GOLDLITE ONLINE SERVICES

Kenya Certificate of Secondary Education

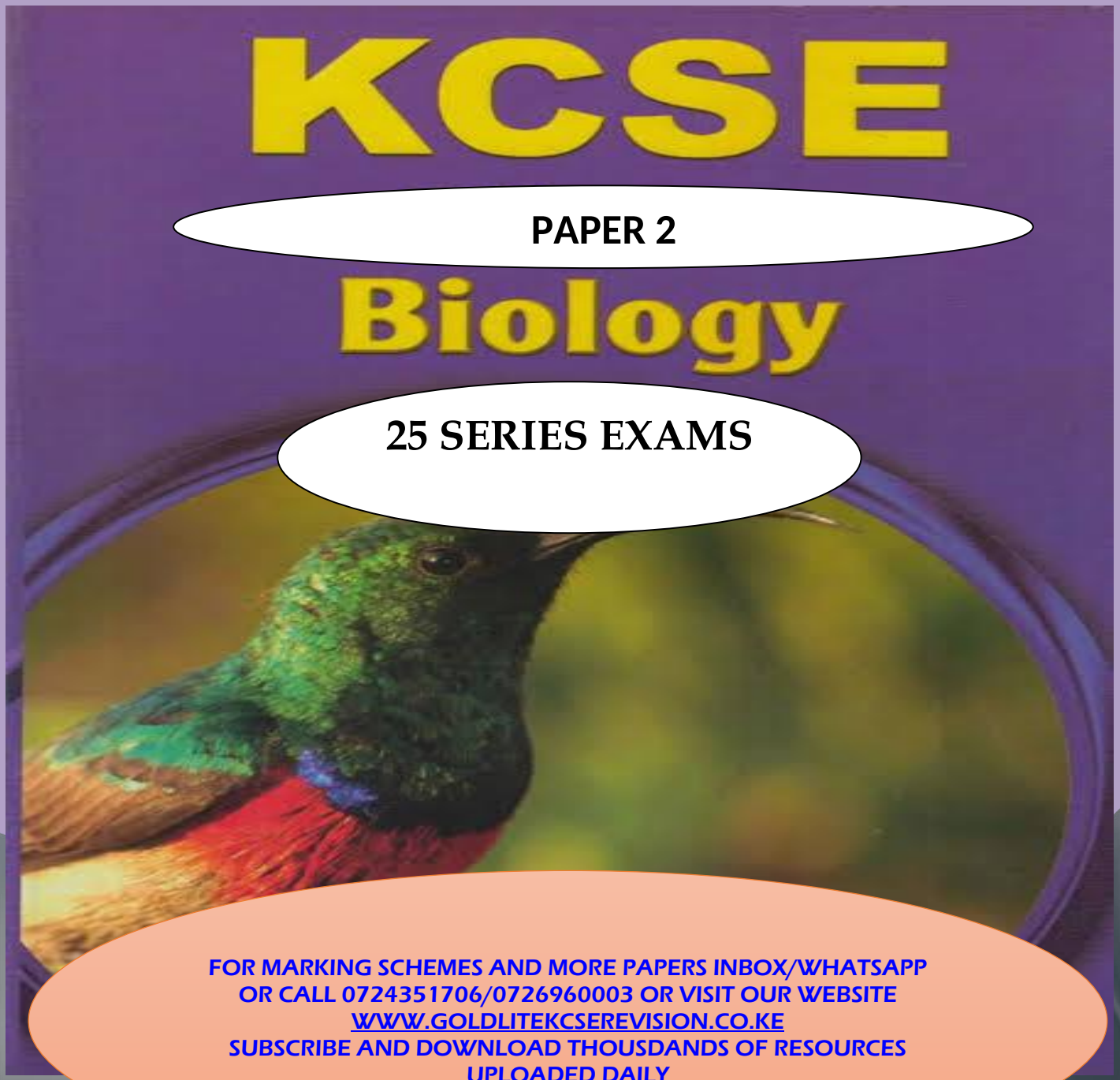
SMARTFOCUS QUICK REVISION SERIES 2025

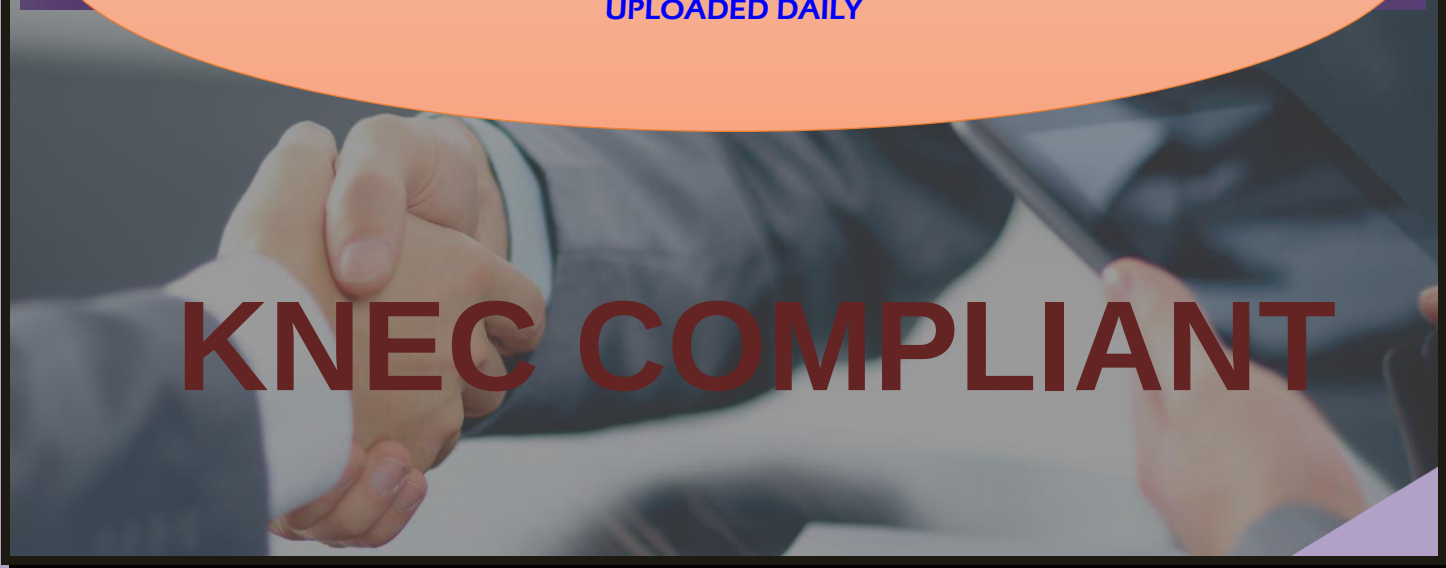
KCSE

PAPER 2

Biology

25 SERIES EXAMS





KNEC COMPLIANT

SERIES 1

Section A

*Answer **all** questions in this section*

1. Haemophilia is a genetic disorder caused by a recessive sex-linked gene. A phenotypically normal couple got a hemophiliac son.

(a) State the genotypes of the parents (2marks)

Father ……...

Mother …….

(b) Using a genetic cross, determine the genotypes of the couple's children (4marks)

(c) Explain why hemophilia is common in males than in females (2marks)

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2. Aplant physiologist studying the transport mechanisms in a particular plant species under different environmental conditions. He measured the rates of water uptake, nutrient absorption and sugar translocation in the xylem and phloem over 48 hours period. The data is summarized in the table below.

condition	Water uptake in mm/hr.	Nutrient absorption Mg/hr.	Sugar translocation Mg/hr.
Normal	15	8	12
High soil salinity	10	5	7
Drought condition	6	4	5

(a). Compare the rate of water uptake during normal conditions and during high salinity conditions (2marks)

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(b). Compare the rate of sugar translocation during normal conditions and during drought conditions (2marks)

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(c). suggest two physiological conditions that plants use to cope the drought conditions (2marks)

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(d)Name the physiological process involved in:

I. Water uptake (1mark)

……..

II.sugar translocation (1mark)

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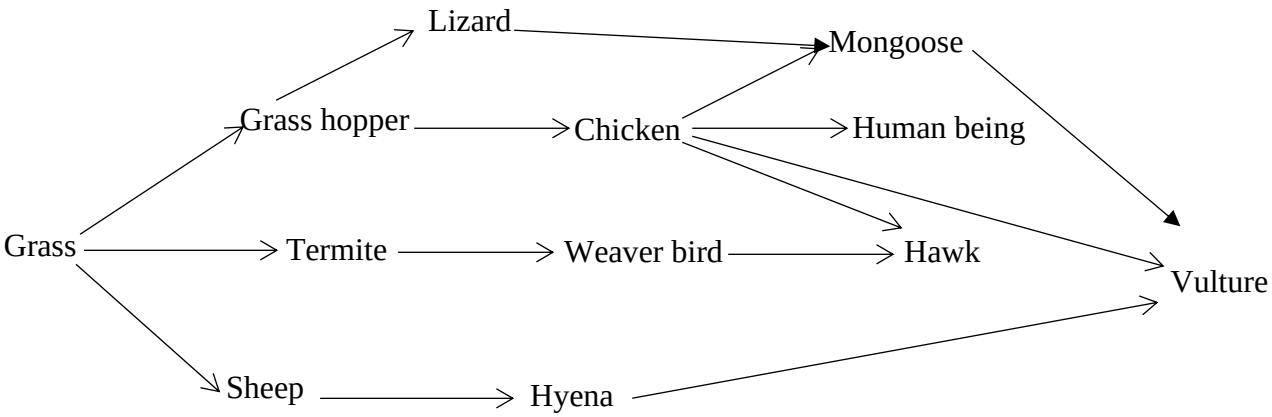
3. The diagram below shows a food web, study it and answer the questions that follow.



(a) Name the tropic level occupied by the following organisms. (2marks)

(i) Human being

……

(ii) Grass

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(b) (i) Identify the organism with the least biomass in this ecosystem. (1mark)

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(ii) Explain your answer in b(i) above. (2marks)

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(c) Name two ways a scientist would use to identify the type of food eaten by the various organisms in order to design the food web (2marks)

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(d) Extract a food chain with a quaternary consumer (1mark)

4. An experiment was carried out to examine the rate of respiration (breaths per minute). The data was collected from infants, children and adults and the data summarized in the table below

Age group in years	Rate of respiration (breaths /min)
Infants (0-1)	30-60
Children (5-10)	20-30
Adults20-30	12-20

a). Account for the trend in respiration rates from infancy to adulthood (2marks)

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b). Apart from age name two other factors that affect the rate of respiration (2marks)

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c) Explain how anaerobic respiration can be applied in making dairy products (2marks)

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d). Name the part of the brain that controls the rate of breathing (1mark)

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(e) Under what condition are proteins utilized as respiratory substrate (1mark)

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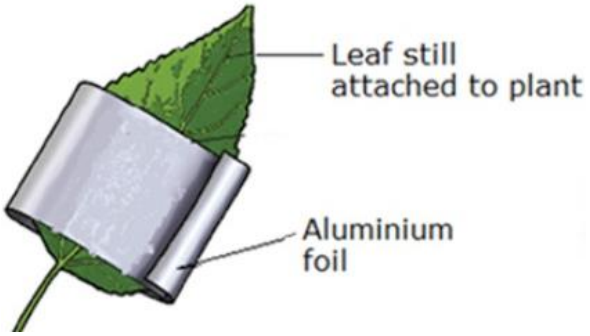
5. In an experiment to investigate a factor affecting photosynthesis, a leaf of a potted plant which had been kept in the dark overnight was covered with aluminum foil as shown in the diagram below. The set up was kept in sunlight for three hours after which a food test was carried out on the leaf



(a) Explain the purpose of this experiment? (1mark)

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b) What food test was carried out? (1mark)

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c)(i) State the results of the food test (2marks)

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(ii) Other than the factor being investigated above, State two other factors that increase the rate of the process studied (2marks)

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SECTION B

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

The following results were obtained from a study of germination and early growth of cowpeas (***Vigna unguiculata***). The grains were sown in soil in a greenhouse and at two days intervals. Samples were taken, oven-dried and weighed. Graph is shown below.

Time after sowing (days)	0	2	4	6	8	10	12
Dry mass of embryo (g)	0.02	0.02	0.08	0.16	0.24	0.34	0.35

a) Using a suitable scale, plot a graph of dry mass of embryo against time (6 marks)

b) Give the name of the type of curve you have obtained in 6 (a) above? (1mark)

……..

c) Explain why the rate of increase is low between day one and day three? (2 marks)

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d) State t**hree** reasons for the limited rate of increase between day nine and day eleven. (3 marks)

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e) Name a phylum whose growth does not take the shape of the curve drawn above. (1mark)

……

f) What name is given to the curve exhibited by organisms in the phylum you have named in (e) (i) above? (1mark)

……

g) What causes the behavior of the curve mentioned in (e) (ii) above? (1mark)

……

h) State **one** advantage of using dry mass instead of fresh weight in estimating growth of an organism. (1 marks)

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i) State the role of the following growth hormones in plant growth and development

i. Abscisic Acid (ABA*)* (2marks)

……

……

……

ii. Florigens (1 marks)

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……

7 (a). Describe the mechanism of inhalation in bony fish (10 marks)

(b). Describe the response of a young herbaceous plant to each of the following unidirectional external stimuli and for each give one significance. (10 marks)

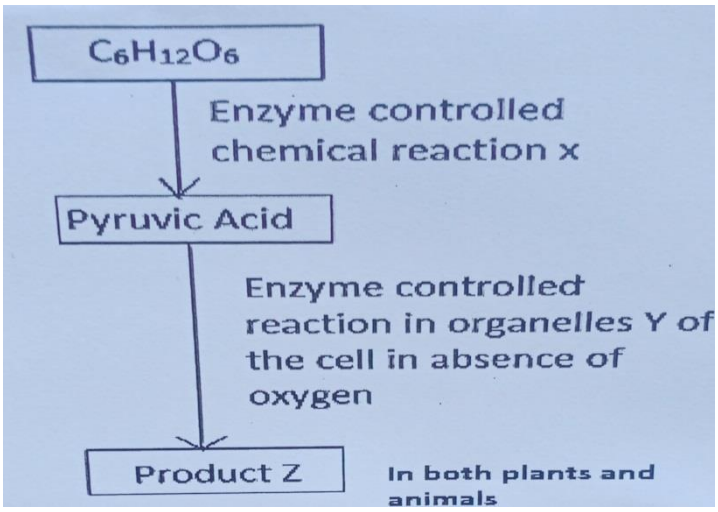
(i) Light
(ii) Contact

8. (a) Explain the role of the liver and pancreas in blood sugar regulation (10 marks)

