NAMBALE ACK DIOSECE TERM 2 2021
231/1
BIOLOGY PAPER 1
THEORY

1. Below is an image of a biological vector. Use it to answer questions that follow.

(a) Identify the parasite transmitted into human blood by the organism. (1 mark)
(b) Name the blood cells that are destroyed by the parasite in (a) above. (1 mark)
(c) State one biological method used to eradicate the larvae of this organism. (1 mark)

2. Give the structural adaptations of the following in an insect pollinated plant.
(a) Pollen grain. (1 mark)
(b) Stigma. (1 mark)

3. A certain plant was found to have the following features
- ✓ Parallel venation of leaves.
- ✓ Sheath like petiole.
- ✓ Flower parts in multiple of three.

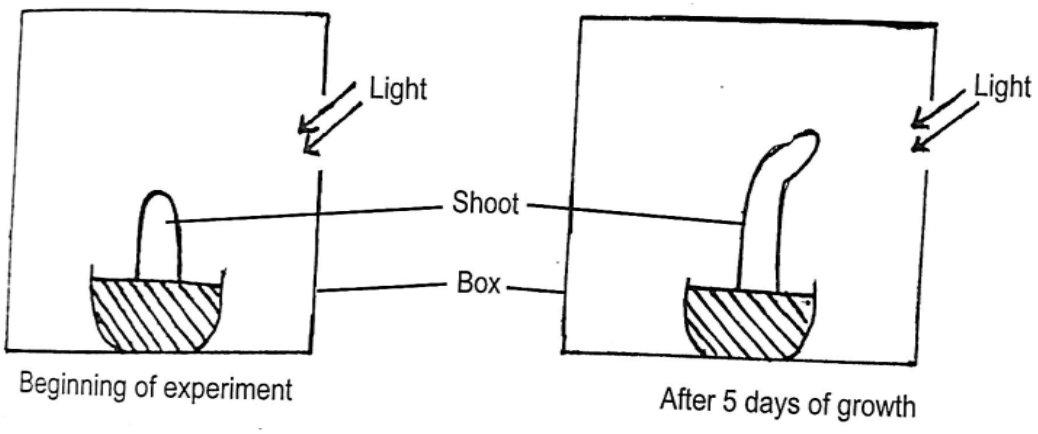
a) Name the class to which the plant belongs. (1mark)
b) Suggest the expected arrangement of vascular bundle in the stem of the plant. (1mark)

4. In an experiment, the rate of gaseous was determined and recorded as shown in the table below. Using these figures, suggest which plant gaseous structure were responsible for these figures

Structure	Gaseous exchange in %
A	Approximately 97
B	Approximately 2.5
C	Approximately 0.5

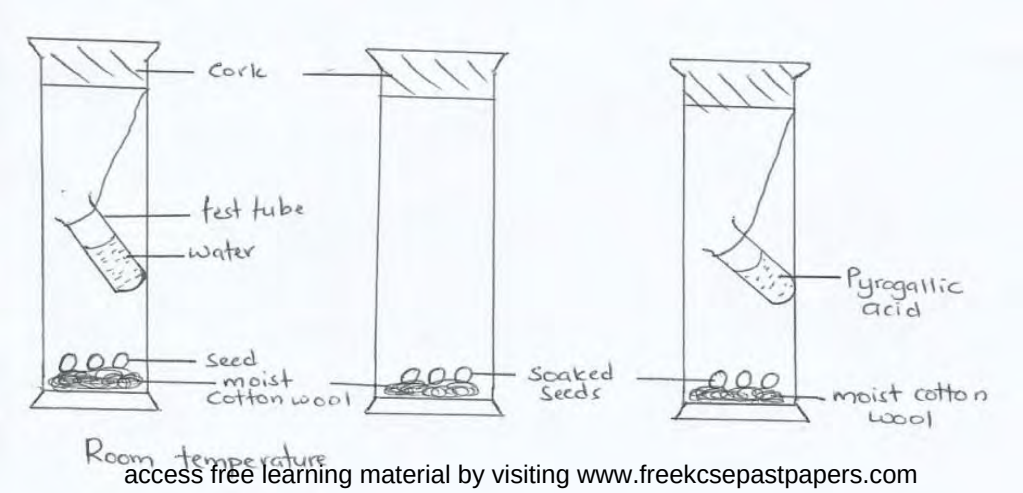
A , B, C (3mark)

5. The diagram below shows an experiment set up using a seedling enclosed in a desk box with a hole on one side at the beginning of the experiment and after five days of growth.



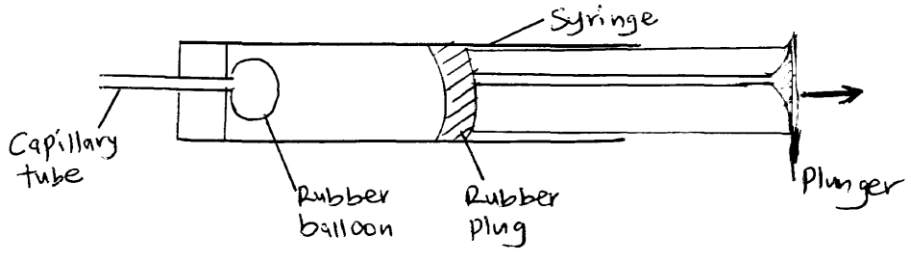
(a) What type of response is shown by the above shoot? (1 mark)
(b) State **two** observable changes which took place in the seedling after five days of growth. (2 marks)
(c) Account for the observable changes in (b) above. (2 marks)

6. (a) State the reason for the following adaptation of the xylem vessels (2marks)
   i) Narrow lumen
   ii) Lack of cross wall
7. Name the organism that causes each of the following diseases.
   i) Gonorrhea (1mark)
   ii) Amoebic dysentery (1mark)
8. a) What is a species? (1mark)
   b) A horse and a donkey can interbreed to give rise to an offspring, the mule. However they are still considered to belong to different species. Explain (1mark)
9. The diagram below represents a set up to investigate the conditions necessary for seed germination. The set up was left for 5 days.



   a) What conditions were being investigated in the experiment? (2marks)
   b) Explain the role of water during seed germination. (2marks)
10. Explain what happens to excess amino acids in the liver of humans. (2marks)
11. State the branch of Biology that deals with: (2 marks)
   (a) Study of birds
   (b) Study of the chemical composition of organisms

12. The apparatus below illustrates breathing in a mammal.



   (a) State the organs represented by:
      (i) Rubber (1 mark)
      (ii) Rubber plug. (1 mark)
   (b) Explain what happens if the rubber plug is pulled in the direction shown by the arrow. (2 marks)
13. (a) Calculate the respiratory Quotient(RQ) from the equation below. (2 marks)

$$2C_{51}H_{95}O_6 + 145O_2 \longrightarrow 102CO_2 + 98H_2O$$

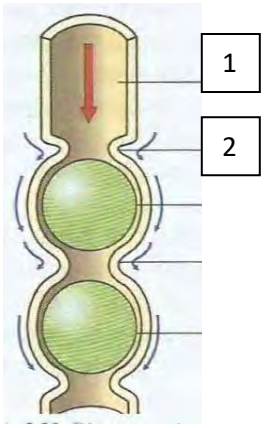
   (b) Identify with a reason the substrate being respired from the equation above. (1 mark)

14. The diagram below shows the base sequence of part of a nucleic acid strand. Study it and answer the questions that follow.

G–T–T–A–G–C–T–G–A

(a) With a reason state whether the strand above is from a DNA or RNA molecule. (2 marks)
(b) State **two** structural differences between DNA and RNA strands. (2marks)

15. The diagram below shows how food bolus moves along the alimentary canal and intestines.



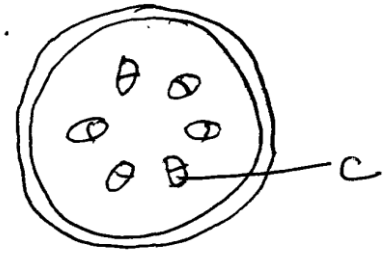
(a) Identify the process illustrated on the diagram. (1 mark)
(b) Briefly explain how the movement of food bolus from position 1 to position 2 in the diagram above is achieved. (2 marks)

16. A person was complaining of thirst most of the times. A sample of the patient's urine was found to contain a lot of sugar.
(a) Name the hormone the person's body was deficient of (1 mark)

(b) Which disease was the person likely to be suffering from? (1 mark)

17. Name two mechanisms that hinder self fertilization in flowering plants. (2 marks)

18. The diagram below represents a cross section of a plant organ. Study it and answer the questions that follow.



(a) (i) From which plant organ was the section obtained from? (1 mark)
(ii) Give a reason for your answer in (a) (i) above. (1 mark)
(b) What is the function of the part labeled C? (1mark)

19. (a) What is meant by vestigial structures? (1 mark)
(b) Give two examples of vestigial structures in humans. (2 marks)

20. Julie observed 8 onion epidermal cells across a field of view of a light microscope. The field of view was 4 mm in diameter; calculate the average of the cells in micrometres. (2 marks)

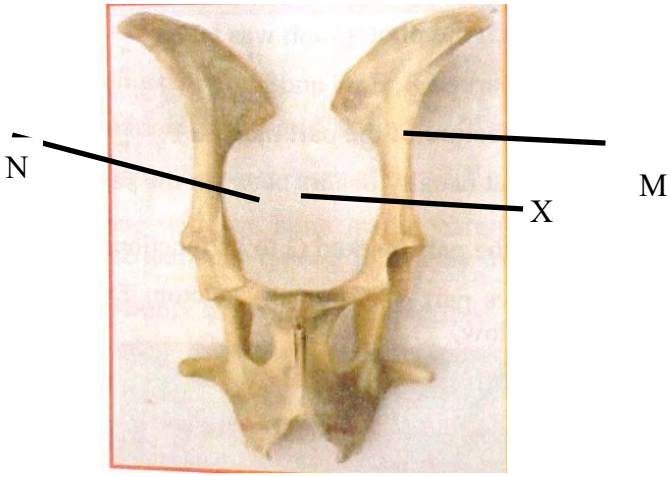
21. State the use of the following plant waste products to humans. (2 marks)
(i) Papain
(ii) Colchicine

22. A student dropped a small piece of fresh liver in a beaker containing hydrogen peroxide. A lot of fizzling and froth was observed.
(a) Name the gas produced. (1 mark).
(b) Write the word equation for the reaction above. (1 mark)

23. Give the functions of the following ecological instruments (2marks)
(a) Seechi disc
(b) Photographic light meter

24. (a) Explain why fertilization must take place in the fallopian tube but not uterus (1mark)
(b) Explain double fertilization in flowering plants (2marks)

25. The diagram below represents a mammalian bone of the appendicular skeleton

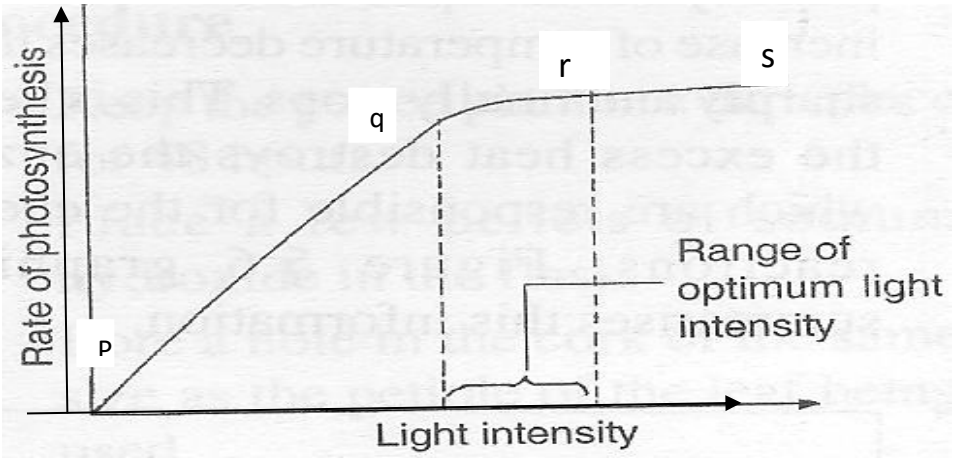


(a) Name and state the functions of the part labeled M and N. (2marks)
(b) State how the structure **X** is adapted to its function (1mark)

26. Use the illustration below to answer questions that follow.

(a) Identify the type of pollution that has such an effect. (1 mark)
(b) State two effects of the type of pollution identified in (a) above to the organism. (2 marks)

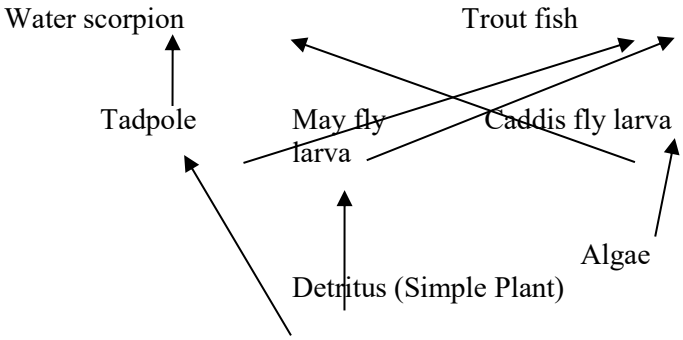
27. The curve below shows the rate of photosynthesis at difficult light intensities



a) With reference to photosynthesis, give the meaning of the phrase limiting factor. (1mark)

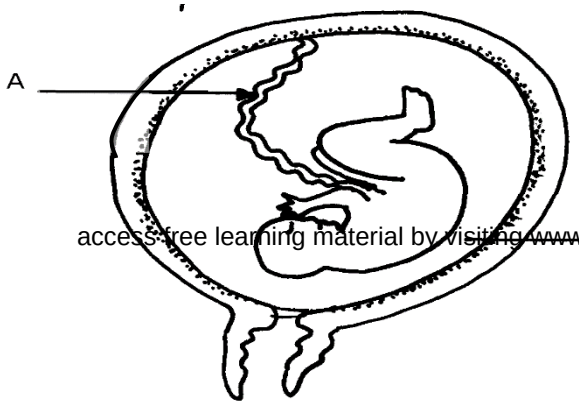
b) Name the limiting factor between the following points (2marks)
   i) P and Q
   ii) R and S

28. Study the food web below and answer the questions that follow.



a) Write down a food chain whose all consumers are Arthropods. (1mark)
b) What would be the short term effects on the habitat if all trout fish were eliminated? (2marks)

29. The diagram below represents a stage in the development of human foetus



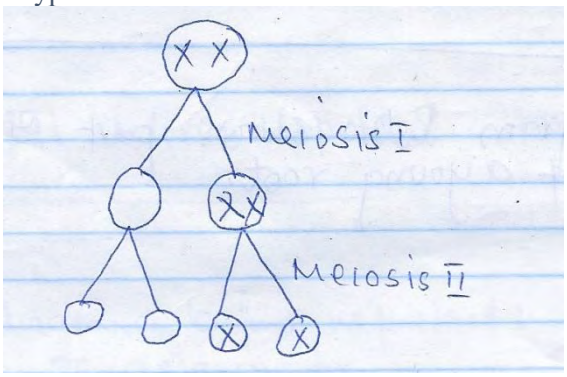
(a) State **one** function of each of the structures labelled **A** and **B.** (2marks)
(b) Apart from the size of the foetus what else from the diagram illustrates that parturition was about to occur. (1mark)

30. Explain why growing grass die a few days when salt is sprinkled on it. (2marks)
31. (a) What is carbonic anhydrase? (1 mark)
    (b) State the role of haemoglobin in the transport of carbon (IV) oxide. (2 marks)

NAMBALE DIOCESE
BIOLOGY PAPER 2(231/2)
231/2
BIOLOGY

SECTION A (40MKS)
Answer ALL questions in this section in the spaces provided.

1. The diagram below illustrate a type of chromosome mutation.



(a) (i) Identify the type of chromosome mutation illustrate above. (1mk)
(ii) State two examples of disorders in humans that are caused by the mutation named in a(i) above. (2mks)
(iii) Name a disorder of blood that is caused by gene substitution. (1mk)

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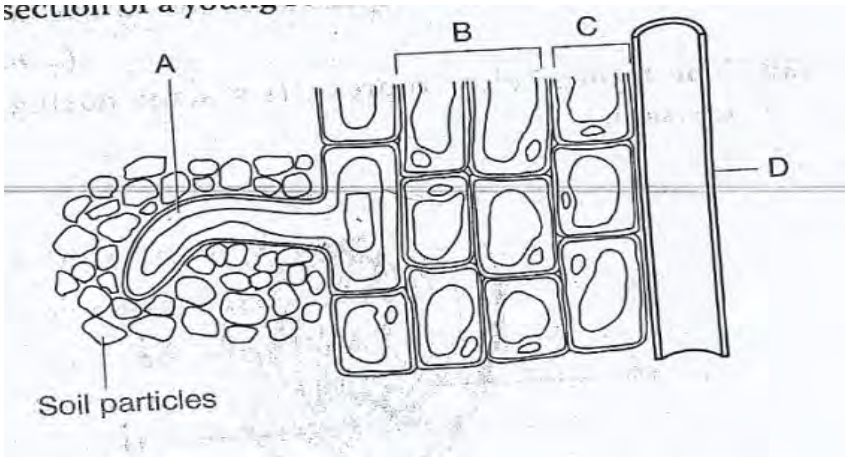
(b) State three differences between deoxyribonucleic acid (DNA and ribonucleic acid. (3mks)
DNA RNA

(c) Define the term mutation (1mk)

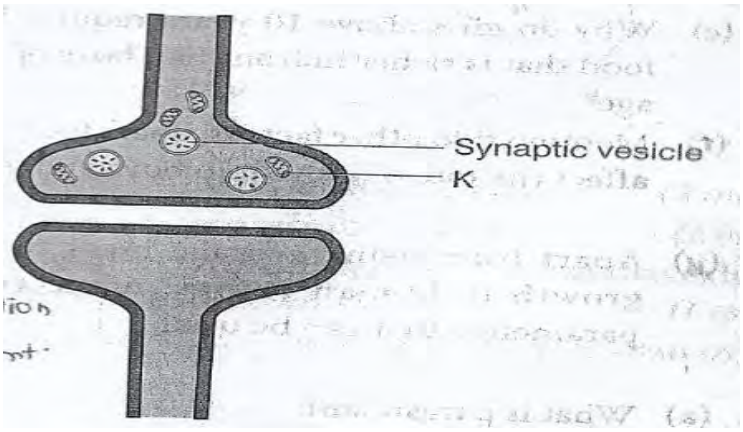
2. The diagram below shows part of a longitudinal section of a young root.



(a) Name he parts labeled A, B, C and D. (4mks)
A - C -
B - D –
(b) State the importance of the cell labeled A. (1mk)
(c) How is the tissue labeled D adapted to the function it performs. (3mks)

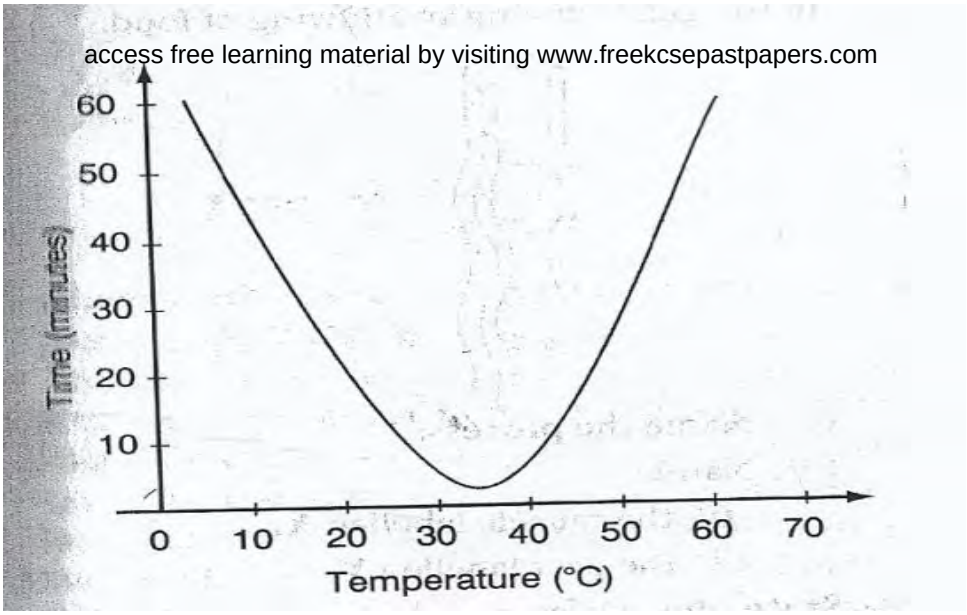
3. a) What is a nerve impulse? (2mks)

b) The diagram below represents a neuro-junction of a mammal.



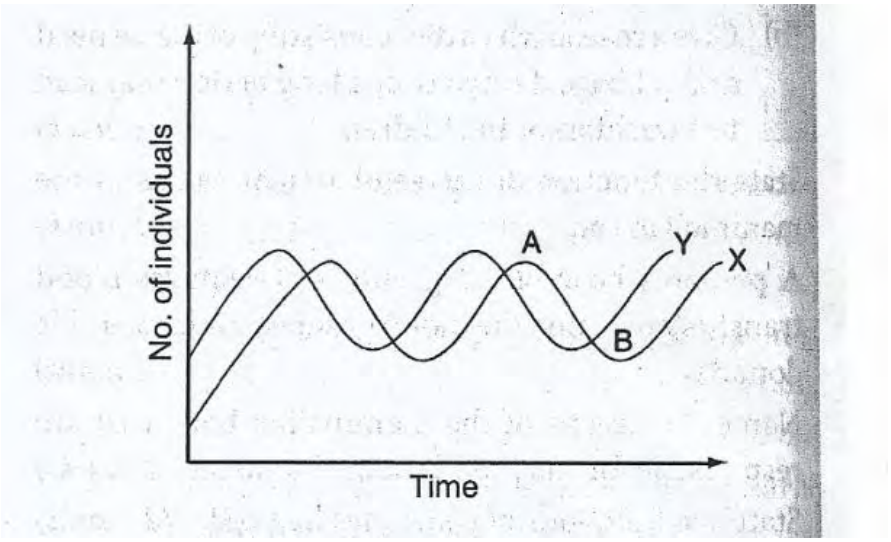
On the diagram, indicate with an arrow the direction of impulse transmission. (1mk)
(c) Name the chemical substance that is contained in the synaptic vesicle. (1mk)
(d) State the function of the part labeled K in the diagram. (1mk)
(e) Name two mineral ions that are involved in the transmission of nerve impulses. (2mks)

4. In an experiment to investigate he action of pepsin on egg albumen, equal amounts of pepsin were added to equal amounts of egg albumen in different test tubes. The test tubes were placed in water baths at different temperatures. The graph below shows the time taken for the enzyme to digest protein at each temperature.



(a) (i) What is the optimum temperature for the enzyme? (1mk)
(ii) Account for the time taken to digest egg albumen at 60^0C. (2mks)
(b) By giving a reason, name the form in which pepsin enzyme is secreted. (2mks)
(c) State three other factors that affect enzyme controlled reactions. (2mks)

5. The graph below shows the relationship between the number of herbivores and carnivores in a park.



(a) Identify the cure that represent carnivores. Give a reason for your answer. (2mks)
(b) Suggest a reason for the slope of curve X between points A and B. (2mks)
(c) (i) Name the type of relationship that exist between herbivores and carnivores as indicated in the graphs. (1mk)
(ii) State the significance of the relationship you have stated in C(i) above. (1mk)
(d) What will be the long term effect on the park ecosystem if all carnivores were eliminated from the park. (1mk)

SECTION B (40MKS)

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

6. Research was carried out to determine the growth rate of some boys and girls. Their average mass in Kilograms was taken separately for 20 years. Their weight are 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	15.00	16.0
6	18.5	19.3
8	22.1	27.1
10	25.1	27.2
12	27.00	30.00
14	37.00	36.00
16	44.00	44.00
18	47.0	52.00
20	48.5	55.00

(a) On the same axis, plot graphs of the average mass of the boys and the girls against their age. (7mks)
(b) From the graph, determine the
(i) Mass for boys at the age of 11 years. (1mk)
(ii) Growth rate for girls between ages 13 and 15. (2mks)
(c) Account for the change in the mass of girls during the age stated in (ii) above. (2mks)
(d) Explain the trend observed in the curves for both boys and girls. (3mks)
(e) Why do girls above 10 years require intake of food that is richer in iron than boys of the same age? (1mk)

(f) Name two other factors, apart from diet, that affect the rate of growth in boys and girls. (2mks)

(g) A part from using average mass to estimate growth in human beings, name two other parameters that can be used. (2mks)

7. a) What is homeostasis. (2mks)

b) Discuss the homeostatic functions of the mammalian liver. (18mks)

8. Describe how xerophytes are adapted to their habitats. (20mks)

A.C.K NAMBALE DIOCESE EXAMINATIONS
BIOLOGY 231/3
(PRACTICAL)
NOVEMBER 2021

1. (a) You are provided with a straw and calcium hydroxide in a test tube.

– Dip one and a half of the drinking straw into the calcium hydroxide solution.
– Place your mouth at the open end of the drinking straw. Breathe out such as to bubbles gas into the calcium hydroxide solution five times.

(i) Record your observations. (1mk)

(ii) Explain you observations in a(i) above. (2mks)

(iii) Write an equation of the reaction that occurred in the test tube. (2mks)

(iv) Apart from the chemical substance under investigation, name two other products that were bubbled into the test tube. (2mks)

(v) Name the parts followed by gases from the lungs until it is exhaled. (2mk)

(b) Examine photograph M below and use it to answer the questions that follows:-

(i) State three observable features which adapt specimen M to gaseous exchange. (2mks)

(ii) State the sub-division and class to which specimen M belongs;-
Sub-division (1mk)
Class (1mk)

2. You are provided with soaked bean seed, Iodine solution, Biuret's reagent, a scalpel and a hand lens.
By use of a scalpel, carefully cut the bean seed longitudinally such as to separate the two cotyledons.

(a) By use of a dropper, smear Iodine solution onto the exposed surfaces of the first cotyledon.

(i) Record your observation. (1mk)

(ii) Account for observation in a(i) above. (1mks)

(b) By use of a dropper, smear some Biuret's reagent onto the exposed surface of the second cotyledon.

(i) Record your observation. (1mk)

(ii) Account for your observation in b(i) above. (1mk)

(c) Explain how the type of germination in the specimen occurs. (3mks)

(d) State the role of the following in the germination of a seed.

(i) Oxygen (1mk)

(ii) Water (2mks)

(iii) Cotyledon (3mks)

3. You are provided with specimen labelled as K and L in a petri-dish. Examine them.

(a) Identify specimens K and L. (2mks)

(b) (i) Draw and label the anterior parts of specimen K. (4mks)

(ii) State ways by which specimen K is adapted to its functions. (3mks)

(c) From which parts of the body were specimens K and L obtained?
Specimen K (1mk)
Specimen L (1mk)
(d) Name the bone that articulates with specimen L at the:
(i) Proximal end (1mk)
(ii) Distal end (1mk)
(e) Name the type of joint formed by specimen L at the anterior part (1mk)

NAMBALE DIOCESE

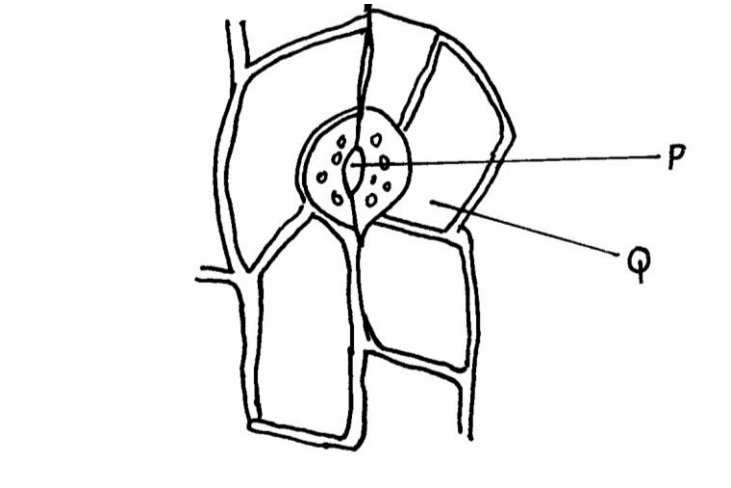
BIOLOGY CONFIDENTIAL (231/3)

(i) Each candidate is required to have the following:-
- A bean seed (soaked overnight)
- scalpel
- Calcium hydroxide (CaOH) - $4cm^3$ in a test tube.
- Drinking straw (transparent.)
- A petri-dish

(ii) Access to the following:-
- Humerus bone - labeled as K
- Thoracic vertebrae - labeled as L
- A Hand lens
- Biuret's reagent + a dropper
- Iodine solution + a dropper

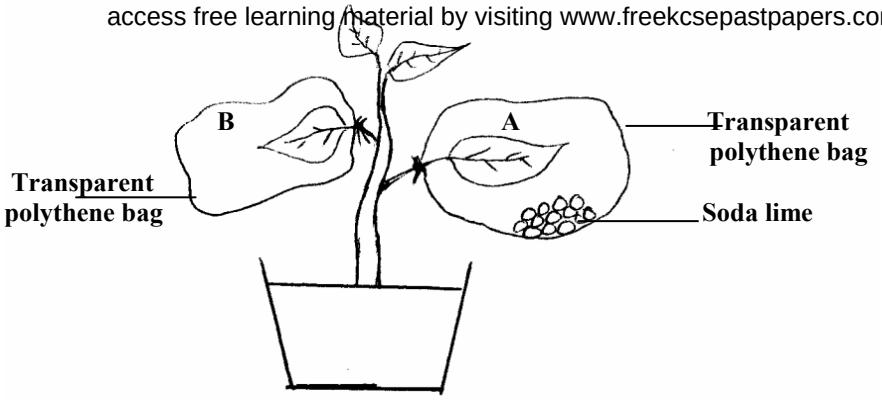
CASPA AMUKURA PARISH JOINT EVALUATION
BIOLOGY PAPER 2
THEORY
2021

1. The diagram below shows a portion of a lower epidermis of a sukuma wiki leaf.



a) Name the parts labeled P and Q. (2mks)
b) Briefly describe the photosynthetic theory of stomata opening. (5mks)
c) State one modification in the stomata of xerophyte plant other than being sunken and hairy. (1mk)

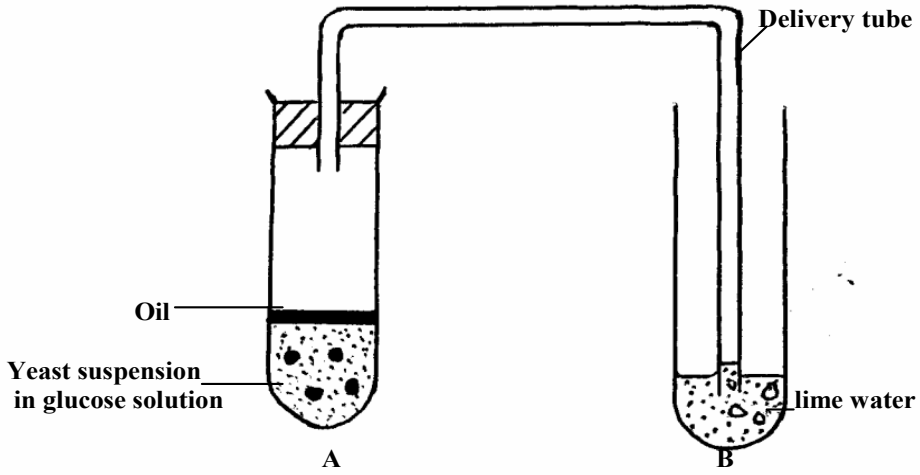
2. The diagram below represents an experimental set-up to investigate an aspect of photosynthesis.



The set up was placed in darkness for 24 hrs and then exposed to light for 5 hrs.

