



**TOP NATIONAL SCHOOLS
TRIAL EXAMS 2022
BIOLOGY**

A SOURCE YOU CAN TRUST

- MARANDA SCHOOL
- ASUMBI GIRLS
- PANGANI GIRLS
- KENYA HIGH
- NAIROBI SCHOOL
- MANG'U SCHOOL
- MOI GIRLS ELDORET
- FRIENDS SCHOOL
- MASENO
- BAHATI GIRLS
- STAREHE BOYS

ASUMBI GIRLS HIGH SCHOOL

1(a) State **two** external features found in class Mammalia only. (2mks)

.....
.....
.....

(b) Name the taxonomic unit that comes immediately after Family in classification. (1mk)

.....

2 (a) Name the basic functional unit of the skeletal muscle. (1mk)

.....

(b) Distinguish between a tendon and a ligament. (1mk)

.....

3. (a) State **two** advantages of using a coverslip when preparing a specimen for observation under the light microscope. (2mks)

.....
.....

(b) How is the low power objective lens manipulated to focus a specimen for observation under a light microscope? (2mks)

.....
.....

4. Explain the significance of the following in the feeding of a mammal (a) Long tongue in herbivores. (1mk)

.....

(b) Canine in carnivores. (1mk)

.....

5. Name the part of maize seed that elongates to bring about hypogeal germination. (1mk)

.....

6. (a) State **two** characteristics of living organisms that are specific to plants. (2mks)

.....
.....

(b) State the name given to the study of;
i) The cell (1mk)

ii) Microorganisms (1mk)

7. What is the function of the following structures in the human reproductive organs;

(a) Fallopian tubes (1mk)

(b) Epididymis (1mk)

(c) Scrotal sac (1mk)

8. Under what conditions do animals use the following food for respiration;

(a) Carbohydrates (1mk)

(b) Fats (1mk)

(c) Tissue proteins (1mk)

9. Distinguish between convergent and divergent evolution (1mk)

10. Fingerlings of fish were introduced to two different ponds. Those fingerlings in pond one all died within four days but the fingerlings in pond two survived. Suggest the likely reasons why the fingerlings in one pond died. (3mks)

11. (a) State the functions of the following parts of a light microscope

i) Objective lens (1mk)

ii) Fine adjustment knob (1mk)

(b) Using a microscope a student counted 66 cells across the field of view whose diameter was 6000 μ m. Calculate the average length of cells. Show your working.

12. Why is a change in dry mass of an organism the best indicator of growth? (2mks)

13. Other than the visceral organs in the body name two other parts of the body where smooth muscles are found. (2mks)

14. State the role of each of the following components of skin

a) Melanin

(1mk)

.....
.....

b) Sebum

(1mk)

.....
.....

c) Adipose tissue.

(1mk)

.....
.....

15 How does a sunken stomata help a plant avoid excessive water during gaseous exchange? (3mks)

.....
.....
.....

16. Name the substances produced as a result of anaerobic respiration in

i) Yeast

(1mk)

.....
.....

ii) Human muscles

(1mk)

.....
.....

17. Why is Lamarck's theory of evolution not accepted by biologist today?

(2mks)

.....
.....

18. Give **two** reasons why animals have specialised organs for excretion as compared to plants. (2mks)

.....
.....
.....

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



(a) Name the type of response (1mk)

.....

(b) Explain how the response illustrated above occurs (3mks)

.....
.....
.....
.....

20. (a) What is meant by the term wilting. (1mk)

.....

(b) Explain how an increase in temperature affects the rate of active transport. (2mks)

.....
.....
.....

21. Explain **four** adaptive characteristics features of respiratory surfaces. (4mks)

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.....
.....
.....

22. (a) State **two** advantages of complete metamorphosis to the life cycle of an insect. (2mks)

.....
.....

(b) Distinguish between primary and secondary growth in plants (2mks)

.....
.....
.....

23. The table below shows the level of two gases X and Y, in blood entering and leaving the lungs during the process of gas exchange.

Gas	Level of gas in cm ³ per/100cm of blood	
	Blood entering lungs	Blood leaving lungs
X	10.6	19.0
Y	58.0	50.0

(a) Name gases X and Y. (2mks)

X..... Y.....

(b) How much gas X enters 100cm³ of blood, before the blood leaves the lungs. (2mks)

24. In a flower name the parts that make up;

i) Gynoecium (1mk)

ii) Androecium (1mk)

25. State **two** sites for gaseous exchange in submerged aquatic plants. (2mks)

26. Viability of a seed is a necessary internal condition for germination. State two factors that may lead to low viability. (2mks)

27. Name two disorders in human caused by chromosomal mutation. (2mks)

28. State two characteristics that researchers select in breeding programme. (2mks)

29. A man and his wife are able to roll their tongues but their children cannot. Rolling tongue is controlled by a dominant gene. What are the genotypes of the parents. (Use letter T to represent the gene for tongue rolling) (2mks)

30. State the economic importance of the following plants excretory products.

i) Papain (1mk)

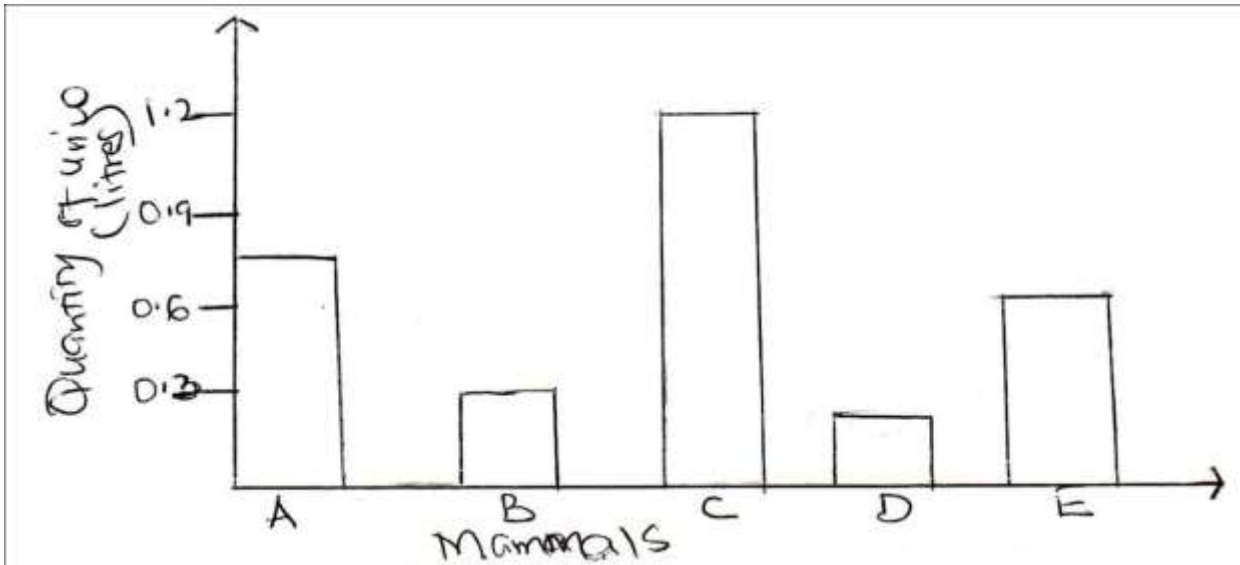
ii) Colchicine (1mk)

iii) Tannin (1mk)

(b) State **two** advantages of homiotherms over poikilotherms. (2mks)

PAPER 2

1. Study the graph below



(a) Which of the above mammals is likely to be excreting urine very high in ammonia? Explain (2mks)

.....

(b) Which of the five mammals was likely to be living in a desert? Explain (2mks)

.....

(c) State two structural differences expected in the nephron of mammals A and D. (2mks)

.....

(d) Name two physiological mechanisms used in mammal D to regulate its salt and water balance in the body. (2mks)

.....

2. (a) State the function of the following parts of mammalian ear;

iii) Tympanic membrane (1mk)

.....

iv) Pinna (1mk)

.....

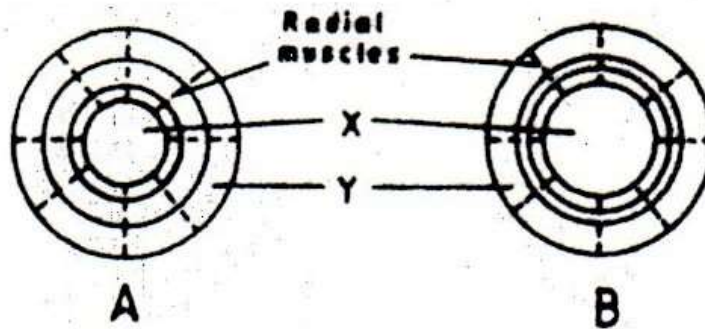
v) Ear ossicles (1mk)

.....

(b) Give **two** defects of mammalian eye

(2mks)

(c) The diagram below show how the iris and pupil of a human eye appear under different Condition



iii) Name the structures labeled X and Y

(2mks)

X.....

Y.....

iv) State the condition that lead to the change in appearance shown in the diagram labeled B

3. A biologist carried out a study to investigate the growth of a certain species of herbivorous fish and the factors influencing plant and animal life in four lakes A,B,C and D. The lakes were located in the same geographical area.

Two of the lakes A and B were found to contain hard water due to the presence of high content of calcium salts. The mean body length of 2 year old fish, amount of plant use and invertebrates biomass in each lake were determined. The data was shown in the table below;

Lakes	Means of fish body length (m)	Type of water	Amount of plant life	Invertebrate biomass g/cm ³			
				insects	snails	crabs	worms
A	31.2	Hard	1050	11	300	10	180
B	38.6	Hard	950	72	100	9	90
C	18.4	Soft	1.2	79	0	2	20
D	16.3	soft	0.5	99	0	1	10

(a) Describe the procedure that may have been used to determine the mean body length of the fish.

(4mks)

(b) What are the likely reasons for the difference in mean body length of the fish living in lakes A

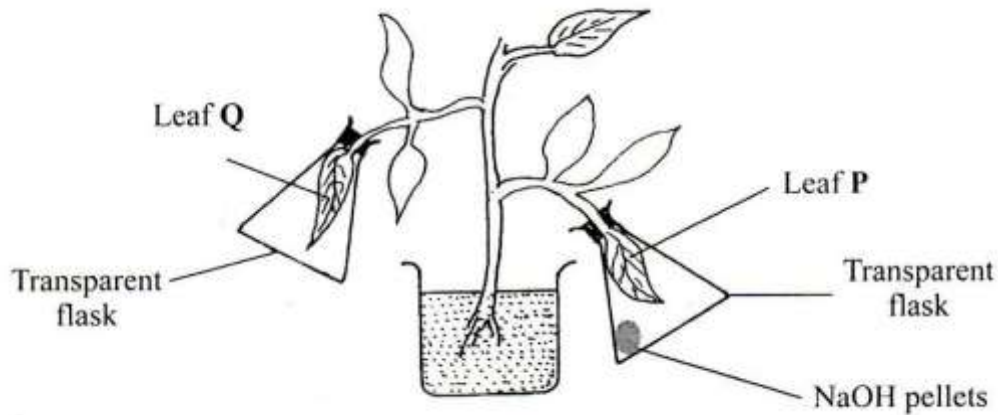
and D

(2mks)

(c) Explain why primary producers have a higher biomass than primary consumers.

(2mks)

4. In an experiment to investigate a factor affecting photosynthesis a potted plant which had been kept in the dark overnight was treated as shown in the diagram below and exposed to light.



(a) why was the potted plant kept in the dark overnight?

(1mk)

(b) Which factor was being investigated in the experiment?

(1mk)

(c) (i) Which test did the students perform to confirm photosynthesis in the leaves labeled P and Q

(ii) State the results obtained in the leaves labeled P and Q.

P

(1mk)

Q

(1mk)

(iii) Explain the results obtained in the leaves labelled P and Q

P

(1mk)

Q

(1mk)

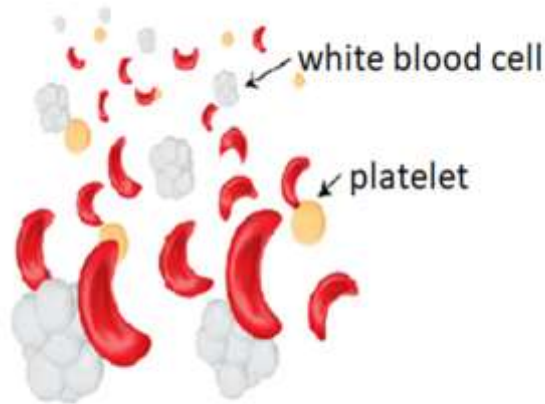
(iv) What was the purpose of the leaf Q in the experiment?

(1mk)

5. The diagram below shows samples of blood obtained from two different persons A and B



PERSON A



PERSON B

(a) What genetic disorder is person B suffering from?

(1mk)

(b) State one advantage and one disadvantage of the disorder exhibited in person A.

(2mks)

(c) Work out the genotype and phenotypes of the resulting offspring of a marriage between person A and B. Show your working

(5mks)

SECTION B

6. The data below represents levels of progesterone hormone produced in a female's body within a period of 34 days. Study the data and use it to answer the questions that follow

NB: The days were counted from the 1st day that menstruation was noticed.

Day	Progesterone hormone concentration in arbitrary units
1	6
2	5
3	3
4	2
5	1
6	1
8	1
10	2
12	4

14	7
16	8
20	9
22	10
24	10
26	10
28	10
30	11
32	11
34	11

(a) Plot a graph of progesterone concentration against time using a suitable scale. (6mks)

(b) Account for the progesterone levels in the blood between

iv) Day 1 - day 5

(2mks)

.....

.....

v) Day 14 – day 20

(2mks)

.....

.....

vi) Day 28 – day 35

(2mks)

.....

.....

(c) Name two structures that produce progesterone in females

(3mks)

.....

.....

(d) Suggest the process that usually takes place at day 14.

(1mk)

.....

.....

(e) Suggest two other hormones that were in high concentration in the body of the female between day 10 – 15 . Give reasons for your answer.

(4mks)

.....

.....

.....

.....

.....

.....

7. Describe how water moves from the soil to the leaves in a tree.

(20mks)

8. (a) Describe the process of carbohydrates digestion in human beings. (12mks)

(b) Describe the flow of energy from the sun through the different trophic levels in an Ecosystem (8mks)

PAPER 3

1. (a) Place 2ml of bicarbonate indicator in a clean test tube. Add dilute hydrochloric acid drop by drop and shake after each drop till there is a permanent color change.

(i) State the resulting color 1mk

.....
.....

(ii) To the mixture obtained above, now add sodium hydroxide solution dropwise until there is a permanent color change. Record your observations 1mk

.....

(iii) From your observations in a) i) and a) ii) above, what is the nature of the bicarbonate indicator 1mk

.....

(b) Place 10ml of a fresh bicarbonate indicator in boiling tube. Using a drinking straw, bubble air through the bicarbonate indicator until there is color change

(i) Record your observation 1mk

.....

(ii) What does the color obtained in b) i) above suggest about the nature of the gas breathed out 1mk

.....

c) Rinse the measuring cylinder and use it to place 2ml of lime water solution in a clean test tube. Rinse the drinking straw in (b) above and use it to bubble air through lime water solution

(i) Record your observation 1mk

.....

(ii) Suggest the identity of the gas that give rise to the observations above 1mk

.....

(d) (i) Name the physiological process in cells that leads to formation of gas named in (c)(ii) above 1mk

.....

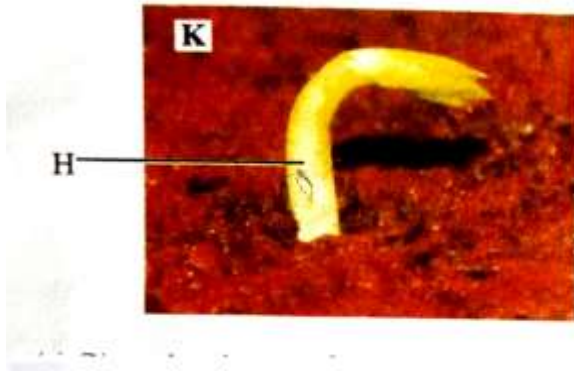
(ii) Write down a word equation for the process named in (d) (i) above 1mk

.....

(iii) What is the importance of the identified process in cells of living organisms 1mk

.....

2. Below are photographs of two seedlings labeled K and L. Examine them.



a) Given that the two plants belongs to the same class, name the class and give a reason based on the observable features in any of the two seedlings or both. 2mks

Class

Reason(s)

b) i) State giving a reason, the type of germination that occurs in each of the two seedlings 4mks

K

L

ii) Explain how the two types of germination you have stated in (b) (i) above occur 2mks

K

L

c) Name the parts labelled H and G on the seedling 2mks

H

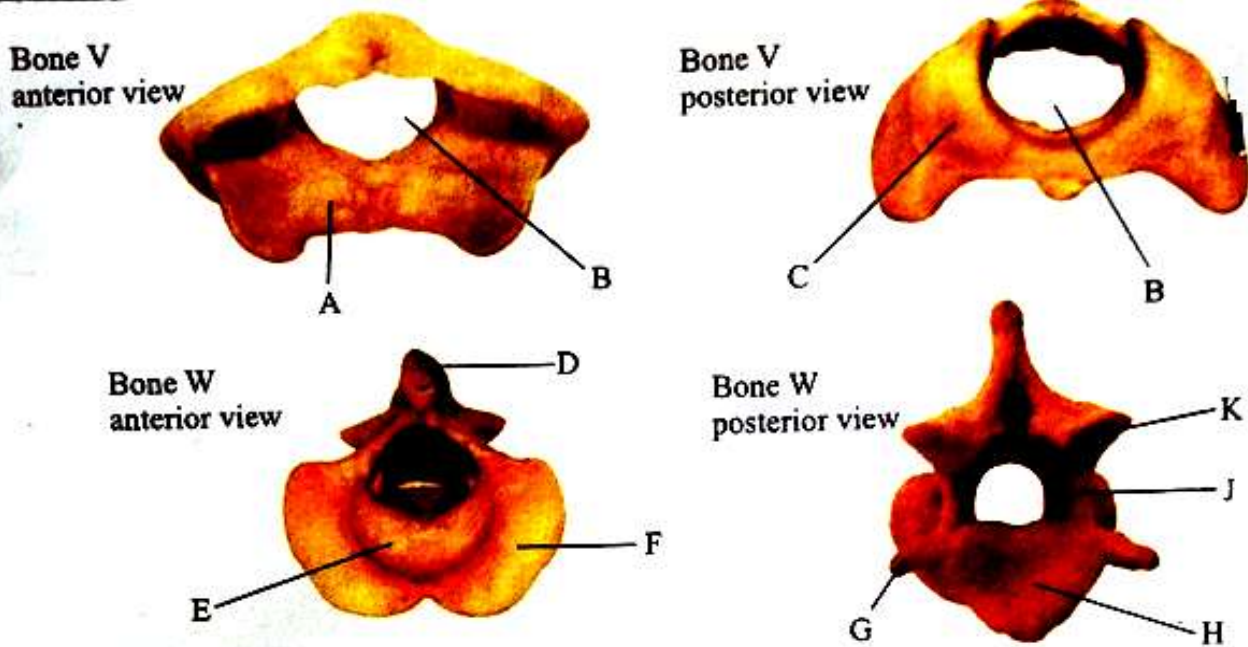
G

d) As germination progresses, both seedlings straightens. Explain how this occurs. 4mks

e) Name the type(s) of root system that will develop in the two seedlings 1mk

f) State another observation that will be made as seedling L straightens 1mk

3. The photographs below are specimens from the same animal of two different bones each shown in two views. Examine them.



- a) Identify the two specimens 2mks
 Specimen V.....
 Specimen W.....

b) Give four observable differences between bones V and W 4mks

Bone V	Bone W

c) Name the structure that articulates with part labeled A 1mk

d) State two roles of opening labeled B 2mks

e) Name the part labelled E and state its role 2mks
 Name
 Role

f) Which of the labelled part(s) are used for articulation with adjacent vertebra 1mk

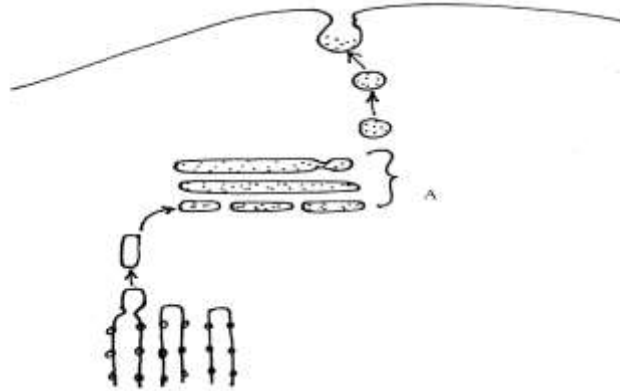
g) State a common role of the parts labelled H and J 1mk

h) Which of the labeled part(s) is(are) used for muscle attachment 1mk

PAPER 1

Answer *all* the questions in the spaces provided

1. The diagram below represents part of an animal cell. Study it and answer the questions that follow.



(a) Identify the organelle marked A. (1 mark)

.....

(b) Give **three** functions of the organelle named in (a) above (3 marks)

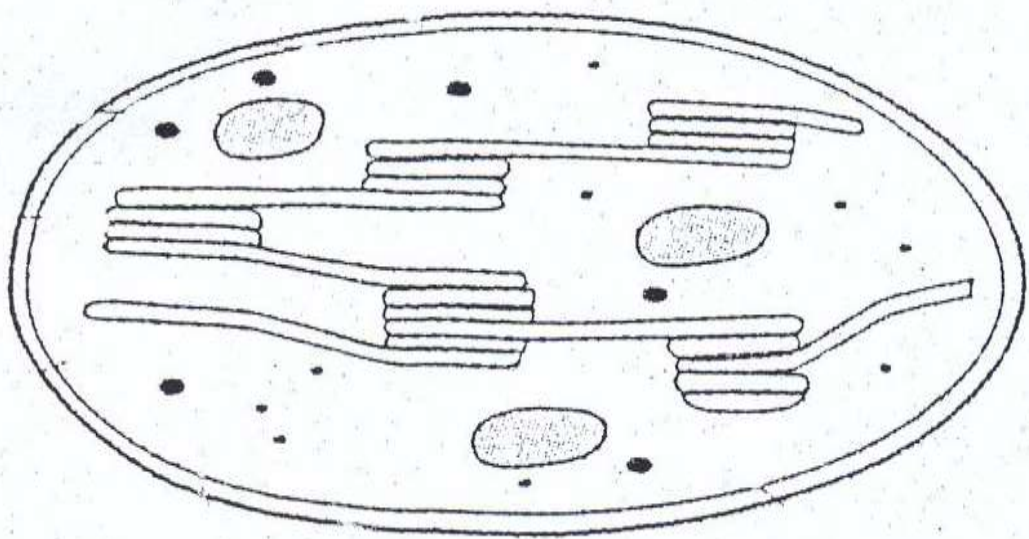
.....
.....
.....
.....

2. Name the organism that causes each of the following diseases: (2 marks)

(a) Amoebic dysentery
.....

(b) Bilharzia.
.....

3. The diagram below represents an organelle.



(a) State the function of the organelle (1 mark)

.....

(b) Label on the diagram, the parts of the organelle where:

i) Oxygen gas is produced as a byproduct (1 mark)

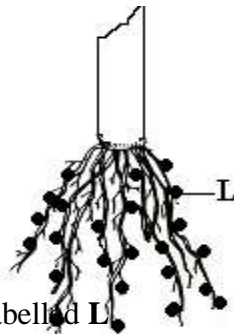
ii) Carbon (IV) oxide fixation takes place (1 mark)

4. State **two** functions of bile salts (2 marks)

.....
.....
.....

5. Name **two** classes of phylum Arthropoda whose members have a cephalothorax. (2 marks)

6. The diagram below shows part of a leguminous plant.



(a) Name the structure labelled **L**. (1 mark)

.....

(b) Identify the micro-organism that would be contained in structure **L**. (1 mark)

.....

(c) What is the significance of the micro-organism named in **b**) above?(1 mark)

.....
.....