(b) Describe the adaptations of halophytes to their habitats (10 marks)

SERIES 2
SECTION A(40 MARKS)

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. (1mk)

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

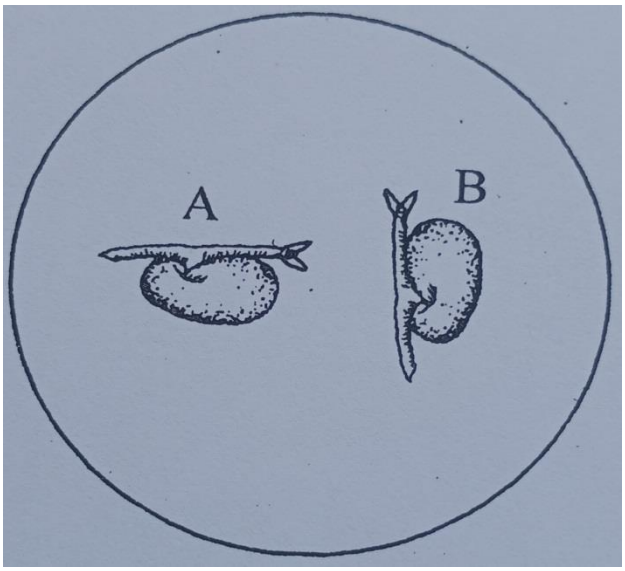
c) Name the product Z in:
   i) Plants (1mk)

   ii) Animals (1mk)

d) What would be the fate of pyruvic Acid if oxygen supply is availed in the mitochondria of an animal cell. (2mks)

e) What is meant by the term oxygen debt. (1mk)

2. A student set up an experiment as shown in the diagram below to investigate a certain phenomenon. The petri dish contained moist cotton wool. The set up was placed in darkness and left for 24 hours.



a) What is the aim of the experiment. (1mk)

b) State the expected results after 24 hours. (2mks)

c) Account for the results you have stated in (b) above. (5mks)

3. (a) Give an example of vestigial structure in humans. (1mk)

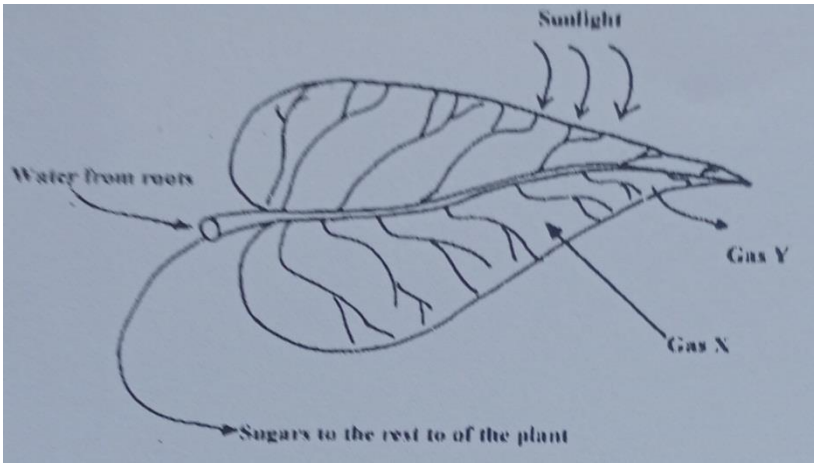
(b) State three evidences of organic evolution. (3mks)

(c) The peppered moth (Biston betularia) exists in many parts of England. It normally rests on barks of trees. It exists in two major forms; a normal or wild type which is speckled white and mutant variety which is darker (melanic form). Before industrialization almost all the peppered moth in England were of white variety. After 1840s the population of the melanic form increased rapidly especially around the industrial cities. The white form dominated in the rural (non-polluted) areas.
i) Discuss why the lighter (non melanic) form was dominant in rural (non-pollued) areas. (1mk)

ii) What factors could have led to the differences in population size of the two variety in the two areas. (2mks)

(d) Distinguish between homologous and analogous structures. (2mks)

4. The following diagram of a leaf shows what happens in a plant leaf during photosynthesis;



a) Name the gases labeled X and Y (2mks)
X

Y

b) Give two ways in which leaves are adapted to absorb light. (2mks)

c) Name the tissue that transports water into the leaf and sugars out of the leaf. (2mks)

d) Explain why it's an advantage for the plant to store carbohydrates as starch rather than as sugars. (2mks)

5. (a) What are sex linked genes. (1mk)

(b) A normal woman and a haemophiliac man have a family. Using a punnet square and letter H for normal blood clotting, determine the possible phenotypes of their offsprings. (5mks)

(c) Other than haemophilia give two examples of sex-linked traits. (2mks)

SECTION B:

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

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

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

a) On the grid provided, plot, graphs of glucose level in blood against time on the same axes. (7mks)

b) What was the concentration of glucose in the blood of X and Y at the 20^{th} minute. (2mks)

c) Suggest why the glucose level in the person X stopped rising after 30 minutes while it continued rising in person Y. (3mks)

d) Account for the decrease in glucose level in person X after 30 minutes and person Y after 60 minutes. (3mks)

e) Name the compound that stores energy released during oxidation of glucose. (1mk)

f) Explain what happens to excess amino acids. (4mks)

7. (a) Describe how gaseous exchange takes place in terrestrial plant. (10mks)

   (b) Describe the mechanism of gaseous exchange in a mammal. (10mks)

8. Explain how abiotic factors affect plant. (20mks)

SERIES 3

1. A Pure – line pea plant with green pods was crossed with a pure – line plant with yellow pods. All F_1 plants had green pods. The F_1 plants were selfed and out of 1160 F_2 plants, 856 had green pods and 304 had yellow pods.

   a) i) Identify the dominant and the recessive genes. (1mark)

.....

.....

   ii) Using letter ***G*** to represent dominant gene and ***g*** to represent recessive gene, work out the phenotypic ratio of the F_2 generation. (3marks)

   b) Showing your working, state the number of plants with; (3marks)

   i) Recessive genes;

.....

   ii) Dominant genes;

.....

.....

   iii) Heterozygous genes;

.....

.....

c) i) What is sickle cell Anemia? (1mark)

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   ii) State one problem faced by people suffering from sickle cell anemia? (1mark)

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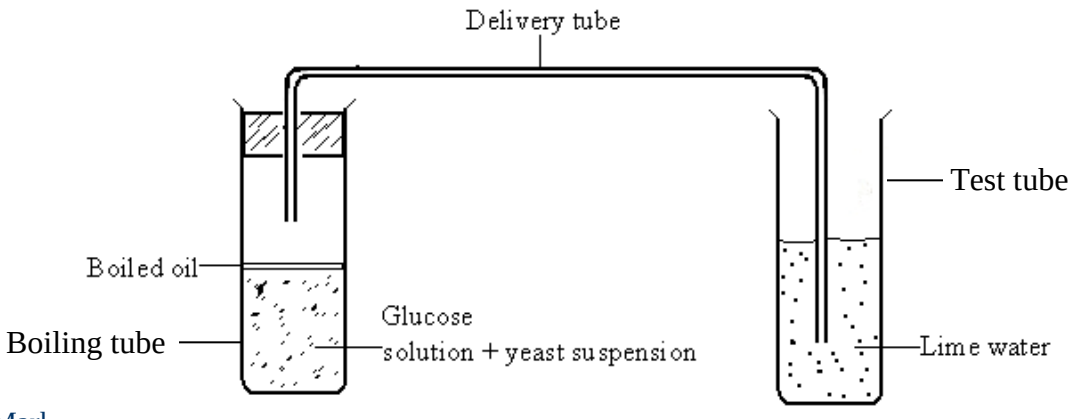
2. (a) Examine the diagram which shows a set used to demonstrate a certain process.



(i) State the aim of the experiment. (1 mark)

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..……..

(ii) Why was it necessary to boil the glucose solution before adding the yeast suspension? (1 mark)

……

..……..

(iii) Why was it necessary to cool the glucose before adding the yeast suspension? (1mark)

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..……..

(iv) Why was the oil layer added? (1 mark)

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..……..

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(v) Write down the equation for the chemical reaction that took place in the boiling tube (2 marks)

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(vi) State the observations made in the test tube after 45 minutes (2 marks)

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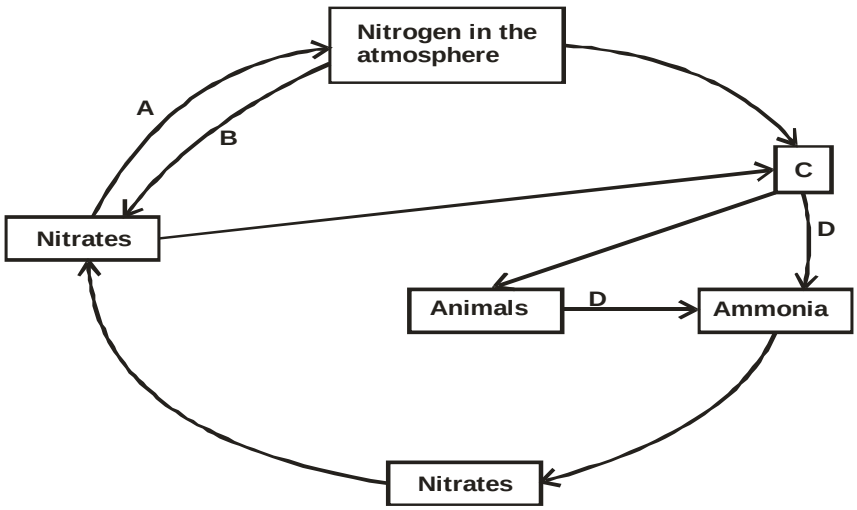
3. The diagram below represents a simplified nitrogen cycle.



a) Name the group of bacteria represented by: (2 marks)

A ……...……

B ……...……

i) Name the group of organisms represented by C. (1 mark)

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...……..

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ii) Give the reasons for your answer in b (i) above. (2 marks)

……

...……..

……

b i) Define the term nitrification. (1 mark)

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...……..

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ii) Explain how excessive use of pesticides will affect nitrification. (2 marks)

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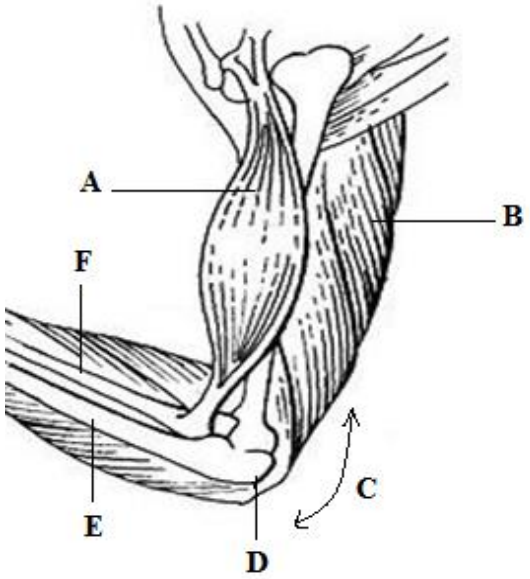
4. Study the diagram below and answer the questions which follow.



(i) Identify the muscle represented by letters A and B (2 marks)

A……

B……

(ii) Describe how muscles A and B cause straightening of joint C (2 marks)

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……

b) Name the joint C (1 mark)

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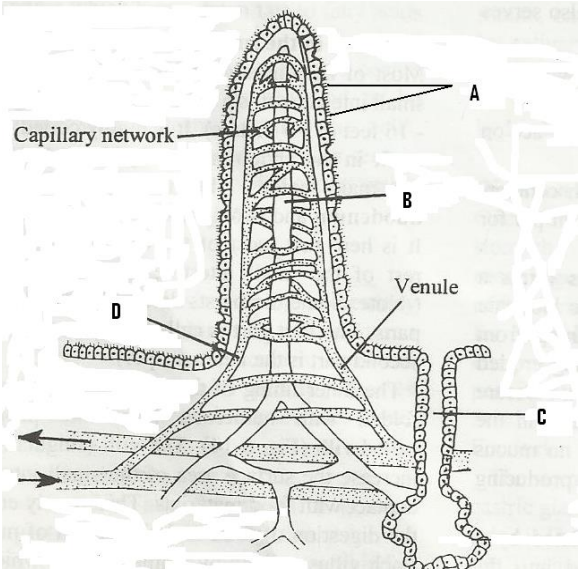
c) Name parts label D, E and F (3marks)

D……

E……

F……

5. The figure below represents a structure obtained from the ileum of a mammal.



a) Give the identity of the structure. (1 mark)

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……..

b) What is the importance of the structure named in (a) above? (1 mark)

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……..

c) Name the parts labeled A, B and D. (3 marks)

A……

B.....……

D.....…….

d) (i) Name the juice secreted by the part labeled C. (1 mark)

…….....……

…….....……

(ii) List **two** enzymes present in the juice named in d (i) above. (2 marks)

……...

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SECTION B (40 MARKS)

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

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 (hrs)	6	8	10	12	14	16	18	20	22	24
Carbon (IV) Oxide consumption mm^3/min	0	43	69	91	91	50	18	0	0	0
Carbon (iv) oxide released mm^3/min	38	22	10	3	3	6	31	48	48	48

a) On the same axes, draw the graphs of volume of carbon (IV) oxide consumed and released against time (7mks)

b) Name the biochemical process represented by

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

……

..……..

(ii) Carbon (iv) oxide release (1mark)

……

..……..

c) Account for the shape of the curve for

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

……

..……..

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..……..

ii) Carbon (IV) Oxide release. (3marks)

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..……..

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..……..

d) i) From the graph state the time of the day when the plant attains compensation point (1mark)

……

..……..

ii) What is made by compensation point? (2marks)

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……..

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

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7. a) i) State **two** significances of transpiration. (2 marks)

ii) Discuss the forces involved in movements of water from roots to the leaves. (8 marks)

b) Describe the mechanism of opening and closing of stomata using photosynthesis theory. (10 marks)

8. a) State four characteristics of gaseous exchange surfaces (4marks)

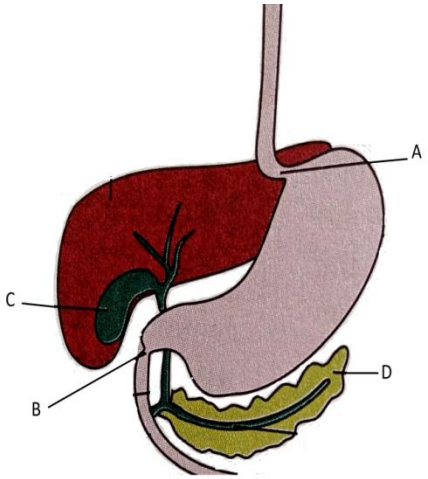
b) Describe the mechanism of gaseous exchange in a named mammal (16marks)

SERIES 4

SECTION A (40 marks)

Answer all the questions in this section in the space provided

1. The diagram below represents the digestive system of man and the associated organs



a) Identify structure labeled C. (1 marks)

……

b) What is the significance of the structure labelled C above (2 marks)

…..……

……

c) Explain digestive and hormonal function of structure labelled D (4 marks)

…..……

……..

d) State significance of structures labelled A (1 marks)

…..……

……...