(a) **What** was the aim of the experiment? (1mark)
(b) Leaves **A** and **B** were tested for starch.
  (i) **What** would be the expected results? (2marks)
  (ii) **Give** reasons for your answer in (b) (i) above. (2marks)
(c) **What** was the role of leaf **B** in the experiment (1mark)
(d) **Why** was the set – up placed in darkness for 24 hours? (1mark)
(e) **Name** the organelle in a plant where photosynthesis takes place (1mark)

3. The diagram below illustrates an experiment to demonstrate a certain biological process.



Before adding yeast suspension in tube **A**, the glucose solution was first boiled and cooled.

a) **What** biological process was being demonstrated? (1mark)

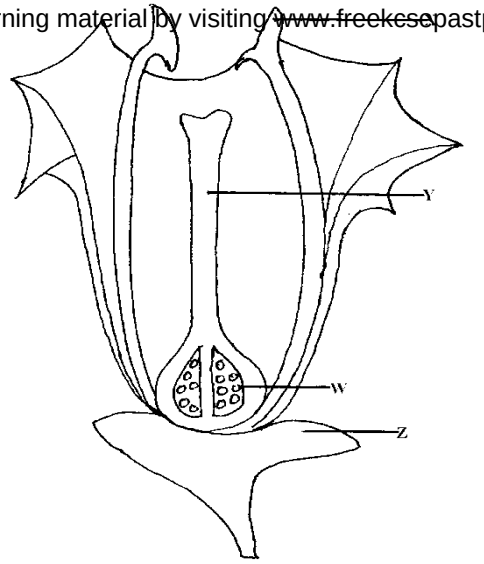
b) (i) **What** observation would be made in tube **B** after 20 minutes of the experiment? (2marks)

(ii) **Account** for the observations made in (b) (i) above (2marks)

c) **Write** down an equation to summarize the reaction taking place in tube **A**. (1mark)

d). State two industrial applications of the chemical reaction taking place in tube **A**. (2marks)

4. The diagram below represents a flower.



(a) **Name** the parts labeled X and Y. (2mks)

(b) **Describe** the ovary position. (1mk)

(c) (i) **Suggest** an agent of pollination of the flower above (1mk)

(ii) **Give** a reason for your answer above. (1mk)

(d) On the diagram above, which part do you expect to find haploid nucleus after meiosis? (1mk)

(e) In the flower above its sepals cell was found to have 20 chromosomes. **What** would be the number of chromosomes found in the endosperm cell of the flower embryo sac after fertilization? (1mk)

(f) **State one** way in which flowers prevent self – pollination. (1mk)

5. When the offspring of purple and white flowered pea plants were crossed, they produced purple and white flowered plants in the ratio of 3: 1

   Using letter H to represent the gene for purple colour

   (a) State the genotype of:
   (i) Parents (2 mks)
   (ii) F_1 Generation (1 mk)
   (b) Work out the cross between plants in the F_1 generation (4 mks)
   (c) Account for the colour the flowers in plants of the F_1 generation (1 mk)

SECTION B (40 marks)

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

6. In an experiment to investigate the effect of temperature on the activity of salivary amylase enzyme, test tubes containing 5 cm^3 of starch solution were placed in water baths maintained at different temperatures. After 30 minutes, 0.1cm^3 amylase solution was added into each of the tubes.

   At one minute intervals, a drop of the mixture in each tube was tested for presence of starch. The time taken for all the starch to be digested was taken and recorded. The results were as shown in the table below.

Temperature (^{0}c)	5	10	15	20	25	30	35	40	45
Time taken to digest all starch (mins)	80	60	48	26	18	9	3	14	75

   (a) On the grid provided **plot** a graph of time taken to digest all the starch against temperature (6 marks)

   (b) **What** was the optimum temperature range for this enzyme? (1mark)
   (c) **Account** for the results obtained at
   (i) 5^0C (2marks)
   (ii) 45^0C (2marks)
   (d) Apart from temperature **name three** other factors that would affect the above reaction. (3marks)
   (e) **Name two** regions in a human body where digestion of starch occurs. (2marks)
   (f) (i) **Give three** metallic ions that act as enzyme co- factors in a human body. (2marks)
   (ii) **What** is the role played by enzyme co- factors in the physiology of human body? (1mark)
   (g) **Name** the major respiratory substrate in a mammalian body during severe starvation. (1mark)

7. How are leaves of mesophytes suited to their function? (20mks)
8. Describe the adaptations of the mammalian skin to its functions. (20mks)

CONFIDENTIAL
CASPA BIOLOGY PAPER 3 TERM 1 2021

1. Each candidate should be supplied with the following

- 4 test tubes in test tube rack.
- 1 boiling tube
- Iodine solution – supplied with a dropper
- Adequate distilled water
- Benedict solution– supplied with a dropper
- Means of heating
- 10% Sodium Hydroxide– supplied with a dropper
- 1% Copper (II) Sulphate– supplied with a dropper
- DCPIP– supplied with a dropper
- $10cm^3$ of solution W in a boiling tube labeled as **solution W**

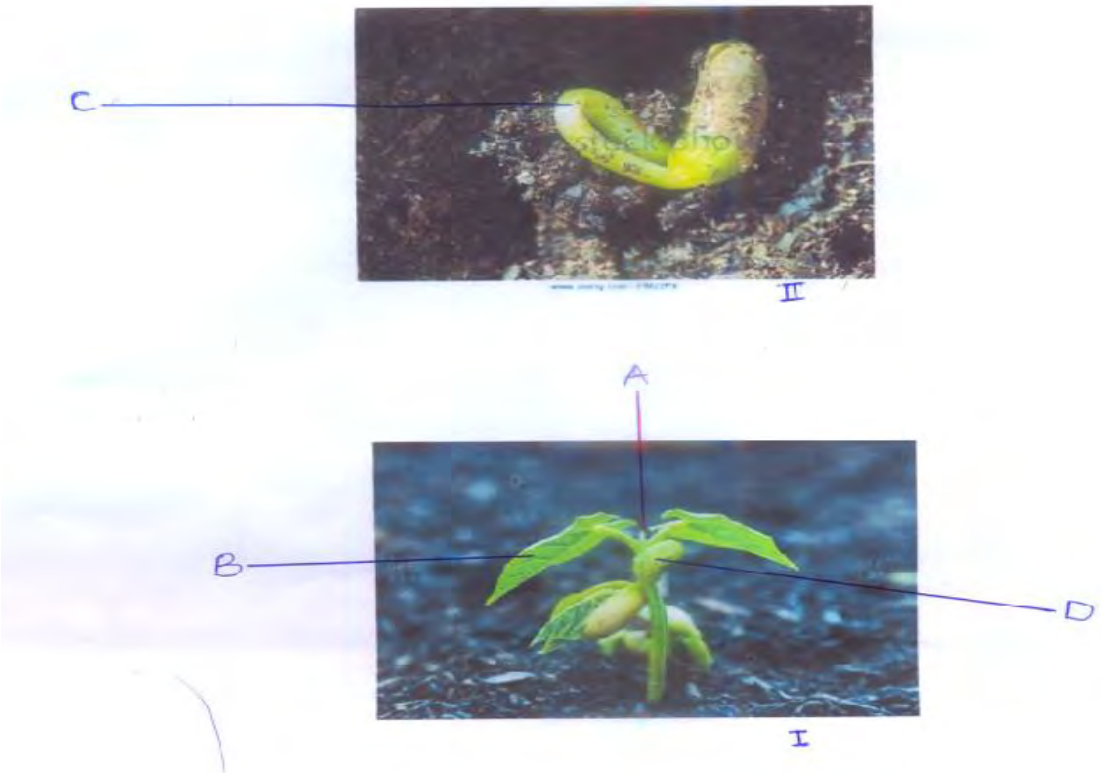
NB: measure 30gms of glucose and 15gms of egg albumen in a 500ml beaker, add $200cm^3$ of distilled water and stir to dissolve. Top up with distilled water to make $500cm^3$solution. Label this solution as solution **W**

CASPA AMUKURA PARISH EXAM
231/3
BIOLOGY PAPER 3 (PRACTICAL)
TIME: $1^3/_4$ Hours

1. You are provided with solution W in a boiling tube. Using the provided reagents, carry out possible food tests to identify food substances present in solution. **(14marks)**

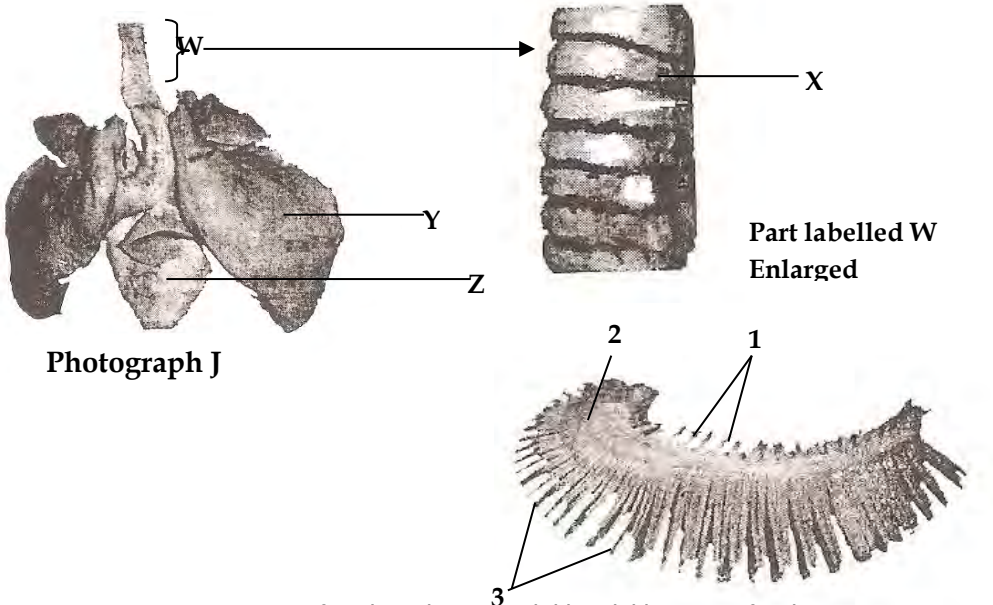
FOOD SUBSTANCE	PROCEDURE	OBSERVATION	CONCLUSION

2. Examine the photographs I and II of seedling specimen shown below and answer the questions that follows;



a) Name the parts labelled A, C and D. **(3 marks)**
b) (i) Name the class to which the specimen belongs. **(l mark)**
(ii) Give two reasons, using observable features to support your answer in (b) (i) above **(2 marks)**
c) Give two functions of the structure labeled D. **(2 marks)**
d) Explain how the curvature labeled C is formed **(3marks)**
e) Name the type of germination exhibited by the seedlings. Give a reason for your answer. **(2marks)**

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



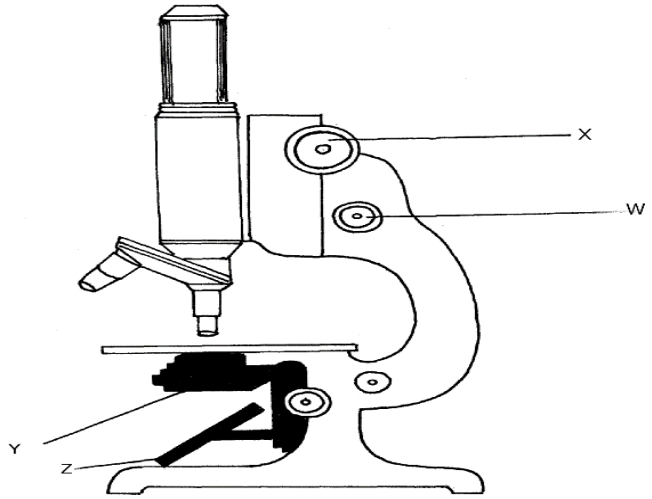
a) Name the phylum to which the organs were obtained from **(1 mark)**
b) Identify the organs. **(2 marks)**
J_____

K_____

c) State the function performed by the organs. **(1 mark)**
d) Name the parts labelled X, Y and Z in **photograph J** **(3 marks)**
e) Identify the parts labelled 1, 2 and 3 in **photograph K**. **(3 marks)**
f) Using observable features, state how the parts labelled **1** and **3** you identified in **(d)** above are adapted to their functions **(3 marks)**

BUTULA SUB-COUNTY EXAMS – 2021 DECEMBER.
231/1
BIOLOGY THEORY
PAPER 1

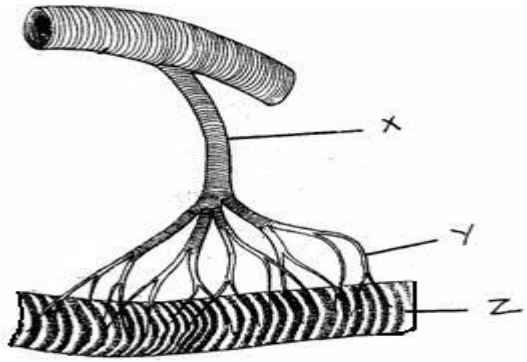
1. The diagram below represents common laboratory equipment.



   a) Label the parts labeled X and Y. (2marks)
   b) Using arrows show how the object is illuminated. (2marks)

2. The Biological name of housefly is **MUSCA DOMESTICA**.
   a) State **two** mistakes in the way the biological (scientific) name is written. (2marks)
   b) Write the name in the correct manner following the rules of binomial nomenclature. (1mark)

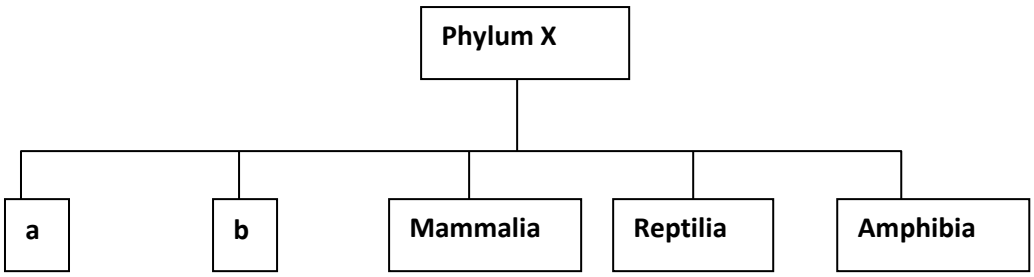
3. The diagram below show a structure used for gaseous exchange in an organism.



   (a) Label parts. (3marks)
   (b) State the adaptation of part labelled **Y**. (1mark)

4. Name the type of response exhibited by.
   (a) Leaves of *Mimosa pudica* when they fold their after being touched. (1mark)
   (b) Euglena when it swims towards the source of light. (1mark)
   (c) Sperm cell when it swims towards the ovum. (1mark)

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



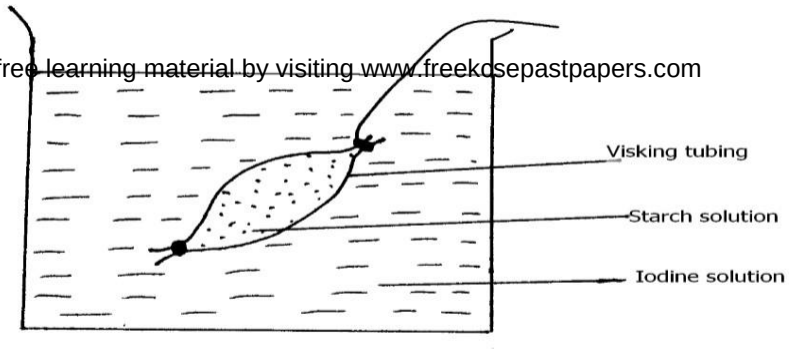
(a) What is the phylum **X**? (1mark)
(b) Name the classes labeled **a** and **b**. (2marks)

6. (a) Define population (1mark)

(b) From three students wanted to estimate the population of grasshoppers in 5km^2 grass field near a school compound. They captured 36 grasshoppers and marked them before returning them back to the field. After two days they made another catch of grasshoppers. They collected 45 grasshoppers of which only 4 had marks.

i) State why the second capture was done after two days. (1 mark)
ii) From the data calculate the population size of grasshoppers in the grass field. (2 marks)

7. The set-up below was prepared by form one students and left for 1 hour



They made the following observations

	At the start	After one hour
In visking tubing	White solution	Blue-black
In beaker	brown	brown

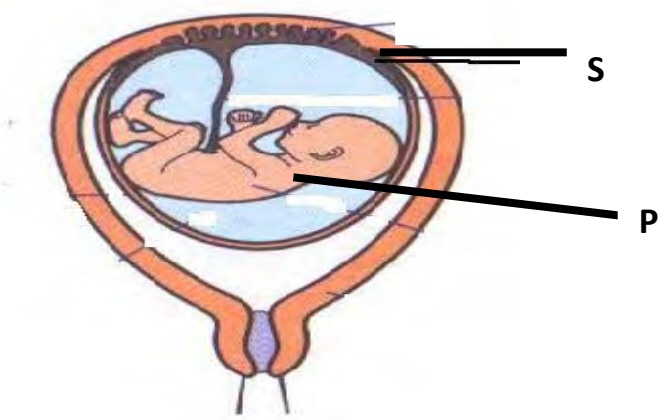
(a) Identify the physiological process being investigated (1mark)
(b) Explain the observation made (3marks)

8. The equation below represents a reaction that occurs during respiration in a cell. K + Phosphate → Adenosine triphosphate (ATP)

(a) Identify the compound K. (1mark)
(b) State **two** differences between **K** and **ATP.** (2marks)
(c) Name the organelle responsible for the production of energy in a cell muscle (1mark)

9. State **three** characteristics of cells at the zone of cell division in an apical meristem (3marks)

10. The diagram below represents human foetus in the womb.



a) Name the part labeled S and P (2marks)
b) Give **two** reasons why you think the foetus is not yet due for birth (2marks)

11. Explain how the biceps and triceps muscles bring about the movement at the hinge joint of the elbow in man. (2marks)

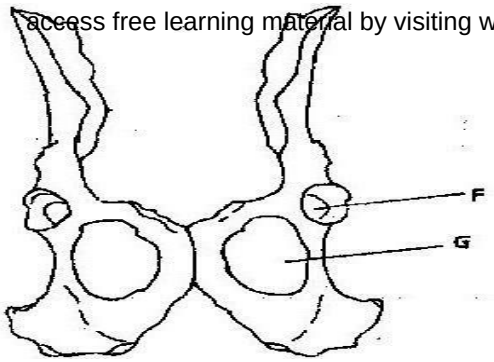
12. Part of one strand of DNA molecule was found to have the following sequence

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

What is the sequence on a:
a) Complimentary DNA strand? (1mark)
b) m-RNA strand copied from this DNA portion? (1mark)

13. Name **two** features that increase the surface area of the small intestines. (2marks)

14. The diagram below shows two fused bones of a mammal.



(a) Identify the fused bone. (1mark)
(b) Name the parts labeled F and G (2marks)
F……G…….
(c). Name the bone that articulates at the point labeled F. (1mark)

15. A person was able to read a book clearly at arm's length but not at normal reading distance.
(a) State the defect the person suffered from? (1mark)
(b) Why was he unable to read the book clearly at normal distance (1mark)
(c) How can the defect be corrected? (1mark)

16. Give **two** functions of saliva in human digestion process (2marks)

17. During a strenuous exercise the chemical process represented by the equation below takes place in the human muscle cells.

$$C_6H_{12}O_6 \longrightarrow 2CH_3CH(OH)COOH + 150KJ$$

(Substance X)

(a) Name the process represented above. (1mark)
(b) Identify substance X (1mark)

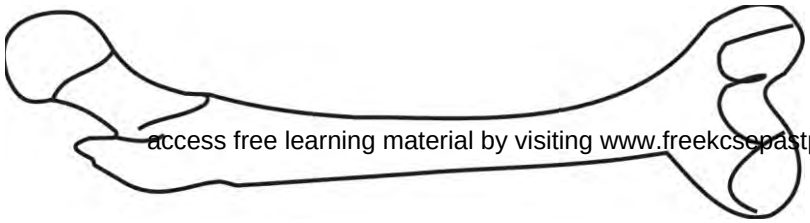
18. a) A mushroom research station would like to employ a researcher. Which scientist is most appropriate. (1mark)
    b) Name the branch of biology that deals with phylogenetic relationship between organisms. (1mark)
19. Explain why plants absorb water in waterlogged soil but not mineral salts. (2marks)
20. To control the spread of malaria, fish are introduced into water bodies near residential area.
    a. Name this method of population control. (1mark)
    b. State an advantage of the above method. (1mark)
21. Explain why resistance to antibiotics is considered an example of evolution. (2marks)
22. a) People are encouraged to take the corona virus disease vaccine. How does it work. (1mark)
    b) What is the significance of;
    - Red blood cells lacking mitochondria. (1mark)
    ii. Xylem vessels being dead. (1mark)
23. A patient complained of frequent thirst. A sample of the patient's urine was found not to have any sugar.
    a) Name the hormone the person was deficient of. (1mark)
    b) Name the gland that secretes the above hormone. (1mark)
24. a) The paddles of a whale and fins of a fish adapt them to aquatic habitat.
    i. Name the evolutionary process that may have given rise do these structures. (1mark)
    ii. What name is given to such structures. (1mark)
    b) State **two** advantages of natural selection. (2marks)
25. a) Explain why ingestion of salty food may reduce the amount of water passed out in urine. (2marks)
    b) Explain why small birds puff their features when cold. (2marks)
26. a) Explain why an effective respiratory system is associated with the circulatory system. (2marks)
    b) Distinguish between haemoglobin and myoglobin. (2marks)
27. New born babies have a higher heart beat than adults. Explain why? (2marks)

LANG'ATA/ KIBRA CLUSTER
231/1
BIOLOGY PAPER 1
(Theory)
DECEMBER 2021

1. State one use of each of the following apparatus in the study of living organism
   a) Bait trap (1mark)
   b) Pooter (1mark)
2. Mention two functions of cell sap (2 marks)

3. State two functions of Rough endoplasmic reticulum (2 marks)
4. Using a microscope, a student counted 30 cells across a field of view whose diameter was 6000µm. Calculate the average length of a cell. Show your working. (2 marks)
5. (a) State two features of a ball and socket joint (2 marks)
   (b) Name the bone that allows the head to, (2 marks)
      (i) Node
      (ii) Turn side ways
6. Name the type of skeleton that makes up the body of each of the following animals (2 marks)
   (a) Locust
   (b) bird

7. The diagram below represents a mammalian bone



   (a) Name the bone (1 mark)
   (b) Name the type of joint formed by the bone at its anterior end with the adjacent bone (1 mark
8. List four symptoms of diabetes mellitus (4 marks)
9. State one economic importance of each of the following (3 marks)
   (a) Tannin
   (b) Quinine
   (c) Caffeine

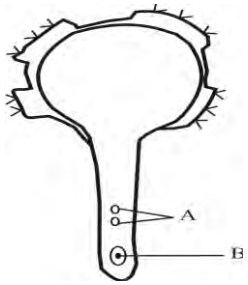
10. Name the organism that;
   (a) (i) causes malaria (1 mark)
      (ii) Transmits malaria (1 mark)
   (b) State two control measures for malaria (2 marks)

11. During an ecological visit to the savanna grassland, students were able to see lions, antelopes, vultures and pastoralists grazing their cattle. Construct a food chain with four consumer levels to illustrate the energy flow in the ecosystem (1 marks)
12. (a) Explain the reason why the action of ptyalin enzyme stops in the stomach (2 marks)
   (b) Name the features that increase the surface area of small intestines (2 marks)

13. The diagram below shows a human tooth

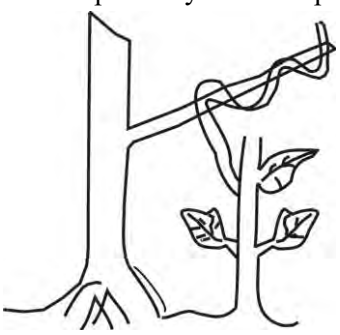
(a) Identify the tooth (1 mark)
(b) How is the tooth adapted to its functions (1 mark)
(c) State the role of Vitamin **C** in the human body. (1 mark)

14. Explain the importance of the following in photosynthesis (3 marks)
(i) Light
(ii) Carbon (IV) oxide
(iii) Chlorophyll
15. An individual is of blood group **B** positive
(a) Name the antigens in the individual's blood (2 marks)
(b) Give the reason why the individual cannot receive blood from a blood group **A** donor (2 marks)
16. State three functions of blood other than transport (3 marks)
17. State four applications of plant hormones in agriculture (4 marks)
18. The diagram below illustrates a growing pollen tube



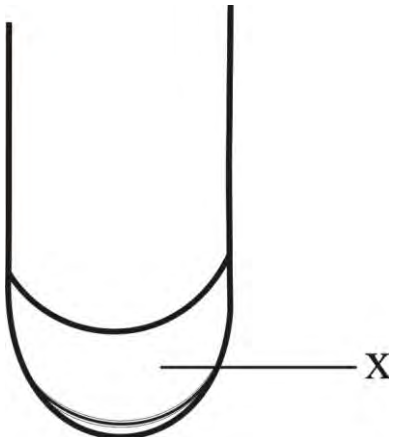
(a) Name the part labeled **B** (1 Mark)
(b) Explain the role of the parts labeled **A** (2 marks)

19. The diagram below illustrates a response by a certain plant



(a) Name the type of response (1 mark)
(b) Explain how the response illustrated above occurs (3 marks)

20. Give reason why each of the following is important in the study of evolution
    (a) fossil records (2 marks)
    (b) comparative anatomy (2 marks)
21. State the theories of evolution proposed by the following scientists (2 marks)
    (i) Charles Darwin
    (ii) Jean Baptise de lamarch
22. Name three types of chromosomal mutation (3 marks)
23 Give four reasons why water is significant in seed germination (4 marks)
24 Explain two roles of diffusion in human beings (2 marks)
25 State two ways in which floating leaves of aquatic plants are adapted to gaseous exchange (2 marks)
26 Explain the meaning of each of the following terms (2 marks)
    (i) Crenated cell
    (ii) Flaccid cell
27 The diagram below represents regions of root tip.



(a) Name the two regions above **X** in an ascending order. (2 marks)
(b) State the function of the part labeled **X** (1 mark)

LANG'ATA/ KIBRA
231/2
BIOLOGY PAPER 2(THEORY)
DECEMBER 2021

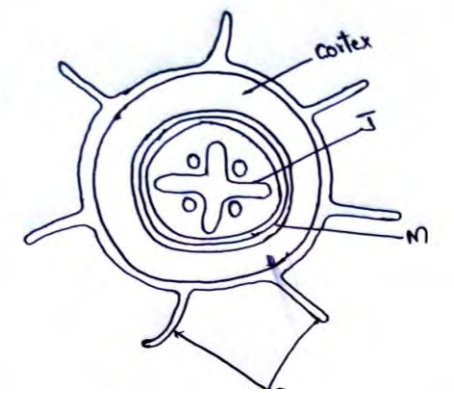
SECTION A (40MKS)
Answer all the questions in this section

1. Haemophilia is a sex linked characteristic caused by a recessive gene located on one of the sex chromosomes.

a) Name the chromosome onto which the gene for haemophilia is linked to (1mk)

b) A normal man for the condition marries a normal woman for the condition but sadly one of their sons develops this condition from birth.
    i) What are the likely genotypes of this couple? (2mks)
    Man
    Woman
    ii) Using a punnet square, carry out a cross to show why the couple gave birth to haemophiliac son (4mks)
    Use (H),to represent the gene for normal condition and (h) to represent the gene for haemophilia
    iii) Why is this haemophiliac condition very common in males than in female (1mk)

2. The figure below represents an organ obtained from a section of a plant. Use it to answer questions that follow.



D

a) i) Name the organ from which the above section was obtained. Give a reason for your answer. (2mks)

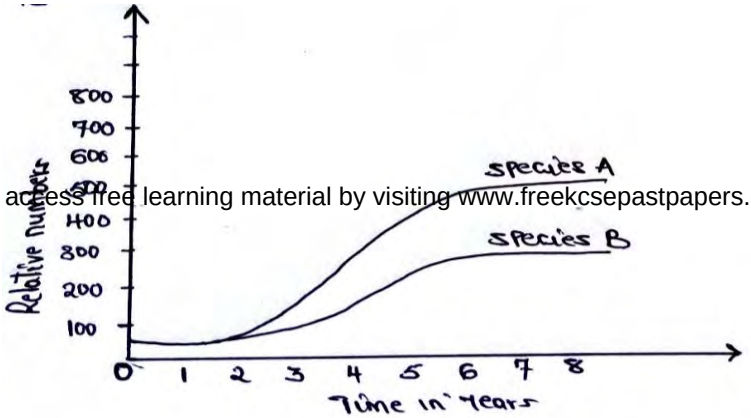
ii) Structure labelled J is described as a mechanical tissue. Explain (1mk)

b) i) Name the process by which water passes across structure M (1mk)

ii) Explain two ways by which cells with structures Dare adapted to their functions (2mks)

c) Name two strengthening materials that strengthen the collenchyma tissue (2mks)

3. The herbivorous mammalian species were introduced into an ecosystem at the same time and in equal numbers. The graph below represents their populations during the first seven years. Study the graph and answer the questions that follow.



a) i) Which species has a better competitive ability (1mk)

ii) Give reason for your answer (1mk)

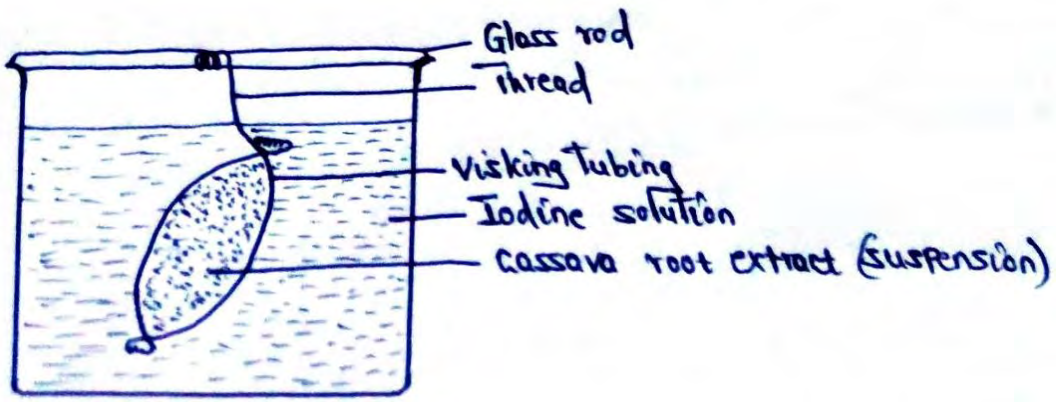
b) Account for the shape of the curve of species A between

i) One year and three years (2mks)

ii) Three years and seven years (2mks)

c) A natural predator for species A was introduced into the ecosystem. With a reason state how the population of each species would be affected (2mks)

4. A student from Abogeta secondary set up an experiment as illustrated below.



The visking tubing was left in iodine solution for 4 hours.

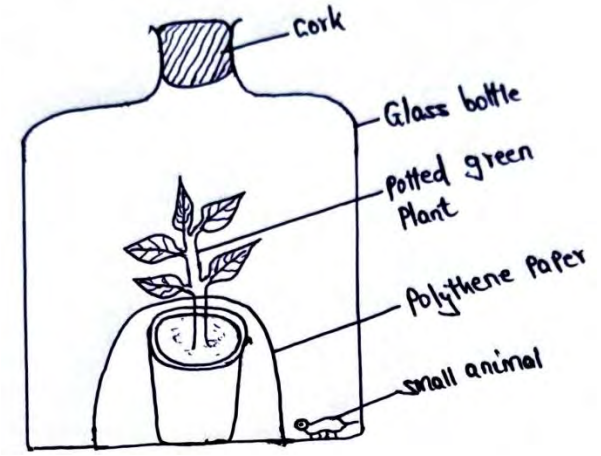
a) State the physiological process being investigated (1mk)

b) i) What were the expected results in the visking tubing and in the beaker (2mks)

ii) Account for your expected result in visking tubing (2mks)

c) Mention three factors that influences the rate of active transport (3mks)

5. An experiment was set up to investigate a factor in autotrophism in green plants.



Vaseline was applied at joint between the cork and the mouth of glass bottle and set up was left under sunlight for 6 hours.

a) Why was it necessary;

i) To apply Vaseline (1mk)

ii) To cover the pot with polythene paper (1mk)

iii) What was the purpose of including the small animals? Give two reasons. (2mks)

b) i) What would happen to the small animal if the set up was left over night in darkness (1mk)

ii) Account for the answer in b (i) above (1mk)

c) State the respiratory surface of the following organism (2mks)

i) Amoeba

ii) Fish

SECTION B (40MKS)

Answer question 6 (Compulsory) and choose either question 7 or 8

6. A hungry person had a meal, after which the concentration of glucose and amino acids in the blood were determined. This was measured hourly as the blood passed through the hepatic portal vein and the iliac vein in the leg. The results were as shown in the table below.

