (1 mark)
30. a) When are organisms said to belong to the same species? (1 mark)
- b) *Ascaris lumbricoides* is a example of an endoparasite. What does the names *Askaris* and *lumbricoides* refer to (2 marks)
- Askaris* _____
- Lumbricoides* _____

IMENTI SOUTH

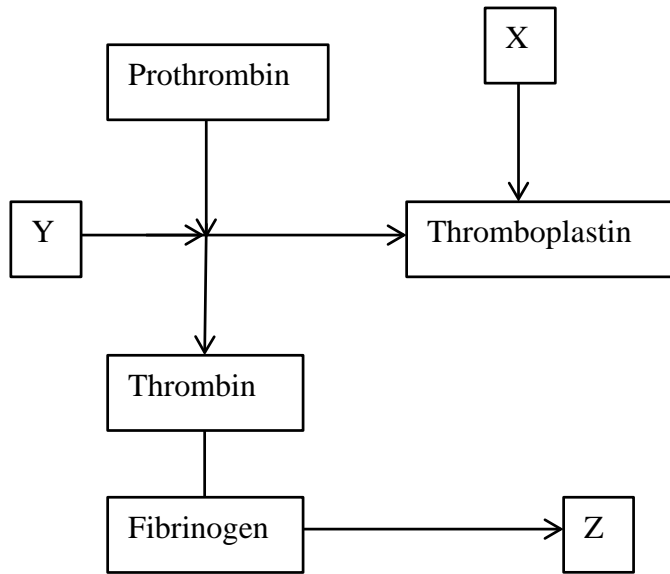
231/2

BIOLOGY PAPER 2 (THEORY)

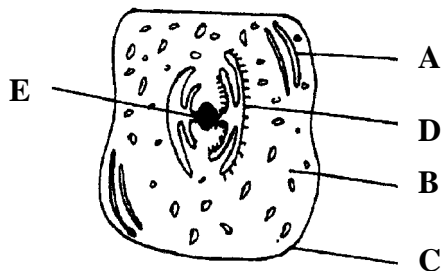
SECTION A (40 MARKS)

Answer **ALL** questions from this section

1. In a garden with plants of the same species, 705 plants had red flowers while 224 had white flowers.
 - a) Work out the ratio of red to white flowered plants. (1 mark)
 - b) i) Using letter R to represent the dominant gene, work out a cross between F1 offspring and a white flowered plant. (4 marks)
 - ii) What is the genotypic ratio from the cross in b(i) above. (1 mark)
 - Genotypic ratio (1 mark)
 - Phenotypic ratio (1 mark)
 - c) What is meant by the term allele? (1 mark)
2. The chart below shows the blood clotting mechanism.

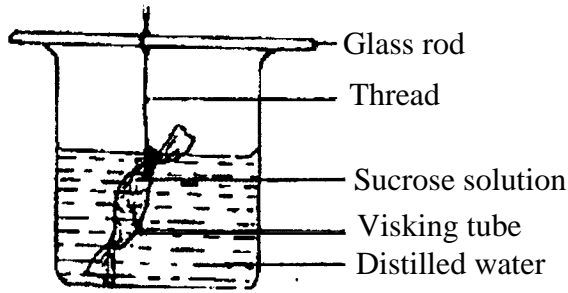


- i) Name the blood cells represented by X. (1 mark)
 - ii) The end product of the mechanism represented by Z. (1 mark)
 - iii) Name a mineral ion and a vitamin involved in blood clotting. (2 marks)
 - a) Mineral ion _____
 - b) Vitamin _____
 - iv) Excessive bleeding can cause death. Explain. (2 marks)
 - v) State **two** ways in which blood can be restored after excessive bleeding. (2 marks)
3. Below is a cell obtained from a living organisms. Study it and answer the questions that follow.



- a) From which kingdom of organisms was the cell obtained? Give two reasons for your answer.
 - i) Kingdom (1 mark)
 - ii) Reasons (2 marks)

- b) On the diagram identify parts A, B and C. (3 marks)
 c) State the role of parts D and E. (2 marks)
4. An experiment was set up as shown in the diagram below. The set up was left for 30 minutes.



- a) State the expected results. (1 mark)
 b) Explain your answer in (a) above. (3 marks)
 c) State **two** importance of osmosis in animals. (2 marks)
 d) How does the following factors affect the rate of diffusion?
 i) Diffusion gradient (1 mark)
 ii) Surface area to volume ratio (1 mark)
5. In an experiment to investigate the effect of temperature on seed germination, soaked bean seeds were subjected to varying temperatures as tabulated below.

Temperature °C	0	6	12	17	28	33	41.5	51
Percentage germination (%)	0	0	2.5	5	13	44	26	3

- a) Account for the germination at
 i) 6°C (3 marks)
 ii) 33°C (3 marks)
 b) State **two** internal factors that affect seed germination. (2 marks)

SECTION B (40 MARKS)

Answer question 6 (Compulsory and either 7 or 8)

6. The data below shows the average number of ticks per animal in a certain farm before and after spraying the animals with a certain chemical. The spraying was done once every month. The data was tabulated as shown below.

Time (months)	0	2	4	6	8	10	12	14
Average number of ticks	200	90	40	20	16	25	45	90

- a) Plot a graph of ticks against time. (6 marks)
 b) Account for the shape of the graph between
 i) 0 – 8 months (3 marks)
 ii) 10 and 14 months (3 marks)
 c) From the graph, determine the average number of ticks after spraying the animals for five months. (1 mark)
 d) If the animals were allowed to graze in an open field, construct a food chain with five organisms in which ticks are secondary consumers. (5 marks)

- e) State **two** methods by which the average number of ticks per animal could have been estimated. (2 marks)
7. State the adaptation of flowers to wind and insects pollination. (20 marks)
8. a) Explain how ileum is adapted to the absorption of digested food materials. (5 marks)
- b) Discuss how environmental factors affect the rate of photosynthesis. (15 marks)

IMENTI SOUTH
231/3
BIOLOGY
PAPER 3(PRACTICAL)

1. You are provided with solution labelled M. Using the reagents provided, carry out the tests to determine the food substance in the solution M.

a)

Food substance	Procedure	Observation	Conclusion

(8 marks)

- b) Solution M is food substance of _____ (1 mark)
- c) Name the parts of the human digestive system where chemical digestion of M occurs. (1 mark)
- d) You are provided with a scapel, specimen Q and R. Cut from each a cube measuring 1cm by 1cm. Put them in each different test tube having about 10 mls of solution X. Record the observations in the table below. (2 marks)

Specimen	Observation
Specimen Q	
Specimen R	

- e) i) Account for the observation in the experiment involving specimen Q and R. (1 mark)
- ii) Name the biological substance being investigated and its significance to the living tissue in the experiment. (2 marks)

2. You are provided with the plant leaves labelled P, Q, R, S, T, U and V. Some are twigs from plants. Examine them.

a) Using observable features in the photographs, complete the dichotomous key given

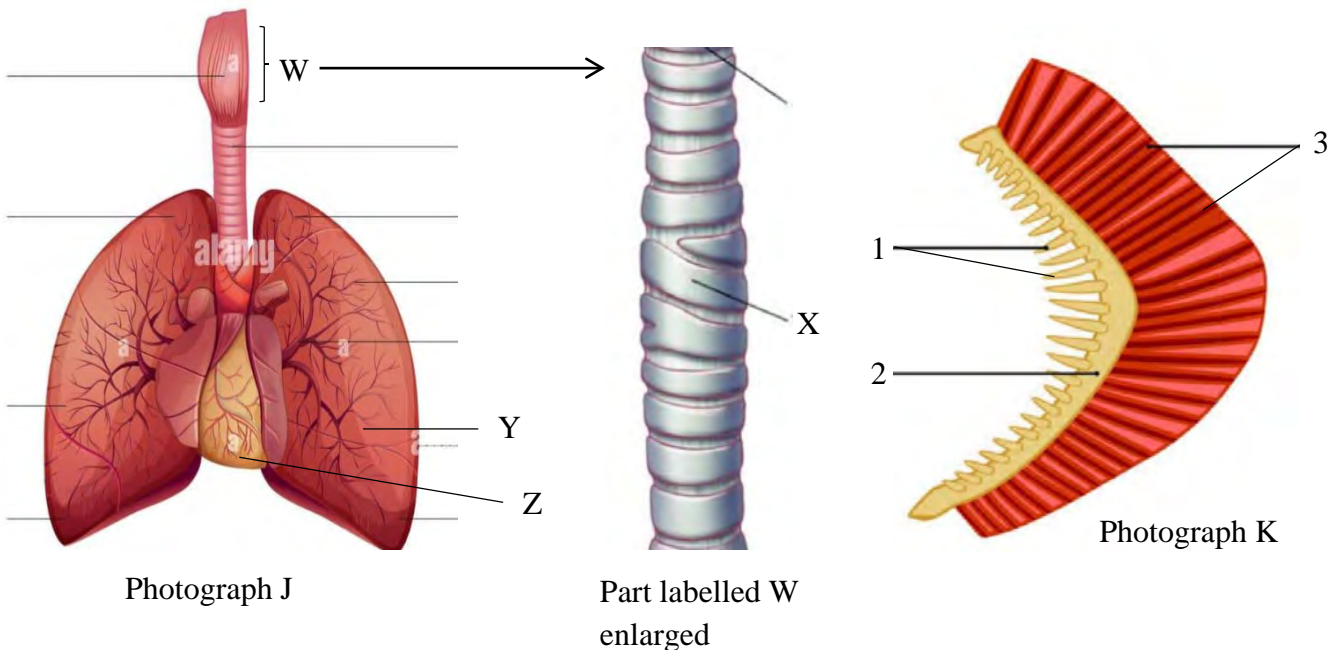
- 1 a) Simple leaves go to 2
- b) Compound leavesgo to 5
- 2 a) Leaves net veinedgo to 3
- b) Leaves parallel veinedcommerlinaceae
- 3 a) _____.....go to 4
- b) Leaves with smooth marginNyctsgibaceae
- 4 a) Leaves alternatemalvaceae
- b) Leaves oppositeVerbenaceae
- 5 a) _____.....go to 6
- b) Leaves bipinnatesBignoniaceae
- 6 a) Leaflet with serrated margincompositae
- b) Leaflets with smooth marginPapilioceae

(2 marks)

b) Use the completed dichotomous key to identify the family which each plant belongs, show the steps followed to arrive at the identity. (10 marks)

Specimen	Steps followed	Identity
P		
Q		
R		
U		
V		

3. Below are photographs labelled J and K of organs obtained from different animal organs. The organs perform similar functions. Examine them.



- a) Identify the organs. J and K (2 marks)
- b) State the functions performed by the organs. (1 mark)
- c) Name the parts labelled X, Y and Z in photographs. (3 marks)
- d) i) Identify the parts labelled 1, 2 and 3 in photographs K. (3 marks)

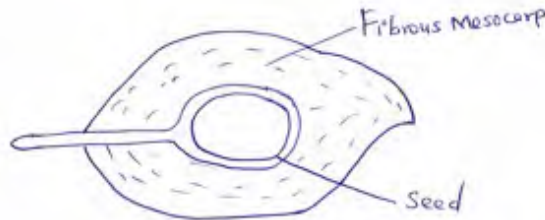
- ii) Using the observable features, state how the parts labelled 1 and 3 you identified in d(i) above are adapted to their function. (4 marks)

KIGUMO

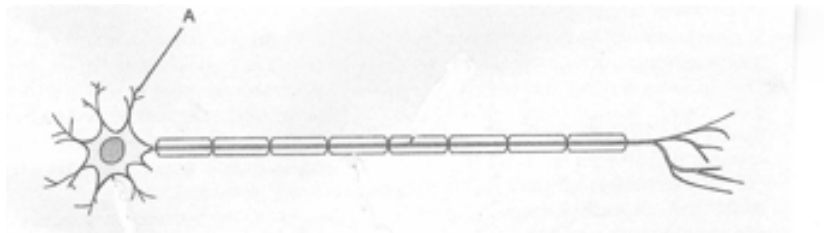
231/3

BIOLOGY PAPER 1

- 1.) The diagram below represent a longitudinal section of a fruit.



- a) Identify the mode of dispersal. (1mk)
 b) Describe **two** adaptations of the fruit to its mode of dispersal. (2mks)
 2. a) Give **two** examples of natural selection in action. (2mks)
 b) List **two** features that make man the most dominant species on the earth. (2mks)
 3. Study the diagram below of a neuron in human being.

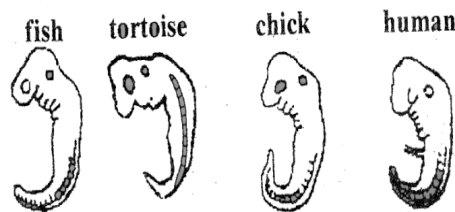


- a) Identify the Neurone. (1mk)
 b) Name the part labeled A. (1mk)
 4. It was observed that during germination of pea seeds 9.3cm^3 Carbon (IV) oxide was produced while 9.1cm^3 of oxygen was used up.
 a) Calculate the respiratory quotient of the reaction taking place. (2mks)
 b) Explain why it is difficult to measure respiratory quotient in plants. (1mk)
 5. The diagrams below represent two types of bacteria species that causes some human diseases. (4 mks)

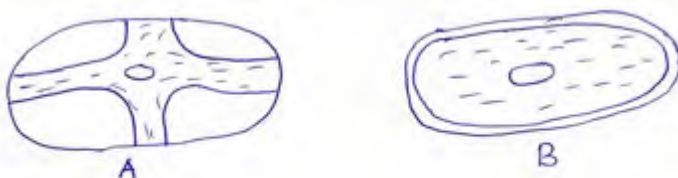


- a) Identify each bacterium and state the disease it causes.
 ADisease it causes
 BDisease it causes.
6. What is the biological significance of metamorphosis to an insect? (2 mks)

7. The diagrams below show embryos of certain vertebrates animals. Study them and answer the questions that follow.



- a) Mention **two** observable features in these embryos that suggest they have a common ancestral origin. (2mks)
- b) What phenomena in organic evolution is exhibited by these diagrams of embryos? (1mk)
8. State **three** ways in which the skin of a frog is adapted for gaseous exchange. (3mks)
9. What would be the effect of the following treatment on the nerve transmission?
 i. Inducing the axon with metabolic inhibitors. (1mk)
 ii. Removing myelin sheath from a nerve fibre. (1mk)
10. Give **two** reasons why blood leaving the lungs may not be fully oxygenated (2mks)
11. What is the importance of retina in vision? (2mks)
12. a) Name the cartilage found between the bones of vertebral column. (1mk)
 b) State 2 functions of the cartilage named in (a) above. (2mks)
13. The cells shown below were obtained from two different plants cells which were immersed in 2% and 25% salt solutions.



- a) Which of the two cells A and B was immersed in 2% salt solution? (1 mk)
- b) Comment on the nature of 25% salt solution in relation to the cell sap. (1mk)
- c) What biological phenomena leads to the observation made in A? (1mk)
14. Name **two** structures found in the cortex of the kidney. (2mks)
15. Explain the disadvantages of anaerobic respiration in plant roots. (2mks)
16. a) State **two** features that reduce resistance in fish during swimming. (2mks)

- b) State **two** protective features of human eye (2mks)
17. Explain why malaria cannot be transmitted through blood transfusion (2 mks)
18. Name **two** types of valves in the mammalian heart (2 mks)
19. State **two** important of stroma in the chloroplast (2 mks)
20. A student mixed a sample of urine from a patient with benedict's solution and boiled the mixture. The colour changed to orange.
- a) What was present in the urine sample? (1mks)
- b) What did the student conclude about the health status of the patient? (1 Mk)
- c) Which organ in the patient may not be functioning properly (1mk)
21. State three adaptations that enable prey to evade predators (3mks)
22. How does light as a biotic factor affect distribution of plants in an ecosystem? (3 mks)
23. Explain why plants absorb water in water logged soil but not minerals salt (2 mks)
24. A biological detergent removes stains like oils from clothes.
- i. Name the enzyme that it contains (1 mk)
- ii. Explain why the stains would be removed faster with the detergent in water 35 °c rather than at 15 °c (2 mks)
25. As a part from vaccination, state two ways of controlling highly infectious disease among animals (2 mks)
26. To control the spread of malaria, fish are introduced into water bodies near residential area.
- a) Name this method of population control (1 Mk)
- b) State **two** advantages of the above method in (a) above (2mks)
27. People are encouraged to take corona virus disease vaccine. How does it work? (1 Mk)
28. What is the significance of;
- a) Red blood cells lacking mitochondria (1 Mk)
- b) Xylem vessels being dead (1 Mk)
29. A patient complained of frequent thirst a sample of the patient urine was found not to have any sugar.
- a) Name the hormone the patient was deficient of (1mk)
- b) Name the gland that secretes the above hormone (1 Mk)
30. Explain why ingestion of salty food may reduce the amount of water passed out in urine (2mks)
31. Explain how the following features adapt root hair cells to absorption.
- a) Large sap vacuole (1mk)
- b) Numerous mitochondria (1 Mk)
32. New born babies have a higher heart beat rates than adults. Explain why (2 mks)

KIGUMO

231/2

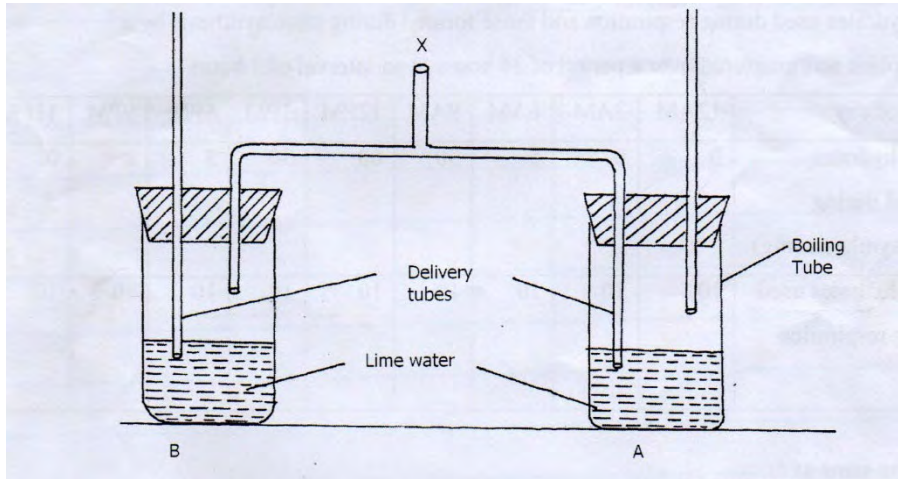
BIOLOGY PAPER TWO -2023

SECTION A

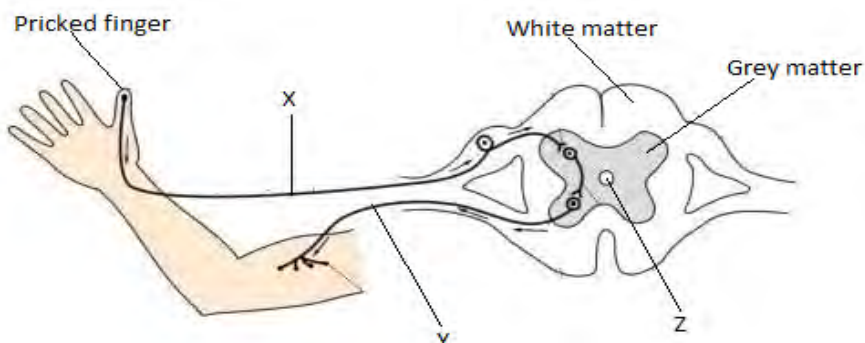
1. i. What characteristic is exhibited by living organisms when they carry out the following processes?
- a) Croton seed becoming a big tree. (1mk)
- b) A pig farrowing. (1mk)
- c) A cheetah running after an antelope. (1mk)
- ii. State the importance of biology in the following areas.
- a) Agriculture. (1mk)
- b) Environment. (1mk)

- c) Food Technology. (1mk)
- iii. Name the apparatus most suitable for collecting the following specimen.
- a) Scorpion. (1mk)
- b) Water beetle. (1mk)
- 2 a) In what form is the carbohydrates stored in;
- i. Muscles. (1mk)
- ii. Endosperm. (1mk)
- b) Give a reason why urine of a mammal does not contain Amino acids. (1mk)
- c) Why is insulin not administered orally? (1mk)
- d) Why would a patient suffering from a liver disease experience chronic general body weakness? (1mk)
- e) Explain why diabetic people produce large volumes of dilute urine even when they have not taken a lot of water. (3mks)

3. An experiment was set up as show below.



- (a) A student blew air in and out through point X. Using arrows indicate how air gets in and out of the set up (2mks)
- (b) i] In which of the tube would lime water form white precipitate first. (1mk)
 ii] Give a reason. (1mk)
- (c) What is the effect of lactic acid in the thigh muscle of an athlete after a short fast race? (2mks)
- (d) Identify the type of muscle in human being where the formation and effect of lactic acid is not felt. (1mk)
- (e) What is the biological significance of boiling milk. [1mk]
4. In Drosophila melanogaster, eye colour is sex-linked, with alleles responsible being X-borne. Red eye colour is dominant over white eye colour. Sex in Drosophila melanogaster is controlled by the same chromosome as in man.
- a) Define allele. (1mk)
- b) Predict the probability of male Drosophila melanogaster who will be born with white eyes if the male parent has red eyes while female parent is red-eyed but heterozygous. Use W to represent the allele for red colour. (5mks)
- c) Name two genetic disorders in human being that are X-borne. (2mks)
5. The diagram below illustrates the components of a simple reflex that takes place when a person's finger is accidentally pricked by a sharp pin.



- (a) Name the neurones labelled X and Y. (2mks)
- (b) State **one** function of the fluid found in the part labelled Z. (1mk)
- (c) Explain how the above simple reflex action takes place. (5mks)

SECTION B

Answer question 6(compulsory) and either question 7 or question 8 in the spaces provided after question 8.

6. An experiment was carried out in which red blood cells were put in salt solutions of different concentrations. The table below shows the percentage of cells which were destroyed by haemolysis in different salt concentration.

Salt concentration (g/dm ³)	% of RBC destroyed By haemolysis
0	100
1	100
2	100
2.5	100
3.0	100
3.5	96
3.7	80
4.0	60
4.5	16
4.7	0
5.0	0
6.0	0

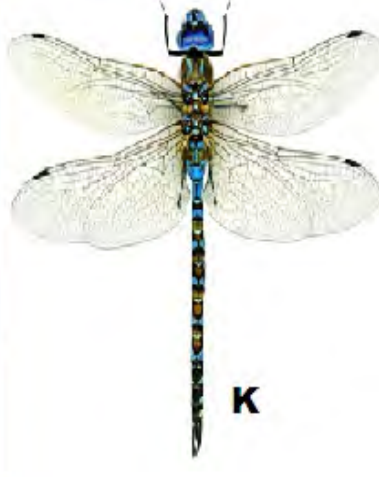
- (a) Draw a graph of percentage of red blood cells haemolysed against salt concentration. (6 marks)
- (b) Explain haemolysis of red blood cells. (3 marks)
- (c) From the graph, state:
- The salt concentration at which 50% red blood cells were haemolysed. (1 mark)
 - The highest salt concentration when the largest number of red blood cells were haemolysed. (1 mark)
- (d) (i) Suggest the normal salt concentration in the blood of the mammal from which the red blood cells were obtained. (2 marks)
- (ii) Give a reason for your answer in (d) (i) above. (1 mark)
- (iii) What term is used to describe the solution with equal solute concentration as that of the cells? (1 mark)
- (e) Name the process in the human body that ensures that haemolysis of red blood cells is prevented. (1 mark)
- (f) State four roles of osmosis in plants. (4 marks)
7. a) Explain the digestion of carbohydrates in the mouth. (10mks)
- b) Describe the process of blood clotting. (10mks)
- 8) Describe how fruits and seeds are suited to their modes of dispersal. (20mks)

KIGUMO**231/3****BIOLOGY PAPER 3 - PRACTICAL**

1. Take 2 clean test tubes and into each add 5cm^3 of dilute hydrogen peroxide. Label the test tubes as **A** and **B**. Cut 2 cubes of Irish potato measuring about 1cm^3 each. Boil one cube in a boiling tube with some water for about 5 minutes. Drop the boiled cube into test tube **A** and unboiled cube into test tube **B**.

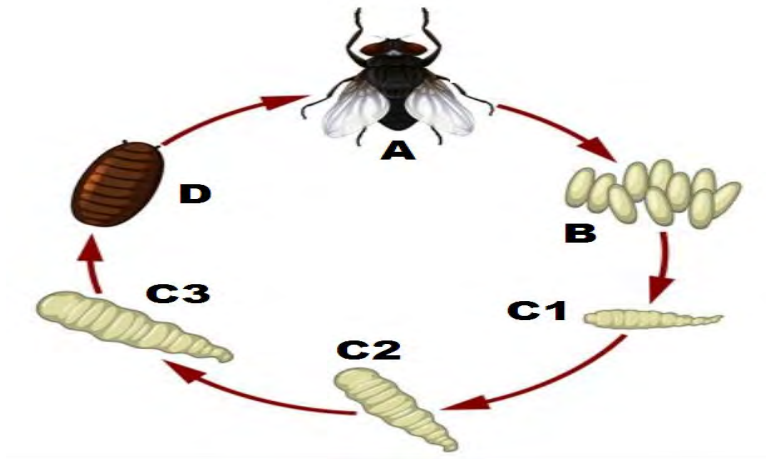
State your observations in ;

- (a) Test tube **A** (1mark)
 Test tube **B** (1mark)
- (b) *Account for* your observations in:
 Test tube **A** (2marks)
 Test tube **B** (2marks)
- (c) Take a small amount of substance **Z** provided and add to it 2cm^3 of sodium hydrogen carbonate.
 i) State your observations (1mark)
 ii) Which process in the body is illustrated above? (1mark)
 iii) State the part of the body where the process takes place. (1mark)
 iv) What is the significance of the process? (1mark)
- (d) Put 2cm^3 of liquid labelled as **C** into a test tube. Squeeze some juice from specimen **X** into a beaker. Draw some of the juice into a dropper. Add 3 drops of the juice into the test tube with solution **C**.
 i) State your observation. (1mark)
 ii) State the part of the human body where the process demonstrated above occurs and the enzyme that carries out the process.
 Part of body (1mark)
 Enzyme (1mark)
 iii) Which gland produces the enzyme stated in (ii) above? (1mark)
 iv) Which hormone stimulates the production of the enzyme stated in (ii) above? (1mark)
2. Below are photographs of two specimens, **J** and **K**. Both of them belong to the same Phylum and Class. Observe them carefully before you answer the questions that follow.



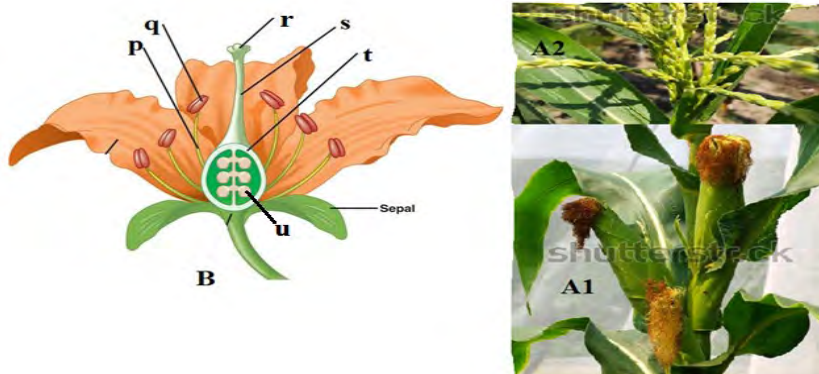
- a) Name the class to which **J** and **K** belong and support your answer with two reasons. (1mk)
 Class (1mk)
 Reasons (2mks)
- b. Suggest why the transport fluid in **J** and **K** has no haemoglobin. (2mks)

c. Below is a diagram showing the life cycle of specimen J.



- i) Identify the stage labeled **D**. 1mk
- ii) Name the hormone responsible for the change from **D** to **A**. 1mk
- iii) Explain the change from;
C3 to **D** (2mks)
D to **A** (2mks)
- d) i) State the form of metamorphosis shown in the above diagrams and give a reason form your answer (2mks)
- ii) How is metamorphosis important to the organism? (1mk)

3. Use the photographs below to answer questions



- (a) (i) Name the type of flowers shown in A1 and A2. (1 mark)
- (i) A1 (1 mark)
- (ii) A2 (1 mark)
- (ii) Describe the feature in flowering plants depicted in (a) (i) above. (1 mark)
- (iii) Explain how flower labeled A1 is modified for pollination. (1 mark)
- (b) Give the functions of the parts labeled p, r and s in specimen labeled B. (1 mark)
- (i) p (1 mark)
- (ii) r. (1 mark)
- (iii) s. (1mk)
- (c) State the structural descriptions of flower B. (2marks)
- (d) Explain what would happen to the following parts after pollination. (1 mark)
- (i) t. (1 mark)
- (ii) u. (1 mark)

**KIGUMO
BIOLOGY CONFIDENTIAL**

Requirements

Each candidate will require the following.

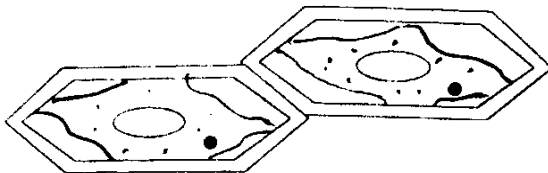
- 10cm³ of dilute hydrogen peroxide.
- Scapel
- 1 piece of Irish potato.
- 1 boiling tube
- Source of heat
- Small amount (2mls) of cooking oil **labeled Z**
- 2cm³ of milk in test tube labeled as **solution C**
- 1 lemon **labeled X**
- 3 clean test tubes
- 2cm³ of sodium hydrogen carbonate solution.

MECS I CLUSTER JOINT EXAMINATION

231/1

BIOLOGY PAPER 1

1. (a) State **two** functions of a microscope. (2mks)
- (b) Define the term field of view as used in microscopy (1mk)
2. Study the diagram below showing a portion of an onion epidermis that had been irrigated with a certain solution X.



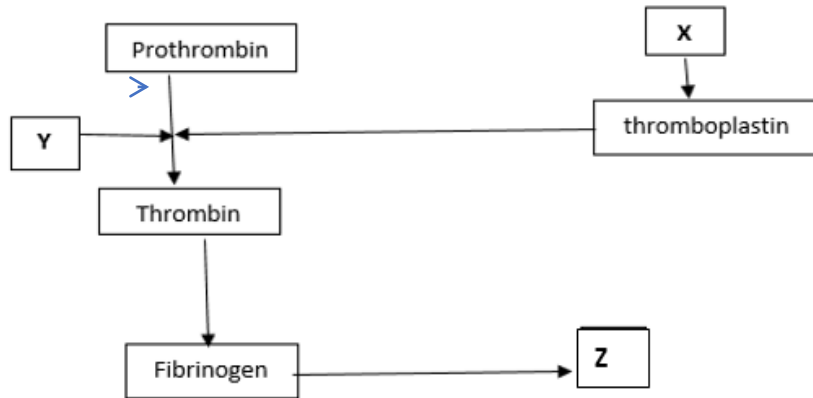
- (a) In **one** word describe the condition of the cells (1mk)
- (b) Describe the process that leads to the condition named above. (3mks)
3. The following reaction may proceed in forward or backward direction
 Glucose + fructose \rightleftharpoons sucrose + water.
- (a) What term is used to refer to the backward reaction. (1mk)
- (b) In which part of alimentary canal does the backward reaction occur? (1mk)
- (c) Name the enzyme that catalyzes the backward reaction. (1mk)
4. A certain metabolic pathway takes the following sequence.



At the start of the experiment an inhibitor was added to the reactants. After the experiment it was found out that there was the same concentration of J, near absence of K, L, M and N. When L was added to the inhibitor set M and N were detected.

- (a) At what stage of the reaction sequence did the inhibitor have its effect? (1mk)
- (b) Explain how the inhibitor affected the reaction. (1mk)
- (c) What is the identity of substance L? (1mk)

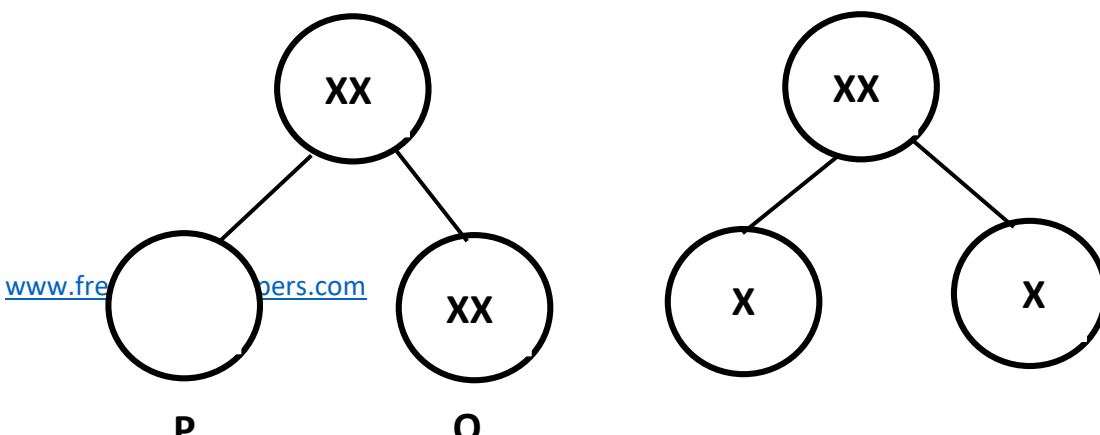
5. After fertilization of an ovule, which parts develops into: -
 - a) Testa (1mk)
 - b) Endosperm (1mk)
6. (i) Name the process through which a plant takes up some mineral ions against a concentration gradient. (1mk)
- ii) State two factors that may affect the process named in (i) above. (2mks)
7. Study the flow chart below which represents a physiological process in mammals



- A i) Name blood components represented by **X**. (1mk)
- ii) What is the significance of product represented by **Z**. (2mks)
- b) Under what condition is thrombokinase released by the platelets? (1mk)
8. a) Name the nitrogenous waste product excreted by a fresh water fish (1mk)
- b) Explain why a person discharges urine more frequently when environmental temperatures are low than when they are high (2mks)
9. Why is it important to use dry mass in ecological studies and not wet mass (2mks)
10. Identify the agent of dispersal of the following (2mks)
 - (i) Fruits which split open along sutures when dry, hauling their seeds away from the parent plant
 - (ii) Light seeds with hairy extensions
11. a) Name the **TWO** components of a lipid molecule (2mks)
- b) State **TWO** disadvantages of using fats as respiratory substrates (2mks)
12. a) Name the pigment that protects humans from the negative effect of Ultraviolet lights (1mk)
- b) Explain how sunlight contributes to stronger bones and teeth in human beings (2mks)
13. Name the main target organ of the following hormones: (2mks)

Aldosterone.....

Insulin
14. Give **THREE** features that make modern man to be more adaptable to the environment (3mks)
15. State **TWO** contributions of Carolus Linnaeus (1708 – 1778) to taxonomy (2mks)
16. A mother had a still birth and the expelled foetus showed clear signs of anemia and jaundice
 - a) Give the name of this disorder (1mk)
 - b) Describe how the disorder arose (3mks)
17. The process of gamete formation is represented below



- a) State a reason why the process above represents gamete formation in female mammals (1mk)
- b) Name the chromosomal mutation represented above
- c) Identify the genetic disorder that arise when the following gametes are fertilized

P (1mk)

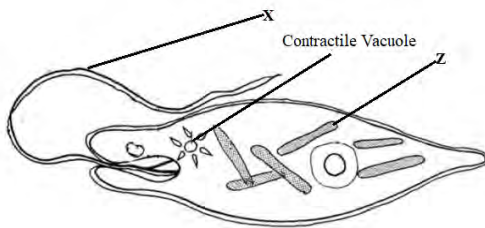
Q (1mk)

18. A sample of air was passed through pyrogallic acid and its volume reduced from 8 cm³ to 7 cm³. When it was later passed through lime water, the volume reduced to 6.8cm³.

- a) What was the role of pyrogallic acid in this experiment? (1mk)
- b) Determine the percentage of Carbon (IV) oxide in the sample of air (2mks)
- c) Is this sample of air exhaled air or inhaled air? (1mk)

19. A zebra is observed to be grazing at a grassland, suddenly a lion appears and the zebra takes off. List two characteristics of living things exhibited by the zebra (2 mks)

20. The diagram below represents an organism. Study it and answer the questions that follow.



- a) Identify the kingdom to which the organism belongs (1 mk)
- b) Name the structure labeled X (1 mk)
- c) Identify the type of nutrition carried out by the organism and give a reason (2 mks)

Type of:

Nutrition.....