2. a) What characteristics do gills of fish and mouth cavity of frog have in common that enable them to be efficient in gaseous exchange. (3 marks)

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b) Describe the change that occur to the rib cage and the diaphragm during inspiration (3marks)

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……..……

a) Why is it advisable to breath in through the nostrils and not mouth (2 marks)

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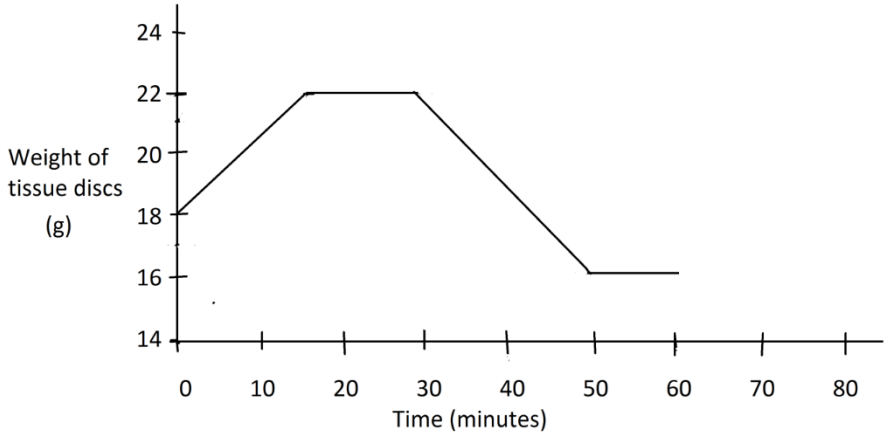
…….

3. In an experiment, some discs cut from living potato tuber tissue were placed in distilled water for 30minutes the discs were then placed in concentrated sucrose solution for another 30minutes.

- At regular intervals of time the discs were out of the liquid ,dried, weighed and replaced in the liquid
- The Results obtained from the experiment are as shown in the graph below



Explain the state of the cells of tissue discs at:

(i) A (2 marks)

……

B (2 marks)

……

(ii) Work out the change in weight between A and B (1marks)

……

……..

(iii) Name the process which brings about change C -D (1marks)

…….

(iv) Name the process which brings about the change in weight (1marks)

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……

(v) Why is it possible for this process to occur? (1marks)

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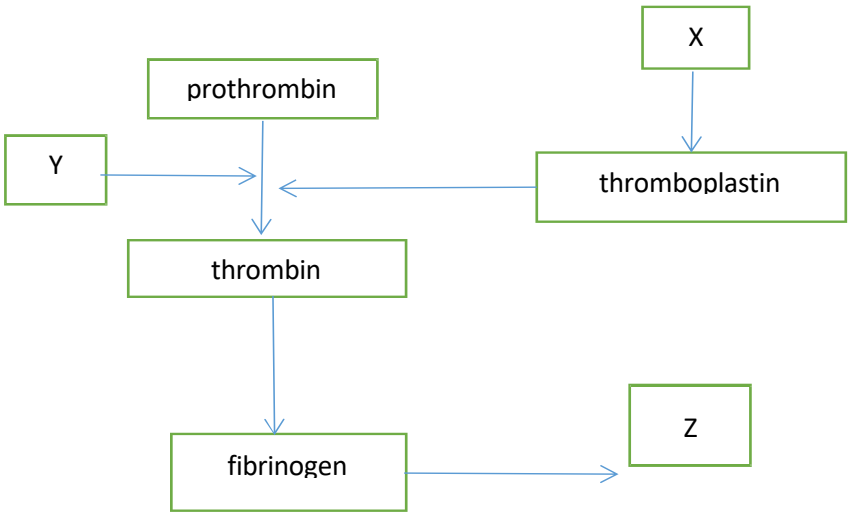
4. The chart below is a summary of the blood clotting mechanism in man



(I) Name

(i) The blood cell X..... ……. (1marks)

(ii) Metal ion Y..... …… (1 marks)

(iii) End product of mechanism represented by Z. (1marks)

….……

(II) Blood samples were taken from groups of people leaving at different altitudes and then numbers of red blood cells in each man of blood was calculated

-The results of this survey are as shown in the table below

Height above sea level	**Red blood cells(per mm^3 of blood)**
0	5,000,000
400	5,750,000
1500	6,500,000
1800	7,000,000
4400	8,000,000

Account for the number of red blood cells per altitude (3marks)

….……

……

……

(III) How does the skin prevent entry of micro-organisms into the body (1mark)

….……

……

(IV) Name the type of cells that destroy micro organisms in the human skin (1mark)

….……

…….

5. When the offspring of pea plant having green pods and pea plant having yellow pods were crossed, they produced green pods and yellow pods in the ratio 3:1. Using letter G to represent the gene for green pods

(a) State genotype of:

(I) Parents ..... ….. (2marks)

(ii) F1 generation ..... (1marks)

(b) Work out the cross between plants in the F 1 generation (4 marks)

(c) Account for the colour of the pods in plants of the F 1 generation (1marks)

….……

SECTION B(40mks)

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

6. The table below shows the results obtained from an experiment carried out to measure the rate of photosynthesis at different light concentrations (brightness) and varying carbon (IV) oxide concentrations. The rate was determined by counting the number of bubbles of oxygen produced per minutes

CO_2 concentration		0%	0.3%	0.6%	0.9%	1.2%	1.5%	1.8%
Light intensity	1,500 lux	0	16	30	38	40	40	40
	6,000 lux	0	52	80	96	100	98	100
	10,000 lux	0	80	100	115	120	122	120

(a) On the same axes ; plot graphs of rate of photosynthesis against carbon (IV) oxide concentration (3marks)

(I) What is the effect of increasing light intensity on the rate of photosynthesis. (3marks)

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(II) How does carbon (IV) oxide concentration affect the rate of photosynthesis (3marks)

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(III) State two other factors other than carbon (IV) oxide concentration and light intensity that will affect the rate of photosynthesis (2marks)

…..

…….

b) Distinguish between photosynthesis and chemosynthesis (2marks)

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7. (a) Differentiate between primary growth and secondary growth (2marks)

(b) Describe how region of growth in roots can be determined (7marks)

(c) Describe secondary growth in dicotyledonous plants (11marks)

8. a) Differentiate between simple reflex action and conditional reflex action (3marks)

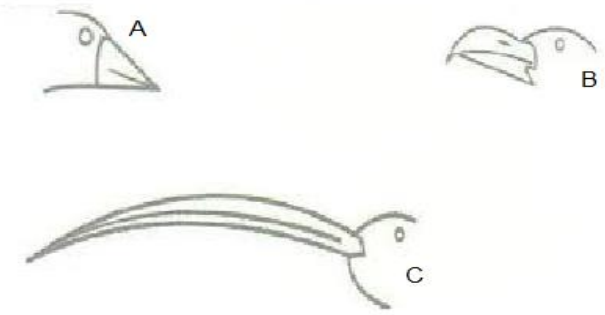
a) Using relevant examples ,describe a simple reflex action (13marks)

C) Describe the resting potential with reference to transmission of an impulse (4mark

SERIES 6

SECTION A (40 MARKS).Answer all questions

1. The diagrams below show beaks of various birds. Study the diagrams and answer the questions that follow.



(a)Name the;

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

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ii) The type of structures represented by the diagrams (1mark)

……..

b)i) Using Darwin's theory of evolution, explain how the beak of bird C would have evolved (3mks)

……

……

ii) Explain how Lamarck could have explained the evolution of beak of bird B (3mark)

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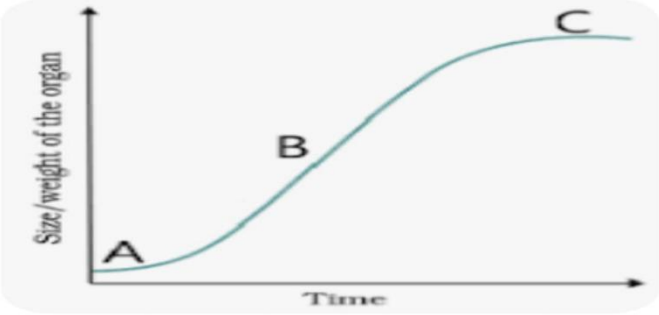
2. The diagram below shows a growth curve of an organ from a certain organism. Study it then use it to answer the questions that follow.



a) Identify the growth curve (1mk)

……

b) State the Phylum from which the organism belongs (1mk)

……

c) Explain the phenomenon that occurs at points

A (2mks)

……

B (2mks)

……

d) State two factors affecting growth in plants (2mks)

……

……

3. A rhesus positive man marries a rhesus positive woman and one of their children happens to be rhesus negative.

(a) work out the possible genotypes of the two parents (1mark)

(b) the rhesus negative daughter of the above couple is married to a rhesus positive but carrier man. work out ;

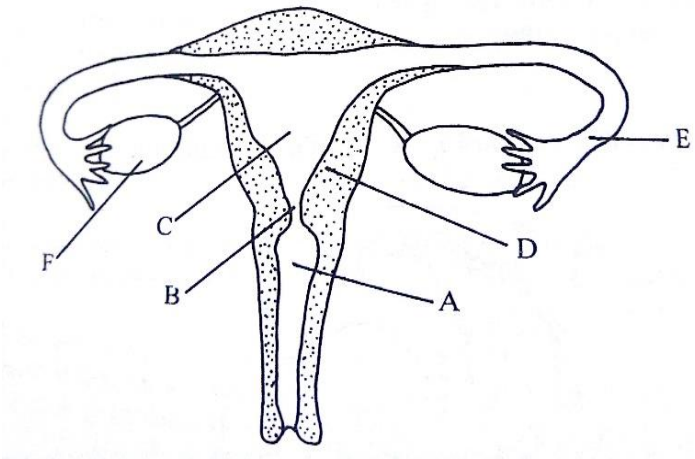
(i) The phenotypes of their offspring (4marks)

ii) The genotypic and phenotypic ratio of their offspring (2mark)

(c) Name the condition that the first offspring in the genetic cross in (b) above will suffer from (1mk)

……

4. The diagram below represents a female reproductive system.



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

……

(b) Identify the letter representing the organ where fertilization takes place (1mark)

……

(c) Name the hormones produced by the part labelled F (2marks)

……

……

……
……

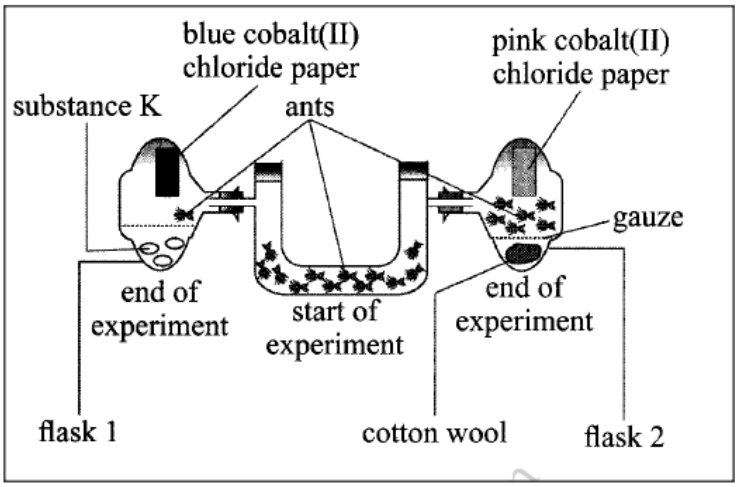
(d) Explain how an ovum moves along the labelled E (2marks)

……
……

(e) Explain why if the parts labelled F are removed after the fourth month, pregnancy can proceed normally.(2marks)

……
……
……

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



a) Name the type of response the experiment was investigating (1mark)

……

b) Name two other types of responses that are shown by animals in relation to stimuli (2mks)

……
……
……

c) State the likely identity of substance K (1mark)

……

d) Explain your answer in (b(i) above (2marks)

……
……
……
……

e) Account for the observations made in flask 2 (2mks)

……

……
……

SECTION B (40 MARKS)

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

6. The relationship between oxygen concentration and sugar consumption in isolated roots of sorghum was determined. The results are shown in the table below. The loss of sugar and potassium uptake are in arbitrary units.

% Oxygen concentration

	0	5	10	15	20	100
Sugar loss	15	20	42	45	45	48
Potassium gain	5	55	70	73	75	70

(a) Plot graphs of sugar loss and potassium gain against percentage of oxygen concentration in the same axis. (8mks)

(b) Name the process by which potassium is taken in by root hairs. Give reasons for your answer.

Process: (1 mk)

Reasons. (1mk)

(c) Account for the sugar loss and potassium gain at:

(i) 0% oxygen concentration. (2mks)

……

(ii) Between 5% and 20% oxygen concentration. (2mks)

d) Apart from oxygen concentration, give **two** other factors that are necessary for the above process. (2mks)

e) State **two** ways in which you can stop the above process from taking place. (2mks)

f)Name **two** main areas in the mammalian body where the above process is involved. (2mks)

……

7a) Describe the causes and effects of water pollution (10mks)

b) State the adaptations of the ileum to its functions (10mks)

8a) Describe the economic importance of plant excretory products (10mks)

b) Describe the mechanism of gaseous exchange in terrestrial insects (10mks)

SERIES 7

Section A (40 marks)

1. A group of students were investigating the number of water beetles in a pond. They caught 78 water beetles, marked and released them back into the pond. After 24 hours, they repeated the process and caught 91 water beetles, 26 of which were marked.

(a) Calculate the total population of water beetles in the pond. (3 marks)

……

……

……

(b) What precautions were taken during the investigation? (2 marks)

……

……

……

(c) In an attempt to clear a certain weed from a fish pond, a certain species of beetles was introduced into the pond.