7. The following is a portion of a nucleic acid molecule.

G-A-C-U-A-G-A-C-G

(a) Name the type of nucleic acid shown above. (1 mark)

.....

(b) Give a reason for your answer in **b**) above. (1 mark)

.....

(c) Write the base sequence of the strand that is complementary to the portion shown above (1 mark)

.....

8. Name the chemical substance in plants that promotes: (3 marks)

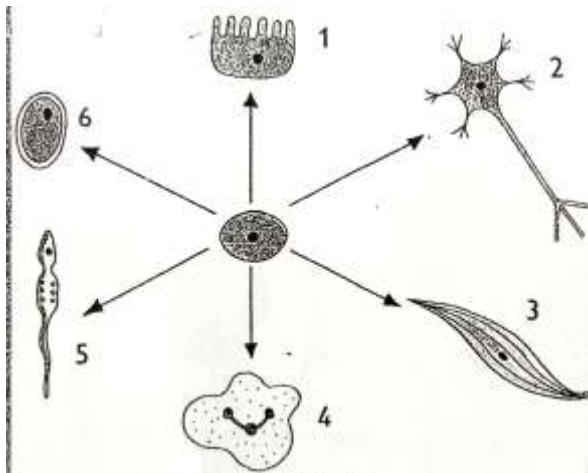
(a) Ripening of fruits

(b) Flowering in plants.

(c) Leaf fall in plants.

.....

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

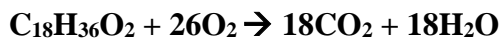


- (a) What process is represented by the arrows? (1 mark)

 (b) Identify the type of cell labelled 4. (1 mark)

 (c) Name the tissue formed by each of the following cells. (2 marks)
 i) 1
 ii) 3

10. The equation below represents oxidation of a certain food substance.

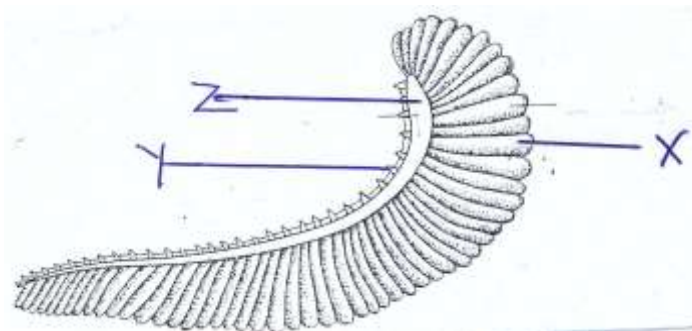


- (a) Calculate the respiratory quotient of the substance being oxidized. (2 marks)

 (b) Name the likely food substance being oxidized (1 mark)

 (c) State **one** reason why respiratory quotient values are important to work out (1 mark)

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



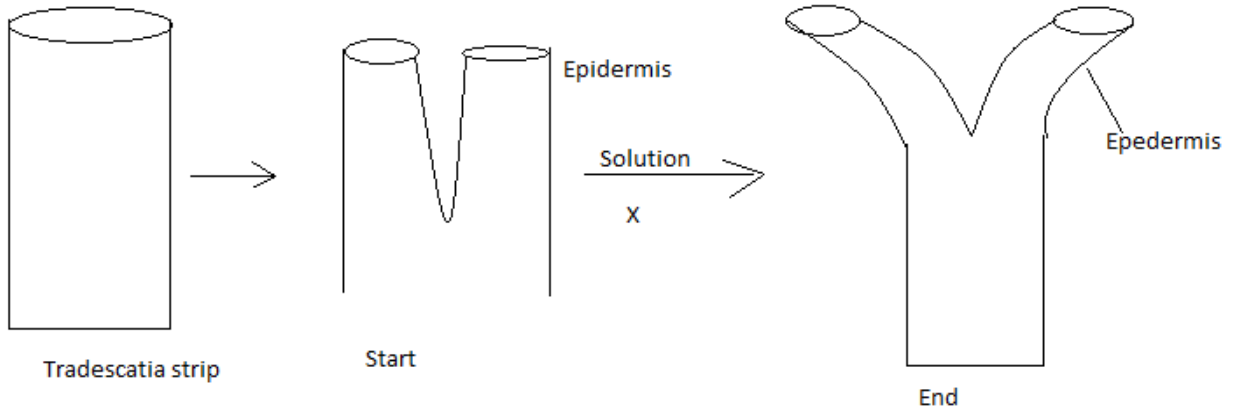
- (a) Name the parts labelled

i) **Y**..... (1 mark)

ii) **Z**..... (1 mark)

(b) Apart from being moist, explain **two** other adaptations of the part labeled **X**. (2 marks)

12. A strip of herbaceous *Tradescantia* was cut longitudinally as shown and placed in **solution X**. After one hour the strip appeared as shown below.



(a) What physiological process was being investigated? (1 mark)

.....

(b) What was the nature of **solution X**? (1 mark)

.....

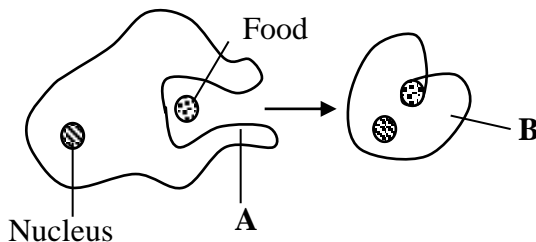
(c) Account for the results at the end of experiment after one hour. (3 marks)

.....
.....
.....
.....

13. On a hot sunny day, an adult elephant flaps its ears twice as much as it's young one. Explain this observation. (3 marks)

.....
.....
.....

14. The diagram below shows stages in the process of feeding by amoeba.



(a) Name the part labelled **A**. (1 mark)

.....

(b) Name the process illustrated in the diagram above. (1 mark)

.....

- (c) Identify the type of cell in the human body that exhibits this process.
(1 mark)

.....

15. A horse has 64 chromosomes in its somatic cells while a donkey has 62. A mule is produced when a horse mates with a donkey. However, the mule is sterile.

- (a) Why is the mule sterile? (1 mark)

.....

- (b) Work out the number of chromosomes in each somatic cell of a mule. (2 marks)

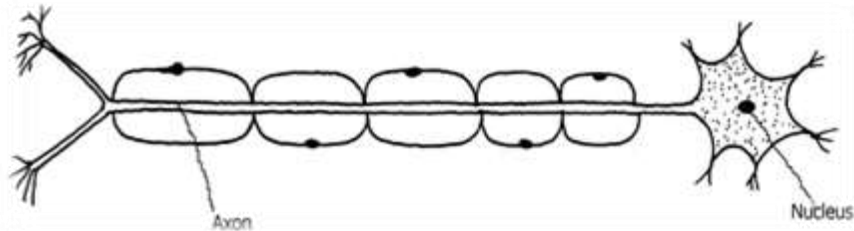
16. (a) Differentiate between Homologous structures and Analogous structures as used in evolution.
(2 marks)

.....
.....
.....

- (b) Explain comparative embryology as an evidence of organic evolution
(3 marks)

.....
.....
.....
.....

17. The diagram below represents a type of neuron.



- (a) Identify the neuron (1 mark)

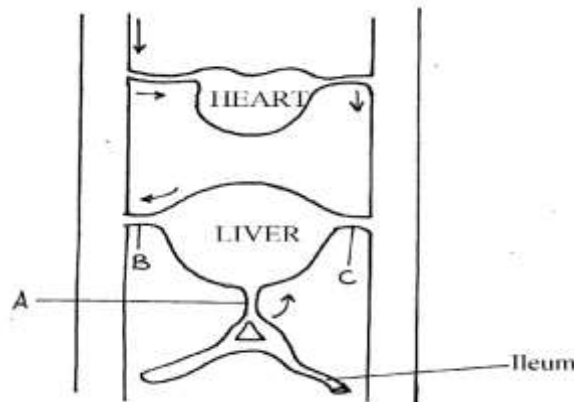
.....

- (b) Give a reason for your answer in a) above. (1 mark)

.....

- (c) Using an arrow, indicate on the diagram the direction of an impulse through the neuron.
(1 mark)

18. The diagram below represents part of the mammalian blood circulatory system and some associated glands.



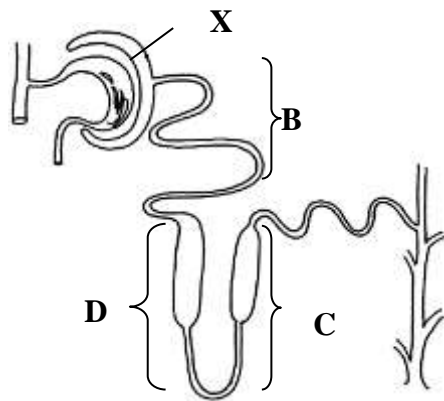
- (a) Name the blood vessels labelled **A** and **B**. (2 marks)
A
B
- (b) Which of the blood vessels will have the highest sugar concentration under the following conditions:
 i) After a heavy meal (1 mark)

 ii) During fasting (1 mark)

19. Name one co-factor and one co-enzyme required for blood clotting process to take place normally

- (a) Co-factor..... (1 mark)
 (b) Co-enzyme (1 mark)

20. The diagram below represents a structure in a mammalian kidney. Study it and answer the questions that follow.



- (a) Identify the structure. (1 mark)

- (b) State the role of the part labelled **C**. (1 mark)

- (c) Which hormone is involved in the function of the part labelled **D**? (1 mark)

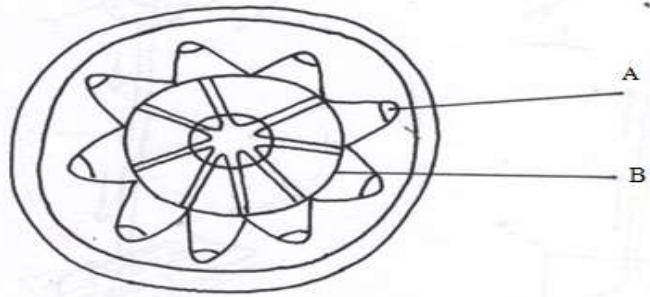
- (d) Give **three** ways in which the part labelled **B** is adapted for its function. (3 marks)

21.
 (a) Define pollination. (1 mark)

 (b) Give **two** factors that hinder self-pollination and self-fertilization in plants (2 marks)

22. State the role of **insulin** hormone in homeostasis (1 mark)

23. The diagram below shows some growth in a plant.



(a) Name the type of growth shown in the diagram. (1 mark)

.....

(b) Name the part labeled A (1 mark)

.....

(c) What is the function of the part labeled B? (1 mark)

.....

24. Below are two different views of a mammalian bone. Study it and answer the questions that follow.



(a) Identify the bone (1 mark)

.....

(b) Give a reason for your answer in (a) above (1 mark)

.....

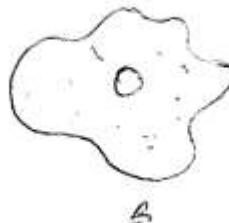
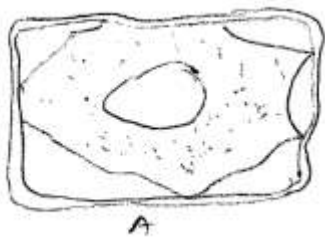
25. Explain how plants compensate for their inability to carry out locomotion. (3 marks)

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PAPER 2

Answer All Questions in the Spaces Provided

1. The diagram shows two types of cells placed in a certain solution. Study them and answer questions that follow

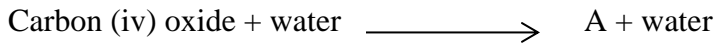


a. Name the physiological process responsible for the observed results. [1 Mark]

[1 Mark]

b. Give the correct biological term used to describe cells A & B. [2 Marks]

2. The equation below shows a chemical reaction that takes place in plants.



a. Identify substance A. [1 Mark]

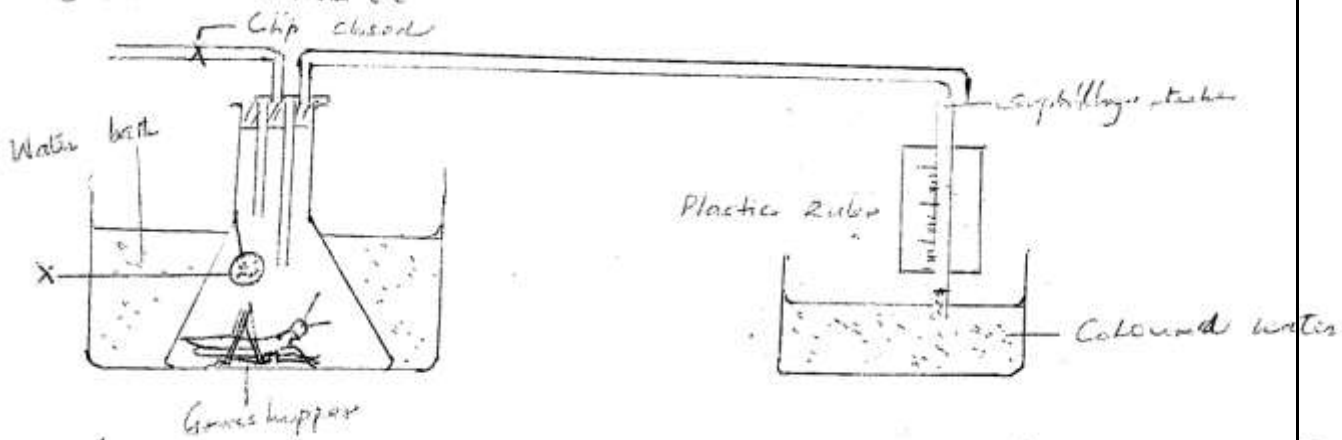
b. Name the process represented by the equation. [1 Mark]

c. Other than the reactants state **two** conditions necessary for this reaction. [2 Marks]

i.

ii.

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



a. Name the chemical compound labeled X and state its function. [2 Marks]
Compound –

Function –

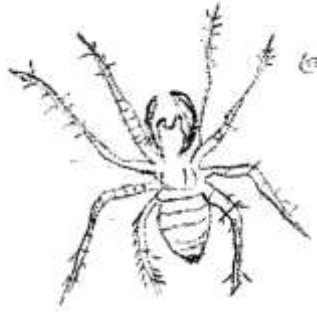
b. Why is the conical flask placed in a water bath? [1 Mark]

c. What would happen to the level of coloured water after 5 minutes? Explain: [2 Marks]

d. How can a control experiment be set? [1 Mark]

4. In a biology lesson a student collected the animal in the diagram below.

Use it to answer questions that follow;



a. Name the phylum and class to which the organism belongs

i. Phylum _____

[1 Mark]

ii. Class _____

[1 Mark]

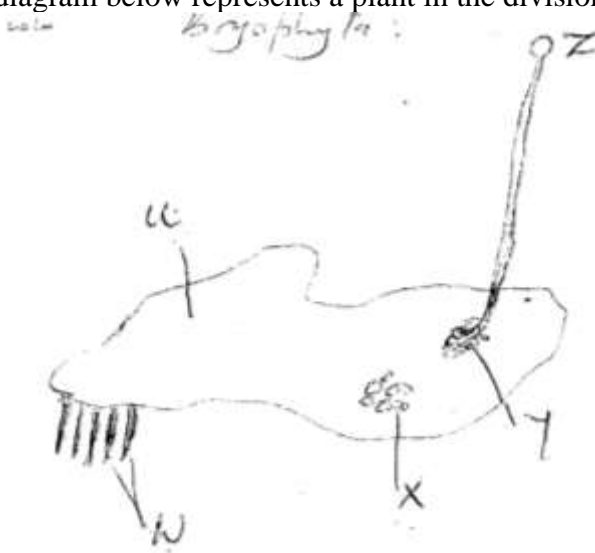
b. Give two reasons for your answer in 1 (i), (ii) above

[4 Marks]

i. _____

ii. _____

5. The diagram below represents a plant in the division Byrophyta:



a. Name the parts labeled

[5 Marks]

U

W

X

Y

Z

b. Name one function of part labeled.

[3 Marks]

X

Y

Z

- 6.
- a. It is observed that when apical bud of a plant is removed, lateral buds sprout, whereas they do not sprout in presence of the apical bud;
- i. What is the biological term used to describe this? [1 Mark]
- ii. Give one application of this phenomena in agriculture. [1 Mark]
- b. State four roles of IAA in plant growth and development: [4 Marks]
- c. In epigeal germination the cotyledon is brought above the soil surfaces; Explain [2 Marks]
- 7.
- a. State 2 structural modifications of nephrons in desert mammals. [2 Marks]
- b. State a kidney disease whose symptom is coloured and turbid urine [1 Mark]
8. In a biological experiment; a cross was made between a tall pea plant & dwarf plants; their progeny was selfed and the resulting plants were in a mixture in the ratio of 3:1. Make a biological cross to show these outcomes. [4 Marks]
9. Explain geographical distribution as evidence of organic evolution. [2 Marks]

SECTION B

Answer Questions 10 (Compulsory) and either question 11 or 12 in the Spaces Provided

10. The table below shows the changes observed in the dry weight in milligrams of a barley seedling, its embryo and Endosperm during the first ten days after the onset of germination.

Time (days)	Dry weight in milligrams		
	Embryo	Endosperm	Whole seedling
0	2	41	45
2	2	39	43
4	7	32	41
6	15	21	38
8	22	11	35
10	35	6	43

- a. Using a suitable scale and on the same axis, plot a graph of dry weight of embryo, endosperm and whole seedling against time. [8 Marks]
- b. State and account for the changes in dry weight shown by:-
 i. Endosperm [4 Marks]
 ii. Embryo [4 Marks]
- c. Explain the role of water during germination [4 Marks]
- 11.
- a. Describe how the mammalian heart is adapted to its function [10 Marks]
 b. How does gaseous exchange take place in terrestrial plants? [10 Marks]
- 12.
- a. How is the Epidermis of a green plant adapted to its function? [6 Marks]
 b. Describe how structural factors affect rate of transpiration in plants [8 Marks]
 c. Describe how xerophytes adapted to minimize water loss in their habitat. [6 Marks]

PAPER 3

(PRACTICAL)

Answer *all* the questions in this paper.

1. You are provided with solid **Q** and **R**. You are also provided with iodine solution, Sodium hydroxide solution and Copper (II) sulphate solution.

- i. Dissolve all solid **Q** in 5cm³ of distilled water in a test tube to form a suspension. Label it as **Q**.
 ii. Dissolve all solid **R** in 5cm³ of distilled water in a test tube to form a suspension. Label it as **R**.

a) Using the procedure outlined in the table below, carry out food tests on the substances **Q** and **R**, write the food, observation and conclusion. (6 marks)

Food	Procedure	Observation	Conclusion
	To 2ml of Q in a test tube, add 3 drops of iodine solution		
	To 2ml of Q in a test tube, add equal amounts of Sodium hydroxide solution then followed by a few drops of Copper (II) sulphate solution and shake		
	To 2ml of R in a test tube, add 3 drops of Iodine solution		
	To 2ml of R in a test tube, add equal amounts of Sodium hydroxide solution then followed by a few drops of Copper (II) sulphate solution and shake		

b) (i) which of the two substances should be included in a diet to protect a child from suffering Kwashiorkor. (1 mark)

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

c) (i) Name **two** enzymes in the human body which digest the food substances found in Q. (2 marks)

.....
.....

(ii) State the organ from which each of the enzymes you have stated in c(i) above acts. (2 marks)

Enzyme:..... Organ:
Enzyme: Organ:

2. You are provided with specimen Y.

(a) (i) Using external features only, identify the part of the plant. (1 mark)

.....

(ii) Give **two** reasons for your answer in a(i) above. (2 marks)

.....

(b) State the class to which the specimen belongs and give **one** reason for your answer. (2 marks)

Class:

Reason:

(c) (i) Explain **two** observable features in the specimen that adapt it to nutrition. (2 marks)

.....

.....

(ii) State **two** features of the specimen that is only observable under a microscope that adapts it to gaseous exchange. (2 marks)

.....

3. (a) The photograph below shows an experiment that was set to investigate a certain process in been seedling.



(i) Identify the response being investigated. (1 mark)

.....

(ii) Account for the observed results for the seedling A after 24 hours. (4 marks)

.....

.....

.....

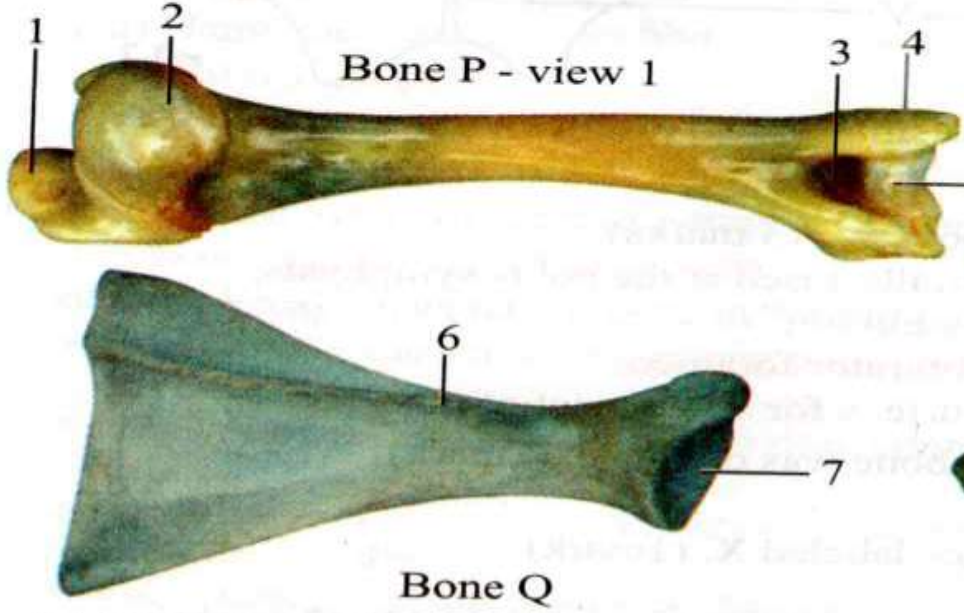
(iii) Explain why the root in the seedling B continued to grow straight downward. (2 marks)

.....
.....

(iv) Explain the significance of the response stated in a(i) above to plant. (2 marks)

.....
.....

(b) You are provided with the photograph of mammalian bones P and Q obtained from the same animal.



(i) Name bone

P: (1 mark)

Q: (1 mark)

(ii) State the part of the body from which the bones were obtained.

P: (1 mark)

Q: (1 mark)

(iii) Which two of the labeled parts forms a ball and socket joint. (1 mark)

(iv) With reasons identify the type of joint formed by bone P at:

Distal end: (1 mark)

Reason: (1 mark)

Anterior end: (1 mark)

Reason: (1 mark)

(v) Name the other bone that articulates with bones P and Q and controls or limits movement in man.