Reason.....

21. A wild beast in Maasai Mara National Park was found to be infested with a lot of ticks. State the trophic level occupied by the following organisms: (2mks)

- (a) (i) Wild beast.....
- (ii) Ticks.....

(b) Construct a food chain from the above information (1mk)

- 22. (a) Name **one** hormone involved in insect metamorphosis. (1mk)
- (b) State the importance of metamorphosis to the life of insects. (2mks)

23. (a) State two differences between the primary growth and secondary growth in woody plants. (2mks)

(b) Name **two** tissues responsible for secondary growth in flowering plants. (2mks)

- 24. a) What is respiratory quotient? (1mk)
- b) Explain why it is difficult to measure respiratory quotient in plants. (2mks)

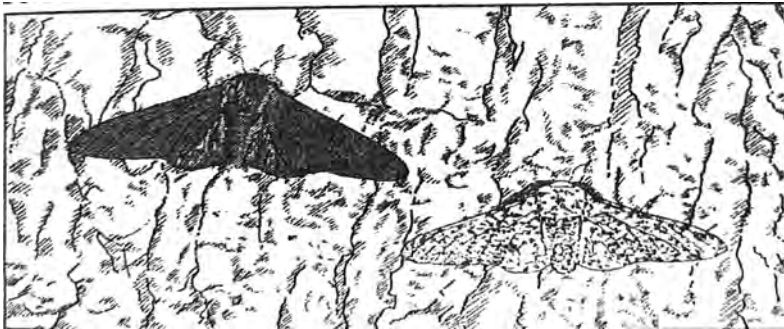
25. Name one class of phylum Arthropoda with cephalothorax (1mk)

26. A section of nucleic strand contains the following sequence.
A — C — G — A — G — A — T — A — C
- a) i) Write the complimentary DNA stand. (1mk)
 - ii) Write the mRNA strand of the strand in (a) above. (1mk)
 - b) Name the site for protein synthesis in a cell. (1mk)
27. (a) What are analogous structures? (1mk)
- (b) Give two examples of analogous structures in animals (2mks)
28. Name any two sites where gaseous exchange takes place in a leaf of a terrestrial plant (2mks)

MECS CLUSTER JOINT EXAMINATION
231/2
BIOLOGY PAPER 2

SECTION A (40 MARKS)

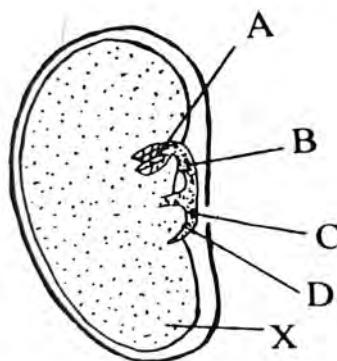
- In *Drosophila melanogaster* (fruit fly) the gene for eye color is sex-linked located on the X chromosome. The gene for red eye is dominant. A cross was made between a homozygous red-eyed female and white-eyed male. Work out the genotype of their off springs. Use R to represent the gene for red eyes. (4 marks)
 - Give **two** reasons why the fruit fly is successfully used in genetic study. (2 marks)
 - In a population, there are more males suffering from colorblindness than females. Explain. (2 marks)
- One variety of the moth, *Biston betularia*, has pale, speckled wings. A second variety of the same species has black wings. There are no intermediate forms. 100 moths of both varieties were released into a wood made up of trees with pale bark as shown below.



After two weeks the moths were caught and the results are shown in the table below.

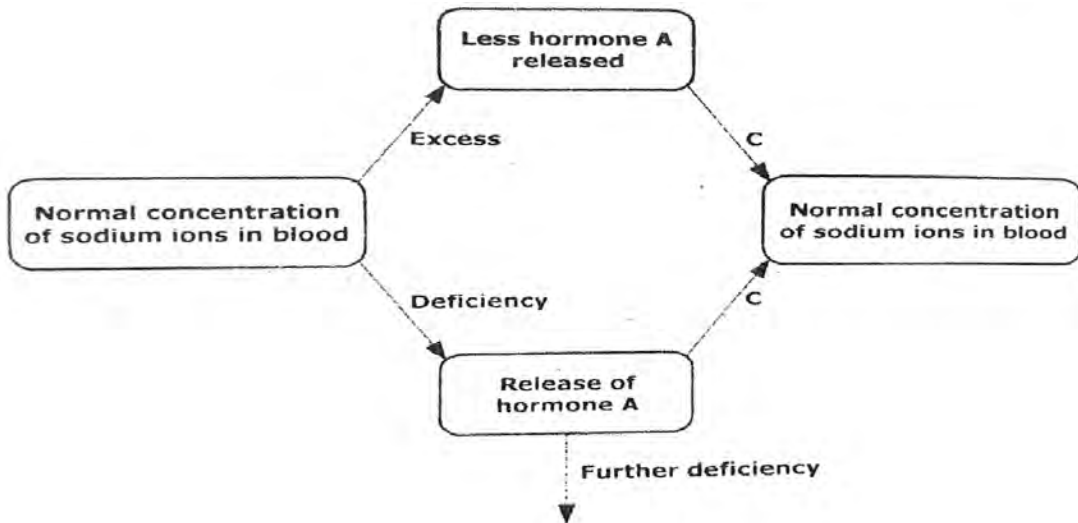
Wing color of moth	Number released	Number caught
Pale, speckled	100	82
Black	100	36

- Explain the difference in the numbers of the varieties of moths caught. (2 marks)
 - What would be different in the number of the varieties of moths caught if they were released in an area where the trees were darkened with soot from air pollution. (1 mark)
 - Define natural selection. (2 marks)
 - Explain why it is more difficult to treat malaria using chloroquine. (3 marks)
- The diagram below shows the internal structure of a broad bean seed.



- a) Name the parts labelled A and B. (2 marks)
- b) State the function of the part labeled X. (1 mark)
- c) Which part undergoes fastest growth to bring about epigeal germination. (1 mark)
- d) Name a plant hormone responsible for: (2 marks)
 - i) Callus tissue formation.....
 - ii) Fruit ripening.....
- e) State **two** roles of water in germination. (2 marks)

4. Study the homeostatic scheme below

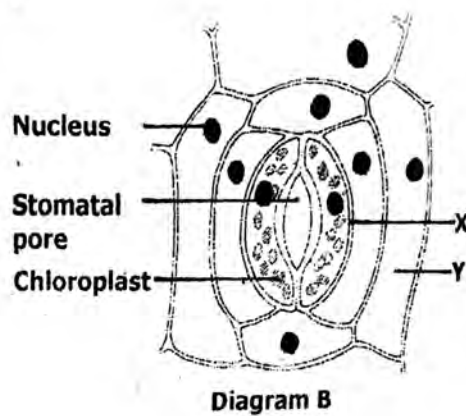
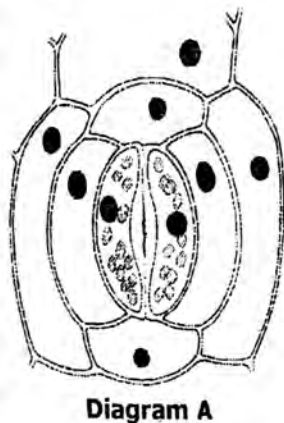


- a) Identify the hormone labelled A. (1 mark)
- b) Which gland releases hormone A. (1 mark)
- c) Identify **two** major sites of action of hormone A. (2 marks)
- d) Identify the mechanism labelled C. (1 mark)
- e) A person was found to pass large volume of dilute urine frequently.

Name the:

- (i) Disease the person was suffering from. (1 mark)
- (ii) Hormone that was deficient. (1 mark)
- f) Give a reason for maintaining a constant body temperature. (1 mark)

5. The diagram below shows a part of a plant tissue.



- a) Label each of the cell X and Y. (2 marks)
- b) Diagram B is drawn to show the change that has occurred in A. State the change. (1 mark)
- c) Explain how light could bring the change you have stated in (b) (ii) above. (4 marks)

SECTION B (40 MARKS)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. The heartbeat rate of a student was measured before and after a period of 2 minutes exercise. Immediately before and after the exercise, the student rested on a bed. The results are shown in the table below.

Time (minutes)	0	1	2	3	4	5	6	7	8	9	10	11	12
Beats per minute	76	76	76	107	135	95	84	84	79	77	76	76	76

- a) Use the data in the table to plot the graph of heartbeat per minute against time. (6 marks)
- b) Explain why the heart beat rate of the student rose during the period of exercise. (4 marks)
- c) By how many beats per minute did the heart beat rate of the student increase during the exercise period? (2 marks)
- d) Explain why after the exercise, the return to resting rate was gradual. (3 marks)
- e) Other than exercise, name **two** factors that increase the rate of heartbeat. (2 marks)
- f) Name the nerve that increases the rate of heartbeat. (1 mark)
- g) Explain why blood in arteries is under high pressure. (2 marks)
7. a) Describe the structure and function of the internal structure of the leaf. (15 marks)
- b) Describe how the stomata of xerophytes are modified to conserving water. (5 marks)
8. a) Describe advantages of asexual reproduction in plants. (5 marks)
- b) Describe the role of the pituitary gland in the female reproductive cycle. (15 marks)

MEC'S JOINT EVALUTION TEST

231/3

BIOLOGY

PAPER 3 PRACTICAL

1. You are provided with solution M, Dilute Hydrochloric acid ,DCPIP, Benedict's solution, 1% copper II Sulphate solution and 10% sodium hydroxide solution.

Add 2ml of hydrochloric acid to solution M and Shake.

Filter the mixture using the filter paper and filter funnel into a boiling tube provided.

Wash the residue from the filter paper into a beaker.

Using the reagents provided carry out food tests on the residue and filtrate. (15 marks)

a) **Residue**

Food substance being tested for	Procedure	Observation	Conclusion
REDUCING SUGARS			
VITAMIN C			
PROTEINS			

b) **Filtrate**

Food substance being tested for	Procedure	Observation	Conclusion
REDUCING SUGARS			
VITAMIN C			
PROTEINS			

- c) Account for the observation in (a) and (b) above. (2mks)
- d) The physiological process demonstrated above occurs in all living things. Name two important processes in animals that depend on it. (2mks)

2. You are provided with specimen R and S

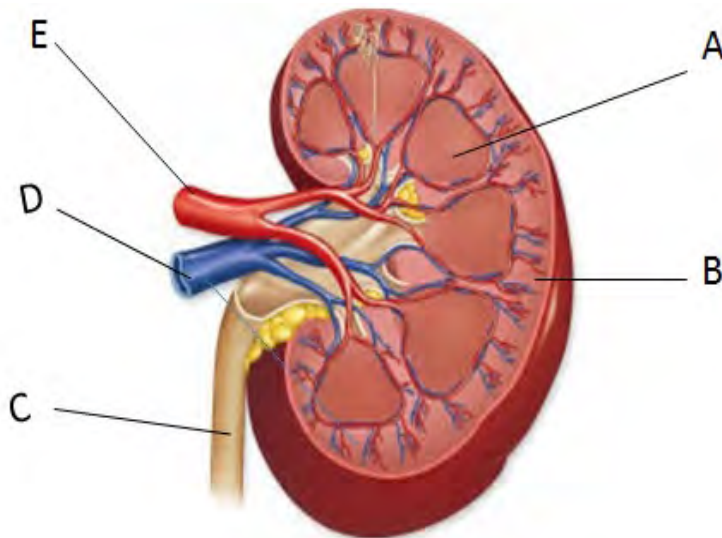
- a) i) Give a reason why both R and S are fruits. (1mk)
- ii) Why is R also a seed? (1mk)
- iii) Tabulate any two differences between specimen R and S (2mks)

Specimen R	Specimen S

(b) Using a blade provide; carefully make transverse section of specimen S.

- i) Make a labelled diagram of the cut section. Label any three parts. (4mks)
- ii) Name the type of placentation in S .Reason (2mks)
- iii) What is the likely agent of dispersal of S? Reason (2mk)

3. The photograph below is of mammalian organ



- a) i) Name the basic functional units of the organ. (1mk)
- ii) State any function of the organ above. (1mk)
- b) Name the parts labelled- A (3mks)
B
C
- c) How is the blood vessel E adapted its function. (2mks)
- d) Give two differences between blood flowing through vessel E and D (2mks)

Blood in E	Blood in D

**MEC'S JOINT EVALUATION TEST
231/3
BIOLOGY PAPER 3 - PRACTICAL**

INSTRUCTIONS TO SCHOOL (CONFIDENTIAL)

- ❖ 20ml of Solution M -A mixture of Glucose, Ascorbic acid and Egg albumen
- ❖ About 5ml of 0.1 M Hydrochloric acid with a dropper
- ❖ Specimen R --- A Maize grain
- ❖ Specimen S ---- A Ripe Orange (Orange in colour)
- ❖ A scalpel blade
- ❖ A filter paper
- ❖ A filter funnel
- ❖ A boiling tube in a rack
- ❖ 10ml Measuring cylinder
- ❖ 4 Test tubes in a rack
- ❖ A 50ml empty beaker

Access to the following:

- ❖ Benedict's solution
- ❖ 1% copper II Sulphate solution with dropper
- ❖ 10% Sodium Hydroxide solution with dropper
- ❖ DCPIP solution with dropper
- ❖ Distilled water in a wash bottle

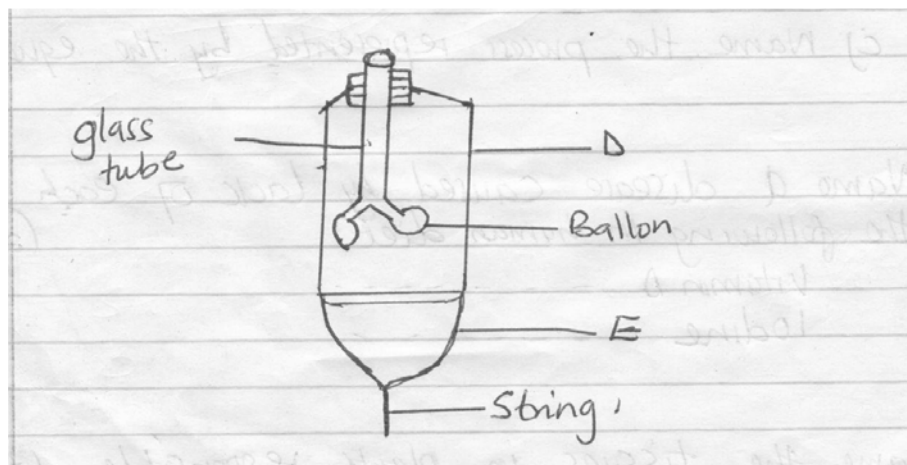
MWAKICAN FORM 4 JOINT EXAMINATION 2023

231/3

BIOLOGY PAPER 1*Questions*

1. State two functions of centrioles in a cell (2 mks)
2. State three factors that affect the rate of diffusion (3 mks)
3. The equation below shows a chemical reaction that takes place in plants

$$\text{Carbon (IV)oxide} + \text{water} \longrightarrow \text{Glucose} + \text{A}$$
 - a) Identify A (1mk)
 - b) Other than reactants, state two conditions necessary for this reaction (2 mks)
 - c) Name the process represented by the equation (1 mk)
4. Name a disease caused by lack of each of the following in human diet (2 mks)
 Vitamin D.....
 Iodine.....
5. Name the tissues in plants responsible for: (3 mks)
 - a) Transport of water and mineral salts
 - b) Transport of carbohydrates
 - c) Primary growth
6. A person whose blood group is AB require a blood transfusion. Name the blood groups of the donors (1mk)
7.
 - a) Why would carboxyhaemoglobin lead to death? (2 mk)
 - b) State three ways in which red blood cells are adapted to their function (3 mks)
8. The diagram below represents a model used to demonstrate breathing in mammals

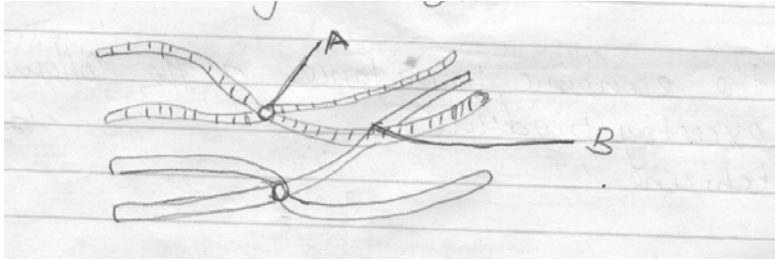


- a) Name the mammalian structure represented by the parts labelled D and E (2 mks)
 - b) State the observation made when the string is pulled down (1 mk)
 - c) Explain the observation in (b) above (2mks)
9. What are the three end products of anaerobic respiration in plants (1 mks)
10. a) State the economic importance of the following plant excretory products (2 mks)
 - i) Colchicine
 - ii) Papain
- b) Name the nitrogen metabolic wastes in birds (1 mk)
11. State three differences between diffusion and active transport (3 mks)

Diffusion	Active transport

12. State two adaptation of leaves in arid and semi-arid areas (2mks)

13. The diagram below shows a phenomenon which occurs during cell division



i) Name the parts labelled A and B (2 mks)

ii) State the biological importance of the part labelled B (1mk)

iii) Identify the stage of cell division in which the phenomenon occurs (1mk)

14. State three differences between deoxyribonucleic acid (DNA) and Ribonucleic acid (RNA) (3 mks)

15. A cross between a red flowered and white flowered plants of mirabilis jalapa produced only pink flowered offspring.

a) Explain the absence of red and white flowered plants in the F₂ offspring (1 mk)

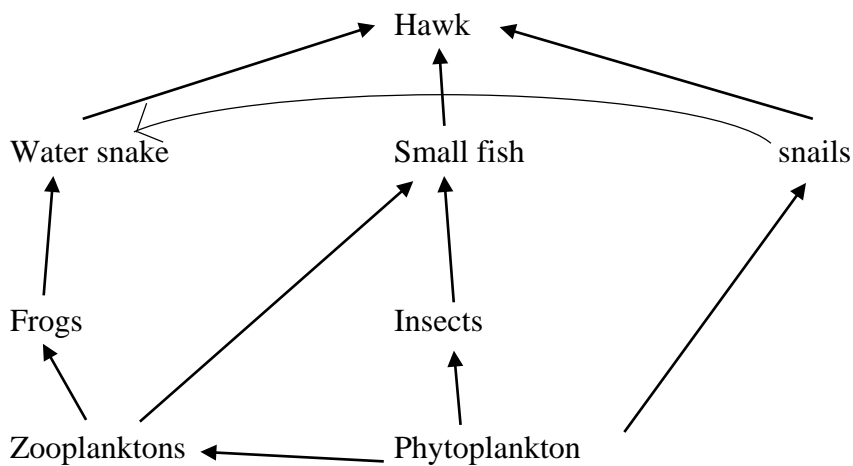
b) Using a genetic cross, show how the F₂ generations was obtained by selfing the F₁ generation. Let R represent the gene for red colour and W represent the gene for white colour (4 mks)

c) Work out the following for the F₂ generation

i) The genotypic ratio (1 mk)

ii) The phenotypic ratio (1 mk)

16. The food web represents a feeding relations in an ecosystem

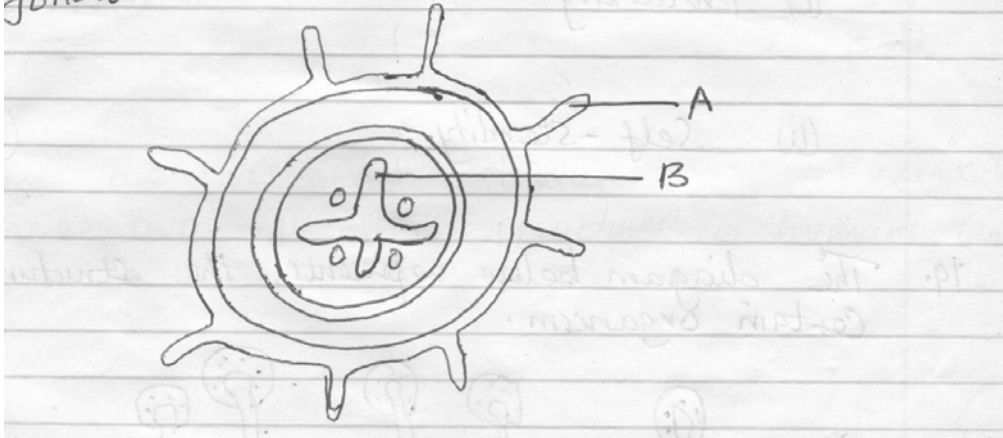


a) Name two organisms which are both secondary and tertiary consumers (2 mks)

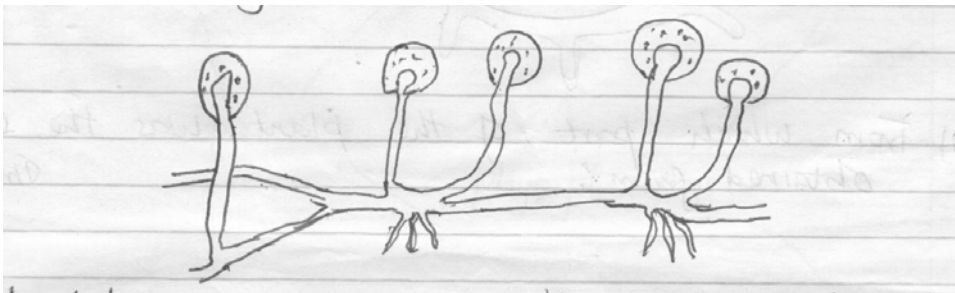
b) State the short term effect of immigration of insects in the ecosystem (2 mks)

c) Which organism has the least biomass in the food web? Give reason (2 mks)

17. The diagram below represents a cross section obtained from a plant. Use it to answer the questions that follows



- a) From which part of the plant was the section obtained from: (1mk)
 - b) Give a reason for your answer in (a) above (1mk)
 - c) Name part B (1mk)
 - d) Name the material that strengthens the part you named in C above (1mk)
 - e) State the function of part A (1mk)
18. a) What is meant by the following terms:
- (i) Protandry (2mk)
 - (ii) Self-sterility (2mks)
19. The diagram below represents the structure of a certain organism



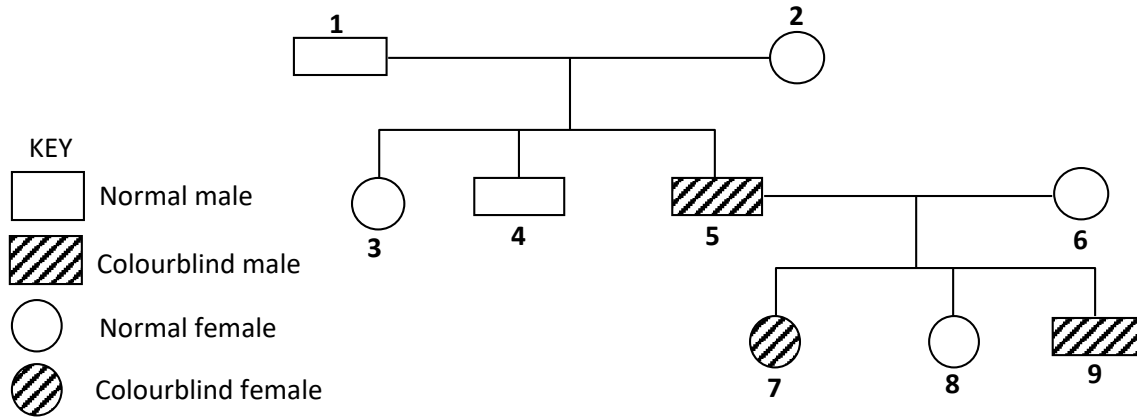
- a) i) State the kingdom to which the organism belongs (1 mks)
 - ii) State two characteristics of the organisms belonging to the kingdom named (a) (i) above (2mks)
 - b) What role is played by the organism represented by the structure (2mks)
20. (a) State five evidences that support the theory of evolution (5mks)
- (b) (i) What are vestigial structures (1mk)
 - (ii) Name two vestigial structures in humans (2mks)
21. State three characteristics of fruits dispersed by animals (3mks)

**MWAKICAN JOINT EXAM
231/2
BIOLOGY PAPER 2**

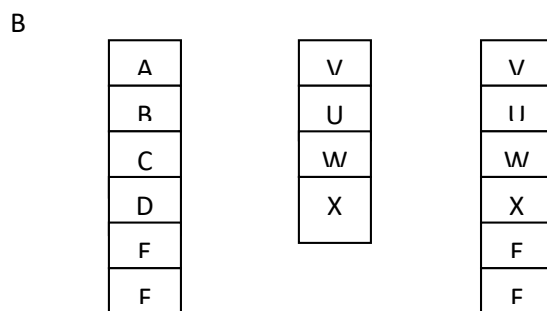
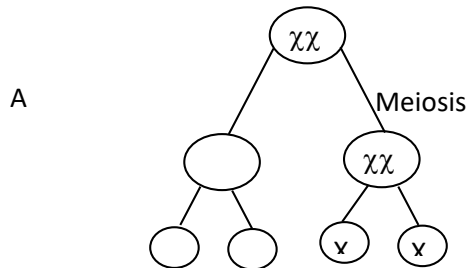
SECTION A: (40 MARKS)

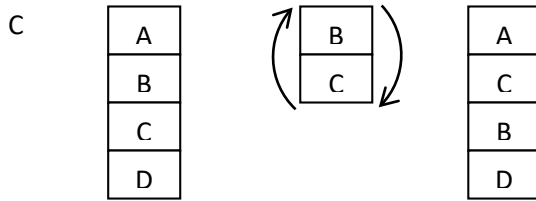
Answer all questions in this section.

1. The figure **below** is a pedigree showing the inheritance of colour blindness, a disease transmitted through a recessive gene located on the X-chromosome.



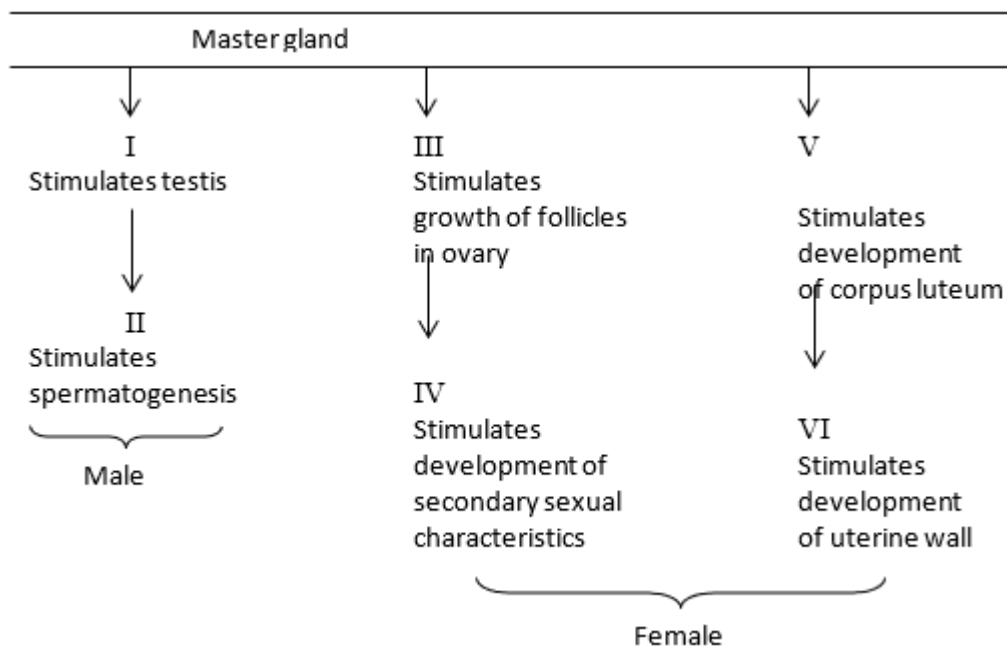
- (a) Using the symbol N for normal gene and n for colour blind gene, write down the genotypes of parents **1** and **2**. (2mks)
- (b) Work out the possible genotypes of the children **3**, **4** and **5**. (3mks)
- (c) The diagrams **below** illustrate some chromosome mutations.





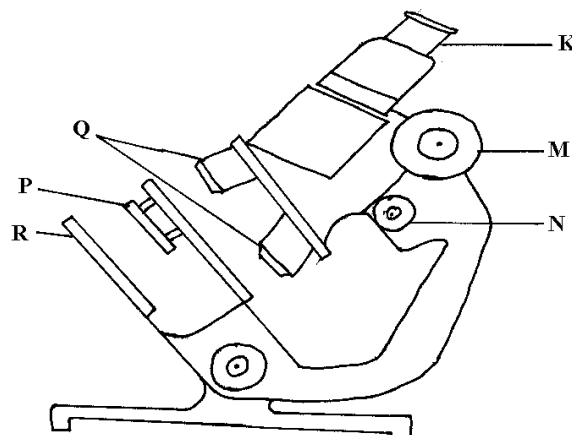
Identify the mutations. A , B & C (3mks)

2. The diagram **below** represents some hormones, their sources and functions in a mammal.



- (a) Identify the gland described as master gland. (1mk)
- (b) Name the hormones:- (3mks)
- (c) Describe the consequences of deficiency of hormone **II** in man. (2mks)
- (d) Other than stimulate development of uterine wall, suggest two other functions of hormone **VI**. (2mks)

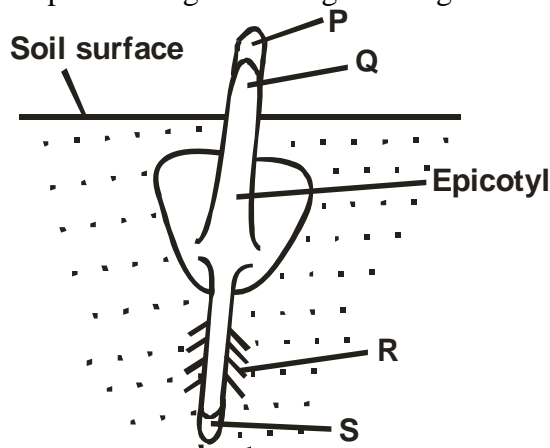
3. The diagram below shows some components of a light microscope.



- a) Name the parts labeled K & M (2marks)
- b) State the functions of P & Q (2marks)
- c) A student was viewing a prepared slide of a plant cell under high power microscope. The features of the cell were blurred. Which one of the labeled parts of the microscope would the student use to obtain:-
 (i) a sharper outline of the features. (1mark)
 (ii) Give the formula used to calculate magnification in a light microscope. (1mark)
- d) A student was preparing a section of a plant cell to be viewed on a light microscope. Give a reason for each of the following steps:-
 (i) Cutting a very thin section (1mark)
 (ii) Staining the section (1mark)
4. The table below shows the contents of urine compared to blood plasma and glomerular filtrate in a mammal. Study it and answer the questions that follow:-

Component	Plasma g/cm ³	Glomerular g/100 cm ³	Urine g/100 cm ³
Urea	0.04	0.04	2.10
Uric acid	0.005	0.005	0.07
Glucose	0.20	0.20	0.00
Amino acids	0.07	0.07	0.00
Plasma proteins	9.00	0.00	0.00
Salts	0.84	0.84	1.96

- a) Account for the absence of:-
 i) Plasma protein in glomerular filtrate. (1 mark)
 ii) Glucose and amino acids in urine. (1 mark)
- b) From the results above, identify two types of wastes eliminated from the mammalian blood through the kidney. (2 marks)
- c) Give a reason why kidney tubules are highly coiled. (1 mark)
- d) Name the hormone responsible for:-
 i) Reabsorption of water..... (1 mark)
 ii) Reabsorption of sodium chloride..... (1 mark)
- e) Name one kidney disease. _ (1 mark)
5. Diagram below represents a germinating seedling.



- a) What is germination? (1 mark)
- b) Name the part labelled P, Q and R. (3 marks)
- c) Identify the type of germination shown in the diagram. (1 mark)
- d) What is the role of the following in germination of the above seedling?
- Oxygen (1 mark)
- Enzymes (1 mark)
- Water (1 mark)

SECTION B: (40 MARKS) Answer question 6 (compulsory) and EITHER question 7 or 8 in the spaces provided after question 8.

6. The pressure in the flow of blood in a mammal was determined at two different vessels; A and B. The data was taken within a period of 1 minute and was presented as follows.

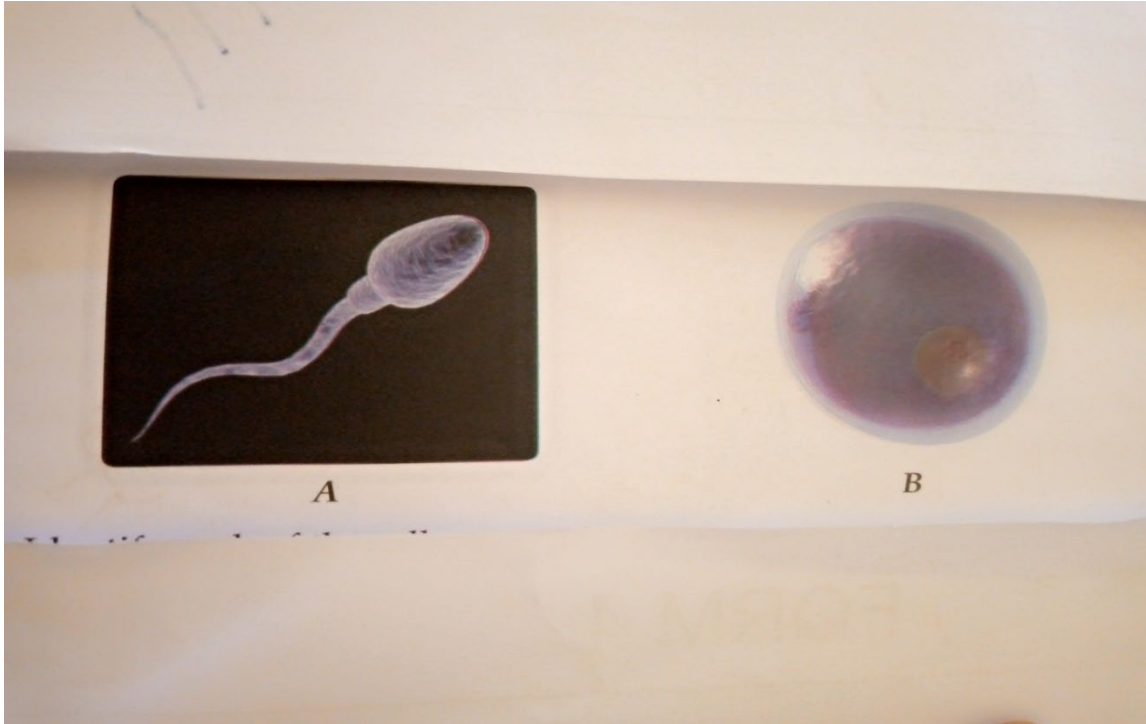
Time in seconds	Blood pressure in	
	Vessel A	Vessel B
0	160	320
10	165	360
20	170	320
30	180	400
40	170	360
50	160	320
60	160	360

- (a) Plot the graph of blood pressure in both vessels against time on the same axis. (7 marks)
- (b) Describe the trend of each curve. (2 marks)
- (c) I) From the graph, suggest the possible identity for:
- i) Blood vessel A. (1 mark)
- ii) Blood vessel B. (1 mark)
- II) Give reasons for your answer in (c) i) and ii) above. (2 marks)
- (d) Explain a factor that would result to an increase in blood pressure in both the blood vessels above. (2 marks)
- (e) State **two** structural differences between the two vessels mentioned in (c) above. (2 marks)
- (f) i) Name **two** diseases of circulatory system in humans. (2 marks)
- ii) Other than transport of substances give one other function of blood. (1 mark)
7. (a) Describe the mechanism of inhalation in man. (10mks)
- (b) Using photosynthetic theory explain the mechanism of opening of stomata. (10mks)
8. Explain the adaptation of the small intestine to their functions. (20marks)

MWAKICAN FORM 4 JOINT EXAMINATION - 2023**231/3****BIOLOGY PAPER 3****PRACTICAL****ANSWER ALL QUESTIONS (40MKS)**

1. You are provided with a specimen labeled K.
- (i) With a reason, identify the part of plant represented by the specimen (2mks)
(ii) Cut the specimen into two halves transversely. Observe the arrangement of seeds inside the specimen. Suggest its placentation. (1mk)
 - (i) Suggest the mode of dispersal for specimen K (1mk)
(ii) Give reason for your answer in b(i) above (1mk)
 - (i) Specimen K in its raw state has an excretory substance in its skin. Name the excretory substance (1mk)
(ii) How is the excretory substance named in c) (i) important to human? (2mks)
 - From the remaining parts of specimen K, cut out thin strips measuring 1cm wide and 5cm long. Place two of the strips in ((solution X) and the other two in (solution Y) Allow the set ups to stand for 30 minutes.
 - After 30 minutes remove the strips from the two solutions. Observe and record the shape of the strips from each solution. (2mks)
Solution X
Solution y
 - Using your fingers, feel the texture of the strips of the two solutions (2mks)
solution X
Solution Y
 - Explain the observations made in d) (i) and (ii) for strips in solution X (3mks)
2. a) Place 2ml of Bromothymol Blue in a clean test tube. Add dilute hydrochloric acid drop by drop and shake till there is a permanent colour change
- State the resulting colour (1mk)
 - To the mixture obtained above, now add sodium hydroxide solution drop by drop until there is colour change. Record your observation (1mk)
 - From your observations in (a)(i) and (a)(ii) above what is the nature of Bromothymol Blue? (1mk)
- b) Place 10ml of fresh Bromothymol blue in a boiling tube. Using the drinking straw, bubble air through the Bromothymol Blue until there occurs colour change
- Record your observation (1mk)
 - what does the colour obtain in b)(i) above suggest about the nature of the gas breathed out (1mk)
- c) Rinse the measuring cylinder and use it to place 2ml of solution L in a clean test tube. Rinse the drinking straw used in b) above and use it to bubble air through solution L.
- Record your observation (1mk)
 - Suggest the identity of solution L (1mk)
 - Suggest the identity of the gas that gave rise to the observation above (1mk)
- d) i) Name the physiological process in the cells that leads to the formation of the gas named in c) iii) above (1mk)
ii) Write down a word equation for the process named in d) i) above (2mks)
iii) What is the importance of the identified process in cells of living organisms (1mk)

- 3) You are provided with photomicrographs of specimens A and B which represents some specialized animal cells.