(i) What name is given to this kind of weed control? (1 mark)

……

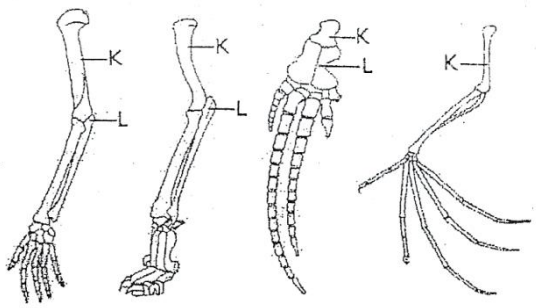
(ii) State **two** advantages of this type of control. (2 marks)

……

……

……

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



(a)(i) What type of structures is represented by the diagrams above? (1 mark)

……

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

……

……

(b) Name the type of evolution evidence illustrated above. (1 mark)

……

(c) Name the bones labelled **K** and **L**. (2 marks)

K ……

L ……

(d) Name the joint formed:

(i) At the anteriour end of bone **K**. (1 mark)

....……

(ii) At the posterior end of bone **K**. (1 mark)

……

(e) State the limitation of Lamarck's theory. (1 mark)

……

3. (a) What makes the cell membrane semi-permeable? (2 marks)

……

……

(b) Why is oxygen important in the process of active transport? (2 marks)

……

……

(c) Into a beaker containing distilled water, 10 crystals of potassium manganate (VII) whose colour is purple were added to the bottom of the beaker by means of a drinking straw. The purple colour rose up gradually and within 6 hours, the liquid had a uniform purple colour.

(i) Name the process by which the purple colour was dispersed. (1 mark)

……

(ii) State **two** ways through which the rate of dispersal of the purple colour could be increased. (2 marks)

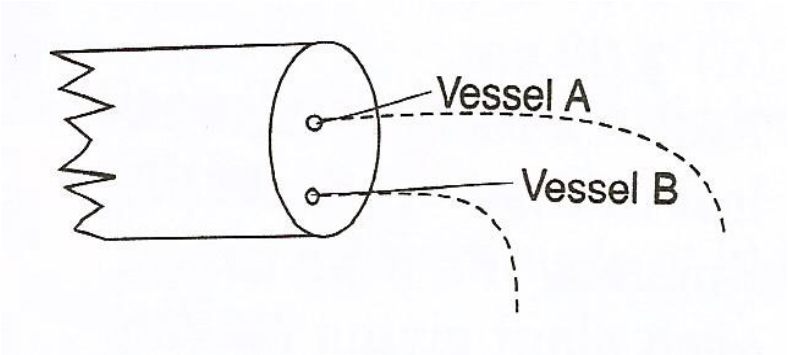
……

……

(iii) State the importance of the process under investigation in the breathing system of a student.

…… (1 mark)

4. In an experiment, a group of students severed the head of a rabbit. Two blood vessels released blood as shown in the diagram below.



(a) State **three** structural differences between vessel **A** and vessel **B**. (3 marks)

……

……

……

……

(b) What is the disadvantage of having an open circulatory system? (3 marks)

……
……
……
……
…….....
……
(c) Explain the advantage of having blood group AB. (2 marks)
……..
……..

5. In human beings, haemophilia is a sex linked trait that is caused by a recessive gene. A non-haemophilic couple had haemophilic children.

(a) Using letter **H** to represent the gene for normal blood clotting, work out the genotypes of the offspring. (4 marks)

(b) What is the probability of having a haemophilic son? (1 mark)
……

(c) Why are sex-linked traits more common in males than females? (1 mark)
……
……

(d) State **two** symptoms of Downs' syndrome (2 marks)
……

SECTION B (40 marks)

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

6. In an experiment, the energy required by persons of different sizes was determined. Their weights and the amount of energy their bodies used at rest were measured.
The results were as shown below.

Weight of individuals (kg)	**Amount of energy used per kg of body weight per day (kJ)**
5	300
15	200
25	150
35	130
45	115
55	105
65	100
75	95

(a) Using a suitable scale, draw a graph of the amount of energy used per kg of body weight against the weight of the individuals, (6 marks)

(b) From the graph, determine the amount of energy required by a person weighing:

(i) 20 kg ……. (1 mark)

(ii) 70 kg ……..… (1 mark)

(c) Account for the amount of energy required by individuals with smaller body sizes compared to those with larger body sizes. (4 marks)

……
……
……
……
…….....

(d)(i) How would the results differ if the experiment was to be repeated using reptiles instead of human beings? (1 mark)

…….....
……

(ii) Give reasons for your answer in (d)(i) above. (4 marks)

……
…….....

(e) Name:

(i) **Two** classes of food that provide energy to the body. (1 mark)

……

(ii) The nutrient whose lack in the human diet leads to bleeding gums. (1 mark)

……

7. (a) Explain the necessity for locomotion in animals. (4 marks)

(b) How are bony fish adapted to locomotion? (16 marks)

8. (a) What is meant by the following terms: (3 marks)

(i) Excretion,

(ii) Secretion,

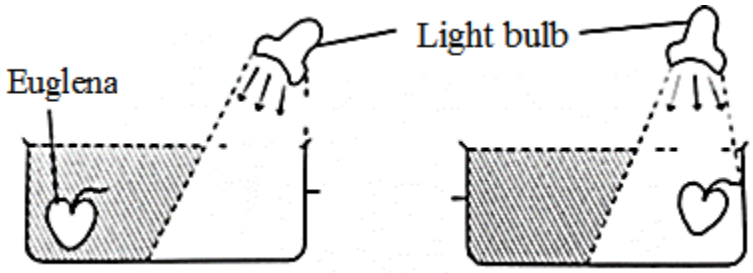
(ii) Egestion.

(b) Describe the formation and removal of urea from the human body. (17 marks)

SERIES 8

SECTION A (40MARKS)

1. In an experiment, Euglena was put in a petri dish. One side of the petri dish was illuminated and the other kept in the dark as shown below.



Start of the experiment **End of the experiment**

(a) Name this type of response. (1mark)

……..

(b) State the significance of this type of response in an organism. (1mark)

……...

……...

(c) Other than light, outline other two factors that may cause change of position in Euglena and state the respective type of response. (2marks)

……...

……...

(d) (i) If the above experiment was repeated using a young potted seedling, name the type of response which will be observed. (1mark)

……...

(ii) Explain the behavior of the seedling after 3days. (3marks)

……...

……...

……...

2. The equation below represents a metabolic process that occurs in a certain organ in the mammalian body.

Ammonia+ carbon (IV) oxide $\xrightarrow{\text{enzyme}}$ organic compound Q + water

(a) Name the process represented in the equation above. (1mark)

……...

(b) Name the organ in which the process occurs. (1mark)

……...

(c) Identify the organic compound Q. (1mark)

……...

……...

(d) Explain the source of ammonia in the organ named in (b) above. (2marks)

……...

……...

……...

……...

e) Outline three ways in which plants excrete nitrogenous wastes (3marks)

……...

……...

……...

……...

3. (a) In human, a certain rare sex linked recessive allele on X chromosome results in a change to the shape of iris. The condition is known as cleff iris. A woman with normal iris becomes pregnant by a man with normal iris. Their first born son had cleff iris. What are the chances that their fifth born son would have cleff iris. Use letter R for the dominant allele. (5marks)

(b) Other than using a test/back cross, name another method that can be used in determining unknown genotype. (1mark)

……...

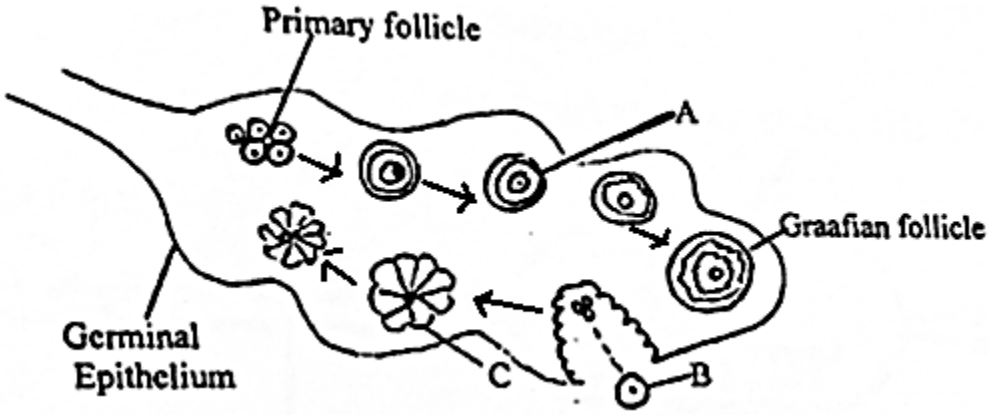
(c) State two importance of human genome project. (2marks)

……...

……...

……...

4. The diagram below shows a section through the human ovary. Study it and answer the questions that follow.



(a)(i) Which part of the ovary divides to form the primary follicle. (1mark)

……...

(ii) Which type of cell division is responsible for the production of primary follicles? (1mark)

……...

(b) Follicle stimulating hormone reaches the ovary so that part A begins to mature.

(i) Name the first hormone which is secreted by the ovary as result of arrival of FSH. (1mark)

……...

(ii) What is the role of this hormone in the menstrual cycle? (1mark)

……

(c) Structure B leaves the ovary.

(i) Where does structure B enter immediately after leaving the ovary? (1mark)

……...

(ii) Which hormone level peaks just before structure B leaves the ovary? (1mark)

……...

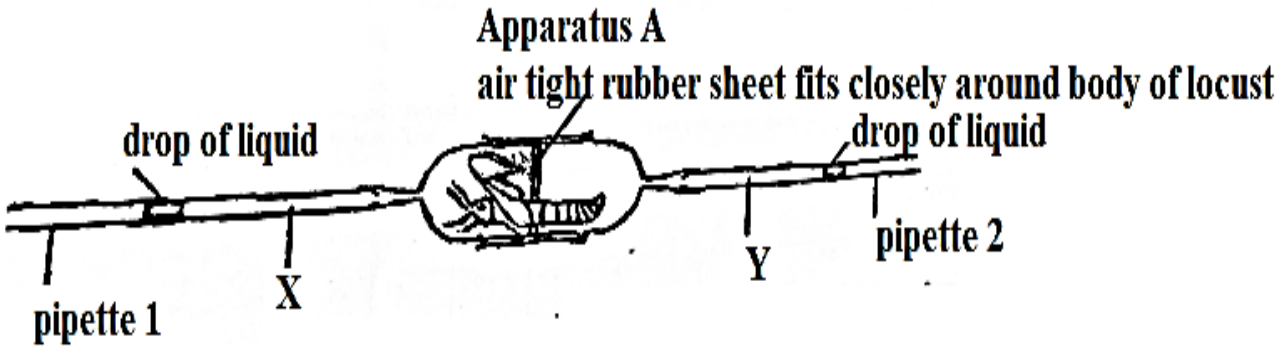
(d) Name structure C and State its role (2marks)

……...

……...

……...

5. (a) Some students investigated gaseous exchange in a locust. They set up the apparatus as shown below.



The drop of the liquid in the pipette 1 moves towards the locust while that in pipette 2 moves away from the locust.

(i) What does the direction of the movement of liquids suggest about the mechanism of gaseous exchange of the locust. (2marks)

……...

……...

……...

(ii) Account for the difference in concentration of carbon (IV) oxide in the air at points X and Y. (2marks)

……...

……...

……...

(b) Study the following data and answer the questions that follows.

Individuals	Breathing rates(breathe per minute)	Haemoglobin(g/100ml of blood)	Oxygen content (ml/100ml of blood)
A(normal)	15	15.1	19.5
B	21	8	13.7
C	12	17.9	22.1
D	22	16	14.1

(i) Which individual has recently moved from a low altitude area to high altitude area? Explain . (2marks)

……...

……...

(ii) Which individual is suffering from dietary iron deficiency? (1mark)

……...

(iii) Name part of the brain that controls breathing in humans. (1mark)

……...

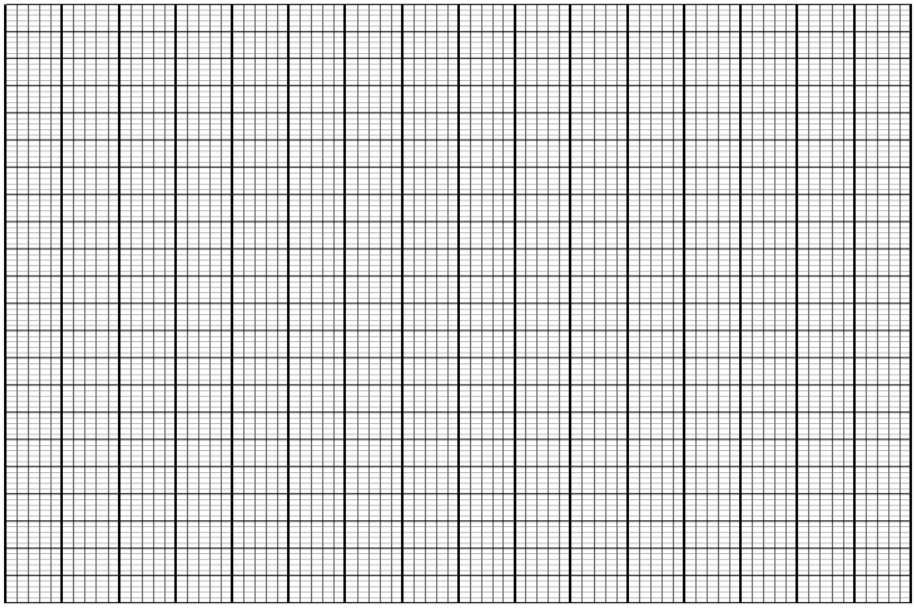
SECTION B (40MARKS)

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

6. The relationship between oxygen concentration, sugar consumption and potassium ion uptake in isolated wheat roots was determined. The results obtained were tabulated as shown below. The loss of sugar and potassium uptake or gain are in arbitrary units.

Percentage of oxygen concentration	0	5	10	15	20	30	100
Sugar consumption	15	20	43	45	45	44	43
Potassium ion gain	5	55	70	75	75	72	70

(a) Plot graphs of sugar loss and potassium ion gain against oxygen concentration on the same axes. (8marks)



(b)(i) Identify the process by which potassium ions are taken up by the roots. (1mark)

……...

……...

(ii) Give an explanation for your answer in b (i) above. (2marks)

……...

……...

……...

(c) Account for sugar consumption and potassium ions gain.

(i) at 0% oxygen concentration (2marks)

……...

……...

(ii) Between 5% and 20% oxygen concentration. (3marks)

……...

……...

……...

……...

(d) (i) State **two** ways by which the process involved in potassium uptake can be stopped. (2marks)

……...

……...

(ii) Name **two** organs in a mammalian body where the above process occurs. (2marks)

……...

……...