Time (Hrs)	Concentration of contents in Hepatic portal vein (Mg/100ml)		Concentration of contents in the iliac vein of the leg (Mg/100ml)	
	Glucose	Amino acids	Glucose	Amino acids
0	85	1.0	85	1.0
1	85	1.0	85	1.0
2	140	1.0	125	1.0
3	130	1.5	110	1.5
4	110	1.5	90	3.0
5	90	3.0	90	2.0
6	90	2.0	90	1.0
7	90	1.0	90	1.0

a) Using the same axes draw graphs of concentration of glucose in the hepatic portal vein and the iliac vein in the leg against time (7mks)

b) Account for the concentration of glucose in the hepatic portal vein from;
   i) 0-1 hour (2mks)
   ii) 1-2 hours (3mks)
   iii) 2-4 hours (3mks)
   iv) 5-7 hours (2mks)

c) Account for the difference in the concentration of glucose in hepatic portal vein and the iliac vein between 2 and 4 hours (2mks)

d) Using the data provided in the table explain why the concentration of amino acids in the hepatic portal vein took longer to increase (1mk)

Essays

7. a) Describe the opening and closing of the stomata using the photosynthetic theory (10mks)
   b) Describe blood sugar regulations in mammals (10mks)
8. a) Describe the adaptation of the following plants to their habitat;
   i) Xerophytes (15mks)
   ii) Hydrophytes (5mks)

LANG'ATA/ KIBRA
BIOLOGY PAPER 3.
CONFIDENTIAL

INSTRUCTIONS TO SCHOOL

1. The information contained in this paper is to enable the head of school and the teacher in charge of Biology to make adequate preparations for this Biology Practical examination. **NO ONE ELSE** should have access to this paper or acquire knowledge of its contents. Great care **MUST** be taken to ensure that the information here does not reach the candidates either directly or indirect.
2. The **Biology teacher** should note that it is his / her responsibility to ensure that each apparatus acquired for this examination agrees with the specifications given.

The question paper will not be opened in advance

Each candidate should be provided with the following:

- Specimen **K** (Orange fruit)
- About **3cm^3** of substance **B** (olive oil)
- About **3cm^3** of liquid **C** (fresh cow milk)
- About **2cm^3** of **0.01%** DCPIP (supplied with a dropper)
- About 2cm^3 of Iodine solution
- About **2cm^3 NaHC0$_3$** solution (supplied with a dropper)
- **6** test tubes in a test tube rack
- Distilled water in a wash bottle
- Scalpel
- **Two** 10ml measuring cylinder
- **One** 100ml beaker
- **2** Labels
- Two droppers

LANG'ATA/ KIBRA
BIOLOGY PAPER THREE
231/3

1. You are provided with **Specimen** arefully cut a transverse section through specimen **K** using a scalpel provided.

(a)

(i) By observing one of the two halves of specimen **K**, Give **two** reasons to **prove** that specimen **K** has **axile** placentation (2mks)

(ii) Squeeze some juice from **specimen K** into 100ml beaker provided and label it as **juice K.** using a portion of **juice K**, carry out the food test using the reagents provided and complete the table below. (**NB preserve the remaining portion of juice K for use in question 2.)** **(8mks**)

Food substance	Procedure	Observation	conclusion

(iii) Name the **deficiency** disease that results from **lack** of the food substance **present** in juice **K.** (1mk)

(iv) Highlight **two** symptoms of the disease named in **(a) (iii)** above . (2mks)

2. Put **2cm^3** of liquid labelled **C** into a test tube. Draw some of the juice from specimen **K** into a dropper. Add 4 drops of the juice into the test tube with solution ***C*** and shake.

(a) (i) State your observation. (1mk)

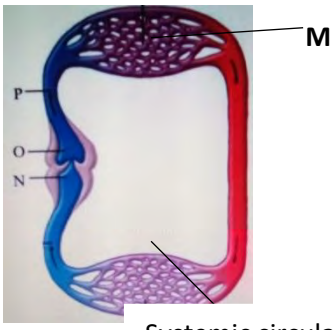
(ii) **State** the part of the human body where the process demonstrated above occurs and the enzyme that carries out the process.
Part of body (1mk)
Enzyme (1mk)

(iii) **Which** gland produces the enzyme stated in (a)(ii) above? (1mk)

(b) Take a small amount of substance **B** provided and add to it **2cm^3** of sodium hydrogen carbonate solution.
(i) **State** your observations (1mk)
(ii) Which **process** in the body is illustrated above? (1mk)
(iii) **State** the part of **the body** where the above process takes place (1mk
(iv) **State** two functions of substance **B** in the body (2mks
(v) Name **two** diseases of the circulatory system caused by **excess** cholesterol in food. (2mks)

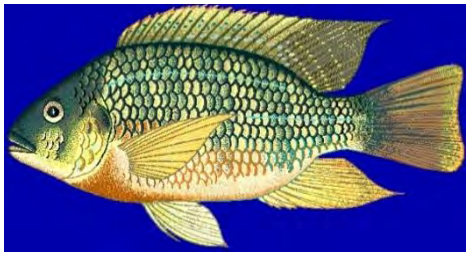
3. **(A)** photograph **J** shows the circulatory system of organism represented by photograph **G**.

J



Systemic circulation

G



(i) Giving **two** reasons to your answer name the **class** to which specimen **G** belongs.
Class……..…….. (1mk)
Reasons…… (2mk)

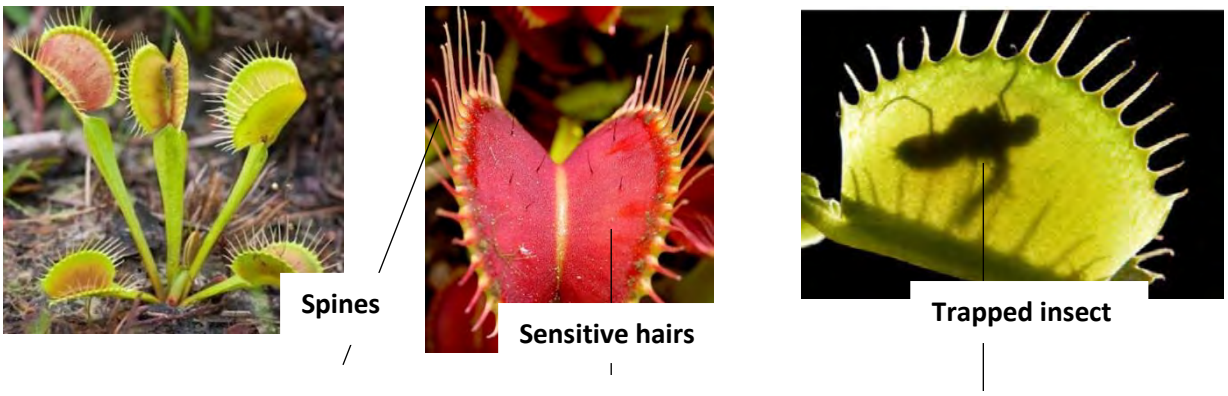
(ii) Name the part labelled: M…….…….. (1mk)
N……..……..…. (1mk)
O ……..……..… (1mk)

(iii) Giving **one** reason to your answer state the type of **closed** circulatory system shown by photograph **J**
Type of circulatory system……..… (1mk)
Reason…….….(1mk)

(iv) State two features of specimen **G** that enhances its **streamlined** shape (2mks)

(B) Below are photographs of **Venus flytrap** (an insectivorous plant). Study them and answer the questions that follow.

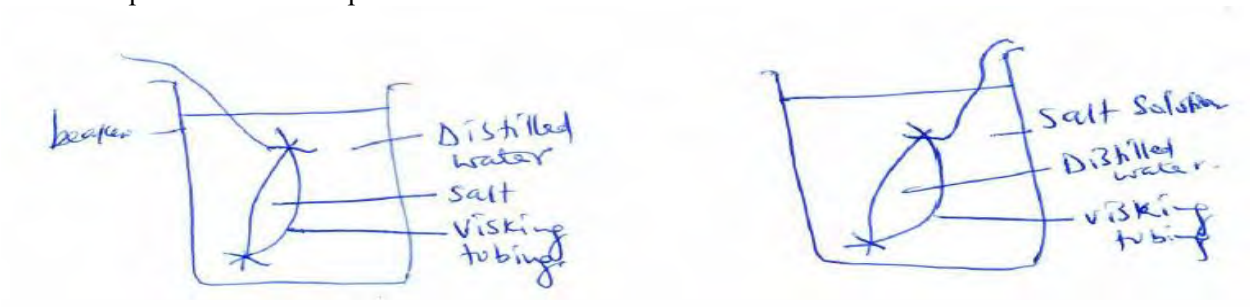
A B C



(i) Name one major nutrient that is **deficient** in the soil where the above plant grows. (1mk)
(ii) Name the type of response shown by plate **C** (1mk)
(iii) **Describe** how the above plant **trap** the insect 4mks)

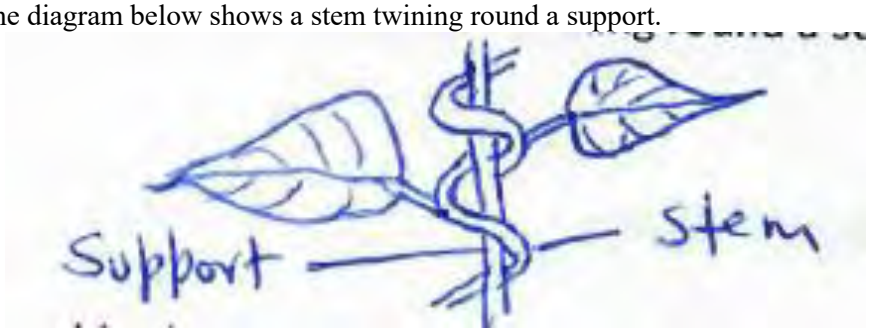
KIGUMO CLUSTER
FORM 4 BIOLOGY
PAPER 1 MOCK 2021
ANSWER ALL QUESTIONS

1. Differentiate nutrition in plants from that in animals. (2 marks)
2. State and explain three modes of feeding in animals. (3 marks)
3. Name two properties of disaccharides. (2 marks)
4. Explain three adaptations of arteries to their function. (3 marks)
5. Explain what happens during photolysis? (3 marks)
6. An experiment was set up as shown.



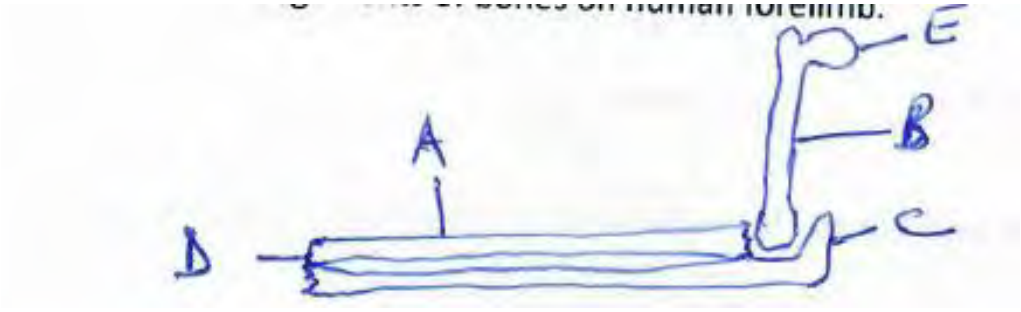
   a) State and explain what happened to visking tubings in both M and N. (4 marks)
   b) What does visiting tubing correspond to in a living organism? (1 mark)
7. State three digestive enzymes present in pancreatic juice. (3 marks)
8. Colour blindness is a condition carried by a recessive gene on X-chromosome. A colour blind man married a homozygous normal woman. One of their daughters married a normal man. Using letter c for colour blindness,
   a) Work out the outcome of the daughter's marriage. (4 marks)
   b) Why is colour blindness more common in men than women? (2 marks)
9. The figure below shows the iris of a mammalian eye.

   a) Label the parts A, B and C. (3 marks)
   b) State three adaptations of the iris to its function. (3 marks)
10. The diagram below shows a stem twining round a support.



a) Explain how this phenomenon occurs (3 marks)
b) Explain three biological significance of this phenomenon. (3 marks)

11. The base sequence on a DNA strand was as follows;
A --- T --- A --- A ---- C ---- G --- G ---- T ---- A
i) Write the sequence on the other strand. (1 mark)
ii) Write the base sequence on RNA strand replicated from the DNA. (1 mark)
12. Explain four adaptations of hydrophytes to their habitat. (4 marks)
13. a) List three differences between the nervous system and the endocrine system. (3 marks)
b) Name two transmitter substances found in the synapse. (2 marks)
14. Explain four roles of water in seed germination. (4 marks)
15. a) Name two plant cells where you would expect to have numerous mitochondria. (2 marks)
b) State one role of nucleolus. (1 mark)
16. Explain three adaptations of the sperm cell to its function. (3 marks)
17. The diagram below shows arrangements of bones on human forelimb.



i) Name bones A and B. (2 marks)
ii) State two roles of the structure labelled C (2 marks)
iii) Name the part that articulates with bone labelled B apart E. (1 mark)
iv) Name the type of joint forms at the part labelled D. (1 mark)

18. a) State two special properties of the cardiac muscles found in mammalian heart. (2 marks)
b) Name three organ systems in human body where smooth muscles are found. (3 marks)
19. State three unique characteristics of members of the class Crustacea. (3 marks)
20. Industrial wastes may contain metabolic pollutants. State how such pollutants may indirectly reach and accumulate in the human body if the wastes were dumped into rivers. (3marks)
21. State three biotic factors that affect distribution of living organisms in an ecosystem. (3marks)

KIGUMO CLUSTER
231/2
BIOLOGY PAPER 2 (THEORY)
DECEMBER, 2021

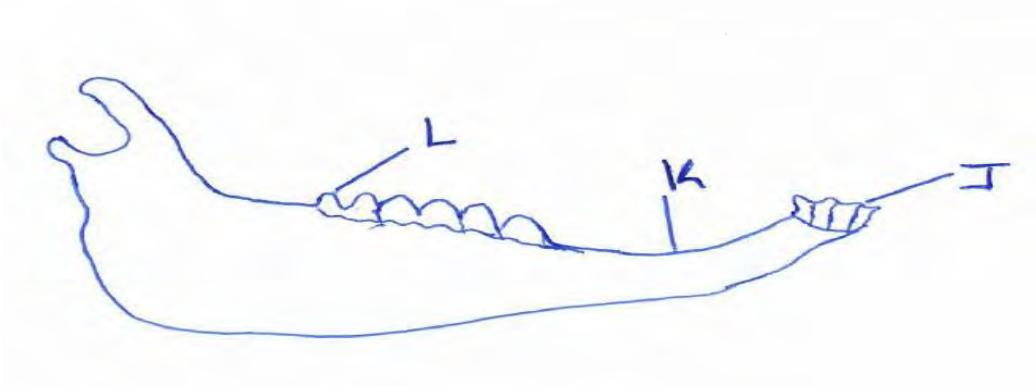
SECTION A

1. When testing a variegated leaf for starch, the following procedure is important
i) The leaf is boiled in water
ii) The leaf is then boiled in methylated spirit
iii) The leaf is taken back to the hot water
iv) The leaf is spread on a white tile and irrigated with iodine solution.

a) Why is the leaf boiled in hot water? (1mk)
b) Why is the leaf boiled in methylated spirit? (1mk)
c) Explain why the leaf is dipped in in hot water. (1mk)
d) Explain the observation made when the leaf is irrigated with iodine solution. (2mks)
e) What is a variegated leaf? (1mk)

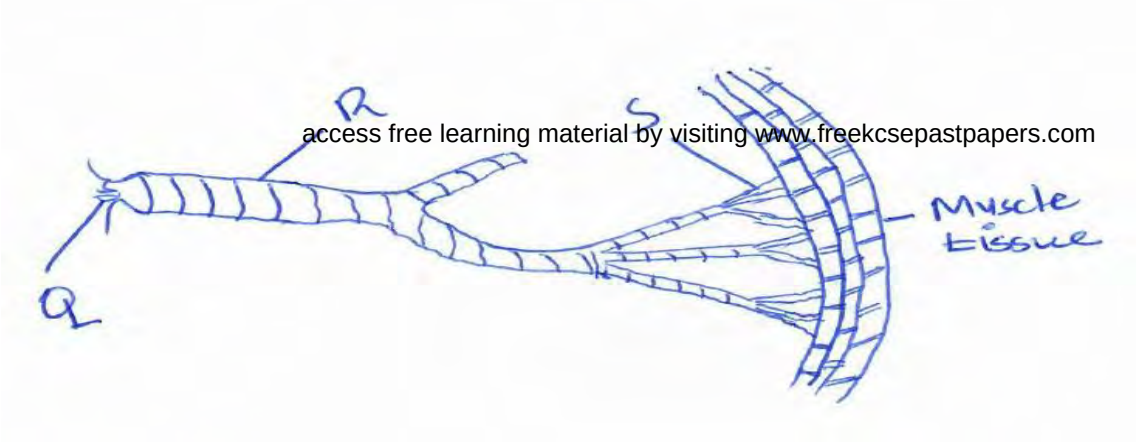
What is to destarch the leaf? (2mks)

2. The diagram below represents the lower jaw of a mammals.



a) Name the mode of nutrition of the mammal whose jaws is shown above. (1mk)
b) State one structural and one functional differences between the teeth labeled J and L. (2mks)
c)
   i. Name the toothless gap labeled K. (1mk)
   ii. State the function of the gap. (1mk)
d) Name the substance that is responsible for hardening of the teeth. (1mk)
e) Distinguish between the terms homodont and hererodent. (2mks)

3. The diagram below shows the gaseous exchange system of a locust.

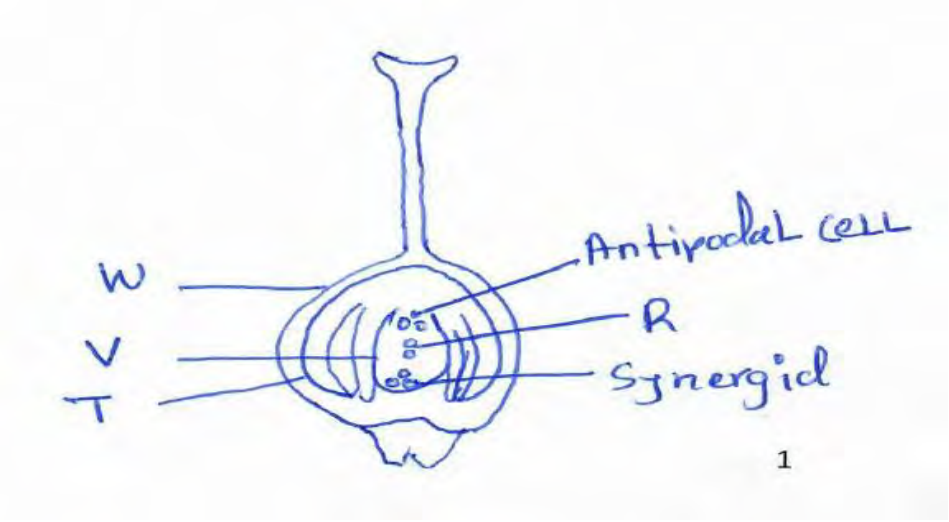


a) Name the structure labeled Q. (1mk)
b) State the function of the part labeled R. (1mk)
c) How is the part labeled S structurally adapted to its function? (2mks)
d) Identify the structure that perform the same function as one illustrated above in. (2mks)
   i. Amoeba
   ii. Fish
e) Name the causative agents for the following respiratory.
   Diseases. (2mks)
   i) Whooping Cough.
   ii) Pneumonia.

4. When pure breeding black guinea pigs were crossed with pure breeding white guinea pigs the offspring had a coat with black and white patches.
   a) Using letter G to represent the gene for black coat colour and letter H for white colour, workout the genotypic ratio of F_2. (5mks)
   b) State the phenotypic ratio of F_2 generation. (1mk)
   c) Name the term used when two alleles in heterozygous state are fully expressed phenotypically in an organism. (1mk)

d) Give an example of a trait in human beings where the condition whose term is named in (c) above expresses it. (1mk)

5. The diagram below shows an embryo sac.



a. Name the structures labeled D and E. (2mks)
b. On the diagram, mark using letter X the point at which the pollen tube enters the embryo sac. (1mk)
c. What is the function of the pollen tube? (2mks)
d. State two factors that hinders self-pollination in flowering plants. (2mks).

SECTION B (40 MARKS)

Answer question 6 (compulsory) and any other one question from this section.

6. 1cm^3 of catalase solution was added to equal volumes of hydrogen peroxide solutions at different pH values. The time taken to collect 10cm^3 of oxygen was measured. The results were as follows.

pH solution	Time taken to collect gas (minutes)
5.5	30
6.0	20
6.5	12
7.0	8
7.5	5
8.0	9
8.5	15
9.0	25

a) Plot a graph of time against pH of solution. (6mks)
b) Account for the rate of reaction at:
   i) pH. 7.5 (2mks)
   ii) pH. 5.5 (2mks)
   iii) pH. 9.0 (2mks)
c) Write a word equation for the reaction above. (1mk)
d) What is the importance of the reaction you have given in c above? (1mk)
e) Name an organ in the human body where the above reaction takes place. (1mk)
f) Other than the factor being investigated above name four other factors that affect the rate of enzyme controlled reaction. (4mks)

7. Describe the functions of a mammalian skin. (20mks)
8. Describe the process of double fertilization in a flowering plant. (20mks)

KIGUMO CLUSTER
213/3 BIOLOGY PRACTICAL
CONFIDENTIAL

Each candidate will require

- **Specimen K** -A mature onion bulb
- **Solution P** -distilled water in a beaker
- **Solution Q** -concentrated sodium chloride solution in a petri dish/beaker
- Empty petri dish
- A scalpel

KIGUMO CLUSTER
231/3 BIOLOGY
PAPER 3 (PRACTICAL)

1. You are provided with a specimen labelled **K** and solutions labelled **P** and **Q**. Cut the specimen into two halves. From one half remove the outer and an inner leaf of the specimen.

a) State two observable features of the outer and inner leaves of the specimen.
   (i) outer leaf (2mks)
   (ii) Inner leaf (2mks)

b) State a function of the inner and outer leaves of the specimen.
   (i) Outer leaf (1mrk)
   (ii) Inner leaf (1mrk)

c) Name the type of reproduction exhibited by specimen **K** (1mrk)

Using the other half of specimen **K**, remove some of the inner leaves. Cut the leaves along their lengths into nine strips. Each strip should be about 2mm wide. Place three strips into the solution labelled **P**. Place another three strips into the solution labelled **Q** and leave the last three strips in a petri dish labelled **R**. Allow the experimental setups to stand for 10 minutes.

d) Use your fingers to feel the texture of the strips. Record your observations.
   (i) Strip in solution P (1mrk)
   (i) Strip in solution Q (1mrk)

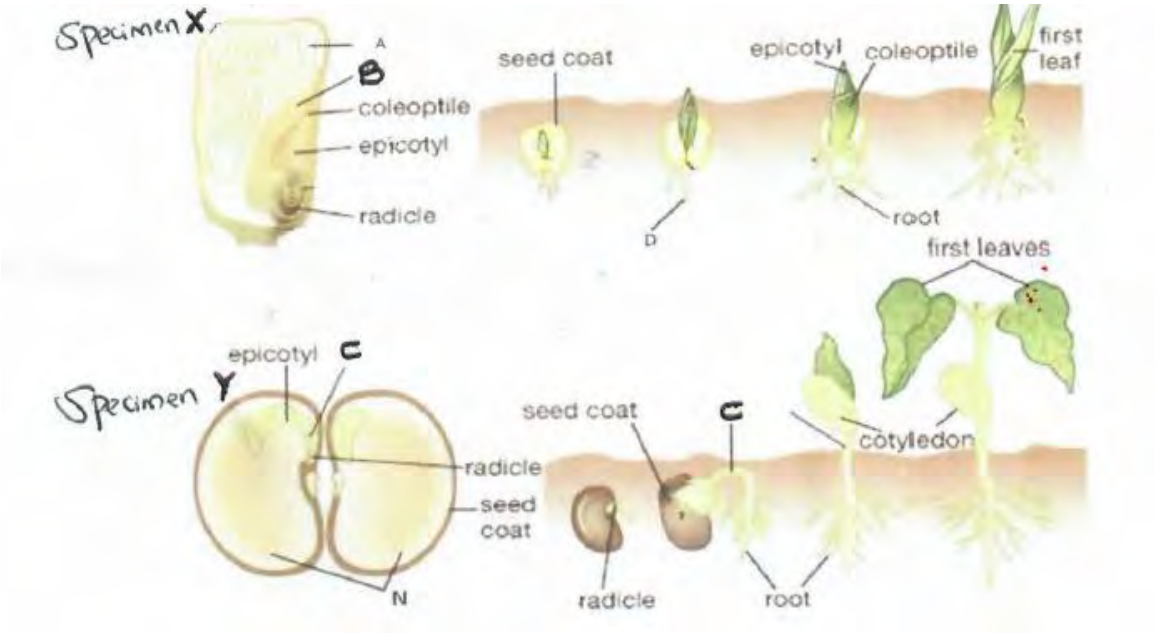
e) Account for the texture of strips in solution Q (3mrks)

f) Suggest the concentration of solution P in relation to the cell sap in the strips of the specimen (1mrk)

g) Give a reason for your answer in (**f**) above (1mrk)

h) State the aim of the setup R (1mrk)

2. The diagram below illustrates photographs of plants undergoing a certain process. Study them carefully and answer the questions that follow.



i) Name the process illustrated on the photograph. (1mrk)

ii) State two differences in the way the process occurs as illustrated in X and in Y. (2mrks)

b) i) State two roles of part C in the process illustrated above. (2mrks)

ii) State two external factors that are necessary for the process above to take place. (2mrks)

c) Name the part labeled B and give its function.

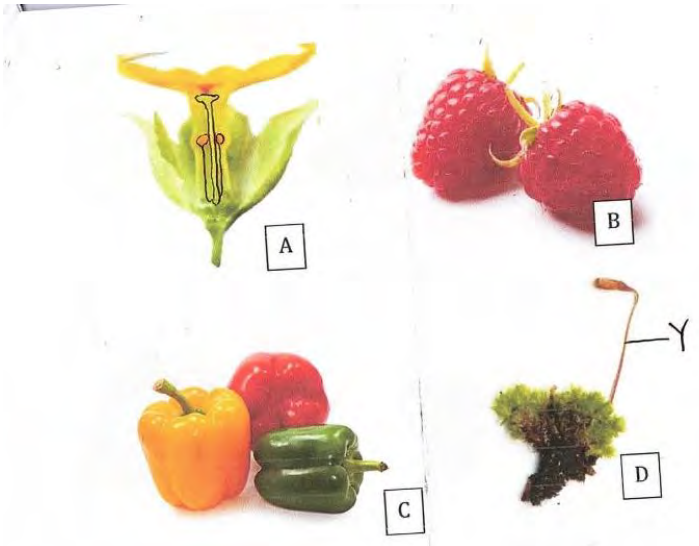
Name: (1mrk)

Function: (1mrk)

d) Using observable features only, name the classes to which the specimen X and Y belong, giving one reason in each case. (4mrks)

SPECIMEN	CLASS	REASONS
X	access free learning material by visiting www.freekcsepastpapers.com	
Y		

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



a) Name the condition exhibited in A which hinders self- fertilization. (1mrk)

b) Explain how the above condition hinders self-fertilization. (2mrk)

c) With reasons give the term given to gynoecium B and C

(i) B (1mrk)

Reason (1mrk)

(ii) C (1mrk)

Reason (1mrk)

d) i) State the division where plant in photograph D belong and give reason for your answer.

Division

(1mrk)

Reason (1mrk)

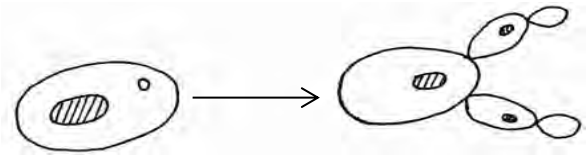
ii) State the type of nutrition exhibited by specimen D. (1mrk)

iii) Give a reason for your answer in d (ii) above. (1mrk)

iv) Give the function of the structure labelled Y. (1mrk)

GATUNDU SOUTH
BIOLOGY 231/1
(THEORY)
DECEMBER 2021

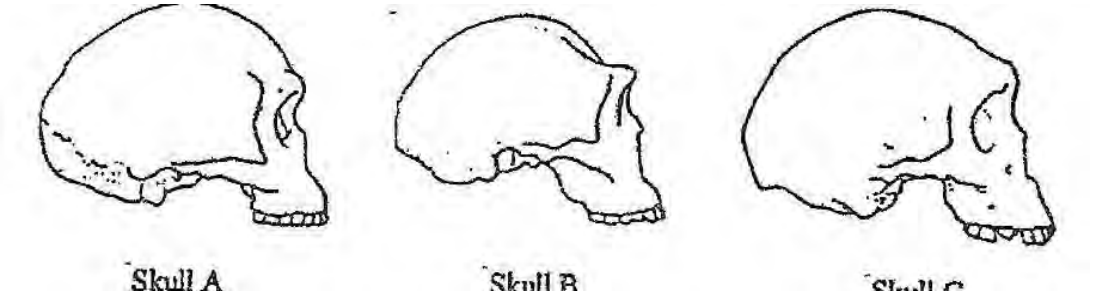
1. State **one** use for each of the following apparatus in the study of living organisms.
   (a) Pooter…… (1mk)
   (b) Bait trap…… (1mk)
2. What name is given to the process that involves the following activities that take place in the nephron of a human kidney?
   (a) Removal of nitrogenous waste from the blood. (1mk)
   (b) Return of useful substances back to the blood. (1mk)
3. State one function of each of the following structures in a cell.
   (a). Smooth endoplasmic reticulum. (1mk)
   (b). Nuclear membrane. (1mk)
4 The diagram below shows reproduction occurring in certain organism.