- Identify each of the cells. A & B (2mks)
- State one function of the cells (1mks)
- On photo A name any three parts of the cell (3mks)
- State one function of each of the parts you have labeled (3mks)
- How is the cell labeled B adapted to its functions (2mks)
- Given that the magnification of the cell labeled A is X2000, calculate its actual size in micrometers (2mks)

**MWAKICANFORM 4 JOINT EXAMINATION 2023
BIOLOGY PAPER 3**

Confidential

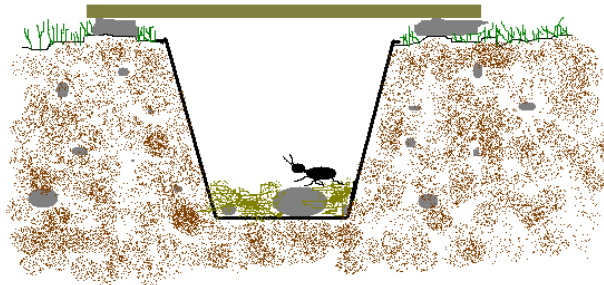
- Specimen labeled K: Mature unripe pawpaw fruit
- 30cm ruler
- Scalpel
- Two 100ml beakers
- distilled water labeled Solution X
- Concentrated salt solution labeled solution Y
- 25ml Bromothymol blue
- Lime water labeled solution L
- Drinking straw
- 2 test tubes
- 10ml measuring cylinder
- Boiling tube
- Dilute Hcl
- Dilute sodium hydroxide

NB; Coloured photographs for question 3.

MURANG'A SOUTH
231/3
BIOLOGY PAPER 3

Instructions: Answer all question in the spaces provided.

1. State the branch of Biology that would be used in solving the problem of disputed parentage. (1mk)
2. Study the diagram below and answer questions that follow



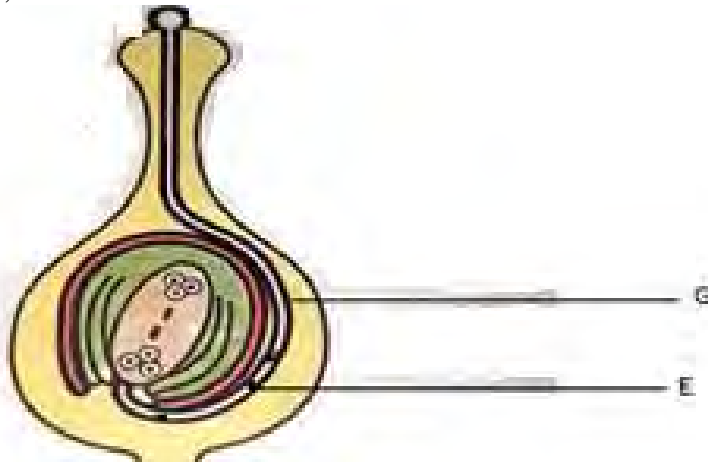
- (i) What is the name given to the apparatus shown above (1mk)
 - (ii) What is its use in Biological studies? (1mks)
3. a) State the role of active transport in animal nutrition (1mk)
 b) Cyanide lowers the rate of active transport. Explain? (2mks)
 4. a) Explain the two role of diffusion in human beings. (2mks)
 b) What is meant by each of the following terms?
 (i) Crenated cell. (1mk)
 (ii) Flaccid cell. (1mk)
 5. The table below shows the effect of wind, still air and stomatal opening on the rate of transpiration of a plant in milligrams of water lost per hour dm^2 . Study the table and answer the following questions

Stomatal opening (μm)	1	2	3	4	5	6	7
Windy	40	63	74	86	94	110	124
Still air	0	6	12	19	23	27	30

- (a) (i) Compare the rates of transpiration in windy and still air conditions (1mk)
 (ii) Explain your observation in a(i) above (2mks)
 - (b) How does stomatal opening affect transpiration rate? [1mark]
6. Phagocytes also called granulocytes or polymorphs are cells found in the blood where they ingest pathogens and cell debris.
 a) Why are they called polymorphs? (1mk)
 b) Name the cell organelle most abundant in phagocytes to enable them function effectively. (1mk)
 7. Name the blood vessel that supplies blood to the
 – Brain (1mk)
 – Cardiac muscle (1mk)
 8. a) Cowpeas seeds were place in a vacuum flask and left for five days. What is the expected change in composition of gases in the flask on the sixth day? (1mk)
 b) Give a reason for your answer in (a) above (1mark)
 9. a) Biotechnologist works day a night to curb food insecurity using the knowledge of polyploidy in genetics. Explain the economic importance of such practice? (2mks)

b) Define a backcross? (1mk)

10. The diagram below shows a pollen tube as it develops down the style. Use it to answer the questions that follows;



(i) Name the part labelled G. (1mk)

(ii) State two functions of structure labelled E. (2mks)

11. A group of Form Three students collected a certain specimen for study as shown below. Study it carefully and use it to answer the questions that follow.

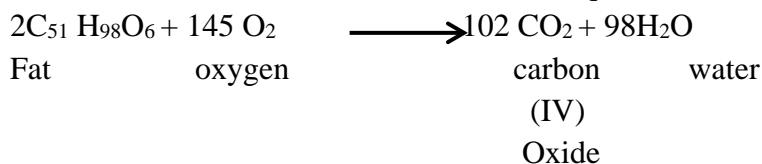


(i) Name the type of metamorphosis in the above specimen. (1mk)

(ii) Give any two advantages of the above metamorphosis. (2mks)

12. A mature coconut fruit has mesocarp which has air spaces. Explain the biological significance of that mesocarp. (2mks)

13. Use the chemical formula below to answer the question that follow;



a) Calculate the respiratory quotient (RQ) (3mks)

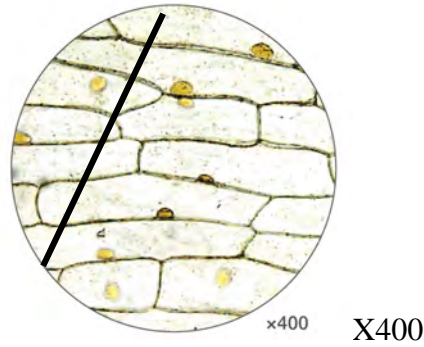
b) Under what condition do animals use tissue protein for respiration? (1mk)

14. Name the causative agent of the following disease.

i) Acquired immune deficiency syndrome (1mk)

ii) Syphilis (1mk)

15. The diagram below shows onion cells in a field of view of a light microscope

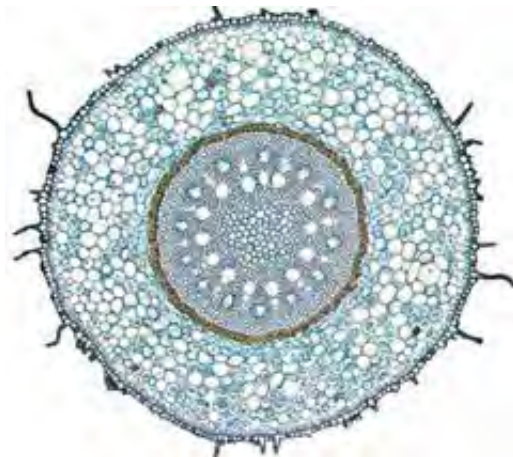


Using the dark line as diameter of field of view, determine the actual diameter of one cell (4mks)

16. Identify the functions of a light microscope as shown by the following diagrams (2mks)



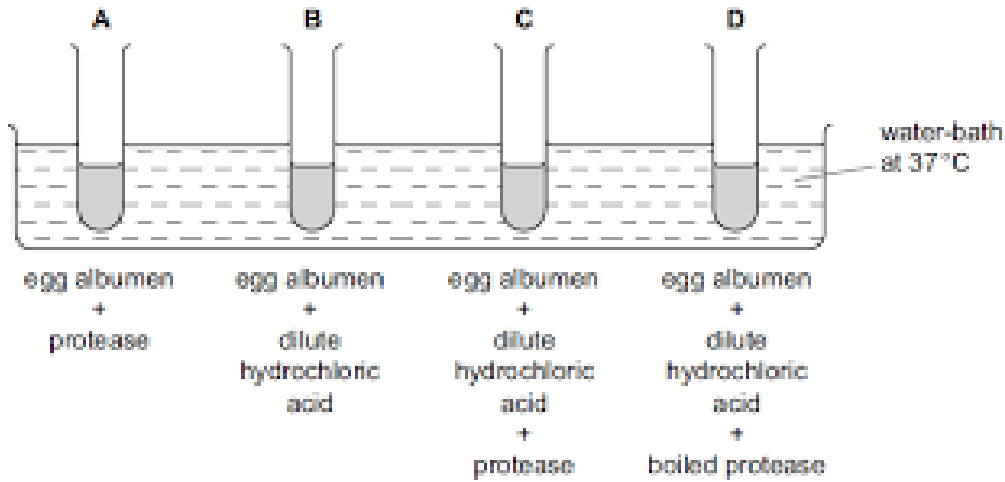
17. The following is a cross-section of part of a plant



Samwel observed that this diagram represents a monocot root. Give a reason why

- i) It is a root (1mk)
- ii) It is from a monocot plant (1mk)

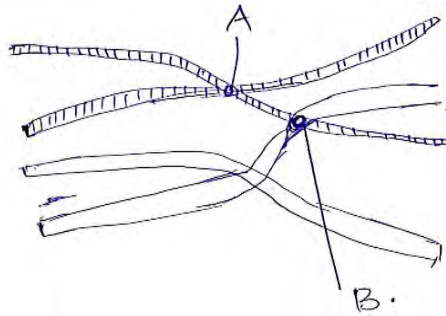
18. An experiment was carried out as shown below to study enzymatic reactions. After 30 minutes, Biuret's test was carried out on contents of each test tube to get results. Fill in the table below to offer explanation for the results obtained (4mks)



Test Tube	Result	Explanation
C	Blue	
D	Purple	

19. State two characteristics that make alveolus and buccal cavity suitable for gaseous exchange. (2 Marks)
20. State the changes that take place during inhalation in mammals in the following structures.
- Rib Cage (1mk)
 - Diaphragm. (1mk)
21. Explain two ways in which the trachea is adapted to perform its functions. (2marks)
22. State two control measures of bilharzia. (2 Marks)
23. a. What is eutrophication? (2 marks)
 b. What are the effects of eutrophication? (2 marks)
24. In an experiment to determine the population size of mosquitoes in Kisumu Museum, Kenya Research Institute researchers caught 600 mosquitoes which they marked and released. After 24hrs 300 mosquitoes were caught out of which 100 already had the marks.
- Suggest a possible instrument of capturing the mosquitoes (1mk)
 - Estimate the population size of mosquitoes in Kisumu Museum. (2mks)
25. Give two classes of the phylum Chordata whose members are all poikilothermic. (2mks)
26. State the role of the following in a nitrogen cycle:
- Nitrogen fixing bacteria. (1mk)
 - Nitrifying bacteria. (1mk)

27. The diagram below shows a phenomenon which occurs during cell division.



- a. Name the parts labeled A and B. (2marks)
 - b. State the biological importance of the part labeled B. (1mark)
 - c. Identify the type of cell division in which this phenomenon occurs. (1mark)
 - d. Name the organs in human being in which the phenomenon occurs. (2marks)
28. a) Give two sex linked traits found on the Y-chromosome. (2mks)
- b) Below is a nucleotide strand

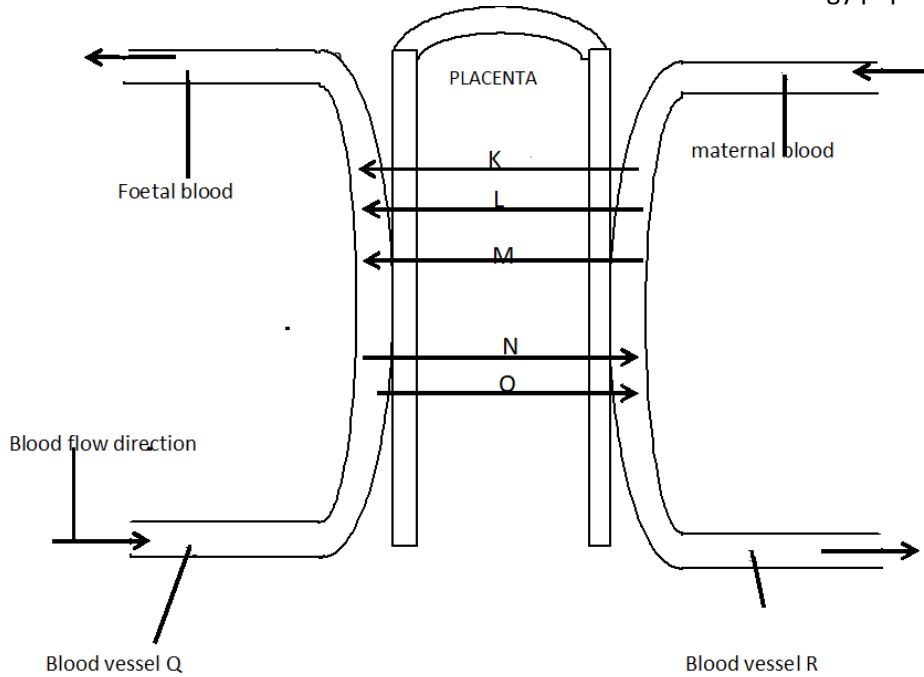
A	A	G	T	C
---	---	---	---	---

- i) Identify the type of nucleic acid. (1mk)
 - ii) Give a reason for your answer in (a) above. (1mk)
29. a) Distinguish between homologous and analogous structures. (2mks)
- b) Give one reason why organisms become resistant to drugs. (1mk)

MURANG'A SOUTH
231/2
BIOLOGY PAPER 2

Instructions: Answer all question in the spaces provided.

- a) Study the diagram of human placenta below carefully and then answer the question that follow

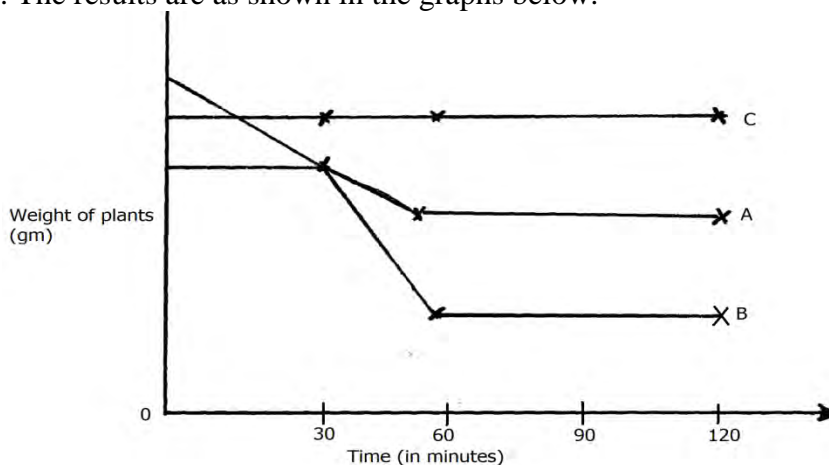


Name any one substance exchange from placenta by the following process (3mks)

- Diffusion -
- Active transport
- Osmosis -

- Name two conditions that may favor influence the diffusion process in the exchange of substances (2mks)
- Which substance would be represent by letter; Name one (1mk)
- What two main methods is the immunization administered in children/ newborn (2mks)

- b) An experiment was carried out to determine the rate of transpiration in three plants A, B and C. Plants A and B belonged to different species while plants B and C belonged to the same species. Plant C had all its leaves removed. The three plants were of similar size and were exposed to the same environmental conditions. The results are as shown in the graphs below.



- Suggest possible environmental conditions under which the experiment was carried out between 30 and 60 minutes (2mks)
- Account for the results obtained for plant C (2mks)
- Suggest the habitat for plant A and B. Give reasons for your answer. (4mks)

Habitat for plant A
Reason
Habitat for plant B
Reasons

- c) The relative rates of photosynthesis in a certain plant were determined at different temperature. The results are shown below.

Temperature o C	Relative rate of photosynthesis mg/hr
25	26
30	37
35	45
40	25

- a) Account for the rate of photosynthesis at;
- 35 ° C (2 mks)
 - 40 ° C (2mks)
- b) Explain what happens during dark reaction in photosynthesis. (2 mks)
- c) In an experiment to show that Oxygen gas is a by-product of photosynthesis a water plant is used. Give two reasons why a terrestrial plant is not used. (2mks)
- d) The figure below shows a diagram of part of the male reproductive system.
- State the letter on Fig. 5.1 that identifies: (3 mks)
 - Where sperm are made.
 - The part that carries urine and sperm out of the body.
 - Where the fluid that is added to the sperm is made.
 - Sperm must pass through different structures in the female reproductive system to reach an egg cell. State the names of three of these structures. (3marks)
 - State two ways that sperm are adapted for their function. (2mks)
- e) (a) Distinguish between the terms homodont and heterodont. (1mk)
- What is the function of carnassial teeth? (1mk)
 - A certain animal has no incisors, no canines, 6 premolars and 6 molars in its upper jaw, in the lower jaw there are 6 incisors, 2 canines, 6 premolars and 6 molars. Write its dental formula (1mk)
 - Suggest the likely type of food eaten by the organism (1mk)
 - The action of ptyalin stops at the stomach. Explain. (1mk)
 - State a factor that denatures enzymes. (1mk)
 - Name two features that increase the surface area of small intestines. (2mks)

SECTION B

In this section attempt question 6 (compulsory) and either questions 7 or 8

- i) An experiment was done to investigate population growth of flour beetles (*tribolium confusum*). 16g and 64g of maize flour was placed in two equal boxes K and L respectively. Equal number of beetles was

added in the boxes. Both boxes were kept under the same environmental condition. Beetles were counted at certain intervals and results tabulated as shown below.

Number of days after introduction of beetles.	Approximate number of beetles present in K and L	
	K	L
0	20	20
5	20	20
40	200	300
60	550	800
80	560	1300
100	650	1750
120	640	1600
135	650	1900
150	645	1500

1. Using the results in the table above draw two graphs on the same axes. Plot approximate number of beetles present on y-axis. (7mks)
 2. What were the approximate number of individuals present in the two boxes on the 90th day? (2 mks)
 - (i) Number in K
 - (ii) Number in L
 3. On what day was population difference. (2 mks)
 - a) Greatest
 - b) Lowest
 4. Account for the shape of the two graphs between 1st and 100th day. (2 mks)
 5. Explain the shapes of the graph K between 80th and 150th day. (2 mks)
 6. Differentiate between intraspecific and interspecific competition. (2 mks)
 7. Name three methods of population estimation. (3mks)
- ii) a) Explain the role of human skin in protection of the body. (10mks)
- b) Explain the importance of protecting the forest ecosystem with reference to the following. (10mks)
- i) Pollution. (4mks)
 - ii) Water conservation. (4mks)
 - iii) Climate change. (2mks)
8. How are xerophytes adapted to their habitats? (20mks)

MURANG'A SOUTH
231/3
BIOLOGY PAPER 3

Instructions: Answer all question in the spaces provided.

- f) a) (i) You are provided with a pestle, mortar, scalpel, specimen Q and R. Cut from each a cube, each measuring 1cm by 1cm. Put them each in a different test tube having 10mls of solution X. Record the observations in the table below? (2 Mks)

Specimen	Observation
----------	-------------

Specimen Q	
Specimen R	

(ii) Account for the observations in the experiment involving specimen Q and R?(2 mks)

- ii) i) Using the remaining portion of specimen Q, Cut 2 other pieces measuring 1cm by 1cm, Crush them separately to form a paste and put them in boiling tubes labelled A and B. To the paste in boiling tube labelled A, add 5mls of solution X. Record the observation in the table below. (1mk)

BOILING TUBE	OBSERVATION
A	

To the paste in boiling tube labeled B add 10mls of distilled water and boil for 5 minutes then allow it cool then add 5mls of solution X. Record the observation in the table below. (1 mk)

BOILING TUBE	OBSERVATION
B	

- ii) Account for the observations made in b (i) above involving boiling tube A and B (4 marks)

Boiling tube A

Boiling tube B

- iii) Name the biological substance being investigated and its significance to the living tissues (2mks)

Biological substance

Significance

- iv) Name the factor being investigated in question 2(b) above (1mk)

g)

- a) Identify specimens labeled M and G provided. (1mk)

- b) From specimen labeled G name any two organs (2mks)

c)

- i) From specimen M – remove one leaf.
List any two observable features (2mks)

- ii) Use the leaf in part C (i) above; place that leaf on graph paper provided and trace it carefully on the graph paper.

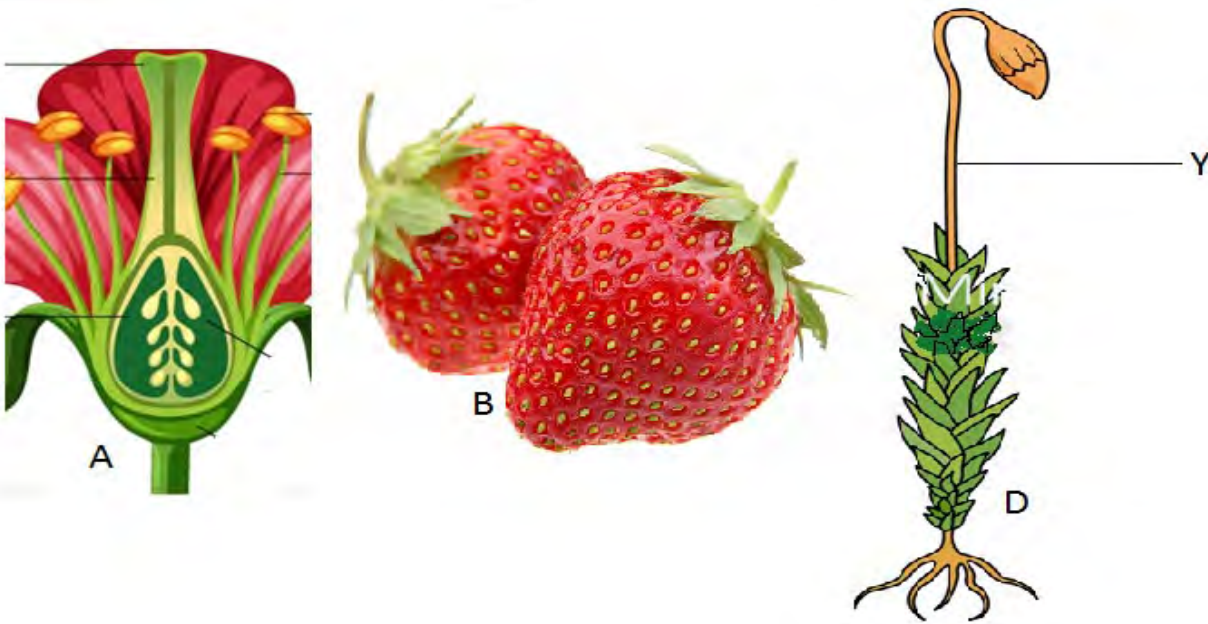
From the traced outline,

- Count the number of complete full square= (1mk)
- Count the number of incomplete squares = (1mk)
- Calculate the area of each square in cm^2 =..... (1mk)
- Calculate the area of the leaf outline..... (2mks)
- From the information obtained in part (d) above compare it with a leaf in specimen G. What advantage does a leaf from specimen G has over leaf from specimen M? (1mk)

6. Giving a reason, in which class does a plant from which specimen G was obtained. (2mks)

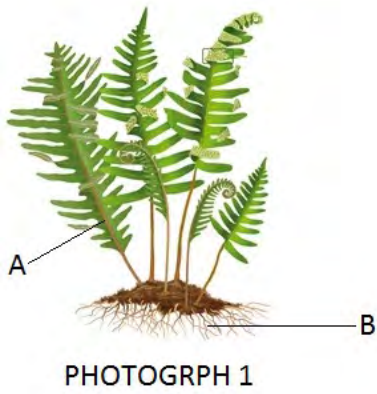
Class	Reason

h) A) Study the photographs below of specimen. A, B, and D and then answer the questions that follows.



- a) Name the condition exhibited in A which hinders self- fertilization. (1mk)
- b) Explain how the above condition hinders self-fertilization. (1mk)
- c) i) State the division where plant in photograph D belong and give reason for your answer. (1mk)
 Division (1mk)
 Reason (1mk)
- ii) State the type of nutrition exhibited by specimen D. (1mk)
- iii) Give a reason for your answer in d (ii) above. (1mk)
- iv) Give the function of the structure labelled Y. (1mk)

3 (B) Photograph 1 below represent a plant that grow in relatively wet habitats. Photograph 2 is a magnified portion of the underside of the leaf of photograph 1.



- a) State the common name of the plant and state the plant division it belongs. (2mks)
Common name:
Division:
- b) Name the structure labelled T and state its function. (2mks)
- c) Name the structure labeled A and B. (2mks)
- d) State one major difference between structure labelled B and the rhizoids of a moss plant. (1mk)

MURANG'A SOUTH

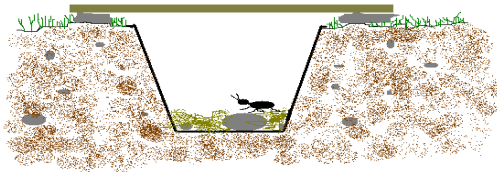
BIOLOGY F4 P3

All candidates to be supplied with:

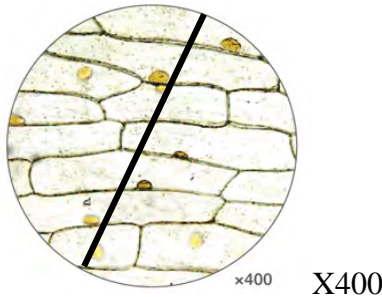
1. Pestle and mortar
2. Specimen Q: LIVER. (1cm by 1cm per student)
3. Specimen R: Banana/ raw: 3 students can share 1
4. Measuring cylinder
5. Ruler
6. 20ml Hydrogen peroxide (Solution X)
7. Source of heat
8. 2 Boiling tubes
9. 4 test tubes
10. Distilled water
11. Labels
12. Stop watch.
13. A mango twig with about three leaves labeled m. – (leaves should be less than 15cm long)
14. Any grass twig with about three leaves labeled G.
15. A magnifying/ hand lens.

WEITHAGA
231/1
BIOLOGY PAPER 1
JULY / AUGUST 2023

1. (a) State the branch of Biology that would be used in solving the problem of disputed parentage. (1mk)
- (b) Study the diagram below and answer questions that follow



- (i) What is the name given to the apparatus shown above (1mk)
- (ii) What is its use in Biological studies? (1mks)
2. The diagram below shows onion cells in a field of view of a light microscope



Using the dark line as diameter of field of view, determine the actual diameter of one cell (3mks)

3. Identify the functions of a light microscope as shown by the following diagrams (2mks)

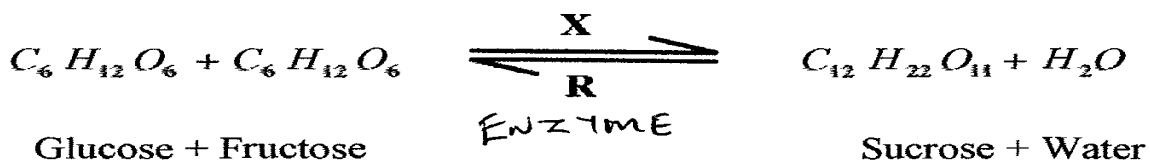


Function:



Function

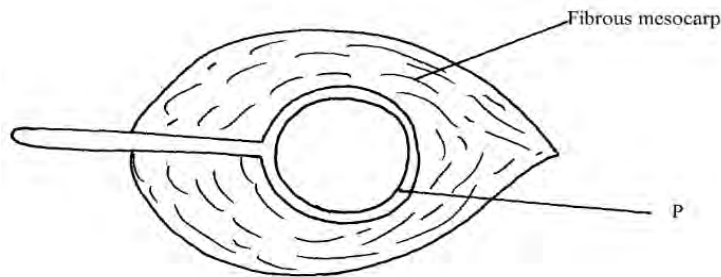
4. Name the main product of the dark stage of photosynthesis. (1 mark)
5. State the function of muscles found in the alimentary canal of mammals. (1mks)
6. (a) What is the function of Sodium hydrogen Carbonate that is added to test solution of non reducing sugars. (1 mark)
- (b) The equation below represents a process X which is controlled by enzymes.



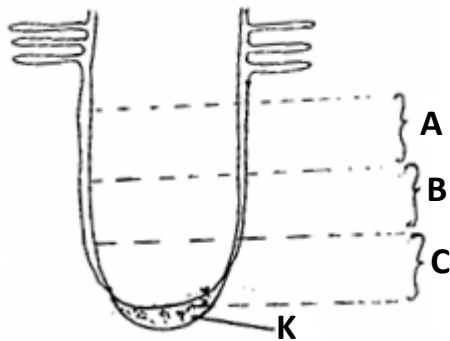
- (i) Name the process X and enzyme R. (2 marks)
- Process X

Enzyme R

7. Give two forms in which carbon (IV) oxide is transported in human blood. (2 marks)
8. It was found that during germination of pea seeds 9.3cm³ of carbon (IV) oxide was produced while 9.1cm³ of oxygen was used up.
 - (a) Calculate the respiratory quotient (RQ) of the reaction taking place. (2 marks)
 - (b) Identify the type of food substance being metabolized. (1 mark)
9. A new respiratory virus COVID 19 was discovered in December 2019 in china.
 - (a) Name the main organ affected by the virus (1mark)
 - (b) State any **two** symptoms that suggest one may have the virus (2 marks)
 - (c) State preventive measures being employed to curb spread of COVID 19. (1 marks)
10. Nitrogen in the atmosphere cannot be directly utilized by plants. State **three natural** ways it is made available for plant use. (3 marks)
11. The diagram below represents a longitudinal section of a fruit



- (a) Name structures labelled P (1 mark)
- (b) Describe two adaptations of the fruit for its mode of dispersal.
 - (i) Mode of dispersal (1mark)
 - (ii) Adaptations (2marks).
12. The diagram below shows regions of growth in a root. Study it and answer the questions that follow.

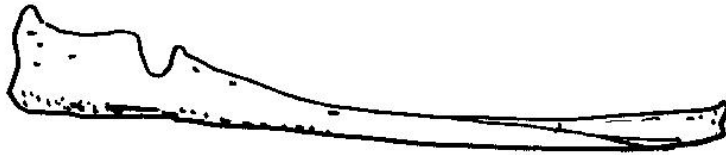


- (a) State the function of part **K** (1 mark)
- (b). State **two** characteristics of the cells found in zone **C** (2 marks)
13. The dark variety of peppered moth is predominantly found in industrial cities while the spackled white variety is predominantly found in rural areas of Europe.
 - (i) Name the phenomenon illustrated above (1 mark)
 - (ii) What is the significance of the phenomenon above to the organism. (1 mark)
14. The table below shows the effect of wind, still air and stomatal opening on the rate of transpiration of a plant in milligrams of water lost per hour dm². Study the table and answer the following questions

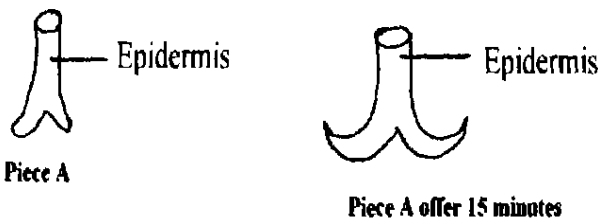
Stomatal opening (µm)	1	2	3	4	5	6	7
Windy	40	63	74	86	94	110	124
Still air	0	6	12	19	23	27	30

- (a) (i) Compare the rates of transpiration in windy and still air conditions (1mk)

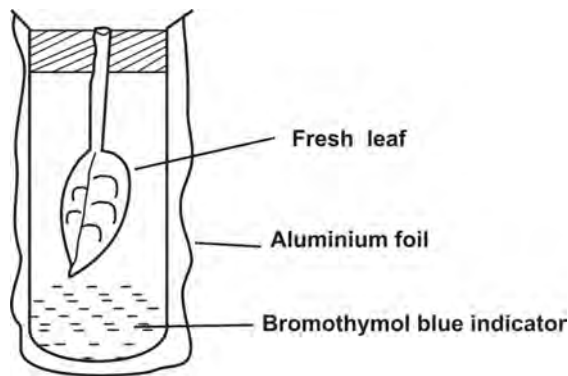
- (ii) Explain your observation in a(i) above (2mks)
 (b) How does stomatal opening affect transpiration rate? [1 mark]
15. Explain why division Pteridophyta is considered more advanced than division Bryophyta. (3mks)
16. Explain why tropical forests do not have undergrowth (2marks).
17. A bone obtained from a mammal is represented by the diagram below.



- a) Name the bone. (1mk)
 b) Which bones articulates with the bone shown in the diagram at the notch? (2mks)
18. a). Two pieces of leaf petiole were cut as shown in the diagram below then each piece placed in solution of different concentration.