7. (a) Explain how endotherms respond to cold conditions in their environment. (10marks)

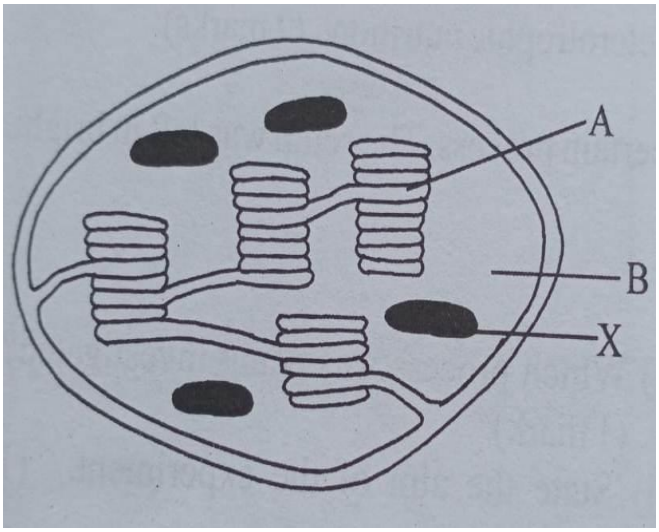
(b) Describe ways in which the human body protects itself against infections (10marks)

8. (a) State the processes involved in uptake of water and mineral salts from the roots to the leaves(4marks)

(b) Describe secondary growth in dicotyledonous plants (16 marks)

SERIES 9
SECTION A(40 MARKS)

1. The diagram below represents a plant cell organelle;



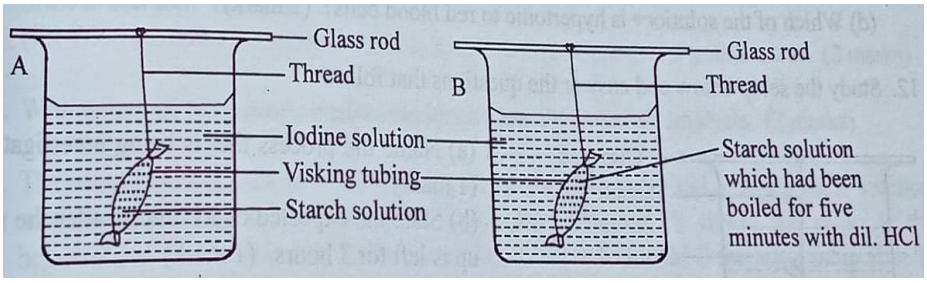
a) Name the organelle (1mk)

b) In which of the labeled parts does carbon(IV)oxide fixation occur? (1mk)

c) Name the parts labeled A and B and state how each is adapted to its function(4mks)

d) Explain what would have happened to the structure labeled X had the plant been kept in darkness for 48 hours (2mks)

2. A group of students set up an experiment as shown below. The experimental set ups were left for 20 minutes.



The observation after 20 minutes were as shown in the table below;

Set up	**Observations**	
	Inside tubing	Outside tubing
A	Blue black colour	Colour of iodine

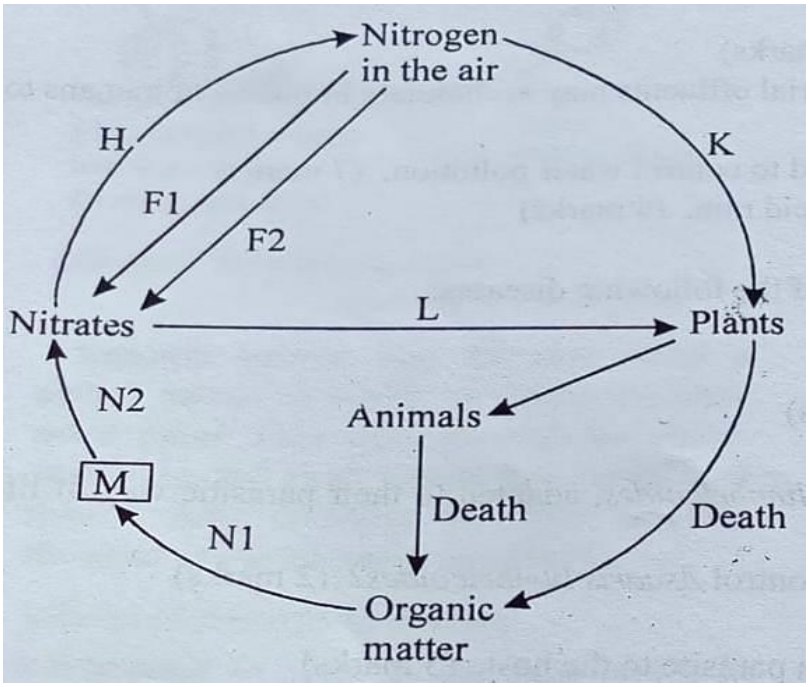
B	Colour of iodine	Colour of iodine

a) State the process being demonstrated in this experiment. (1mk)

b) Explain the results in set up A; (4mks)

c) Why was there no blue black colour inside the visking tubing in set up B; (2mks)

3. The diagram below represents the nitrogen cycle;



a) Name the process labeled; (2mks)
i) L

ii) N_1 and N_2

b) Name the organisms that convert M into nitrates. (1mk)

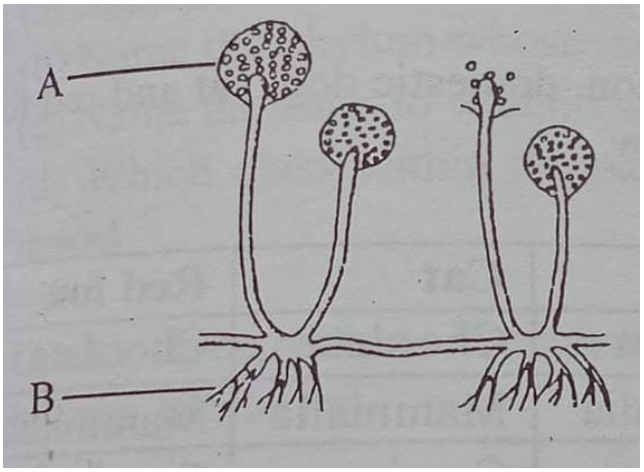
c) Name the organism in plants which promotes process K(1mk)

d) State the relationship between the organisms stated in (c) above and the plant;(1mk)

e) How would excess pesticides in the soil interfere with process K;(2mks)

f) If F_1 is nitrogen fixation by free-living bacteria, $F_2$is nitrogen fixation by what? (1mk)

4. The diagram below shows a mould of the genus Rhizopus;



a) Name the kingdom to which it belongs; (1mk)

b) Name the structures labeled A and B (2mks)

c) Give the functions of the structure labeled B (2mks)

d) How do the structures labeled B differ from plant roots(1mk)

e) Give two ways in which members of the kingdom you stated in (a) above are useful to man. (2mks)

5. (a) Name the two types of variations. (2mks)

(b) In a garden with pea plants, 625 plants had tall stems while 205 had short stems in the F_2 generation;
i) Work out the ratio of tall to short plants (give your answer correct to the nearest whole number) (1mk)

ii) Using letter T to represent the dominant gene, work out a cross between an F_1 offspring and a short plant. (4mks)

iii) What is the genotypic ratio from the cross in b (ii) above (1mk)

SECTION B:

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

6. An experiment was carried out to investigate transpiration and absorption of water in a certain plant species. The plants were potted and supplied with adequate water. The amount of water lost and absorbed was determined. The results are shown in the table below;

Time of the day	**Amount of water in grams**	
	Transpiration	**Absorption**
0700-0900	30	15
0900-1100	40	25
1100-1300	48	34
1300-1500	56	45
1500-1700	40	50
1700-1900	25	40
1900-2100	15	28
2100-2300	10	21

a) Using the same axes, plot graphs to show transpiration and absorption of water in grams against time of the day. (7mks)

b) At what time of the day was the amount of water the same for transpiration and absorption;(1mk)

c) Explain the shape of the graphs of:-
   i) Transpiration (3mks)

   ii) Absorption (3mks)

d) Suggest what would happen to transpiration and absorption of water if the experiment was continued for another 2 hours; (2mks)

e) Name two factors and explain how they would affect transpiration and absorption at any given time. (4mks)

7. (i) Describe the process of fertilization in flowering plant. (10mks)

   (ii) How is the human male reproductive system adapted to its functions? (10mks)

8. (i) Explain the methods of excretion in plants. (10mks)

   (ii) Explain how the nephron is adapted to its functions. (10mks)

SERIES 10

SECTION A (40 MARKS)

1.(a) Explain the role of the following organs in the digestion of food in a mammal e.g humans.

(i) Salivary glands (2marks)

……

……

(ii) Pancreas (2marks)

……

……

(b) Explain how beneficial it is for some herbivores being grazers and others being browsers. (2marks)

……

……

(c) What is the importance of roughage in the diet (2marks)

……

……

……

2a)The part of one DNA strand molecule was found to have the following base sequence **G-C-C-T-A-T-C-A-C**.What is the base sequence of:

i) The complimentary DNA strand. (1mark)

……..

ii) m-RNA strand copied from this DNA portion. (1mark)

……..

b) In maize the gene for purple colour is dominant to the gene for white colour. A pure breeding maize plant with purple grains was crossed with a heterozygous plant of the above traits.

i)Using letter **G** to represent the gene for purple colour,work out the genotypic ratio of the offspring. (4marks)

……

……

iii) State the phenotypic ratio of the offspring. (1mark)

……

c) What is meant by hybrid vigour? (1mark)

……

3.A student observed a feeding relationship while on a field study on an island.

- Small fish feed in sea grass.
- Eagles feed on small fish.
- Insect larvae and mollusks feed on sea grass.
- Insect larvae fed on by small fish while crabs feed on insect larvae and mollusks.

a) From the above information construct a food web. (3marks)

b) In which trophic level is mollusks found? (1mark)

……

c) Extract a food chain where the eagle is a tertiary consumer. (1mark)

……

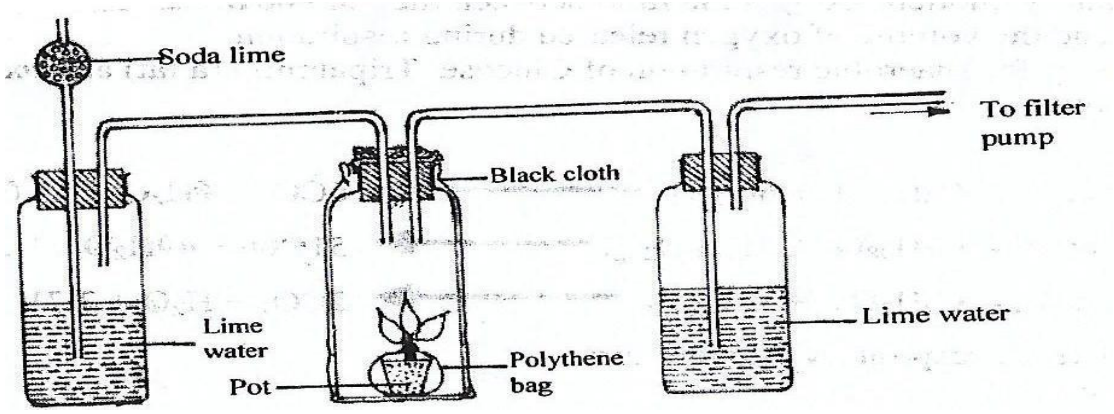
d) Suppose all the crabs were poisoned to death ,what would be the immediate effect in the ecosystem? Give a reason. (2marks)

……

e) State any **one** abiotic factor in an ecosystem. (1mark)

……

4.The diagram below illustrates an experiment to demonstrate certain aspect of respiration.



A B

a.i. State the aim of experiment. (1mark)

ii. What is the role of soda lime in the set up? (1mark)

……

iii. State observations made in vessels A and B (2marks)

iv.Account for the observation made in vessel B in (iii) above. (2marks)

……

v.Why is it necessary to enclose the pot with polythene bag? (1mark)

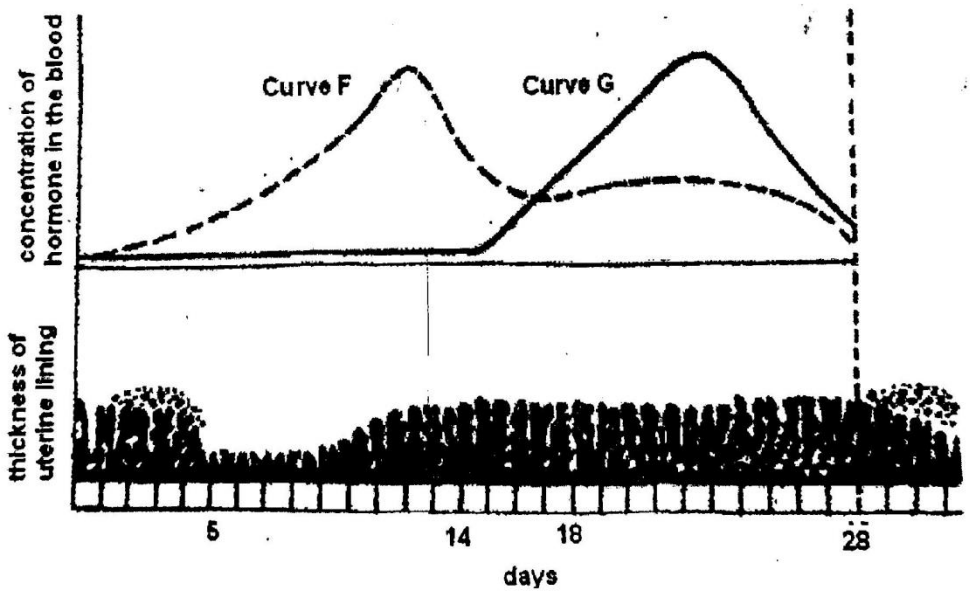
……

……

b. During aerobic respiration involving lipid as a respiratory substrate, 102 cm^3 of carbon (iv) oxide was produced. Determine the volume of oxygen that was used given that the respiratory quotient(RQ) was 0.71 (1mark)

……

5. The figure below shows changes that take place during menstrual cycle in human.



(a) Name the hormone whose concentrations are represented by curves F and G (2marks)

F……

G……

(b) State the effects of the hormones named in (a) above on the lining of the uterus. (2marks)

……

……

(c) (i) Name the hormone which is released by the pituitary gland in high concentration on the 14th day of the menstrual cycle. (1mark)

……

(iii) State two functions of the hormone named in (c) (i) above (2marks)

……

……

(d) Using the above figure, state the **fertile period** during the menstrual cycle . (1mark)

……

SECTION B

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

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

Time of the day	6am	8am	10am	12am	2pm	4pm	6pm	8pm	10pm	12am
Carbon (IV) oxide consumption I n mm/min	20	86	138	182	182	100	36	0	0	0
Carbon (IV) oxide released in mm/min	76	44	20	06	06	12	62	96	96	96

a)On the same axis on the grid provided ;plot graphs of volume of carbon (IV) oxide consumed and carbon (IV) oxide released against time. (7marks)

b) Name a biochemical process responsible for; (2marks)

(i) Carbon (IV) oxide consumption.