   (a) Name the type of asexual reproduction shown. (1mk)
   (b) Name an organism that shows this type of reproduction. (1mk)
5 State **two** functions of bile juice in digestion of fats. (2mks)
6. (a) Name a disease of the liver whose symptom is hardening and swelling of the liver. (1mk)
   (b) State the causative agent of the following diseases.
   (i) Typhoid.(1mk)
   (ii) Amoebic dysentery. (1mk)

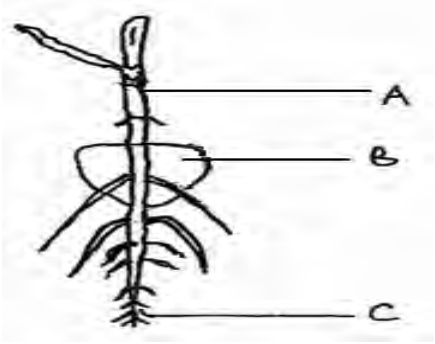
7. What happens when a human cheek cell is placed in distilled water? (2mks)

   b. Name any two organs in man where active transport occurs. (2mks)
8. State how the following factors affect enzyme activity.
   (a) Increase in temperature up to the optimum. (1mk)
   (b) Change of PH beyond the optimum range. (1mk)
   (c) Presence of inhibitors. (1mk)
9. A cross between a black cat and a tan cat produces a tabby pattern (black and tan fur together)
   i) What pattern of inheritance does this illustrate (1mk).
   ii) What percentage of kittens would have tan fur if a tabby cat is crossed with a black cat 4mks.
10. a) Name the type of evolution involved in the development of homologous structures. (1mk)
    b) The diagrams A, B and C below shows three reconstructed fossil skulls of the genus Homo.



   i) Arrange the letters in order with the earliest skull first and the most modern skull last. (1 mk)
   ii) Give two features shown by these skulls which support your answer to (b) (i) above. (2mks

11. The diagram below represents a maize seedling.



(a) Name the structures labelled **A** and **C**. (2mks)
(b) State the functions of the parts labelled **A**, **B** and **C**. (3mks)

12. (a) What is oxygen debt? (1mks)
(b) List **two** factors that determine the amount of energy a human being requires in a day. (2mks)

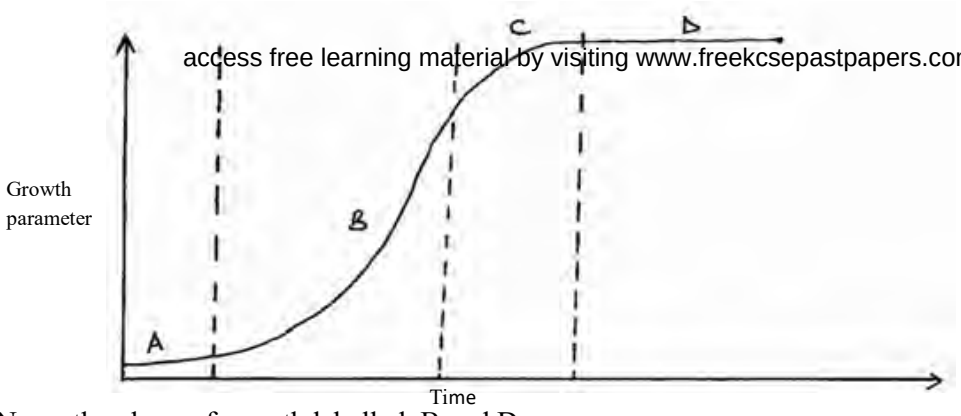
13. Blood samples of persons from high altitude areas are found to have more red blood cells than those from low altitude areas. Explain. (2mks)

14. State the role of each of the following parts of the mammalian heart
a) Tendons (1mk)
b) Coronary artery (1mk)

15. Name the part of the brain that controls the rate of breathing. (1mk)

16. a) A group of students visiting a National Park noted that migrations of lions were closely related to those of hyenas and vultures. Suggest a possible cause of this migration. (1mk)
b) Explain the observation. (1mk)
c) Name **three** methods of estimating population. (3mks)

17. The graph below show the growth curve of an organism.

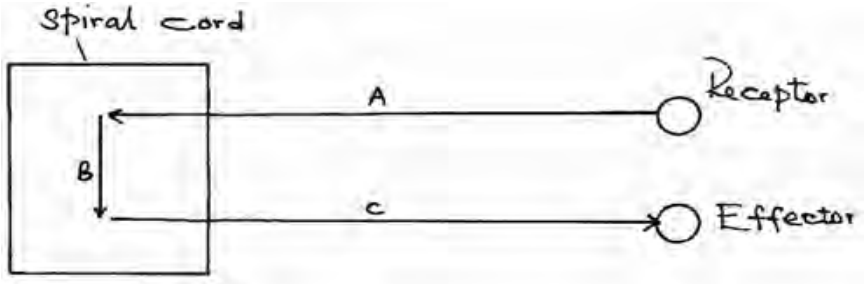


(a) Name the phase of growth labelled. B nad D (2marks)
(b) Account for the growth shown in phase **A**. (1mark)

18. a) State the function of carbonic anhydrase in the red blood cells. 1 mk
b) What is attenuation as used in immunization? 1 mk

19. Name the structures that:
(a) Join bones to bones. (1mark)
(b) Join muscles to bones. (1mark)

20. The diagram is a simplified part of the nervous system. Use the diagram to answer the following questions.



(a) Name the nerve cells **A** and **C**. (2marks)

(b) A person with a spinal injury is unable to move part of the body below the injury. Explain. (2marks)

21. a) What is double circulatory system? (1mark)

b) Name **two** classes of animals which have a double circulatory system. (2marks)

22. Two students were observing bacteria using two slides that were duplicates of each other. Student A saw 10 bacteria while student B saw 50 bacteria using identical microscopes.

a) Suggest a reason why they observed different numbers of bacteria. (1mark)

b) Which of the following combination would give a higher total magnification? (1mark)

Eye piece × 10	Objective × 20
Eye piece × 10	Objective × 40

23. The diagram below shows a human tooth.

(a) Identify the tooth. (1mark)

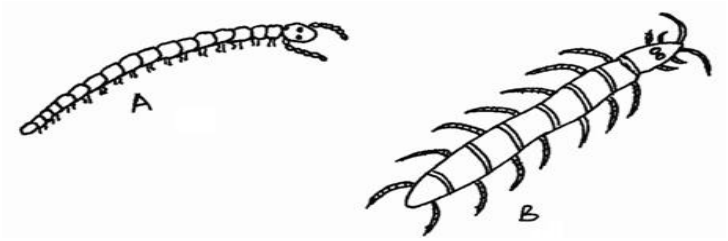
(b) How is the tooth adapted to its function? (1mark)

(c) State the deficiency disease caused by lack of the following vitamins in the human body:

(i) Vitamin A. (1mark)

(ii) Vitamin D. (1mark)

24. The figures below show two types of animals.



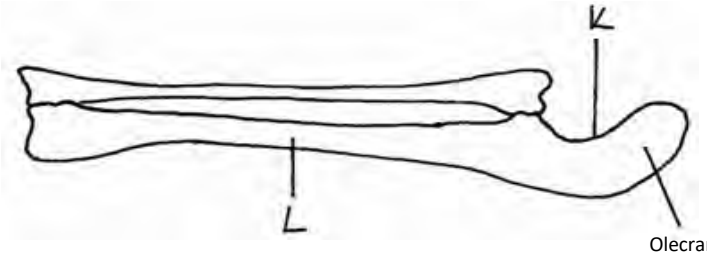
(a) Identify the phylum of the **two** organisms. (1mark)

(b) (i) Identify **two** distinguishing characteristics which are used to put the organisms into their different classes. (2marks)

(ii) Name the classes to which the organisms belong. (2marks)

25. State **three** features in bisexual flowers that hinder self-fertilization. (3marks)

26. The diagram below shows the bones of the lower arm.



Olecranon process

a) Identify the part labelled **K**. (1mark)
b) Name the bone labelled **L**. (1mark
c) What is the function of the olecranon process? (1mark)

27. a) Define 'transpiration'. (1mark)
(b) State **two** structural factors that would favor increase in transpiration rate. (2marks)

28. During a clinical laboratory test, some sugar was detected in an individual's sample of urine
Name:
a) The hormone that was deficient in the patient (1mk)
b) The gland that produces the hormones named in (a) above; (1mk)
c) The disease the individual was likely to be suffering from (1mk)

GATUNDU SOUTH
231/2
BIOLOGY
PAPER 2 (Theory)

SECTION A (40 MARKS)
Answer all questions in this section in the spaces provided.

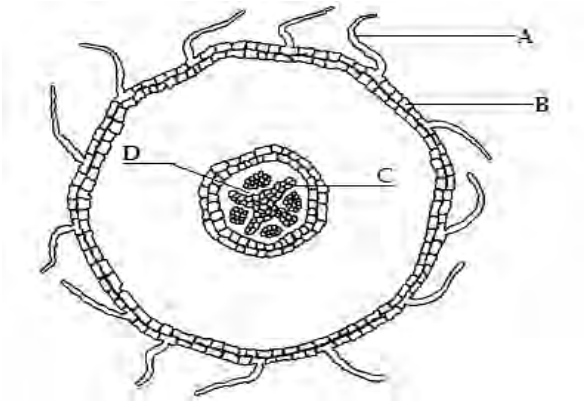
1. a) Define the term mutation.
(1mark)
b) A couple, George and Grace had a son who was suffering from haemophilia even though none of them showed signs of haemophilia.
i) State the genotype of George and Grace. (2marks)
ii) Using a genetic cross work out the genotype of the couple's son. (4marks)
c) What are linked genes? (1mark)

2. Three pieces of potato cylinders of equal length were placed in three solutions of different concentrations. The set ups were left to stand for 45 minutes. The results were recorded in the table below.

Solution	Initial length of cylinder (mm)	Final length of cylinder (mm)
A	40	40
B	40	38.5
C	40	41

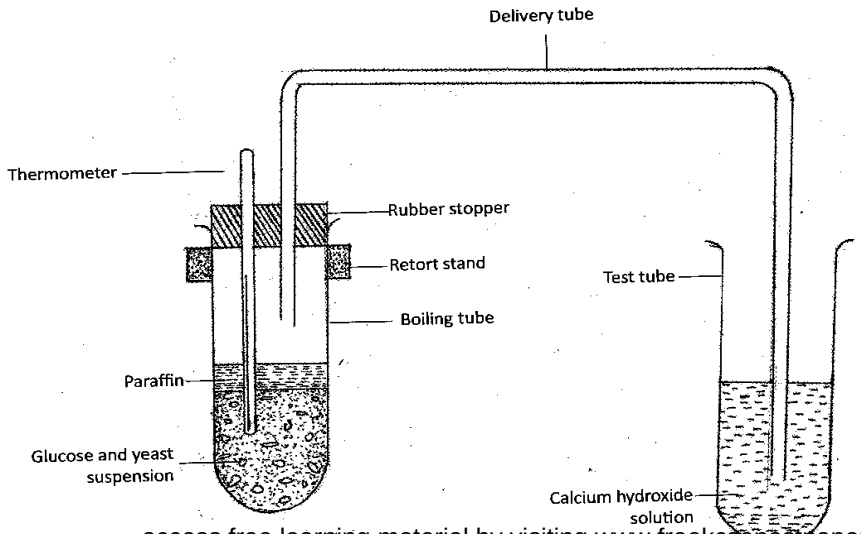
a) Describe the nature of solution **A** in relation to the concentration of the potato cells. (1mark)
b) Explain the observation that was made on the potato cylinder which was put in solution **B.** (3marks)
c) i) State what would happen to red blood cells if they were placed in solution **C.** (1mark)
ii) Explain your answer in (c) (i) above. (2marks)
d) Name the process involved in uptake of mineral salts by plants from the soil. (1mark)

3. The diagram below shows a transverse section of a certain part of an angiosperm. Study the diagram carefully and answer the questions that follow



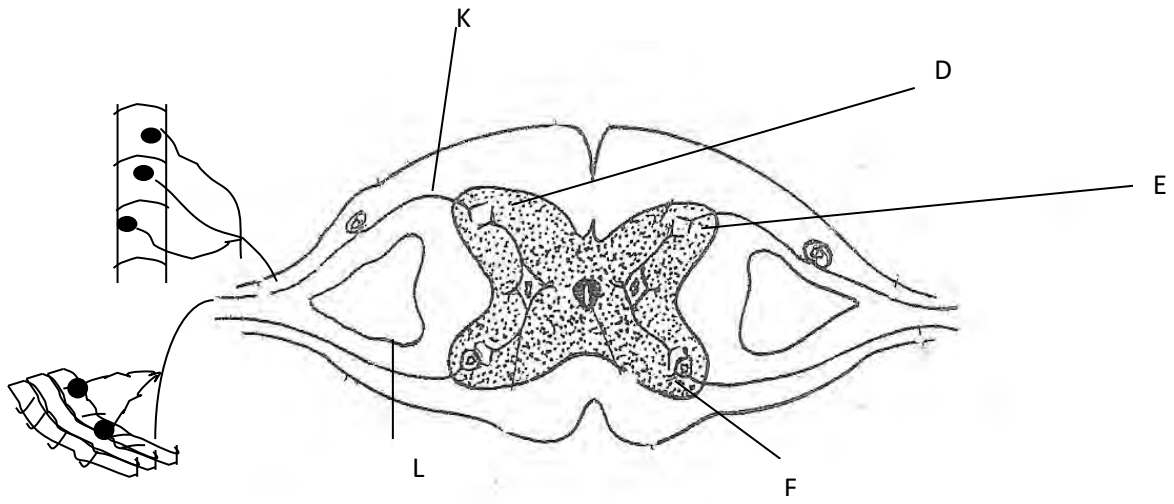
(a) With a reason, name the part of the plant from which the section was made **(2 marks)**
Part of plant
Reason
(b) Name each of the parts labelled **C** and **D** **(2 marks)**
(c) Name the tissue labelled **B** **(1 mark)**
(d) state three adaptations of part labeled A (3marks).

4. The set up below illustrates an experiment to demonstrate a certain biological process, before the addition of the yeast suspension the glucose solution was first boiled and then cooled at 40°C.



a) What was the aim of the experiment? (1mark)
b) What observations would you make in the tubes a few minutes after the experiment begun (2marks)
c) Explain the observations made in (b) above . (3marks)
d) Why was glucose solution boiled before cooling at 40°C (1mark)
e) How can you set up a control experiment for the above (1mark)

5. The diagram below shows a simple reflex arc



(a) Identify the structures labelled:
E……. (1mark)
F…….. (1mark)
(b) What is the functional difference between K and L (1mark)
(c) Explain how a nerve impulse is transmitted across the gap labeled D. (3marks)
(d) State **two** differences between nervous communication and endocrine communication. (2mks)

Nervous communication	Endocrine communication
i)	
ii)	

SECTION B: (40 MARKS)

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

The table below shows the population of Paramecium aurelia and yeast cells, cultured in a solution containing sugar.

Time (hours)	2	4	6	8	10	12	14	16
Paramecium	20	90	120	95	50	20	40	60
Yeast	60	140	100	65	25	50	80	100

a) Using the same set of axes, plot graphs of population of Paramecium aurelia and yeast. 7mks
b) At what time was the population of Paramecium aurelia and yeast the same. (2marks)
c) Explain the relationship between Paramecium aurelia and yeast. (2 marks)
d) What is the approximate time lapse between the maximum population of yeast and maximum population of paramecium? Suggest a reason for this lapse. (2 marks)
e) Account for the shape of the graph of Paramecium aurelia between;
2 and 6 hours (3 marks)
6 and 12 hours (3marks)

f) Suggest what would happen to the population of paramecium if the temperature was lowered to 0°C. (1 mark)

7. How is mammalian gaseous exchange system adapted to its function? 20mks
8. Describe what happens in a flower from the time of pollination up to the time of seed and fruit development. 20mks

GATUNDU SOUTH EVALUATION EXAMINATION
231/3
BIOLOGY PAPER 3

CONFIDENTIAL.
The information contained here should not be availed to unauthorized persons.

1. Photographs must be coloured
2. Olive oil 2 ml per candidate
3. Sodium hydroxide solution presented as solution P 2ml per candidate
4. Two empty test tubes in a test-tube rack
5. Two labels per candidate
6. Access to water on the bench- can be shared
7. A twig of Kai apple (*Dovyalis caffra*) containing thorns
8. A twig of pencil cactus(*Euphobia tirucalli*)

GATUNDU SOUTH
231/3
BIOLOGY PAPER 3 PRACTICAL

1. You are provided with the following
– Oil
– Water
– Liquid P

Procedure
– Label two test tubes 1 and 2.
– Put 2cm^3 of water in each test tube
– Add 1cm^3 of oil into each test tube
– Add solution 1 cm3 of solution p into test tube 1
– Shake both test tubes and allow to settle for a minute

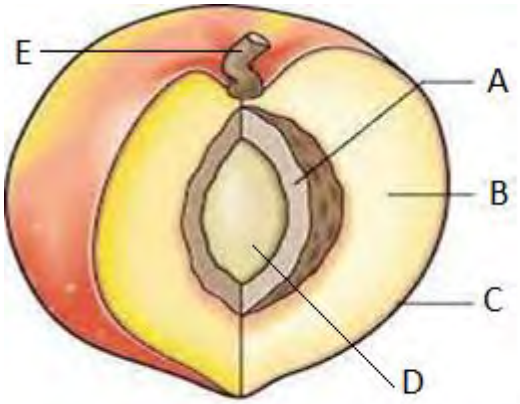
a. (i) Record the results
Test tube 1 (1 mark)
Test tube 2 (1 mark)
ii) Name the process that has taken place in test tube 1 (1 marks)
iii) What is the significance of the process named in a (ii) above (1 mark)
iv) Name the substance in the human digestive system that are represented by liquid P (1 mark)
V) What is the significance of test tube B in the experiment (1 mark)

b) You are provided with specimen labeled T and S, study them carefully to answer the questions that follow
i. Name the habitat from which of each of the plant
Specimen A (1 mark)
Specimen B (1 mark)
Give the adaptations of each specimen to its habitat
Specimen A (2 marks)
Specimen B (4 marks)

2. The photographs labeled U, V ,W and X are sections of some plant parts

PHOTGRAPH U PHOTGRAPH V

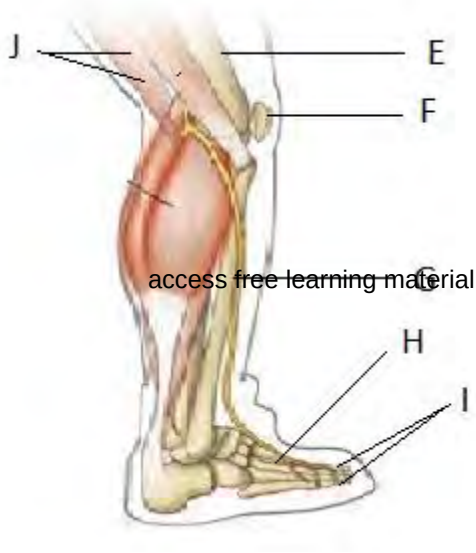
PHOTGRAPH W



PHOTGRAPH X

a. Name the type of placentation in the specimens shown in photograph U, V and W (3 marks)
b. Name the parts labeled A,B,C,D and E on specimen X (5 marks)
c. Explain the mode of dispersal in specimen V (4 marks)

3. The photograph below represent a mammalian hind limb. Use it to answer the questions that follow;



a. Name the bones labeled E, F, G and H (4 marks)
b. Name the types of joint formed
   i. Between bone E and G (1 mark)
   ii. Between the bones labeled I (1 mark)
c. What is the significance of bone F at the joint (1 mark)
d. I) Name the type of tissue labeled J (1 mark)
   ii) Explain how the tissue labeled in d(i) above bring about movement of the limb (2 marks)
   iii Explain how tissue J is adapted to its function (4 marks)

MURANG'A SOUTH
231/1
BIOLOGY PAPER 1

1. Name three sites of gaseous exchange in frogs. (3mks)
2. a) What is organic evolution (1mk)
   b) Distinguish between divergent and convergent evolution giving example in each case. (4mk)
3. State three applications of plant hormones in agriculture (3 marks)
4. (a) Give an equation to show that respiration involves oxidation of glucose (1mk)
   (b) How is an energy rich molecule rebuilt after muscle contraction (2mks)
   (c) apart from energy, name another end product of anaerobic respiration in animals (1mks)
5. Give the functions of the following ecological instruments (2mks)
   (a) Seechi disc
   (b) Photographic light meter
6. a) Which genetic disorder is caused by lack of a gene which causes production of Melanin. (1mk)
7. List down **two** phenotypic characteristics that have been selected for the production of strains suitable for modern agricultural purposes (2mks)
8. A plant was observed to have parallel venation and fibrous root system. Name.
   (i) Subdivision of this plant. (1 mk)
   (ii) Class to which the plant belongs. (1 mk)
9. Name the organism that;
   (a) (i) causes malaria 1 mark)
   (ii) Transmits malaria 1 mark)
   (b) State two control measures for malaria (2 marks)
10. Explain two milestones in the evolution of man that have made him the most dominant species on earth. (2marks)
11. 50 black mice and 50 white mice were released into an area inhibited by a pair of owls. After four months 38 of the black mice and 9 of the white mice were recaptured.
    a) How this observation would be explained. (2 marks)
    b) Name the theory of evolution that support the results in (a) above. (1mark)
    c) Name one vestigial structures in man. (1 marks)

12. State the functions of the following apparatus.
    (i) Bait trap (1mk)
    (ii) Pooter (1mk)
13. a) Define the term 'parthenocarpy'. (1mk);
    b) Name **two** plant growth hormones that promote parthenocarpy. (2mks)
14. What is the biological importance of the larval stage during metamorphosis (2mks)
15. a) State **one** structural and one functional difference between motor and sensory neurone. (2mks)
    Structural
    Functional
    b) What name is given to the gap between the sensory neurone and intermediate neurones. (1mk)
    c) Name the transmitter substance found in the gap named in (b) above. (1mk)
16. Name the type of response shown by: (2mks)
    a) Sperms when they swim towards ovum.
    b) Euglena when they swim towards the source of light.
17. Give **two** reasons why the pressure of blood is greater in the arteries than in the veins in mammals. (2 marks)
18. a) What is the importance of heartbeat in blood circulation? (1mk)
    b) If the nerve supply to the heart of a mammal is severed, the rhythmic heart movement will still go on and the heart continues to beat. Explain this observation. (1mk)
19. What happens when respiration exceeds photosynthesis in the guard cells of terrestrial plants? (3 mks)
20. a) Name the hard body covering found in organisms of the phylum arthropoda. (1mk)
    b) Give **two** uses of the structure mentioned in (a) above. (2mks)
21. Describe how the following conditions promotes cross pollination
    (i) heterostyly (1 mark)
    (ii) self sterility (1 mark)
22. Distinguish between plasmolysis and deplasmolysis as used in cell physiology (3 marks)

23. Explain how surface area to volume ratio affect the rate of diffusion in living organisms (2 marks)
24. State two differences between the product of mitotic division and those meiotic division (2 marks)

mitosis	meiosis

25. Explain why fresh water aquatic animals excrete nitrogenous waste inform of a ammonia (3 marks)
26. Alongside alimentary canal are enzyme that digest food into simpler absorbable forms. study the illustration below to answer questions that follows

protein $\xrightarrow{\text{enzyme K}}$ peptide $\xrightarrow{\text{enzyme L}}$ aminoacids

(a) Identify enzyme K and its site of action in alimentary canal (2 marks)

Enzyme	Site of action

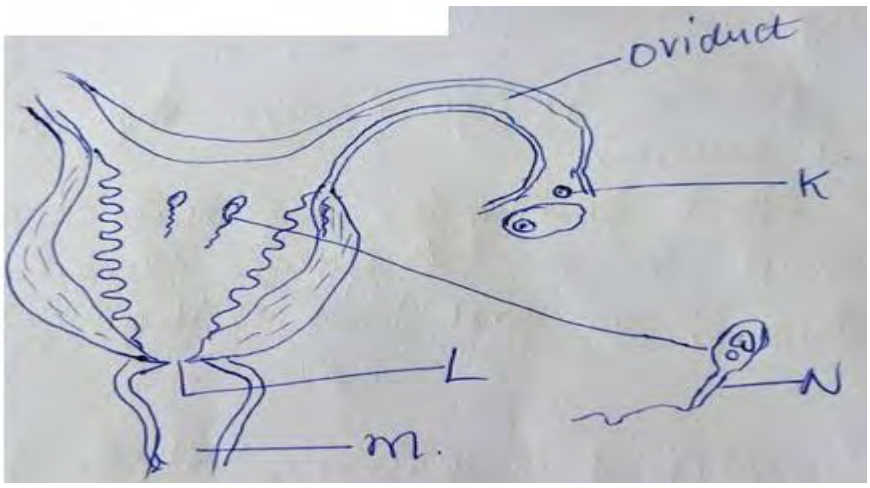
(b) Identify enzyme L and state its pH under which it works best (2 marks)

Enzyme	pH

27. a) What makes young herbaceous plants remain upright (2 marks)
    b) Why should herbaceous plant remain upright (2marks)
28 a) Name the main excretory product stored in the coffee berries (1mk)
    b) What is the economic use of the products named in a (a) above (1 mark)
29. a) state one advantages of asexual reproduction (1mk)
30. Define the term photolysis (1 marks)
31. Outline one functions of the femur bone (2 marks)

MURANG'A SOUTH
231/2
BIOLOGY PAPER 2

1. Study the diagram below and use it to answer the questions that follow



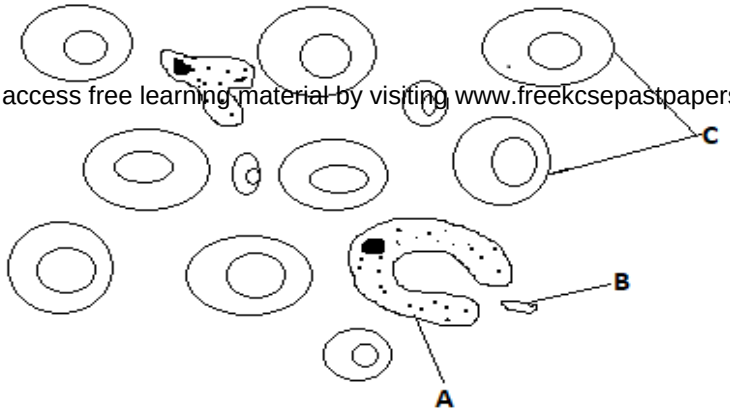
(a) (i) Label parts labelled (2mks)
(ii) Through which process is structure labeled K in (a) (i) above produced? (1mk)
(b) How is the cell labeled N adapted to perform its functions. (3mks)
c) Name the hormone that stimulates the production of cell labeled K.at puberty. (1mk)

2. Bile and pancreatic juice are important secretions in animal nutrition.
(a) In which part of the digestive system do they exert their influence? (1mk)
(b) (i) For efficient digestion, which of the two secretions should be mixed with the chyme first? (1mk)
(ii) Explain your answer (4mks)
(C) Explain why an adult does not need to eat too much protein in a meal/diet. (2mks) ,

3. The table below shows the approximate distribution of blood groups in a sample of 100 people in a population.

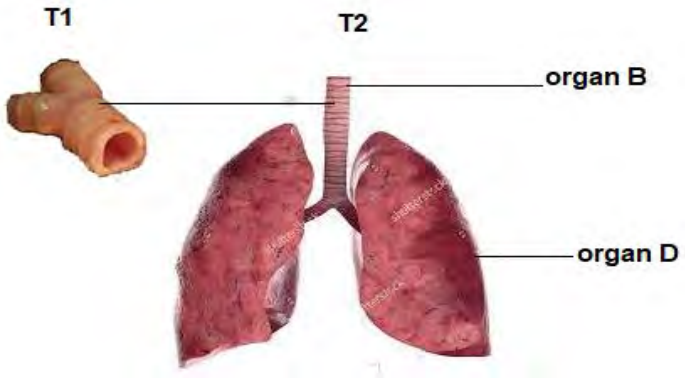
Blood group	**Frequency**	**Rhesus +ve**	**Rhesus -ve**
A	**26**	**22**	**4**
B	20	18	2
AB	4	3	1
O	50	42	8

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

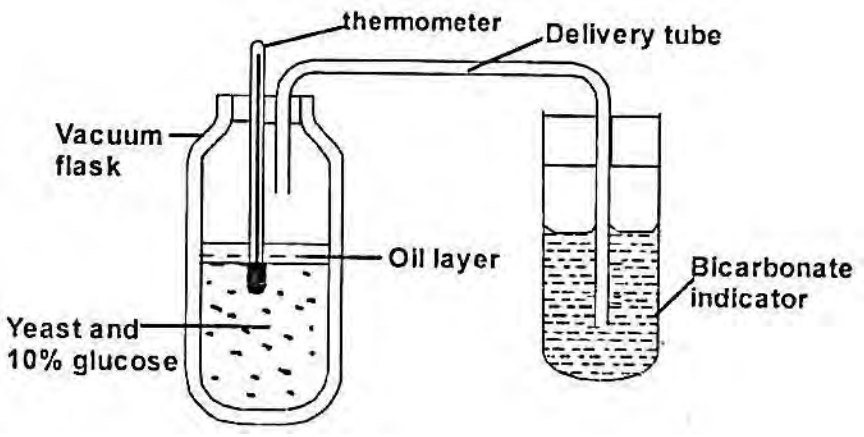
4(a). Identify organs B and D in photograph T2 and state the class of organism from which they were obtained. (4mks)



ORGAN	IDENTITY	CLASS

(b) State the common function of the organs identified in (a) above. (1mk)
(c) Name the parts of the body where B and D in photograph T2 are found. (2mks)
(d) List the adaptations of D to its functions. (3mks)
(e) Using observable features only, state how B is adapted to its function (2mks)

4. The set apparatus was assembled by a group of students to investigate some physiological process. Glucose solution was boiled and oil added on top of it. The glucose solution was then allowed to cool before yeast was added.



a) i) Give ONE aim of the experiment. (1mk)
ii) Explain observations expected after 24 hrs. (2mks)

b) i) Why was the glucose solution boiled before adding the yeast suspension? (1mk)
ii) What was the importance of cooling the glucose solution before adding the yeast? (1mk)
(c) In another investigation, a bird was found to use 10 litres of oxygen to give a respiratory quotient of 0.7 during period of flight.
i) Name the type of food that was being respired by the bird (1mk)
ii) Determine the amount of carbon (IV) oxide produced during the same flight. (2mk)

5. Mr. Juma has sued Serenity Hospital on grounds that their child was wrongly identified such that they got the wrong one. The child is blood group O. Mr. Juma is blood group AB while Mrs. Juma is heterozygous blood group A.
a) Work out the possible blood group of their offsprings. (4 mark
b) Is Mr. Juma justified in his claims? Explain. (2 mark)
c) State <u>two</u> blood disorders in humans that result from mutation. (2 marks)

6. <u>SECTION B:</u>

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

A Farmer wished to plant certain species of *Erythrina* trees on his farm. However, their seeds normally take time to germinate after sowing. To overcome this problem, he put the seeds in hot water maintained at 50^{o}C. Batches of 20 seeds were removed at one minute intervals and then planted in trays containing moist soil. After 15 days, the number of seeds that germinated in each tray was counted.

The results obtained were as shown in the table below.

Batch order	Time intervals(minutes)	Germinated seeds	Percentage of seeds that Germinated.
1st	0	3	
2nd	1	3	
3rd	2	8	
4th	3	15	
5th	4	18	
6th	5	13	
7th	6	10	
8th	7	6	
9th	8	2	
10th	9	0	
11th	10	0	

a) Calculate the percentage germination rate for each batch and fill in the table. (5mks)
b) Use your results to plot a graph showing percentage germination against the duration in which the seeds were soaked in hot water. (6mks)
c) From the graph derive the expected number of seeds that would germinate if soaked for 4.5 minutes. (1mk)
d) Using the graph briefly explain the effect of hot water treatment on seed germination of *Erythrina*. (5mks)
e) Explain why there was no germination of seeds soaked in hot water for nine to ten minutes. (1mks)
f) Besides hot water treatment, suggest two other methods that can be used to speed up germination in *Erythrina.* (2mks)

7. Explain the adaptations of parts of the ear in the outer and middle ear. (20 mks)
8. Describe how the kidney Nephron functions. (20 mks)

MURANG'A SOUTH
231/3
BIOLOGY
PRACTICAL
CONFIDENTIAL.

In addition to the apparatus found in biology laboratory, each candidate should be provided with

1. Ripe Yellow/purple passion fruit labeled specimen J.
2. Dry black jack fruit labeled K.
3. Fresh green peas/bean pod labeled specimen L.
4. Hand lens.
5. 3ml of DCPIP.
6. Dropper.
7. 50ml beaker.
8. Filter funnel.
9. Stirring rod.
10. One test tube.
11. Test tube rack.