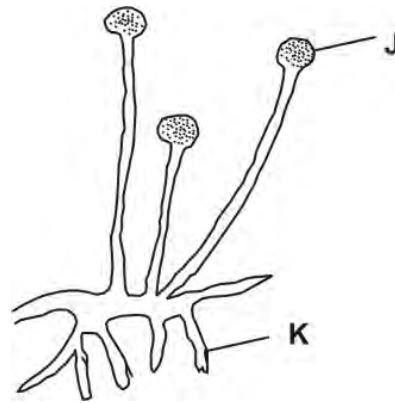


- i). What physiological process was being investigated in this experiment? (1mark).
 ii). Suggest the type of solution piece B was placed. (1mark).
 iii). Explain the appearance of piece A after 15minutes. (2marks).
- b) Explain the effect of water logging on the rate of mineral absorption. (2marks).
19. Study the diagram below and answer the questions that follow;



- a) State the expected result at the end of the experiment (1mk)
 b). Account for your answer in (a) above (2mks)
20. Give two reasons why transportation of carbon(IV)oxide in a red blood cell is advantageous. (2mks)
21. State the change that occurs in arterioles in the human skin during thermoregulation (2mks)
- 22 a) Name the fluid that is produced by sebaceous gland (1mk)
 b). State two roles of this fluid (2mks)

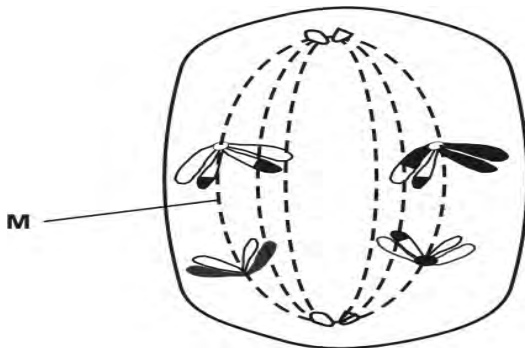
23. The diagram below illustrates the structure of bread moulds ;



- a) Name the part labeled J (1mk)
- b). State the functions of the structure labeled K (2mks)

24. What is meant by the term biological control? (1mk)

25. The diagram below represents a stage during cell division

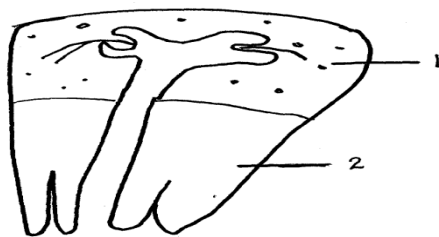


- a) (i) Identify the stage of the cell division (1mark)
- ii. Give three reasons for your answer in (a)(i) above (3marks)
- b). Name the structures labeled M (1marks)

26. Distinguish between divergent and convergent evolution (2mks)

27. State three survival values of tactic response. (3marks).

28. The diagram shows a section through part of the mammalian kidney.



- a) Name the parts labeled 1 and 2. (2mks)
- b) State two ways in which nephrons of desert animals differ from those of man. (2mks)

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BIOLOGY PAPER 2 (Theory)

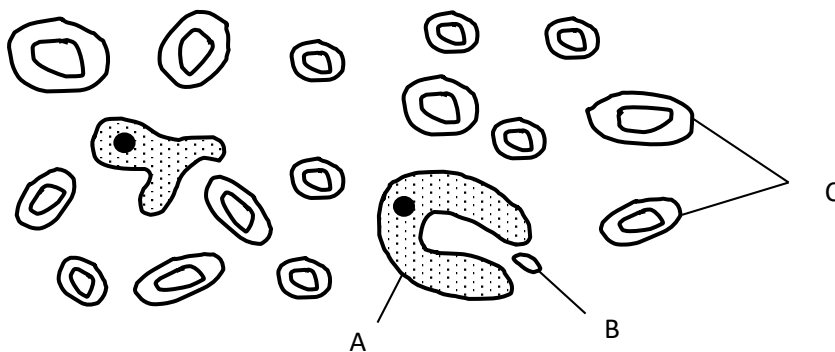
July / August 2023

SECTION A (40 marks)

1. (a) Define sex linkage. (1mk)
- (b) In a marriage of Jane and Otieno who are both normal for hemophiliac condition, gave birth to four children Susan, Grace, Tom and Peter. Tom the second born child was hemophilic. Later in life Tom married Alice who was normal. Their first born child was hemophiliac.
Let H represent gene for normal condition.
- (i) What was the genotype of Alice. (1mk)
- (ii) Work out the phenotypic ratio of F₂. (4mks)
- (c) How does the police force use knowledge on genetics. (1mk)
- (d) What is the name given to points of contact in a pair of homologous chromosomes (1mk)
2. The table below shows the approximate distribution of blood groups in a sample of 100 people in a population.

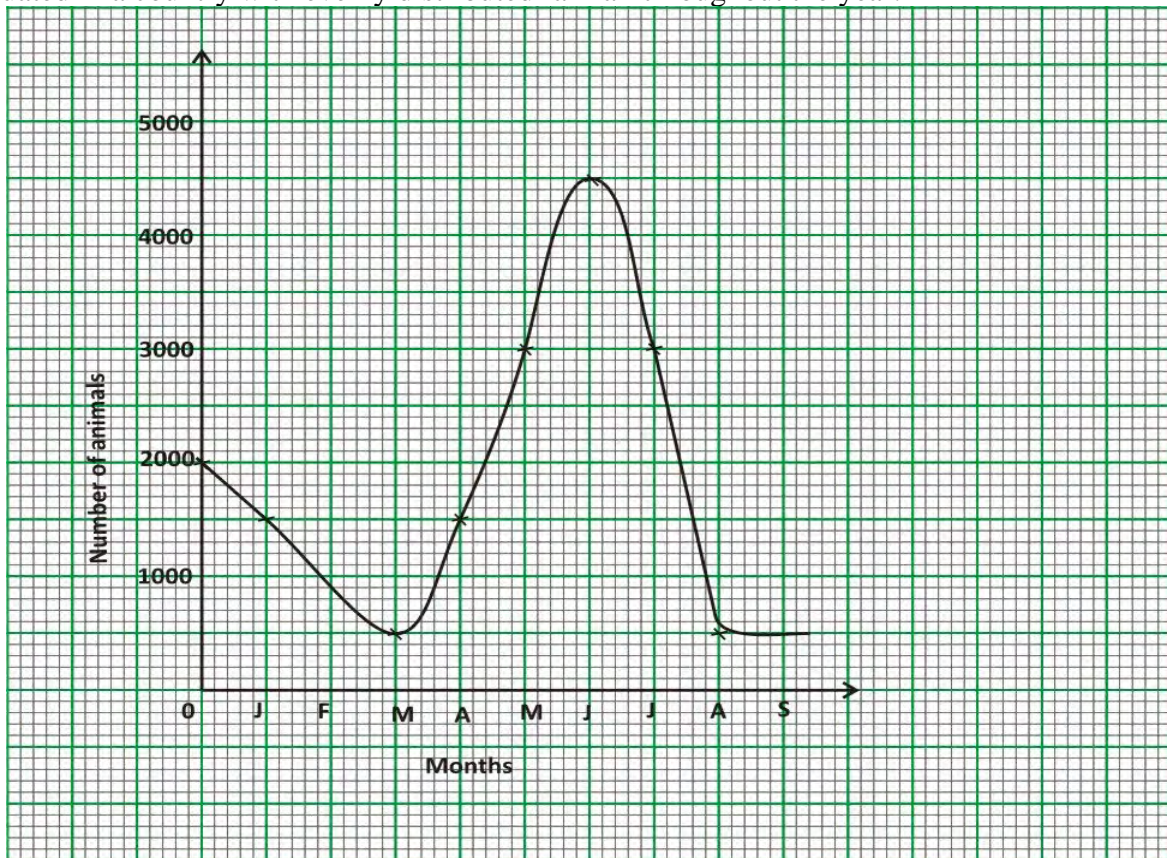
Blood group	Frequency	Rhesus +ve	Rhesus -ve
A	26	22	4
B	20	18	2
AB	4	3	1
O	50	43	8

- (a) Calculate the percentage of Rhesus negative (Rh-ve) individuals in the population? (1 mk)
- (b) Account for
- (i) The large number of blood group O individuals in a population. (2 mks)
- (ii) The small number of individuals with blood group AB. (2 mks)
- (c) The diagram below represents a blood smear on a glass slide.

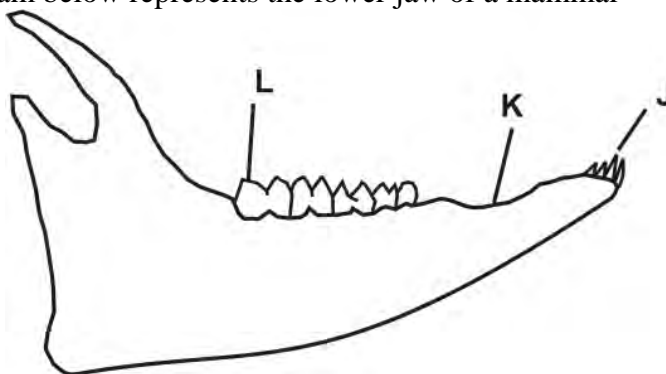


- (i) State the importance of structure C being large numbers in the blood smear. (1mk)
- (ii) Give a reason why structure C would be found in large numbers in high altitude than in low altitude. (1mk)
- (iii) Name the process by which structure A would engulf structure B. (1mk)

3. The graph below represents the population of animals in a pond over a period of 9 months. The pond is situated in a country with evenly distributed rainfall throughout the year.

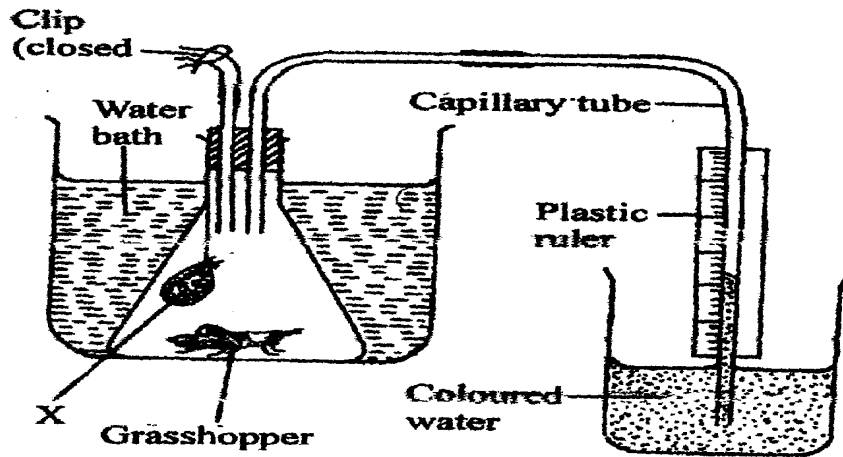


- a) What times of the year affect the number of the animals adversely (2mks)
 b) What is the average number of animals in the pond between April and may (2mks)
 c) Give three possible reasons for the drop in the number of animals in the pond (3mks)
 d) Give a reason to explain the events in the pond between March and April (1mks)
4. a) Distinguish between the terms homodont and heterodont (1mk)
 b) What is the function of carnassial teeth? (1mk)
 c) The diagram below represents the lower jaw of a mammal



- (i) Name the mode of nutrition of the mammal whose jaw is shown above (1mk)
 (ii) State one structural and one functional differences between the teeth labeled **J** and **L** (2mks)
 (iii) (a) Name the toothless gap labeled K (1mk)
 (b) State the function of the gap (1mk)
 (c) Name the substance that is responsible for hardening of teeth (1mk)

5. The diagram below illustrates an experiment to determine the rate of respiration in a small insect.



- (a) Name the chemical compound labeled X and state its function. (2 marks)
 Name
 Function
- (b) Why is it necessary to place the flask in a water bath? (1 mark)
- (c) What changes would you expect to observe in the level of coloured water in the capillary tube after the experiment has run for five minutes? (1 mark)
- (d) Explain the results stated in part (c) above. (3 marks)
- (e) Suggest a control experiment that would be set up for the above experiment. (1 mark)

SECTION B (40 marks)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8

6. A research was carried out to determine the trend of growth for some boys and girls. Their average mass in kilograms was taken separately for a period of 20 years and tabulated as shown in the table below.

Age	Average Mass of boys (kg)	Average mass of girls (kg)
0	2.5	2.5
2	11.1	11.5
4	15.0	16.0
6	18.5	19.3
8	22.1	27.1
10	25.1	27.1
12	27.5	30.5
14	37.0	35.5
16	44.0	44.0
18	46.9	52.5
20	48.5	55.0

- (a) On the same axis draw a graph of average mass of girls and of boys against the age. (7 marks)
- (b) From the graph, determine the;
 - (i) Mass for boys at age of 11 years. (1mark)

- (ii) Growth rate in girls between ages 13 and 15 (3 marks)
- (c) Account for the change in the mass of girls during the age stated in (ii) above. (2 marks)
- (d) Explain the trend observed in the curves for both boys and girls. (2 marks)
- (e) Why do girls above 10 years require intake of food that is richer in iron than boys of the same age. (1 mark)
- (f) Mention two other factors apart from the diet that affect the rate of growth in boys and girls. (2 marks)
- (g) Apart from using average mass to estimate growth in human beings, name two other parameters that can be used. (2 marks)
7. (a) Describe the adaptation of floating water lily leaf to its photosynthetic function. (10mks)
- (b) Describe the activities that take place in the chloroplast of growing plants. (10mks)
8. (a) Explain how the various components of blood cells are adapted to perform their functions. (12mks)
- (b) Discuss the process of double fertilization in flowering plants. (8mks)

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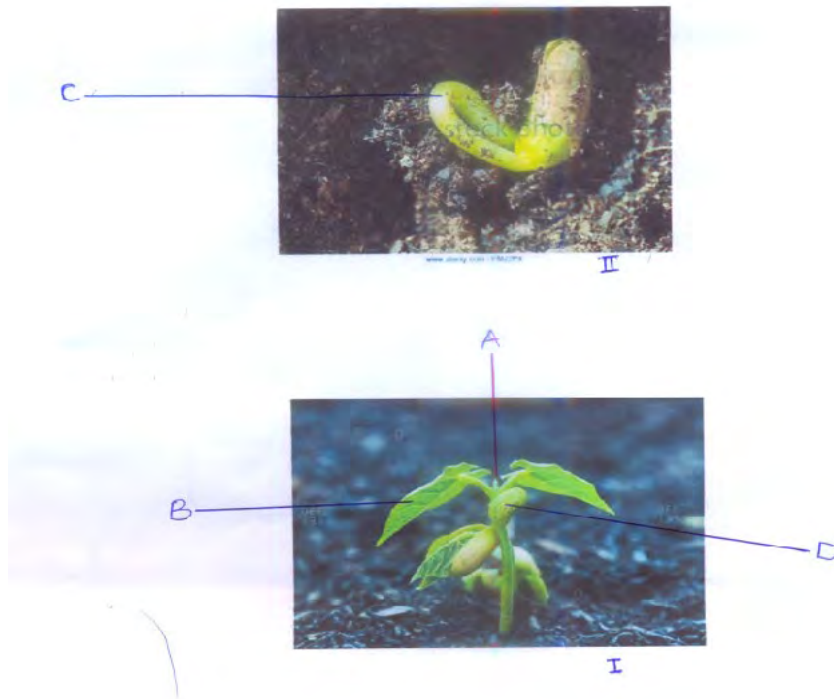
BIOLOGY PAPER 3**(PRACTICAL)**

1. You are provided with five potato cylinders each measuring 5cm long, liquid S₁ and S₂, Hydrogen Peroxide, dilute Hydrochloric Acid, and test tubes labeled A,B and C.
- a) i) Place one cylinder in a beaker containing liquid labeled S₁ and another in the liquid labeled S₂. Allow to stand for 30 minutes, then remove the cylinders, wipe them dry using blotting paper. Measure each cylinder in centimeters and record their length and texture in the table given below. (4 marks)

CYLINDER	LENGTH IN CM	TEXTURE
LIQUID S ₁		
LIQUID S ₂		

- ii) Account for the results obtained in a (i) above (2marks)
- iii). Using a scalpel cut one of the cylinders into 5 parts each one centimeter long. Put the pieces into test tube A. Crush the other two using mortar and pestle into a paste. Divide the paste into two equal lots. Put one lot into test tube B and the other into test tube C. To each of the test tubes A and B add 2cm³ of hydrogen peroxide and to test tube C add 1 cm³ of dilute Hydrochloric Acid, then 2cm³ of hydrogen peroxide. Record your observation below. (3marks)
- Test tube A
Test tube B
Test tube C
- (iv) Write a word equation for the reaction that occurs in the test tubes (1mark)
- (v) Account for the rate of reaction in test tube A, B and C. (4 marks)

2. You are provided with plant specimens labeled A, B, C, D, E and F
- a) Using features in order given below, construct a dichotomous key that can be used to identify the specimens provided (10marks)
- Simple or compound leaves
 - Leaf venation
 - Leaf margin
 - Arrangement of leaves on the stem
 - Pinnate/bipinnate or trifoliate nature of leaves
- (b) Give two observable differences between stem of specimen labeled E and D (2mks)
3. Examine the photographs I and II of seedling specimen shown below and answer the questions that follows;



- a) i) Name the parts labelled C and D. (2mks)
- ii) Name two hormones that brings about cell division in parts labelled A (2mks)
- b) (i) Name the class to which the specimen belongs. (1mk)
- (ii) Give two reasons, using observable features to support your answer in (b) (i) above (2mks)
- c) Give two functions of the structure labeled D. (2mks)
- d) Explain how the curvature labeled C is formed (3mks)
- e). Name the type of germination exhibited by the seedlings. Give a reason for your answer. (2mks)

Type

Reason

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BIOLOGY PAPER 3 (PRACTICAL)

CONFIDENTIAL REQUIREMENTS

Each candidate will require the following.

- 5 – Potato cylinders measuring 5cm long and a half (½ cm /0.5 cm) wide.
- Concentrated salt solution in a beaker labeled S₂
- Distilled water in a beaker labeled S₁
- 10 ml of hydrogen peroxide in a beaker
- Dilute hydrochloric acid in a beaker
- 3 – test tubes labeled A,B and C.
- A pair of forceps.
- A ruler graduated in centimeters (cm)
- A test tube rack
- Filter paper. (2)
- blackjack twig with at least two leaves labeled specimen **A**
- Accacia /wattle tree twig with at least two leaves labeled specimen **B**
- Tradescantia Leaf labeled specimen **C**
- Lantana /Tick berry twig with at least two leaves labeled specimen **D**
- Bougainvillea twig with at least two leaves labeled specimen **E**
- Jacaranda twig with at least two leaves labeled specimen **F**

CEKENAS END OF TERM TWO EXAM – 2023**231/1****BIOLOGY****PAPER 1 (THEORY)**

1. State the name given to the study of: (2marks)
 - (i) Chemical changes in living organisms.
 - (ii) Insects.
2. State the category of variation into which the following traits fall. (2marks)
 - a) (i) Skin pigmentation.
 - (ii) Blood group .
 - b) Give two possible genotypes of blood group A. (2marks)
3. Give two differences between scientific names and common names. (2marks)

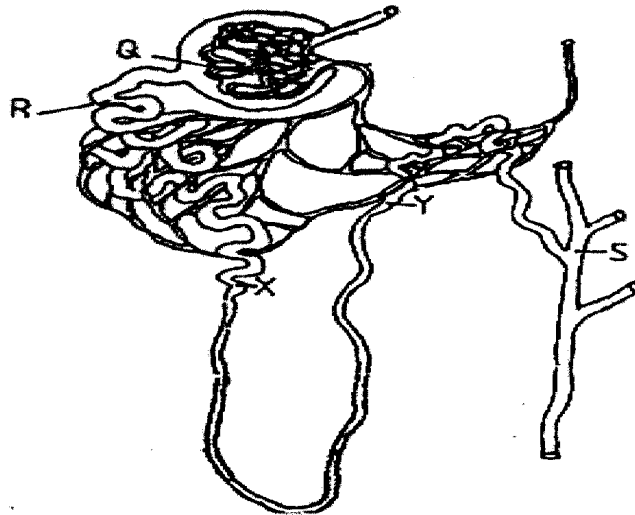
Scientific Names	Common Names

4. Explain two adaptation that enable the halophytes to survive in their habitats. (2marks)
5. (i) What is parthenogenesis. (1mark)
- (ii) Monocotyledonous plants do not undergo secondary growth. Explain, (1mark)
6. Name two classes of Phylum Arthropoda whose members' head is fused with the thorax. (2marks)
7. Name two excretory products produced by both plants and animals. (2marks)
8. The shirt of a student was stained by a solution of DCPIP. A friend advised him to wash with lemon juice. Explain. (1mark)
9. Two freshly cut banana peels A and B measuring 4cm long were cut, which were later placed in solutions of different concentrations in two separate beakers for 30minutes. The appearance after 30minutes is as shown below.

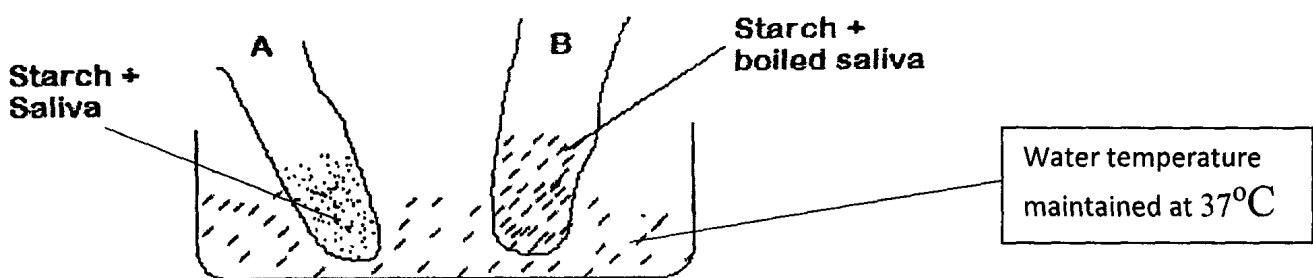


- (a) What is the nature of the solution in which piece B was placed. (1mark)
- (b) Account for the appearance of piece A. (3marks)
10. I The ovum is fertilized only by one sperm yet there is millions of sperm surrounding the ovum. Explain. (1mark)
- II Give the role of the following parts of the male reproductive system.
 - (a) Epididymis (1mark)
 - (b) Prostate gland (1mark)
11. When a person has oxygen debt the heart beat increases. Give two importance of the increase in heart beat. (2marks)

12. The diagram below shows part of a nephron from the human kidney.



- a) Give two factors that lead to creation of higher pressure in the structure labelled Q. (2marks)
- b) **On the diagram above label the part** where the sodium ions are reabsorbed and write down the hormone involve in regulating the level of this ions (2marks)
Name of the hormone;
13. Explain how the following parts of a light microscope are modified to perform their function
(i) Diaphragm (1mark)
(ii) Mirror. (1mark)
14. a) Explain two adaptations of cell membrane to its function. (2marks)
b) Why is oxyhaemoglobin formation is highly preferred during transportation of oxygen in the body. (2marks)
15. I Explain how smoking of tobacco lead to lung cancer. (1mark)
II. How does age affect the breathing rate in human? (2marks)
16. In an experiment to investigate an aspect of digestion, two test tubes A and B were set as shown below. The set up was left for 30 minutes and the temperature of water was maintained at 37°C.



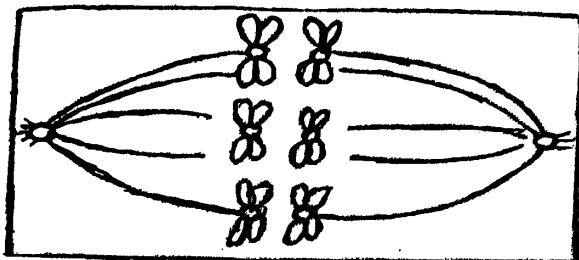
The resulting content in each test tube A and B were placed into two separate visking tubing which were then placed in a beaker containing iodine solution, for 20 minutes.

- (a) What was the observation that was made in the visking tubing containing contents of test tube A. (1mark)
- (b) Account for the result in visking tubing which was containing contents of test tube B. (3marks)

17. During a biological excursion a group of form 4 students collected plant specimen whose reproductive organ is shown below.

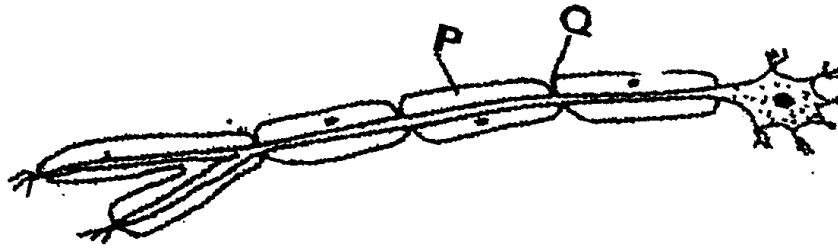


- (i) Name the sub-division of the plant in which the above specimen was obtained. (1 mark)
 - (ii) Other than the presence of the above characteristics, state two characteristics of plants in the sub-division named above. (2marks)
18. Enzymes are important in various physiological processes in living things.
- (a) Differentiate between an enzyme and a hormone (1 mark)
 - (b) Name one property of an enzyme exhibited by the lock and key hypothesis (1 mark)
19. I The transverse section of a young dicotyledonous root was cut and iodine solution was applied. One of the part of the section turned to blue-black colour. Identify the part of the root and give a reason for your answer.
- Part (1 mark)
- Reason (1 mark)
- II. Distinguish between transpiration and guttation. (1 mark)
20. The diagram below shows a cell undergoing a stage in cell division.



- With a reason, identify this stage (2mark)
- Identify
- Reason .
21. a) Define the term immunity. (1 mark)
- b) Identify one immunizable disease in Kenya (1 mark)
- c) State two ways in which lymphocytes kill disease causing microorganism. (2marks)

22. Study the diagram below and answer the questions that follow.



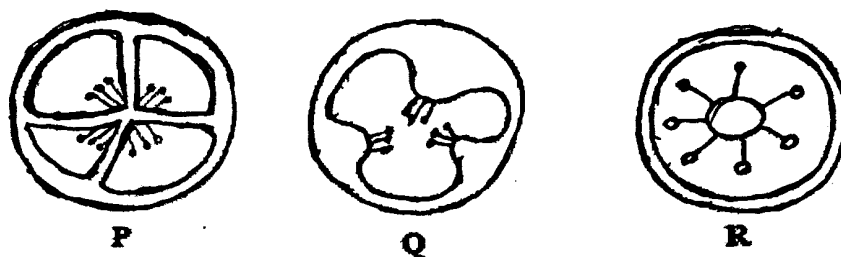
- (i) With an arrow, **indicate on the diagram** the direction of the impulse through the neuron. (1mark)
- (ii) State the function of the parts labelled P (1mark)
- 23. Name the type of response exhibited by;
 - (i) Sperm cell when it swims towards the ovum. (1mark)
 - (ii) Leaves of Mimosa pudica when they fold their leaves after being touched. (1mark)
- 24. a) Distinguish between hypogeal and epigeal germination. (1mark)
- b) State two internal factors necessary for germination (2marks)
- 25. a) Give two importance of divergent evolution to animals (2marks)
- b) Explain two limitations of fossil record as an evidence for evolution (2marks)
- 26. What causes the following diseases?
 - a) Diabetes mellitus (1mark)
 - b) Diabetes insipidus (1mark)

27. Study the diagram below and answer the questions that follows.



- a) Identify the tooth. (1mark)
- b) Give a reason for your answer in 27(a) above (1mark)
- c) State two mineral ions deposited on the bones to harden them. (2marks)
- 28. I. The following is food chain that was presented by a student in class.
 Grasshopper → Lizard ← Chicken → Hawk
 State two errors that are made in the food chain (2marks)
- II. Give a reason why pyramid of biomass is considered to be more accurate over the pyramid of numbers. (1mark)

29. Below are cross section of diagrams of fruits.



Identify the type of placentation present in the three diagrams (3marks)

CEKENAS END OF TERM TWO EXAM – 2023

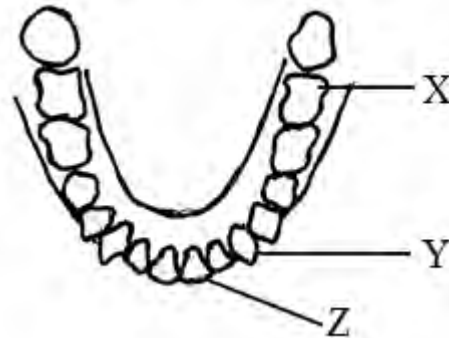
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BIOLOGY PAPER 2 (THEORY)

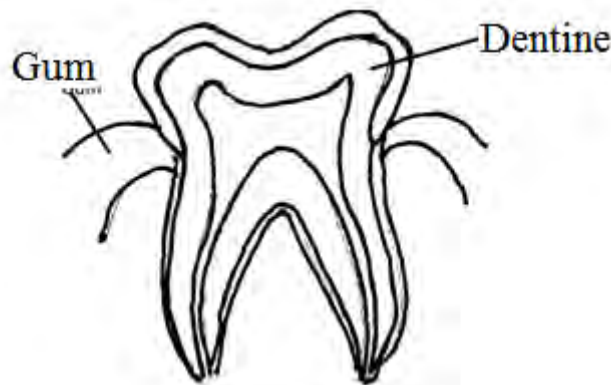
JULY/AUGUST 2023

SECTION A: 40 MARKS

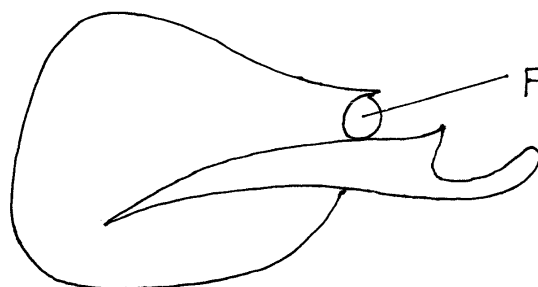
1. The figure below shows the teeth in the lower jaw of an adult human



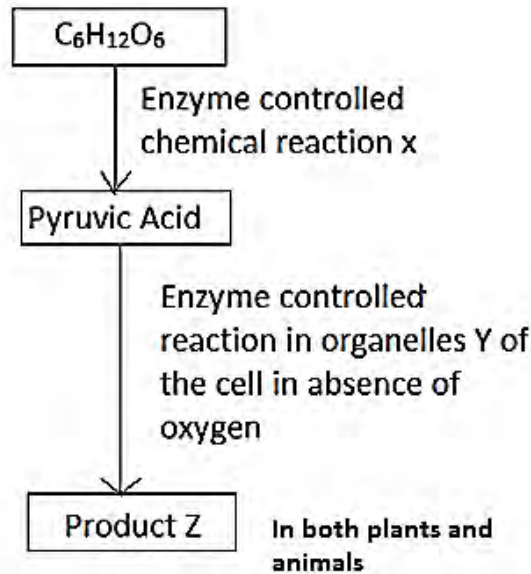
- a) i) Name the teeth labelled X and Z (2marks)
- ii) Describe the functions of teeth Y and Z (2marks)
- b) Name **one** mineral and one vitamin that are essential for the healthy development of teeth (1mark)
- c) The figure below shows a section through a tooth.



- (i) Tooth decay is caused by bacteria getting into the dentine. Explain how bacteria can enter the dentine (2marks)
 - (ii) List **one** action you could take to reduce the risk of tooth decay (1mark)
- 2.
- a) What are the analogous structure as used in evolution (1mark)
 - b) How do disease causing micro-organisms become resistant to drugs (3mark)
 - c) The diagram below represents a bone of a mammal

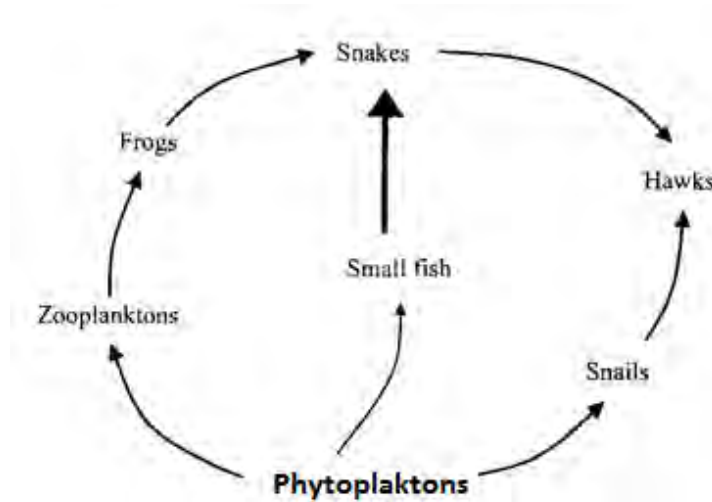


- (i) Identify the bone (1mark)
 - (ii) Name the bone that articulate at the point labelled F (1mark)
 - (iii) Explain two adaptations of the bone identified in (i) above (2marks)
3. Study the flow chart below of a process that takes place in both plants and animals



- a) Name the above process (1mark)
 - b) (i) In the above process name the chemical reaction represented by X (1mark)
 - (ii) Name the part of the cell where the enzyme controlled reactions in b(i) above takes place (1mark)
 - c) Name the product Z in
 - (i) Plants (1mark)
 - (ii) Animals (1mark)
 - d) What would be the fate of pyruvic Acid if oxygen supply is availed in the mitochondria of an animal cell (2marks)
 - e) What is meant by the term oxygen debt (1mark)
4. a) Differentiate between the following terms
- (i) Dominant gene and recessive gene (1mark)
 - (ii) Continuous variation and discontinuous variation (1mark)
- b) In *Drosophila melanogaster* the gene for eye colour is sex linked. The gene for red eye is dominant. A cross was made between homozygous red eyed female and a white eyed male. Work out the phenotypic ration of the F₁ generation.(use R to represent the gene for red eyes) (4marks)
- c) Suggest two reasons to explain why *Drosophila melanogaster* is most preferred for studies in modern genetics. (2marks)

5. The diagram below represents a feeding relationship in an ecosystem



- a) Name the type of ecosystem represented by the above food web (1mark)
- b) Name the organism in the food web that:
 - (i) Are producers (1mark)
 - (ii) Occupies the highest trophic level (1mark)
- c) (i) Write a food chain that ends with the hawk as quaternary consumer (1mark)
- (ii) State two short term effects on the above ecosystem if all the small fish were killed (2marks)
- d) How does oil spills lead to death of fish (1mark)
- e) Name one other cause of water pollution apart from oil spills (1mark)

SECTION B: 40 MARKS

Answer question 6(compulsory) and either question 7 or 8 in the spaces provided

6. Two species of parasitic wasps X (*Vespula vulgaris*) and Y (*Vespula acadica*) were introduced in an orchard in order to control the population of aphids. The numbers of each species of wasps were counted at two-month intervals and recorded. The table below shows the population of the two wasps over a 18-month period in the orchard.

Time		0	2	4	6	8	10	12	14	16	18
Population	Species X	40	100	280	440	540	600	640	640	620	640
	Species Y	40	180	240	220	180	140	80	60	40	60

- a) Plot a graph of population of wasp against time (7marks)
 - b) State the type of relationship between the two wasps population (1mark)
 - c) Account for the differences in population of the two wasp populations:
 - (i) 0 – 3 years (3marks)
 - (ii) 4 – 14 years (3marks)
 - d) The experiment was continued for another 8 months. On the 18th month the population of species X increased and surpassed that of Y. Account for this observation (3marks)
 - e) Explain how the population of the wasps was determined (3marks)
7. Describe how the structure of mammalian eye is adapted to its function (20marks)
8. a) State four characteristics of gaseous exchange surfaces (4marks)

b) Describe the mechanism of gaseous exchange in a mammal

(16marks)

CEKENAS END OF TERM TWO EXAM – 2023
BIOLOGY 231/3
231/3
BIOLOGY PAPER 3 PAPER THREE (PRACTICAL)
JULY/AUGUST 2023

1. You are provided with three solutions K, M3 & M4. M3 is the same as M4 except that M4 is boiled. You are also provided with 2 visking tubing, piece of thread, two beakers, 6 test tubes in a rack, thermometer, test tube holder and the following solutions; iodine, sodium hydroxide, copper(II) sulphate and Benedict's.
- (a) Tie one end of the visking tubing tightly using a thread. Put 10ml of solution K and 1 ml of solution M3 into the visking tubing. Tie the other end of the visking tubing. Place the visking tubing in a beaker half filled with iodine solution. Take a second visking tubing and repeat the same using M4. Place the beakers containing the visking tubing in a water bath maintained between $(35 - 38)^{\circ}\text{C}$. Allow the set-ups to stand for 30minutes. Then after 30 minutes remove the visking tubings and test their contents and those of the beakers.