..... (1 mark)

PAPER 1

1. Give the structure of the cell that perform the following function-: (2Mks)

a) Regulate exchange of substances in and out of the nucleus

b) Synthesis of ribosomes

2. State the functions of the followings apparatus in collecting and observing specimens (3Mks)

a) Pooter

b) Abait trap

c) Pit fall trap

3. Define the term resolution (1Mk)

4. Explain the absence of the following components in urine of a healthy person (2Mks)

i) Glucose

ii) Plasma proteins

5. Differentiate between primary and secondary growth (2Mks)

6. Give a reason why lack of roughage in diet often leads to constipation. (1Mks)

7. a) State the role of the following bacteria in the nitrogen cycle (3Mks)

i) Rhizobium bacteria

ii) Nitrosomonas

iii) Nitrobacter

8. What is the function of carnassial teeth. (2Mks)

9. List the changes that takes place during inhalation in the breathing cycle of a mammal in the following (2Mks)

a) Ribcage

b) Diaphragm

10.a)What is metamorphosis? (1Mk)

b) What is the biological importance of the larval stage during metamorphosis (2Mks)

11.a) What is seed dormancy ? (1Mk)

b) Name a growth inhibitor in seeds (1Mk)

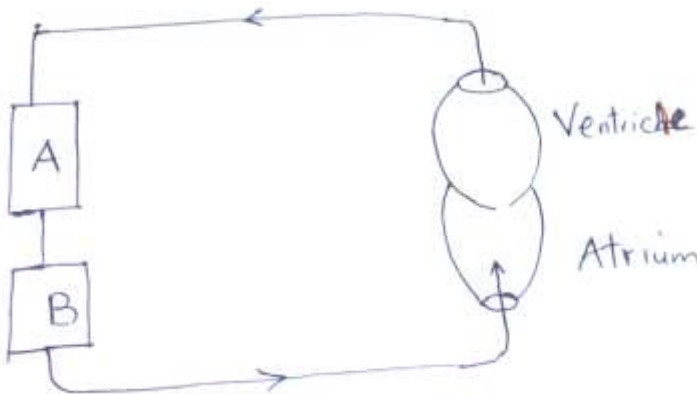
c) Differentiate between hypogeal and epigeal germination in seeds (2Mk)

12. Name the causative agent of the following diseases in man (2Mks)

a) Candidiasis

b) Syphilis

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



a. i) Identify the type of circulatory system shown above (1Mk)

ii) Give a reason for your answer in (a) (i) (1Mk)

iii) Give a disadvantages of this type of circulation (1Mk)

14. Give a reason for each of the following biological phenomenon (2Mks)

a) A mature plant cell does not lose its shape after losing water

b) Amoeba will not burst when placed in a hypotonic solution

15. Mention two differences between pollen grains of wind and insect pollinated flower (2Mks)

Wind	insect

16. State the functions of the following structures in human reproductive system (3Mks)

Seminiferous tubules _____

Interstitial cells _____

Epididymis _____

17. The following are text messages on a cell phone that represent gene mutation

Intended message

Actual message

A. Buy me a coat

Buy me a goat

B. John is paying

John is praying

a) Identify the type of gene mutation that is represented in each case (2Mks)

b) Identify any two disorder arising due to gene mutation in humans (2Mks)

18. State one effect of magnesium deficiency in green plants. (1Mks)

19. Explain why water logging of the soil may lead to death in plants. (2Mks)

20. A dog weighing 15.2kg requires 216kj while a mouse weighing 50g requires 2736kj per day. Explain. (2Mks)

21. The equation below shows an oxidation reaction of food substance.



a) Determine respiratory quotient of the oxidation of food substance. (2Mks)

(b) Give two reasons why the above food is not the main substrate. (2Mks)

22. An individual is blood group B positive (2Mks)

a) Name the antigens in the individual's blood

b) Give the reason why the individual cannot receive blood from blood group A donor (2Mks)

23. Below data was obtained in an ecosystem

Mango tree - 1

Caterpillars – 100

Sparrow- 50

Hawk- 5

a) Sketch a pyramid of numbers for their feeding relationship (2Mks)

b) Identify the shape of the pyramid of number (1Mk)

24. a) What is organic evolution? (1Mks)

b) i) What are vestigial structures? (1Mk)

ii) Give two examples of vestigial structures in human (2Mks)

25. Name the kidney disease which affects the glomerulus (1Mk)

26. Name the kingdom to which plasmodium belongs. (1Mks)

27. a) What is non- disjunction (1Mk)

b) State two disorders in human that are as a results of non-disjunction (2Mks)

28. Name two external features found in the class Mammalia only. (2Mks)

29. State two roles of diffusion in human being. (2Mks)

30. How do the following factors affect the rate of diffusion. (2Mks)

a) Diffusion gradient

b) Surface area to volume ratio

31. Name two fat soluble vitamin manufactured by the human body. (2Mks)

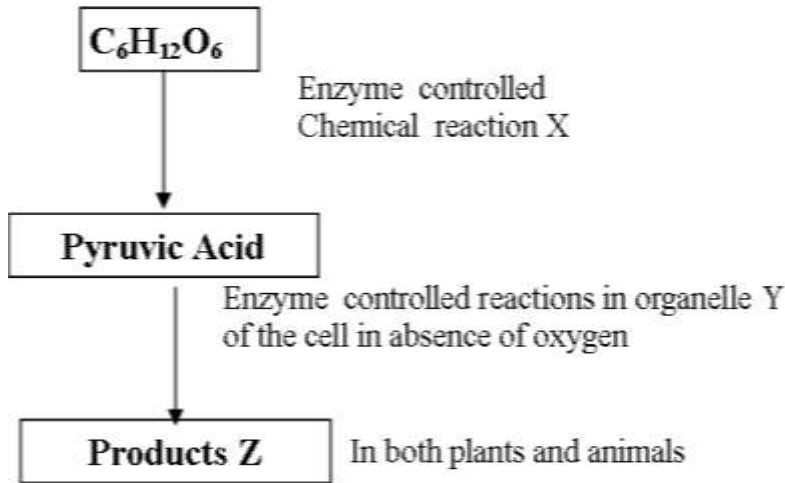
32. Name two sites of gaseous exchange in frogs. (2Mks)

33. State two characteristic features of members of division Bryophyta. (2Mks)

34. How are lenticels adapted for gaseous exchange. (2Mks)

PAPER 2

1. Study the flow chart below of a process that takes place in both plants and animals.



a) Name the above process. (1mk)

.....

b) i) In the above process name the chemical reaction represented by X. (1mark)

.....

ii) Name the part of the cell where the enzyme controlled reactions in b(i) above takes place. (1mark)

c) Name the products Z in
i) Plants..... (1mark)

ii) Animals..... (1mark)

d) What would be the fate of pyruvic acid if oxygen supply is available in the mitochondria of an animal cell (2marks)

.....
.....
.....

(e) Define the term oxygen debt (1mark)

2. In a certain bird species red flight feathers is controlled by gene R while white flight feather is controlled by gene r. The heterozygous condition Rr results into pink flight feathers.

(a) Using a punnet square, find the genotype of a cross between pink flight feathered bird and white flight feathered bird. (4 marks)

.....
.....
.....
.....
.....
.....

(b) Which type of dominance is illustrated here? (1 mark)

.....

(c) i) Identify the nuclei acid whose base sequence is shown below. (1 mark)

.....

G - A - C - U - A - G - C - G - U

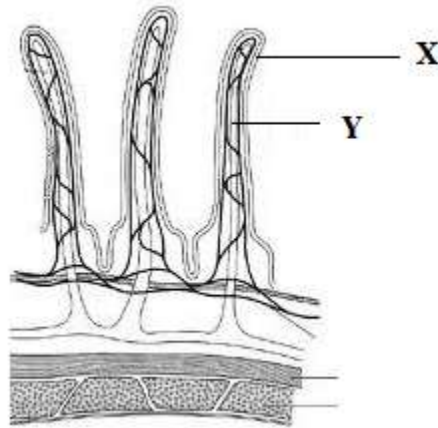
(ii) Give a reason for your answer in (i) above (1 mark)

.....

(iii) If this nucleic acid was involved in protein synthesis, how many amino acid would be present in the protein synthesized. (1 mark)

.....

3 .The diagram below represents a longitudinal section through the ileum wall.



a) Identify the structures labeled X and Y (2 marks)

X.....

Y.....

b) State one function of X and Y (2 marks)

c) State two functions of the ileum (2 marks)

.....

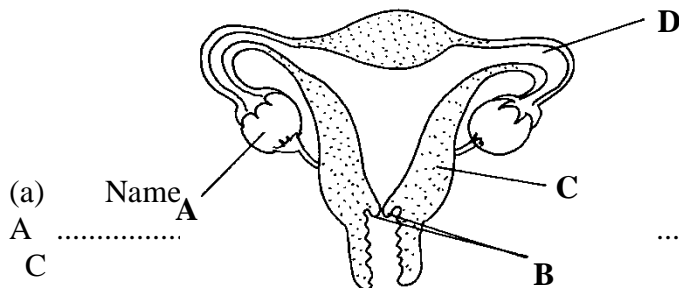
d) Explain the role of the liver in digestion (1 mark)

.....

e) State the endocrine (hormonal) role of pancreas in a mammal (1 mark)

.....

4. The diagram below represents the female reproductive system.



(a) Name A

A

C

(2 marks)

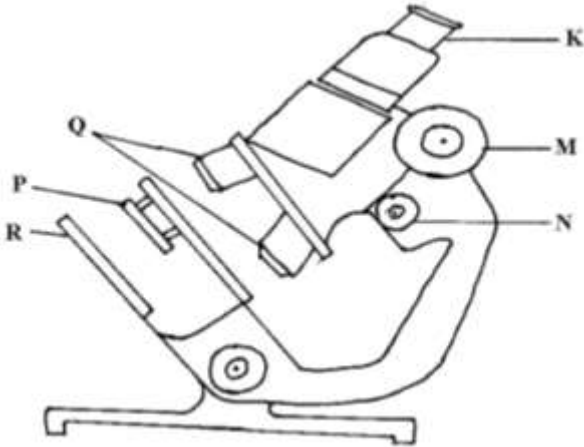
.....

(b) State the conditions that results if implantation occurs at point labeled **D**. (1 marks)

(c) Name the hormone secreted by the part labeled **A** and for each give **one** function (4 marks)

(d) What role does part labeled **B** play during pregnancy? (1 mark)

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



a) Name the parts labeled (2 marks)

K
M

b) State the functions of (2 marks)

P
Q

c) A student was viewing a prepared slide of a plant cell under high power microscope. The features of the cell were blurred. Which one of the labeled parts of the microscope would the student use to obtain:-

(i) A sharper outline of the features. (1 mark)

(ii) Give the formula used to calculate magnification in a light microscope. (1 mark)

d) A student was preparing a section of a plant cell to be viewed on a light microscope. Give a reason for each of the following steps:-

(i)Cutting a very thin section.....(1 mark)

(ii)Staining the section..... (1 mark)

(iii)Putting the section in water..... (1 mark)

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

6 During germination and growth of a cereal, the dry weight of the endosperm, the embryo and total dry weight were determined at two day intervals. The results are shown in the table below.

Time after planting (Days)	Dry weight of endosperm (mg)	Dry weight of embryo (mg)	Total dry weight (mg)
0	43	2	45
2	40	2	42
4	33	7	40

6	20	17	37
8	10	25	35
10	6	33	39

- a) On the same axes, draw graphs of dry weight of endosperm, embryo and the total dry weight against time. (7marks)
- b) What was the total dry weight on day 5?(1mark)
- c) Account for: i) Decrease in dry weight of endosperm from day 0 to day 10. (2marks)
 ii) Increase in dry weight of embryo from day 0 to day 10. (2marks)
- iii) Decrease in total dry weight from day 0 to day 8. (1mark)
- iv) Increase in dry weight after day 8. (1mark)
- d) State **two** factors within the seed and two outside the seed that cause dormancy.
- i) Factors within the seed..... (2marks)

- ii) Factors outside the seed. (2marks)

- e) Give **two** characteristics of meristematic cells..... (2marks)
7. Describe how the mammalian skin is adapted to its functions (20 marks)
8. a) Describe how xerophytes are adapted to living in their habitat. (10 mks)
 b) Explain how an upright position is maintained in herbaceous plants. (10 mks)

PAPER 3

1. You are provided with olive oil, liquids labeled L₁ and L₂, and an Irish potato. Label test tubes A and B. Place 2cm³ of water into each test tube. Add 8 drops of olive oil into each test tube. To test tube A, add 8 drops of liquid L. Shake both test tubes. Allow to stand for 2 minutes.

IHLGJ

(a) (i) Record your observations (2 marks)

Test Tube A

.....

Test Tube B

.....

(ii) Name the process that has taken place in test tube A (1 mark)

.....

(iii) State the significance of the process named in (a) above (1 mark)

.....

(v) Name the digestive juice in humans that has the same effect on oil as liquid L₁ (1 mark)

.....

(v) Name the region of the alimentary canal into which the juice is secreted (1 mark)

.....

(b)

(i) Label two test tubes C and D place 2cm³ of liquid L₂ into each test tube. Add a drop of iodine solution into each test tube. Record your observations. (1 mark)

(ii) Suggest the identity of L₂

(1 mark)

(iii) Cut a cube whose sides are 1cm³ from the Irish potato. Crush the cube to obtain a paste. Place the paste into a test tube labeled C. add 2cm³ of amylase solution. Leave the set up for at least 30 minutes.

Record your observations

(2 marks)

C
D

(iv) Account for the result in (b)(iii) above

(2 marks)

(c) Cut another cube whose sides are 1cm from the Irish potato. Crush the cube. Place the crushed paste into a test tube. Carry out food test with reagents provided. Record your procedure and results.

Procedure:

(1 mark)

Results:

(1 mark)

2. You are provided with specimen **K**. Use it to answer the questions that follow

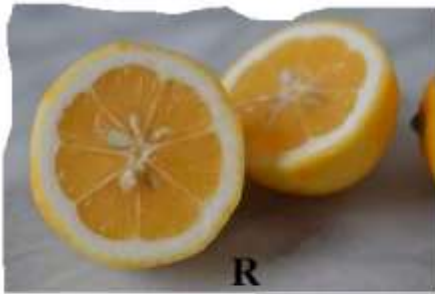
a) Cut the specimen **K** longitudinally. Draw one of the sections

(4marks)

b) With a reason state the agent of pollination

(1mark)

c) The photographs labelled **Q**, **R**, and **S** are sections of some plant parts.



(i) Name the type of placentation in the specimens shown in photographs **Q**, **R** and **S** (3 marks)

(ii) Giving a reason in each case, name the mode of dispersal of the specimen in photograph **Q** and **S**

(4mark)

Q Mode.....

Reason

S

Mode.....

Reason

3. Study photographs shown below then answer the questions.



Q1



R1

R



S1

S



A1



B1

B



C

C1

M

(a) State the type of evolution represented by structures **Q1**, **R1** and **S1**. (1mk)

b) Explain the type of evolution identified in (a) above. (1mk)

(c) Give the evolution term used to describe structures;

(i) **Q1**, **R1** and **S1**. (1mk)

(ii) **A1**, **B1** and **C1**. (1mk)

d). what type of evolution is illustrated by the limbs (**A1**, **B1** and **C1**)? (1mk)

e). (i) Name classes for organisms labeled **Q**, **R** and **S**.

(ii) Give two reasons for placing **S** in the class above (2mks)

.....
.....
.....
.....

f) (i) Suggest the diet of animals **B** and **R**.

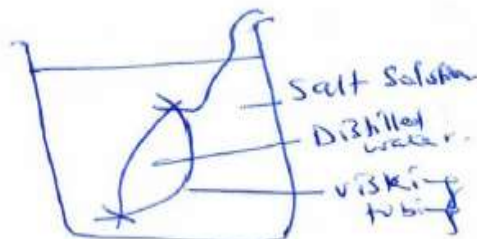
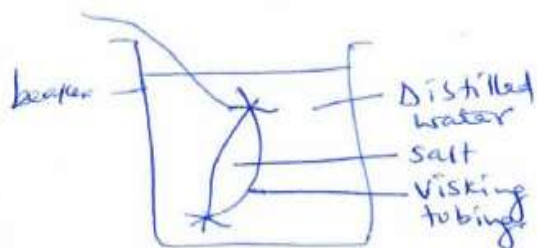
B..... (1mk)

R..... (1mk)

(ii) How is beak of animal **B** adapted to its function? (2mks)

PAPER 1

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 visking 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)

- A-
- B-
- C-

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)

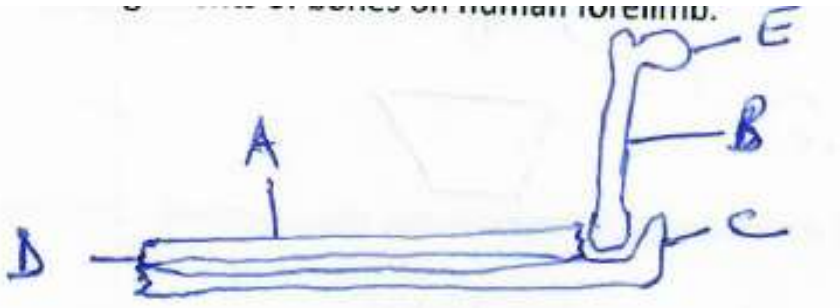
b) State one role of nucleolus.

(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)

A-

B-

ii) State two roles of the structure labelled C

(2 marks)

iii) Name the part that articulates with bone labelled B at part 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)

PAPER 2

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)

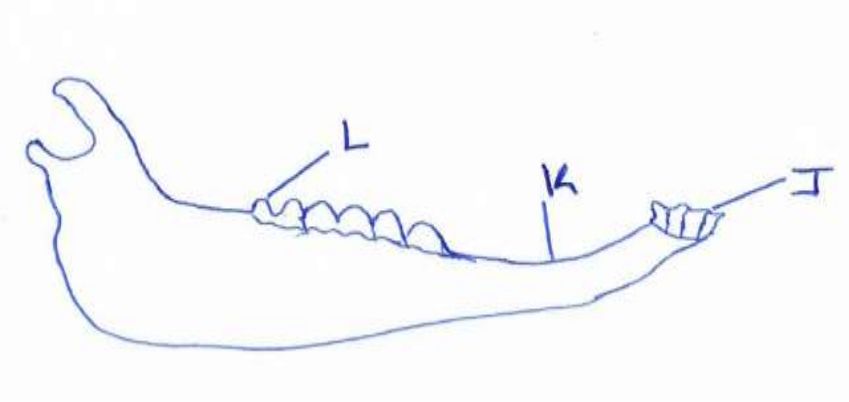
- c) Explain why the leaf is dipped in in hot water. (1mk)

- d) Explain the observation made when the leaf is irrigated with iodine solution. (2mks)

- e) What is a variegated leaf? (1mk)

- f) 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)

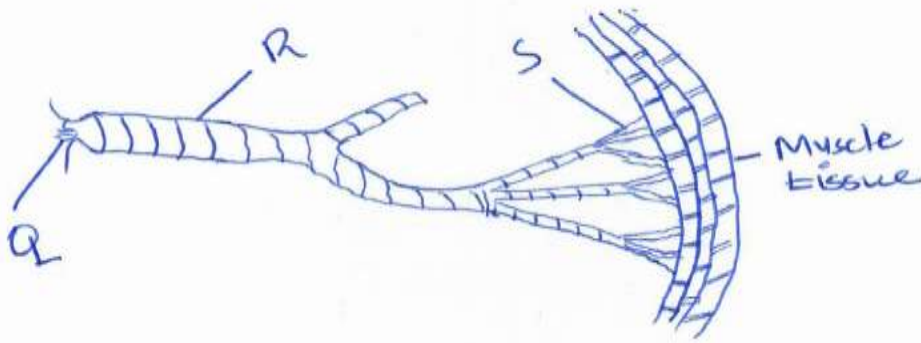
- c)
 - i. Name the toothless gap labeled K. (1mk)

 - 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 heterodont. (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, work out the genotypic ratio of F₂. (5mks)

b) State the phenotypic ratio of F₂ generation. (1mk)

.....
.....

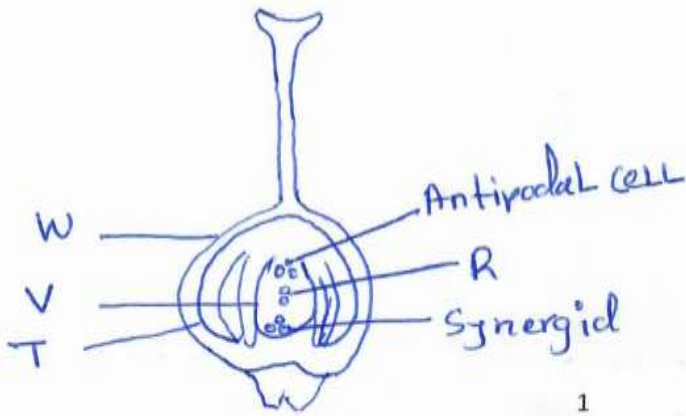
c) Name the term used when two alleles in heterozygous state are fully expressed phenotypically in an organism. (1mk)

.....
.....

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)

(2mks)

.....
.....
.....

b. On the diagram label the integuments. (1mk)

c. On the diagram, mark using letter X the point at which the pollen tube enters the embryo sac. (1mk)

d. What is the function of the pollen tube? (2mks)

.....
.....
.....

e. 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. 1cm³ of catalase solution was added to equal volumes of hydrogen peroxide solutions at different pH values. The time taken to collect 10cm³ 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)

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. (2mks)

(i) outer leaf (2mks)

(ii) Inner leaf (2mks)

b) State a function of the inner and outer leaves of the specimen. (1mrk)

(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)

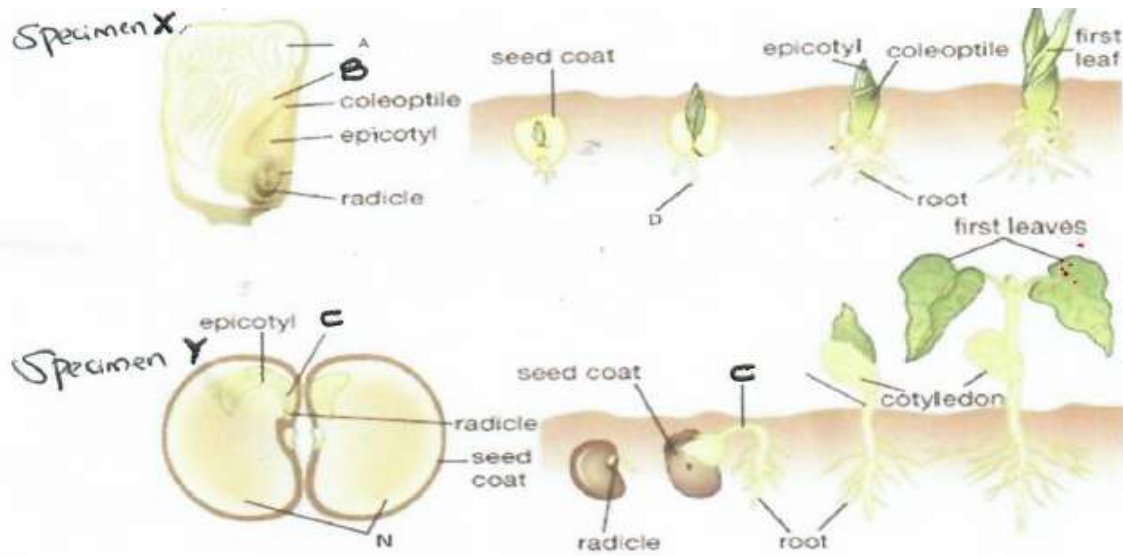
e) Account for the texture of strips in solution Q (3mrks)

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)

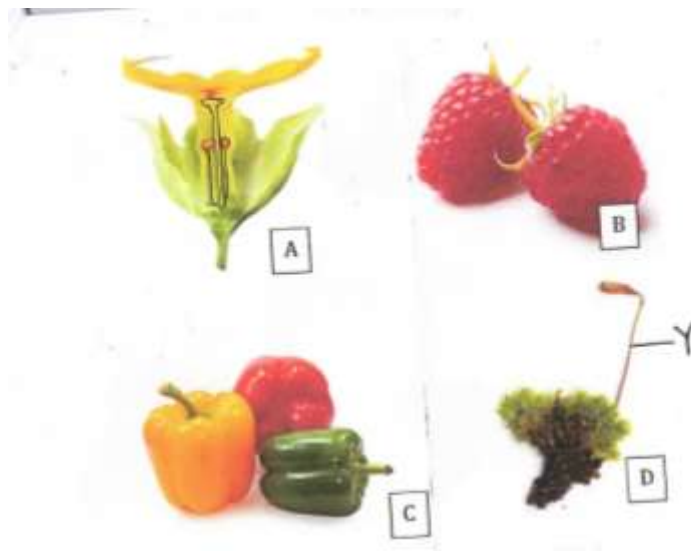
Function:

(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		
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)

PAPER 1

1. Name **two** branches of microbiology (2marks)
.....
.....

2. Give **two** important functions of a fruit with regard to a plant (2marks)
.....
.....

3. Construct a food chain with the following: (1mark)
Orange fruit, large bird, fruit fly, small bird

4. A student wrote the scientific name of Baobab tree as adansonia Digitata.
(a) Identify two mistakes made by the student (2marks)
.....
.....

(b) Identify the species name (1mark)
.....
.....

5. State the differences between light and electron microscopes in terms of the following: (2marks)
(a) way of illumination
.....