NOTE:

MURANG'A SOUTH
231/3
BIOLOGY Paper 3
(PRACTICAL)

1. you are provided with specimens J, K and L.

a) (i) identify specimen J. (1mk)

(ii) Give a reason for your answer in a) (i) above. (1mk)

b) Using the scalpel provided, carefully make a cross section of specimen J.

i) name the type of placentation (1mk)

ii) extract juice form specimen J and test it for vitamin C. (3mks)

Food tested	Procedure	Observation	Conclusion

c) complete the table below using the specimens provided. (9mks)

specimen	Agent of dispersal	One adaptation of the specimen
J		-
K		-
L		-

2. The photographs below represents leaves from different plants.use them to answer the questions that follow.

a) Each of the leaves A,B and C are modified to perform different functions. With a reason, state the functions. (10mks)

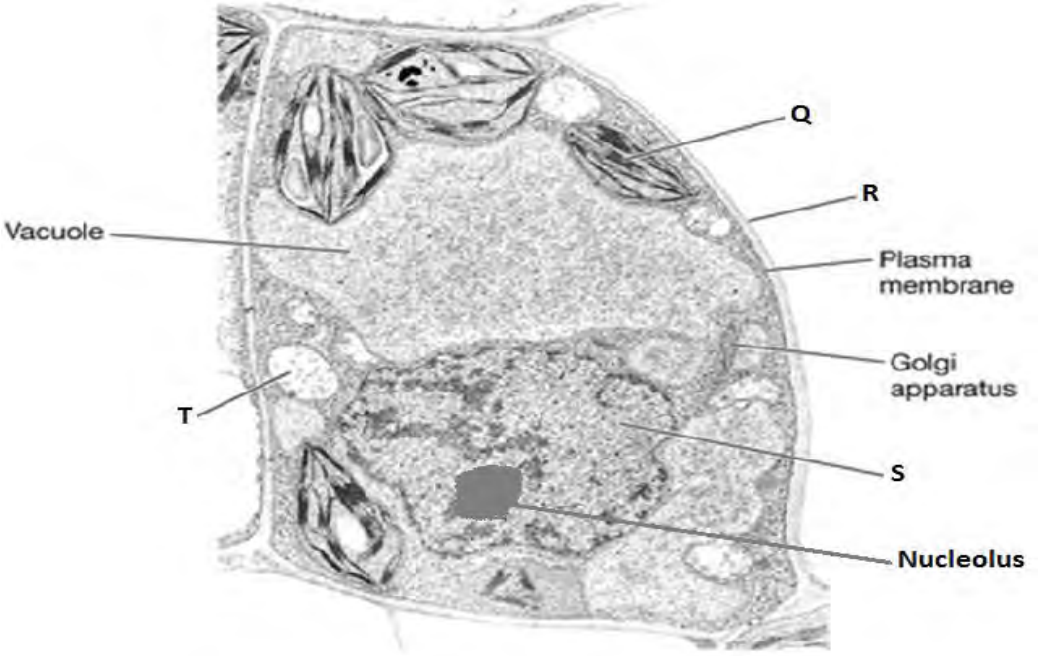
LEAF	**FUNCTION**	**REASON**
A		
B		
C		

b) State the type of evolution that may have led to the emergence of the different leaves shown in leaf A, B and C. (1mk)

c) Name the type of evolution structure represented by the leaves above. (1mk)

d) Name two examples of such structures as named in (b) (ii) above in aves. (2mks)

3. Below is a photomicrograph of a plant cell. Study it and answer the questions that follow.



a) (i) Label the parts labeled R, S and T. (3mks)

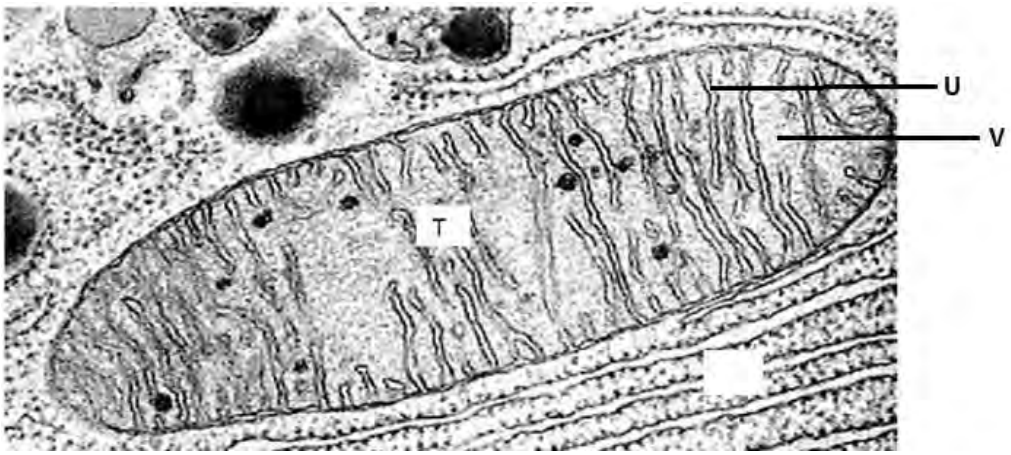
ii) Name the chemical compound that constitutes part labeled R above. (1mk)

b) State the function of part labeled

i) Q. (1mk)

ii) Nucleolus. (1mk)

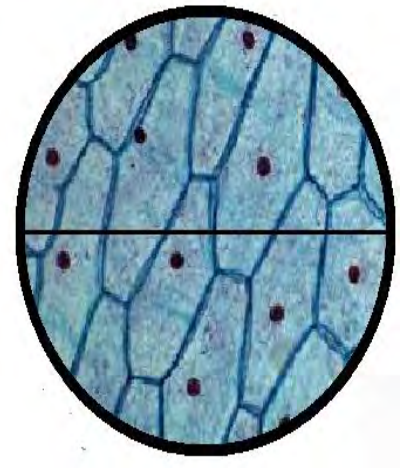
c) Below is an enlarged micrograph of organelle T.



i) What is the function of organelle T.? (1mk)

ii) What is the biological significance of having numerous parts U in organelle T.? (1mk)

d) A student observed onion epidermal tissue using a microscope whose field of view was _____mm in diameter as shown below. Calculate the approximate width of one of the cell. (3mks)

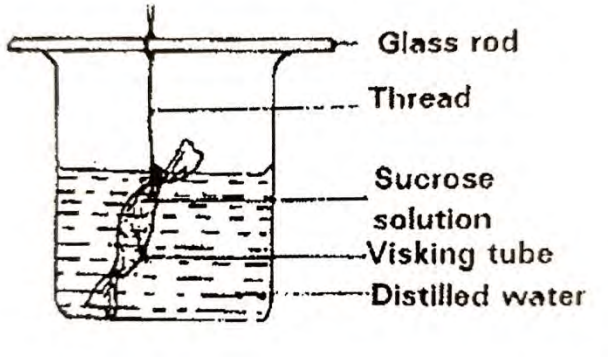


SAMIA SUB-COUNTY JOINT EVALUATION
231/1
BIOLOGY PAPER 1 (THEORY)
DECEMBER 2021

1. State the significance of the following characteristics of living organisms. (2marks)
   i) Irritability
   ii) Reproduction
2. The scientific name ***lantana camara*** refers to a green herbaceous plant. Other related plants include ***lantana trifoliate*** and ***vitex trifoliate.*** From the list, identify the plants belonging to the same genus. (2marks)

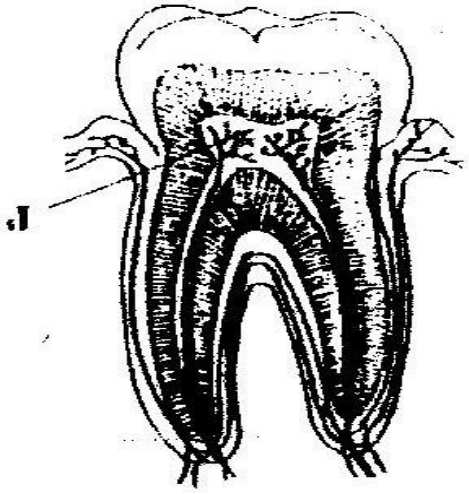
3. Which cell organelle will be abundant in: (2marks)
   i) Skeletal muscle cell
   ii) Palisade cell

4. An experiment was set up as shown below. The set up was left for 30 minutes.



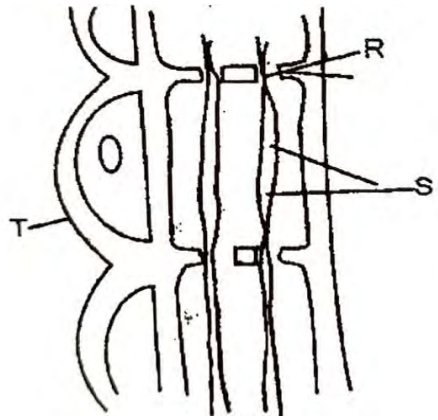
   i) State the observations made after 30 minutes. (1mark)
   ii) Explain the observations made in (i) above. (3marks)

5. The diagram below represents a section though a human tooth



   a) (i) Name the type of tooth shown (1 mark)
      (ii) Give a reason for your answer in (a) (i) above (1 mark)
   b) State the functions of the structures found in part labeled **J** (2 marks)
6. Describe what happens during the light stage of photosynthesis (3 marks)

7. The diagram below represents part of the phloem tissue.



a) Name the structures labeled **R, S** and a cell labeled **T** (3marks)
b) State the function of the structure labeled **S**. (1mark)

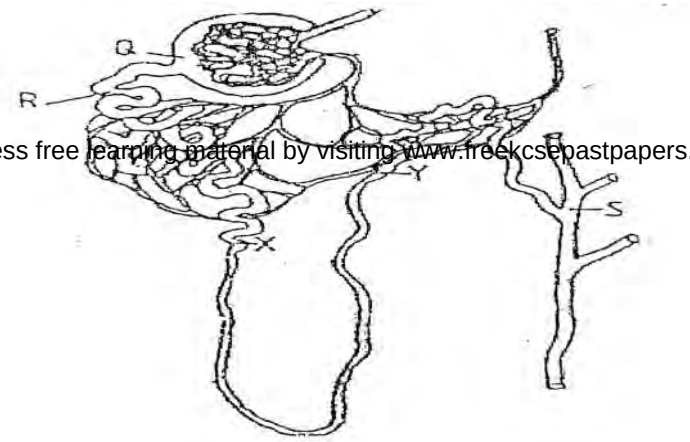
8. a) What prevents blood in veins from flowing backwards? (1mark)
b) State two ways in which the red blood cells are adapted to their functions. (2marks)

9. Differentiate between Active immunity and Passive immunity. (2marks)

10. State three gaseous exchange structures in terrestrial plants. (3marks)

11. Give two reasons why accumulation of lactic acid during vigorous exercise leads to an increase in heart beat. (2marks)

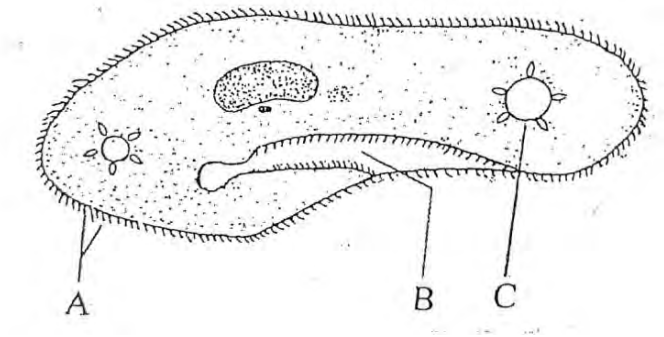
12. The diagram below illustrates part of a Nephron from a mammalian kidney.



a) Name the fluid in the part labeled **Q** (1mark)
b) Identify the process responsible for the formation of the fluid named in (a) above. (1mark)
c) Which two hormones exert their effects in the Nephron? (2marks)

13. Give one economic importance of the following plant excretory product. (1mark)
(i) Tannins

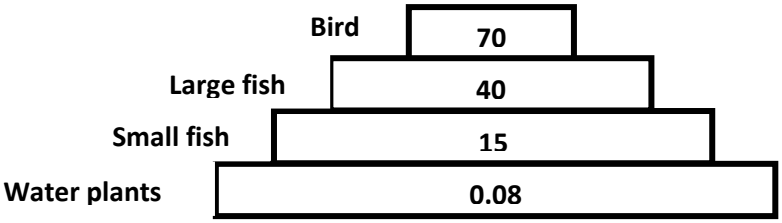
14. The diagram below represents a living organism.



a) Name the structures labeled **A** and **C** (2marks)

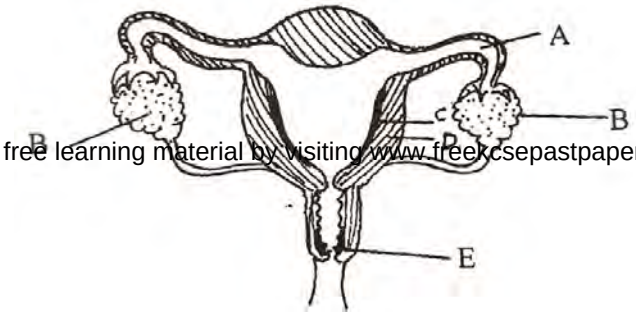
b) Identify the kingdom of the above organism. (1mark)
c) Give a reason for your answer in **(b)** above (1mark)

15. Name the phylum, whose members posses a notochord. (1mark)
16. Define the following terms: - (3marks)
    i) Ecological niche
    ii) Habitat
    iii) Carrying capacity
17. The figure below shows the amount of **DDT** at different levels in a food chain in a lake.



a) At what trophic level is **DDT** most likely to have the highest marked effect? (1mark)
b) Suggest two ways in which the birds might have come into contact with **DDT** (2marks)
c) Extract and write down a food chain from the above figure. (1mark)

18. Study the diagram below and use it to answer the questions that follow:



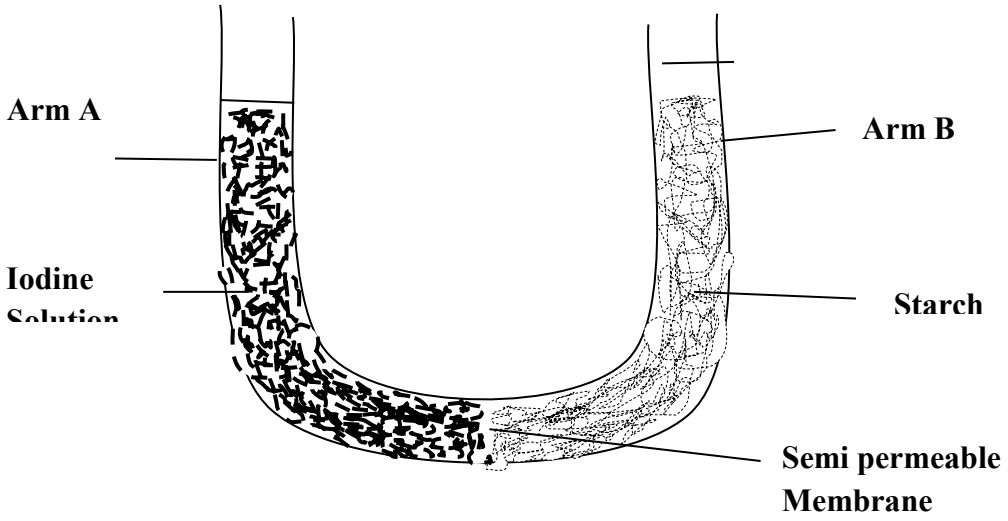
a) Name the part labeled E (1mark)
b) What are the functions of the part labeled **A**? (2marks)

19. Explain how the following factors hinder self-pollination in plants. (2marks)
    i) Protogyny
    ii) Dioecism
20. a) Name the part of the flower that develops into each of the following (2marks)
    i) Seed coat.
    ii) Seed
    b) State two environmental conditions that can cause seed dormancy (2marks)
    c) State two ways of breaking seed dormancy (2marks)
    d) Give one role of water in germination(1mark)
21. Define the following terms as used in genetics. (3marks)
    i) Alleles
    ii) Gene mutation
    iii) Discontinuous variation
22. State two sex-linked traits located on the **Y**- chromosome (2marks)
23. State three limitations of using fossil records as an evidence for organic evolution (3marks)
24. State three types of neurons (3marks)
25. Define the following types of responses (3marks)
    i) Phototropism
    ii) Chemotaxis
    iii) Thigmotropism
26. Differentiate between **support** and **movement** (2marks

SAMIA SUB-COUNTY JOINT EXAMINATION
231/2
BIOLOGY PAPER 2
(THEORY)
DECEMBER 2021

SECTION A. (40 MARKS)
Answer all questions in this section in the spaces provided.

1. The set up below show an experiment in which iodine solution and starch were separated by a semi permeable membrane.



(a) Name the process that is being investigated. (1mk)
(b) (i) State the observations made in the two arms of the U-tube. (2mks)
Arm A
Arm B
(ii) Account for your answer in (i) above. (2mks)
(c) (i) State two applications of the process in (a) above in animals. (2mks)
(ii) Name one factor that will affect the process named in (a) above. (1mk)

2. (a) (i) Name the components of blood that are absent in the glomerula filtrate. (2mks)
(ii) Give a reason for your answer above. (1mk)
(b) (i) What would happen if a person produced less antidiuretic hormone. (1mk)
(ii) Name the disease described in b (i) above? (1mk)
(c) Explain what happens to excess amino acids in the liver of humans. (3mks)

3. (a) (i) Premature baldness in a sex linked trait. A bald headed man marries a woman. Work out the genotype of the off springs. Use letter B to represent the gene for bald head. (4mks)
(ii) What is the probability that their daughter will have premature baldness? (1mk)
(iii) Give a reason for the answer in 3 (ii) above. (1mk)

(b) The diagram below show the template strand of a Deoxyribonucleic acid molecule.

A	G	T	A	T	C	G

(i) Draw a diagram to represent a complimentary RNA strand. (1mk)
(ii) State one advantage of polyploidy in plants. (1mk)

4. The table below shows some of the components found in 100cm^3 of cow's milk, breast milk and breast milk substitute (formula milk).

component	cow's milk	Breast milk	breast milk substitute
Protein/g	3.3.	1.2	1.3
Sugar/g	4.2	6.4	7.0
Fat/g	3.0	4.0	1.4
Calcium /mg	120.0	120.0	49.0
Iron/mg	0.1	0.1	0.5
vitamin C/mg	1.0	2.0	8.3
Vitamin D/µg	20.0	200.0	1.2

(a) Name two main components of a normal healthy diet that do not appear in the table .(2mks)

(b) State which type of milk would be least likely to ensure the development of healthy bones and teeth, and explain your answer? (2mks)

Type of milk

Explanation

(c) State which type of milk would provide a baby with the greatest amount of energy? Give your reasons (2mks)

Type of milk

Reasons

(d) Suggest why babies fed on breast milk may have more resistance to diseases than those fed on any other type of milk. (2mks)

5. (a) What is the difference between Darwinian and Lamackian theories of evolution? (2mks)

(b) What is meant by the following terms? Give an example in each case.

(i) Homologous (1mk)

Example (1mk)

(ii) Analogous (1mk)

Example (1mk)

(iii) Vestigial Structures

(1mk)

Example (1mk)

SECTION B

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

6. The menstrual cycle is a sequence of events repeated monthly in the female reproductive system. The table below shows the concentration of oestrogen and progesterone hormones and body temperatures of female against time.

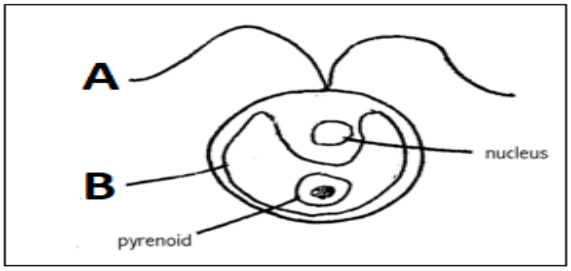
Time in days	**Oestrogen mg/100cm^3**	**progesterone mg/100cm^3 of blood**	**Temperature in 0^{o}C**
1	20	0	36.4
3	25	0	36.7
5	30	0	36.7
7	35	0	36.8
9	48	0	36.6
11	64	0	36.7
13	80	0	36.4
15	140	50	36.6
17	70	130	37.2
19	60	160	37.1
21	130	130	37.2
23	130	90	37.0
25	80	50	37.2
27	20	0	36.4

(a) Using the same axes draw graphs of oestrogen and progesterone against time. (8mks)
(b) State the possible event taking place in the uterus during the first week. (1mk)
(c) State the events taking place in the ovary between day 1 and day 13. (2mks)
(d) Account for the sudden increase in the progesterone concentration between day 14 and day 18. (2mks)
(e) Account for the change in temperature between day 14 and 17. (1mk)
(f) Account for the change of the curve of progesterone between day 19 and 27. (2mks)
(g) State the function of the following:
  (i) Testes. (2mks)
  (ii) Sertoli cells (1mk)

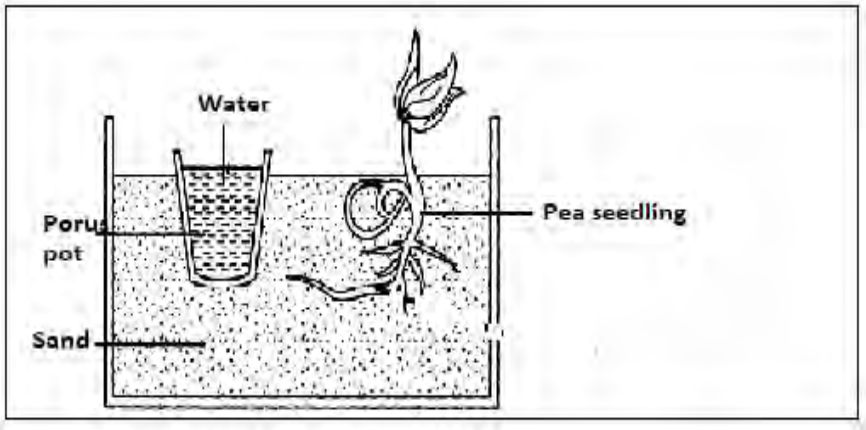
7. (a) State four industrial applications of anaerobic respiration. (4mks)
   (b) Describe the mechanism of gaseous exchange in humans. (16mks)
8. (a) Describe biological nitrogen fixation in leguminous plants. (5mks)
   (b) Explain how abiotic factors affect plants. (15mks)

SUKELLEMO JOINT MOCK
231/1
BIOLOGY –PAPER 1
(Theory)

1. Define the following terms:
   (a) Phylogeny (1mark)
   (b) Ontogeny (1mark)
2. Differentiate between a test cross and a back cross (2marks)
3. State two roles of Golgi apparatus. (2marks
4. The diagram below represents a living organism. Study it and answer the questions that follows.

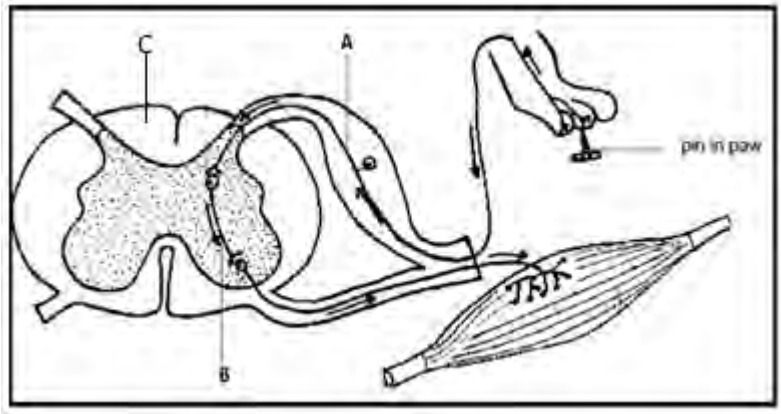


a) (i)State the kingdom in which the organism belongs (1mark)
   (ii) Give a reason for your answer. (1mark)
   (b) What is the role of structure labeled B (1mark)
5. State the role of each of the following in the mammalian respiratory system
   (a) Surfactant fluid (1mark)
   (b) Epiglottis. (1 mark)
6. Why is it necessary for blood from the gut to pass through the liver before joining general circulation? (2 marks)
7. The diagram below represents a type of response in an organism use it to answer the question that follows:



   (a) State the type of response represented above (1mark)
   (b) What is the importance of the response to plants. (1mark)
8. Identical twins were separated after birth and were then raised in different environments. One in Kenya and the other in U.S.A. They rejoined after 18 years and they looked slightly different.
   (i) Name the type of variation the twins exhibited (1mark)
   (ii) Give two observable differences likely to be noted between the twins (2marks)

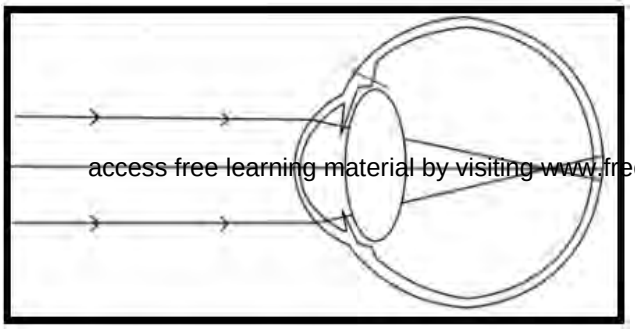
9. The diagram below indicates a type of response in a given animal



(a) Name the part labelled
A ..... (1mark)
(b) In the space provided below give the letter(s) that represents the part of the reflex arc that consists mainly of axons of sensory and motor neurons. (1mark)
(c) State the role of part labeled B. (1mark

10. Explain why a pregnant woman excretes less urea compared to a woman who is non- pregnant. (2marks)

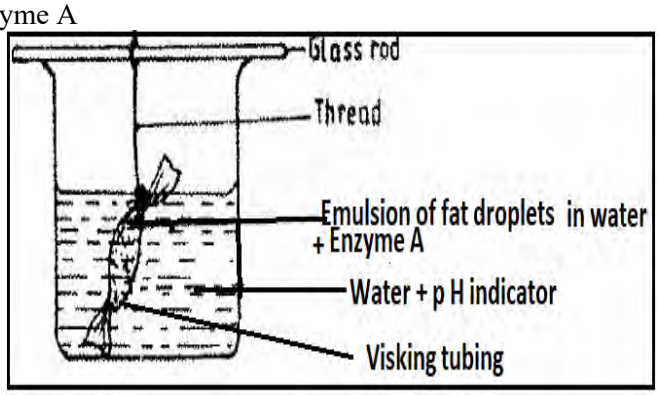
11. The diagram below indicates an eye defect use it to answer the question that follows:



(a) Name the eye defect using the diagram given above (1mark)
(b) Draw a diagram that indicates how the defect can be collected (2marks)

12. What is the significance of the following processes during meiosis I?
(a) Shortening of the spindle fibres during Anaphase I (1mark)
(b) Chiasma formation (1mark)

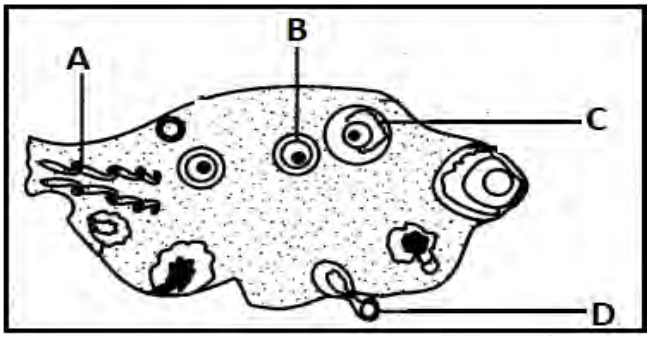
13. The figure below shows an apparatus at the start of an experiment to investigate the digestion of an emulsion of fat droplets in water by enzyme A



When the pH of the solution is 7 the colour of the pH indicator is green, blue when the pH is above 7 and red when below 7. The apparatus is kept at 40 degrees Celsius for 20 minutes during which time the indicator changes from green to red.

(a) Describe how the products of fat digestion enter a person's transport system (2marks)
(b) State the identity of enzyme A (1mark)
(c) Describe the process that led to the change in p H (2marks)

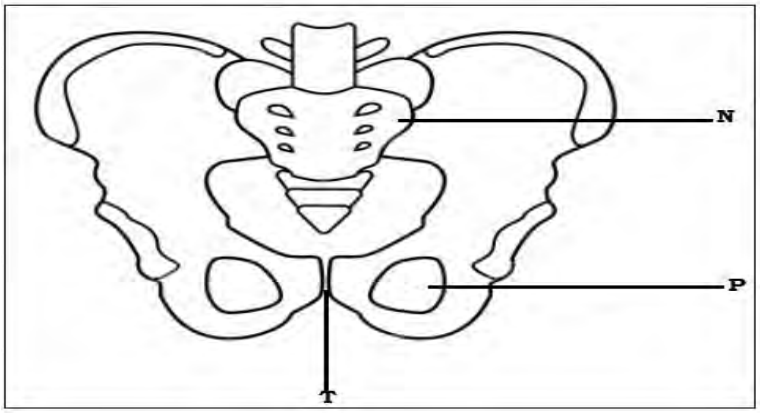
14. (a) Distinguish between parthenocarpy and parthogenesis. (2marks)
(b) State the role of juvenile hormone in insect metamorphosis. (1mark)
15. Explain how industrial melanism can be used to provide evidence for evolution (4marks)
16. What is the causative agent of the following conditions?
(a) Amoebic dysentery (1mark)
(b) Candidiasis (1mark)
17. The diagram below shows a section through the human ovary. Study it and answer the questions that Follows:



(a)Name the parts labelled A, B and C (3mks)
(b)Explain how the part labelled D is adapted to its function (2marks)

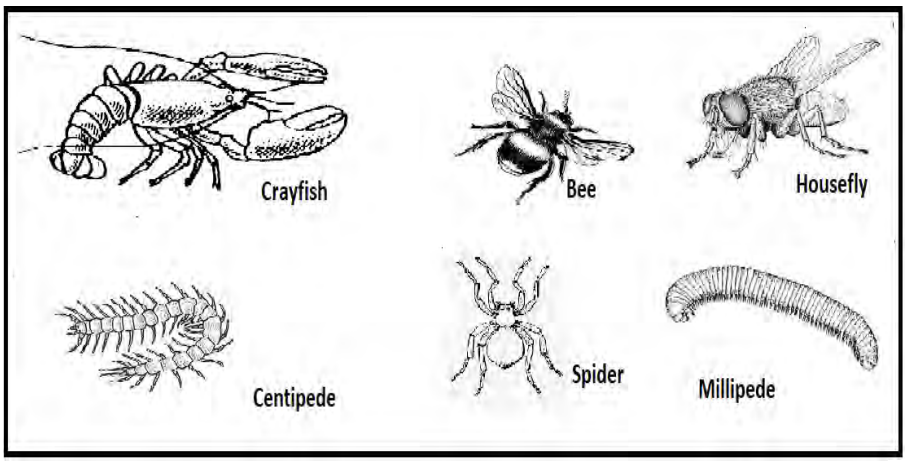
18. Most of carbon (IV) oxide is transports from tissues to lungs within red blood cells and not blood plasma explain? (2marks)
19. What is the significance of the counter current flow system in the loop of Henle? (2marks)

20. The diagram below shows parts of the human skeleton. Study it and answer the questions that follow.

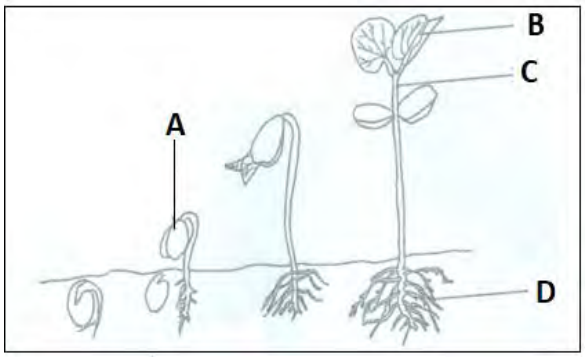


a) Name the part labeled N and P (2marks)
b) State the role the part marked T. (1mark)
c) In a mammal bone is usually made of many small fused bones. How many such bones constitute structure N of this mammal (1mark)

21. Examine the drawings of organisms shown below. Using features that are clearly visible, construct dichotomous key that can be used to distinguish them (4marks)

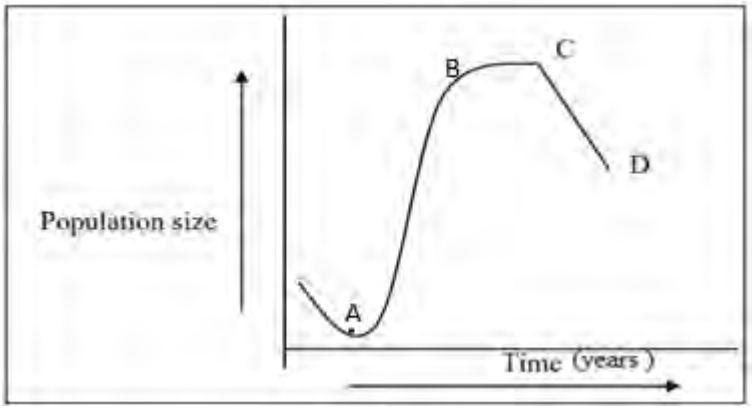


22. Explain any two processes by through which plants excrete waste products from their bodies (2marks)
23. G A C A G U A C represents the base sequence of a segment of nucleic acid.
    (a) Which nucleic acid does the above segment represent? (1mark)
    (b) Give a reason for your answer in (a) above (1mark)
    (c) Write down the complementary base sequence of the strand (1mark)
24. State two differences between Krebs cycle and Glycolysis. (2marks)
25. The images shown below were taken from a given experiment whose objective was to determine germination using given seed that was subjected into various suitable conditions. Use the images given below to answer the questions that follows:



    (a) Name the parts labelled C (1mark)
    (b) What is the function of the part labelled D (1mark)
    (c) Name the type of germination above (1mark)
    (d) Explain how the part labelled A is carried above the soil level (2marks)
26. An elephant weighing 2000Kg requires 3000kJ per gram body weight while a rat weighing 100g requires 5000kJ per gram body weight. Explain (2marks)
27. Explain the fate of excess glucose in humans (2marks)

28. The figure below shows the change in the population of herbivores after new animals were introduced into a new isolated habitat with abundant vegetation and no natural enemies.