SAMPLE 1 (K + M3) (6 MARKS)

CONTENTS IN	TEST	OBSERVATION	CONCLUSION
VISKING TUBING	Iodine test		
	Benedict's test		
	Biuret's test		
BEAKER	Iodine test		
	Benedict's test		
	Biuret's test		

SAMPLE 2 (K + M4) (6MARKS)

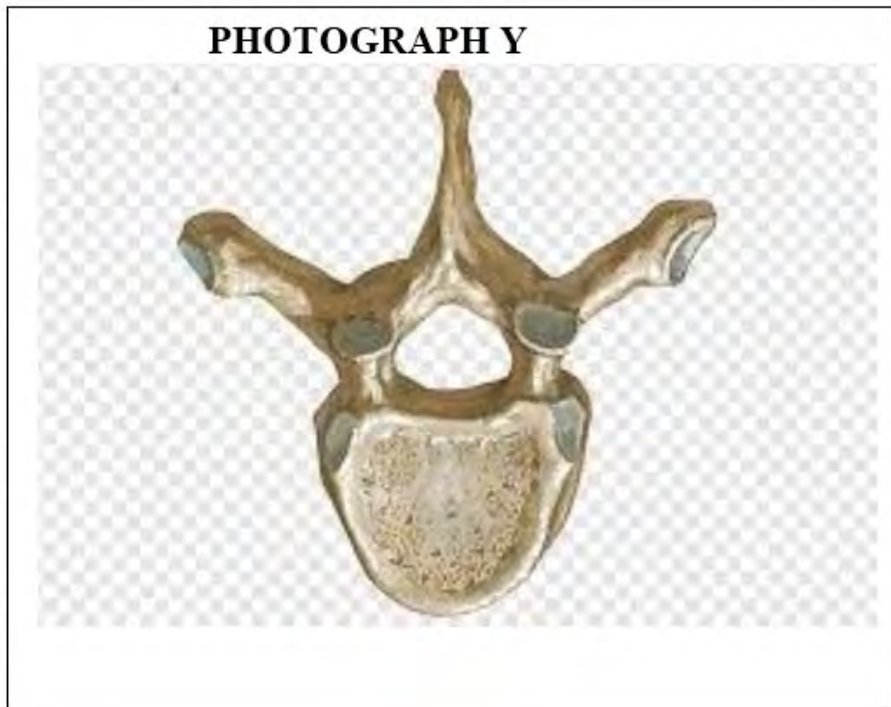
CONTENTS IN	TEST	OBSERVATION	CONCLUSION
VISKING TUBING	Iodine test		
	Benedict's test		
	Biuret's test		
BEAKER	Iodine test		
	Benedict's test		
	Biuret's test		

- (b) Account for the results in:

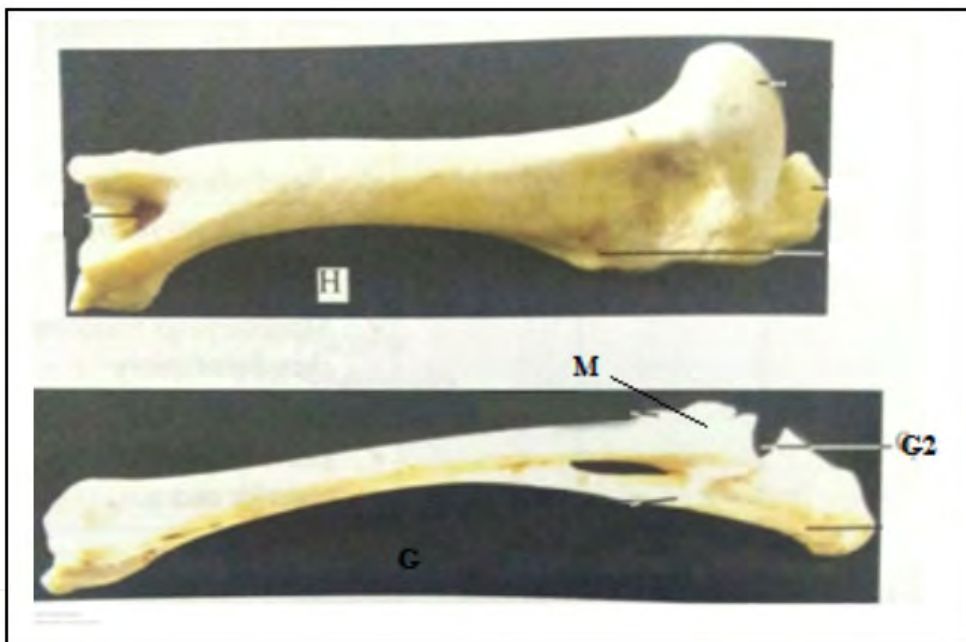
- (i) Table 1
(ii) Table 2

(1mark)
(2marks)

2. You have been provided with specimen labelled X. The specimen and the photograph of Y are obtained from the same animal. Use them to answer the question that follow.

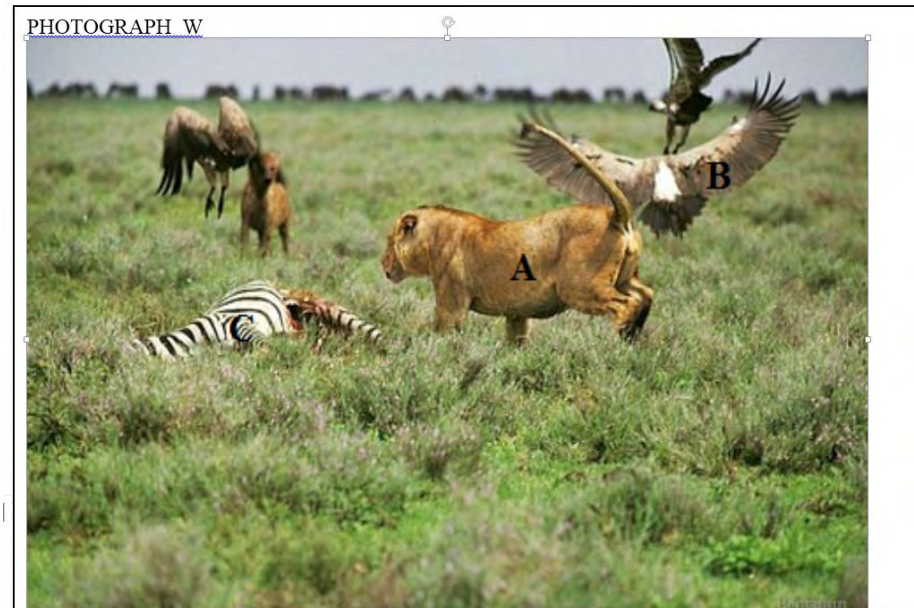


- a) Giving two reasons identify Y. (1mark)
 (i) Identity (2marks)
 (ii) Reasons (2marks)
- b) Give two adaptations of the specimen labelled X (2marks)
- c) State two observable differences between X and Y (2marks)
- d) Make a drawing showing the anterior view of X and label all the parts (4marks)
- e) The photograph below shows bones from another animal



- (i) Which part of the body was H obtained from (1mark)
- (ii) Identify G2 (1mark)
- (iii) With a reason name the type of joint at the proximal end of specimen H (2marks)

3. Study the photographs below and answer the questions that follow



- a) Name the type of relationship in:
 - (i) Photograph W (1mark)
 - (ii) Photograph M (1mark)
- b) Explain your answer in a(ii) above (2marks)
- c) What is the importance of the relationship taking place in the photograph W (1mark)
- d) Using observable feature only explain two ways in which the flower is adapted for the activity taking place in photograph M (2marks)
- e. (i) Give the biological term used to refer to the phenomenon captured in photograph W between organisms A and B towards C (1mark)

(ii) State two implications of the phenomenon mentioned in d(i) above (2marks)

CEKENAS END OF TERM TWO EXAM – 2023
231/3
BIOLOGY PAPER 3
(PRACTICAL)

CONFIDENTIAL INSTRUCTIONS

These instructions are to enable the head of institution and the teacher in charge of biology to make adequate preparations for 231/3 Biology Practical

No one else should have access to this information either directly or indirectly.

Each candidate requires the following

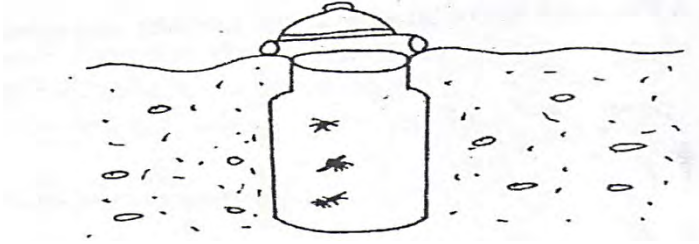
- 30 ml of solution K (mixture of starch and albumin)
- 3 ml of solution M3 (enzyme diastase)
- 3 ml of solution M4 (boiled enzyme diastase)
- Iodine solution (100ml)
- 6 test tubes in a test tube rack
- Specimen X (Thoracic vertebrae)
- Test tube holder
- Means of timing
- Thermometer
- Water bath (to hold two 100ml beakers simultaneously)
- Two visking tubings (each 6cm long) and threads to tie their ends
- Two 100 ml beakers

Access to

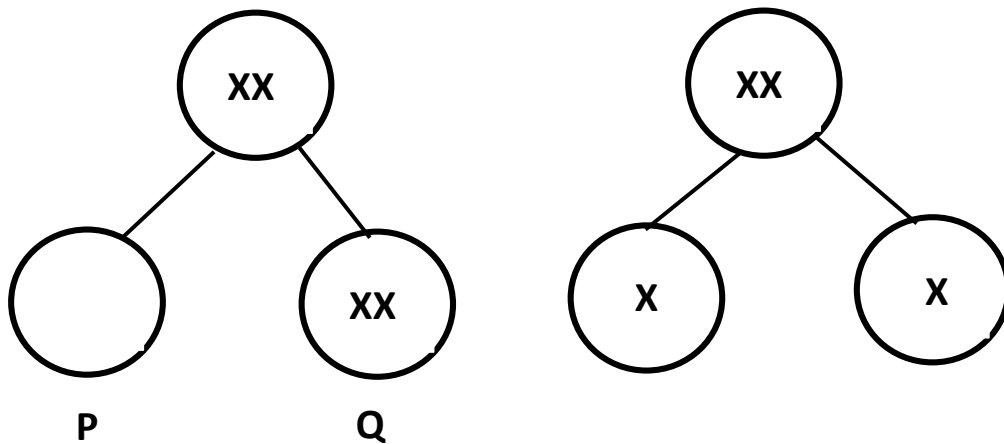
- Means of heating
- Sodium hydroxide solution (10%)
- Copper (II) sulphate solution (1%)
- Iodine solution
- Benedict's solution

GATUNDU SOUTH JOINT EXAMINATIONS–2023
231/1
BIOLOGY PAPER 1 (Theory)

1. The diagram below shows an apparatus used during collection of specimen

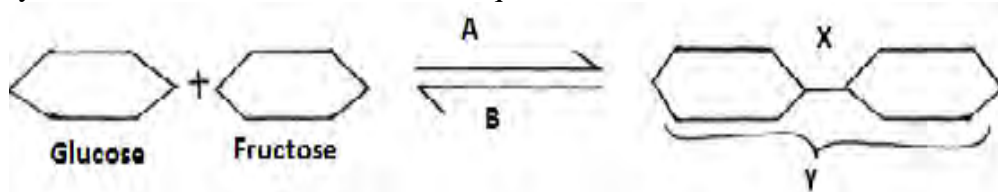


- a) Identify the apparatus (1mk)
- b) What is the use of the apparatus named above (1 mk)
- 2. Students at Handege secondary school observed that when sodium chloride was poured onto grass the grass dried up. Explain this observation? (2mks)
- 3. Explain why food is stored in an insoluble form in the cells of living things. (2mks)
- 4. (a) Name the blood vessel that connects arteries to vein. (1mk)
- (b) Explain three ways in which the vessel named in (a) above are adapted to carry out their functions. (3mks)
- 5. How does hot water act as a pollutant when it is discharged from industries into rivers? (2mks)
- 6. Explain how the following factors hinder self-pollination in plants:
 - (i) Protogyny (1mk).
 - (ii) Dioecism (1mk)
- 7. Name the causative agents of the following diseases in humans. (2mks)
 - (a). Whooping cough
 - (b). Pneumonia.
- 8. a) Define the term immunity. (1mk)
- b) Distinguish between natural immunity and acquired immunity. (1mk)
- c) Identify one immunizable disease in Kenya. (1mk)
- 9. What happens to glucose synthesized during photosynthesis. (2mks).
- 10. The process of gamete formation is represented below



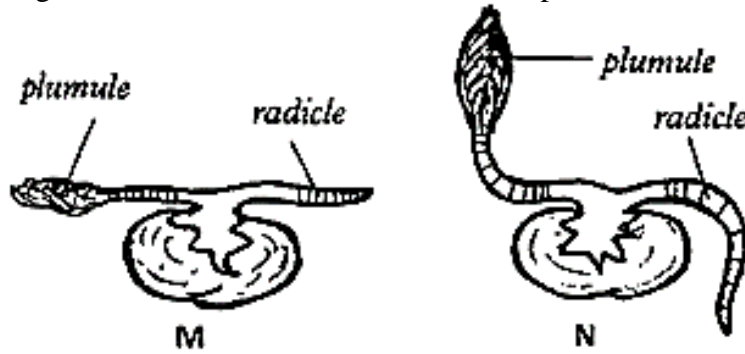
- a) State a reason why the process above represents gamete formation in female mammals (1mk)
- b) Name the chromosomal mutation represented above (1mk)

- c) Identify the genetic disorder that arise when the following gametes are fertilized
P - (1mk)
Q - (1mk)
11. (a) Name the nitrogenous waste product excreted by a fresh water fish (1mk)
 (b) Explain why a person discharges urine more frequently when environmental temperatures are low than when they are high (2mks)
12. A wild beast in Maasai Mara National Park was found to be infested with a lot of ticks. State the trophic level occupied by the following organisms: (2mks)
 (a) (i) Wild beast
 (ii) Ticks
 (b) Construct a food chain from the above information (1mk)
13. Describe double fertilization in flowering plants. (2mks)
14. Explain how blood sugar level is maintained constant in human blood (2mks)
15. a) During a field trip a plant that had flowers drew the attention of a student. Name the division of the plant. (1mk)
 b) Students observed an animal with the following features
 – Dorsoventrally flattened body
 – One pair of legs per segment
 – Poison claws on the head
 i) Name the class to which the animal belongs. (1mk)
 ii) State the mode of feeding of the animal (1mk)
16. How is mammalian skin adapted for excretion (3mks)
17. The paddles of whales and the fins of fish adapt these organisms to aquatic habitats.
 a) Name the evolutionary process that may have given rise to these structures. (1mk)
 b) What is the name given to such structures? (1mk)
18. A patient with blood group A was involved in a road accident and required urgent blood transfusion. His relatives were invited to donate blood.
 [a] Name the compatible blood groups [2 marks]
 [b] State why other blood groups were not compatible [2 marks]
19. (a). State two effects of Gibberellins on shoots of plants. (2mks)
 (b). Account for loss in dry weight of cotyledons in a germinating bean seed. (1mk).
20. Explain why a pregnant woman excretes less urea compared to a woman who is non pregnant. (2mks)
21. Study the reaction below and answer the questions that follow.



- a) What biological processes are represented by A and B? (2mks)
 b) Identify the product Y. (1mk)
 c) State the bond represented by X. (1mk)
22. The oxidation state of a certain food is represented below by a chemical equation.
 $2C_3H_2O_2N + 6O_2 \longrightarrow (NH_4)_2CO_2 + 5CO_2 + 5H_2O$
- [a] Calculate the respiratory quotients [RQ] of the food substance. (2mks)
 [b] Identify the food substrate (1mk)

23. An experiment was set to investigate a certain aspect of response. A seedling was put on a horizontal position as shown in figure M below. After 24 hours, the set up was shown in figure N.



- a) Name the response exhibited by the shoot. (1mk)
 b) Explain the curvature of the shoot upwards. (3mks)
24. During an accident a victim suffered injuries in the head. After the accident he lost his memory and was passing excessive amount of dilute urine. Suggest the part of the brain that was damaged in relation to:
 a) Memory (1mk)
 b) Passing large amounts of dilute urine (1mk)
25. Name the tissues whose cells are thickened with;
 a) Cellulose and pectin (1mk)
 b) Lignin (1mk)
26. State the function of the following structures found in the wall of the trachea. (3mks)
 i) Cilia
 ii) Mucus
 iii) Rings of cartilage
27. Name the organelle that would be most abundant in:
 i) White blood cell (1mk)
 ii) Salivary glands (1mk)
28. The diagram below represents a bone of a mammal



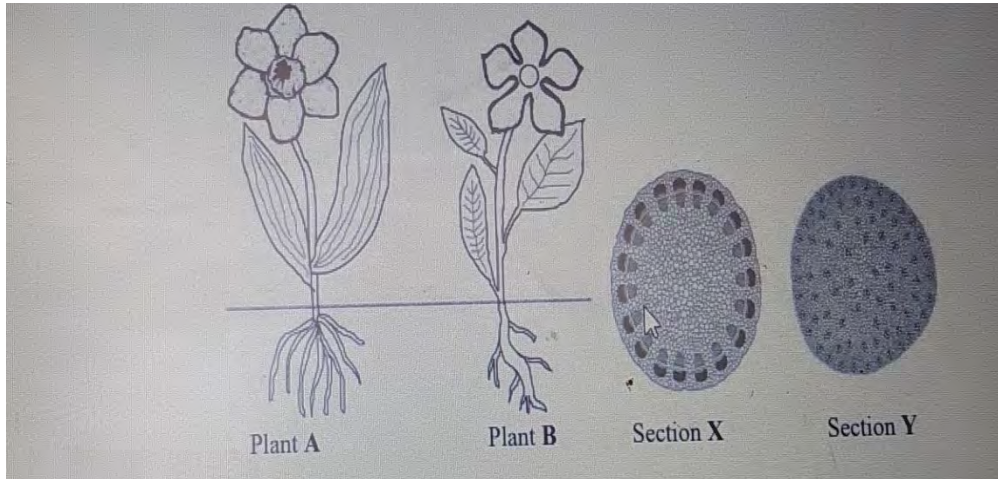
- (a) Identify the bone. (1 mark)
 (b) Name the part marked X. (1 mark)
 (c) Name the bone that articulates at the part labeled F. (1 mark)
 (d) State two ways in which the bone is adapted to its function. (2 marks)
29. a) Under which of the following magnifications would one see a larger part of the specimen X 40 or X 500? Give a reason. (2 marks)
 b) State how magnification is worked out in a light microscope (1mark)

GATUNDU SUBCOUNTY JOINT EXAMS

231/2

BIOLOGY PAPER 2

1. The diagrams shown below represent two different plants and sections of tissues obtained from them
 Plant A Plant B Section X Section Y



- a) Giving reasons based on the floral parts only, name the classes to which the plants belongs (4mks)

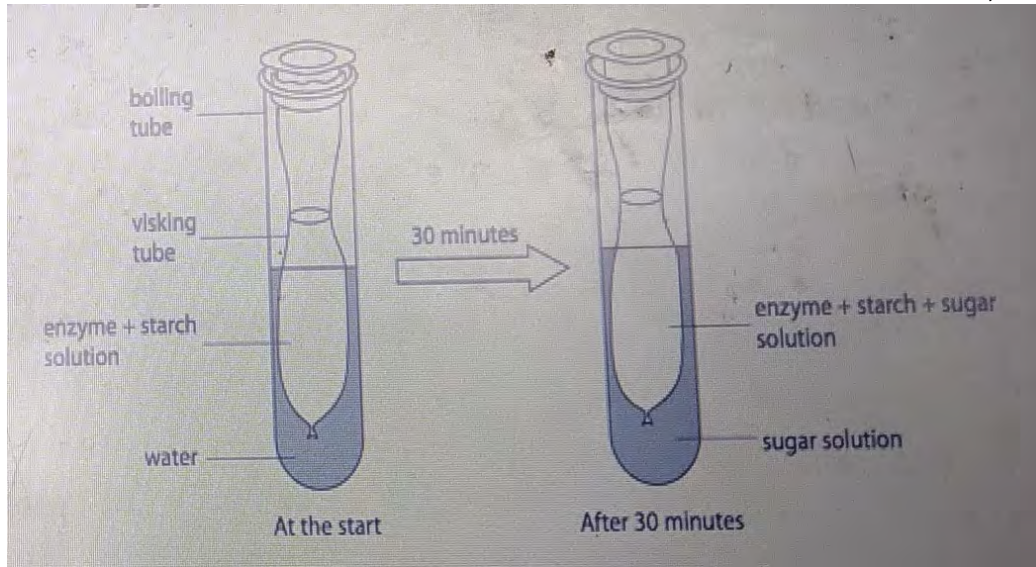
Plant	class	reason
A		
B		

- b) i) From which organ of the plant were the sections X and Y obtained? (1mk)
 ii) Fill in the table below to match the sections and the plants represented above from which the sections were obtained (2mks)

Section	plant
X	
Y	

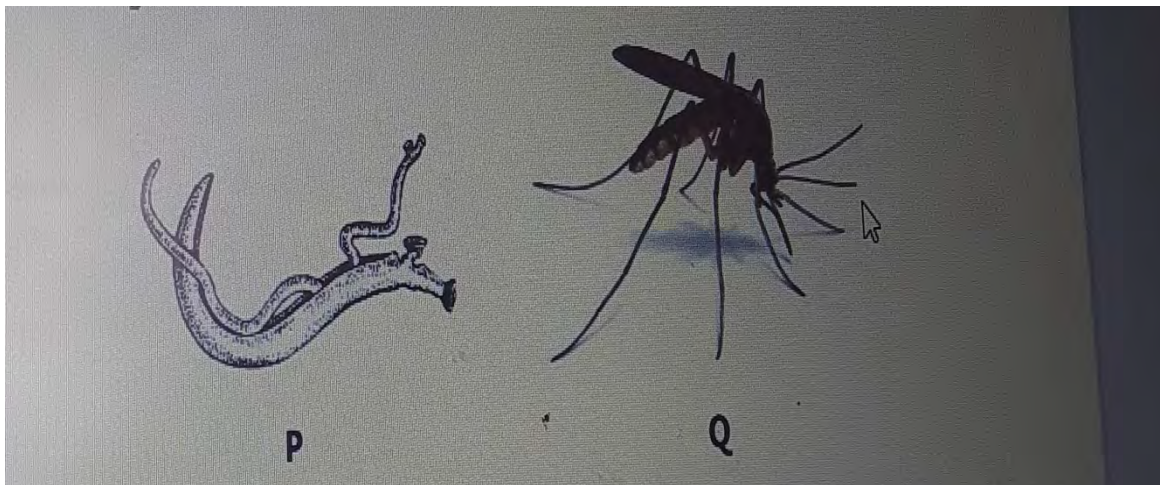
- c) Which feature shows that the above plants belong to the Sub-division Angiospermaphyta (1mk)

2. The following experimental set up was maintained at 30° for 30 minutes in a water bath for a biology study by Form ones in Kilimo High School.



- a) i) Why was the set up maintained at 30° temperature? (1mk)
 ii) Suggest an identity of the enzyme used in the experiment (1mk)
- b) i) Account for the observation made after 30 minutes (3mks)
 ii) Suggest a control experiment for the experiment above (1mk)
- c) Give **TWO** ways of increasing the rate of reaction in the visking tubing in order to have results of the experiment in less than 10 minutes (2mk)

3. The diagrams shown below are of two organisms associated with human diseases



- a) i) Name the vector of parasite labelled P (1mk)
 ii) What is the survival advantage of the close association of the male and female of parasite P as shown in the diagram above? (1mk)
 iii) List **TWO** symptoms of the disease caused by P (2mks)
 - b) i) Name the parasite transmitted by the organism labelled Q (1mk)
 ii) Explain why only the female of organism Q transmit human diseases (1mk)
 - c) Small fish can be used to control spread of human disease associated with Q. Explain. (2mks)
4. A cross of red flowered plant and white flowerd plant produced plants with pink flowers. Using letter R to represent gene for red colour and W to represent white colour;
- a) work out a cross between f1 plants. (4mks)
 - b) Give the
 - i) Phenotypic ratio of f2 plants (1mk)
 - ii) Genotypic ratio of f2 plants (1mk)

- c) Name a characteristic in human which is controlled by multiple alleles. (1mk)
- d) Which is the biological term used to refer to the condition exhibited by f1 plants. (1mk)
5. a) State one economic importance of the following plants excretory products. (3mks)
- i) tannin
 - ii) quinine
 - iii) Caffeine
- b) State **two** reasons why animals need elaborate excretory system. (2mks)
- c) Describe how you can test for presence protein in urine. (3mks)

SECTION B (40 Marks)**Answer question 6 (compulsory and either question 7 or 8)**

6. In an experiment, several cubes of liver of same mass were put in separate test tubes each with equal amount of hydrogen peroxide. Each test tube was placed in a water bath at various temperatures. The time taken for the hydrogen peroxide to decrease in each test tube was determined and recorded results are shown in table below.

Temperature(oc)	15	20	25	3	35	40	45	50
Time taken for hydrogen peroxide to decrease(minutes)	45	30	15	10	4	4	30	57

- a) Using appropriate scale, plot a graph of duration of reaction against temperature. (7mks)
- b) From your graph, determine the optimum temperature for the decomposition of hydrogen peroxide. (1 mark)
- c) Account for the changes that occur between
 (i) 15⁰C - 35⁰C (2 marks)
 (ii) 35⁰C - 40⁰C (2 marks)
 (iii) 40⁰C - 35⁰C (2 marks)
- d) Name the enzyme in the liver that decomposes hydrogen peroxide. (1 mark)
- e) Other than temperature, state three other factors that affect enzyme controlled reactions. (3 marks)
- f) Name two types of enzyme inhibitors. (2 marks)
7. Discuss how a fish is adapted to locomotion in water. (20mks)
8. Describe the uptake and movement of water from the soil to the leaves of a tall plant till transpiration. (20mks)

GATUNDU SUBCOUNTY JOINT EXAMS**231/3****BIOLOGY PRACTICAL****PAPER 3**

1. You are provided with
- Specimen **M**
 - Specimens **N**
 - 10cm³ of hydrogen peroxide
- a) Cut a cube of specimen **M** measuring 1cm by 1cm by 1cm and place in a boiling tube labeled A. Repeat the procedure using specimen **N** and place in a second boiling tube labeled B. To each of the boiling tubes add 5cm³ of hydrogen peroxide provided. Preserve the remaining piece of M to be used in question 2. Record the comparative observations in the table below. (2marks)

Test tube	Observation
A	
B	

- b) Explain the difference in the observations made between the reactions in test tube A and B (3marks)
- c) Using a glowing splint, identify the gas produced (1 mark)
- d) Write an equation for the reaction taking place in boiling tube A and B (1mark)

- e) State the importance of the reaction above in the mammalian body. (1 mark)
- f) Suppose specimen N and M were dipped in concentrated hydrochloric acid for 10 minutes before the experiment. Explain the expected results. (3 marks)
- g) Give two functions of the organ from which specimen M was obtained. (2 marks)
2. The photograph below are plants exhibiting a given response. Study it carefully to answer the questions that follow.



- a. (i) Name the type of response exhibited by the plants (1 mark)
- (ii) Account for the appearance of the plants (3 marks)
- (iii) State the importance of the above response to plants (1 mark)
- b. Obtain another **TWO** pieces of about 1cm^3 each from specimen M. Immerse one piece in solution Q and the other piece in solution R. Leave them to stand for about 20 minutes. Remove the specimen and press gently between the fingers.
- (i) Record your observation in
- | | |
|------------|----------|
| Solution Q | (1 mark) |
| Solution R | (1 mark) |
- (ii) Account for the observations in b(i) above (5 marks)
- Explain what will happen if solution Q was used to water a tree seedling. (2 marks)
3. The photographs below are organisms found in a given ecosystem. Study them carefully and answer the questions that follow.



Photograph W



Photograph X



Photograph Y



Photograph Z

- a) During an ecological study in the ecosystem above ecologists established the biomass of the four organisms in the table below. Match the biomass with the organisms above to complete the table below. (2 marks)

Biomass	Organism/photograph
400 Kg	
1000 Kg	
100 Kg	
600 Kg	

- (b) Construct a possible food chain for the ecosystem above (2 marks)
- (c) (i) Using a suitable scale, use the data provided to construct a suitable ecological pyramid for the above ecosystem. (5 marks)
- (ii) Account for the shape of the pyramid above (2 marks)
- d) Give four major adaptations of specimen X that enable it to survive in the above ecosystem (2 marks)

CONFIDENTIAL

Question 1

- Half a piece of medium sized potato tuber labeled M
- A small piece of liver fresh liver tissue(1cm x 1cm) – i.e 1/4kg for about 50 students
- Wooden splint
- Hydrogen peroxide about 10ml per student
- Means of burning the wooden splint
- Scalpel
- Two empty boiling tubes per student

Question 2

- 20 ml of concentrated salt solution in a beaker labeled Q per student
- 20 ml of distilled water in a beaker labeled solution R per student

NOTE: All photographs should be colour printed



Photograph W



Photograph X



Photograph Y



Photograph Z

NTIMARU SUB-COUNTY CLUSTER EXAMS

231/1

BIOLOGY PAPER 1

JULY/AUGUST 2023 - 2 Hours

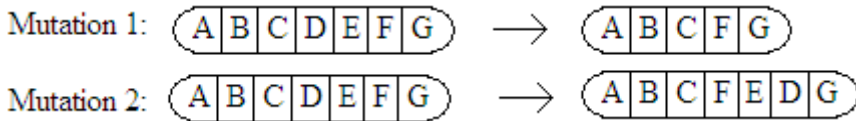
1. In a prolonged drought period, forage was scarce. It made animals reach out for higher forage and this way the giraffes got the stretched long necks.
 - (a) What is the term used for a characteristic such as the long necks outlined? (1mk)
 - (b) What is the name given to the theory that describes the evolution of such structures like the long necks? (1mk)
 - (c) State and explain the limitation of the theory you named in (b) above. (2mks)
2. (a) A goat weighing 20kg requires 216kJ while a mouse weighing 54gms requires 2830kJ per day. Explain. (2mks)
- (b) What is the end product of respiration in plants when there is insufficient oxygen supply? (1mk)
3. State the functions of the following male hormones.
 - (a) Follicle stimulating hormone. (1mk)
 - (b) Luteinizing hormone. (1mk)
4. (i) Name the class in the phylum arthropoda with the largest number of individuals. (1mk)
- (ii) State **two** adaptations that make this class very successful. (2mks)
5. How does carboxyhaemoglobin lead to death? (3mks)
6. (a) In which organ is cardiac muscle found. (1mk)
- (b) What is the function of the cardiac muscle in the organ you have named in (a) above. (1mk)
7. The number and distribution of stomata on three different leaves are shown in the table below;

Number of stomata		
Leaf	Upper Epidermis	Lower epidermis
A	300	0

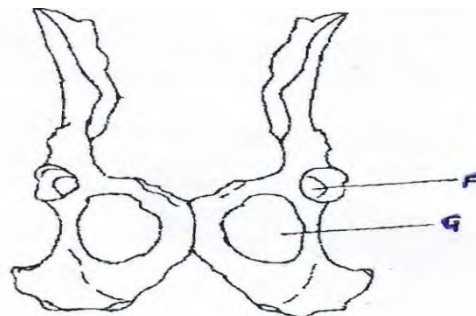
B	150	200
C	4	13

- a) Suggest the possible habitat of each of the plant from which the leaves were obtained (3mks)
- b) State the modification that maybe found in the stomata of leaf C (2mks)
8. a) What is sex linkage? (1mk)
- b) Name the sex linked trait that are only found in male (2mks)
9. A student was using a microscope whose eyepiece lens was marked X4. The high powered objective lenses were marked X10. Calculate the total magnification of the microscope (2mks)
10. Name the disease of the blood characterized by,
- (a) Abnormally large number of white blood cells (1mk)
- (b) Crescent –shaped hemoglobin (1mk)
11. (a) State **two** roles of hydrochloric acid secreted by the stomach wall. (2mks)
- (b) Name the cells that secrete the above component. (1mk)

12. The diagram below shows various types of gene mutations.



- (a) Identify the type of gene mutation shown above. (2mks)
- Mutation 1
- Mutation 2
- (b) Distinguish between gene and chromosomal mutations (2mks)
13. If the ovaries of a woman are removed during the first four months of pregnancy miscarriage is very likely to occur. However if they are removed after the fourth month pregnancy can proceed normally. Explain (3mks)
14. State **two** reasons why anaerobic respiration yields less energy than aerobic respiration (2mks)
15. State **two** reasons why fat is not an efficient substrate. (2mks)
16. State **two** reasons why humans are not used as specimens for genetic studies (2mks)
17. The diagram below shows two fused bones of a mammal.

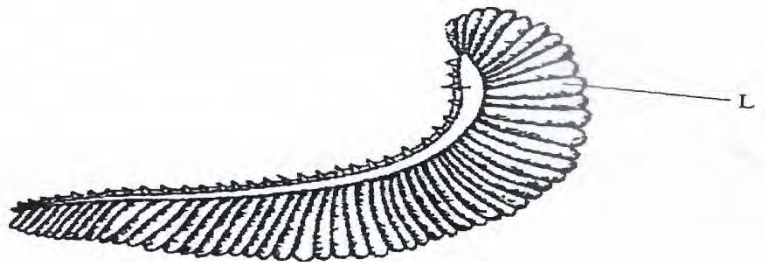


- (a) Identify the fused bone (1mk)
- (b) Name the:
- (i) Bone that articulates at the point labeled F (1mk)
- (ii) The hole labeled G (1mk)
18. (i) Define the term predation (1mk)
- (ii) State **three** behavioral adaptations displayed by the prey to minimize predation (3mks)

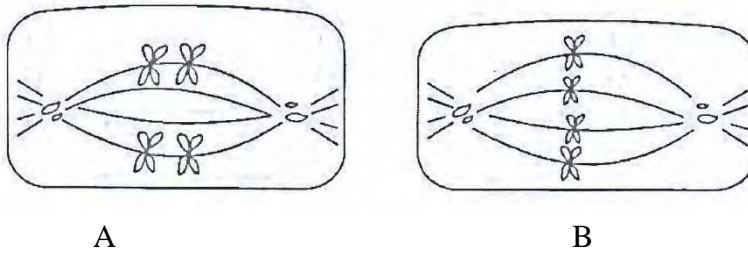
19. A shoot of a seedling exposed to light on one side bends towards the source of light as it grows.
 (a) Name the response exhibited by the shoot of the seedling (1mk)
 (b) Explain how the bending towards the source of light occurs (3mks)
20. The diagram below shows the position of an image formed in a defective eye.



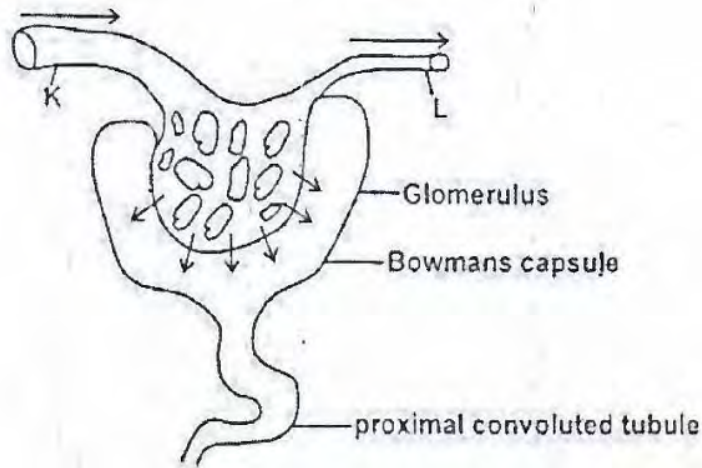
- (a) Name the defect (1mk)
 (b) Explain how the defect named in (a) above can be corrected (2mks)
21. State **three** ways by which plants compensate for lack of ability to move from one place to another. (3mks)
22. The diagram below represents an organ in a bony fish.



- (a) Name the organ (1mk)
 (b) Name structure L (1mk)
 (c) Explain why a bony fish dies shortly after being removed from water (3mks)
23. The diagram below represents a stage of cell division.



- (a). Identify the type of cell division represented by the cells labeled A and B. (2mks)
 (b). Which stage of cell division is represented by cells A and B? (2 mks)
24. The diagram below shows part of the mammalian nephrone.



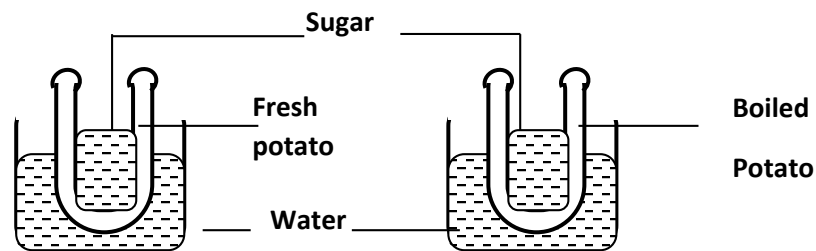
- a. Name the vessel labeled L (1mk)
 - b. Explain the significance of vessel K being wider than the vessel labeled L. (2mks)
 - c. Name the component of the blood that do not form the glomerular filtrate. (1mk)
25. State **two** factors which destroy the semi-permeability of the cell membrane. (2mks)
26. A plant cell was put in highly concentrated salt solution for five hours. Describe what happened to the cell. (3mks)

NTIMARU SUB-COUNTY CLUSTER EXAMS
231/2
BIOLOGY PAPER 2
JULY-AUGUST 2023 - 2 Hours

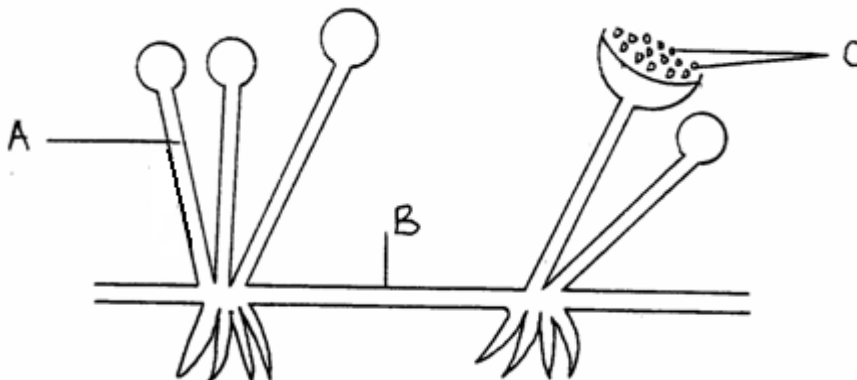
SECTION A

Answer all questions in the spaces provided

1. a) A man marries a woman with blood group **B** and the couple has three children. The man disputes Parentage of the second born child, who is blood group **O**. His dispute is incorrect given that he belongs to blood group **A**. Explain without using a genetic cross or a punnet square. (2marks)
 - b) Haemophilia is a sex linked trait in humans caused by a recessive gene located in the X chromosome.
 A man with normal blood clotting marries a woman who also has normal blood clotting in the event of a cut. On getting offsprings, one of their sons turned out to be a haemophiliac. By the use of letter H for Normal blood clotting, illustrate the outcome of the haemophiliac son using a genetic cross. (4marks)
 - c) Other than haemophilia state **two** sex linked traits in human. (2marks)
2. A student set up materials in an experiment as shown below.