(b) Source of illumination
.....
.....

(c) State two factors to consider the type of microscope to be used in a given biological investigation (2marks)
.....
.....

6. Explain how parasitism differ from predation (2marks)
.....
.....

7. (a) Explain how papain is used as a meat tenderizer in food processing industries (2marks)
.....
.....

(b) Name a plant excretory product that is toxic to plasmodium (1mark)
.....
.....

8. Distinguish between ilium and ilium (1mark)

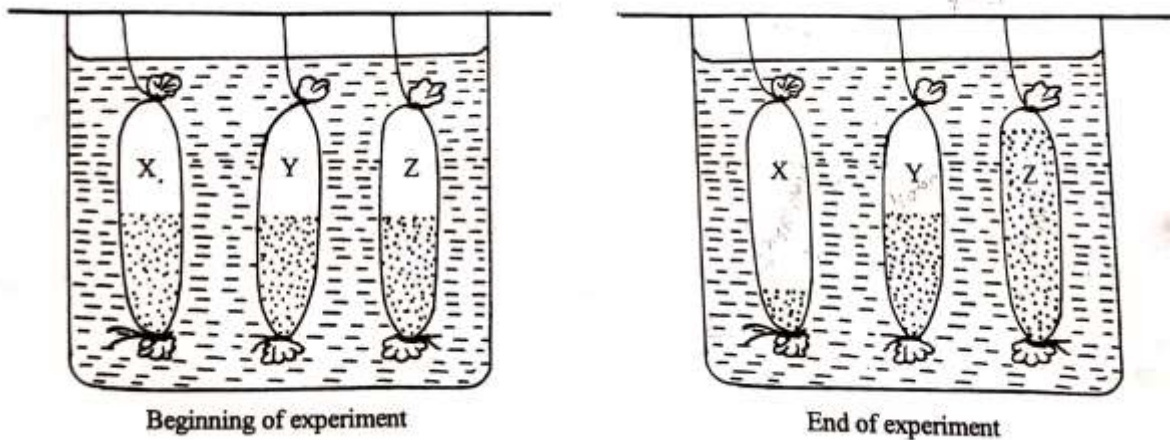
9. Explain why Egyptian mummies are not regarded as fossils

(1mark)

10. Explain what would happen to digestion and blood sugar regulation if the pancreatic duct of a mammal was blocked.

(3marks)

11. Equal amounts of three different sugar solutions were placed in the visking tubings X, Y and Z. the tubings were placed in a beaker of water containing 5% sugar solution. The set up was left for two hours. The results were as shown below.



(a) Name the process being tested in this experiment

(1mark)

(b) Account for the observation

(3marks)

12. (a) Define the term allergy

(1mark)

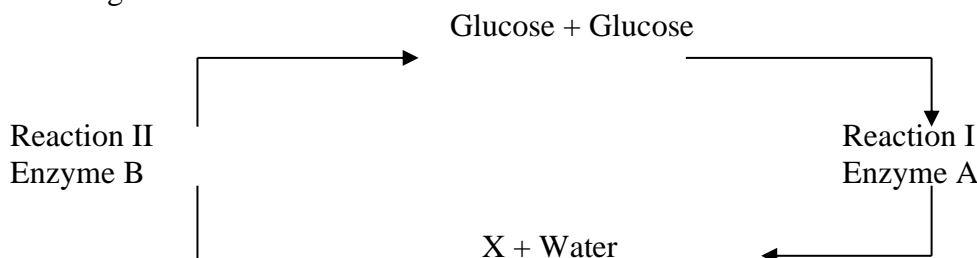
(b) Distinguish between allograft and isograft

(2marks)

13. State **two** adaptations of the placenta to its function

(2marks)

14. The diagram below shows chemical reactions I and II which are controlled by enzymes.



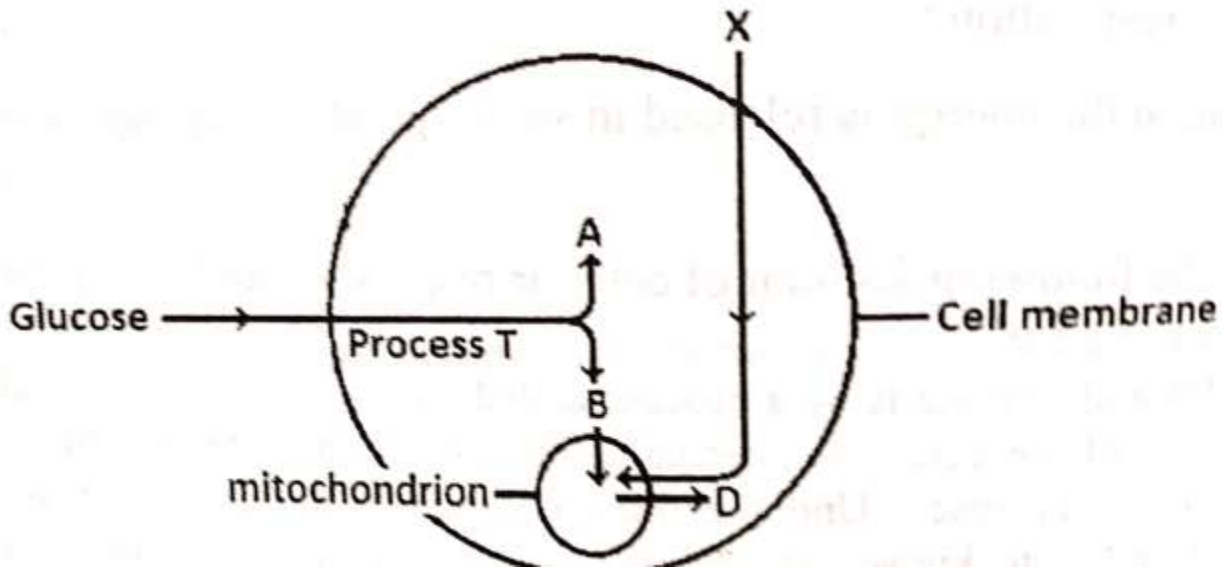
(i) Into which class of carbohydrates is X? (1mark)

(ii) Name reaction I and enzyme A (2marks)

Reaction I.....

Enzyme A.....

15. The figure below illustrates aerobic respiration in a cell



(a) Name the raw material named X and products A and B (3marks)

(b) Identify process T (1mark)

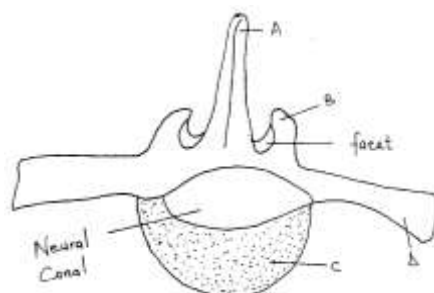
16. Name a characteristic in man controlled by multiple alleles (1mark)

17. Some scientists argue that Lamarck's theory is false and not valid. What is your scientific view on this? (3marks)

18. State **two** natural ways in which in which seed dormancy can be terminated (2marks)

19. Explain why the temperate bears have thick adipose tissues (2marks)

20. Study the diagram shown below of the anterior view of a lumbar vertebra of a mammal.



(a) Name the parts labelled: A, and B, (2 marks)

.....
.....
.....

(b) State the adaptation of the part labelled D. (1 mark)

.....

21. Distinguish between parthenocarpy and parthenogenesis (2marks)

.....
.....

22. State **three** symptoms of menopause (3marks)

.....
.....
.....

23. The figure below shows feet of various birds. Study the diagram and answer the questions that follow.



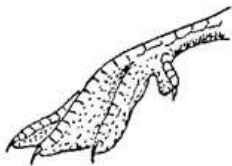
bird A



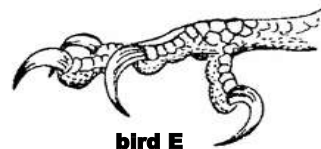
bird B



bird C



bird D



bird E

(i) Name the type of evolution represented by the diagrams. (1 mark)

.....

(i) Using Darwin's theory of evolution, explain how the feet of **bird E** would have evolved.

(3 marks)

.....
.....
.....

24. Describe how contraction of the diaphragm muscles leads to inhalation (4marks)

.....
.....
.....
.....

25. Explain the effect of burning of fossil fuels on the health of humans (3marks)

.....
.....
.....

26. State **two** distinguishing characteristics of members of the kingdom Monera (2marks)

.....
.....

27. State **two** structural differences between the xylem and the phloem (2marks)

.....

.....
.....

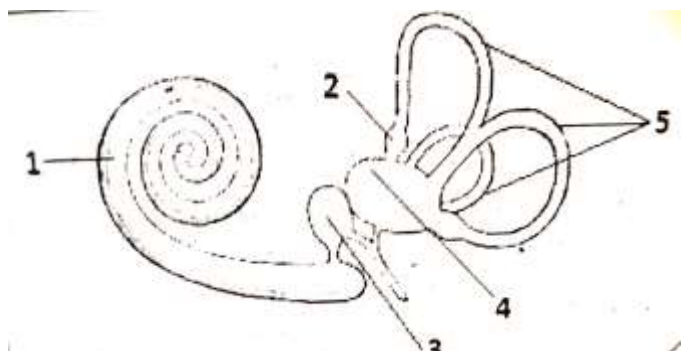
28. Explain why seeds buried deep in the soil fail to germinate (2marks)

.....
.....

29. Explain how starch provides energy for living organisms (2marks)

.....
.....

30. The diagram below shows part of the inner ear



(a) Name the apparatus (1mark)

(b) State the function of the apparatus (1mark)

(c) Name the parts labeled 1 and 5 (2marks)

.....
.....

31. (a) state the role of the following hormones during lactation (2marks)

(i) Prolactin

.....
.....

(ii) Oxytocin

.....
.....

(b) Other than the role mentioned above, give another role of oxytocin in the body of a female (1mark)

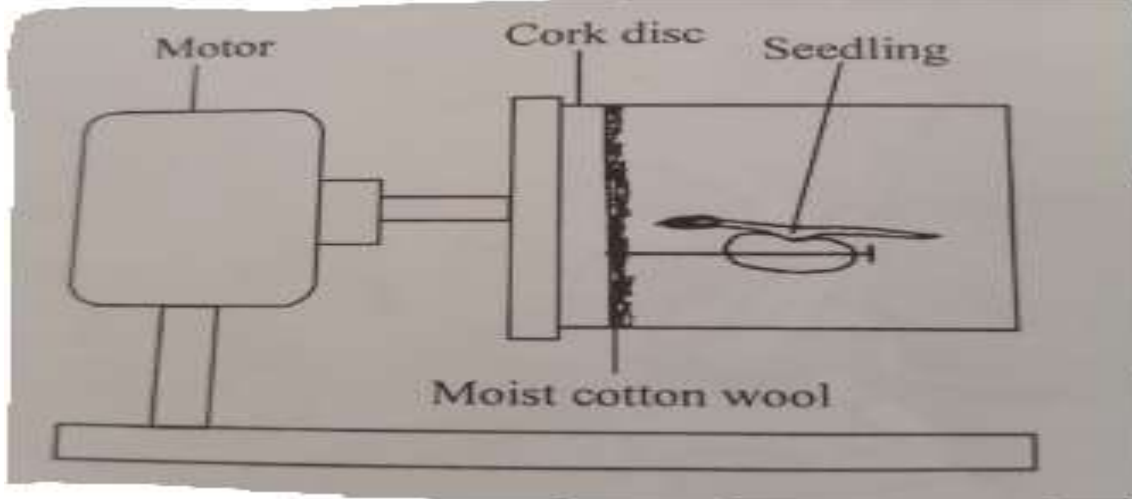
PAPER 2 (THEORY)

SECTION A.

1. (a) Viable seed may not germinate even when provided with favorable condition. State the importance of the above phenomena. (2mks)

.....
.....
.....
.....

- (b) Monocotyledonous plants do not undergo secondary growth. Explain. (2mks)
 (c) In the diagram below, a bean seedling was pinned in a horizontal position inside a clinostat.



- (i) Explain what you would expect to observe after 48 hours if the clinostat was not rotating. (2mks)

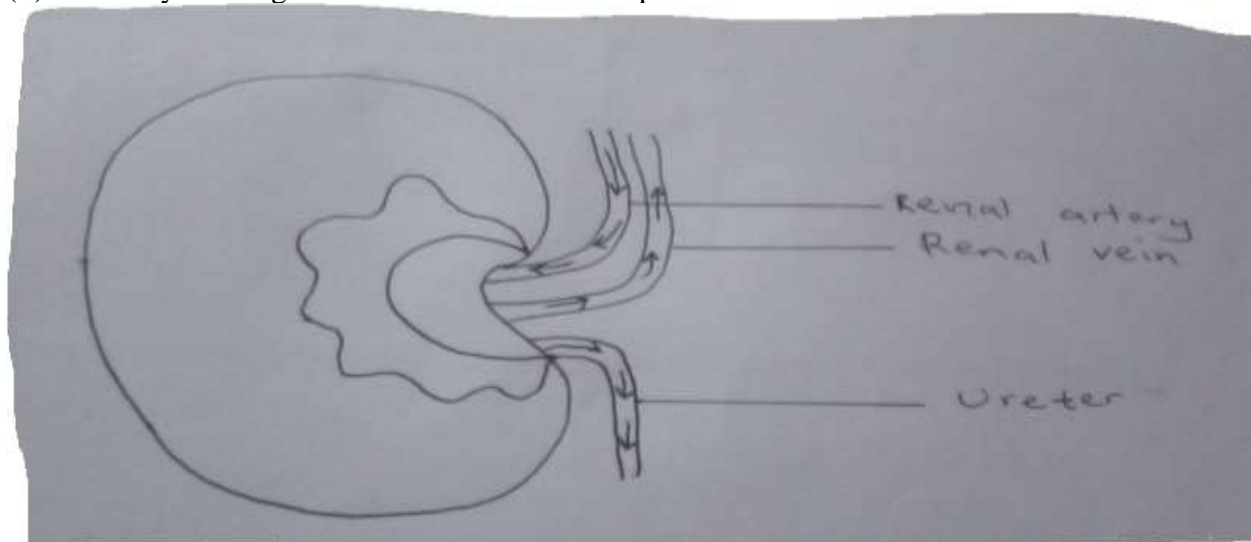
.....

- (ii) Explain what you would expect to observe after 48 hours if the clinostat was rotating slowly. (2mks)

2. (i) Explain the concept of the negative feedback mechanism. (3mks)

.....

- (ii) Study the diagram below and answer the question that follows.



On the organ above, draw a small circle and label it **X** to show where the adrenal gland is located. (1mk)

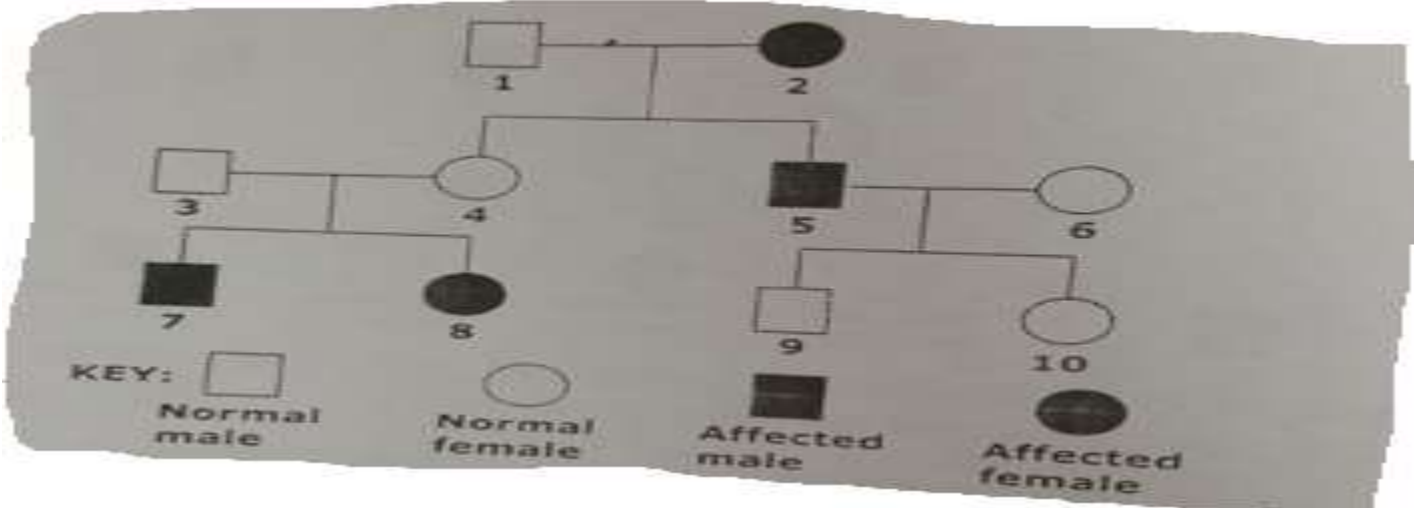
(i) Explain the effect of the hormone secreted by the adrenal gland in blood sugar regulation. (2mks)

.....

(ii) Name two diseases that affect organ labeled A. (2mks)

.....

3. The pedigree diagram below show part of a family tree in which the inherited condition of phenylketonuria occurs.



(a) Identify and explain one piece of evidence from this family tree to show that the allele for phenylketonuria is a recessive to allele for the normal condition. (2mks)

.....

(b) If individual 10 married a man who is the heterozygous for the gene, what is the probability that their first child will be affected? (2mks)

.....

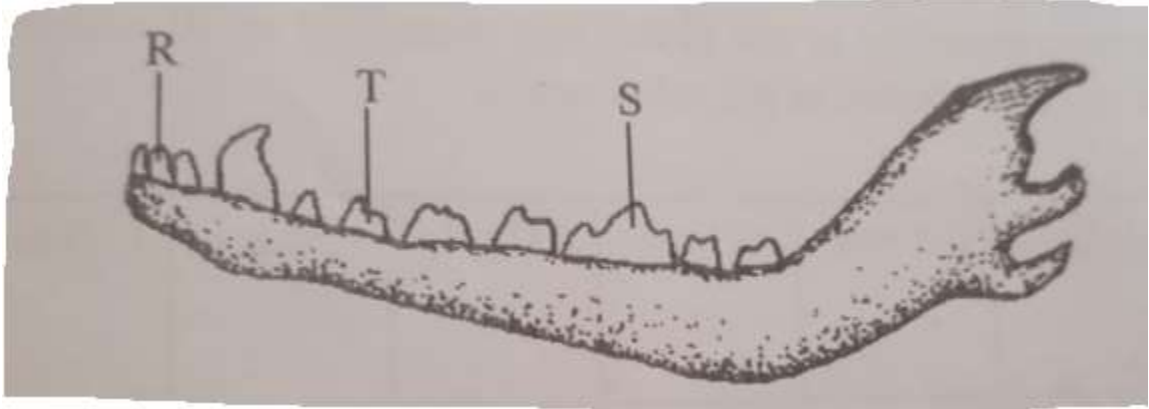
(c) A garden pea plant was crossed with a dwarf garden pea plant and all the offspring's were tall. Using later T to represent the gene for tallness, determine the genotype of the F₂ if the F₁ were test crossed. (4mks)

(4mks)

4. (i) Distinguish between dentition and dental formula. (2mks)

.....
.....
.....
.....

(iii) The diagram below represents the lower jaw of a mammal.



(a) Name the mode of nutrition of mammal whose jaw is shown. (1mk)

.....
.....

(b) State one structural and one functional difference between the teeth labeled R and T. (2mks)

.....
.....
.....
.....
.....

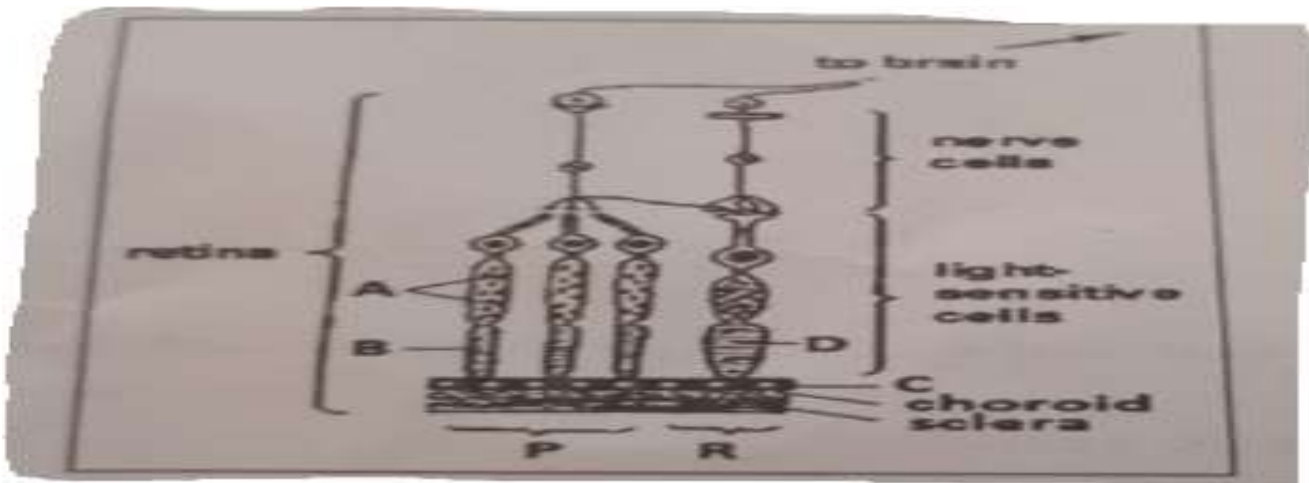
(c) (i) Name the tooth labelled S. (1mk)

.....
.....

(ii) State how the tooth named in C (i) above is adapted to its function. (2mks)

.....
.....
.....
.....

5. The figure below is a cross-section of retinal cells of a mammalian eye.



(a) Identify the retinol cells labeled P and R. (2mk)

.....

(b) Label each of the parts marked A, B, C and D. (2mks)

.....

(c) Based on the diagram, explain why it takes long for the eye to adjust when one move from a Lit room to a dark room. (3mks)

.....

(d) State structural difference between cell P and cell R. (1mk)

SECTION B.

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

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

(a) Plot the graph of blood pressure in both vessels against time in the same axis. (7mks)

(b) Describe the trend of each curve. (2mks)

.....

(c) From the graph, suggest the possible identity for:

(i) Blood vessel X. (1mk)

.....

(ii) Blood vessel Y. (1mk)

.....

(d) Give reason for your answer in (c) (i) and (ii) above. (2mks)

.....

.....

..... (e) Explain a factor that would result in to an increase in blood pressure in both the blood vessels above.

(2mks)

.....

..... (f) State two structural differences between the two vessels mentioned in C above. (2mks)

.....

.....

..... (g) Name two diseases of the circulatory system in humans. (2mks)

.....

.....

.....

(h) Other than, transport of substances state one other function of blood. (1mk)

.....

.....

7. (a) Discuss the economic importance of bacteria. (10mks)

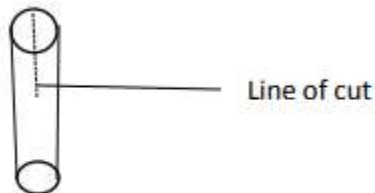
(b) Discuss the adaptation of *Schistosoma mansoni* to its survival. (10mks)

8. (a) Describe the photosynthetic theory. (10mks)

(b) Describe gaseous exchange in terrestrial plant. (10mks)

PAPER 3

1. You are provided with a specimen labelled K, Using the scapel cut 8 cm of the petiole from the side close to the lamina. cut 2 pieces each measuring 4cm. using a scapel cut a slit halfway through the middle of each piece as shown in the diagram below.



Place one piece in solution labelled A and the other in solution labelled B. Allow the set up to stand for 30 minutes.

a) After 30 minutes remove the pieces and press each gently between the fingers.

(i). Record your observations (2mks)

solution A

.....
.....

Solution B

.....
.....