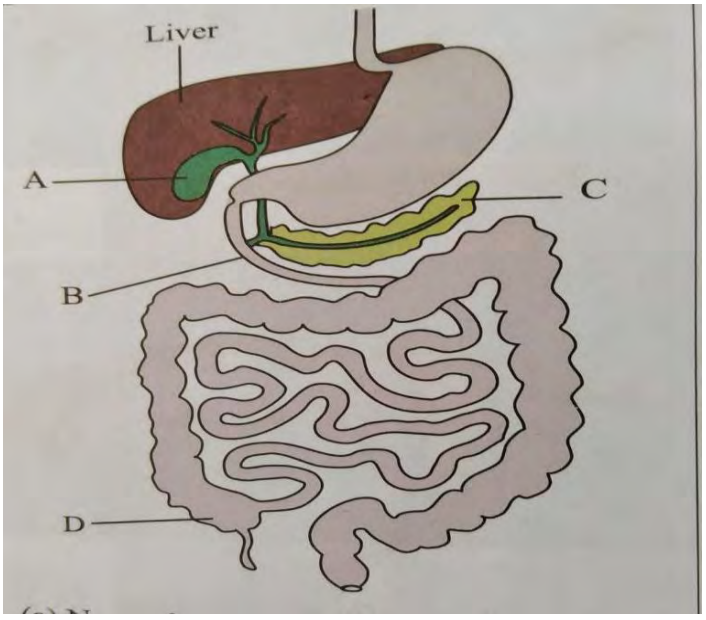


a) Account for the change in population between point A and B (2marks)
b) Explain one factor that maybe responsible for the change in population between point C and D. (2marks)
c) What term is used to describe the change in population between point C and D. (1mark)

SUKELLEMO JOINT MOCK EXAMINATION
231/2
BIOLOGY PAPER 2
(THEORY)

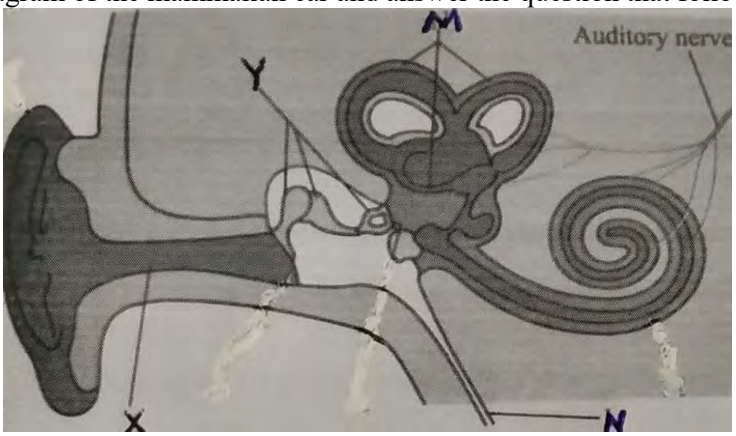
SECTION A (40 marks)
*Answer **all** the questions in this section in the spaces provided.*

1. Below is a diagram showing part of human digestive system.



(a) Name the parts labelled B and C. (2mks)
(b) (i) Name the substance produced by the part labelled A. (1mk)
(ii) State the function of the substance named in (b)(i) above. (1mk)
(c) `What is the functional relationship between the part labelled A and the liver. (1mk)
(d) The part labelled D is poorly developed in humans. Name the group of mammals in which it is well developed and describe its role. (3mks).

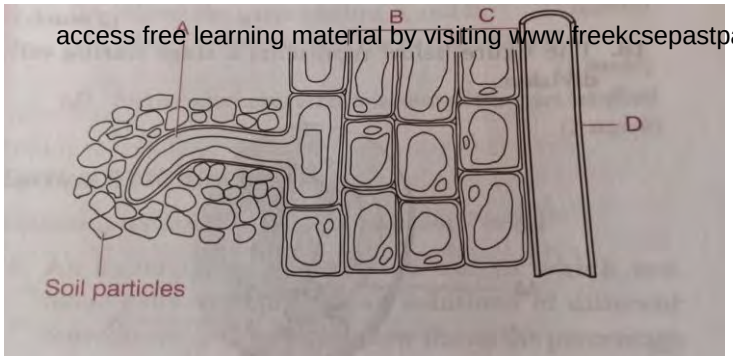
2. Study the diagram of the mammalian ear and answer the question that follow.



(a) Name the parts labelled X, Y and N. (3mks)
(b) State how the parts labelled Y are adapted to their functions. (2mks)
(c) (i) Besides hearing, state one other function of the ear. (1mk)
(ii) Which of the labelled parts is responsible for the function you have stated in c(i) above. (1mk)
(d) What would happen if the auditory nerve is completely nerve is completely damaged? (1mk)

3. In human beings, the allele for a curved thumb (T) is dominant over the allele for a straight thumb (t).
(a) State the possible genotypes of individuals who have curved thumbs. (2mks)
(b) Work out the genotypic and phenotypic ratio of a cross between a heterozygous male and a female with a straight thumb. (5mks)
(a) What is mutation? (1mk)

4. The diagram below shows part of a longitudinal section of a young root.



(a) Name the parts labeled: (2mks)
B ……
C…….
(b) State the significance of cell A. (1mk)
(c) Explain how water from the soil reaches tissue D. (4mks)
(d) State one adaptation of part D to its function. (1mk)

5. A student obtained a piece of petiole of pumpkin leaf and split it lengthwise into two halves. She placed one of the split in solution A and the other one in solution B. After 30 minutes she observed that the split in solution A was firm, rigid and curved outwards while the one in solution B was soft, flabby and curved inwards.
(a) Account for the observations made for the split in A and B.
A B (3mks)
(3mks)
(b) State two roles of the process that was being investigated in this experiment. (2mks)

SECTION B (40 marks)

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

6. The data provided below represent the growth of a pollen tube of a certain plant species over a given time.

Time in minutes	0	30	60	90	120	150	180
Growth in millimetres	0	1.8	2.8	6.2	9.0	10.2	10.4

Draw a graph of growth of pollen tube against time. (6mks)

a) (i) At what intervals was the growth of the pollen tube measured. (1mk)

(ii) At what time was the length of the pollen tube 7.8mm? (1mk)

c) With reasons describe growth pattern of the pollen tube between:

(i) 0 to 120 minutes (1mk)

Reason (1mks)

(ii) 120 to 180 minutes (1mk)

Reason (1mks)

(d) Apart from nutrients, state two factors that affect the growth of pollen tube. (2mks

(e) State two functions of the pollen tube. (2mks)

(f) Describe what happens when the pollen tube enters the embryo sac. (4mks)

7. (a) Define the following terms: (3mks)

- Excretion
- Egestion
- Secretion

(b) Describe how urea is formed in the human body. (7mks)

(c) Explain the various methods of excretion in plants giving examples of waste product in each case. (10mks)

8. (a) Why is locomotion important to animals? (4mks)

(b) Explain how a finned fish is adapted to swimming. (16mks)

F4 BIO (PRACTICAL)

SUKELLEMO JET 2021

Each candidate require the following

- One table spoonful of millet **soaked for not more than one hour** labeled **M**.
- Measuring cylinder
- 4 Labels
- Thermometer
- Means of timing
- 0.1M hydrochloric acid labeled L
- Four clean test tubes
- Pestle and mortar
- Scarpel / razor blade
- Iodine solution
- Benedict's solution
- 250ml glass beaker
- Water bath
- Source of heat
- White tile
- Solution of amylase /diastase enzyme labeled **K**
- Source of clean water.
- A dry maize grain labeled specimen **D1**
- A mature intact pea or bean pod labeled specimen **D2**
- A hand lens

SUKELLEMO JOINT EVALUATION TEST– 2021
231/3
BIOLOGY PAPER 3
(PRACTICAL)
November 2021

1. You are provided with specimen labeled M-soaked millet. Grind them using pestle and mortar, add some water to get fine solution. Label four clean test tubes: A, B, C, and D. Put about 4ml of the solution into each of the four test tubes.

a) To solution in test tube A, add some few drops of iodine. Shake the solution to mix well. Pour some little solution onto a white tile.
   (i) Record your observation. (1mk)
   (ii) Account for your observations in a) (i) above (1mk)

b) Into solution in test tube B, add about 2ml of Benedict's solution. Place it in a boiling water bath.
   (i) After about 3 minutes, record your observation (1mk)
   (ii) What is your conclusion from observation in b) i) above? (1mk)
   a) For the remaining test tubes:-

c) To test tube C, add about 3ml of solution labeled K. To test tube D, add about 3ml of solution K and about 2ml of solution labeled L. Place both test tubes C and D in a water bath. Maintain the water bath at 37 ^{0}C Allow it to stand in the water bath for 30 minutes. After 30 minutes, remove the test tubes. Add about 2ml of Benedicts solution to each test tube and shake well. Place the two test tubes in a boiling water bath. After about 5 minutes record your observations in the table below (4mks)

Test tube	Observation	Conclusion
C		
D		

   d) Account for your observations in the test tubes C and D. (2mks)
   e) i) Why was set up placed at 37^{0}C? (1mk)
      ii) Suggest identity of solutions K and L (2mks)

2. You are provided with specimen D1 and D2 which are organs of two different plants. Examine them carefully and answer the questions that follow.

(a) Name the type of fruit of each specimen
   (i) Type of fruit D1 (1mk)
   (ii) Type of fruit D2 (1mk)
(b) Draw and label the unopened fruit D2. (3mks)
(c) Carefully open specimen D2 and remove one seed. State two differences and two similarities between specimens D1 and D2.
   Differences (2mks)
   Similarities (2mks)

(d) Classify D1 upto the division (2mks)
   Kingdom……..
   Division……
(e) State the method of dispersal of specimen D2 (1mk)

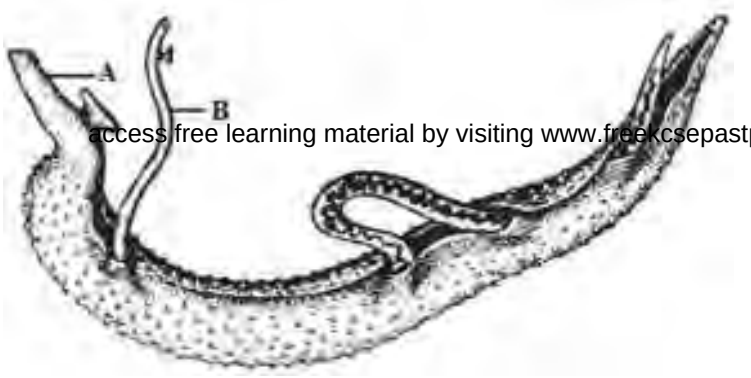
3. The photographs below are of the same mammalian vertebra showing two views of the same bone. Examinethem carefully.

View 1

View 2

(a) (i) Identify the vertebra…….. (1mk)
(ii) Name part X…….. (1mk)
(iii) State the function of part X (1mk)
(b) State the functional difference between a tendon and a ligament (1mk)
(c) Which of the labeled part(s) are used for articulation with an adjacent vertebra? (2mks)
(d) State a common role of the parts labeled H and J. (1mk)
(e) Which of the labeled part(s) is (are) used for muscle attachment? (2mks)

(f) The diagram below represents two mature parasitic worms, labelled **A** and **B**, of the species *Schistosoma mansoni* that causes bilharzia



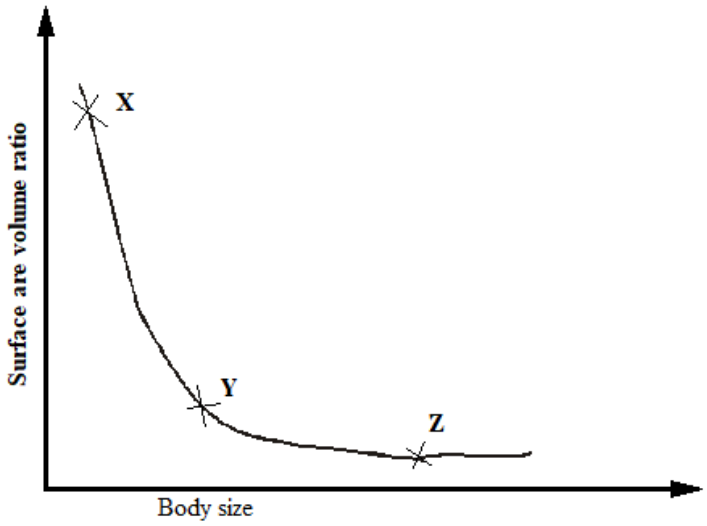
i) With a reason, identify the male and the female worm in the diagram above. (3mks)
ii) Male ……Female……
Reason……...
iii) Name **two** hosts, primary and intermediate, for theseparasiticworms. (2mks)
Primary host……
Intermediate host……..
iv) State **two** ways of controlling the spread of bilharzia. (2mks)

KIRINYAGA WEST
231/1
BIOLOGY PAPER 1
DECEMBER 2021

1. State the functions of the following cells organelles. (2 marks)
   (i) Golgi apparatus
   (ii) Mitochondria
2. State the branch of Science that is concerned with the study of organisms in relation to their environment. (1 mark)
3. Name the process by which mineral salts are absorbed by plant. (1 marks)
4. (a) State **two** disadvantages of sexual reproduction. (2 marks)
   (b) State **two** adaptations of human spermatozoa. (2 marks)
5. How do plants cell walls differ from cell membranes? (3 mark)
6. List **two** important functions of water to a living organism. (2 marks)
7. Explain why primary productivity decreases:-
   (a) With depth in aquatic environment. (2 marks)
   (b) Removal of predators for a herbivore may in the long run lead to decrease in it's populations suggest reasons to account for this observation. (3 marks)
8. The diagram below shows various types of gene mutations.

   (a) Identify the type of gene mutation shown above. (2 marks)
   Mutation 1
   Mutation 2
   (b) Distinguish between gene mutations and chromosomal mutations. (2 marks)

9. The graph below shows relationship between body size and surface area to volume ratio of three animal species **X**, **Y** and **Z** found in the same habitat.



(i) Which of the three animals is likely to have the simplest transport systems? (1 mark)
(ii) Give a reason for your answer in (a)(i) above. (2 marks)

10. (a) State **two** factors within the seed that cause seed dormancy. (2 marks)
(b) State **two** characteristics of meristematic cells in plants. (2 marks)

11. (a) A garden pea plant that produces purple coloured seeds were crossed with garden pea plant that produces white coloured seeds. The first generation of the cross produce purple coloured seeds only. Give a reason why there were no white seeds in the first generation. (2 marks
(b) What is meant by co-dominance? (2 marks)

12. A biological washing detergent contains an enzyme which removes stains like mucus and oils from clothes which are soaked in water with the detergent.
(a) Explain why stains would be removed faster with the detergent in water at 35^0C rather than at 5^0C. (2 marks)
(b) Why is boiling the clothes with the detergent less likely to remove stains? (1 mark)

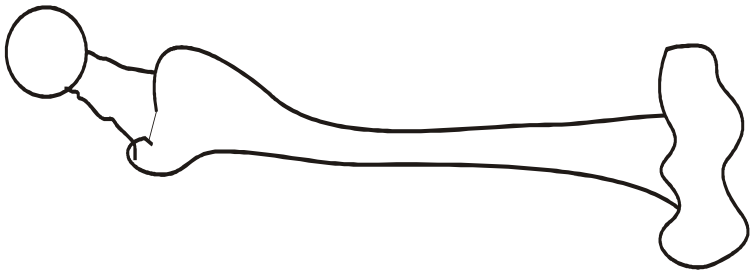
13. (a) Define the term accommodation of the eye. (1 mark)
(b) Identify the:-
(i) Photochemical pigment for dim light vision. (1 mark)
(ii) Photochemical cell with high visual acuity. (1 mark)

14. Name the disease caused by lack of the following is the diet.
(a) Vitamin A (1 mark)
(b) Calcium (1 mark)

15 .(a) What happens when a wilting young plant is well watered? (2 marks)
(b) Name a support tissue in plants thickened with:
(i) Cellulose. (1 mark)
(ii) Lignin (1 mark)

16. Name the apparatus used for the following :-
(a) Sucking small animals from the rock surfaces. (1 marks)
(ii) Attracting and trapping small animals. (1 mark)

17. The diagram below represents a mammalian bone.



(a) Name the above. (1 mark)
(b) Name the type of the joint formed by the bone at its anterior end with adjacent bone. (1 mark)

18. On a certain cold night a man lit a 'jiko' to warm the house, closed all the windows and went to sleep. The following morning, he was found dead. What could have led to his death? (3 marks)

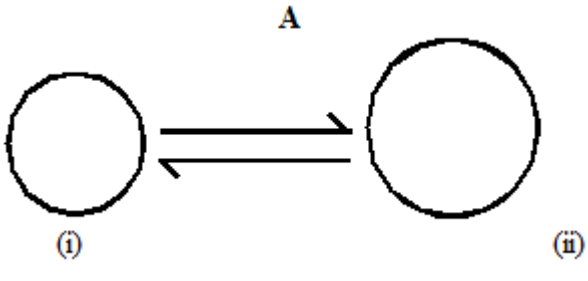
19. Explain why Lamaraks theory of evolution is not accepted by biologists today. (2 marks)

20. State two advantages of metamorphosis in the life of insects. (2 marks)

21. State the biological significance of each of the following:-
(i) Thick muscular wall and narrow lumen in arteries. (1 mark)
(ii) Narrow xylem vessels in flowering plants. (1 mark)

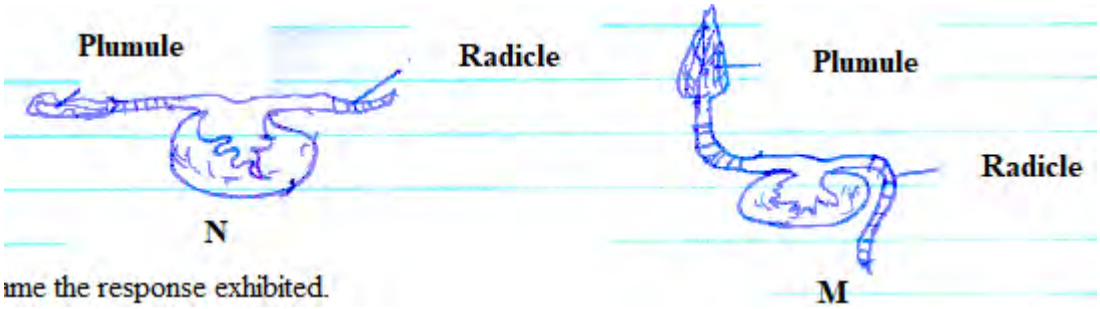
22. (a) (i) What is meant by the term vestigeal structures? (1 mark)
(ii) Give **one** example of a vestigeal structure in humans. (1 mark)
(b) Name the type of evolution illustrated by:-
(i) Hind limbs of birds. (1 mark)
(ii) Wing of birds and insects. (1 mark)

23. The diagram below represents **two** states of a blood vessel in human skin under two different environmental conditions.



(i) Identify process **A**. (1 mark)
(ii) What environmental condition would make the vessel to be in state (i)? (1 mark)

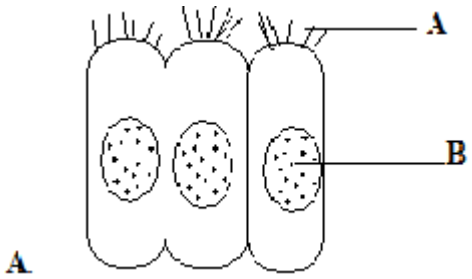
24. An experiment was set to investigate a certain aspect of response. A seedling was put on a horizontal position as shown in figure **M** below. After 24 hours the set up was as shown in figure **N**.



ıme the response exhibited.

(a) Name the response exhibited. (1 mark)
(b) Explain the curvature of the shoot upwards. (3 marks)

25. Study the figure below which shows a type of epithelia tissue.



(a) State the name of structure **A**. (1 mark)
(b) Give an example in humans where this epithelium tissue is found. (1 mark)

26. During breathing in a mammal, there are changes that occur in the diaphragm, intercostal muscles, ribcage and volume of the lungs,
Explain briefly what happens during breathing in to:-
(a) Diaphragm (2 marks)
(b) Intercoastal muscles. (2 marks)

27. (a) Name the type of response exhibited by Euglena towards fresh water from saline water. (1 mark)
(b) State the survival value of this response. (1 mark)

28. Name the causative agent of the following diseases. \
(a) Typhoid\ (1 mark)
(b) Tuberculosis\ (1 mark)

29. State **two** effects of air pollution. (2 marks)

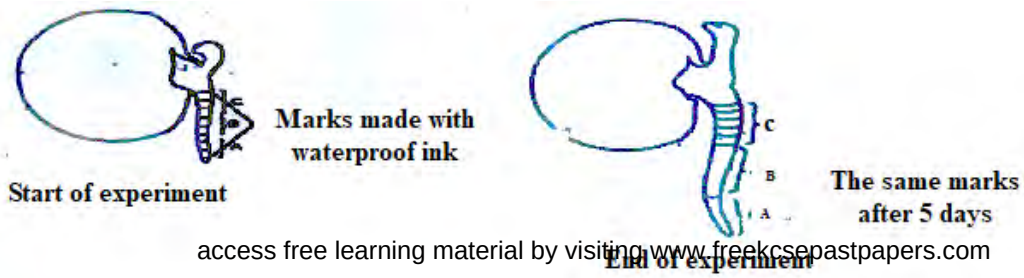
KIRINYAGA WEST.
231/2
BIOLOGY PAPER 2
DECEMBER 2021

SECTION A
Answer all the questions in this section. (40 marks)

SECTION A
Answer all the questions in this section. (40 marks)

1. Hemophilia or bleeders disease is a condition in which blood takes longer time than usual to clot. This is due to lack of certain blood proteins. The gene for hemophilia is recessive to the gene for normal clotting factor and is found in the **X**- Chromosome.
   (a) Explain why there are only female carriers of hemophilia and no male carriers for traits. (2 marks)
   (b) A carrier female for hemophilia trait married a normal male. Work out the possible genotypes of the children. Let letter **H** represent the normal gene and letter **h** represent the gene for hemophilia. (4 marks)
   (c) Name **two** other sex linked trait in human. (2 marks)

2. The diagram below shows the results obtained in an experiment on growth of a bean seedling.



   (a) Suggest the aim of the experiment (1 mark)
   (b) State the processes that occur in each of the regions marked **A**, **B** and **C**. (3 marks)
   (c) Account for the observations made in the region **A** and **C**. (4 marks)

3. The table below shows the concenration of some ions in pond water and in the cell sap of an aquatic plant growing in the pond.

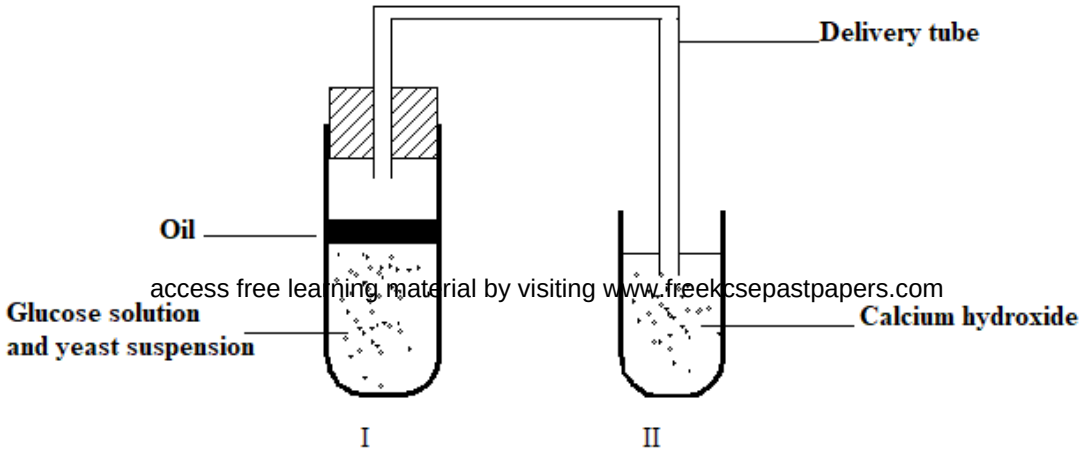
Ions	Concentration in pond water (parts per million)	Concentration in cell sap (parts per million)
Sodium	50	30
Potassium	2	150
Calcium	1.5	1
Chloride	180	200

   (a) Name the process by which the following ions could have been taken up by this plant. (2 marks)
      (i) Sodium ions.
      (ii) Potassium ions
   (b) For each processes named in a (i) above and a(ii) above, state one condition necessary for the process to take place. (2 marks)
   (c) What is the role of process named:- a(i) and a(ii) in plants? (2 marks)
   (d) What is the role of the sodium ions in the human body? (1 mark)
   (e) Define the term osmosis. (1 mark)

4. The diagram below represent the lower jaw of a mammal.

(a) Name the mode of nutrition of the mammal whose jaw is shown above. (1 mark)
(b) State **one** structural and one functional differences between the teeth labelled **J** and **L**. (2 maks)
(c) (i) Name the toothless gap labelled **K**. (1 mark)
(ii) State the function of the gap. (1 mark)
(d) Name the substance that is responsible for hardening of teeth. (1 mark)
(e) Distinguish between the terms homodont and heterodont dentition. (2 marks)

5. The digram below shows aa set up that was used to demonstrate a certain physiological process.



The glucose solution was boiled and oil added on top of it. The glucose solution was then allowed to cool before adding yeast suspension.

(a) Identify the physiologicl process that was being investigated using the above set up. (1 mark)
(b) Why was glucose boiled during the experiment? (1 mark)
(c) What was the importance of cooling the glucose before adding the yeast suspension? (1 mark)
(d) What observation would be made in test tube II at the end of the experiment? (1 mark)
(e) How would the observation made in (d) above be affected if oil was not added on top of the yeast suspension during the experiment? (1 mark)
(f) In another investigation, a bird was found to use 10 litres of oxygen to give a respiratory quotient of 0.7 during period of flight. Name the type of food that was being respired by the bird and determine the amount of carbon(IV) oxide produced during the same flight.
Type of food. (1 mark)
Volume of carbon (IV) oxide produced. (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 carried out to investigate the nutritional value of two dry powder animals feeds **C** and **Y** over a period of six months. Twenty 5 month's old castrated goats were used. The goats were divided into two equal groups **A** and **B**.
The animals in group A were fed on feed **X** throughout the experiment while those in group **B** were fed on feed **Y**.
The feeds were supplemented with dry hay and water. The average body weight of each group of goats and weight of the dry powder feeds were determined and recorded each month. The faeces produced by each group was dried and weighted and the average dry faecal output per month was also recorded.
The result are as shown below:-

	GROUP A			GROUP B		
Months since commencement of the experiment	Average total weight of goats (kg)	Average weight of total feed (kg)	Average monthly dry faecal output(kg)	Average total weight of goat (kg)	Average weight of total feeds (kg)	Average monthly dry faecal output (kg)
0	20.4	26.7	10.5	20.5	35.4	16.5
1	22.5	27.5	10.7	19.5	34.3	17.7
2	24.5	25.8	10.3	19.0	35.2	17.2
3	26.3	18.5	8.8	18.5	36.1	17.5
4	28.0	16.6	7.2	17.1	36.0	17.5
5	29.4	16.3	6.0	16.3	35.8	16.8
6	29.5	16.1	5.6	15.6	35.5	16.6

(a) (i) What is the relationship between the amount of feed and the faecal output? (2 marks)

(ii) Work out the average increase in weight for the animals's in gorup **A** during:- (4 marks)
The first four months

Th last two months

(iii) Account for the average increase in weight in goats in group **A**. (4 marks)
The first four months
The last two months

(iv) Which of the two feeds is more nutritious? Give reasons for your answer. (2 marks)

Explain the digestion of lipids in humans. (8 marks)

7. (a) What is meant by the term natural selection? (2 marks)

(b) Describe how natural selection brings about the adaptations of a species to its environment. (8 marks)

(c) Distinguish between convergent and divergent evolution. (2 marks)

(d) Discuss four evidences to show that revolution has taken place. (8 marks)

8. (a) Explain the role of:-
(i) Insulin in blood sugar regulation. (4 marks)
(ii) Antidiuretic hormone in water balance. (4 marks)

(b) (i) Describe the process of absorption of water from the root hair to the xylem of the root.. (8 marks)

(ii) Describe how temperature and light intensity increases the rate of transpiration. (4 marks)

KIRINYAGA WEST
231/3
BIOLOGY PAPER 3 (PRACTICAL)
DECEMBER 2021
FORM 4

Each candidate will require:-

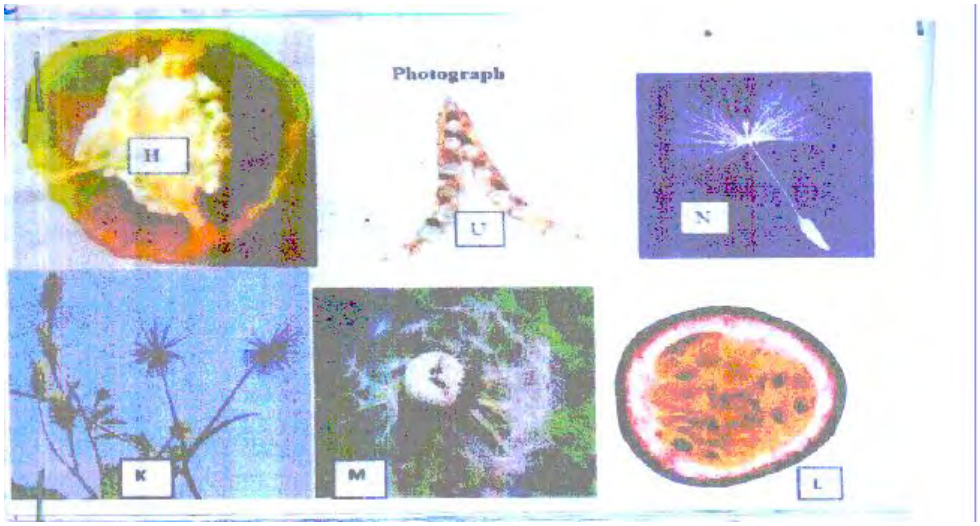
1. Ripe orange labelled **Q**.
2. Boiling tube. (1 each)
3. Scalpel
4. Benedict's solution.
5. Iodine solution.
6. Dichloropheno Indolphenol (DCPIP)
7. Source of heat. (water bath)
8. 3 test tubes
9. Test tube rack
10. Test tube holder.

KIRINYAGA WEST
231/3
BIOLOGY
PAPER 3 (PRACTICAL)
DECEMBER 2021

1. You are provided with specimen **Q**. Cut it into two halves squeeze juice from one half into a boiling tube. Using the reagent provided, test the food substances present in the extract from specimen **Q**. Record down the food substances being tested, procedure, observation and conclusion in the table below. (12 marks)

Food substances	Procedure	Observation	Conclusion

2. Study the photographs below and answer the questions that follows.



(a) Write a reason: Identify the type of fruit in photograph **K**. (2 marks)
   (i) Type of fruit.
   (ii) Reason
(b) With the reasons identify the type of placentation shown in the photographs **U** and **L**. (4 marks)
   (i) Placentation **U**
   Reason
   (ii) Placentation **L**
   Reason
(c) Other than the placentation types identified above, give one other type of placentation. (1 mark)
(d) Name the plant hormone that promotes ripening of the fruit? (1 mark)
(c) In the table below, name the mode of dispersal and one adaptive feature. (6 marks)

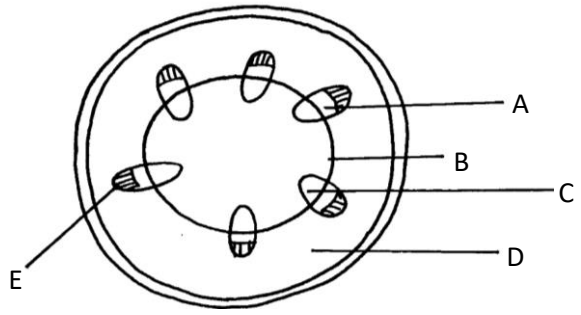
Specimen	Mode of dispersal	Adaptive features
U		
N		
K		

3. The seedlings on plate **A** were placed in a given section of the laboratory. They were subjected to unidirectional light source.