……

(ii) Carbon (IV) oxide released.

……

c)Account for the shape of the curve for;

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

……

……

(iii) Carbon (IV) oxide released. (3marks)

……

……

d)(i) Name the end-products of the light stage in photosynthesis. (3marks)

……

……

(ii) Explain how temperature affects the rate of a carbon (IV) oxide consumption in a plant. (2marks)

……

7(a) State any **five** functions of blood in mammals. (5marks)

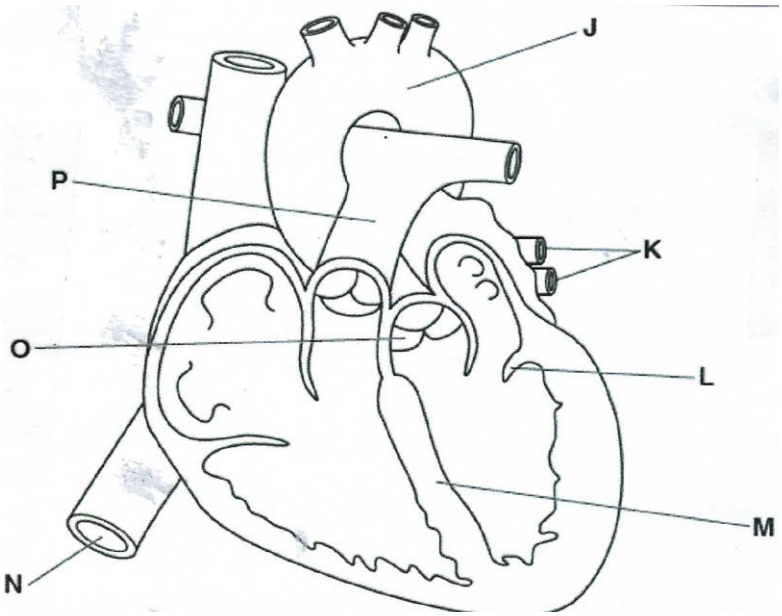
(b)Discuss the adaptations of the mammalian heart to its function. (15marks)

8. a) **Describe** the process of double fertilization in angiosperms. (15marks)

b) State any **five** changes in a flower after fertilization. (5marks)

SERIES 11

1.Study the diagram below and answer questions that follow;



a) Name the structures labelled O and M **(2 marks)**

O - .....

M - .....

b) Identify a letter in the diagram that represents blood with the highest concentration of carbon (iv) oxide **(1 mark)**

.....

.....

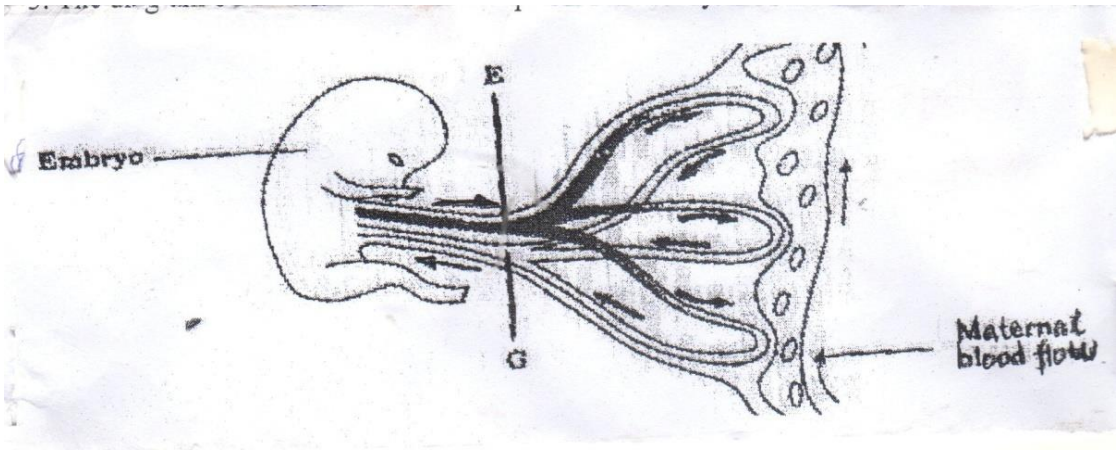
c) Describe how blood is moved by the heart from blood vessel k to blood vessel J. **(3 marks)**

.....

d)State two features of blood vessel K **(2 marks)**

.....

2. The diagram below shows exchange of materials between embryo's bloodstreams and mother's blood stream



(a) (i) Give the names of the parts labelled E and G

E. ..... **(1mark)**

G. ..... **(1mark)**

(ii) Name one substance that is in high concentration in E **(1mark**

(iii) In which organ does this kind of exchange shown occur? **(1mark)**

.....

(b) Suggest the biological significance of each of the following

i) Development of the pollen tube in fertilization in plants. **(1mark**)

.....

.....

ii)Fusion of petals to form funnel-shaped corolla tube in certain flowers. **(1mark)**

.....

.....

c)Give 2 advantages of cross-pollination over self-pollination. **(2marks)**

.....

.....

3. Form two students subjected an orange plant growing outside the laboratory to the following;

i) Selected two sized leaves and gently brushed them clean on both sides.

ii) Placed two strips of dry cobalt chloride paper on both sides of each leaf and opposite each other and covered the cobalt chloride papers with cello tape. They observed the time taken for any colour change to occur and recorded the following.

Side of leaf	**Upper epidermis**		**Lower epidermis**
Time taken	5 minutes		2 minutes

Use the above information to answer the following questions.

a.i) What was the aim of the above experiment. **(1mark)**

……

ii) What was the purpose of brush cleaning the leaf **(1mark)**

……

iii) What was the role of cello-tape in this experiment? **(1mark)**

……

……

b.i) What was the original colour of dry cobalt chloride paper. **(1mark)**

……

ii) What colour change did the students observe? **(1mark)**

……

c. Explain the difference in time taken for the colour change observed. **(3marks)**

……

……

……

4a). The diagram below represents a member of kingdom Animalia.

i)Name the phylum to which the organism belong. **(1mk)**

……

ii)Using observable features in the diagram, give **three** reasons for the answer in 4a (i) above**. (3mks)**

……

……

……

b. To estimate the population size of crabs in a certain lagoon, traps were laid at random. 400 crabs were caught, marked and released back into the lagoon on the first day. Four days later, traps were laid again at random. Out of the 374 crabs caught the second time, 80 were found to have been marked.

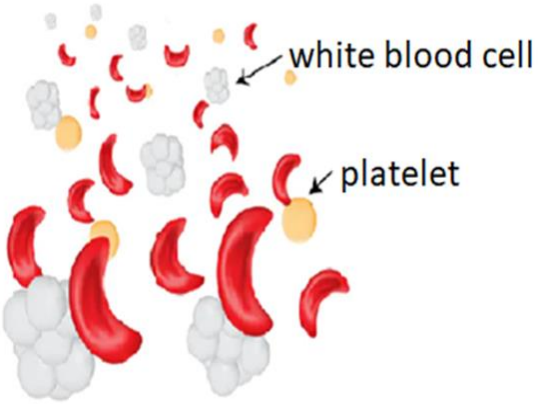
i) Calculate the population size of the crabs in the lagoon. **(3mks)**

ii)What is the name given to this method of estimating the population size? **(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? **(1mark)**

.....

(b) State one advantage and one disadvantage of the disorder exhibited in person A. **(2marks)**

……

.....

(c) Work out the genotype and phenotypes of the resulting offspring of a marriage between person A and B. Show your working **(5marks)**

.....

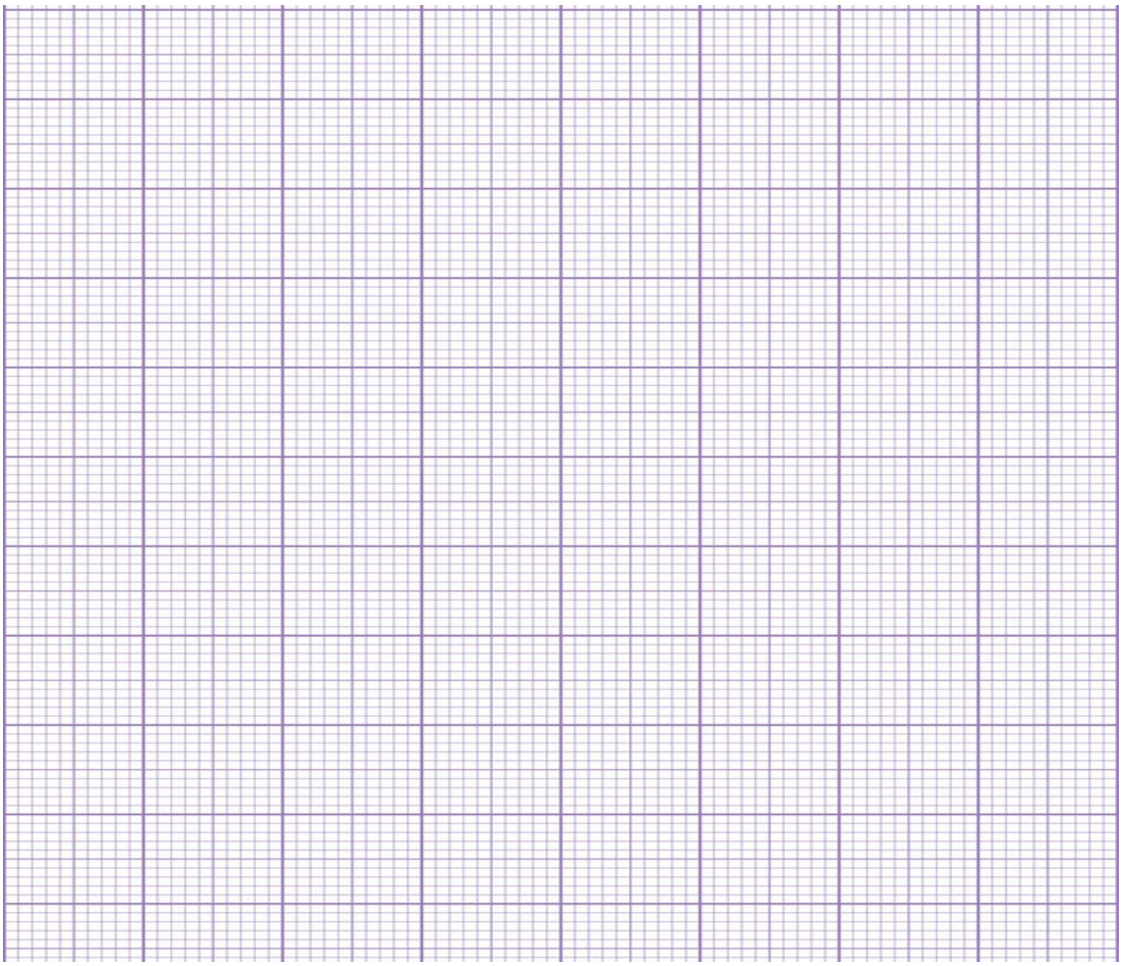
SECTION B: 40 Mks: Answer question 6 (compulsory) and either question 7 or 8.

6.An experiment was carried out to investigate the effect of temperature on the rate of reaction catalyzed by an enzyme. The results are shown in the table below.

Temperature ^{0}c	Rate of reaction in mg of product per unit time
5	0.2
10	0.5
15	0.8
20	1.1
25	1.5
30	2.1

35	3.0
40	3.7
45	3.4
50	2.8
55	2.1
60	1.1

(a) On the grid provided draw a graph of rate of reaction against temperature**.** **(7mks)**



(b) When was the rate of reaction 2.6 mg of product per unit time? **(2 mks)**

……

……

(c) Account for the shape of the graph between

(i) 5^0 C and 40^0 C **(2mks)**

……

……

(ii) 45^0 C and 60^0C **(2mks)**

…… …..

……..

(d) Other than temperature name **two** ways in which the rate of reaction between 5^0C and 40^0C could be increased. **(2mks)**

……

……

(e) (i) Name one digestive enzymes in the human body which works best in acidic condition **(1mk)**

……

(ii) How is the acidic condition for the enzyme named in (e) (i) above attained? (**2mks)**

……

……(f) The acidic conditions in (e) (ii) above is later neutralized(i) Where does the neutralization take place? **(1mk**)

……

(ii) Name the substance responsible for neutralization. **(1mk)**

……

7. Discuss various evidence to support organic evolution **(20mrks)**

8. (a) (i) State two significances of transpiration. **(2mks)**

(ii Discuss the forces involved in movements of water from roots to the leaves **(8mks)**

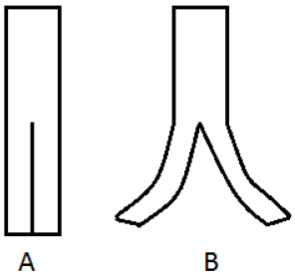
(b) Describe the mechanism of opening and closing of stomata using photosynthetic theory. **(10mks)**

SERIES 12

SECTION A

(Answer ALL questions in this section)

1. In a biology lesson, some students obtained a young stem and split it half way along the length as shown in diagram A. They then placed it in solution Y for two hours before making observations. The results were as shown in diagram B.



a) What was the nature of solution Y? (1mk)

b) Explain why the stem curved as shown in diagram B. (4mks)

c) State **three** roles of active transport in organisms. (3mks)

2. (a) In human, premature baldness is controlled by a gene on the **Y** chromosome. Using **B** to represent the gene for baldness, work out a cross between a bald man and his wife. (4 mks)