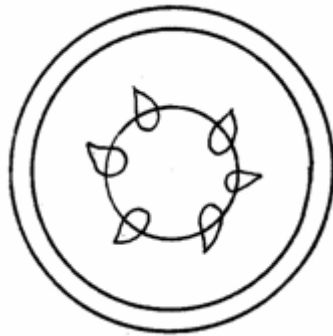
- (a) State the physiological process being investigated. (1mark)
 - (b) If the experiment set up was left over-night, state observation in the set up A and B. (2marks)
 - (c) Account for the observations in each set up. (3marks)
 - (d) If another experiment C was set such that nothing is placed in the potato cup, state and explain the results that would have been obtained. (2marks)
3. The diagram below represents bread mould (Rhizopus).



- (a) Identify the part labelled **A** (1 mark)
- (b) State the function of parts labelled **C**. (1mark)
- (c) List **two** differences between Class chilopoda and diplopoda. (2marks)

Class chilopoda	Class diplopoda

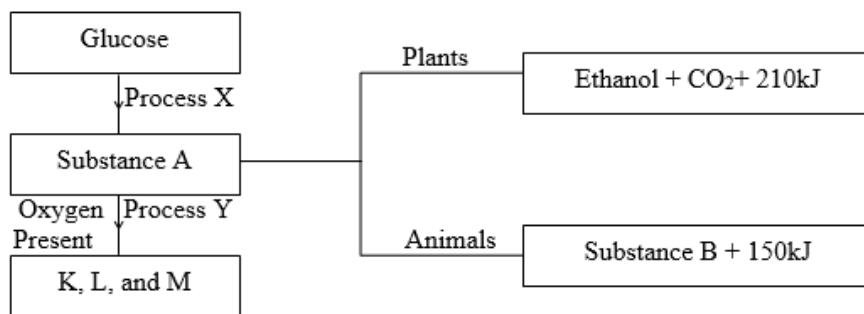
(d) The diagram below represents a section obtained from a plant.



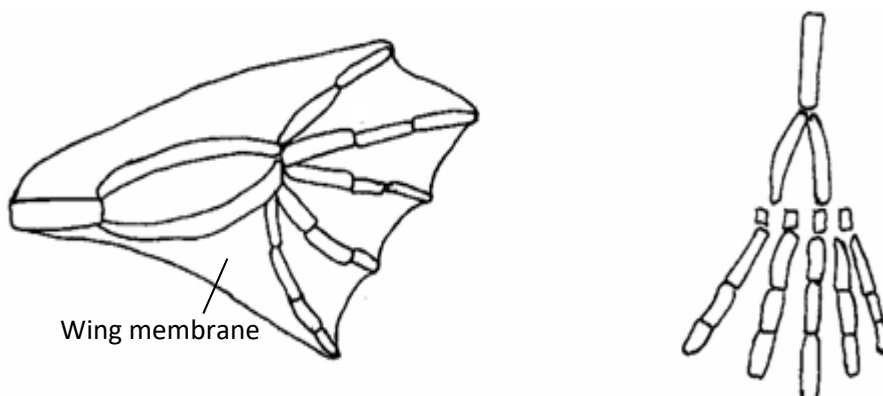
Classify the plant from which the section was obtained under the following: (2marks)

- (i) Division.....
- (ii) Class
- (e) Give **two** reasons for your answer in d (ii) above. (2marks)

4. . The diagram below represents a simple respiratory pathway in cells.



- a) Name the process marked **X** and **Y**. (2marks)
 - b) State **two** differences between process **X** and **Y**. (2marks)
 - c) State the name of substance **B** and condition under which it is formed. (2marks)
 - d) Explain how body size affects the rate of respiration in animals. (2marks)
5. The diagram **below** shows structures of the bat wing and human arm.



- a) These structures are thought to have same ancestral origin. State **one** structural similarity and **one** adaptational difference between the two.
- (i) Structural similarity. (1mark)
- (ii) Adaptational difference. (2marks)
- b) Give **two** other examples of structures in nature that show the type of evolution as in (a) above. (2marks)
- c) Distinguish between the terms 'chemical evolution' and 'organic evolution'. (2marks)
- d) What is the study of fossils? (1mark)

SECTION B (40 MARKS)

Answer question 6 (compulsory) and either 7 or 8 in the spaces provided.

6. The table below how the quantities of sweat and urine vary with external temperature.

External Temperature ($^{\circ}$ c)	0	5	10	15	20	25	30	35
Urine cm^3/h	100	90	80	70	60	50	40	30
Sweat cm^3/h	5	6	10	15	30	60	120	200

- a) Using the same grid, draw graphs of quantities of urine and sweat produced against external temperature . (6marks)
- b) At what temperature is the amount of sweat and urine produced equal. (1mark)
- c) Account for the amount of sweat produced as the temperature rises. (3marks)
- d) Explain the observations made on the amount of urine produced as temperature rises. (4marks)
- e) Explain how the erector pili muscle help in temperature regulation when it is cold. (4marks)
- f) How does **Anti diuretic hormone** affect the amount of urine produced by a mammal per day. (2marks)
7. Explain how various structural features of plants affects the rate of transpiration. (20marks)
8. a). Describe what happens in the nervous system of a person who withdraws a finger from very hot object (10marks)
- b). Describe the roles of the following plants hormones in growth and development of plants.
- (i) Auxins/ Indole acetic acid; (5marks)
- (ii) Gibberllins; (5marks)

NTIMARU SUB-COUNTY CLUSTER EXAMS

231/3

BIOLOGY PAPER 3

JULY/AUGUST - 1¾ HOURS

1.

- (a) You are provided with specimen X, using a cork borer, remove eight strips of 2cm length from specimen X. Place two strips into solution labeled L and another two strips into solution labeled M. Leave the set up to stand for 20 minutes.

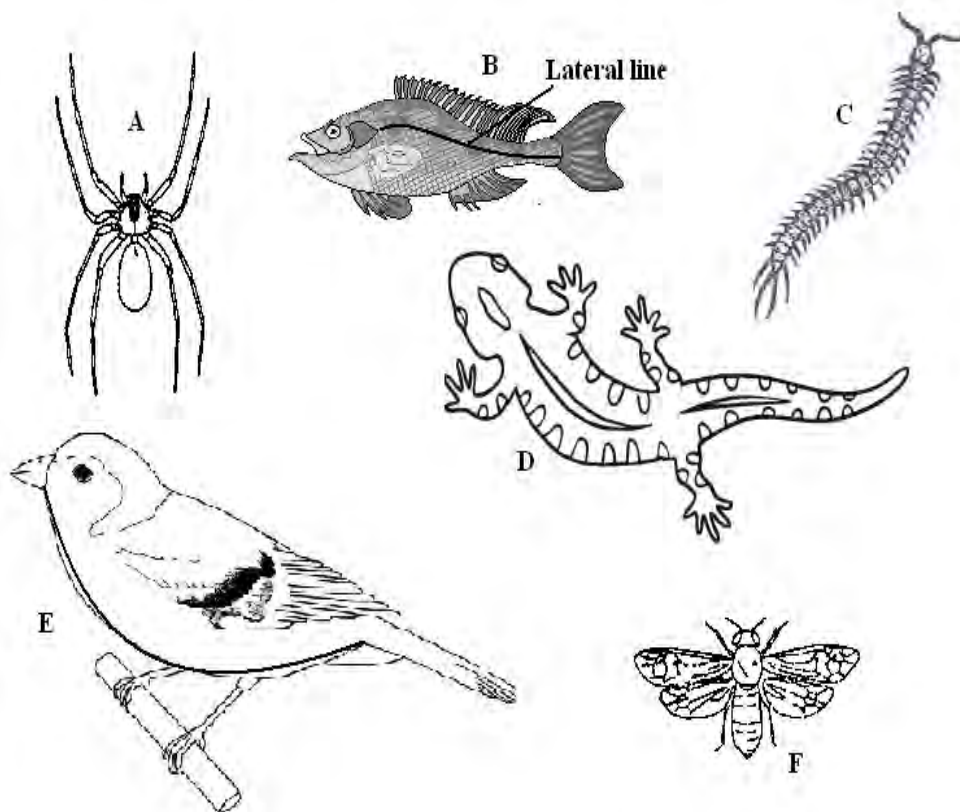
NB Preserve the other two for use later in question 1(b) (i)

- (i) State the observation after 20 minutes when the strips are touched. (6marks)

	Initial length	Final length	Change in length	Texture
Strips in solution L	2cm			
Strips in solution M	2cm			

- (ii) Account for the observations in (i) above (4marks)
- (b) (i) Using a mortar and a pestle crush one of the remaining strip, place the extract in a test tube and add solution N. State your observation. (1 mark)
- (ii) Repeat the procedure in (b) (i) with distilled water instead of hydrogen peroxide. State your observation. (1mark)
- (c) Explain why:
- (i) It was necessary to crush specimens in the experiment. (1mark)
- (ii) Hydrogen peroxide should not accumulate in living tissue. (1mark)

2. Study the organisms drawn below and answer the questions that follow.



- (a) Use the dichotomous key below to identify the class the organisms belong to. (12 marks)
1. (a) Phylum Chordata go to 2
 (b) Phylum arthropoda go to 3
 2. (a) Has scales on the body go to 4
 (b) Has no scales on the body Mammalia
 3. (a) Has cephalothorax Arachnida
 (b) Has no cephalothorax go to 5
 4. (a) Has fins Pisces
 (b) Has no fins go to 7
 5. (a) Has three pairs of legs Insecta
 (b) Has more than three pairs of legs go to 6
 6. (a) Two pairs of legs per segment Diplopoda
 (b) One pairs of legs per segment Chilopoda
 7. (a) Has feathers Aves
 (b) Has no feathers go to 8
 8. (a) Has a tail Reptilia
 (b) Has no tail Amphibia

Specimen	Step followed	Identity
A		
B		
C		
D		
E		
F		

- (b) If the actual length from the tip of the mouth to the tip of the tail of the specimen B is 100mm, calculate the magnification. (2marks)
3. Photograph below shows 3 different plants growing in the same habitat. Use the photograph to answer questions below.



- a. Name the response exhibited by the plant. (1mark)
- b. State the significance of the response (2marks)
- c. Explain how response named in (a) above occurs (4marks)
- d. Name the stimulus that cause the response above (1mark)
- e. Draw and label root system of P (3marks)
- f. Name the subdivisions to which R and T belong (2 marks)

NTIMARU SUB-COUNTY CLUSTER EXAMS
BIOLOGY Paper 231/3

CONFIDENTIAL INSTRUCTION TO SCHOOLS

Each candidate should be provided with the following:

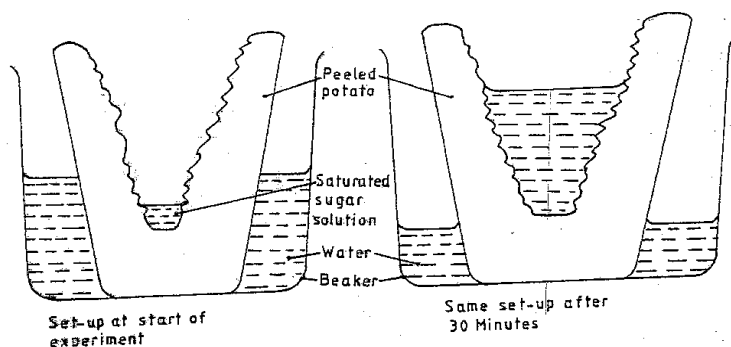
- Means of timing. A wall clock will be appropriate
- Scalpel
- Mortar and pestle
- Cork borer
- 2 medium Irish potatoes labeled X
- 20mls distilled water labeled as solution L
- 20mls concentrated salt solution labeled as solution M
- 2mls hydrogen peroxide labeled as solution N
- Distilled water in a wash bottle
- Two test tubes in a test-tube rack

MUMIAS WEST JOINT EVALUATION

231/1

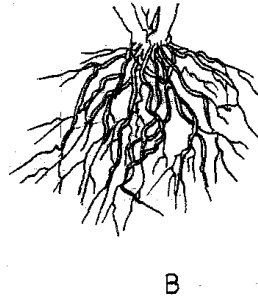
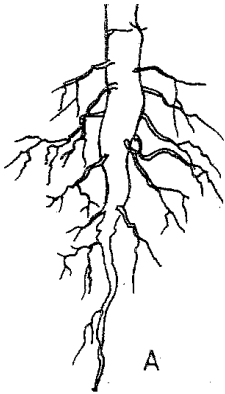
BIOLOGY THEORY PAPER 1

1. State the function of:
 - a) Ribosomes (1mk)
 - b) Lysosomes (1mk)
2. State **two ways** in which a respiratory surface is adapted to its function. (2mks)
3. What is meant by the following term?
 - a) Habitat (1mk)
 - b) Ecosystem (1mk)
4. Explain why is not advisable to be in a poorly ventilated room with a burning charcoal. (2mks)
5. The diagrams below show an experiment set up to investigate a certain process in a plant tissue.



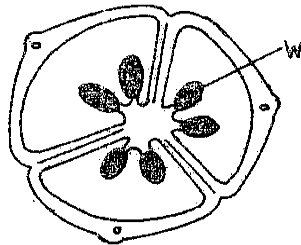
Explain the results obtained after 30 minutes. (3mks)

6. The diagrams below illustrate the organs of some flowering plants.



State the classes of plants to which each belong. (2mks)

7. Give reasons for carrying out the following procedures when preparing temporary wet mounts of plant tissues.
- (a) Making thin plant sections (1mk)
 - (b) Adding water on the plant section. (1mk)
8. The diagram below represents a transverse section of an ovary from a certain flower.



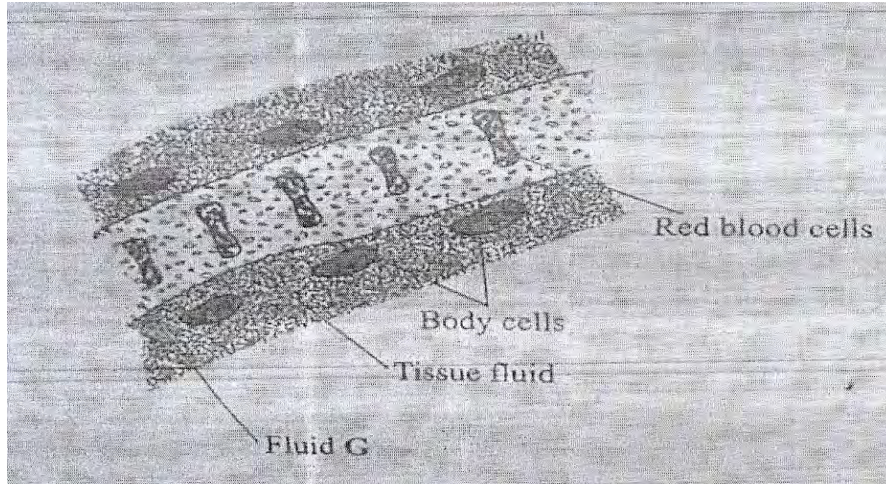
- (a) (i) Name the structure labeled W (1mk)
 - (ii) Name the type of plantation illustrated in this diagram. (1mk)
9. a) The diagram below illustrates a germinating seedling



- i) Name the type of germination illustrated in the diagram (1 mark)
 - ii) Describe how the type of germination named in(i) above is brought about (3 marks)
- (b) Name the gland that secretes the following hormones. (2mks)
- (i) Ecdysone.....
 - (ii) Juvenile.....
- (c) Give two sex linked genes found on the Y-chromosomes. (2mks)
- (d) Below is a nucleotide strand

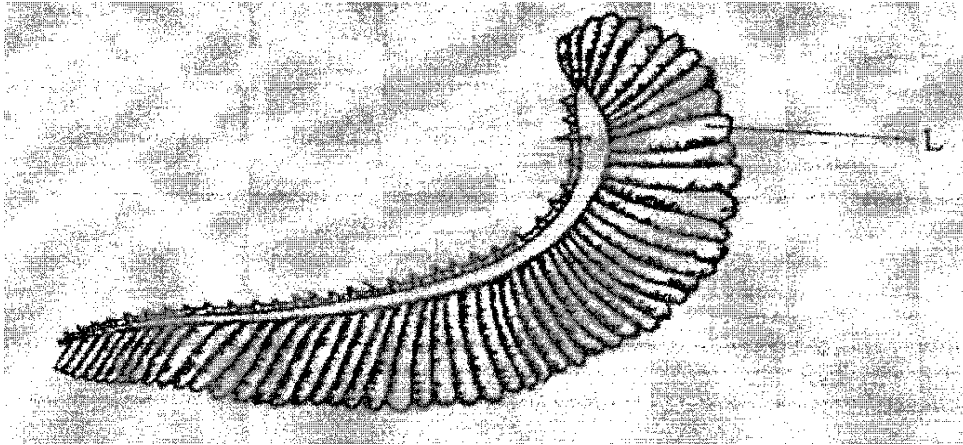
A	A	G	T	C
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- (i) Identify the type of nucleic acid. (1mk)
 - (ii) Give a reason for your answer in (i) above (1mk)
10. State two observable features that place a millipede into its class (2mks)
11. The diagram below illustrates tissue fluid and cells surrounding a capillary



- i) Name fluid G (1mk)
 - ii) Give two ways by which fluid G is different from tissue fluid (2mks)
12. a) Define respiration (1mk)
- b) Name two products of respiration in plants (2mks)
 - c) State three activities in the human digestive system that depend on respiration (3mks)
13. State three ways in which blood capillaries are structurally adapted to their functions (3mks)

14. The diagram below represents an organ in a bony fish



- a) Name the organ (1mk)
 - b) Describe how air in water reach the capillaries inside structure L (3mks)
15. During a practical investigation on food tests, students were provided with the following reagents:
- Benedict’s solution
 - Sodium hydrogen carbonate
 - Dilute hydrochloric acid
- (a) Identify the food substance the students were to test. (1mark)
 - (b) State the role of hydrochloric acid and sodium hydrogen carbonate during the experiment.
 - (i) Dilute hydrochloric acid (1 mark)
 - (ii) Sodium hydrogen carbonate (1 mark)

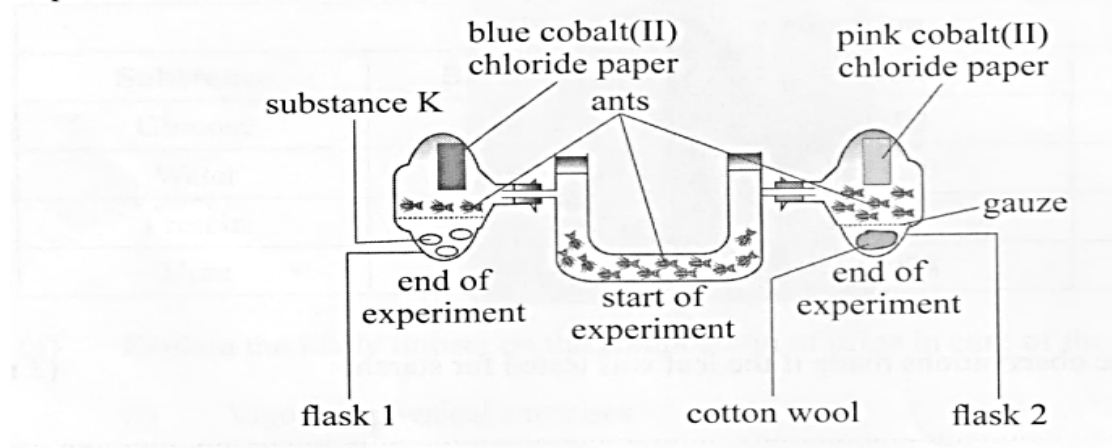
16. The table below shows the percentage concentration of certain substances in blood plasma glomerular filtrate and urine in a human being at a particular time.

Percentage concentration			
Substance	Blood plasma	Glomerular filtrate	Urine
Glucose	0.023	0.02	0.0
Water	92.70	92.70	96.08
Protein	5.69	0.0	0.0
Urea	0.087	0.098	2.6

- (a) Explain the likely impact on the composition of urine in case of the following:
 - (i) Vigorous physical exercises (2 mks)
 - (ii) A meal rich in proteins (2 mks)
- (b) Name the processes responsible for:
 - (i) Presence of glucose in glomerular filtrate (1 mk)
 - (ii) Absence of glucose in urine (1 mk)

17. The diagram below represents a set up during an experiment.

Experiment



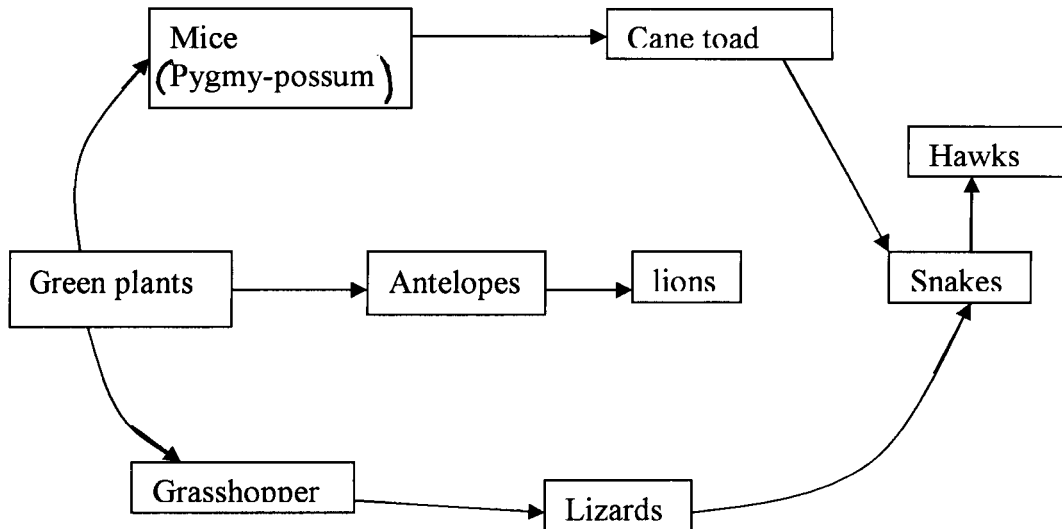
- (a) (i) What was the experiment investigating? (1 mk)
 (ii) State the likely identity for substance K. (1 mk)
 (iii) Explain your answer in (a) (ii) above. (1 mk)
- (b) Account for the observations made in flask 2. (2 mks)
18. (a) Beside venation, state two other external characteristics of leaves that can be used to classify plants. (2mks)
 (b) How can floral parts be used to classify plants (2mks)
19. (a) What is meant by the term seed dormancy? (1mk)
 (b) State three causes of seed dormancy. (3mks)
20. Explain why;
 (a) Mammalian testes are located to hang outside the body. (2mks)
 (b) Four months after fertilization, ovaries can be removed from a human female, without terminating pregnancy. (2mks)
21. State **three** structural differences between arteries and veins. (3 mks)
22. What is the function of the following structure in the human reproductive organ?
 a) Fallopian tubes. (1 mk)
 b) Epididymis. (1 mk)
 c) Scrotal sac (1mk)
23. (a) State **two** ideas proposed by Lamarck's in his theory of evolution. (2 mks)
 (b) Why is Larmark's theory not acceptable? (1 mrk)

MUMIAS WEST JOINT EXAMINATION
231/2
BIOLOGY Paper 2
(THEORY)

SECTION A (40MKS)

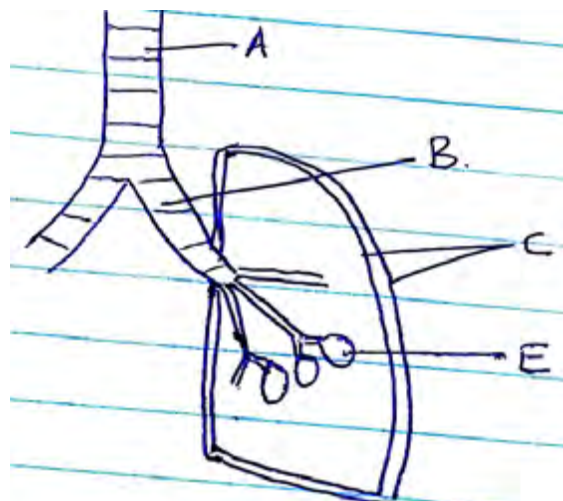
Answer ALL the questions in this section in the spaces provided.

1. The diagram below represents a food web in a terrestrial ecosystem.



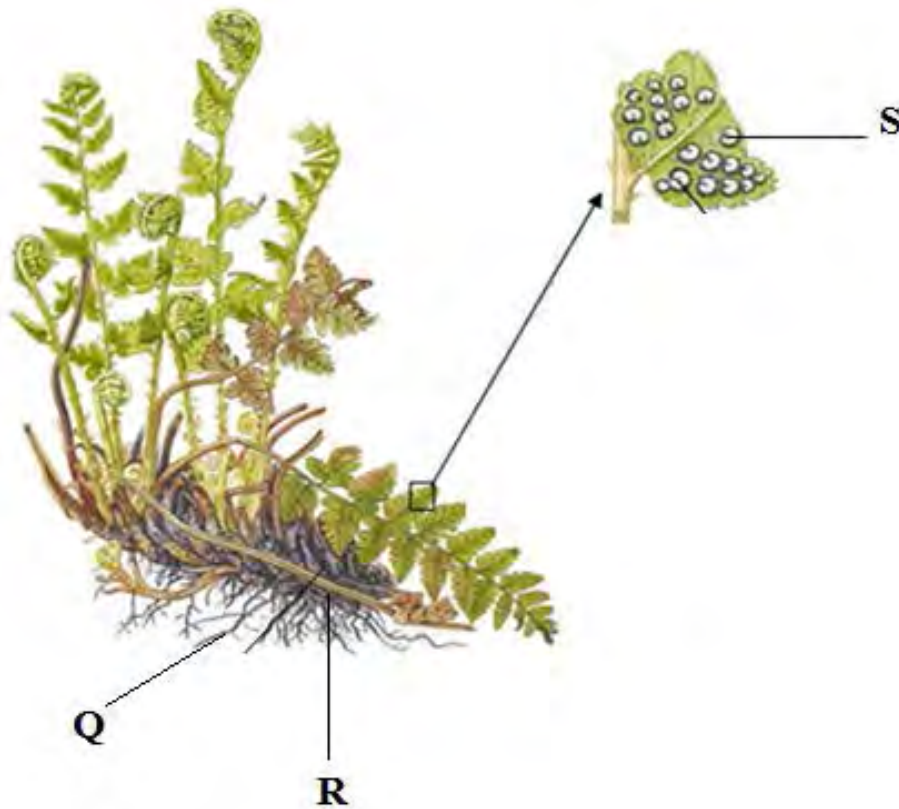
- (a) Which organism has the highest number of preys (1 mk)
- (b) Construct food chains with snakes as tertiary consumers (2mks)
- (c) State the trophic level occupied by hawks in the food chains constructed in b) above (1mk)
- (d) Describe how capture-recapture method can be used in estimating the population of fishes in a lake. (4mks)

2. Study the diagram below and answer the questions that follow.



- a) Name the part labeled A and B (2marks)
- b) State the function of the part labeled C (2marks)
- c) How is the part labeled E adapted to its function (2marks)
- d) Identify the structure that perform the same function as one illustrated above in (2marks)
 - i) Amoeba
 - ii) Fish

- 3 (a) What is multiple allelism? (1mk)
- (b) A pure breeding black male mouse was mated with a pure breeding brown female mouse. All the offspring had black coat colour.
Explain the appearance of black coat colour in the offspring. (1mk)
- i) If the black parental mouse was mated with a mouse that is heterozygous for coat colour, work out the genotypic ratio of the offspring. Show your working. (4mks)
- ii) State **two** disorders in human beings that are as a result of chromosomal mutation. (2mks)
4. (a) Explain what happens to excess amino acids in the liver of humans (3mks)
- (b) Name two parts of human nephron which are only found in the kidney cortex. (2mks)
- (c) (i) In what form is carbon(ii) oxide transported in blood. (1mk)
- (ii) Explain why it may cause death (2mks)
5. The diagram below indicates an organism that grows under shaded places with damp conditions. Study it and answer the questions that follow.



- (a) Name the division to which the specimen belongs. (1 mark)
- (b) Name and state the functions of the parts labelled Q, R and S. (6 marks)
- (c) Name the two body forms of the organism in its alternation of generation. (1 marks)

SECTION B (40 MARKS)

Answer question 6 compulsory and either 7 or 8 in the spaces after question 8.

6. The following data results of making daily growth measurement on an organism over a period of 24 days during its development.

DAY	WIDTH OF HEAD (MM)	LENGTH OF HIND FEMUR 1MM
1	3.0	7.0
2	3.5	7.5
3	4.0	8.0
4	4.0	8.0
5	4.0	8.0
6	4.0	8.0
7	4.0	8.0
8	4.4	9.2
9	4.7	10.5
10	5.0	12.0
11	5.0	12.0
12	5.0	12.0
13	5.0	12.0
14	5.0	12.0
15	5.0	12.0
16	5.0	12.0
17	5.6	13.3
18	6.4	14.8
19	7.0	16.4
20	7.6	18.0
21	7.6	18.0
22	7.6	18.0
23	7.6	18.0
24	7.6	18.0

Using a suitable scale, draw graphs of width of head and length of femur against time.

Draw the graphs on the same axis.

(8 marks)

- (b) (i) Name the growth pattern represented by the graphs. (1 mark)
(ii) With reference to your graph, identify the phylum to which the organism belongs. Give a reason for your answer. (2marks).
- (d) (i) Account for the length of hind limb (femur) between day 3 and day 7. (3 marks)
(ii) Day 7 and day 10. (2 marks)
- (e) State the hormones involved in the growth pattern represented by the graphs. (2 marks)
- (f) State two advantages for metamorphosis in organisms. (2 marks)
- 7 a) Describe the structural adaptations of mammalian heart to its functions (10mks).
b) Explain the role of osmosis in organisms (10mks)
8. Describe the movement of water from the soil up to the leaves and then into the atmosphere. (20 marks)

MUMIAS WEST JOINT EXAMS

BIOLOGY

231/3

BIOLOGY PRACTICAL

- i) a) You are provided with specimen M. Peel off the epicarp. Scoop three spatulas full of the endocarp and place the portion into a clean beaker. Smash the specimen in the beaker using a glass rod. Add 20 ml of distilled water and stir using the glass rod to form solution M. Using the reagents provided carry out a food test to test for the food substance found in solution M. Spare the remaining solution to be used later. Fill the table below.

Reducing sugar test	Starch test
Observation:	Observation:
Conclusion:	Conclusion:

(4mks)

- b) Movement of food molecules from the digestive system into the blood stream can be investigated using a visking tube. You have been provided with a 6cm visking tube.

PROCEDURE :

Soak the visking tube in water for a few minutes then open the visking tubing and tightly tie one end such that there should be no leakage.

Fill the tubing with 5ml of solution M from the beaker and tie the remaining end. Ensure again there is no leakage.

Rinse the outer surface of the visking tubing to remove any traces of the paste;

Immerse visking tubing and its contents in distilled water in a boiling tube. Pour into the boiling tube distilled water such that the visking is fully immersed.

Leave the set up undisturbed for at least 20 minutes. Carefully remove the visking tubing and its contents from the boiling tube.

After 20 minutes carry out a food test again using the sample of water from the boiling tube in which the visking tube had been immersed.

Reducing sugar test	Starch test
Observation:	Observation:
Conclusion:	Conclusion:

(4mks)

- c) (i) Why was the visking tube rinsed before the start of the experiment. (1mk)
 (ii) Explain what has happened in (b) above at the end of the experiment. (2mks)
- d) Name the part of the digestive system that might be represented by the visking tube. (1mk)
- e) (i) Name the blood vessel that transports oxygenated blood from the part named (d) above to organ R (in question 2 below). (1mk)
 (ii) With reference to the visking tube provided state one observable feature that adapts the part named in (d) above to its function. (1mk)

- ii) You are provided with a photograph of specimen R showing an organ from the body. You are also provided with a piece of specimen R. Study them and answer the questions that follow.

SPECIMEN R.



- a) (i) Name specimen R. (1mk)
- (ii) label on the photograph the following parts. (3mks)
- Gall bladder
- Aorta.
- Inferior venacava
- b) Explain why malfunctioning of R leads impaired sugar regulation. (3mks)
- c) Cut specimen R into two equal pieces. Immerse one piece into aboilling tube. Add alittle water and boil it for five minutes. Label one boiling tube A. Label another boiling tube B. Using a pair of forceps remove the piece of R that has been boiled from the boiling tube and put it in the boiling tube labeled A. Take the remaining piece of R that was not boiled and put it into the other boiling tube labeled B. In each of the boiling tubes A and B add 10 ml of hydrogen peroxide respectively.
- (i) Record your observation
- A: (1mk)
- B: (1mk)
- (ii) Account for the observation in
- A: (2mks)
- B: (1mks)
- (iii) Which excretory function of specimen R is being investigated. (1mk)
- iv) State one disease that can affect specimen R. (1mk)
- iii) You are provided with specimens H and K. Observe the specimens keenly.
- (a) State two functions of specimen K. (2 marks)
- (b) Name the division and class to which specimen H belongs.
- Division (1 mark)
- Reason (1 mark)
- Class (1 mark)
- Reasons (2 marks)
- c) State three adaptations of specimen K for maximum photosynthesis. (3marks)
- d) Explain two ways in which specimen H is adapted for survival in its habitat. (2 marks)

**MUMIAS WEST JOINT EXAMS
BIOLOGY PRACTICAL CONFIDENTIAL**

Each candidate will require the following:

1. Empty 100ml/250ml beaker/test tube rag
2. Distilled water
3. 4 boiling tubes
4. 10ml measuring cylinder
5. Stopwatch
6. Scalpel
7. Glass rod
8. 50ml plastic beaker
9. Spatula
10. Dropper
11. 4 test tubes
12. Specimen R - A small piece of liver
13. Specimen H - complete grass
14. Specimen K - Bipinnate leaf
15. Specimen M - Half portion of ripe banana
16. 8cm visking tube
17. 2 pieces of thread
18. Two labels

Access to:

- a) Source of heat
- b) Benedict's solution
- c) Iodine solution

NOTE:

THE PHOTOGRAPH SHOULD COLOURED

**EASTERN CLUSTER EVALUATION - 2023
BIOLOGY PAPER 1
TERM 2, 2023**

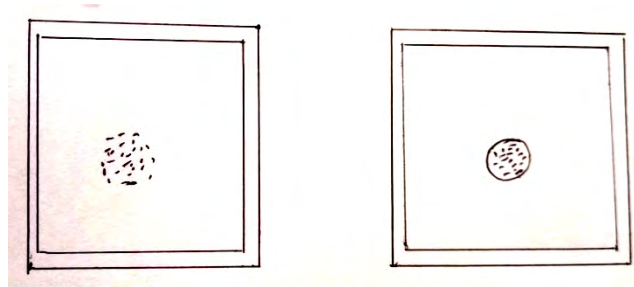
1. State the name given to the study of:
 - (a) Fish (1 mark)
 - (b) Cell (1 mark)
2. Student classified a lion as follows:

Kingdom : Animalia
Phylum: Mammals
Specific name: Panthera leo

 Identify **three** mistakes in her work. (3 marks)
3. State why it is important for plants to lose water into the atmosphere. (3 marks)
4. (a) Name the disease that causes:
 - (i) Thickening and hardening of arteries (1 mark)
 - (ii) Formation of clot in blood vessels (1 mark)
 (b) In a certain person, blood took a long time to clot after a cut. What vitamin deficiency was the person likely to have been suffering from? (1 mark)

5. (a) Name the causative agents of the following diseases.
- (i) Pulmonary tuberculosis (1 mark)
 - (ii) Whooping cough (1 mark)
- (b) In an experiment to analyse a sample of air, a J – tube was used to find out the amount of carbon (IV) oxide and oxygen in the sample. The length of the sample air in J- tube was 8cm and after mixing it with some sodium hydroxide solution for some minutes, the length was reduced to 7.6cm. When pyrogallic acid was also made to mix with the sample of air for some minutes, the length reduced further to 6.6cm.
- a) What was the percentage of:
 - (i) Oxygen in the air sample? Show your working (2 marks)
 - (ii) Carbon (IV) oxide in the air sample? Show your working (2 marks)
 - b) What was the role of:
 - (i) Sodium hydroxide solution (1 mark)
 - (ii) Pyrogallic acid (1 mark).
6. (a) Use the data given to answer the questions that follow.
- | Organism | Number |
|----------|--------|
| Lion | 10 |
| Grass | 1000 |
| Antelope | 200 |
- (i) Construct a possible food chain. (1 mark)
 - (ii) Construct a pyramid of numbers from the given data. (2marks)
- (b) What is the role of the following bacteria in the nitrogen cycle?
- (i) Nitrobacteria (1 mark)
 - (ii) Clostridium (1 mark)
 - (iii) Thiobacillus denitrificans (1 mark)
7. It was observed that when maggots are exposed to light, they move to dark areas. On the other hand, chlamydomonas and spirogyra move towards light.
- (a) Name the type of response shown by the organisms. (1 mark)
 - (b) Give **one** advantage of the response shown by chlamydomonas and spirogyra. (1 mark)
 - (c) Shoot tips are observed to bend towards light coming from one direction.
 - (i) Name the type of response. (1 mark)
 - (ii) Explain how this response occurs. (4 marks)

8. (a) State **two** factors that cause seed dormancy. (2 marks)
 (b) What is the role of the following hormones in insect metamorphosis? (2 marks)
 (i) Juvenile hormone
 (ii) Ecdysone
9. (a) Name any **two** salivary glands. (2 marks).
 (b) Name **two** digestive enzymes secreted in their inactive form. (2 marks)
10. Draw a trifoliolate dicotyledonous leaf that has serrated margin and rounded tip/apex. (3 marks)
11. Two normal parents gave birth to a son later in his years they found out that he always picked up a red jersey when going to school yet the school uniform was a green jersey. They tried to explain to the boy the mistake but the boy could not understand.
 (i) Identify the generic disorder the boy was suffering from. (1 mark)
 (ii) The possible genotype of the parents. (2 marks)
 (iii) Using a genetic cross determine the boy's genotype. (4marks)
12. The figure below illustrates two cells obtained from two different organisms.