(a) On the diagram, using an arrow indicate the light source. Let the arrow head point to the light source direction. 1 mark)
(b) What is the name given to the response shown by the plant? (1 mark)
(c) Explain how the response occurs. (3 marks)
(d) Chlamydomonas also responds by moving towards unidirectional light source. State **three** differences in response to light by chlamydomonas and that shown by plants in plate **A**. (3 marks)
(e) Study the photograph in plate **B** and answer the questions that follow:-
   i) Name the response shown in the photograph **B**. (1 mark)
   ii) Name the hormone responsible for the response shown in the photograph **B**. (1 mark)
   iii) How does the hormone named above bring about the response shown in the photograph **B**. (3 marks)
   iv) What is the significance of response shown by the plant? (1 mark)

MOKASA II JOINT EVALUATION EXAMINATION
231/2
BIOLOGY PAPER 2(THEORY)
DECEMBER 2021

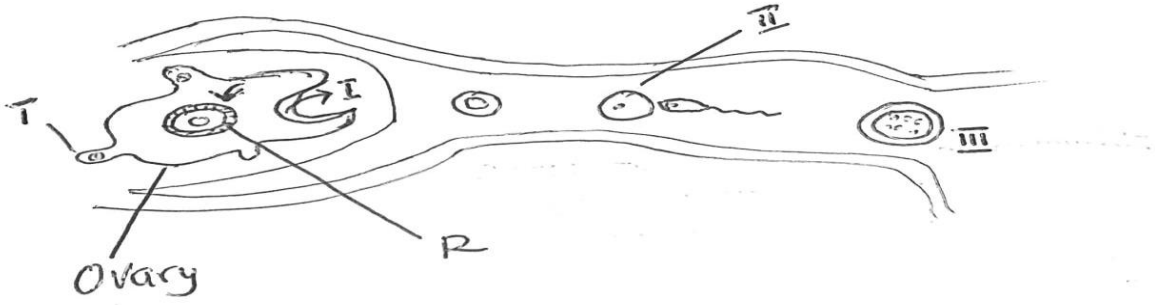
1. The diagram below shows the traverse section of a young stem.



(a) (i) Name the class of the plant from which the section was obtained belong. (1 mark)
(ii) Give a reason for your answer in **(a)(i)** above (1 mark)
(b) What are the functions of the structures labelled **A, B** and **E** (3 marks)
(c) What type of cells are fond in the parts labelled **D** (1 mark)
(d) Name the tissue labelled **C** (1 mark)
(b) How is the part labelled **C** adapted to its functions? (1 mark)

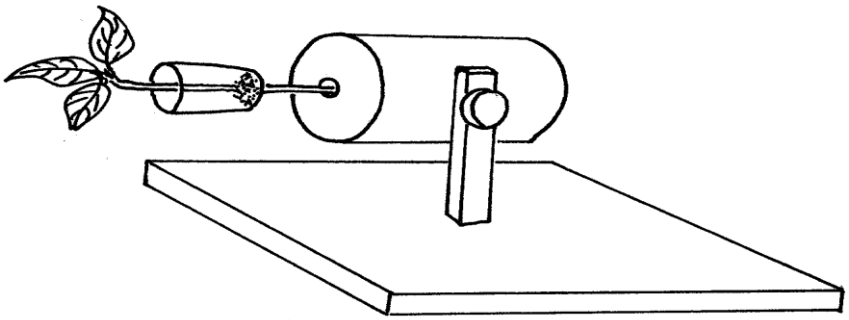
2.
(a) What is meant by the term non-disjunction (1marks)
(b) Differentiate between continuous and discontinues variations, giving examples of each (2 marks)
(c) A female with sickle cell trait marries a normal man. The allele for sickle cell is Hb^S and the normal allele is Hb^A. Using a Punnet square, determine the probability that their first born will have sickle cell trait. Show your working. (5 marks)

3. The diagram below shows some of the processes that take place in the female reproductive system.



(a) Name the part process labeled **I** and state the hormone responsible for triggering the process. (2 marks)
(b) (i) Name the structures labeled **R**; (1 mark)
(i) Identify the hormone responsible for the formation of the structures named in **b (i)** above; (1 marks)
(d) (i) Identify the process labeled II (1 mark)
(ii) Explain what leads to the process named in d(i) above. (3 marks)

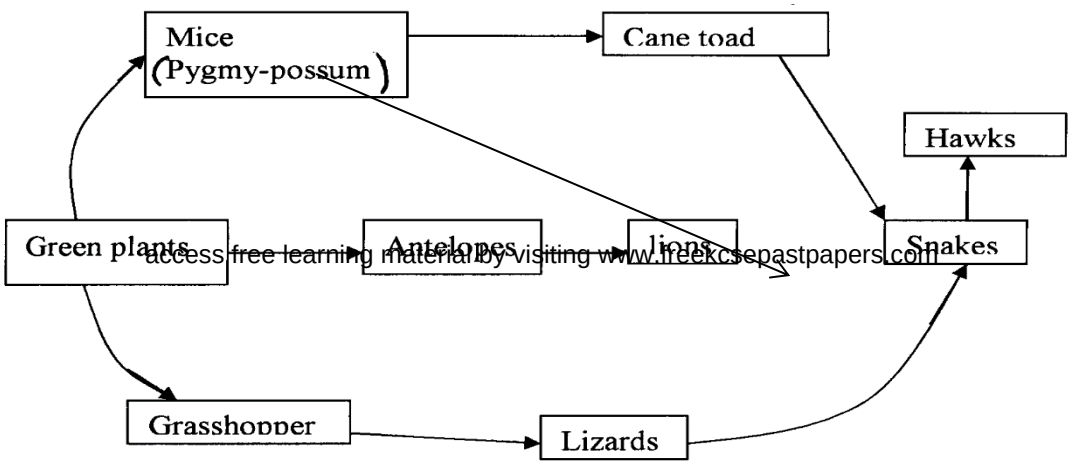
4. Study the diagram below which makes 4 revolutions per hour. A tomato seedling with a straight radicle and plumule was attached to the apparatus as shown below.



a) Give the name of the above apparatus (1mk)
b) i) Make a drawing of how the seedling above might have appeared after a fortnight. (Draw the seedling alone with radicle and shoot) (2mks)

ii) Account for the observation in b) (i) above (2 marks)
c) What type of responses are being expected in this experiment? (2 marks)
d) Give one survival value of the response above (1 mark)

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



(a) Which organism has the highest number of preys (lmk)
(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 (1 mark)
(d) Describe how capture — recapture method that can be used in estimating the population of fishes in a lake. (4mks)

6. The length of a grasshopper femur and internode of a seedling were recorded in a period of 19 weeks. The results are recorded in the table below.

Week	1	3	5	7	9	11	13	15	17	19
Average length of femur(mm)	8.0	9.0	9.0	9.0	13.0	13.0	15.0	19.0	19.0	19.0
Average length of internode(mm)	5.0	6.5	10.5	16.5	24.5	27.5	32.5	34.5	36.0	37.5

(a) Plot a graph of length of femur and internode against time on the same (7mk)
(b) (i) What was the average length of internode in the 8th week? (1mk)
(ii) Suggest how average length of internodes was obtained. (2mk)

(c) Name the type of growth curve shown by:
  (i) Grasshopper (1mk)
  (ii) Seedling (1mk)
(d) Account for the change in length for femur between:
  (i) 3rd and 7th week. (2mk)
  (ii) 16th and 20th week. (2mk)
(e) (i)Which animal phylum exhibits the growth pattern of the femur? (1mk)
  (i) Name the hormone responsible for the growth pattern in grasshopper . (1mk)
  (ii) Work out the rate of growth of the seedling between week 7 and 10. (2mk)
7. Describe the adaptation of the mammalian eye to its functions (20 marks)
8. (a) (i) Define the term natural selection (1 mark)
  (ii) Explain how the distribution of the two types of moths were used as evidence of natural selection in action (5 marks)
  (b) Describe evidences to support organic evolution (14 marks)

CONFIDENTIALS
MOKASA MOCK
231/3
BIOLOGY PAPER 3 (PRACTICAL)

Each candidate should be provided with the following requirements;
1. Specimen **L** - Axis vertebra
2. Specimen **M** - Lumbar vertebra
3. Irish potato tuber
4. Scalpel
5. 10 ml measuring cylinder
6. 5 test tubes in a test tube rack
7. 20% Hydrogen peroxide
8. Benedict's solution
9. Iodine solution
10. Morta and apestle
11. Source of heat
12. A ruler
13. Distilled Water in a wash bottle.

MOKASA MOCK
231/3
BIOLOGY PAPER 3
(PRACTICAL)

1. You are provided with irish potato tuber labeled specimen **K,** use it to answer questions that follow.
Cut out two cubes whose sides measure 1cm from the irish potato provided
Label three test-tubes as, **A**, **B** and **C** and put them into the test-tube rack.

A) Crush one cube to obtain a paste and add about 15 cm^3 of distilled water to the paste to form a solution and then carry out the following procedure;
  i) Use a measuring cylinder to pour 10 cm^3 of potato extract solution into test-tube **A**.
  ii) Use the measuring cylinder to transfer 5 cm^3 of potato solution extract from test-tube **A** to test-tube **B**.
  iii) Use the measuring cylinder to add 5 cm^3 of distilled water to test-tube **B**. Place a stopper in test-tube **B** and shake it.
  iv) Remove the stopper. Use the measuring cylinder to transfer 5 cm^3 of the liquid in test-tube **B** to test-tube **C**.
  v) Use the measuring cylinder to add 5 cm^3 of distilled water to test-tube **C**. Place a stopperin test-tube **C** and

shake it. Using a measuring cylinder reduce the volume of solution **C** to 5 cm^3.

a) Table below shows the percentage concentration of the potato extract solution.

test-tube	percentage concentration of potato extract solution
A	100.00
B	
C	

Complete the table above by calculating and writing in the percentage concentration of potato extract solutions in test-tube **B** and **C**. **(2mks)**

b) Using a measuring cylinder pour 1 cm^3 to each of hydrogen peroxide to the contents in test tube **A** to **C** and make the observations **(3mks)**

Test tube	**Observations**
A	
B	
C	

(i) What was the aim of the investigation above **(1mk)**

(ii) Write the word equation for the reactions taking place in the test tubes **(1mk)**

(iii) What will be the expected observation if the irish potato was replaced with a piece of mammalian liver **(1mk)**

(iv) Explain your answer in c (iii) above **(2mk)**

(B) Crush the remaining cube to obtain the paste. Use the reagents provided to and carry out food test on the extract. **(4mks)**

TEST	PROCEDURE	OBSERVATIONS	CONCLUSION

2. You are provided with specimens labeled **L** and **M**. Study them then answer questions that follow:

a) Identify the specimens. **(2mk)**

b) Name the part of the body where each is found. **(2mk)**

c) State **three** adaptive characteristic features of the bone **L**. **(3mks)**

d) State two observable differences between bones L and M. **(2mks)**

e) Study the diagrams below and answer questions that follow.

I) Identify the bone labelled C in the diagram. **(1mk)**

II) Name the type of joint and bone formed at the proximal and distal end of bone B **(4mks)**

Proximal end;

(i) Bone ……..…….

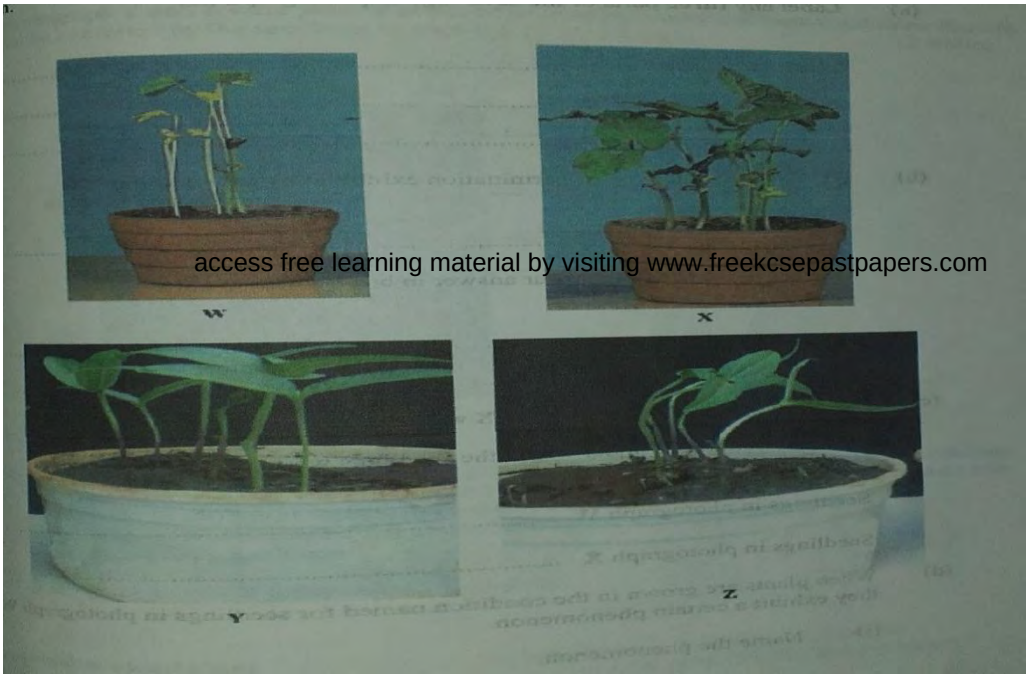
(ii) Type of joint ……..

Distal end;

(i) Bone(s)…….

(ii) Type of joint ……

3. The photo graphs labelled **W, X, Y** and **Z** show seedlings that were grown under different conditions. Examine them.



(a) Label any **two** parts of the seedlings in photograph **W**. **(2 mks)**

(b) (i) Name the type of germination exhibited by the seedlings. **(1 mk)**

(ii) Give a reason for your answer in b(i) above. **(1 mk)**

(c) Seedlings in photographs **W** and **X** were planted at the same time. State the conditions under which the seedlings were grown. **(2 mks)**

(i) Seedlings in photograph **W**.

(ii) Seedlings in photograph **X**.

(d) When plants are grown in the condition named for seedlings in photograph **W**, they exhibit a certain phenomenon.

(i) Name the phenomenon. **(1 mk)**

(ii) State the significance of the phenomenon named in d(i). **(1 mk)**

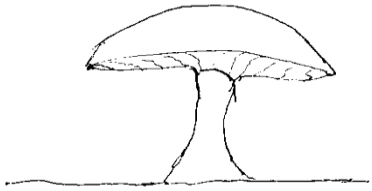
(e) Using observable features only, state **two** differences between the seedlings in photographs **W** and **X**. **(2 mks)**

(f) Seedlings in photographs **Y** and **Z** were planted at the same time but under different conditions. Explain how the response exhibited by seedlings in photograph Z occurred. **(2 mks)**

A	
B	
C	

BUURI STANDARDS TEST 2021
231/1
BIOLOGY PAPER 1
2 HOURS

1. (a) Name any two physiological processes that take place across a cell membrane. (2 mks)
   (b) Explain one property of the cell membrane. (1 mk)
2. A group of students saw the following organism growing outside their laboratory during a field study.

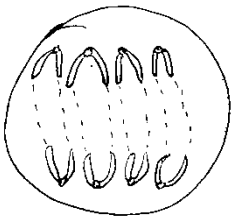


   (a) (i) Identify the kingdom to which the above organism belongs. (1 mk)
   (ii) State the mode of feeding of this organism. (1 mk)
   (b) Give one economic importance of this organism. (1 mk)
3. A solution of sugarcane was boiled with dilute hydrochloric acid, sodium hydrogen carbonate was added and then heated with Benedicts' solution. An orange precipitate was formed.
   (a) Why was the solution boiled with dilute hydrochloric acid? (2 mks)
   (b) To which class of carbohydrates does sugarcane belong? (1 mk)
4. (a) What is the significance of blood clotting. (1 mk)
   (b) Explain the reason why blood does not clot in undamaged blood vessels. (2 mks)
5. (a) What is a respiratory surface? (1 mk)
   (b)State three characteristics that adapt respiratory surfaces to their function. (3 mks)

6. During a strenuous exercise, the chemical process represented by the equation below takes place in human muscles.

$C_6H_{12}O_6 \longrightarrow 2CH_3CH(OH)COOH + 150\ kJ$
(Glucose) $\longrightarrow$ (substance X) Energy

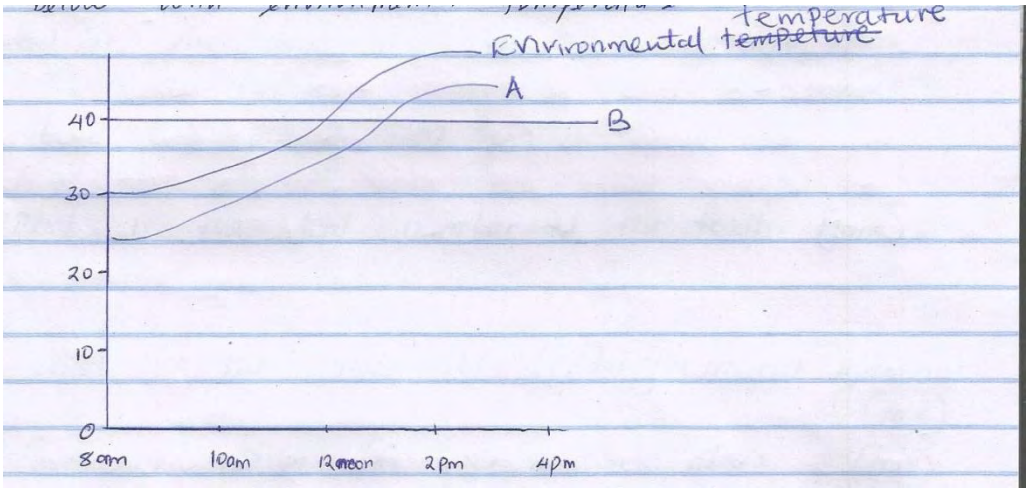
   (a) What is the name of the process? (1 mk)
   (b) Name substance X. (1 mk)
   (c) Explain what happens in the body when substance X accumulates in the muscle in high amounts. (2 mks)
7. Study the illustration below then answer the questions that follow.



   (a) Identify the type of cell division shown in the diagram. (1 mk)
   (b) Give a reason for your answer in (a) above. (1 mk)
   (c) What is the significance of crossing over between non-sister chromatids during prophase? (1 mk)
8. (a) What hormone is responsible for moulting in insects. (1 mk)
   (b) What is the importance of moulting in insects? (1 mk)
9. A doctor added a few drops of anti B- serum to two samples of blood in a blood test. No agglutination occured. Name the blood groups of the blood samples. (2 mks)
10. In an accident a victim suffered damage of his internal organs, consequently he started having excess glucose in his blood.
    (a) Which organ was damaged? (1 mk)
    (b) Give a reason for your answer. (1mk)

11. (a) What is meant by the term sex-linkage. (1 mk)
    (b) Part of one strand of DNA molecule was found to have the following sequence.
    G – C – C – G – A - T- T – T – A – C – G –G
    What is the sequence?
    (i) Of the complimentary DNA strand. (1 mk)
    (ii) On a mRNA strand copied from this portion. (1 mk)

12. The body temperatures of two animals A and B varied as below with environmental temperature.



    (a) Which of the animals is:-
    (i) Endothermic (1 mk)
    (ii) Ectothermic (1 mk)
    (b) With a reason, state which of the animal is likely to be widely distributed. (2 mks)

13. In a prolonged drought period, forage was scarce. It made animals reach out to higher forage and this way the giraffes got the stretched long necks.
    (a) What is the term used for characteristics such as long neck outlined. (1 mk)
    (b) Which theory is this? (1 mk)
    (c) State its limitations. (2 mks)
14. Below is the dental formula of a mammal.
    $i\ \frac{0}{4}\ c\ \frac{0}{0}\ pm\ \frac{3}{3}\ m\ \frac{2}{3}$
    (a) What is the total number of the teeth? (1 mk)
    (b) (i) What is the mode of feeding in the mammal? (1 mk)
    (ii) Give one reason for your answer above. (1 mk)
15. Name two tissues in plants which are thickened with lignin. (2 mks)
16. (a) Using a microscope, a student counted 55 cells across a field of view whose diameter was 6000µM.
    Calculate the average length of the cells. Show your working. (2 mks)
    (c) State the functions of:- (2 mks)
    (i) Ribosomes
    (ii) Lysosomes
17. What is the importance of the following in an ecosystem? (2 mks)
    i). Decomposers
    ii). Predation
18. How does temperature affect the rate of enzyme action? (2 mks)
19. The diagram below shows a stage during fertilization in plants.

(a) Name the parts labeled S and R. (2 mks)
(b) State the function of pollen tube. (1 mk)

20. Name the type of skeleton that makes each of the following animals. (2 mks)
(a) Cockroach
(b) Bird

21. What characteristics of living things is shown by each of the following?
(i) Football fan watching a game and cheering. (1 mk)
(ii) An athlete panting at the end of a marathon race (1 mk)

22. The diagram below shows a transverse section of a plant organ.

(a) Name part X. (1 mk)
(b) Name the plant organ from which the section was obtained. (1 mk)
(c) (i) Name the class to which the plant organ was obtained. (1 mk)
(ii) Give a reason for your answer in C(i) above. (1 mk)

23. What is meant by the following terms:- (2 mks)
(a) Habitat
(b) Ecosystem

24. Give two reasons why animals have specialized organs for excretion as compared to plant (2 mks)

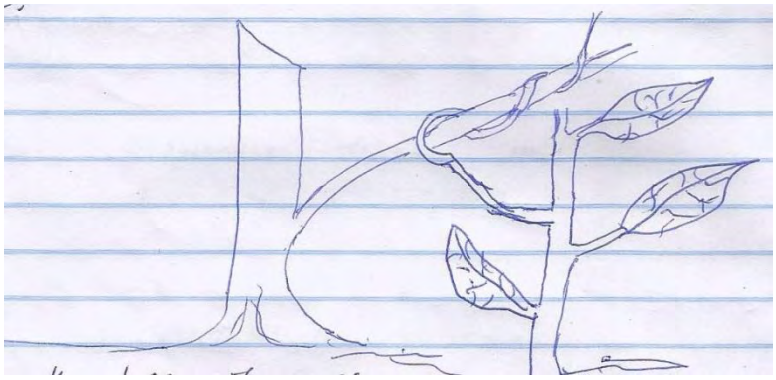
25. What is the function of the following structure in the human reproductive system?
(a) Fallopian tubes (2 mks)
(b) Epididymis

26. State two factors that contribute to the decelerating phase in the population curve of an organism. (2 mks)

27. Give an example of a genetic disorder caused by:- (2 mks)
(i) Non-disjunction
(ii) Gene mutation

28. A herds boy sees a lion and experiences the following; increased heartbeat, increased rate of breathing, body temperature rises followed by sweating.
(a) Name the hormone responsible for the experience. (1 mk)
(b) What is the importance of the changes stated above? (1 mk)

29. The diagram below illustrates a response by a certain plant.



(a) Name the type of response. (1 mk)
(b) Explain how the response illustrated above occurs. (3 mks)

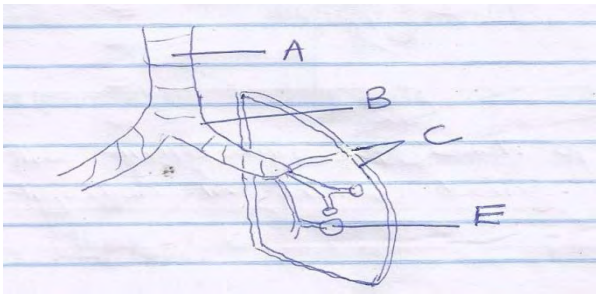
BUURI STANDARDS TEST 2021
231/2
BIOLOGY PAPER 2
2 HOURS

SECTION A (40 marks)
Answer all the questions in this section in the spaces provided.

1. In humans hairy ears is controlled by a gene on the Y-chromosome.
   (a) Using letter Y^H to represent the chromosome carrying the gene for hairy ears. Work out a cross between a hairly eared man and his wife. (4 mks)
   (b) (i) What is probability of the girls having hairly ears? (1 mk)
   (ii) Give a reason for your answer in b(i) above. (1 mk)
   © Name two disorders in human that are determined by sex-linked Genes. (2 mks)

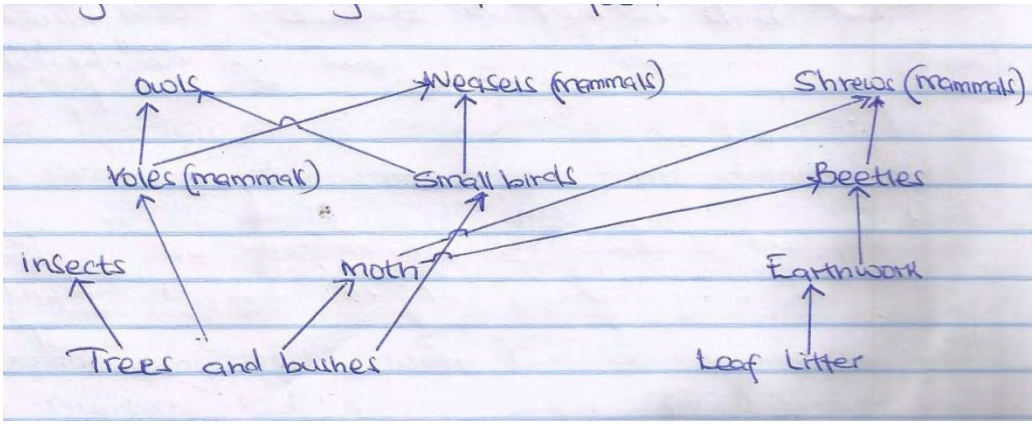
2. (a) Explain the importance of each of the following during digestion in human beings.
   (i) Teeth (1 mk)
   (ii) Saliva (1 mk)
   (b) State the role of each of the following in photosynthesis.
   (i) Light (1 mk)
   (ii) Chlorophyll (1 mk)
   (iii) Carbon (IV) oxide (1 mk)
   (c) State the gas produced during photosynthesis. (1 mk)
   (d) Explain how each of the following structures of a leaf affects the rate of photosynthesis.
   (i) Broad flat lamina (1 mk)
   (ii) Presence of stomata (1 mk)

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

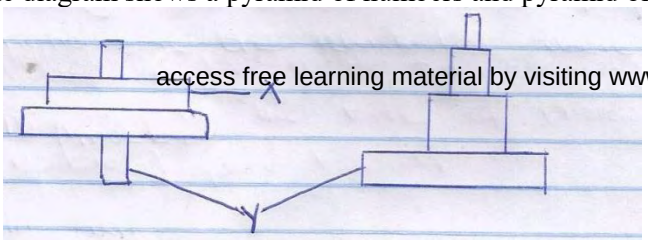


(a) Name the part labeled A and B. (2 mks)
(b) State the function of the part labeled C. (2 mks)
(c) How is the part labeled E adapted to its functions. (2 mks)
(d) Identify the structure that perform the same function as one illustrated above in.
i) Amoeba (1 mk)
ii) Fish (1 mk)

4. Study the diagram of the food web below.

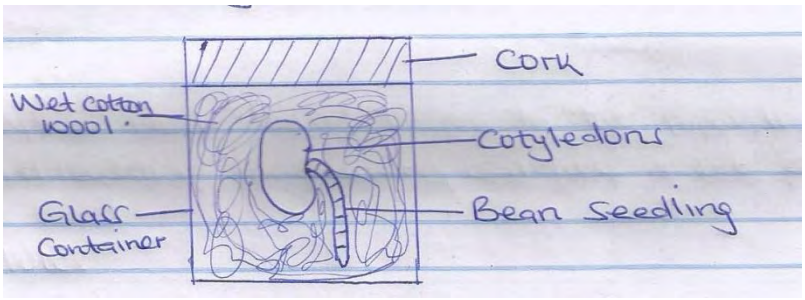


(a) Give a food chain that contains four organisms and includes shrews. (2 mks)
(b) Explain what would happen to the populations of roles and owls if a farmer catches a lot of weasels.
Voles (1 mk)
Owls (1 mk)
(c) The diagram shows a pyramid of numbers and pyramid of biomas for the same area in this wood.



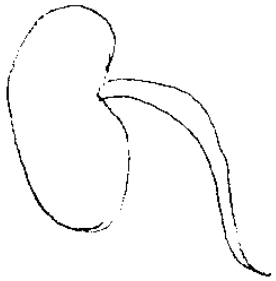
(i) Name two organisms from the food web that is in trophic level x . (2 mks)
(ii) The organisms in trophic levels X are described as secondary consumers. What term describes the organism in trophic level Y? (1 mk)
(iii) Explain why trophic level y is narrow in the pyramid of numbers but is the widest trophic level in the pyramid of biomass. (1 mk)

5. A student set up an experiment as shown in the diagram below.



(a) What was being investigated in the experiment? (1 mk

(b) On the diagram below indicate the expected results after three days. (2 mks)



(c) What is the role of each of the following to a germinating seed?
(i) Oxygen (1 mk)
(ii) Cotyledons (1 mk)

(d) Why was it necessary to have wet cotton wool in the container? (1 mk)

(e) Small seeds require light immediately after germination. Explain. (2 mks)

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

6. Two persons X and Y drunk volumes of concentrated solution of glucose. The amount of glucose in their blood was determined at intervals. The results are shown in the table below.

Time (minute)	Glucose level in blood mg/100cm^3	
	X	Y
0	87	84
15	112	123
30	139	170
45	116	188
60	100	208
90	95	202
120	92	144
150	88	123

(a) On the grid provided, plot graphs of glucose level in blood against time on the same axis. (8 mks)
(b) What was the concentration of glucose in the blood of X and Y at the 20th minute. (2 mks)
(c) Suggest why the glucose level in person X stopped rising after 30 minutes while it continued rising in person Y. (3 mks)
(d) Account for the decrease in glucose level in person X after 30 minutes and person Y after 60 minutes. (2 mks)
(e) Name the compound that stores energy released during oxidation of glucose. (1 mk)
(f) Explain what happens to excess amino acids. (4 mks)

7. Describe various evidences which show that evolution has taken place. (20 mks)
8. (a) State the possible applications of the following plant hormones in agriculture. (6 mks)
(i) Auxins
(ii) Gibberellins
(b) Describe the role of hormones in the human menstrual cycle. (14 mks)

BUURI STANDARD TESTS 2021
BIOLOGY PP3
CONFIDENTIAL

Each candidate requires the following:-

- A straight portion of raw pawpaw labeled P.
- Two petri dishes, a scalpel, two beakers containing liquid C and K.
- In beaker C place 30cm^3 of distilled water.
- In beaker k place 30cm^3 of distilled water
- In beaker K place 30cm^3 of sugar solution
- A 50 mls measuring cylinder
- Means of labeling
- Ruler
- Mature lemon labeled B
- 2cm^3 of 0.1% DCPIP
- Three test tubes
- Two droppers
- 0.1% ascorbic acid enough to provide 10 drops i.e 5cm^3.
- Filter paper and funnel

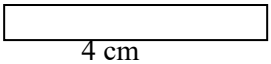
To prepare 0.1% ascorbic acid: measure 0.1g of ascorbic acid in 100ml of water.
To prepare 0.1% DCPIP, measure 0.1g of DCPIP and dissolve in 100ml of water.

BUURI STANDARDS TEST
231/3
BIOLOGY (PRACTICAL)
PAPER 3

1. You are provided with the following materials and reagents.
   A straight portion of raw pawpaw labeled p, two petri dishes
   A scalpel/sharp razor blade
   Liquid C in a beaker
   Liquid k in a beaker
   Measuring cylinder
   A stop watch/a wall clock
   Means of labeling

   Procedure

i) Label the two petri dishes C and K.
ii) Place 30cm^3 of liquid C in the petri dish C and 30cm^3 of liquid K in petri dish K.
iii) Using a scapel, prepare four thin, straight flat strips from raw pawpaw peel.
iv) Each strip should measure 4cm by 2cm as illustrated below



(i) Immerse two strips in petri dish C and the other two in petri dish K and leave the set up undisturbed for 10 minutes.

(a) (i) State your observation in petri dish C and K after 10 minutes. (2 mks)
Petri dish C
Petri dish K

(ii) Account for the observation in a(i) above
Petri dish C (2 mks)
Petri dish K (2 mks)

(b) Describe the nature of liquid C and K in the relation to the sap found in paw paw peel used in the experiment.
Petri dish C (1 mk)
Petri dish K (1 mk)

(c) With reference to the observation made, compare the nature of the outer and inner layer of the paw paw peel. (2 mks)

(d) (i) Name the cell structure responsible for the observation made in the experiment. (1 mk)

(ii) Name how the cell structure named in d(i) above brings about observation made. (1 mk)

2. You are provided with a specimen labeled B, 0.1% DCPIP and 0.1% ascorbic acid. Examine specimen B.

(a) (i) What part of the plant is specimen B. (1 mk)

(ii) Give a reason for your answer in a(i) above. (1 mk)

(b) Cut a transverse section through specimen B.