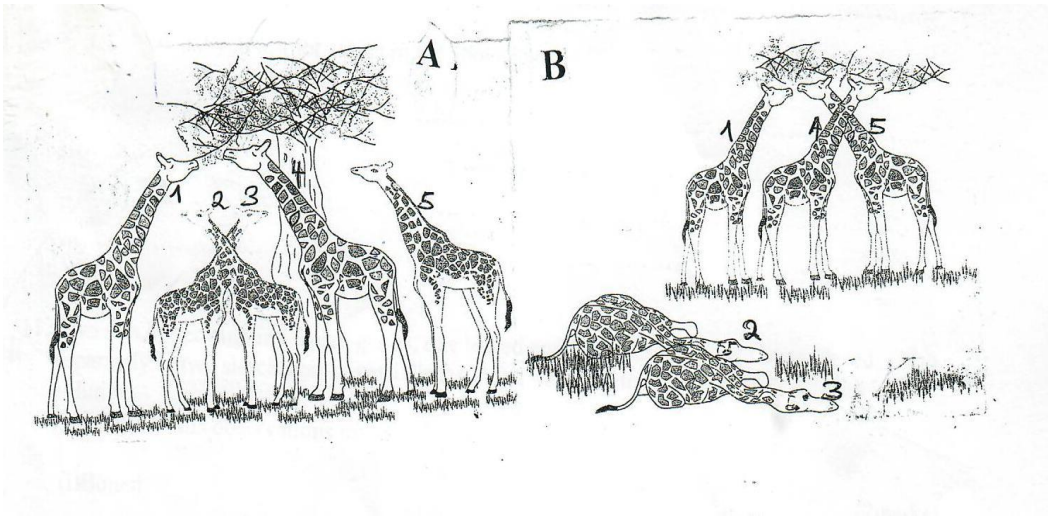
(b)(i) What is the probability of their daughters being bald? (1 mk)

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

(c) Name **one** trait in human beings that is determined by multiple allele (1mk)

(d) Name **one** genetic disorder affecting the human eye (1mk)

3. The picture below represents an evolutionary phenomenon. Study it and answer the questions below.



(a) What name is given to the above evolutionary phenomenon? (1 mk)

(b) Account for your observation in pictures A and B Observation (2mks)

Accounting (2 mks)

(c) Explain how continental drift is an evidence for organic evolution (3 mks)

4. The micrographs below is of a tissue showing mitosis. Examine it and answer the questions.

R

T

a.) i. Identify the tissue from which the micrographs were obtained (1mark)

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

Name the stages represented by **R** and **T**. (2marks)

b.) State two significance of mitosis to an organism. (2 marks)

c.) Name two regions in higher plants where cells actively undergo mitosis (2marks)

5. An analysis was done on the contents of faeces of a cow. The results are as shown in the table below.

Content	**Percentage**
Carbohydrates	12
Proteins	0.8
Fiber	14
Fats	1

(a) Name the other component that makes up the faeces of a cow and give its percentage. (1 mk)

(b) Name the substance that contributes the fiber in the faeces. (1 mk)

(c) Cow faeces are normally used as fertilizer that increases nitrates in the soil.

(i) State the component in the faeces that yield nitrates. (1 mk)

(ii) Describe how the component named in (c)(i) above is converted into nitrates (4 mks)

(d) Explain why the manure would be better if the cows urine was added to the faeces. (2 mks)

SECTION B (40 Marks)

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

6.The length of a grasshopper femur and internode of a seedling were recorded in a period of 24 weeks. The results are recorded in the table below.

Week	**1**	**3**	**5**	**7**	**10**	**13**	**16**	**18**	**20**	**24**
Average length of femur	**8.0**	**9.0**	**9.0**	**9.0**	**13.0**	**13.0**	**15.0**	**19.0**	**19.0**	**19.0**
Average length of internode(mm)	**5.0**	**6.5**	**10.5**	**16.5**	**24.5**	**27.5**	**32.5**	**34.5**	**36.0**	**37.5**

(a) Plot a graphs of length of femur and length internode against time on the same axis.(7mks)

(b) (i)What was the average length of internode in the 8^{th} week? (1mk)

(ii)Suggest how average length of internodes was obtained. (2mks)

(c) Name the type of growth curve shown by

(i) Grasshopper (1mk)

(ii) Seedling (1mk)

(d) Account for the change in length for fermur between

(i) 3^{rd} and 7^{th} week (2mks)

(ii) 16^{th} and 20^{th} week (2mks)

(e) (i) State what causes increase in length of internodes in the seedling. (1mk)

(ii) Exhibits the growth pattern of the femur. (1mk)

(iii) Name the hormone responsible for the growth pattern in grasshopper. (1mk)

(iv) Work out the rate of growth of the seedling between week 7 to 10 (2mks)

ANSWER EITHER QIESTION 7 OR 8 ONLY

7. (a). During a finance bill protest, tension was high and one of the police officer was furious and wanted to face and fight a very aggressive protester. Explain the physiological changes that occur in his body to prepare him for the fight. (14mks)

(b). (i) Identify each of the following responses described below.

(a). A person coughs whenever a foreign body irritates the respiratory tract (1mk)

(b). whenever a bell is rung, a dog is presented with a meal. After several days of practice, the dog salivates once the bell is rung even if food is not available (1mk)

(ii) State the difference between the two responses identified in (b) above (4mks)

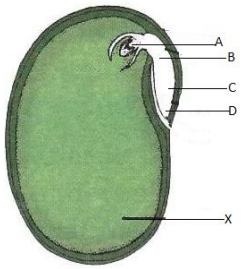
8.(i) State **two** significances of transpiration. (2 marks)

(ii) Discuss the forces involved in movements of water from roots to the leaves. (8 marks)

(iii) Describe the mechanism of opening and closing of stomata using photosynthesis theory. (10 marks)

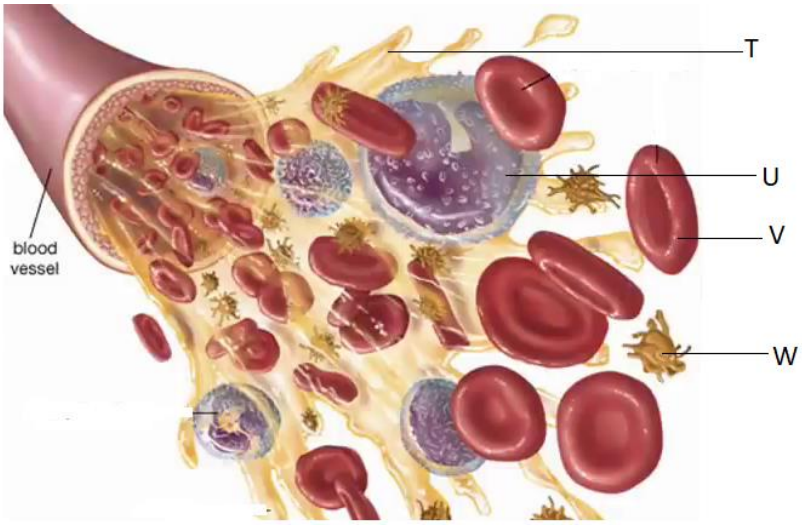
SERIES 13

1. The diagram below shows the internal structure of a bean seed.



   a) Name parts labelled A-D. (4mks)
   b) What is the role of structure labeled X. (1mk)
   c) What is the main difference between epigeal and hypogeal germination. (1mk)
   d) Why is important that the radicle develops first during germination. (2mks)

2. The photograph below shows components of blood from a ruptured blood vessel. Study it and answer the questions that follow.



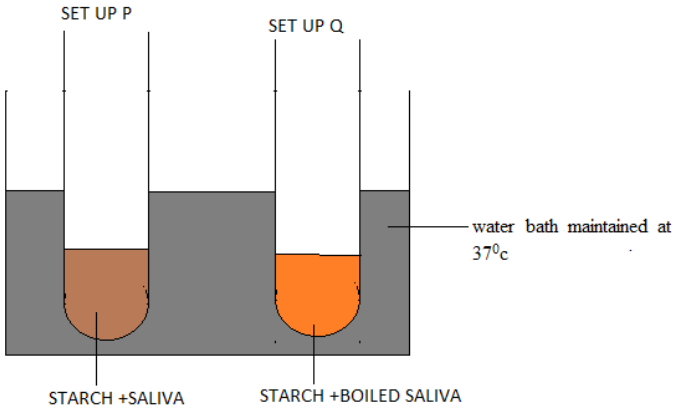
   a) Suggest the identity of the above blood vessel if a lot of digested food substances were found dissolved in part T. (1mk)
   b) Identify cell U and suggest its function. (2mks)
   c) i) name three types of antigens that are likely to be present on the surface of the membrane of cell V (3mks)
      ii) Where in the human body is cell V produced? (1mk
   d) What role does structure W play in blood clotting? (1mk)

3. (a) During a lesson, students observed the structure of a bat, cat and human forelimbs to determine their evolutionary relationship.
   (i) State the term used to describe the structure of the limbs observed by the students. (1mk)
   (ii) Name the type of evolution illustrated by the structure of the limbs observed. (1mk)
   (iii) What evidence of evolution is illustrated by the limbs. (1mk)
   (iv) State the significance of the type of evolution illustrated by the limbs. (1mk)

   (b) Explain how comparative embryology is an evidence for organic evolution in vertebrates. (2mks)

   (c)Explain the theory of evolution by natural selection. (2mks)

4. In an experiment to investigate an aspect of digestion, two test tubes P and Q were set up as shown in the diagram below.



The test tubes were left in the water bath for 30 minutes. The contents of each test tube was then tested for starch using iodine solution.

(a) What was the aim of the set-up P? (1mk)
(b) What results were expected in test tubes P and Q. (2mks)
(c) Account for the results obtained in (b) above for test tubes P and Q.(2mks)
(d) Explain why the set up was maintained at 37°c. (1mk)
(e) Name the carbohydrate stored in. (2mks)
    (i) Mammalian liver.
    (ii) Potato tuber

5. Haemophilia is a genetic disease which is transmitted through a recessive gene linked to the X chromosome. The normal gene may be represented by H and the gene for haemophilia may be represented by h.
   (a) A woman who is a carrier for haemophilia married a normal man. Work out the expected genotypic and phenotypic ratio of their children. Show your working. (6mks)

Parental phenotype — Carrier Woman × Normal man

Parental genotype — $X^H X^h$ × $X^H Y$;

Gametes — X^H, X^h, X^H, Y ;

Fusion ;

F1 Genotype	$X^H X^H$	$X^H Y$	$X^H X^h$	$X^h Y$;
	1 :	1 :	1 :	1 :
F1 phenotype	Normal female	Normal male	Carrier female	Haemophiliac male

2 normal females:1 normal male:1 normal female ;

(b) Haemophilia is more common in men than in women. Explain. (2mks)

6. The table below shows how quantities of sweat and urine vary with external temperatures

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

(a) Using the same axes, draw a graph of quantity of urine and sweat against the external temperature. (7 marks)

(b) (i) State the quantity of urine and sweat produced when external temperature was 12.5^0c. (2mks)

(ii) State the physical process through which the body was cooled by sweating as temperature was rising. (1mk)

(iii) Account for the quantity of urine produced as the temperature increased. (4mks)

(c) State three nitrogenous wastes that could be eliminated in urine or sweat in human beings. (3mks)

(d) State three behavioral mechanism that poikilotherms use to regulate their body temperature under hot conditions. (3mks)

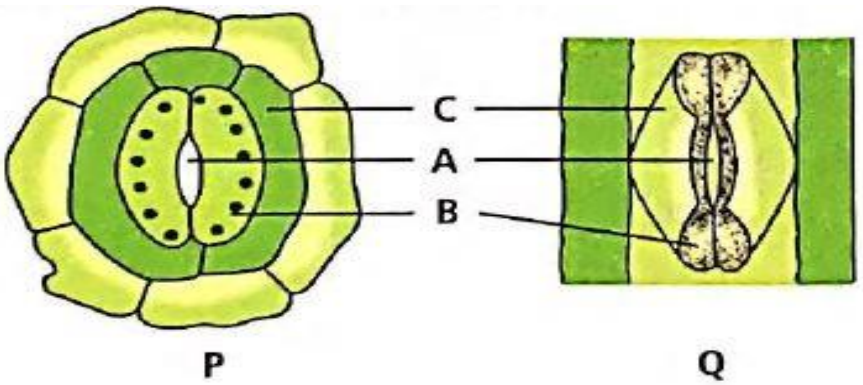
7.Describe causes and methods of controlling water pollution. (20mks)

8.a) Name the tissues involved in support in plants. (4mks)

b). Explain how the ear brings about balance in relation to movement of the head. (16 mks)

SERIES 14
SECTION A (40 MARKS)

1. The following is a diagram representing stoma in terrestrial plants. **Q** is the appearance when **P** was placed in the dark for 6 hours.



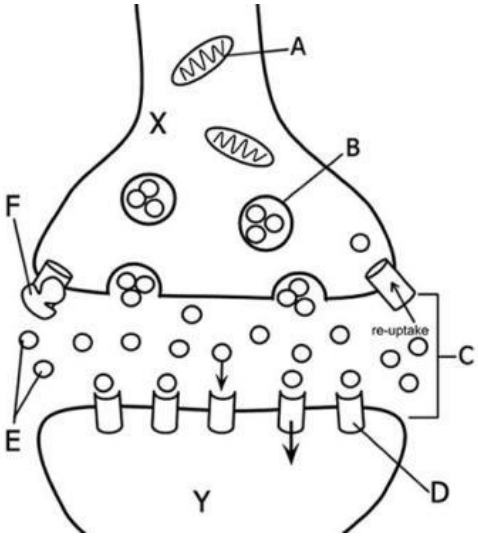
a) State the importance of closure of **A** being as seen in **Q** to the plant (1mk)

b) State **TWO** modifications found in Cells **B** and not **C** (2mks)

c) What is the importance of part **A** to photosynthesis? (1mk)

d) Account for appearance of **A** as seen in **Q** using the Potassium Ion theory (4mks)

2. The following is an illustration of an important feature of the nervous system



a) Name the chemical found in part labeled **B** (1mk)

b) Give the importance of the structure above to the functioning of the nervous system(1mk)

c) What is the significance of high number of organelle **A** in the region **X**? (2mks)

d) Describe how an impulse reaches region marked **Y** (4mks)

3. .In a given species of beetles, a cross between red wing beetle and orange wing beetle produces F1 off-springs with yellow wings.

a) Explain the absence of red wing and orange wing in the F1 (2mks)

b) If the F1 were selfed, work out the genotypes of the offspring's

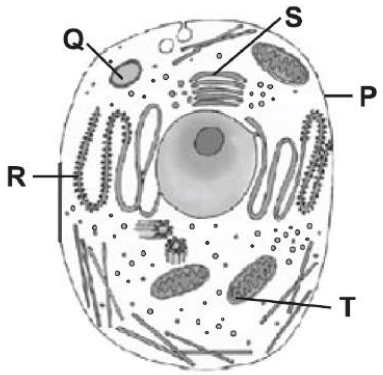
(use capital R to represent the gene for red colour and capital O for the orange colour)(4mks)

c) From the genetic cross in b) above give the following:

i) Genotypic ratio (1mk)

ii) Phenotypic ratio (1mk)

4. Use the illustration of a cell shown below to answer questions that follow



a) Give **TWO** reasons why the above is an animal cell. (2mks)

b) i) State the identity of organelle **T** (1mk)

ii) Identify the substance processed in organelle **R** (1mk)

c) Which letter represents organelle that will be abundant in the following? (2mks)

i) Muscle tissue

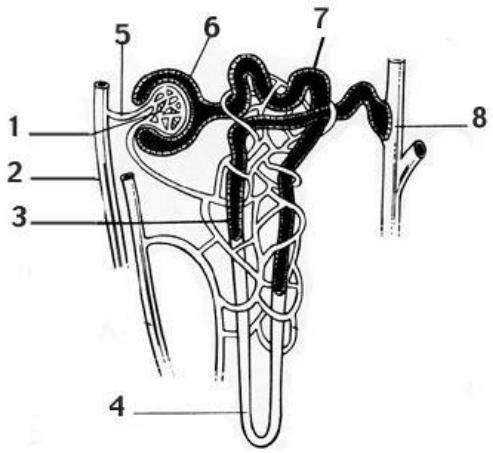
ii) Secretory glands.

d) State the significance of the following properties to the functioning of **P** (2mks)

i) Being Polarised.

ii) Semi-permeability

5. The following diagram is an illustration of kidney nephron



a) Identify the parts labeled: (2mks)

i) **6**

ii) **7**

b) State the importance of the following observations:

i) Vessel **2** being wider than vessel **5** (1mk)

ii) Concentration of urea is higher in region **8** than in region **4** (1mk)

c) Explain the importance of adrenal glands in region **4** when the blood has low ionic concentration (2mks)

d) State the adaptations of region **7** in relation to mitochondria and microvilli (2mks)

SECTION B (40 MARKS)

Answer **Question 6** which is **Compulsory;** then choose either Question **7** or **8**

6. The table shown below was developed after an experiment where raw potato strips were placed in different concentrations of sucrose.