- (a) Give the name used to:
 (i) Cell J (1 mark)
 Reason: (1 mark)
 (ii) Cell R: (1 mark)
 Reason: (1 mark)
- (b) State the function of the following parts of a microscope
 (i) Mirror (1 mark)
 (ii) Condenser (1 mark)
 (iii) Stage (1 mark)
13. (a) (i) What is respiratory quotient. (1 mark)
 (ii) State its importance. (2 marks)
 (b) State **two** factors affecting the rate of respiration. (2 marks)
14. State **three** methods of fossil formation. (3 marks)
15. (a) Name **two** types of involuntary muscles in mammals. (2 marks)
 (b) Differentiate between a tendon and ligament. (1 mark)
 (c) Name **two** types of synovial joint. (2 marks)
16. Explain why:
 (a) Four months after fertilization, ovaries can be removed from human female without terminating pregnancy. (2 marks)
 (b) The chances of fertilization are higher in organisms having internal fertilization. (2 marks)
17. List **three** symptoms of diabetes mellitus. (3 marks)
18. State **three** ways in which osmosis is significant to plants. (3 marks)

EASTERN CLUSTER EVALUATION - 2023

231/2

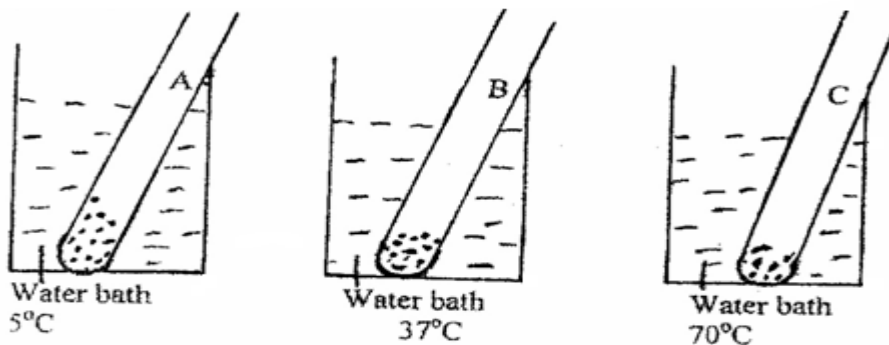
BIOLOGY PAPER 2 (THEORY)

SECTION A.

1. (a) **What** is accommodation? (1mk)
 (b) **Describe** the sequence of events that occur in the eye for one to be able to see clearly
 (i) a distant object (4mks)
 (ii) if one moved from a dim lit room to bright light. (3mks)
2. The following are short messages (sms) on cell phone communication between Mrs. Mkenzie and her husband. They can be used as analogies of gene mutation

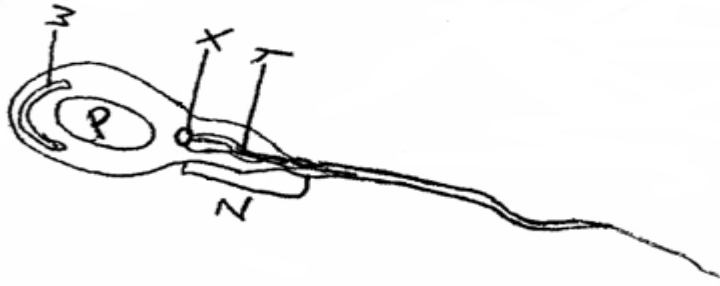
	Intended message	Actual message
1.	I want a drive	I want a driver
2.	Yesterday was my shopping day	Yesterday was my hopping day
3	My skirt was stolen	My shirt was stolen
4	Tomorrow I will be visiting my team	Tomorrow I will be visiting my mate

- a) For each of these messages identify the type of gene mutation illustrated (4mks)
 b) State one example of chromosomal mutation that lead to
 i) Change in chromosome structure (1mk)
 ii) Change in chromosomal number (1mk)
 c) Explain why genetic counseling is termed as one practical application of genetics (2mks)
3. (a) **What** is active transport? (1mk)
 (b) **State three** factors that increase the rate of active transport. (3mks)
 (c) **Give four** roles of active transport in living organisms. (4mks)
4. Three tubes each containing 1ml saliva and 1ml water were incubated in water baths at different temperatures as shown in the diagram below for 30 minutes. Another one tube containing 1ml starch solution was incubated for the same length of time in each water bath. The contents of the two tubes in each water bath was then mixed and incubated for further 30 minutes. The content of each tube was then tested for starch using iodine solution.



- (a) What was the aim of the experiment? (1 mark)
 (b) Why was it necessary to incubate the tubes for 30 minutes before mixing their contents? (1 mark)
 (c) State the colour changes you would expect to observe after adding iodine solution. (3 marks)
 (d) Account for the expected observations. (3 marks)

5. Below is a diagram of a sperm cell.



- (a) Identify parts labeled **X** and **Y**. (2 marks)
 - (b) Explain how parts **W** and **Z** adapt the cell to its function. (4 marks)
 - (c) Using letter **P** identify or label on the diagram the part of the cell rich in DNA. (1 mark)
 - (d) State the function of part **X**. (1 mark)
6. An experiment was carried out whereby three healthy rats were fed on equal amounts of glucose. After half an hour, the glucose concentration per ml. of blood was measured at 15 minutes intervals for three hours. The following results were obtained.

Glucose conc. mg/ml Rats	0 min	15 min	30 min	45 min	60 min	75 min	90 min
A	0.800	0.774	0.715	0.680	0.650	0.595	0.555
B	0.745	0.695	0.695	0.660	0.635	0.600	0.545
C	0.795	0.695	0.665	0.635	0.590	0.550	0.495
Mean	0.780	0.72	0.691	-	0.625	-	0.532

- (a) (i) Calculate the mean concentration of glucose in mg per ml of blood at 45 and 75 minutes. Record your answer on the table. (2 marks)
 - (ii) On the graph paper provided, plot a graph of the mean glucose concentration against time. (6 marks)
 - (iii) What was the mean glucose concentration in the blood after 37.5 minutes? (1 mark)
 - (iv) Give a reason why it was necessary to use three rats in the experiment instead of one. (1 mark)
 - (v) Why was the initial concentration of glucose in the rats not the same? (2 marks)
 - (vi) Account for the difference in mean glucose concentration during the period. (3 marks)
 - (b) Give **two** reasons why glucose is the main respiratory substrate. (2 marks)
 - (c) Give three ways in which glucose is assimilated in the body. (3 marks)
7. (a) What assumption are made when using the captured recapture method in estimating population of animals. (5 marks)
- (b) Describe how you would use the capture – recapture method to estimate the population of fish in the school pond. (13 marks)
- (c) State two other methods of estimating population. (2 marks)
8. **Describe** the role of the liver in homeostasis. (20mks)

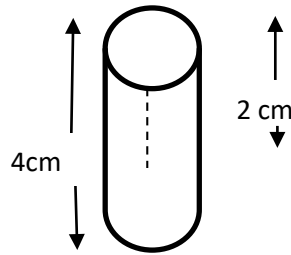
EASTERN CLUSTER EVALUATION - 2023

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BIOLOGY PAPER 2

PRACTICAL

1. Cut 2 pieces of specimen Q provided; each 4 cm long. Split each half-way at the center (cut about 2 cm) as shown below on the diagram.

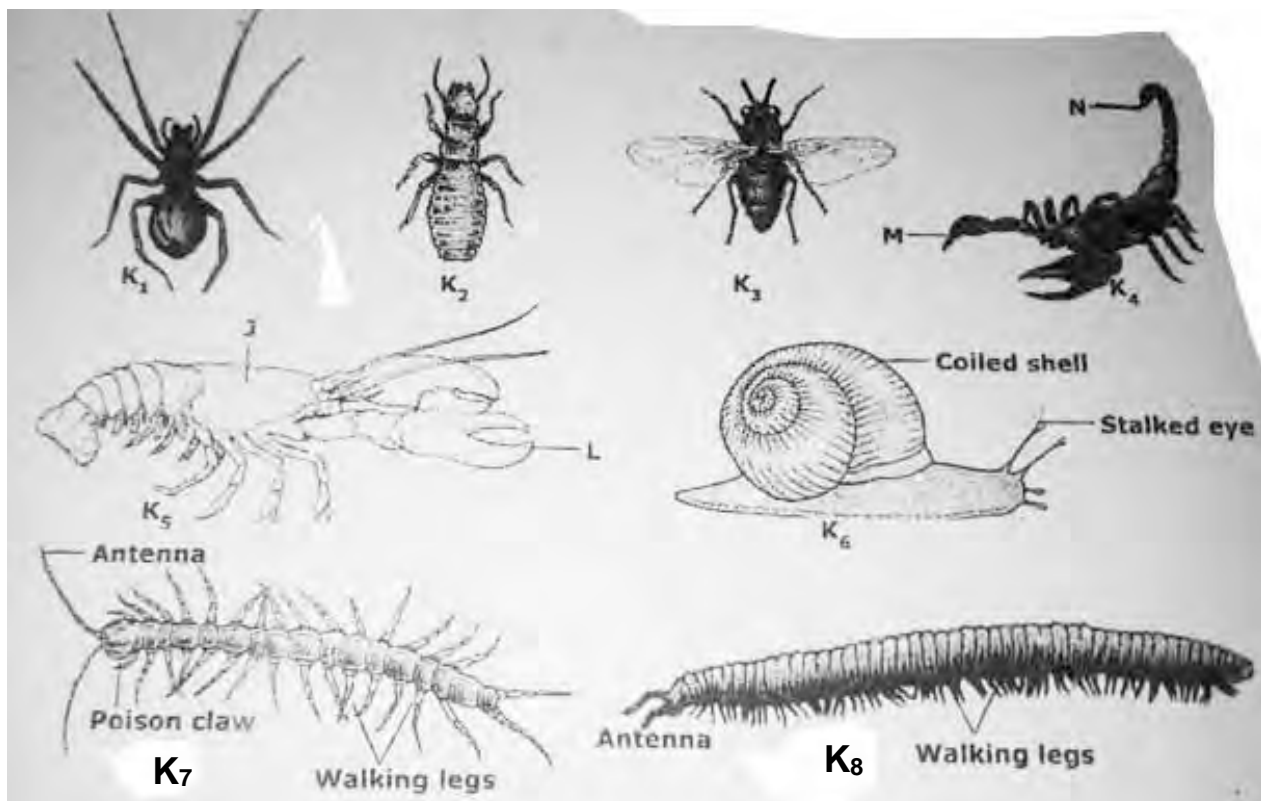


You are provided with 2 petri dish S and T. Place one piece on petri dish S, the other on Petri dish T. To S, add distilled water, and T add 25% sucrose solution. Leave the set-up for 15 minutes.

Record observation on the table below (2mks)

Petri-dish	Observation
S	
T	

- (i) Explain the observation in S, T (4mks)
 - (ii) Feel both Q in S and T between 2 fingers and record observations. (2mks)
 - (iii) Explain the significance of the conditions in S to flowering plants. (2mks)
 - (iv) Explain what would happen to red blood cells when placed to 23% sucrose solution. (2mks)
2. A student collected a number of organisms as shown below. She constructed a dichotomous key as shown below



Dichotomous key:

1. a) Organism with limbs go to 2
b) Organism without limbs go to 3
2. a) Organism with three pairs of limbs go to 4
b) Organism with more than three pairs of limbs go to 5
3. a) Organism with calcareous shell *Mollusca*
b) Organism with horny scales on body *Ophidia*
4. a) Organism with wings *Diptera*
b) Organism without wings *Isoptera*
5. a) Organism with four pairs of limbs go to 6
b) Organism with more than four pairs of limbs go to 7
6. a) Organism with poison claw *Arachnida*
b) Organism without poison claw *Arachnida*
7. a) Organism with chelicerae *Crustacea*
b) Organism without chelicerae go to 8
8. a) Organism with a pair of legs per segment *Chilopoda*
b) Organism with two pairs of legs per segment *Diplopoda*

(a) Using the key, write the steps followed to arrive at identity of each specimen. (8mks)

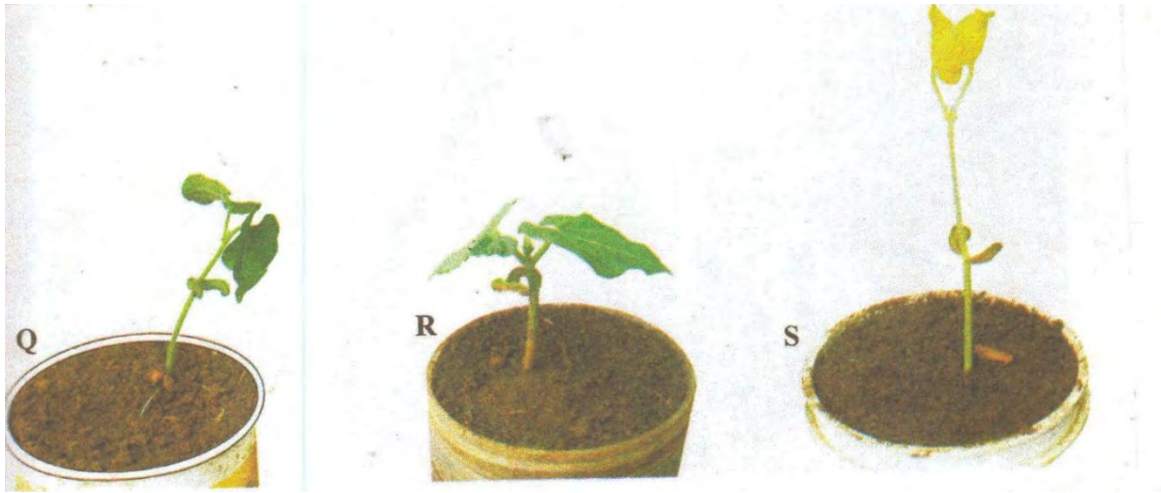
Specimen	Steps	Identity
K1		
K2		
K3		
K4		
K5		
K6		
K7		
K8		

(b) Name and state the functions of the following parts

Part	Name	Function
M
N

- (c) (i) Name the class of K3 (1mk)
(ii) Give a reason (1mk)

3. Study the experiments below and answer the following questions. Q, R and S were grown in different environmental conditions.



- (a) State the conditions under each seedling was grown. P,Q , R (3mks)
 (b) List in a table form the observable differences between R and S. (3mks)

Seedling R	Seedlings S

- (c) State the term used to describe seedling S. (1mk)
 Significance of this condition (1mk)
 (d) Account for differences in length of R and S. (1mk)
 (e) Name the response shown by seedling Q and explain how it occurs
 Response: (1mk)
 Explain (2mks)
 (f) State the type of germination (1mk)
 Reason (1mk)

EASTERN CLUSTER EXAMS

BIOLOGY 231/3

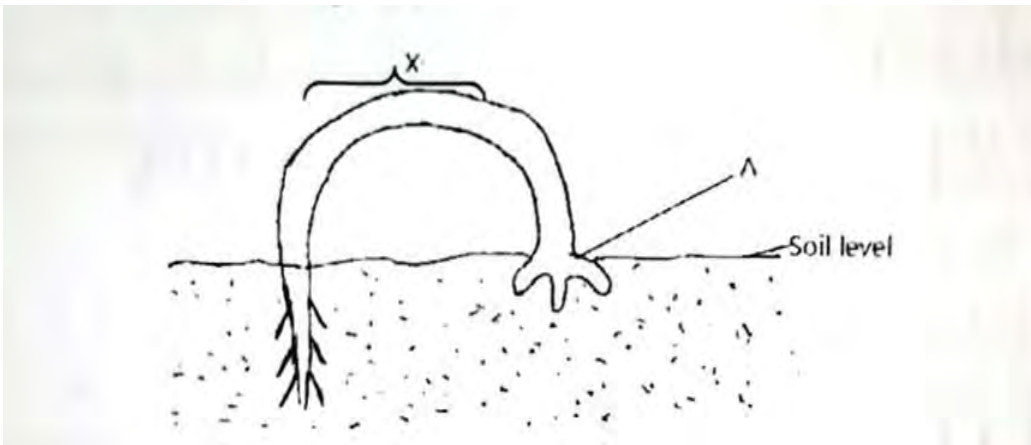
CONFIDENTIAL

- 2 pieces of 4cm long stalk of young bidens pilosa or Tradescantia or zebrina.
 - Means of labelling 2
 - 3 empty petri dishes
 - Distilled water
 - 25% sucrose solution

BOKAKE EXAMINATION**231/1****BIOLOGY PAPER 1 (THEORY)**

1. Name the reagent used for testing presence of (3 marks)
 - (a) Starch
 - (b) Reducing sugars
 - (c) Vitamin c
2. State the processes which occur in each of the following organelles. (2 marks)
 - (a) Chloroplast
 - (b) Mitochondrion
 - (c) Ribosomes
3. A student observed a specimen through a light microscope. He used the objective lens marked X40. If he indicated the magnification of the image as x 400, what was the eye - piece magnification?
(Show your working). (3 marks)
4. State the function of the following in mammalian trachea. (3 marks)
 - (a) Rings of cartilage
 - (b) Mucus
 - (c) Cilia
5. (a) What do you understand by the term biological control? (1 mark)
(b) Explain why all the energy produced by producers does not flow to the tertiary consumers. (2marks)
6. Name any three forces that maintain the transpiration stream (3 marks)
7. Give the form in which the following gases are transported in blood. (3 marks)
 - (a) Oxygen
 - (b) Carbon (IV) oxide.
 - (c) Carbon (II) oxide
8. (a) Name the main group of organisms which comprise the Kingdom Monera. (1mark)
(b) State any three ways in which the organisms named in 8 (a) above affect human lives. (3marks)
(c) State the main characteristics of Monera which distinguish it from all other kingdoms. (1 mark)
9. Seed germination is affected by certain plant growth regulators.
Describe two actions of gibberellins during seed germination (2marks)
10. Why is it necessary for an athlete to breathe heavily after running? (2 marks)
11. State ways in which the following diseases can be prevented (2 marks)
 - (a) Typhoid (2 marks)
 - (b) Malaria (2 marks)
12. A person fell from the third floor of a storey building and had part of his brain damaged indicate the part of the brain damaged if the person suffers from the following (4marks)
 - i) Loss of memory and speech.....
 - ii) Inability to regulate body temperature.....
 - iii) Irregular heartbeat and breathing.....
 - iv) Inability to maintain proper body balance and posture.....
13. (a) Name the main product of the dark stage of photosynthesis. (1mark)
(b) What is the role of chlorophyll during photosynthesis (2mark)
14. Name three mechanisms that prevent self-pollination in flowers that have both male and female parts. (3 marks)
15. State three applications of anaerobic respiration. (3 marks)
16. What is the significance of highly folded inner membrane of a mitochondrion? (2 marks)
17. Why is it necessary for blood from the gut to pass through the liver before joining general circulation? (2 marks)

18. A person's urine tested positive for reducing sugars.
- (a) Name the type of sugar present in the urine. **(1mark)**
- (b) Name the gland and the hormone which failed to control the above condition. **(2marks)**
 Gland
 Hormone
- (c) Which disease was the person suffering from? **(1mark)**
19. State two roles played by the process of reproduction. **(2marks)**
20. a) Name the genetic disorder in humans that is characterized by inability of blood to clot **(1mark)..**
- b) A female human was found to have an extra sex chromosome in her cells.
- i) Give the total number of chromosome in the male individuals cells **(1mark)**
- ii) Explain the possible causes of this condition **(2marks)**
- iii) State two physical characteristics observed in the male individual with such a condition **(2marks)**
21. (a) State ways in which molars are adapted to their functions. **(2marks)**
22. (a) Explain why fossil records as evidence of organic evolution are usually incomplete **(3 marks)**
- (b) Name the evidence of organic evolution exhibited by occurrence of similar amino acid molecules in a range of organisms **(1mark)**
23. The diagrams below represent germination of a certain seed

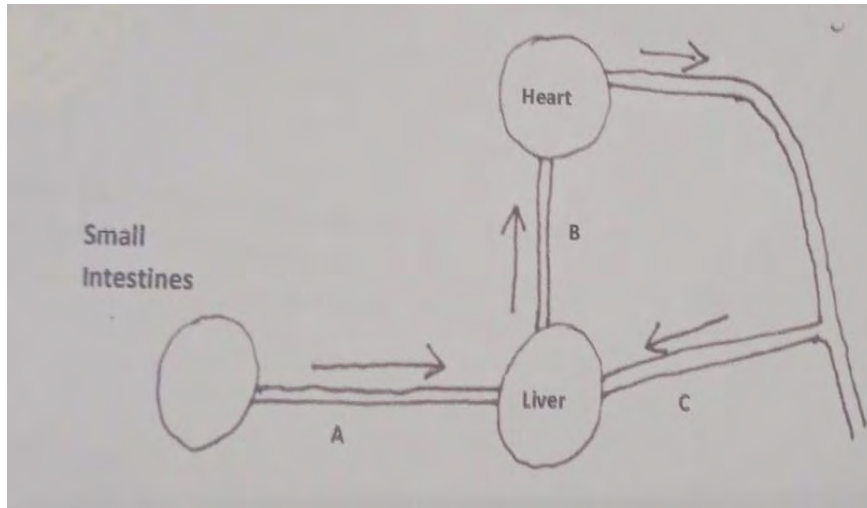


- a) Name the type of germination exhibited by the seedling above **(1mark)**
- b) Name the region labeled x **(1mark)**
- c) Explain how the part labeled x of the seedling straightens after exposure to sunlight. **(3marks)**
24. State any one characteristic common to all living organism? **(1mark)**
25. (a) State one event that occurs in prophase of meiosis I which does not occur in prophase of mitosis. **(1 mark)**
- (b) What are the results of the above phenomena? **(2 marks)**
26. Explain why growing grass die a few days when salt is sprinkled on it. **(3marks)**

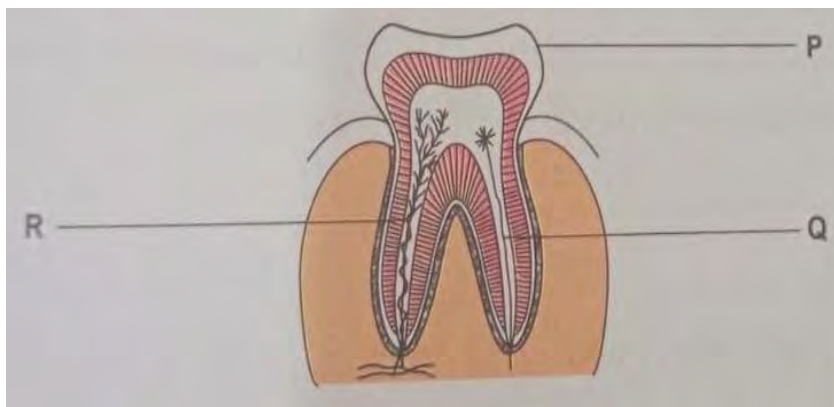
BOKAKE JOINT EXAMS
231/2
BIOLOGY PAPER 2 THEORY
END OF TERM 2, 2023

SECTION A (40 MARKS)

1. The diagram below illustrates circulation in certain organs of the mammalian body.

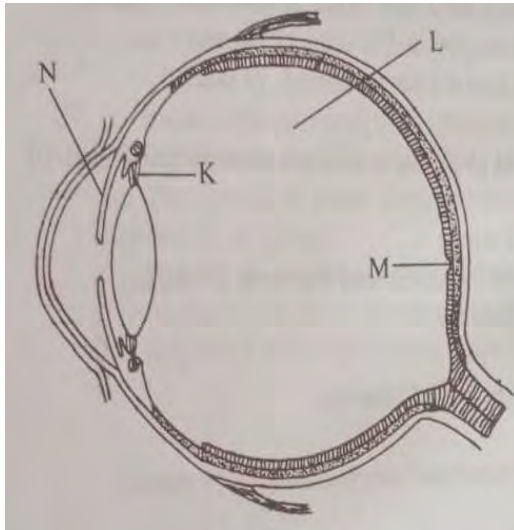


- (a) Identify the blood vessels represented by A, B and C. (3mks)
 - (b) Explain why blood from the small intestines goes to the liver before it goes to any other organ of the body. (2mks)
 - (c) Compare the blood in vessels B and C (1mk)
 - B - C -**
 - (d) Outline how a glucose molecule in vessel A finally reaches the heart. (2mks)
2. The diagram below represents a section through a human tooth.



- i) Name the type of tooth shown (1mk)
- ii) Give a reason for your answer (i) above. (1mk)
- iii) Name the structures P, Q, R. (3mks)
- iv) State three ways of keeping teeth healthy. (3mks)

3. The diagram below represents a longitudinal section through the human eye.



- (a) Name the structures labeled K and L (2mks)
 - (b) State the changes that would occur in the structure labeled N when a person in a dark room switches on the lights. (2mks)
 - (c) Name the part labeled M and state how it is adapted to its function. (2mks)
 - (d) How does the human eye obtain nutrients? (2mks)
4. An investigation was carried out to study the effects of the concentration of sucrose solutions on pieces of tulip stem 44mm in length. The pieces were placed in different concentrations of sucrose solutions and measured after two hours of immersion. The results are shown in the table below.

Sucrose concentration (moles per litre)	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Length after 2 hours (mm)	50	48	46	44	42	42	42

- (a) Explain the effects of the 0.2 moles per litre sucrose solution on the length of the pieces of tulip stem. (3mks)
 - (b) Use information from the table to predict the concentration of a sucrose solution isotonic to the cells in the tulip stem. (1mk)
 - (c) (i) Give the term which would be used to describe the cells in the tulip stem after immersion in a solution with a sucrose concentration of 0.7 moles per litre. (1mk)
 - (ii) Draw the appearance of a cell from the tulip stem after immersion in a solution with a sucrose concentration of 0.7 moles per litre. (2mks)
 - (d) State one role of the process being investigated in plants/ (1mk)
5. (a) How many sex chromosomes are there in each human somatic(body) cell. (1mk)
- (b) What is meant by the term sex-linkage? (1mk)
- (c) Haemophilia is due to a recessive gene. The gene is sex linked and located on the X chromosome. In a family where both parents were normal, one of the sons was haemophiliac.
- (i) Using letter H for normal blood clotting gene, work out the genotype of the children. (4mks)
 - (ii) What is the probability of a child born by this couple being a boy and haemophiliac. (4mks)
- (d) Explain why haemophilia is more common in males than in females. (1mk)

SECTION B (40MARKS)**Answer questions 6(compulsory) and either question 7 or 8:**

6. The mean dry weight in milligrams of germinating barley grains was worked out for whole grain, endosperm and the embryo. The means were determined at two day intervals for twelve days. The results are shown in the table below;

Time in days	Dry weight of whole grain (mg)	Dry weight of endosperm (mg)	Dry weight of embryo (Mg)
0	49	45	6
2	46	42	6
4	44	35	9
6	42	24	17
8	40	12	25
10	41	8	32
12	45	8	40

- (a) Using the same axes, draw graphs for dry weight of endosperm, embryo and the total dry weight against time. (7mks)
- (b) What was the average dry weight of the embryo on day 9? (1mk)
- (c) Account for the dry weight of;
- (i) Endosperm from day 0 to 12. (4mks)
- (ii) Whole grain from day 0 to 12. (4mks)
- (d) Other than water which other factors are necessary for germination. (2mks)
- (e) Name the two types of germination. (2mks)
7. (a) Describe the mechanism of opening and closing of the stomata using the following theories. (12mks)
- a) Photosynthetic theory.
- b) Starch sugar inter-conversion theory.
- c) The potassium ion theory.
- (b) Explain how respiratory surfaces in animals are adapted to their functions. (8mks)
8. (a) Define pollution. (2mks)
- (b) Describe water pollution under the following:-
- (i) Causes. (6mks)
- (ii) Effects of pollutants on plants and animals. (6mks)
- (iii) Methods of controlling pollution. (6mks)

BOKAKE EXAMINATON
231/3
BIOLOGY PAPER 3
PRACTICAL

1. You are provided with solution M, Dilute Hydrochloric acid ,DCPIP, Benedict’s solution, 1% copper II Sulphate solution and 10% sodium hydroxide solution.
 Add 2ml of hydrochloric acid to solution M and Shake.
 Filter the mixture using the filter paper and filter funnel into a boiling tube provided.
 Wash the residue from the filter paper into a beaker.

Using the reagents provided carry out food tests on the residue and filtrate. (15 marks)

a) **Residue**

Food substance being tested for	Procedure	Observation	Conclusion
REDUCING SUGARS			
VITAMIN C			
PROTEINS			

b) **Filtrate**

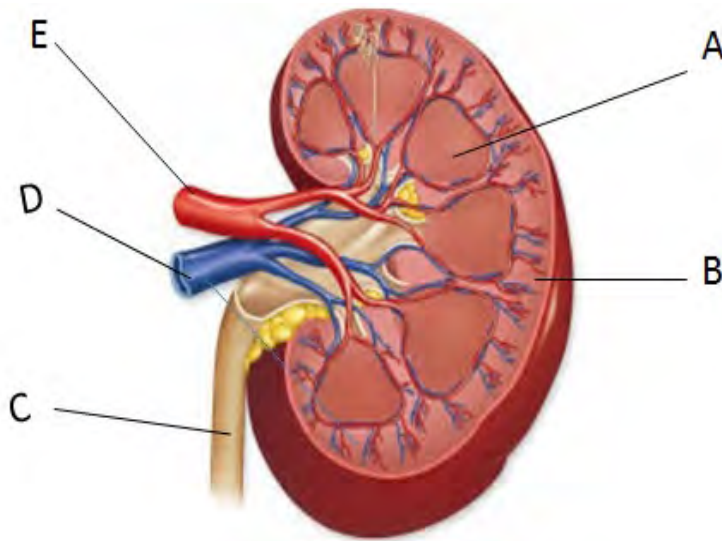
Food substance being tested for	Procedure	Observation	Conclusion
REDUCING SUGARS			
VITAMIN C			
PROTEINS			

- c) Account for the observation in (a) and (b) above. (2mks)
 d) The physiological process demonstrated above occurs in all living things. Name two important processes in animals that depend on it. (2mks)
2. You are provided with specimen R and S
- a) i) Give a reason why both R and S are fruits. (1mk)
 ii) Why is R also referred to as a seed? (1mk)
 iii) Tabulate any two differences between specimen R and S (2mks)

Specimen R	Specimen S

- b) Using a blade provided; carefully make transverse section of specimen S.
- i) Make a labelled diagram of the cut section. Label any three parts. (4mks)
 ii) Name the type of placentation in S .Reason (2mks)
 iii) What is the likely agent of dispersal of S? Reason (2mk)

3. The photograph below is of mammalian organ



- a) i. Name the basic functional units of the organ. (1mk)
- ii) State any function of the organ above. (1mk)
- b) Name the parts labelled- A, B & C (3mks)
- c) How is the blood vessel E adapted its function. (2mks)
- d) Give two differences between blood flowing through vessel E and D (2mks)

Blood in E	Blood in D

**BOKAKE 231/3
BIOLOGY
PAPER 3 PRACTICAL**

INSTRUCTIONS TO SCHOOL (CONFIDENTIAL)

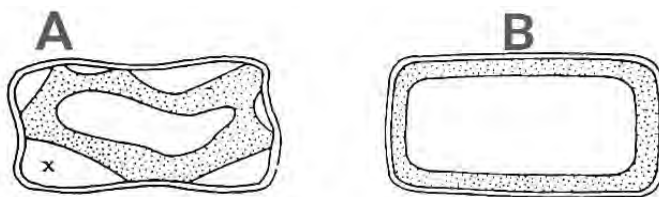
1. 20ml of Solution M -A mixture of Glucose, Ascorbic acid and Egg albumen
2. About 5ml of 0.1 M Hydrochloric acid with a dropper
3. Specimen R --- A Maize grain
4. Specimen S ---- A Ripe Orange
5. A scalpel blade
6. A filter paper
7. A filter funnel
8. A boiling tube in a rack
9. 10ml Measuring cylinder
10. 4 Test tubes in a rack
11. A 50ml empty beaker

Access to the following:

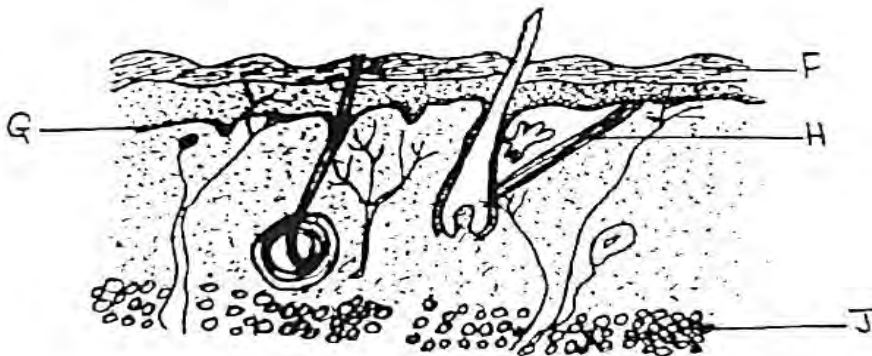
- ❖ Benedict’s solution
- ❖ 1% copper II Sulphate solution with dropper
- ❖ 10% Sodium Hydroxide solution with dropper
- ❖ DCPIP solution with dropper
- ❖ Distilled water in a wash bottle

KIHARU KAHURO
231/1
BIOLOGY PAPER 1

- 1 a) state the most appropriate apparatus for collection of the following living organisms
 - Rats [1mark]
 - Centipedes [1mark]
- b) Name the characteristics of living organisms shown by the following
 - Involved in energy transformation [1mark]
 - Important but one can do without and yet live a full life [1mark]
2. Give three general characteristics of members of kingdom Monera [3marks]
3. The diagrams below represents plant cell A and B, placed in two different solutions. Study the diagrams and answer questions that follow.



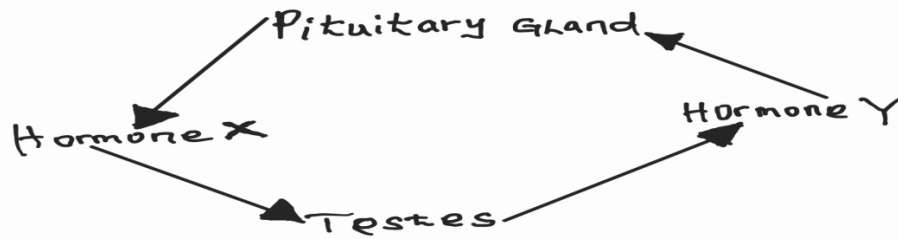
- i) Identify the nature of solution into which each cell was placed. A & B [2mark]
 - ii) Name the physiological process responsible for the observed results [1mark]
 - iii) Describe what would happen if a red blood cell was placed in solution in which B was placed [2marks]
4. a) Name two tissues which are thickened with lignin and serve as strengthening tissues in plants [2marks]
 - b) Explain why the presence of air bubble in a xylem vessel would cause drying up of the plant [2marks]
5. a) A certain organ X was surgically removed from a rat, later a drastic increase in glucose level was observed in the blood. Substance S was injected into the animal's blood. The whole process reversed. Identify;
 - Organ X
 - Substance S
 - b) The diagram below shows a longitudinal section of a mammalian skin.