(ii) Account for the observations made in the petiole dipped in solution A. (3mks)

.....
.....
.....

b) Explain the role of the physiological process identified above in plant nutrition (2mks)

.....
.....

c) State the **sub-division** to which the plant from which specimen **K** was obtained belongs. (2mks)

.....
.....

d) State **TWO** observable features that adapt specimen K for **gaseous exchange** (2mks)

.....
.....
.....

e) cut a transverse section of the petiole , using a hand lens observe the arrangement of the vascular bundles and make a diagram of the same. (3mks)

2. You are provided with two bones labelled .Examine them and answer the questions below

a) Giving reasons, identify bones **W and Q** (4mks)

(i) Identity of **bone W**

.....
.....

Reasons

.....
.....

Identity of **bone Q**

.....
.....

Reasons

.....
.....

b) State **TWO** adaptations of specimen **Q** (2mks)

.....
.....

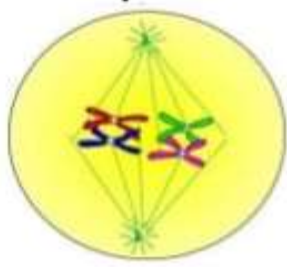
(c) Bone Q and Bone W articulate , draw a diagram showing how the two bones articulate. (5mks)

.....
.....

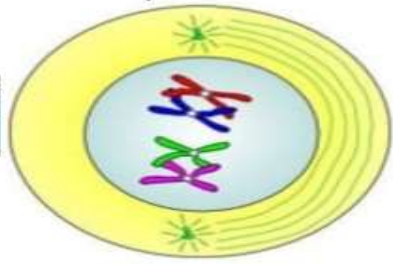
(d) State the significance of the **articulation** of the **TWO** bones. (2mks)

.....

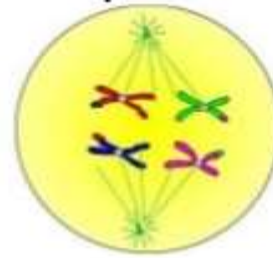
3. The photograph below show stages in cell division.



X



Y



Z

a) Name the stages represented by the cells labelled X, Y and Z (3mks)

X.....

Y.....

Z.....

b) State the significance of the above cell division to an organism. (3mks)

.....
.....
.....

c) Name **TWO** regions in higher plants where the above process occur (2mks)

.....
.....

d) Explain the events that take place in the phase after phase Y. (3mks)

.....
.....
.....

e) State the importance of the above in a member of a species (2mk)

.....

PAPER 1

1. Name the product of anaerobic respiration that is essential in: (2marks)
a) The brewing industry

b) The bread making industry

2. (a) What part of the human body is affected by the virus that causes poliomyelitis? (1mark)

(b) What is a vaccine? (1 mark)

(c) Other than poliomyelitis name another immunizable disease in Kenya (1mark)

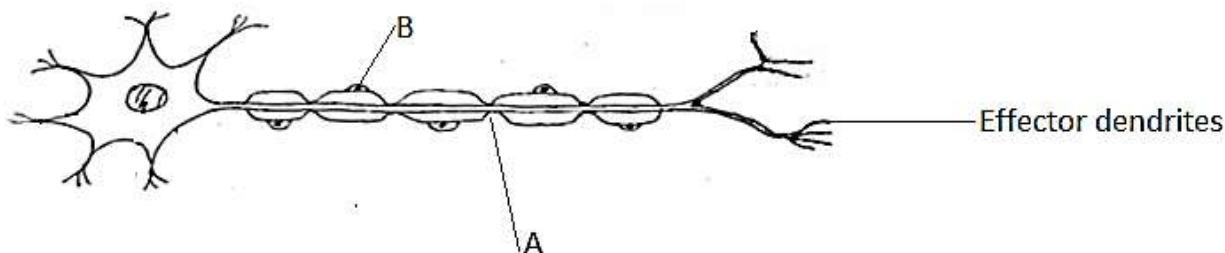
3. A student mixed a sample of urine from a person with Benedict's solution and heated, the colour changed to orange.

a) What was present in the urine sample? (1 mark)

b) What did the student conclude on the health status of the person? (1mark)

c) Which organ in the person may not be functioning properly (1mark)

4. Study the diagram **below** of a neuron in human being.



(a) Identify the type of neurone. (1mark)

(b) Name the parts labelled A and B. (2 mks)

A

B

(c) On the diagram indicate the direction of movement of a nerve impulse along the neuron (1 mark)

5. In an experiment, it was observed that when maggots are exposed to light, they move to dark areas. On the other hand, Euglena and Chlamydomonas move towards light.

(a) Name the type of response exhibited by the organisms (1mark)

(b) State one advantage of the response shown by Euglena and Chlamydomonas (1mark)

6.a) Name two features used to group organisms in the phylum Arthropoda into classes. (2marks).

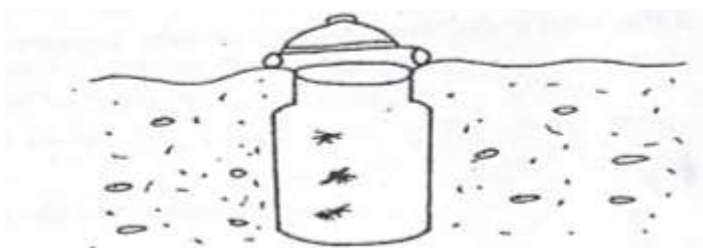
b) Name three economic importance of organisms in kingdom Fungi. (3marks)

7. Name three tissues responsible for secondary growth in flowering plants. (3marks)

8. A certain plant was found to have 22 chromosomes in its calyx cells. State the number of chromosome present in:
(2marks)

- a) Egg cell
- b) Endosperm cell

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



- a) Identify the apparatus (1 mark)
- b) What is the use of the apparatus named above (1 mark)

10. A DNA strand has the following base sequence G C C T A G A T C A C

What is the sequence of the:

- a) Complementary DNA strand (1 mark)
- b) m-RNA strand copied from this DNA strand (1 mark)

11. Phagocytes, also called granulocytes or polymorphs are cells found in the blood where they ingest pathogens and cell debris

- a) Why are they called polymorphs? (1 mark)
- b) Name the cell organelle most abundant in phagocytes to enable them function effectively (1 mark)

12. a) State three evidence of organic evolution. (3marks)

b) Explain why continuous use of antibiotics results to resistance. (2marks)

13. State three biotic factors that could affect a zebra living in the Nakuru National Park. (3marks)

14. List three methods used to show energy flow through the ecosystem. (3 marks)

15. Name three organelles that would be abundantly present in secretory cells (3 marks)

16. Name the part of the seed whose growth brings about epigeal germination. (1 mark)

17. State three aspects of light that affect the rate of photosynthesis. (3 marks)

18. a) State two environmental problems that can be solved by studying biology. (2 marks)

b) State two characteristics of organisms that are easily observed in both animals and plants. (2marks)

19. A student smeared the abdomen of a locust with Vaseline.

(a) What were the likely results after ten minutes? (1 mark)

(b) Account for the results obtained above. (2marks)

(c) When the locust blood was analysed it was found that the blood does not have blood pigments such as haemoglobin. Explain (2marks)

20. Name the causative agents of the following diseases:

(a) Cholera (1 mark)

(b) Malaria (1 mark)

21. Name the only epidermal cell in plants that contain chloroplast (1 mark)

22. Name two end products of the dark stage of photosynthesis. (2 marks)

23. Name the fins that prevent the following movements of fish during swimming (3marks)

a) Yawing

b) Pitching

c) Rolling

24. The scientific name of a bean is *Phaseolus vulgaris*. What do these names represent?

a) *Phaseolus* (1 mark)

b) *vulgaris* (1mark)

25.a) Name the process by which urea is formed in the liver (1mark)

b) Name one class of animals that excrete their nitrogenous waste product mainly in the form of uric acid. (1mark)

26. State two functions of sweat in the human body (2marks)

27. Name two vitamins which their absence in the diet may cause a dental disease called gingivitis
(2marks)

28. State three reasons why *Drophila melanogaster* is preferred for genetic study. (3marks)

29. a) Explain what would happen to a plant cell if it is placed in a concentrated salt solution.
(3marks)

b) How can plasmolysis be reversed? (1mark)

PAPER 2

SECTION A 40 MARKS

1. A potted plant was placed in each of the following conditions for a period of one hour in the order given and transpiration in each hour was measured. The air temperature was 18⁰C throughout the experiment.

CONDITIONS	RELATIVE HUMIDITY	TRANSPIRATION g/hr
A) Still air in sunlight and shade	70	1.2
B) Moving air only	70	1.6
C) Still air in bright sunlight	70	3.75
D) Still air in dark chamber	100	0.20

a) Account for the rate of transpiration in
i) Condition C (3mks)

.....
.....
.....
.....

ii) Condition D (3mks)

.....
.....
.....
.....

b) Name the apparatus used to measure the rate of transpiration. (1mark)

c) Give one modification in the stomata of xerophytes that reduce the rate of transpiration.
(1 marks)

2. **Sickle cell anaemia** is a disease in which people produce abnormal haemoglobin in their red blood cells. Letter **H** represents the gene for normal haemoglobin while letter **S** represent the gene for abnormal haemoglobin. Heterozygous individuals are said to have **sickle cell trait**.

a) If both parents have sickle cell trait, work out the proportion of their offspring that have sickle cell anemia. (5marks)

.....

.....

.....

.....

b) Explain why sickle cell trait is more prevalent in tropical countries than temperate countries. (2marks)

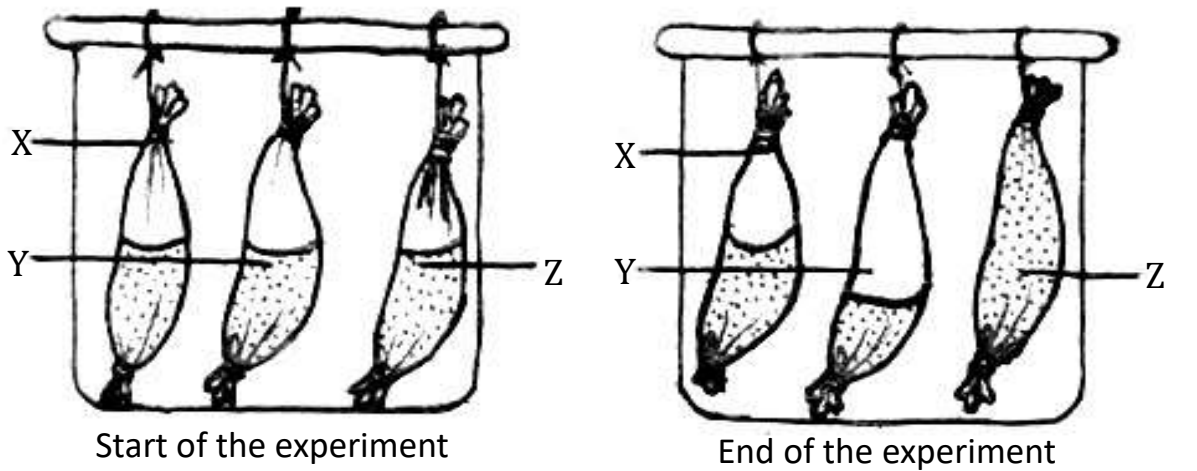
.....

.....

(c) Name any other disease caused by gene mutation. (1mk)

.....

3. Equal volumes of three different sugar solutions were placed in visking tubings X, Y and Z. The tubings were placed in a beaker containing 5% sugar solution. The set up was left for two hours. The results were as shown in the diagram below.



.....

.....

.....

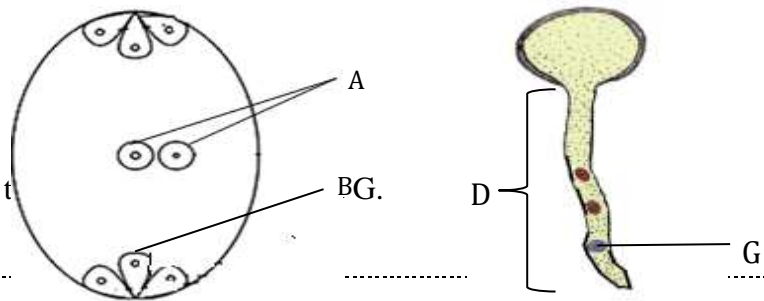
.....

d) Name a structure in cells that can be compared to the visking tubing. (1mark)

e) Explain how high temperature above 40°C will affect the process being investigated in the cells of organism. (1marks)

.....

4. The diagrams below show changes in the life cycle of a flowering plant.



a) Name the parts of the gynoecium shown in the diagrams. (3marks)

A-.....
 B-.....
 G-.....

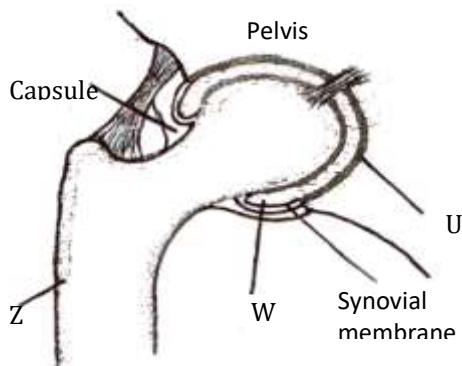
b) State the function of the part labelled D. (1mark)

c) (i) What will part A develop into after fertilization? (1mark)

(ii) Define the term parthenocarpy. (1mark)

d) Name two features in flowering plants that prevent self-fertilization (2marks)

5. The diagram below represents one of the joints in the mammalian body.



a) Name the bone Z. (1mark)

b) Name each of the structures U and W. (2marks)

Z-.....
 U-.....

c) State two functions of the fluid found in W. (2marks)

d) Identify the type of muscle found attached to bone Z. (1mark)

e) State two differences between the muscle identified in (d) above and those found in the gut. (2marks)

SECTION B (40MARKS)

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

6. In an experiment to investigate a certain process in a given plant species, the rate of carbon (IV) oxide consumption and the rate of carbon (IV) oxide released were measured over a period of time of the day. The results of the investigation are shown in the table below.

Time of day	6am	8am	10am	12pm	2pm	4pm	6pm	8pm	10pm	12am
CO ₂ consumption (mm ³ /min)	0	43	69	91	91	50	18	0	0	0
CO ₂ release (mm ³ /min)	38	22	10	3	3	6	31	48	48	48

(a) On the same axis, plot graphs of volume carbon (IV) oxide against time (7mk)

b) Name the biochemical process represented by:

i) Carbon (IV) oxide consumption (1 mark)

ii) Carbon (IV) oxide released (1 mark)

c) Account for the shape of the curve for:

i) Carbon (IV) oxide consumption (3 marks)

.....

.....

.....

.....

ii) Carbon (IV) oxide released (3marks)

.....

.....

.....

.....

d) (i) What is meant by the term compensation point? (1marks)

.....

(ii) From the graph state the time of the day when the plant attains compensation point (2 mark)

.....

e) Explain how temperature affects the rate of CO₂ consumption in a plant. (2 marks)

.....

.....

.....

7. a) Explain how the villi in the small intestines are adapted to their functions. (10 marks)

b) Describe the photosynthetic theory as a mechanism of opening and closing of the stomata. (10marks)

8. a) Explain how ultrafiltration occurs within the kidneys. (5marks)

b) Describe water pollution under the following headings:

i) Causes (5marks)

ii) Effects (5marks)

iii) Control measures. (5marks)

PAPER 3

1. (a) You are provided with solution Q, Solution W, Visiking tubing and a thread. Divide solution Q and W into two halves in separate beakers. Use one half for **Procedure 1** and second half for **Procedure II**.

Procedure 1

- ❖ Using reagents provided and one half of solution Q, carry out tests to determine the food substance present in solution Q.
- ❖ Record the procedure, observations and conclusions in the table below.
- ❖ Repeat the same procedure using the half of solution W. (10mks)

Test	Food Solution	Procedure	Observation	Conclusion
Starch	Q			
	W			
Reducing sugars	Q			
	W			

Procedure II

(Clean and rinse properly any of the beakers that contained Solution W or Solution Q for use in this procedure)

- ❖ Tie one end of visking tubing provided with a thread tightly.
- ❖ Measure about 5ml of solution Q into the visking tubing (**Stir the solution thoroughly before use**).
- ❖ Tie the other end tightly to ensure that there is no leakage.
- ❖ Immerse the visking tubing and its content into a beaker containing solution W.
- ❖ Allow it to stand for 20 minutes.
- ❖ After 20 minutes empty the content of the visking tubing into a clean empty beaker.

- b) Use the solution that was in the visking tube to test for starch and reducing sugars. Record the observations and conclusions in the table below:

Test	Observations	Conclusions
Starch test		

Reducing sugars test		
-----------------------------	--	--

(4mks)

i) Name the physiological process being investigated in the experiment. (1mark)

ii) Which structure in the living organism is represented by the visking tubing? (1mark)

iii) Account for the observation made in the table (b) above. (2marks)

2 a) Study the photograph below. The specimen had been placed in adequate light at a horizontal position for one week.



- i) What was the aim of this experiment? (1 mark)
- ii) What would be the result if seedling is placed on a working klinostat? (1 mark)
- iii) Explain how the growth curvature occurred. (3 marks)

b) Study the Photographs below and answer the questions that follows :



Photo E



Photo F

- i) Name the type of relationship in Photograph E and F:
 - Photograph E(1mk)
 - Photograph F(1mk)

ii) What is the importance of the relationship taking place in Photograph E. (1mk)

.....
.....
.....

iii) Using observable features only explain two ways in which the flower is adapted for the activity taking place in Photograph F. (2mks)

.....
.....
.....

3. The photographs below shows bones obtained from different regions of a mammalian body. The photographs are in different views.



Anterior view of bone A



Dorsal lateral view of Bone B



Anterior view of bone C

- a) Identify the bones. (3 marks)
A.....
B.....
C.....
- b) Name the regions from which bone B was obtained from. (1 marks)
- c) State **two** distinguishing features of the bone in photograph labeled B. (2 marks)
- d) State the significance of the part labeled T in the photograph of bone A. (1 mark)
- e) With reason state the type of joint formed at the distal and proximal ends of specimen C. (4 marks)
- i) Distal end
Reason Proximal end.
Reason
- f) Name the bone that articulates with the proximal end of the bone in photograph labelled C.(1 mark)

PAPER 1

1. Define the following terms:

(a)Phylogeny (1mark)

.....
.....

(b)Ontogeny (1mark)

.....
.....

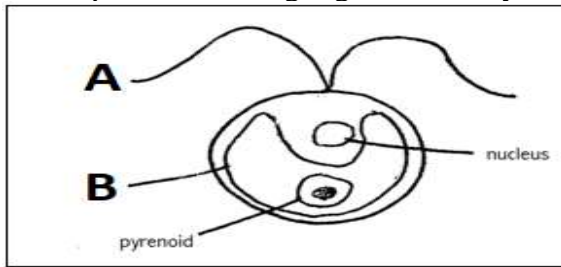
2. Differentiate between a test cross and a back cross (2marks)

.....
.....

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)

.....

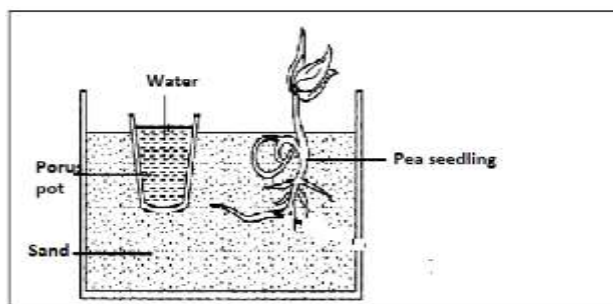
(b) Epiglottis. (1 mark)

.....

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)

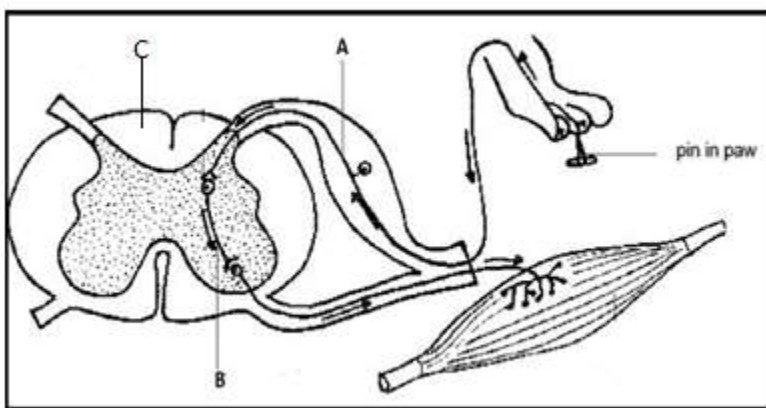
(b) What is the importance of the response to plants. (1mark)

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



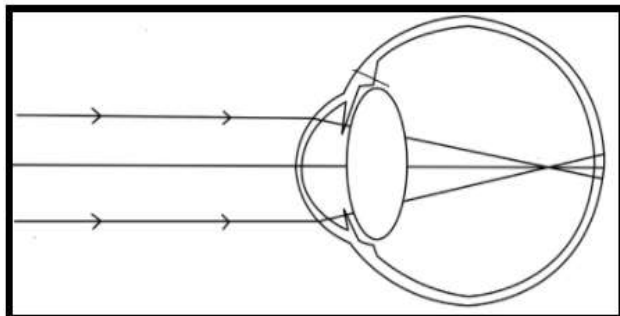
(a) Name the part labelled A (1mark)

(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)

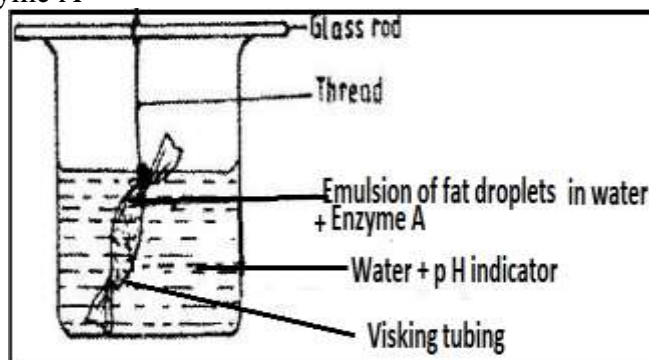
.....
(b) Draw a diagram that indicates how the defect can be corrected (2marks)

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)

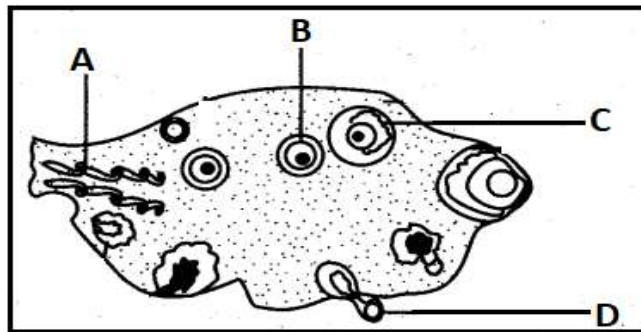
.....
.....
15. Explain how industrial melanism can be used to provide evidence for evolution (4marks)

.....
.....
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 and B

A.....(1mark)

B.....(1mark)

C.....(1mark)

(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)

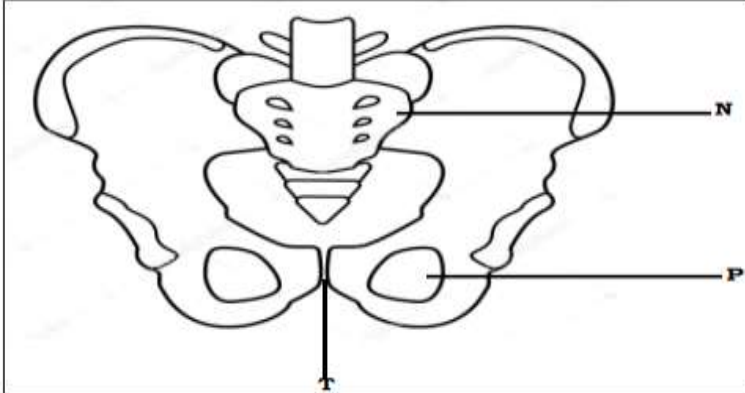
.....
.....
.....

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)

N.....

P.....

b) State the role the part marked T.