(i) Draw and label one of the cut surface. (3 mks)

(ii) State the type of placentation of specimen B. (1 mk)

(c) Name the agent of dispersal of specimen B. (1 mk)

(d) State how specimen B is adapted to its mode of dispersal. (1 mk)

(e) (i) To $1cm^3$ of DCPIP in a test tube add 0.1% solution of ascorbic acid dropwise until the colour of DCPIP disappears. Shake the test tube after addition of each drop. Record the number of drops used. (1 mk)

(ii) Squeeze out the juice of specimen B into a beaker. Filter and discard off the residue. To another $1cm^3$ of DCPIP in a test tube add the juice from specimen B drop by drop. Shake the test tube after addition of each drop until the colour of DCPIP disappears. Record the number of drops used. (1 mk)

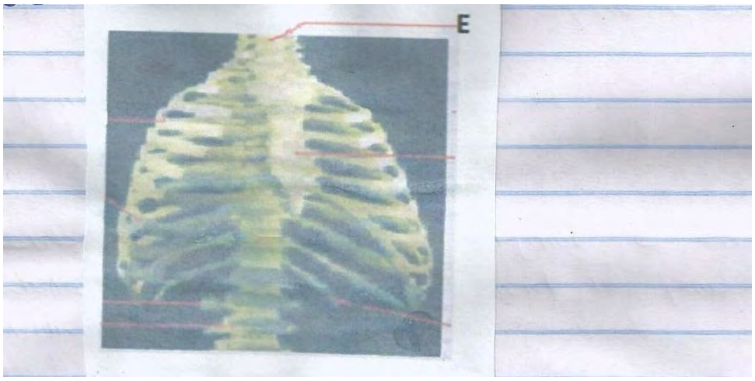
(iii) From the results obtained in e(i) and (ii) above, calculate the percentage of ascorbic acid in the juice obtained from specimen B. Show your working. (1 mk)

(iv) State two factors that would influence the accuracy of the results. (1 mk)

(f) (i) Suggest the expected results if the juice from specimen B was boiled for 30 minutes, cooled and added drop by drop to DCPIP solution. (1 mk)

(ii) Explain the expected results in f(i) above. (1 mk)

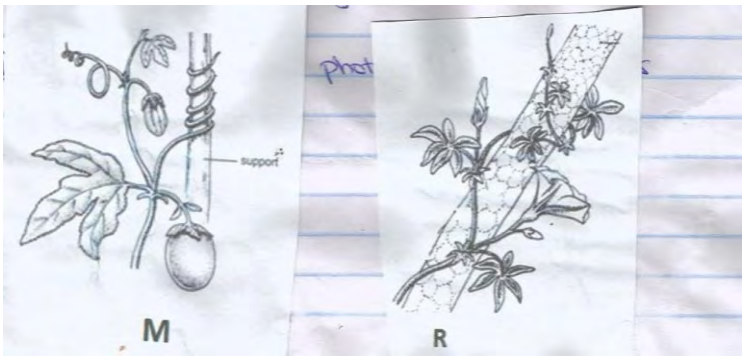
3. (a) You are provided with a photograph with part of human skeleton.
Use it to answer question that follow.



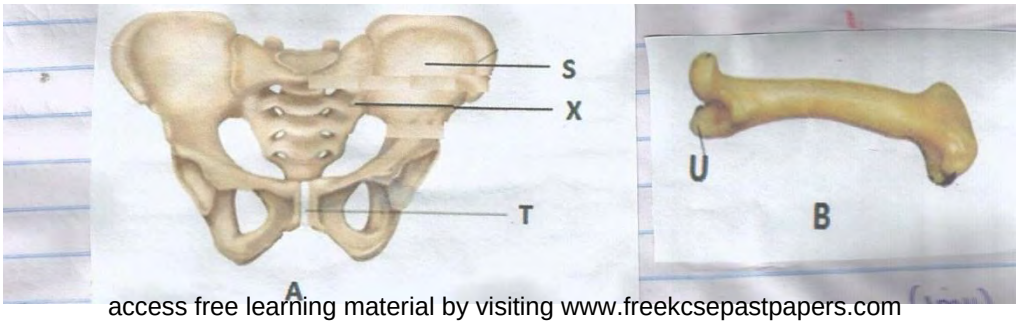
(i) Name the first vertebra labeled E and state how it is adapted to its function.
Name (1 mk)
Adaptations (2 mks)

(ii) Name the structure in the skull that articulates with the vertebra E. (1 mk)

(iii) Below are two photographs of plants



(a) Identify support structures used by the plants in photographs M and R shown above. (2 mks)
(b) Other than the structures illustrated above, name any one support structure in herbaceous plants. (1 mk)
(c) The photographs below represents some skeletal materials obtained from a certain mammal. Study them then answer the questions that follow.



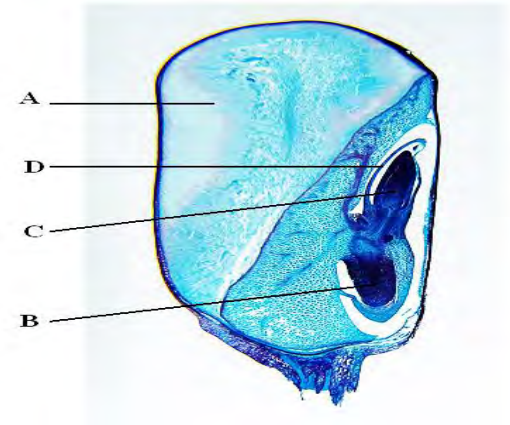
Identify fused bone labeled X. (1 mk)
(i) Name parts S and T on photograph A and part U on photograph B. (3 mks)
(ii) Name the type of joint formed at the proximal and distal end of bone B. (2 mks)
Proximal end
Distal end
(iii) Name the type of joint found in structure labeled X. (1 mk)

IGAMBA NG'OMBE
231/3
BIOLOGY PAPER 3 (PRACTICAL)

1. You are provided with a specimen labeled N. Squeeze the contents of N into the test tube. Add 3 cm^3 of water and shake the contents. Reserve the piece of intestine for question (b)
   a. Use the reagents provided to test for the presence of various food substances in N extract. Record your observations in the table below (6marks)

Food substance tested	**Procedure**	**Observation**	**Conclusion**

   b). Account for the results obtained in (a) above. (2 marks)
   C).Cut specimen N along its length to expose the inner surface, using a hand lens:
   i) Carefully observe the inner surface of the specimen. Record your observations. (2 marks)
   ii) Account for your observation of the inner surface. (2 marks)
2. Study the photomicrograph of the longitudinal section of a maize fruit below and answer the questions that follow.



(a) (i) Name the parts labelled A, B, C and D. (4 **marks**)

(ii) Give the role played by A and D. (2 **marks**)

(b) (i) Name the type of germination exhibited by maize grain. (1 **mark**)

(ii) Place the plant from where the photomicrograph was obtained into its Kingdom,DivisionandClass. (3 **marks**)

Kingdom …….

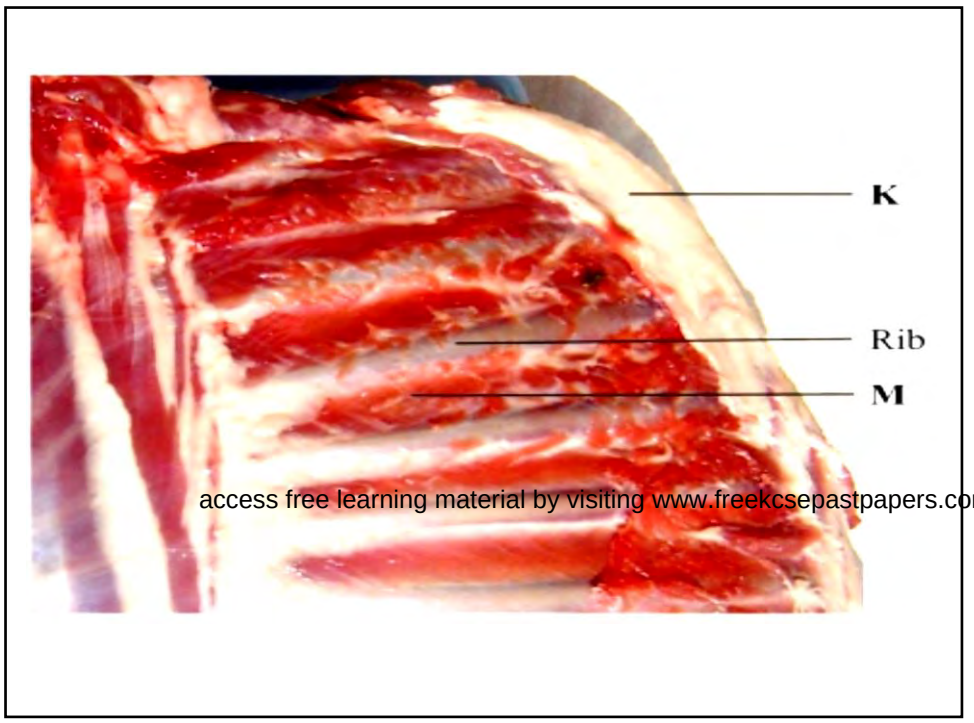
Division ……..

Class ……..

(iii) State three characteristics of members of the class identified in b (ii) above (3 **marks**)

(c) Give a reason why the maize grain is classified as a fruit. (1 **mark**)

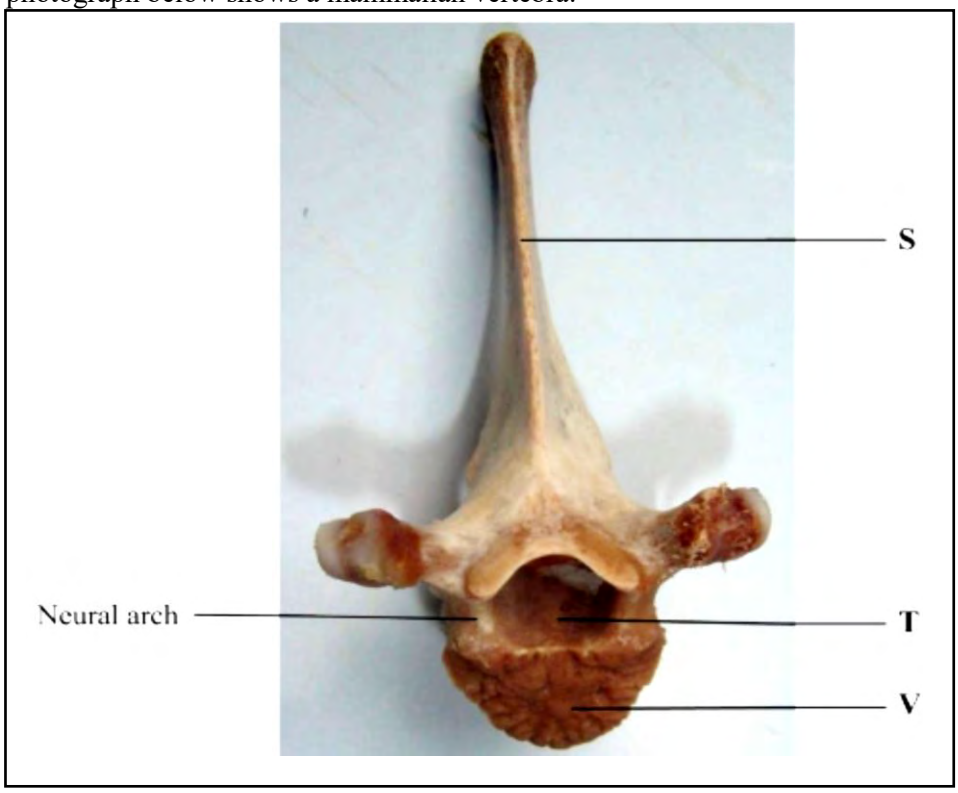
3. The photograph below shows the inner surface of the upper left side of the rib cage



a. i. Name the bone covered by the fatty tissue labelled K (1 mark)

ii. Explain the role of the part labelled M in inhalation (5 marks)

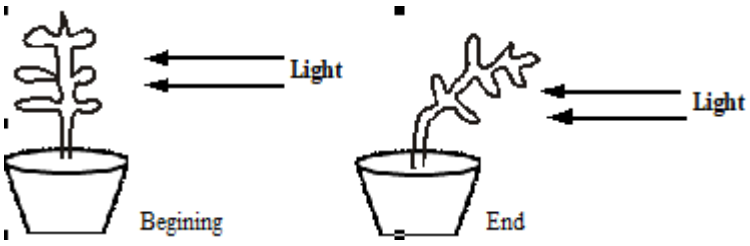
b. The photograph below shows a mammalian vertebra.



i. Identify the vertebra presented in the photograph (1 mark)
ii. State the view of the vertebra presented (1 mark)
iii. Name and state one function of the part labelled T (2 marks)
iv. How are the parts labelled S and V adapted to their functions (4 marks)

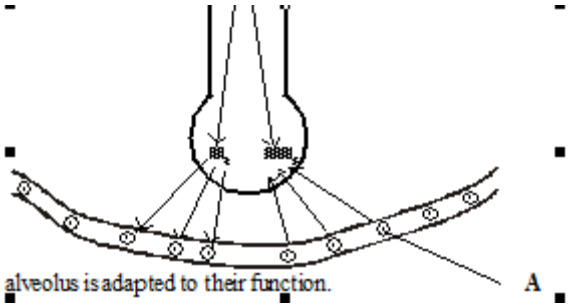
KIRINYAGA CENTRAL SUB-COUNTY
231/1
BIOLOGY PAPER 1
NOVEMBER / DECEMBER 2021

1. Name the branch of biology that deals with the following:-
   (a) Study of cockroaches, housefly and locusts. (1 mark)
   (b) Study of yeast, mushroom, penicillium and toadstools. (1 mark)
2. The set up below was done to illustrate a characteristi of living things.

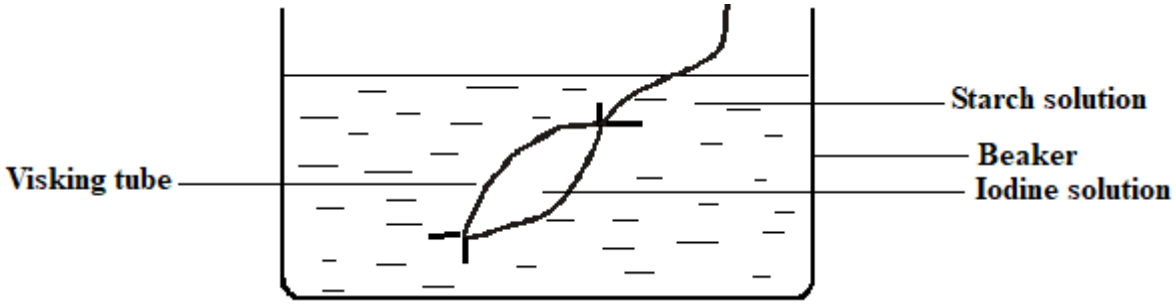


Begining End

   (a) Name the characteristic. (1 mark)
   (b) Name the response. (1 mark)
   (c) State the importance of the response stated in (b) above. (1 mark)
3. (a) Distinguish between homologous and analogous structures. (2 marks)
   (b) Explain the term continental drift as used in evolution. (2 marks)
4. The Diagram below shows the exchange of gases in alveolus.

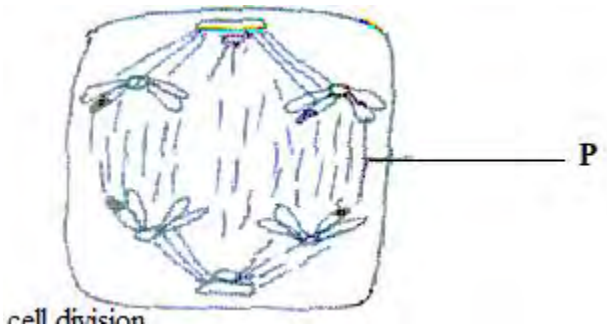


4. (a) State how the alveolus is adapted to their function. (3 marks)
   (b) Name the cell labelled **A** (1 mark)
5. An experiment was set up as shown below.



i) What physiological process was being demostrated? (1 mark)
ii) The **two** observation made after 30 minutes. (2 marks)
iii) Explain the observation made. (2 marks)
iv) What conclusion can you make from the above? (1 mark)

6. The diagram below represents a stage during cell division.

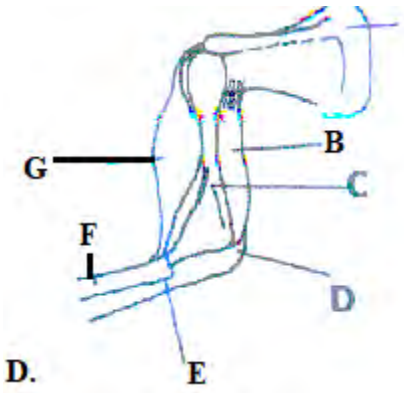


i) Identify the stage of cell division. (1 mark)
ii) Give **one** reason for your answer in a(i) above. (1 mark)
iii) Significance of chiasmata formation. (1 mark)
iv) Name the type of cell division shown above. (1 mark)

7. (a) A patient whose blood group is '**A**' died shortly after receiving blood from a person of blood group '**B**'. Explain the possible cause of death of the patient. (2 marks)
(b) A person of blood group '**AB**' requires a transfusion:-
(i) Name the groups of the possible donors. (2 marks)
(ii) Give reasons for your answer in (i) above. (2 marks)

8. (i) Name a pigment found in the Malphigian layer of the skin. (1 mark)
(ii) State **two** functions of this pigment. (2 marks)

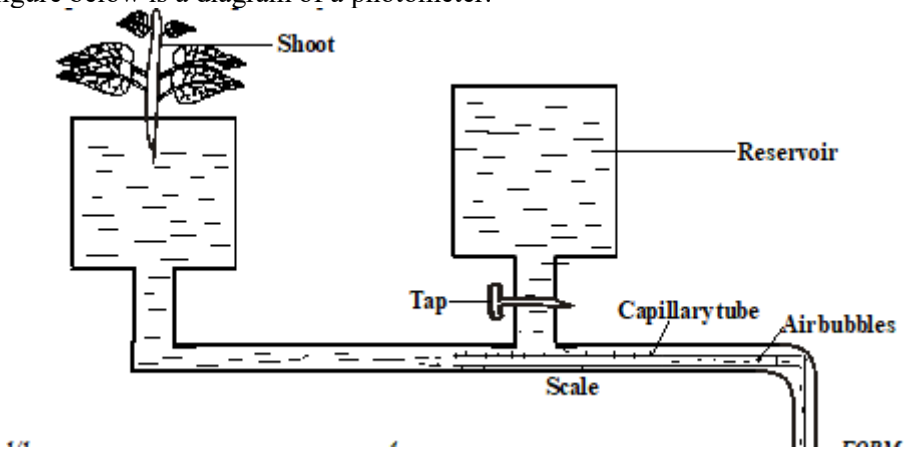
9. The diagram below represents bones at a joint found in the forelimb of a mammal.



(a) Name the bone labelled **A**, **C** and **D.** (3 marks)
(b) Name the structure that joins bones and muscles. (1 mark)

10. Give reasons for each of the following:-
(a) Constant body temperature is maintained in mammals. (2 marks)
(b) Low blood sugar level is harmful to the body. (2 marks)

11. The figure below is a diagram of a photometer.



(a) What is it used for? (1 mark)
(b) State the precautions which should be taken when setting up a photometer. (2 marks)

12. (a) A student collected a plant with the following features:-
- Vascular bundles in the stem were scattered with no cambium.
- Fibrous roots.

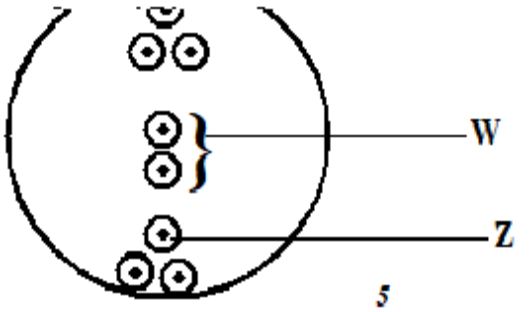
Name the sub-division and class to which the above plant belonged. (2 marks)
(i) Sub-division
(ii) Class

(b) State the kingdom to which the following organisms belong. (3 marks)
Plasmodium
Bat
Yeast

13. (a) What is the basic unit of a DNA molecule? (1 mark)
(b) Name the chemical components of the unit named in (a) above. (3 marks)

14. To estimate the population of Quelea birds that eat up rice grains before harvesting in one farm in Kimbimbi, traps were laid at random 1200 birds were caught, marked and realeased. Three days later, traps were laid again and 1122 birds were caught. Out of the 1122 birds, 240 were found to have been marked.
(a) Calculate the population of the Quelea birds that invade the farm using the formula:
$P = \frac{FMXSC}{MR}$ (2 marks)
(b) What name is given to this method of estimating population? (1 mark)
(c) State **three** assumptions made during the investigation. (3 marks)

15. Below is a diagram of a mature embryo sac.



5

(a) Name the parts labelled: **W, Z** (2mark)
(b) Give the name of the part of the seed formed when the part labelled **W** fused with one of the male nucleus. (1 mark)

16. (a) Name **two** types of immunity. (2 marks)
(b) List **two** diseases that are effectively controlled through vaccination. (2 marks)_

17. In Novembe 1918 there was an outbreak of Severe Acute Respiratory Syndrome in China which spread and killed people in Europe, America, Canada, Asia and Africa. The disease was mainly transmitted through the air.
(a) Name the organ that is likely to be infected. (1 mark)
(b) List the ways in which the diseases would be prevented from spreading.
(i) Person to person. (2 marks)
(b) Country to country (2 marks)

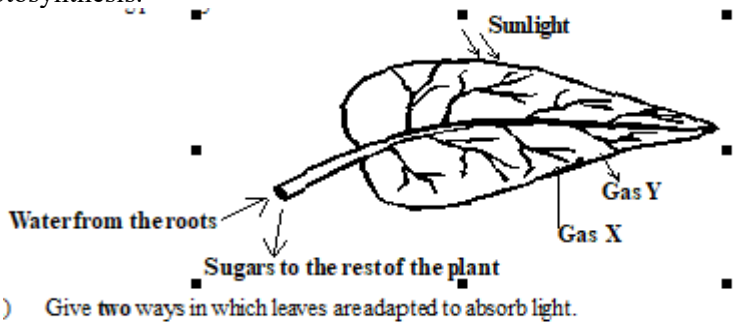
18. (a) Short-horned grasshopper moults five times before reaching adult size. Draw the kind of growth curve you would expect for the grasshopper if the change in its length are plotted against time. (2 marks)
(b) Name the hormones that bring about:- (3 marks)
(i) Moulting in the insects.
(ii) Metamorphosis in frogs tadpoles.
(iii) Growth in humans.

19. (a) What is Respiratory quotient (RQ)? (2 marks)
(b) Given the RQ values as 1.0 and 0.9 indicate the type of substrate oxidized. (2 marks)
1.0
0.9

KIRINYAGA CENTRAL SUB-COUNTY
231/2
BIOLOGY PAPER 2
NOVEMBER / DECEMBER 2021

SECTION A
Answer all the questions in this section. (40 marks)

1. Leaves are the organs of photosynthesis. The following diagram shows what happens in a plant leaf during photosynthesis.

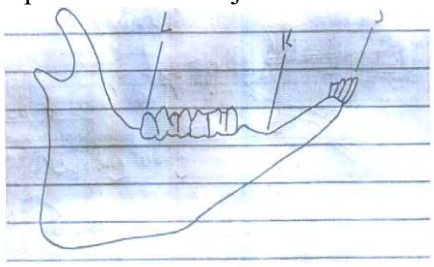


) Give **two** ways in which leaves are adapted to absorb light. (2 ma

(a) Give **two** ways in which leaves are adapted to absorb light. (2 marks)
(b) Name the gases labelled X and Y. (2 marks)
(c) Name the tissues which transport water into the leaf and sugars out of the leaf. (2 marks)
(d) Explain why it is an advantage for the plant to store carbohydrates in form of starch rather than as sugars. (2 marks)

2. (a) State **three** pieces of evidence that support the theory of Evolution. (3 marks)
(b) What is meant by Convergent Evolution? (2 marks)
(c) Explain why Larmacks theory of Evolution is not accepted by biologists today. (1 mark)
(d) Give **two** examples of natural selection in action today. (2 marks)

3. A pea plant with smooth seeds was crossed with wrinkled seeds. The gene for smooth seed is dominant over that for wrinkled seed.
   Use letter R to represent the dominant gene.
   (a) State the genotype of the parents if the plant with smooth seeds was heterozygous. (2 marks)
   (b) State the gametes produced by the smooth seeds and wrinkled seeds parents. (2 marks)
   (c) State the genotype and phenotype of the F1 generation. Show your working. (2 marks)
   (d) What is a test cross? (1 mark)
4. (a) Name part of a flower responsible for the:-
      i) Gamete formation. (1 mark)
      ii) Developing into a seed. (1 mark)
   (b) Name **three** mechanism that ensure cross pollination takes place in flowering plants. (3 marks)
   (c) State **two** roles of oestrogen in mentruation. (2 marks)
   (d) Explain why pregnancy continues if the ovary of an expectant mother is removed after the 4th month. (1 mark)
5. The diagram below represent the lower jaw of a mammals.



   (a) Suggest the mode of nutrition of the mammal whose jaw is shown above. (1 mark)
   (b) State **one** structural and one functional differences between the teeth labelled **T** and **V**. (2 maks)
   (c) (i) Name the gap labelled W. (1 mark)
      (ii) State the function of the gap named in (i) above. (1 mark)
   (d) Name the substance that is responsible for hardening of teeth. (1 mark)
   (e) Distinguish between the homodont and heterodont dentition. (2 marks)

SECTION B (40 marks)

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

6. The table below shows the body temperature of a group of children and a certain variety of a frog. The temperature were taken at intervals of four hours.

Time (hours)	Temperature (^{0}C)	
	children	Frog
7.00 am	37.0^{0}C	12.5
11.00 am	37.0^{0}C	18.0
3.00 pm	37.0^{0}C	24.0
7.00 pm	37.0^{0}C	20.0
11.00 pm	37.0^{0}C	15.0
3.00 am	37.0^{0}C	13.5
7.00 am	37.0^{0}C	18.0

   (a) Plot 2 graphs on the same axis of body temperature against. (6 marks)
   (b) Account for the temperature of frogs and children over a period of study. (4 marks)
   (c) (i) Name the part of the mammalian brain responsible for temperature regulation. (1 mark)
      (ii) Explain the importance of maintaining a constant body temperature. (2 marks)

(d) State and explain what happens to the following parts of the skin when temperature rises.
(i) Blood vessels. (2 marks)
(ii) The hair. (2 marks)

(e) Explain why adult elephant flaps their ears more frequently than their calves inorder to cool their bodies on a hot day. (3 marks)

7. (a) What is homeostasis? (2 marks)
(b) Discuss the homeostatic functions of the mammalian liver. (18 marks)

8. (a) Describe the movement of water in plant from time of uptaken from the soil by the roots until it reaches the leaves and is eventually transpired. (10 marks)
(b) Describe the circulation of blood in the mammalian heart. (10 marks)

KIRINYAGA CENTRAL SUB-COUNTY
231/3
BIOLOGY PAPER 3 (PRACTICAL)
NOVEMBER / DECEMBER 2021
FORM 4

Each candidate will require:-

- 4 labels
- 6 test tubes
- Olive oil
- Liquid L_1 - concentrated sodium hydrogencarbonate soln.
- Liquid $_2$ - 1% starch solution.
- Pestle and motar
- Ruler
- Surgical blade
- 4 droppers
- Iodine solution
- Benedict's solution
- Means of heating
- Distilled water
- One irish potato

KIRINYAGA CENTRAL SUB-COUNTY
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BIOLOGY
PAPER 3 (PRACTICAL)
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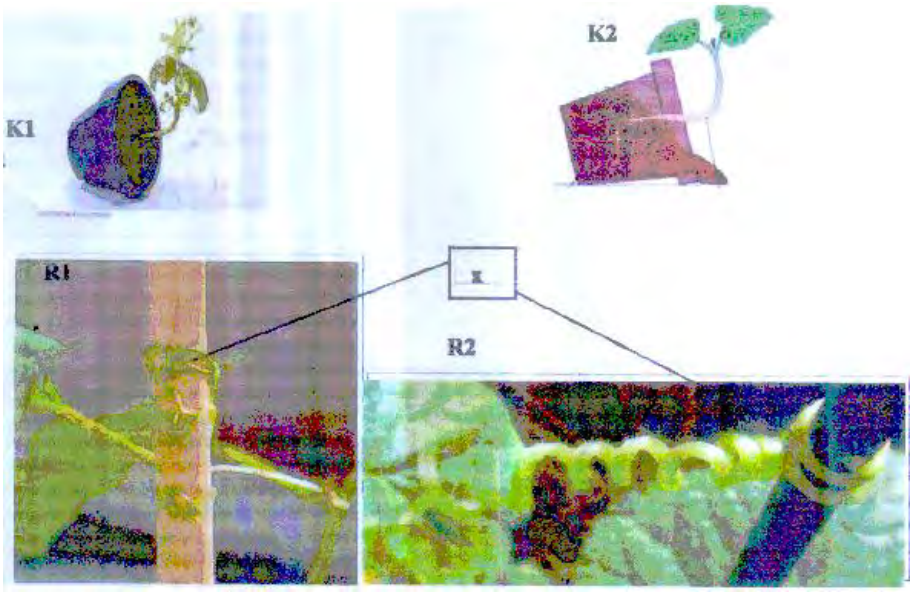
1. You are provided with olive oil, liquids labelled L_1 and L_2 and an Irish potato. Label two test tubeX and Y. Into each test tube, put 2 cm^3 of water and 8 drops of olive oil. To the test tube labelled X add 8 drops of liquid L_1. Shake both test tubes and allow the content to stand for five minutes.

(a) (i) Record your observation in:-
Test tube X. (1 mark)
Test tube Y (1 mark)
i) Name the process that has taken place in test tube X (1 mark)
ii) State the significance of the process named in a (ii) above in digestion. (1 mark)
iii) Name the digestive juice in humans that has the same effect on oil as liquid L_1 (1 mark)

(b) Label two test tubes E and F. Place 2 cm^3 of liquid L_2 into each. Add a drop of iodine solution into each test tube.
i) Record your observation. (1 mark)
ii) Suggest the identity of liquid L_2. (1 mark)
iii) Cut out a cube whose side are 1 cm from Irish potato provided. Crush the cube to obtain a paste and place the paste in the test tube labelled E. Leave the set up for at least 30 minutes. Record your observation. (2 marks)
iv) Account for the results in b(ii) above. (3 marks)

(c) i) Cut out another cube whose sides are 1 cm from Irish potato and crush it. Place the crushed paste into a test tube. Carry out food test with the reagent provided.
Procedure. (1 mark)
Results (1 mark)
ii) Account for the results in (c)(i) above. (2 marks)

2. Examine photograph K1 and K2 then answer the questions that follow.



a) Name the response that is exhibited by the seedlings K1 and K2. (1 mark)
b) Explain how the response you have stated in (a) above occurs. (4 marks)
c) What is the significance (survival value) of the response you have stated in (a) above. (1 mark)
d) Photographs R1 and R2 shows a certain response in plants:-

i) Name the response shown by plant part X. (1 mark)
ii) Explain how the response you have stated in (a) above occur. (2 marks)
iii) (What is the biological significance of the response shown by X? (2 marks)

3. Your are provided with photographs of specimens N, P and R. Study the photographs and answer the questions that follow.

(a) (i) State the class to which the specimens N and P belong. (1 mark)
(ii) Give **three** reasons for your answer. (3 marks)
(b) With a reason in each case state the type of environment to which each specimen is suited. (3 marks)

Specimen	**Type of environment**	**Reason**

(c) State the mode of locomotion for each specimen. (3 marks)

Specimen	**Type of locomotion**	**Reason**

(d) Specimen R is a stage in the life cycle of the housefly (musca domestica)
(i) Identify the stage. (1 mark)
(ii) Give a reason for your answer. (1 mark)
(iii) State the importance of this stage in the life cycle of the housefly. (1 mark)