- i) Name the parts labeled F and G [2marks]
 - ii) State one function of part H [1mark]
6. a) Explain why feeding on ugali and milk only would lead to constipation [2marks]

b) Explain why it is an advantage for the plant to store carbohydrates as starch rather than as sugars [2marks]

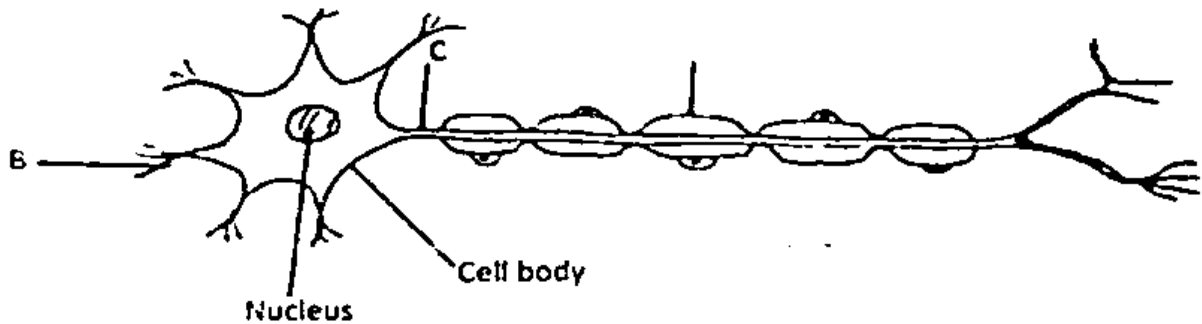
7. The diagram below represents a simple endocrine feedback mechanism in human male.



a) Name the hormone labeled X [1mark]

b) State two differences that may be observed between a normal male and one who is incapable of producing hormone labeled H [2marks]

8. Study the diagram of a neurone in human beings



a) Identify the neurone [1mark]

b) Name the part labeled B [1mark]

c) What would be the effect of the following treatments on transmission of nerve impulse?

i) Inducing axon with metabolic inhibitors [1mark]

ii) Removing myelin sheath from a nerve fiber [1mark]

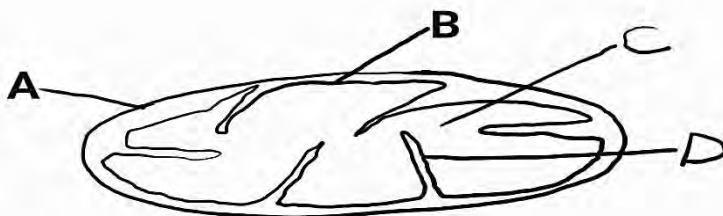
9. a) What is sex_ linkage? [1mark]

b) Name two sex linked traits in Y chromosome in humans [2marks]

10. a) Explain why Lamarck's theory of evolution is not accepted in modern science [2marks]

b) Give two examples of natural selection in action [2marks]

11. Below is a diagram of an organelle that is involved in aerobic respiration



a) Name the organelle [1mark]

b) Identify the parts labeled A and B [2marks]

c) What is the purpose of in- folding in part labeled D [1mark]

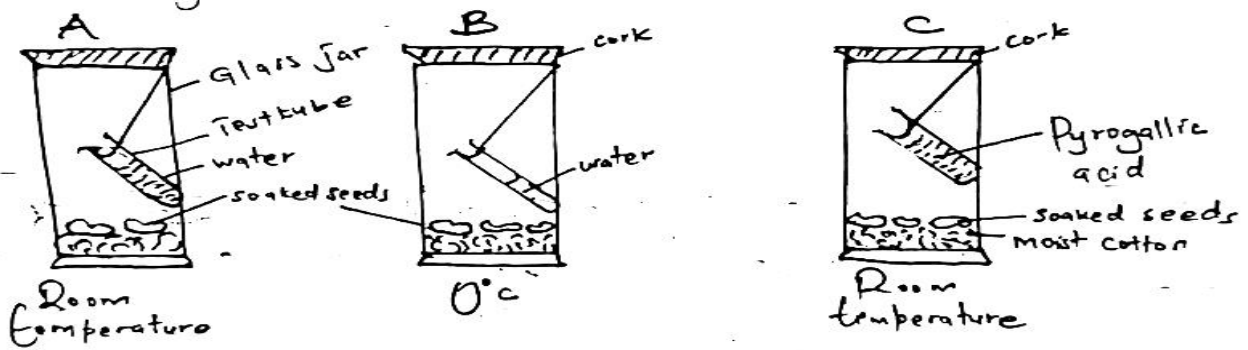
d) Give the mechanical compound which is formed in the organelle and forms the immediate source of energy [1 mark]

12. i) Suggest the significance of the following adaptations in bony fish;
 Flexible vertebral column [1mark]
 Presence of a swim bladder [1mark]
- ii) State two features which reduce resistance in fish during swimming [2marks]
13. In an experiment on respiration, a mouse was observed to have inhaled 200cm^3 of oxygen and exhaled 199.75cm^3 of carbon[IV] oxide in ten minutes.
 I] Calculate the respiratory quotient for the activity in the experiment [2marks]
 II] Suggest the food substrate that was broken down [1mark]
14. a) Explain why malaria cannot be transmitted through blood transfusion [2marks]
 b) Explain the significance of the following with respect to ecosystem
 Decomposers [1mark]
 Predators [1mark]
15. State three ways in which seed dormancy benefits a plant [3marks]
16. a) Explain why maize stalks do not undergo secondary growth yet they increase in girth [3marks]
 b) State two characteristics of meristem tic cells [2marks]
17. i) Explain why two species cannot occupy the same niche [2marks]
 ii) Name the bacteria found in root nodules of leguminous plant [1mark]
18. a) What are the roles of testes in the mammalian reproductive system? [2marks]
 b) Explain why female frogs produce large number of eggs [2marks]
19. a) Differentiate between gaseous exchange and respiration [2marks]
 b) State two characteristics of a respiratory surface [2marks]
20. Study the diagram below and the answer questions below

Trypsinogen Compound X → **Trysin**

- i) Name compound X [1mark]
 ii) State the role played by compound X in small intestine [1mark]
 ii) Other than trypsin, name two other enzymes produced in precursor form [2marks]
 iii) State the role played by compound X in the stomach [1mark]
21. Name the organelle that perform each of the following
 Protein synthesis [1mark]
 Transport of cell secretions [1mark]
22. Name the type of muscle found in human heart [1mark]

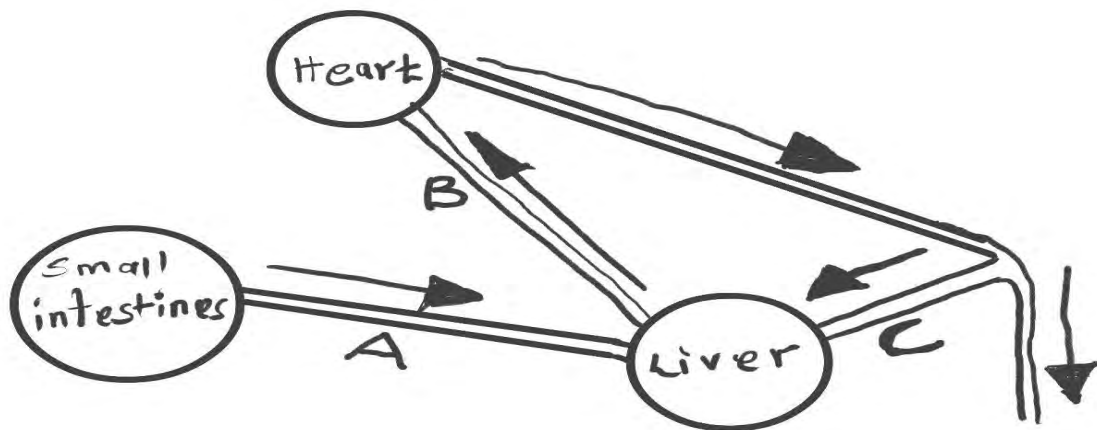
3. The diagram represents a set up to investigate the conditions necessary for seed germination . The set up was left or 7 days



- ii) What conditions were being investigated in the experiment? (2marks)
- iii) Account for the for the expected results in each set up after 7 days

- A (2marks)
- B (2marks)
- C (2marks)

4. The diagram below illustrates circulation in certain organs of the mammalian body .



- a) Identify the blood vessels represented by: A, B & C (3marks)
 - b) Explain why blood from the small intestines goes to the liver before it goes to any other organ of the body. (2marks)
 - c) Compare the blood in vessel B and C (1mark)
 - d) Outline how a glucose molecule in vessel A finally reaches the heart. (2marks)
5. Haemophilia is a sex linked characteristics caused by a recessive gene carried on the X chromosome.

A carrier woman marries a normal man. Use letter H to represent the dominant gene

- a) Work out the phenotypes of F1 generation (show your working) (5marks)
- b) What is the probability of couple getting b a hemophiliac son? (1mark)
- c) Define the following terms as used in genetics
 - i) Allele (1mark)
 - ii) Genetic engineering (1mark)

SECTION B

6. A student grew two separate cultures of single celled organisms. One culture contained *Paramecium caudatum* and the other contained *Paramecium Aurelia*. the cultures were grown under the same condition and the number of paramecia (per drop) in each culture was estimated every two days for a period of 16 days . The results are shown in the table below.

No of days		0	2	4	6	8	10	12	14	16
No of paramecia present (per drop)	P Caudatum	4	1	30	4	58	62	60	61	60
	P Aurelia	4	1	46	6	70	69	71	71	71

- a) Using the same axis , draw graphs of number of paramecia in the culture against time (8marks)
- b) How many paramecia were present on the 7th day (2marks)
- c) Account for change in the populations between day 0 and 8 (4marks)
- d) i) what happens to P Caudatum between day 10 and 16? (1mark)
 ii) What biological Phenomenon is represented by observation in (d)(i) above (1mark)
- e) State any four biological factors that regulate population growth of animals in this habit (4marks)
7. Describe how the structure of mammalian eye is adapted to its function (20marks)
8. a) Describe factors that make the leaf of a terrestrial plant to absorb maximum light for photosynthesis (12 marks)
 b) Describe how support is achieve in herbaceous Plant and shrubs (8 Marks)

KIHARU KAHURO

231/1

BIOLOGY PAPER 3[PRACTICAL]

Q1. You are provided with a mature specimen H.

- Make a cross section cut of specimen H,
Draw and Label at least 3 parts of the diagram. (3marks]
- Suggest the placentation of specimen H. (1mark)
- Squeeze the juice from the halves into a beaker. Filter the juice and discard the residue. Using part of the juice and the reagents provided only, test for the food substance in the juice. Record in a table, the food substance tested. The procedure of the test, the observation and conclusions. (9marks)

Q2. a) Take a small amount of substance B provided and add 2cm³ of sodium hydrogen carbonate solution.

- State your observation. (1mark)
- Which process in the body is illustrated above? (1mark)
- State the part of the body where the above process takes place. (1mark)
- State two functions of substance B in the body. (2marks)
- Name two diseases of the circulatory system caused by excess cholesterol in the food. (2marks)

b) The photograph below an the plants adopted to difficult habitats. Examine them.



- Which of the plants are adapted to arid conditions. (2marks)
- Give three observable features that enable the plant you have stated in (a) (i) above to survive in the arid regions. (3marks)
- State three other adaptive feature not observable in the diagram in the photograph of the plants you state in (a) (i) above. (3marks)
- Give the term used for plants that are adapted to arid and semi-arid conditions. (1mark)

Q3. You are provided with an actual specimen labeled D. Study it and answer the questions that follows:

- State the class from which specimen D was obtained and give two reasons for you answer.
Class. (1mark)
Reason. (1mark)
- State two observable features that adopt specimen D for gaseous exchange. (2marks)
- Account for the following features of the specimen D.
 - Extensive network of veins. (1mark)
 - Tough leaf blade. (1mark)
 - Strong and extended petiole. (1mark)

- d) Explain why the following procedures would be necessary during the preparation of sections for observation.
- i) Putting the sections in water on a Petridis. (1 mark)
 - ii) Using a sharp scalpel /razor blade. (1mar)
 - iii) Cutting very thin sections. (1mark)

KIHARU KAHURO
BIOLOGY PP3

CONFIDENTIAL, TERM 2 2023

A) Specimens

- i) Specimen H (Mature orange fruit)
- ii) Specimen D Kale (sukumawiki) leaf with petiole

OTHERS

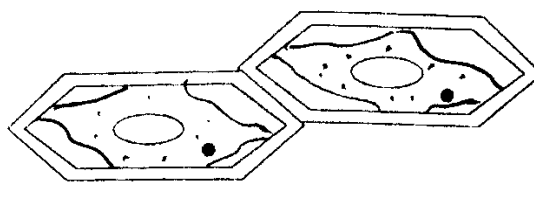
1. Six test tubes per student
2. Scapel/Razor blade
3. White tile
4. Droppers
6. Source of heat

B) Chemical and Reagents

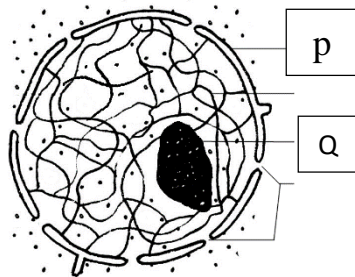
1. DCIPIP
2. Iodine solution
3. Benedict's solution
4. About 3cm³ of substance B (Olive oil)
5. About 20cm² NaHCO₃

LUGARI CONSTITUENCY -MOCK 1
231/1
BIOLOGY PAPER 1
JULY/AUGUST 2023

1. Study the diagram below showing a portion of an onion epidermis that had been irrigated with a certain solution X.

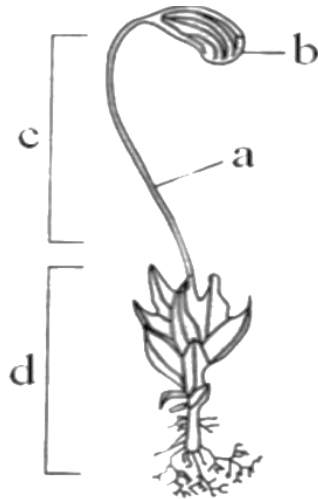


- a) In one word describe the condition of the cells (1mk)
 b) Describe the process that lead to the condition named above. (3mks)
2. The following reaction may proceed in forward or backward direction
 Glucose + fructose \rightleftharpoons sucrose + water.
- a) What term is used to refer to the backward reaction. (1mk)
 b) In which part of alimentary canal does the backward reaction occur? (1mk)
 c) Name the enzyme that catalyzes the backward reaction. (1mk)
3. The diagram shown below represents a nucleus

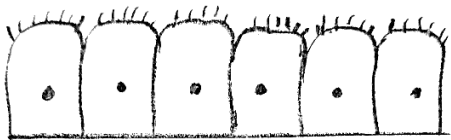


- a) State the role of the organelle labelled **Q** (1mk)
 b) Name a Kingdom whose members lack structure labelled **P** (1mk)
 c) Which is the general term given to organisms whose cells have structure **P**? (1mk)
4. After fertilization of an ovule, which parts develops into: -
 a) Testa (1mks)
 b) Endosperm (1mk)
5. a) Explain two roles of diffusion in human beings. (2mks)
 B i) Name the process through which a plant takes up some mineral ions against a concentration gradient. (1mk)
 ii) State two factors that may affect the process named in b(i) above. (2mks)
 c) Distinguish between haemolysis and plasmolysis. (1mk)
6. An insect landed on a leaf of an insectivorous plant. Consequently, the leaf closed with its spines interlocking trapping the insect inside it. Name the response exhibited by the leaf. (1mk)

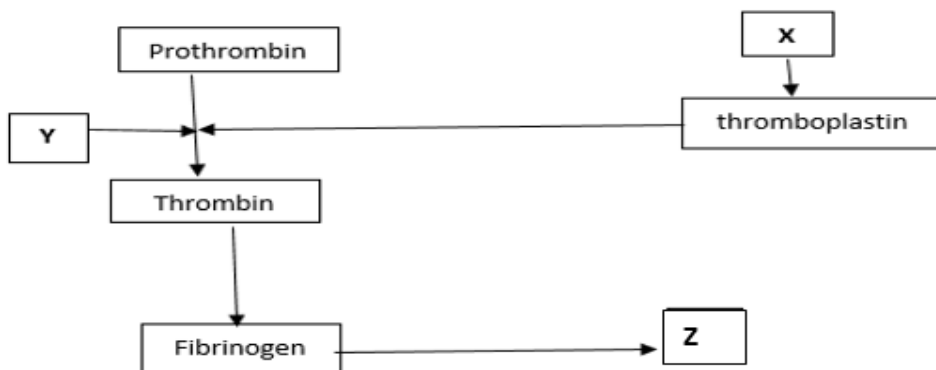
7. The figure below represents a plant.



- a) State the division it belongs to. (1mk)
 - b) Label the parts labeled a & b (2mk)
 - c) State the role of part labeled d in the life cycle of the organism. (1mk)
8. State any two adaptations of the cardiac muscle that enable it to undergo systole. (2mks)
9. a) Why are carbohydrates and not lipids the first choice respiratory substrates? (2mks)
- b) $2C_{57}H_{110}O_6 + 163O_2 \longrightarrow 114CO_2 + 110H_2O + \text{Energy}$. (2mks)
- Calculate the RQ from the equation in (c) above. (2mks)
10. Below is a diagram of a group of cells of a specific tissue.

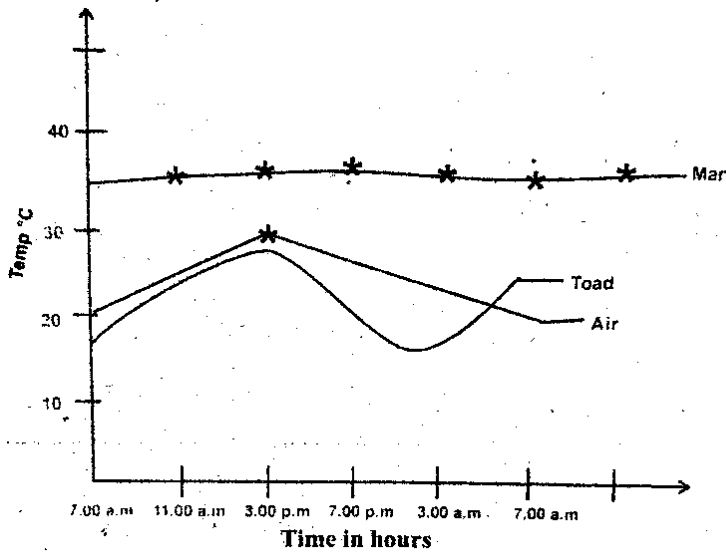


- i) Name the tissue (1mk)
 - ii) This tissue lines the trachea and bronchi. Suggest its function in these structures. (1mk)
11. Study the flow chart below which represents a physiological process in mammals

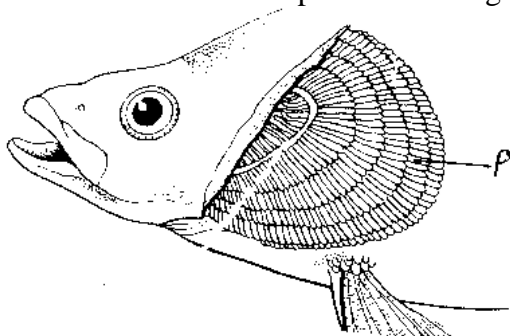


- A i) Name blood components represented by X. (1mk)
 - ii) What is the significance of product represented by Z. (2mks)
 - b) Under what condition is thrombokinase released by the platelets? (1mk)
12. a) Explain what happens to excess amino acids in the liver of humans. (3mks)
- b) Which portions of the human nephron are only found in the cortex? (1mks)

13. A potted plant is transferred from outside on a sunny and windy day, to a dark room.
- Briefly explain the effect this is likely to have on:
 - The rate of loss of water from its leaves. (3mks)
 - The rate of water absorption. (2mks)
14. Give a reason why urine of a mammal does not contain amino acids. (1mks)
15. a) In what form is energy stored in muscles? (1mk)
 b) State the role of insulin in human body. (2mks)
16. Name the processes that take place in the liver to bring about differences between blood in the Hepatic portal vein and that in the hepatic vein. (3mks)
17. The graph below shows how the body temperature of a toad and man varies with time in hours. Study it and answer the questions that follow.

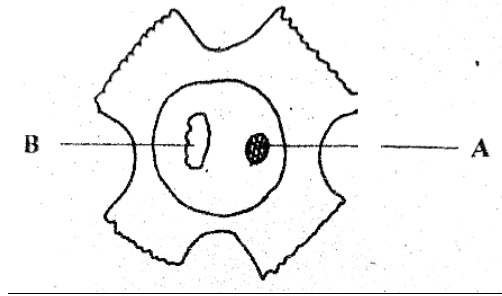


- What is the relationship between the body temperature of the toad and that of the atmospheric air? (1mk)
 - State two corrective measures that maintains man's body temperature at norm even when the environmental temperature is below 30°C. (2mks)
 - Give one behavioral adaptation observed in a lizard when the environmental temperature is above 39°C. (1mk)
18. The figure below shows the exposed breathing apparatus of a fish.

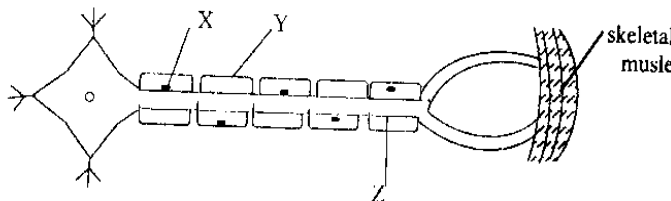


- Name the structure that was removed to expose the apparatus. (1mk)
- Name structure P. (1mk)
 - State two structural adaptations of the respiratory surface in insects. (2mks)

19. The following is a reproductive structure of a plant.



- a) Identify the structure. (1mk)
 - b) Name the sub-division of the plants that produces the above reproductive structure. (1mk)
 - c) i) Name structure B. (1mk)
 - ii) What is the function of structure A? (1mk)
20. Nucleic acids are made up of nucleotides that bears a sugar component.
- a) Name the sugar component found in: - (2mks)
 - i) DNA fragment -----
 - ii) RNA fragment -----
 - b) The following nucleotide sequence was found in a segment of DNA: - **A G C C T**. Write down the complementary base sequence in the corresponding m RNA segment during transcription. (1mk)
 - c) A point mutation altered the base sequence from the original to **G G C C T**. Identify the type of gene mutation. (1mk)
21. Below is a drawing of a cell.



- a) With two reasons, identify the cell. (2mks)
 - Identify. -----
 - Reasons:
 - b) Which of the three structure X, Y and Z speeds up transmission of the impulse. (1mk)
22. a) Name the pigment that protects humans from the negative effect of Ultraviolet lights. (1mk)
- b) Explain how sunlight contributes to stronger bones and teeth in human beings (2mks)
22. a) State two structural differences between skeletal muscles and smooth muscles. (2mks)

Skeletal muscle	Smooth muscle
(i)	
(ii)	

- b) What are antagonistic muscles? (1mk)

23. Name the substrates for the following enzymes
- i) Carbonic anhydrase (1mk)
 - ii) Cholinesterase (1mk)
24. A tilapia fish has a full length of 300mm but measures 200mm from the mouth tip to its anus. Determine the tail power of the fish (2mks)
25. State the differences between cones and rods in terms of the following (2mks)

Feature	Cone	Rod
Visual acuity		
Photochemical		

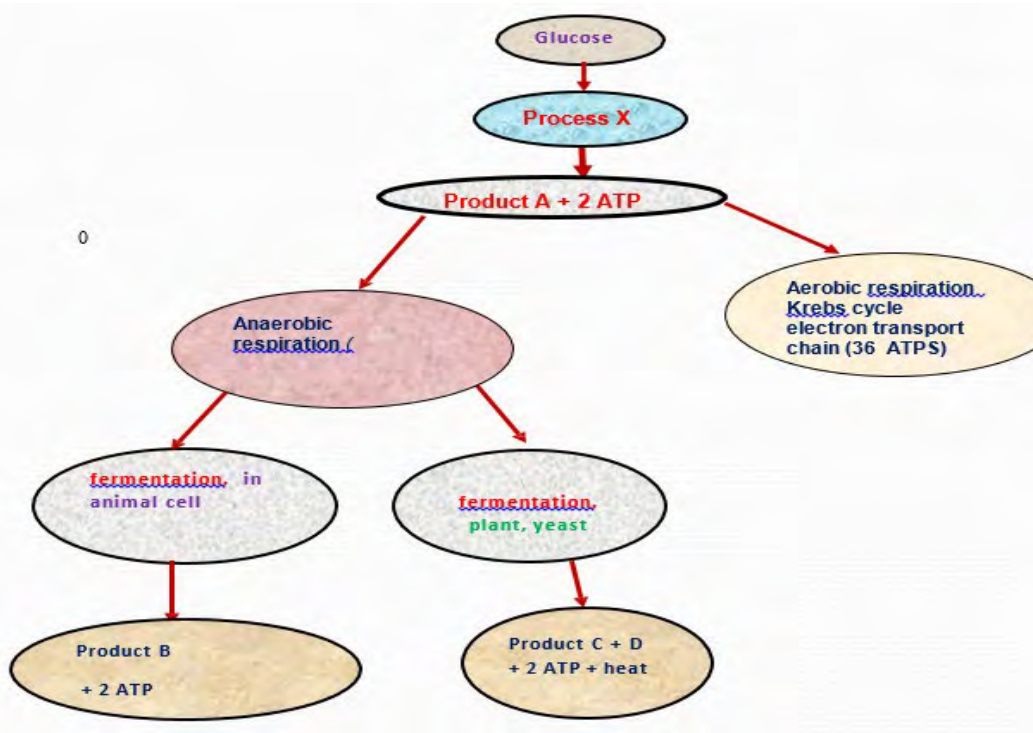
26. Impulse transmission across a synapse is in one direction. Explain 2mks
27. The diagram shown below represents a section of the vertebral column



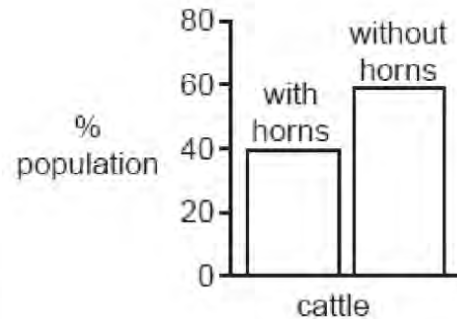
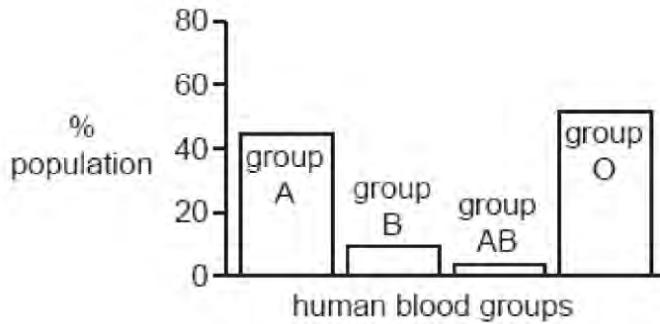
- a) Name the part labelled S (1mk)
 - b) State **TWO** ways in which part T is important to movement in human beings (2mks)
28. Give **TWO** features that make modern man to be more adaptable to the environment (2mks)

LUGARI CONSTITUENCY EXAM
231/2
BIOLOGY PAPER 2
(THEORY)

1. The flow chart below shows a process in a plant and animal cell



- a) Why is this process necessary in living organisms (3 marks)
- b) i) Name the process labelled X (2 marks)
- ii) Name the part of the cell where process X occurs (1 mark)
- c) Name products A, B (2marks)
2. . a) The bar charts show the percentages of a human population with each type of blood group and the percentages of a cattle population with and without horns.



Which type of variation is shown in each population? (1mark)

Human:

Cattle:

- (b) Albinism (lack of skin pigmentation) in humans is caused by two recessive alleles. A phenotypically normal (non-albino) couple have three children; the first two are non-albino, the third is an albino. In your answer, use “A” for the dominant allele and “a” for the recessive allele.
- (i) What are the genotypes of the parents? (1mark)
- (ii) Is there a possibility that their next child will be an albino? Explain your answer (2 marks)
- (iii) The albino child eventually marries a non-albino whose father was an albino. What is the probability that their first child will be an albino? Show all working. (4marks)

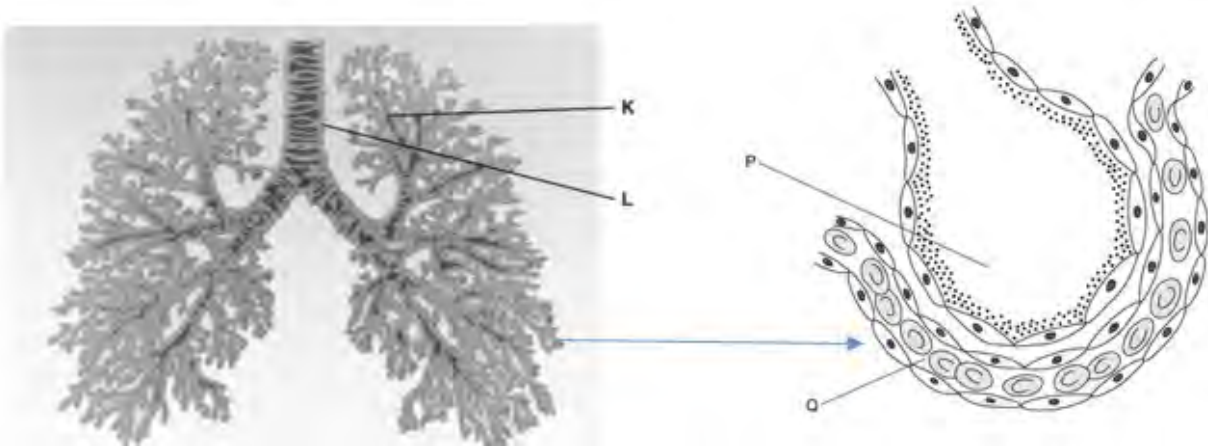
3. The diagram below shows structures of the bat wing and human arm.



These structures are thought to have same ancestral origin.

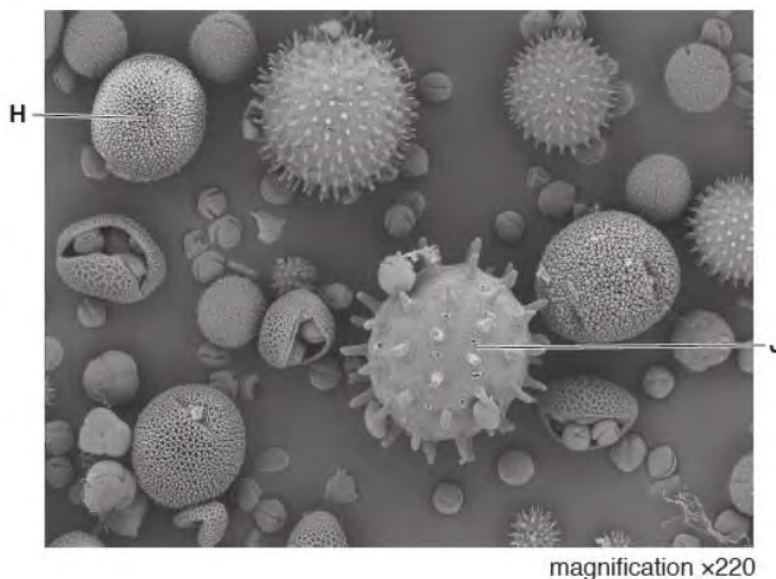
- a) State one structural similarity and one adaptational difference between the two.
 - (i) Structural similarity. (1 mark)
 - (ii) Adaptation difference. (2 marks)
- b) Give two other examples of structures in nature that show the type of evolution as in (a) above. (2 marks)
- c) Distinguish between the terms 'chemical evolution' and 'organic evolution'. (2 marks)
- d) What is the study of fossils called? (1 mark)

4. The diagram below shows structures of gaseous exchange system in man



- a) Name the structure labeled K (1 mark)
- b) Structure labelled L is lined with two cells name these two cells (2 marks)
- c) Explain the function of these two cells identified in 4 (b) above in the structure labelled L (2 marks)
- d) Explain how oxygen moves fro P to Q (2 marks)
- e) Tobacco smoke affects gaseous exchange system name the component of the tobacco that affects this gaseous exchange system (1mark)

5. The diagram below shows a scanning electron micrograph of some pollen grains from insect pollinated flowers and wind pollinated flowers



With reasons identify the pollen grains that are from

- i) Insect pollinated flower
Reasons

(1mak)

(2marks)

- ii) Wind pollinated flower (1 mark)
 Reason (1mark)
 b) Write the formula that would be used to calculate the actual diameter of pollen grain H (1mark)
 c) After pollination pollen grains germinate into pollen tubes. State two functions of pollen tube (2maks)

SECTION B

Answer two questions in this section questions 6 is compulsory and chose either question 7 or 8

6. The table below shows the fresh weight and dry weight of maize plants at different stages of growth.

Time in weeks	0	2	4	6	8	10	12	14	16
Fresh weight (g)	20	120	300	700	1000	1220	1500	1400	1100
Dry weight (g)	20	60	200	500	680	800	880	1000	1000

- a) On the same axes, plot graphs of fresh and dry weights against time. (8mks)
 b) Account for the shape of the curve of fresh weight between:
 i) 2—10 weeks. (2mks)
 ii) 12—16 weeks. (2mks)
 c) Suggest why dry weight remains constant after week 14. (2mks)
 d) Describe how the dry weight of the maize could have been determined at various times. (3mks)
 e) State two advantages and one disadvantage of fresh weight as a measure of growth. (3mks)
7. Describe how the leaves of mesophyte are suited to their function (20marks)
 8. Describe the nitrogen Cycle (20 marks)

LUGARI CONSTITUENCY JET EXAM
BIOLOGY PAPER 3
(PRACTICAL)

1. You are provided with a specimen labelled J.
 (a) With reasons identify the organ of a plant represented by J. (1mk)
Reasons (2mks)
 (b) Using observable features only identify the class to which J belongs.
 Class (1mk)
 Observable features. (1mk)

(c) In a previous experiment the lower epidermis and the upper epidermis were peel off, the number of stomata was determined using a microscope at high power objective. The results obtained are recorded in the table below.

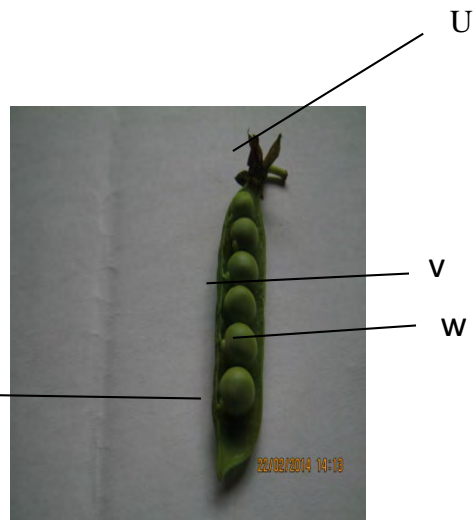
Arrange number of stomata in the field of view	
Lower epidermis	Upper epidermis
30	13

(1) Account for the average number of stomata on the upper and lower side of specimen J.
 Upper epidermis. (3mks)
 Lower epidermis. (3mks)

2 You are provided with photographs of:
 Specimen SI – mango fruit
 Specimen T1 – Garden pen pod



S1



T1

(a) Specimen SI was cut longitudinally. The photograph below shows one half



S1

- (i) Name the parts labelled a,b,c,d and e (5mks)
 Study the photographs of specimen T₁ and name the parts labelled u,v,w,x ,y and z labeled (4mks)
- (iii) Identify the type of presentation in each fruit. S₁, T₁ (2mks)
- (b) Using observable features identify the method of dispersal for each fruit and in each case give reasons for your answer.
- S₁
 Method of dispersal (1mk)
 Reasons (3mks)
- T₁
 Method of dispersal (1mk)
 Reasons (2mks)
- (c) Name the type of fruits represented by
- S₁ (1mk)
 T₁ (1mk)
- (d) What is the importance of fruit and seed dispersal. (3mks)

Q3 You are provided with solution S

- (a) Using the reagents provided to carry out the appropriate food tests and complete the table below. (8mks)

Food substance	Procedure	Observation	Conclusion

BIOLOGY PAPER 3

231/3

FORM 4

CONFIDENTIAL

Each student should have

- Specimen J (young kales leaf(sukuma wiki)
- Solution S - (solution S is dilute milk)
- Benedicts solution
- 10% sodium hydroxide
- 1% copper sulphate solution
- 0.1% DCPIP