(1mark)

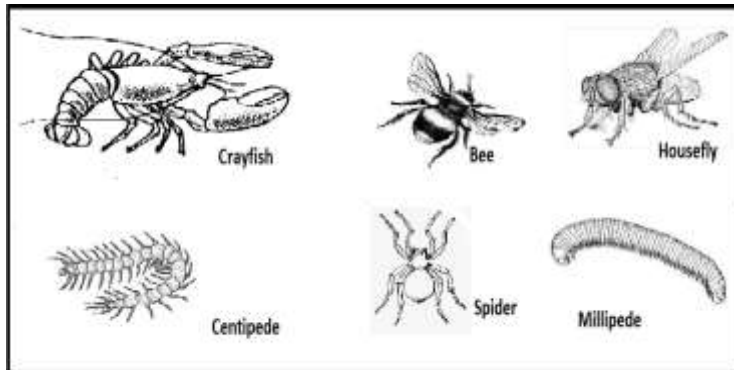
.....
.....

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)

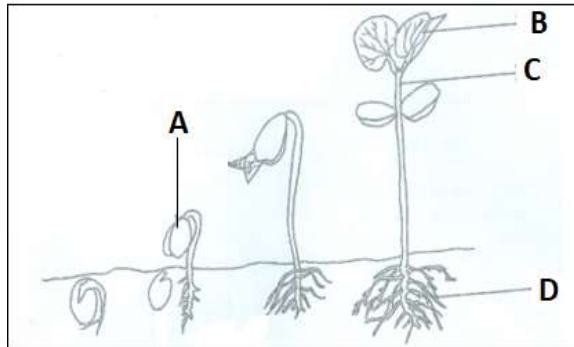
(b) Give a reason for your answer in (a) above (1mark)

(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)

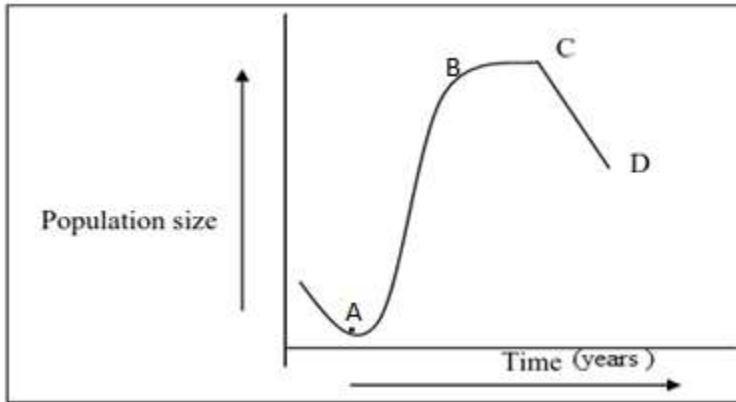
(d) Explain how the part labelled A is carried above the soil level (2marks)

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.



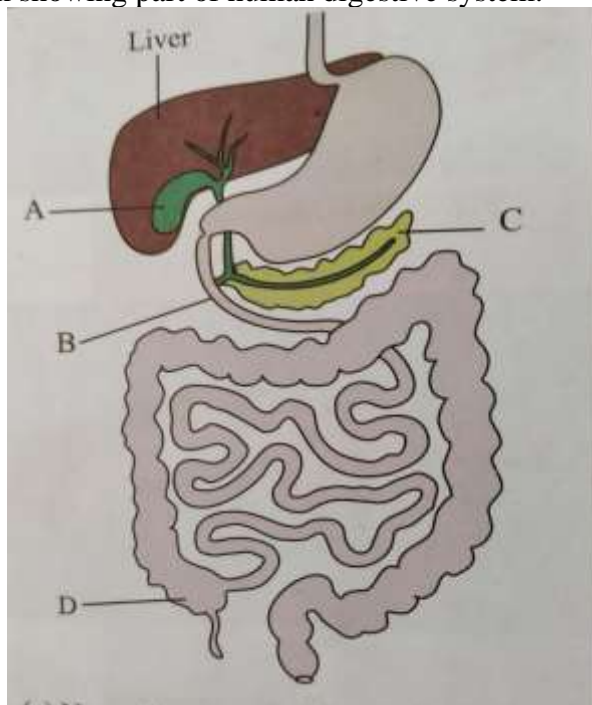
a) Account for the change in population between point A and B (2marks)
.....
.....

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)

PAPER 2

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



(a) Name the parts labelled B and C. (2mks)

B.....

C.....

(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)

.....
.....

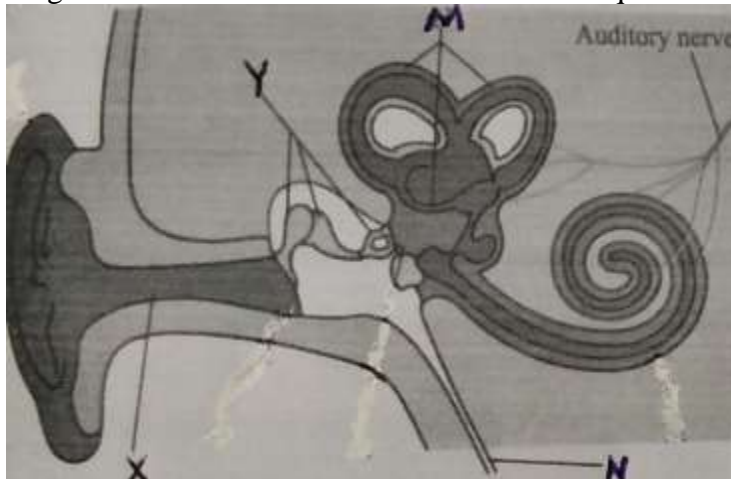
(c) What is the functional relationship between the part labelled A and the liver. (1mk)

.....
.....

(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)

X.....

Y.....

N.....

(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 damaged? (1mk)

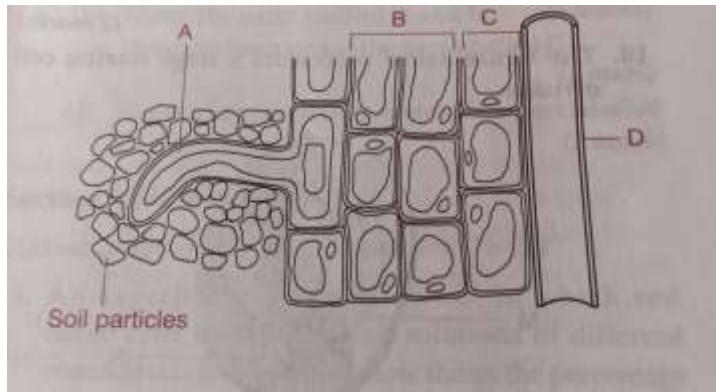
3. In human beings, the allele for a curved thumb (T) is dominant over the allele for a straight thumb (t).

(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. (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)

(i) Excretion

(ii) Egestion

(iii) 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)

PAPER 3

(PRACTICAL)

1. You are provided with specimens labelled **A** and **B**. Examine the specimens and answer the questions that follow.

(a) With a reason state the type of germination in each of the specimens. (4 marks)

Specimen **A**. Type of germination:

Reason:

Specimen **B**. Type of germination:

Reason:

(b) Draw a well labelled diagram of specimen **B**. (5 marks)

(c) Using observable features only state the class to which each of the specimens belongs. (4 marks)

Specimen **A**. Class:

Reason:

Specimen **B**. Class:

Reason:

Q2. You are provided with a specimen labeled **T** which is a fruit. Use it to answer the questions that follow.

a) Make a **transverse** section of the specimen **T**. Draw and label at least 3 parts.

6mks

b) With reasons, state the identity of fruit **T**.

Type of fruit.....1mk

Reason 1mk

c) Suggest the possible agent of dispersal and give **two** reasons

Agent 1mk

Reason

.....

.....

2mk

d) What is the placentation of **T**?1mk

e) Specimen **T** was green in colour before it was treated with a plant hormone.

Suggest the plant hormone.

.....1mk

3. You are provided with a specimen labeled N. Squeeze the contents of N into the test tube. Add 3cm^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 (6mks)

Food substance tested	Procedure	Observation	Conclusion

b) Account for the results obtained in (a) above.

(2marks)

.....

.....

.....

.....

c) Cut specimen N along its length to expose the inner surface

(2marks)

.....i) Compare the inner and outer surface of the specimen. Record your observations.

(2marks)

PAPER 1

1. Which organelle would be numerous in the following cells? (2 mks)

(a) Liver cells

.....

(b) Palisade cells

.....

2. State the functions of the following cell structures during cell division. (2 mks)

(i) Centriole –

.....

(ii) Centromere –

.....

3. In an investigation, the pancreatic duct of a mammal was blocked. It was found that the blood sugar regulation remained normal while, food digestion was impaired. Explain these observations.

(2 mks)

.....
.....
.....

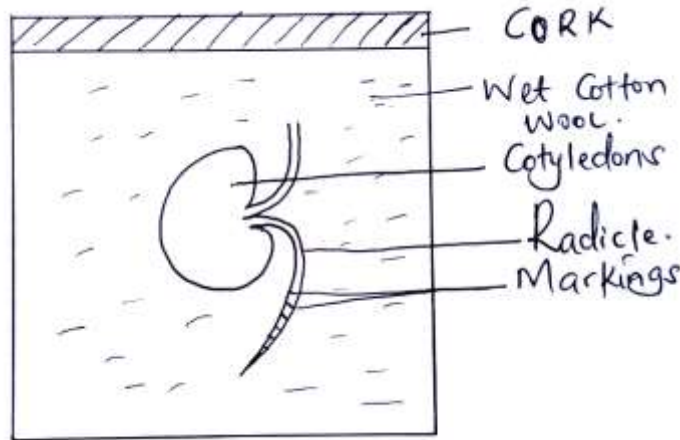
4. State two structural differences between ribonucleic acid (RNA) and deoxyribonucleic acid (DNA). (3 mks)

.....
.....

5. Explain why glucose does not appear in urine of a healthy person even though it is filtered in the Bowman's capsule of a mammal. (2 mks)

.....
.....
.....

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



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

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

.....
(b) What is the role of the following in germinating seed? (2 mks)

(i) Oxygen –

.....
(ii) Cotyledon –

.....
7. Give a reason why it is only mutation in genes of gametes that influence evolution. (1 mk)

.....
8. A person was able to read a book clearly at arm's length, but not at normal distance.
(a) State the eye defect the person suffered from. (1 mk)

.....
(b) Why was he unable to read the book clearly at normal distance? (1 mk)

.....
(c) How can the defect be corrected? (1 mk)

.....
9. Some form three students took a germinating maize grain and placed it in a starch paste in a petri dish and put the petri dish in a water bath maintained at 30°C . After 48 hours, the starch paste was irrigated with iodine solution. The area around the maize grain changed to the colour of iodine solution while the rest turned blue-black.

(a) Account for the observation. (2 mks)

.....
(b) Why was the petri dish put in a water bath maintained at 30°C? (1 mk)

.....
10. State two functions of muscles found in the alimentary canal of a mammal? (2 mks)

.....
11. State the stage in a cell division in which the following events occur:
(i) Replication of the genetic material. (1 mk)

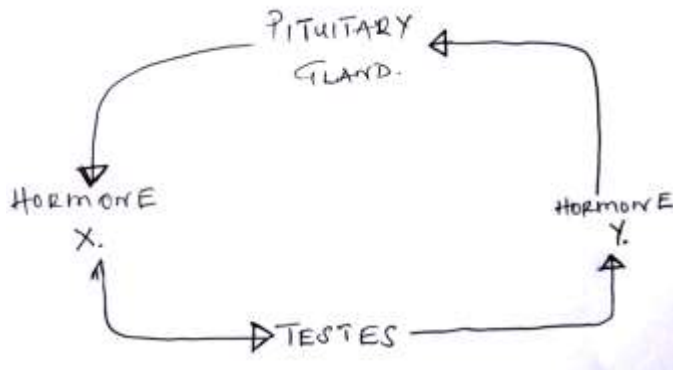
.....
(ii) Exchange of genetic material.

(1 mk)

.....
12. Explain what happens when a marine amoeba is transferred to fresh water environment.

.....
.....
.....
13. In blood test, a few drops of anti-B serum were added to two samples of blood. It was noted that agglutination occurred. What were the possible blood groups of the two blood samples?
(2 mks)

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



(a) Name the hormone labeled X.

(1 mk)

.....
(b) State two differences that may be observed between a normal male and one who is incapable of producing hormone labeled Y.
(2 mks)

.....
.....
15. A small amount of chemical M was put on one side of maize coleoptiles. After some days, it was noted that the coleoptiles curved away from the side to which the chemical was applied .

(a) Suggest the possible identity of chemical substance M.

(1 mk)

.....
.....
(b) Explain how this chemical might have caused the coleoptiles to curve.

(2 mks)

.....
.....
16. In which part of the spinal cord is the cell body of the motor neurone found?

(1 mk)

.....
(b) Below are two features which make a neurone a specialized cell. State their role.

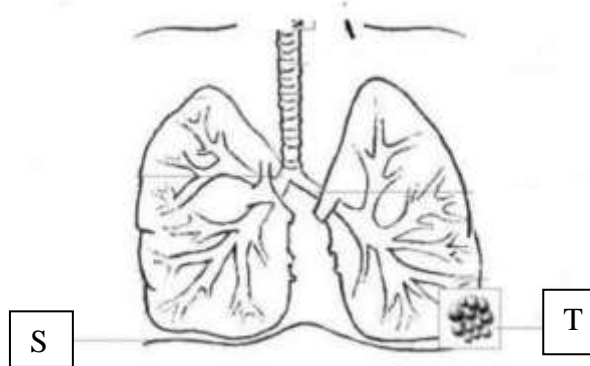
(i) Axon –

.....
(ii) Dendrites –
.....

17. (a) What is a natural selection? (1 mk)
.....

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

18. The diagram below shows part of a mammalian respiratory system.



(a) Explain two ways in which the part labeled T is adapted to its functions. (2 mks)
.....
.....

(b) How does the part labeled S facilitates inhalation ? (1 mk)

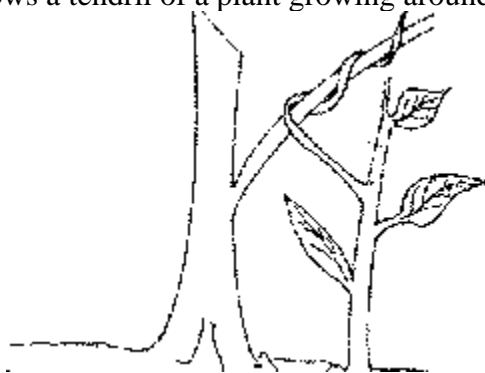
19. (a) Explain why the body temperature of a healthy human being must rise up to 39°C on humid day. (2 mks)
.....
.....

(b) In an experiment, a piece of brain was removed from a rat. It was found that the rat had large fluctuation of body temperature. Suggest the part of the brain that had been removed. (1 mk)
.....

20. Name the distinguishing features of class mammalian. (3 mks)
.....
.....

21. State three types of asexual reproduction and give its examples. (3 mks)

22. The figure below shows a tendril of a plant growing around a trunk.



(a) Identify the types of response which causes the twisting growth. (1 mk)

.....

(b) Explain how the twisting process is accomplished. (3 mks)

.....

24. Active yeast cells were added to a dilute sugar solution in a container. The mixture was kept in warm room. After a few hours bubbles of gas were observed escaping from the mixture.

(a) Write an equation to represent the chemical reaction above. (1 mk)

.....

(b) What is the economic importance of this type of chemical reaction above? (1 mk)

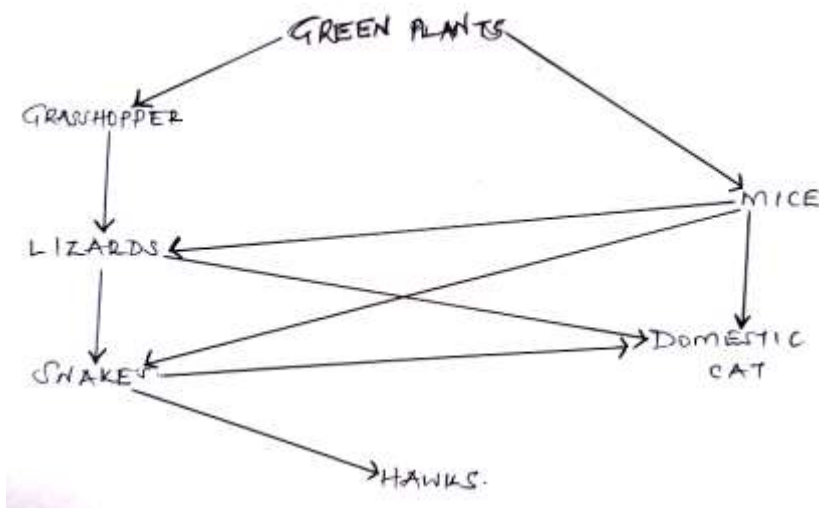
.....

(c) Why is that the total energy being released at the end of respiration (oxidation) being released in a small quantity. (1 mk)

.....

25. Describe three roles or active transport in living organisms. (3 mks)

26. The diagram below shows a feeding relationship in a certain ecosystem.



(a) Construct two food chains ending with a tertiary consumer in each case. (2 mks)

(b) Suggest three ways in which the ecosystem would be affected if there was prolonged drought. (3 mks)

.....
.....
.....
27. Explain how the following parts of a mammalian reproductive system are adapted to their functions:

(i) Testis (1 mk)

.....
(ii) Uterus (1 mk)

.....
(b) Explain why removal of the ovary after four months of pregnancy does not terminate pregnancy. (1 mk)

.....
28. (a) What is meant by double fertilization in flowering plants. (2 mks)

.....
(b) State two advantages of cross pollination in a flowering plant. (2 mks)

.....
29. Name the division in kingdom plantae with the following spore producing bodies

(i) Capsule

.....
ii) Account for your observation of the inner surface. (2marks)

PAPER 2

SECTION A

1. In a certain plant species which is normally green, a recessive gene for colour (n) causes the plant to be white when present in a homozygous state. Such plants die at early age. In heterozygous state, the plants are pale green in colour but grow to maturity.

(a) Suggest a reason for the early death of plants with homozygous recessive gene. (2 marks)

.....
(b) If a normal green plant was crossed with a pale green plant, what would be the genotype of the F1 generation? (Show your working) (3 marks)

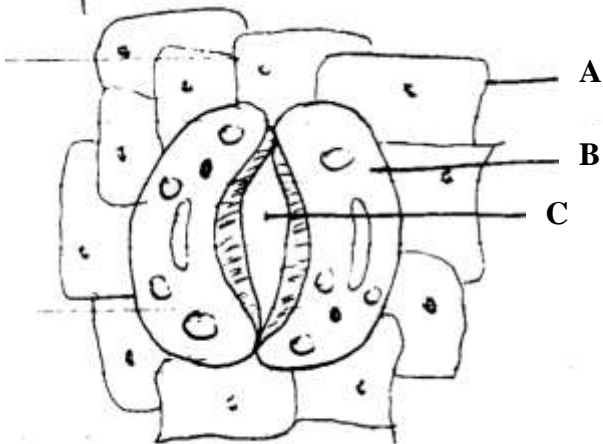
.....
(c) If seeds from the heterozygous plants were planted and the resulting plants allowed to self pollinate. Work out the phenotypic ratio of the plants that would grow to maturity. (2 marks)

.....

(d) Give an explanation for occurrence of the pale green colour in heterozygous plants. **(1 mark)**

.....

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



a) Name the tissue where the cells drawn above are found. **(1 mark)**

.....

b) Identify cells A and B. **(2 marks)**

A.....
 B.....

c) Give **two** structural differences between cell A and cell B. **(2 marks)**

.....

d) Describe how structure C opens as explained by the photosynthetic theory. **(3 marks)**

3. Catalase is an enzyme present in all living tissues in both plants and animals. It breaks down toxic hydrogen peroxide produced during cellular metabolism into less toxic water and oxygen is evidenced by effervescence.

In an experiment 10 ml of hydrogen peroxide was put in different boiling tubes into which different specimens were put. The table below summarizes part of the results. Carefully analyze the table and answer the questions that follow.

	The specimen	Observation
A	Fresh liver	A lot of bubbling almost violent
B	Boiled liver	No bubbling

C	Fresh muscle tissue	Vigorous bubbling less than tube A
D	Dry bean seed	Very slow bubbling
E	Soaked bean seed	Vigorous bubbling done intensity of tube C
F	1 cm ³ potato cube	Moderate bubbling
G	1 cm ³ mashed potato	Vigorous bubbling since intensity as in tube E

(a) Compare & account for the rate of bubbling between

(i) Tube A and tube B.

(2 marks)

.....

.....

(ii) Tube A and C

(2 marks)

.....

.....

(iii) Tube D and tube E

(2 marks)

.....

.....

(iv) Tube F and G

(1 mark)

.....

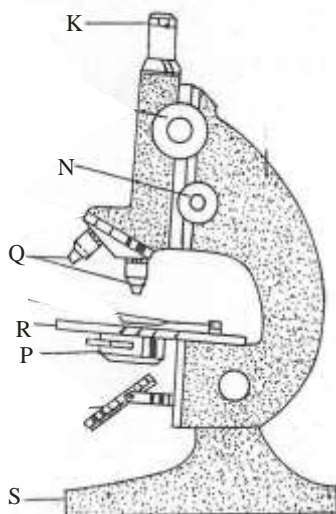
.....

(b) Write the equation for the reaction that produces the bubbling.

(1 mark)

.....

4. The diagram below shows an instrument used in the laboratory.



(a) Name the apparatus shown above

.....

(1 mark)

(b) Name the parts labeled Q , K and R

(3 marks)

Q.....

K.....

R.....

(c) What are the functions of parts P, N and S.

(3 marks)

P.....

N.....

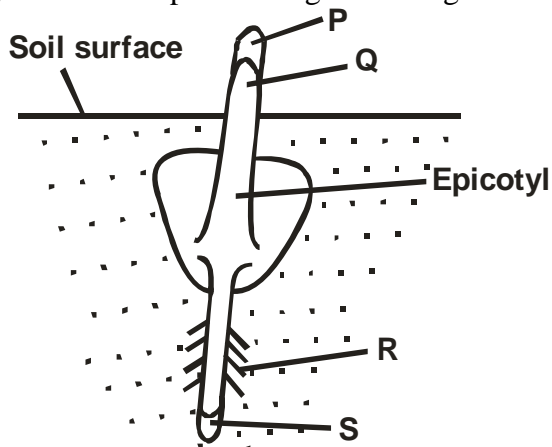
S.....

(d) What is the formula of calculating linear magnification

(1 mark)

.....

5. Diagram below represents a germinating seedling.



a) What is germination?

(1 mark)

.....

b) Name the part labelled P, Q and R.

(3 marks)

P.....

Q.....

R.....

c) Identify the type of germination shown in the diagram.

(1 mark)

.....

d) What is the role of the following in germination of the above seedling?

1. Oxygen

(1 mark)

.....2.

Enzymes

(1 mark)

.....3.

Water

(1 mark)

SECTION B

Answer question 6 and either 7 or 8

6. Some students used a model to demonstrate the effect of sweating on human body temperature. Two boiling tubes A and B were filled with hot water. The surface of tube A was continually wiped with a piece of cotton wool soaked in methylated spirit. The temperature of water in the tubes was taken at the start of the experiment and then at 5 minutes interval. The results obtained are as shown in the table below.

Time (in minutes)	Temperature (°C) in tubes	
	A	B
0	80	80
5	54	67
10	40	59
15	29	52
20	21	47
25	18	46

(a) On the same axis plot graphs of temperature of water in the tubes against time. **(7 marks)**

(b) At what rate was the water cooling in tube A? **(2 marks)**

.....

.....

(c) Why was tube B included in the set up? **(1 mark)**

.....

.....

(d) Account for the rate of cooling in tube A **(3 marks)**

.....

.....

(e) State **two** processes of heat loss in tube B. **(2 marks)**

.....

.....

(f) What would be the expected results if tube B was insulated? **(1 mark)**

.....

(g) What would the insulation be compare to in

(i) Birds ? **(1 mark)**

.....

(ii) Mammals? **(1 mark)**

.....

(h) Name the structures in the human body that detect

(i) External temperature changes **(1 mark)**

.....

(ii) Internal temperature changes **(1 mark)**

.....

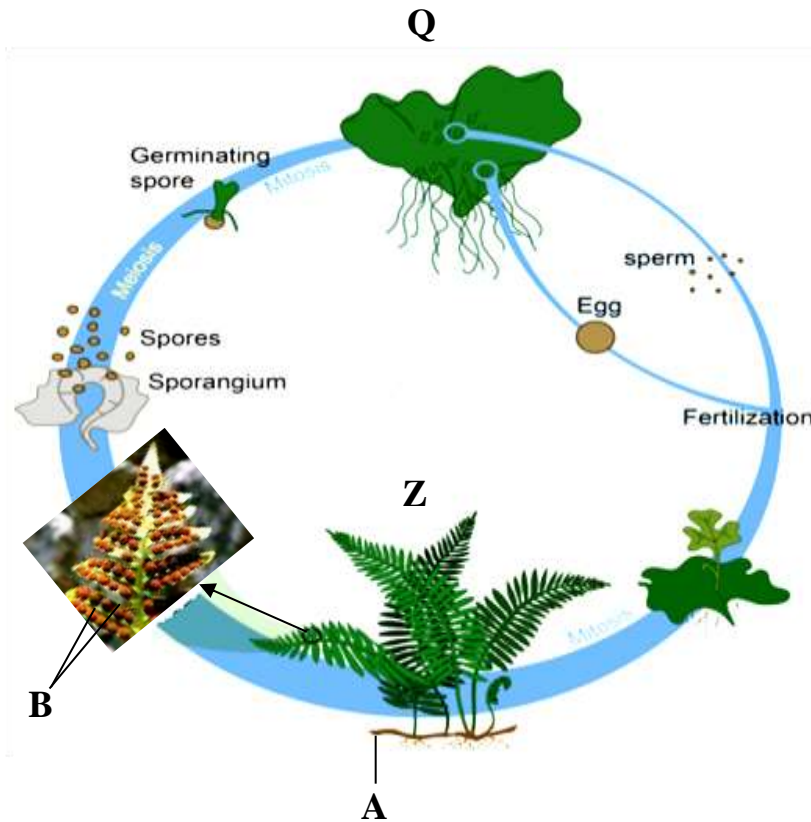
7. (a) Differentiate between nervous system and endocrine system. **(5 marks)**

(b) Describe how hormones regulate the menstrual cycle in human being. **(15 marks)**

8. How is the mammalian intestine adapted to its functions? **(20 marks)**

PAPER 3

1. The diagram below illustrates the life cycle of a certain organism.



a) (i) Giving reasons, name the division to which the organism belongs.
 Division.....(1mark)
 Reasons (2marks)

.....

(ii) Which portion of the plant's life is independent? (1mark)

.....

b) (i) Name the parts labeled A and B. (2marks)

A

B

(ii) State one function of the part labeled B. (1mark)

.....

(iii) Define the term alternation of generation. (1mark)

.....

.....
.....
(ii) Identify the generations labeled K and L. (2marks)

Q

Z

(iii) In what way is generation L advantageous to generation K? (2marks)

.....
.....
.....
.....
(iv) Give a reason why the plant shown in the diagram above is common in swampy areas (2marks)

2. You are provided with several specimens **N** and indicator **D**, which is Bromolthymol blue. Study them and answer the questions that follow:

(a) (i) Identify the part of plant represented by specimen **N**. (1mark)

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

.....
.....
(b) i) Name the physiological process which is taking place in specimen **N**. (1mark)

.....
.....
ii) Describe the **two** changes which occurred to specimen **N** during the process named in b) i) above. (2marks)

(c) i) State **two** internal factors which would promote the physiological process exhibited by specimen **N**, (2marks)

ii) State **two** external conditions which would inhibit the process demonstrated by specimen **N**.(2marks)

(d) Add 1ml of indicator marked **D** into a test tube, add 6 pieces of specimen **N** into the test tube. Close the mouth of the test tube tightly using a tissue paper. Leave the set up to stand on the tube rack for 30 minutes after which carefully remove specimen **N** without pouring the indicator marked **D** using a wooden splint.

(i) Record your observation after 30 minutes (1mark)

(ii) Account the observation in d) i) above (3marks)

.....
.....
(iii) Suggest a control for his experiment. (1mark)

3. You are provided with photograph L, K and J. Examine them.

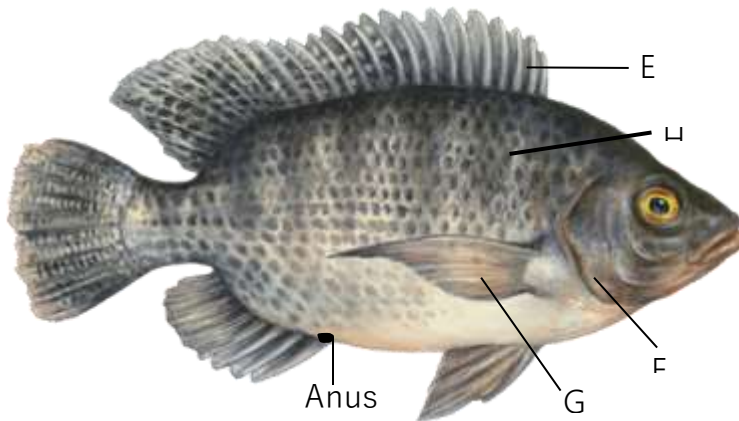
PHOTOGRAPH L



PHOTOGRAPH K



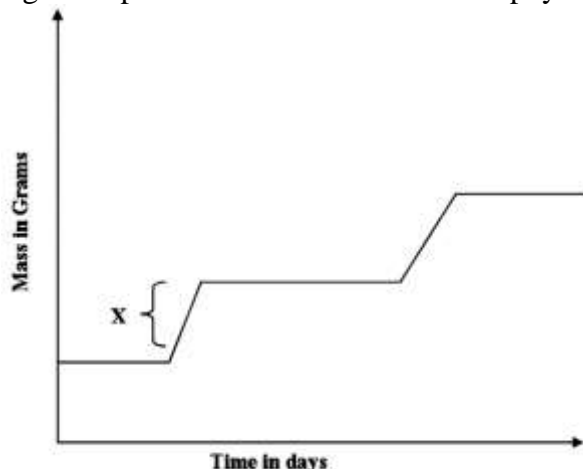
PHOTOGRAPH J



- a) Using observable features only, state class of animals shown in the photograph L and K. (4 marks)
- L**
 Class
- Reason.....
- K**
 Class
- Reason.....
- b) (i) On the photograph J name the parts labeled E, F and G. (3 marks)
- E.....
- F.....
- G.....
- (ii) State the functions of the structures labeled H in photograph J. (2marks)
- c) (i) The actual length of animal J in cm is shown by a section of the ruler in the photograph.
 Calculate the tail power (show your working) (2marks)
- (ii) State the significance of tail power to the life of fish in water. (1mark)

PAPER 1

1. The graph below represents the growth pattern of animals in a certain phylum.



(a) Name the type of growth curve shown above. (1 mark)

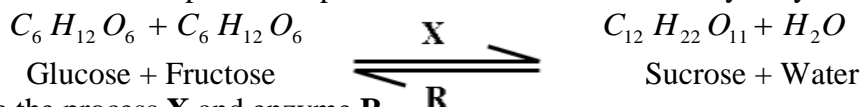
(b) (i) Identify the process represented by X. (1 mark)

(ii) Name the hormone responsible for the process in b(i) above. (1 mark)

(c) State the importance of the growth of a pollen tube to a plant. (1 mark)

2. (a) What is the function of Sodium hydrogen Carbonate that is added to test solution of non-reducing sugar. (1 mark)

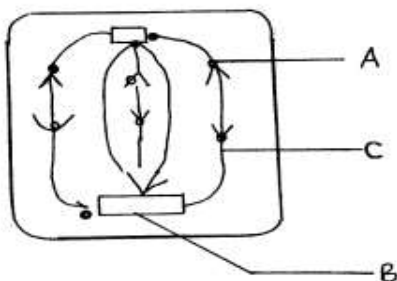
(b) The equation below represents a process X which is controlled by enzymes.



(i) Name the process X and enzyme R
 Process X (1 mark)

Enzyme R (1 mark)

3. The diagram shows an epidermal cell undergoing mitotic cell division.



(a) Name the stage of mitosis it represents (1 mark)

(b) Name the structures

A (1 mark)

C (1 mark)

iii) What is the effect of gibberellins on the shoots of plants? (4 marks)

5. (a) Give **two** forms in which carbon (IV) oxide is transported in human blood. (2 marks)

(b) Name the enzyme that enhances the loading and off – loading of carbon (IV) oxide in the human blood. (1 mark)

.....
.....

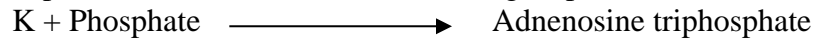
6. (a) What is the importance of the counter current flow in the exchange of gases in a fish? (2 marks)

.....
.....

(b) State **two** ways in which the tracheoles of an insect are adapted to their functions. (2 marks)

.....
.....

7. The equation below represents a reaction that occurs during respiration in a cell.



(a) Identify the compound K. (1 mark)

(b) State **two** differences between **K** and **ATP**. (2 marks)

.....
.....

(c) Name the organelle responsible for the production of energy in a cell muscle. (1 mark)

.....

8. Explain how crops grown along roads can be a source of lead poisoning to human beings. (2 marks)

.....
.....

9. Explain why plants growing in low altitude areas grow faster than those in high altitudes. (3 marks)

.....
.....
.....

10. List down **four** phenotypic characteristics that have been selected for the production of strains suitable for modern agricultural purposes. (4 marks)

.....
.....
.....

.....
.....
11. Name the type of eye defects that can be corrected by;

(i) Use of bifocal lens (1 mark)

.....
(ii) Use of artificial lens (1 mark)

.....
(iii) Use of concave lens (1 mark)

12. (a) The length from the tail tip to the anus of a certain tilapia fish is 10 cm. The length from the tail tip to the mouth is 35cm. Calculate the tail power of the fish. (Show all your working).

(2 marks)

.....
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.....
(b) What is the significance of high tail power in fish? (1 mark)

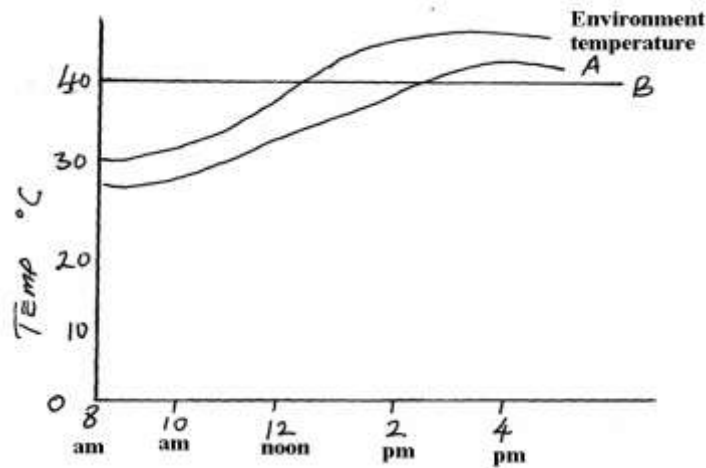
13. List down **three** differences between the endocrine system and nervous system. (3 marks)

Endocrine system	Nervous system
i.	i.
ii	ii
iii	iii

14. Distinguish between the struggle for existence and survival for the fittest as used in the theory of natural selection. (2 marks)

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

Temperature



- (a) Which of the animals is;
- (i) Endothermic (1 mark)
 - (ii) Ectothermic (1 mark)
- (b) With a reason, state which of the animals is likely to be widely distributed. (2 marks)

.....

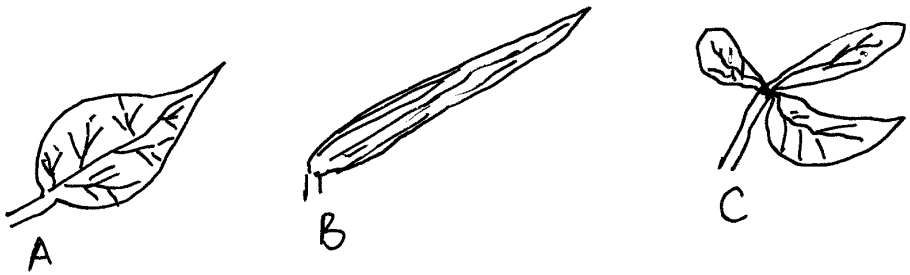
16. State **three** roles of oestrogen during the menstrual cycle (3 marks)

.....

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

.....

18. Below are diagrams of three leaves A, B and C. Construct a two step dichotomous key which can be used to identify each of them. (4 marks)



.....

.....
19. (a) Name **two** mutagenic agents. (2 marks)

.....
.....

b) Identify the type of gene mutations represented by the following pairs of words.

i) Shirt instead of skirt (1 mark)

ii) Hopping instead of shopping (1 mark)

20. Liver damage leads to impaired digestion of fats. Explain this statement. (2 marks)

.....
.....

21. Explain why several lateral buds sprout when a terminal bud in a young tree is removed. (3 marks)

.....
.....
.....
.....

22. (a) State **two** structural adaptations that make xylem vessels suitable for transport of water and mineral salts. (2 marks)

.....
.....
.....
.....

(b) List any **three** adaptations of the root hair cells to their functions (3 marks)

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.....
.....
.....

23. (a) Define the following terms:- (2 marks)

(i) Species

(ii) Binomial nomenclature

24. What is the significance of active transport in the human body? (3 marks)

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.....

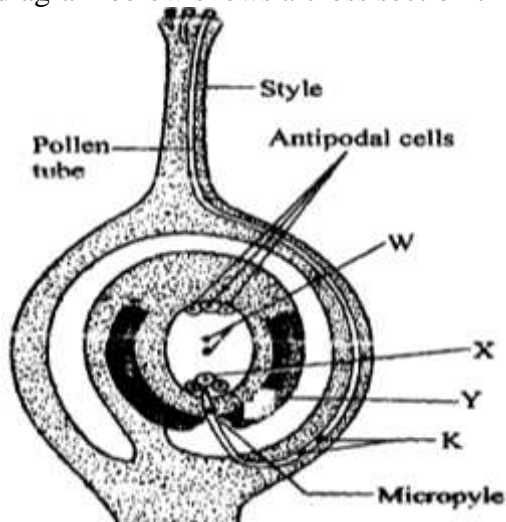
25. Explain how the biceps and triceps muscles bring about the movement at the hinge joint of the elbow in man. (2 marks)

PAPER 2

SECTION A (40 MARKS)

Answer all questions in this section.

1. The diagram below shows a cross section through the female part of a flower.



(a) Name the structures labeled **W**, **X** and **Y**.

(3 marks)

(b) State **two** functions of the pollen tube.

(2 marks)

(c) What happens to antipodal cells after fertilization?

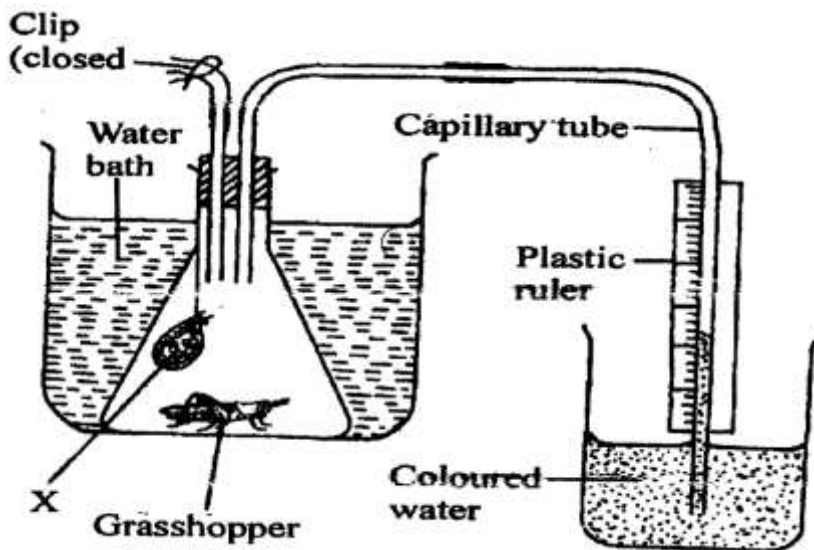
(1 mark)

(d) Name the structure labeled **K** and state their role.

(2 marks)

.....

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



(a) Name the chemical compound labeled **X** and state its function.

(2 marks)

.....
(b) Why is it necessary to place the flask in a water bath? (3 marks)

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(c) What changes would you expect to observe in the level of coloured water in the capillary tube after the experiment has run for five minutes? (1 mark)

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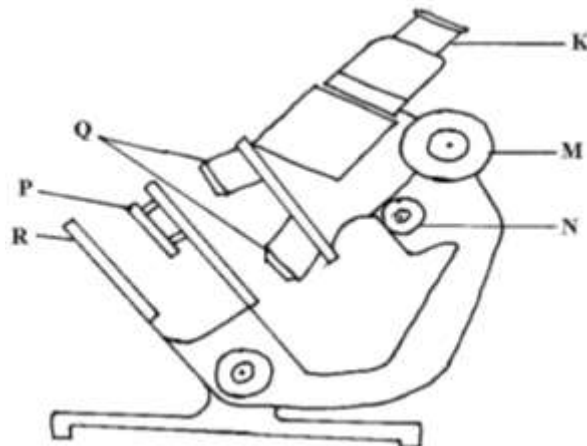
(d) Explain the changes you have started in (c) above. (3 marks)

.....
.....
.....

(e) State how you can set up a control experiment. (1 mark)

.....
.....

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



d) Name the parts labeled (2 marks)

K
M

e) State the functions of (2 marks)

P
Q

f) A student was viewing a prepared slide of a plant cell under high power microscope. The features of the cell were blurred. Which one of the labeled parts of the microscope would the student use to obtain:-

v) a sharper outline of the features. (1mark)

.....

vi) Give the formula used to calculate magnification in a light microscope. (1mark)

.....

g) A student was preparing a section of a plant cell to be viewed on a light microscope. Give a reason for each of the following steps:-

(i) Cutting a very thin section. (1mark)

.....
.....

(ii) Staining the section. (1mark)

.....
.....

(iii) Putting the section in water. (1mark)

.....
.....

4. In an experiment, a black mouse was mated with a brown mouse; all the off-springs were black. The off-springs grew and were allowed to mate with one another. The total number of (F2) generation off-springs was 96.

vii) Using the letter symbols capital letter **B** for the gene of black colour and small **b** for brown colour, Work out the genotype of the F1 generation. (3 marks)

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.....
.....
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.....

(b) From the information above, work out the following for the F2 generation.

(i) Genotypic ratio. (2 marks)

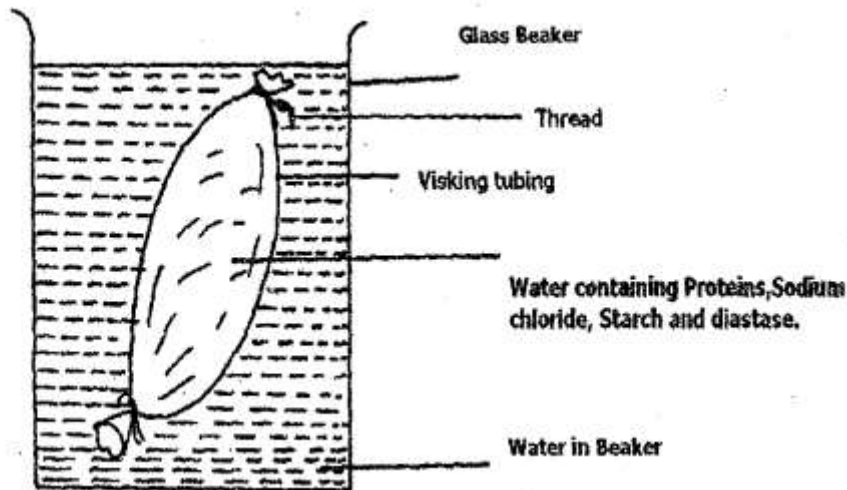
.....

(ii) Phenotypic ratio. (1 mark)

.....

(iii) The total number of brown mice (2 marks)

5. In a physiological experiment, starch, protein, diastase and sodium chloride were added to water and put inside a visking tubing. The visking tubing was then placed in a water bath maintained at a temperature between 35 – 40°C. The set up was as shown in the diagram below.



The following observations were made after the procedures indicated.

Contents in	At the start of experiment	After 1 hour
Visking tubing	(i) Solution tastes salty	Solution tastes salty
	(ii) Visking tubing is not firm	Visking tubing is firm
	(iii) After boiling with Benedicts solution, solution remains blue	After boiling with Benedicts solution the solution turns brown
	(iv) On addition of sodium hydroxide followed by copper sulphate solution to the solution, the colour changes to purple	On addition of sodium hydroxide followed by copper sulphate to the solution, the colour changes to purple
Beaker	(i) Water is tasteless	Solution tastes sweet/salty
	(ii) After boiling solution with Benedicts solution, Blue colour remains	After boiling solution with Benedict's solution, colour turns to brown.
	(iii) On addition to sodium hydroxide followed by copper sulphate solution, colour remains blue	On addition of sodium hydroxide followed by copper sulphate solution, colour remains blue

- a) Name the process by which salt moved into the water in the beaker from the visking tubing. (1mark)
-
- (b) (i) Name the food substance responsible for the brown colour observed after 1 hour both in the beaker and visking tubing when solutions are boiled with benedicts solution. (1 mark)

(ii) Account for the observation in (b i) above. (3 marks)

(c) (i) Name the food substance tested with sodium hydroxide followed by copper sulphate solution(s) (1 mark)

(ii) Account for the absence of the food substance named in (c i) above in the beaker after 1 hour. (1 mark)

(d) After one hour the visking tubing was firm. State the term used to describe this state. (1 mark)

SECTION B (40 MARKS)

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

6. An experiment was carried out whereby three healthy rats were fed on equal amounts of glucose. After half an hour, the glucose concentration per ml. of blood was measured at 15 minutes intervals for three hours. The following results were obtained.

Glucose conc. mg/ml	0 min	15 min	30 min	45 min	60 min	75 min	90 min
Rats							
A	0.800	0.774	0.715	0.680	0.650	0.595	0.555
B	0.745	0.695	0.695	0.660	0.635	0.600	0.545
C	0.795	0.695	0.665	0.635	0.590	0.550	0.495
Mean	0.780	0.720	0.691	-	0.625	-	0.532

(a) (i) Calculate the mean concentration of glucose in mg per ml of blood at 45 and 75 minutes. Record your answer on the table. (2 marks)

(ii) On the graph paper provided, plot a graph of the mean glucose concentration against time. (6 marks)

(iii) What was the mean glucose concentration in the blood after 37.5 minutes? (1 mark)

(iv) Give a reason why it was necessary to use three rats in the experiment instead of one. (1 mark)

(v) Why was the initial concentration of glucose in the rats not the same? (2 marks)

(vi) Account for the difference in mean glucose concentration during the period. (3 marks)

(b) Give **two** reasons why glucose is the main respiratory substrate. (2 marks)

(c) Give three ways in which glucose is assimilated in the body. (3 marks)

7. (a) What assumption are made when using the captured recapture method in estimating population of animals. (5 marks)

(b) Describe how you would use the capture – recapture method to estimate the population of fish in the school pond. (15 marks)

8. (a) Define natural selection. (2 marks)

(b) Natural selection brings about adaptation of a species to the environment. Discuss. (18 marks)

PAPER 3

1. The diagram below shows bones obtained from the same mammal.



(4 marks)

Name them

- 1.....
- 2.....
- 3.....
- 4.....

(b) Draw a diagram of the bones, arranged as they appear in the mammal from which they were obtained from. (3 marks)

(c) On your diagram indicate by naming the types of joints between the bones. (2 marks)

(d) (i) Give **three** adaptations of bone labeled 3 to its functions. (3 marks)

(ii) Give **three** adaptations of bone labeled 4 to its functions (4 marks)

2. You are provided with solution labeled **J**, use the reagents provided to test for the food substances.

(a) Use the iodine solution to test for the food substance in solution **J**.

- Food substance (1 mark)
- Procedure (1 mark)
- Observation (1 mark)
- Conclusion (1 mark)

(b) Use Benedict's solution to test for the presence of the food substance in solution **J**.

- Food substance (1 mark)
- Procedure (1 mark)
- Observation (1 mark)
- Conclusion (1 mark)

(c) Use DCPIP solution provided to test for the presence of the food substance in solution **J**

- Food substance (1 mark)

-
- Procedure (1 mark)

Observation (1 mark)

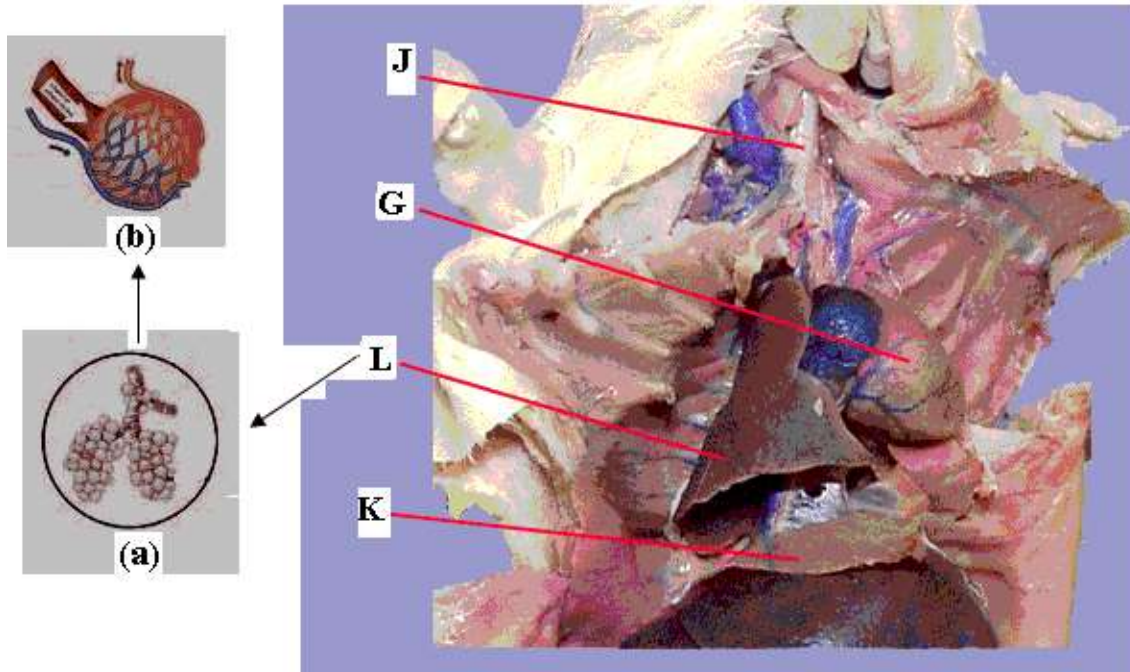
Conclusion (1 mark)

(d) When testing for non-reducing sugars explain the role of the following substances.

(i) Dilute hydrochloric acid. (1 mark)

(ii) Sodium hydrogen carbonate (1 mark)

3. Study photograph labeled **V** which is a display of internal organs of a small mammal. Photograph **F** is an inset of internal structure of part labeled **L**. Study them carefully.



Photograph F

Photograph V

(a) Name the part of the mammalian body where the organs shown in the photograph are found. (1 mark)

(b) Identify the organ system that consists of parts **J** and **L** in the photographs. (1 mark)

(c) (i) Name the parts labelled **J** and **K**. (2 marks)

(ii) Give the function of the part labelled **G**. (1 mark)

(d) State **two** adaptations of organ in **L** to its functions (2 marks)

(e) **F (a)** is an inset of the internal structure of part **L** showing the position of the functional units of **L**. One of these functional units is shown in the inset **F (b)**.

(i) Identify the functional unit shown in inset **F(b)** and give its function. (2 marks)

PAPER 1

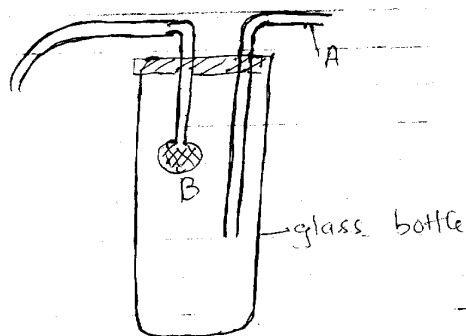
1. List down the external features that can be used to identify the following during classification (5mks)

a) Seed bearing plants

b) Moss plants

c) Insects

2. Below is a biology apparatus. Use it to answer the questions that follow below.



a) State the use of the point labeled

i. A

(1mk)

ii. B

(1mk)

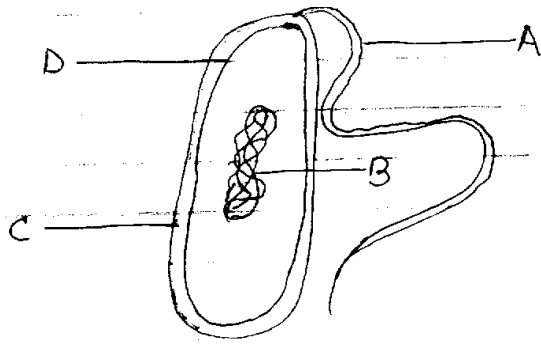
b) State the use of the whole apparatus

(1mk)

c) State one advantage of having the apparatus made of clear glass

(1mk)

3. The organism below was observed under a light microscope by form one students.



a) State the function of structures labeled A and D

A

(1mk)

D

(1mk)

b) Name structure C

(1mk)

c) State one difference between structure B and the nucleus of an animal cell. (1mk)

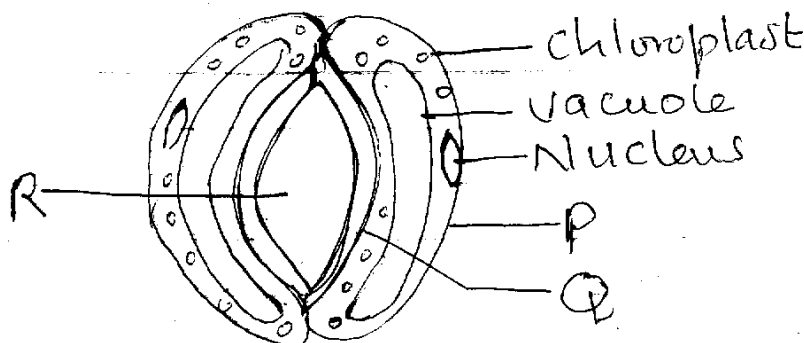
4. (a) State the function of a mirror in a light microscope

(1mk)

(b) Name three parts of a microscope that are held by the body tube.

(3 mks)

5. Below is a plant structure found in the leaves. Study the structure and answer the following questions



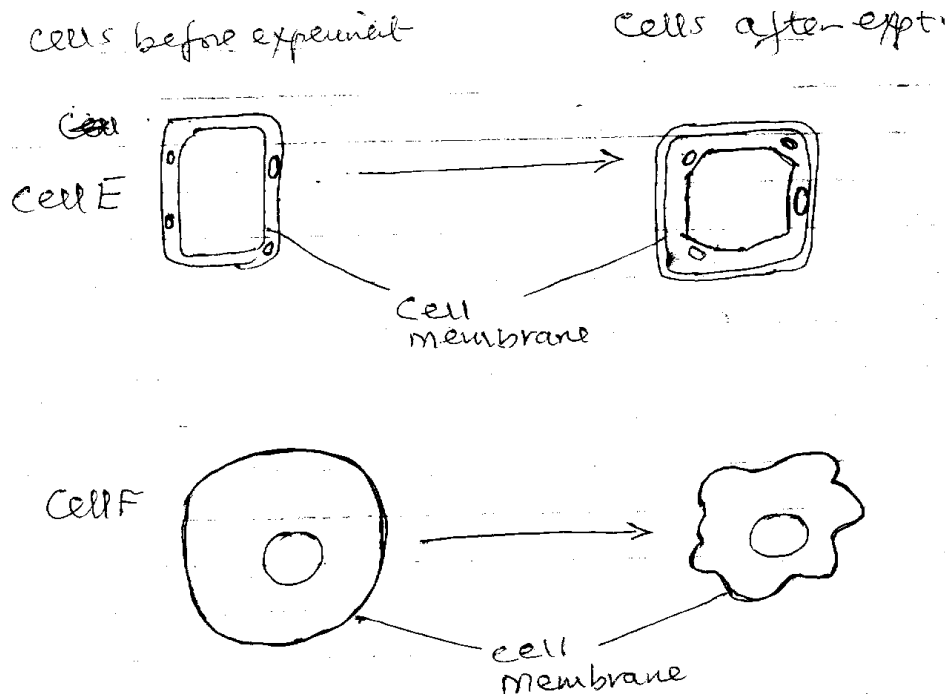
a) Name part labeled R

(1mk)

b) Explain the role of structure P and Q in the functioning of R

(3mks)

6. Two cells from different organisms were placed in similar solution. After 20 minutes the cells were examined under a microscope. Their appearances before and after the experiment are shown below.



a) State medium in which the cells were before the experiment

(1mk)

b) State the process through which cell E has gone

(1mk)

c) State one major difference between cell E and F

(1mk)

d) Explain what happened to both cell E and F during the experiment

(4mks)

7. (a) State three functions of carbohydrate in plants and animals

(3mks)

(b) Predict what would happen if the canine teeth of leopard are removed (2mks)

8. Explain the difference in pH in the human mouth, stomach and duodenum (3mks)

9. Name three classes of animals that excrete their nitrogenous waste products mainly in form of uric acid. (3mks)

10. (a) What is the meaning of the terms

i. Homeostasis? (1mk)

ii. Osmoregulation? (1mk)

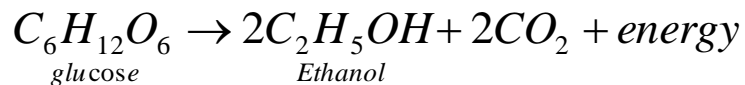
(b) Name the hormones involved in regulating glucose levels in the blood. (2mks)

11. State one use of each of the following excretory products of plants.

a) Tanin (1mk)

b) Papain (1mk)

12. A process that occurs in plants is represented by the equation below



a) Name the process above (1mk)

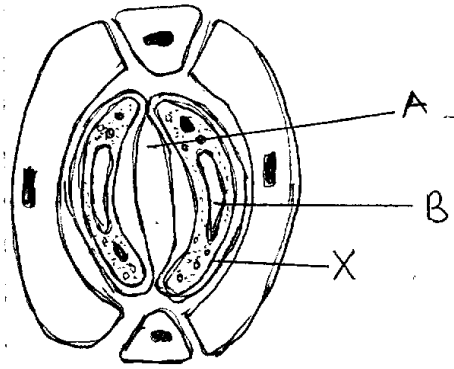
b) State the economic importance of the process named in (a) above (1mk)

13. Name the causative agents for the following respiratory diseases

a) Whooping cough (1mk)

b) Pneumonia (1mk)

14. Examine the diagram below and answer the questions that follow



a) Name the structures labeled A and B (2mks)

b) Give two adaptations of the cell labeled X (2mks)

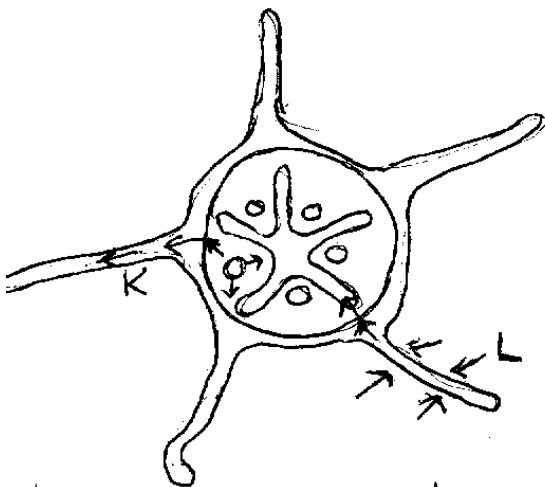
15. Name the following

a) Blood components involved in the blood clotting (1mk)

b) Vitamin involved in clotting (1mk)

c) Mineral involved in blood clotting (1mk)

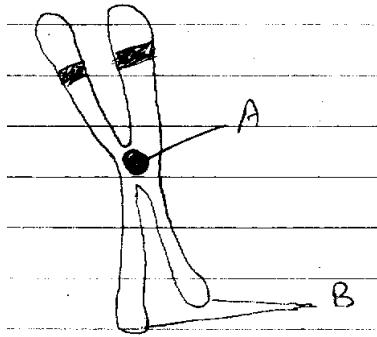
16. Below is an illustration of a cross section of a plant root showing the transportation of substances in the plant



- a) Name the substances transported along the paths labeled K and L (2mks)
b) Give a reason for your answer in L above. (1mk)

17. Differentiate between discontinuous and continuous venation. (2mks)

18.



a) Name and label part of a chromosome

A (1mk)

B(1mk)

19. (a) State the first law of heredity (2mks)

20. (a) What is mutation? (1mk)

(b) Name three causes of mutation (3mks)

21. Name the nucleic acid which contains the genetic information in the cell (1mk)

22. DNA is made up of a basic unit termed nucleotide. Name 3 units which make up the nucleotide (3mks)

23. State 3 advantage of genetic counseling (3mks)

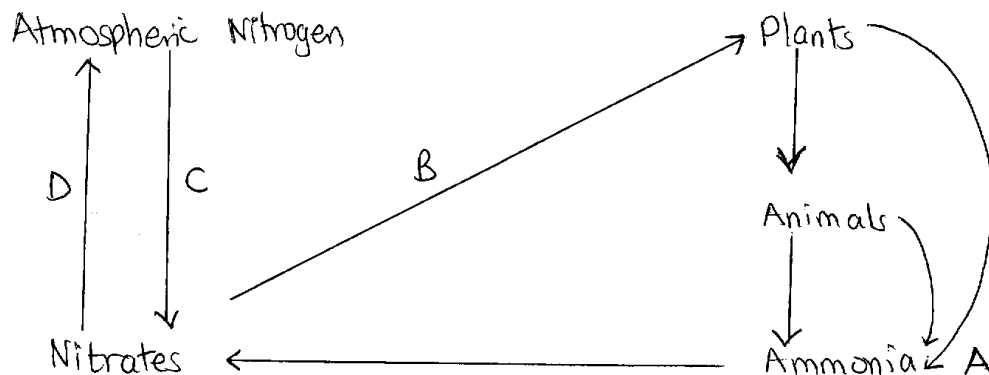
24. In terms of bases differentiate between DNA and RNA (1mk)

25. Distinguish between complete and incomplete dominance. (2mks)

PAPER 2
SECTION A

1. (a) Define the term Respiratory quotient in cellular respiration (1mk)
- (b) The equation below illustrated the breakdown of glucose in a cell and the respective products
 $C_6H_{12}O_6 + 6O_2 \rightarrow Energy + 6H_2O + 6CO_2$
- i. Calculate the respiratory quotient for glucose (2mks)
- (c) List down three way in which anaerobic respiration is useful to our country Kenya (3mks)
- (d) State the role of Cristae in a mitochondrion (2mks)
2. (a) Describe the term discontinuous variation as used in genetics. (1mk)
- (b) Name two examples of discontinuous variation in human beings (2mks)
- (c) A man who is blood group A married a woman who is blood group B, Their firstborn child was found to be blood group O. Explain using genetic crosses. (5mks)
3. (a) State the relationship between
- i. A bacteria and a root nodule of a legume (1mk)
- ii. A plant leaf and a phytophthora infestans fungi (1mk)

(b) The following chart illustrates a natural matter cycle. Study it and answer the questions that follow.



i. Name the process illustrated above.

(1mk)

(c) Name

i. The biological processes labeled

(2mks)

A

B

ii. Physical process labeled

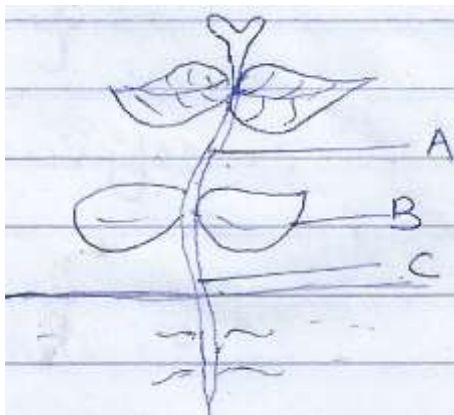
(2mks)

C

D

(d) Name an intermediate compound between ammonia and nitrates in the cycle. (1mk)

4. The diagram below shows a developing seedling



a) (i) Name the parts labeled A, B and C

(3mks)

(ii) Name the type of germination exhibited by the germinating seed?

(1mk)

- b) State the biological importance of each of the following environmental factors in seed germination
- i. Temperature of 39⁰C
 - ii. Oxygen
 - iii. Water
 - iv. Light

5. (a) State the mode of transmission of HIV/AIDS from the infected person (3mks)

(b) Suggest three effective ways of preventing HIV and AIDS transmission to uninfected persons. (3mks)

c) State the functions of each of the following (1mk)

- i. Seminiferous tubules

- ii. Oviduct (1mk)

SECTION B: (40 MARKS)

Answer questions 6 and any other question in this Section

6. In an experiment to determine the effect of ringing on the translocation of Sugar in phloem, a ring of bark from the stem of a tree was removed. The amount of sugar in grams per 10cm³ piece of the bark above the ring was measured at 3 hours interval. Sugar was also measured in the bark of the stem at the same height of a similar tree which was not ringed. The results are shown in the table below.

Time of day	Amount of Sugar in grams/10cm ³ piece of bark	
	Normal Stem	Ringed Stem
0700	0.48	0.48
1000	0.57	0.66
1300	0.70	0.90
1600	0.65	1.01
1900	0.56	0.90
2200	0.47	0.75
0100	0.40	0.56

- a) Using the same axis, plot a graph of the amount of sugar against time (6mks)
- b) What was the amount of sugar at 1430 in
- i. Ringed Stem (1mk)
 - ii. Normal stem (1mk)
- c) How much sugar would be in the normal stem if the experiment was continued for another 3 hours? (1mk)
- d) Give reasons why there was sugar in the stems of both trees at 0700 hours? (2mks)
- e) Account for the shape of the graph for
- i. Ringed Stem between 0700 hours and 1600 hours (3mks)
 - ii. Normal stem between 1300 hours and 0100 hour (2mks)
- f) Other than carbohydrates name three compounds that are synthesized by plants (3mks)
- g) Name the structure in phloem that controls translocation of manufactured food. (1mk)

7. (a) List down the characteristics of gaseous exchange structures/respiratory surfaces. (4mks)

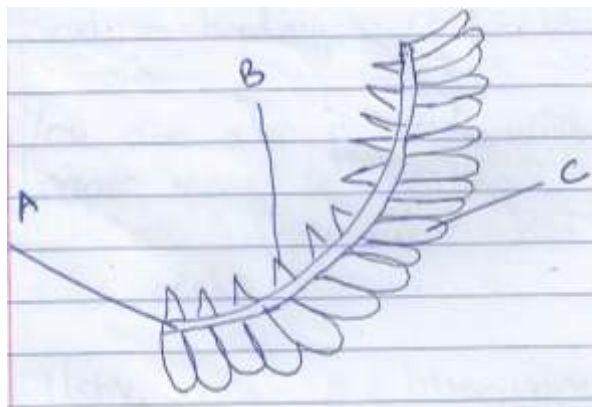
(b) Describe the mechanism of gaseous exchange in the gill of a named fish. (16 mks)

8. With reference to leaf morphology, anatomy and physiology. Only explain how each group of the following plants are adapted to their habitat.

- a) Xesophytes (12 mks)
- b) Hydsophytes (4mks)
- c) Mesophytes (4mks)

PAPER 3

1. The diagram illustrated the structure of a gill



- a) Name the structure labeled A, B and C and give their functions (6mks)
- b) In bony fish, water flows along the gill lamellae in a direction opposite that of the flow of the blood. Explain the importance of this. (4mks)
- c) In what ways are the structures labeled C adapted for their function (3mks)
- d) Give the class that the bony fish belong? (1mk)
2. You are provided with two unknown liquids S and X, Sodium hydrogen carbonate solution labeled W. You are also provided with iodine solution, a filter paper, a means of heating, test tubes, test tube holder, labels and test tube rack.
- a) Using only the filter papers provided, test for the food substances present in liquid S. Record as follows:
- | | |
|--------------|--------|
| Procedure | (2mks) |
| Observations | (1mk) |
| Conclusions | (1mk) |
- b) Label two test tubes A and B. Place about 2 cm³ of water into each of the two test tubes. Add 10 drops of liquid S into each test tube. To test tube A, add 10 drops of liquid W. Shake both test tubes and allow them to stand for two minutes.
- i. Record your observations
- | | |
|-------------|--------|
| Test tube A | (2mks) |
|-------------|--------|

Test tube B

(1mk)

ii. Name the process that takes place in test tube A (1mk)

c) A process similar to the one seen in test tube a also occurs in the mammalian digestive system

i. What is the importance of the process in digestion? (1mk)

ii. Name the digestive juice that is responsible for the process. (1mk)

iii. In what part of the body is the juice you have mentioned in (ii) above formed? (1mk)

iv. In what part of the digestive system does the juice you have mentioned in (ii) above act? (1mk)

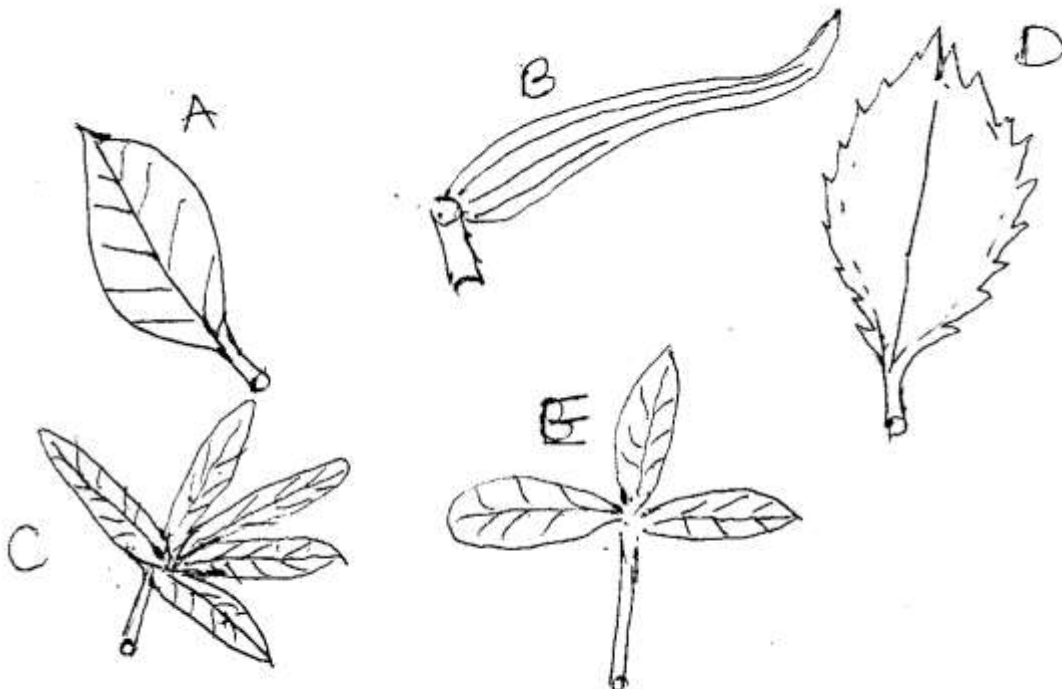
d) Label one test tubes C, Place about 2 cm³ of liquid X into each test tube. Add 2 drops of iodine into the test tube.

i. Record your Observation. (1mk)

ii. Suggest the identity of X (1mk)

3. Below are diagrams of 5 different leaves;

a) Using their characteristics contact a dichotomous key to classify them (8mks)



b) Write a summary of the steps followed to classify each in the table below (5mks)

Leaf	Steps
A	
B	
C	
D	
E	