Concentration of sucrose solution (mol/dm^3)	**Initial length of potato strip (mm)**	**Final length of Potato strip (mm)**	**Change in length of potato strip (mm)**	**Percentage Change in length of Potato strip (%)**
0.0	50.0	53.0	3.0	
0.2	50.0	52.0	2.0	
0.4	50.0	51.0	1.0	
0.6	50.0	50.5	0.5	
0.8	50.0	49.0	-1.0	
1.0	50.0	48.0	-2.0	

1.2	50.0	48.0	-2.0	

a) Complete the table above by filling in the column for percentage change in length of potato strip (%) (3mks)

b) Account for the change in length of the potato strip at the following concentration of sucrose:

i) 0.2mol/dm^3 (2mks)

ii) 0.8mol/dm^3 (2mks)

iii) 1.0 - 1.2 mol/dm^3 (2mks)

c) On the graph below draw a graph of percentage change in length of the potato strip against concentration of sucrose. (6mks)

d) Determine the normal concentration of the potato cell sap from the graph. (1mk)

e) i) Explain how a potato strip placed at 1.4mol/dm^3 can regain its normal shape.(1mk)

ii) Name the process described in e (i) above (1mk)

f) State **TWO** importance of Osmosis to animals. (2mks)

7. a) During an ecological field study involving collection and observation of specimen, give **SIX** precautions that need to be observed. (6mks)

b) Describe the effect of increased physical activity of an athlete on the following organs.

i) Skin (7mks)

ii) Heart (7mks)

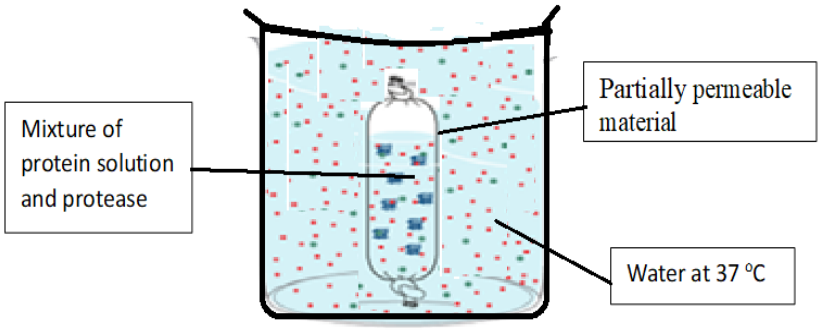
8. a) Describe the process of exhalation in members of Class Mammalia. (8mks)

b) Explain why drug abuse should be discouraged among youths. (12mks)

SERIES 15

SECTION A 40 MKS

1. Form 2 students set up an experiment on diffusion as shown below. The set up was left to stand for 15 minutes.



a) What does the partially permeable material represent in a cell. (1mark)

b) Give a reason for keeping the water at 37 °C. (2marks)

c) The students carried out a test for proteins using the **contents of the partially permeable material** after the 15 minutes. Suggest the conclusions made. (1 mark)

Explain your answer in c) above. (1mark)

d) Amino acids were found to be present in the water. Explain its source and presence there. (3 marks)

2.The diagram below shows the base sequence of part of a nucleic acid strand. Observe it and answer the question that follows

G T T A C G C A

a) Giving the reason, identify the type of nucleic acid (2 mks)

b) Show the complimentary RNA strand (1mk)

c) Haemophilia is a genetic disorder which is transmitted through recessive gene linked to X-Chromosome. A woman who is a carrier to haemophilia married a normal man. Using the punnet square, work out the genotype of F1 Offspring (4 mks)

3. The equation below shows the chemical reaction that takes place in plants.

Carbon (IV) oxide + water $\longrightarrow$ Glucose +A

i) Identify substance A (1mk)

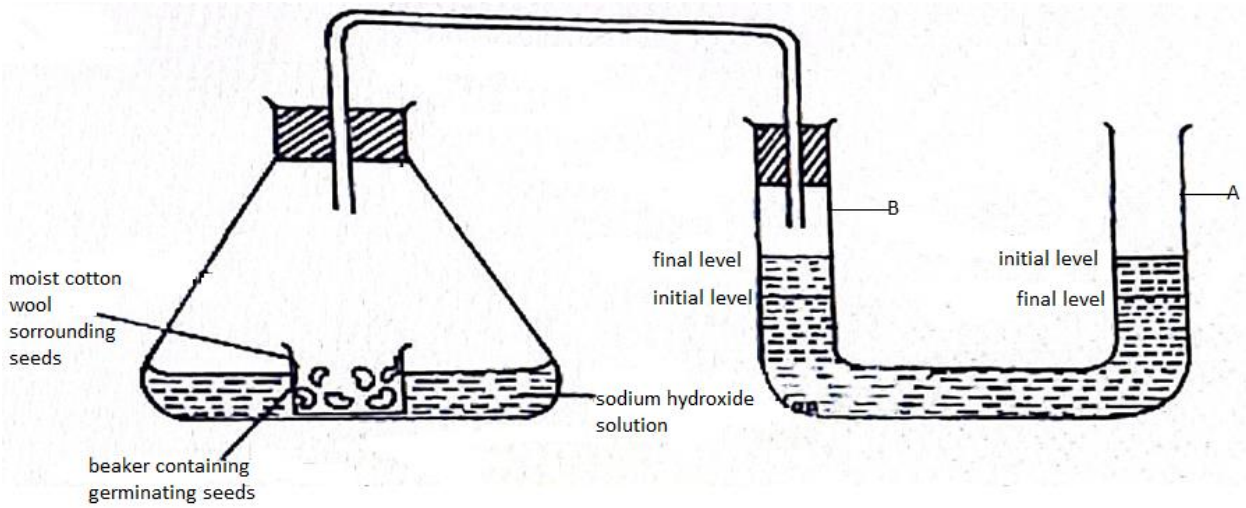
ii) Other than the reactants, state two conditions necessary for this reaction (2mks)

iii) Name the process represented by the equation above (1 mk)

iv) Give two types of cell where this process occurs (2mks)

v) How would the process named in (iii) above be affected by age of leaves in plants (2mks)

4. The apparatus below was set up by a student to find out the changes in gases during germination



a) After 48 hours the level of water in the U-tube at **A** and **B** was as shown. Explain the observation (3mks)

b) Calculate the respiratory quotient (**RQ**) from the equation below:- (2mks)

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

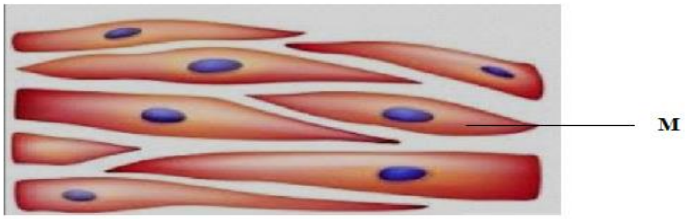
c) Identify the substrate being respired in the above equation (1mk)

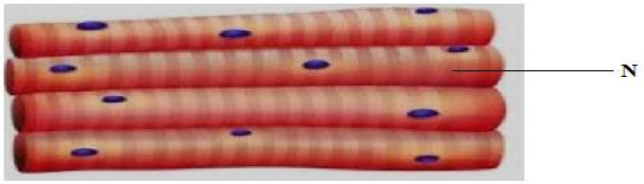
d) (i)where in the cell does glycolysis take place? (1mks)

ii) what is oxygen debt? (1mks)

.

5.The figures below illustrate specialised cells in animal's body





i)Identify cells M and N **(2mks)**

M

N

ii) State two structural differences between M and N **(2mks)**

M	N

iii) Which of the above specialized cells is found in the gut or human intestines **(1mk)**

iii) Which organelles are found in large numbers in N (1mks)

iv) Name a carbohydrate and form of energy stored in cell N(2mks)

carbohydrate

form of energy

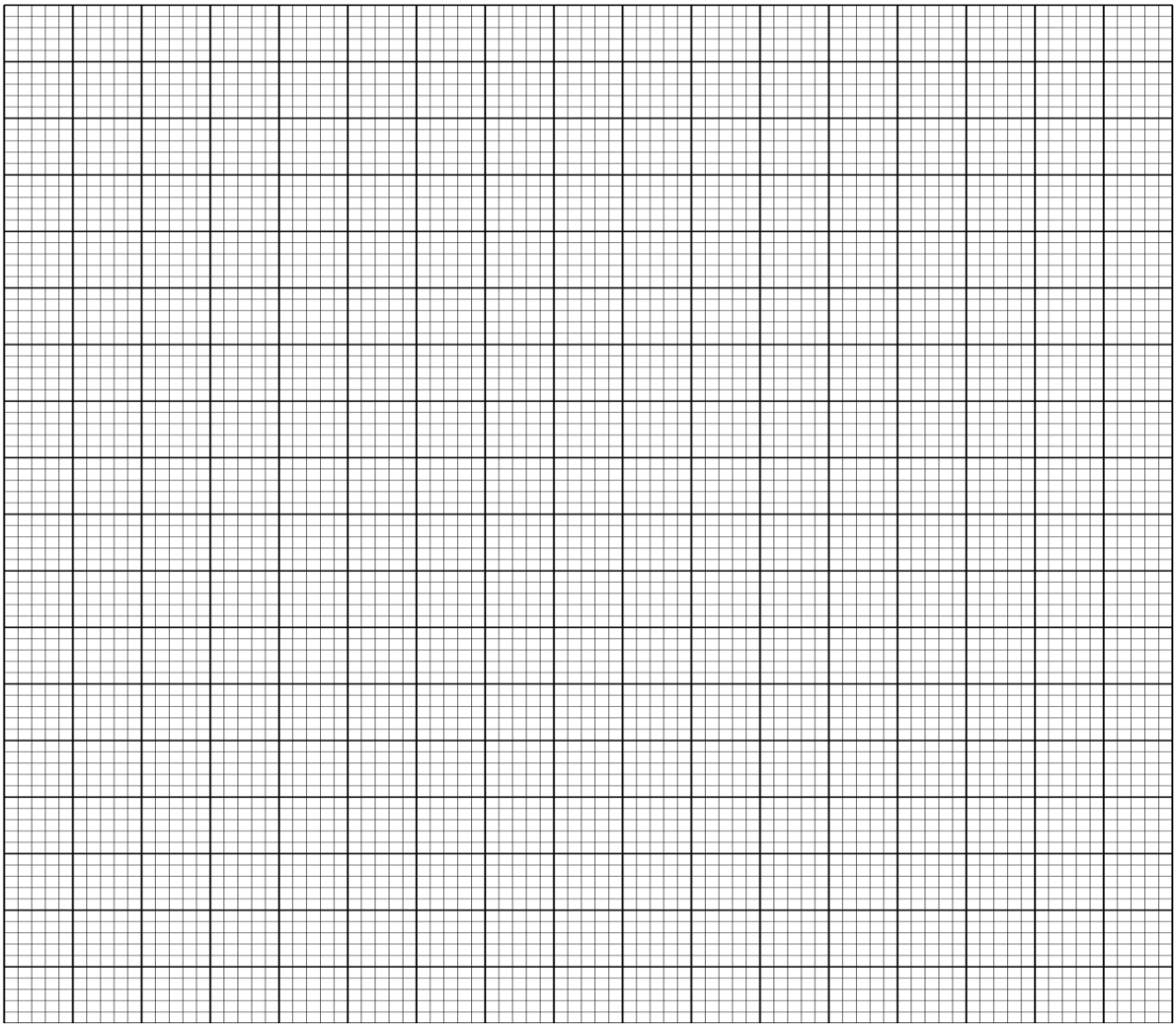
SECTION B (40 marks)

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

6. An experiment was carried out to investigate transpiration and absorption of water in a certain plant species. The plants were potted and supplied with adequate water. The amount of water lost and absorbed was determined. The results are shown in the table below;

Time of the day	Amount of water in grams	
	Transpiration	**Absorption**
0700	30	15
0900	40	25
1100	48	34
1300	56	45
1500	40	50
1700	25	40
1900	15	28
2100	10	21

a) Using the same axes, plot graphs to show transpiration and absorption of water in grams against time of the day. (7mks)



b) i)At what time of the day was the amount of water the same for transpiration and absorption; (1mk)

ii) how much water was absorbed at 1800 hours? (1mk)

c) Explain the shape of the graphs of:-

i) Transpiration (4mks)

ii) Absorption (4mks)

d) Suggest what would happen to transpiration and absorption of water if the experiment was continued for another 2 hours; (1mks)

e) Name two environmental factors that affect the rate of transpiration (2mks)

7 (a) Describe fertilization in flowering plants. (14marks)

(b). Explain ways through which plants hinder self-pollination and encourage cross pollination. (6mks)

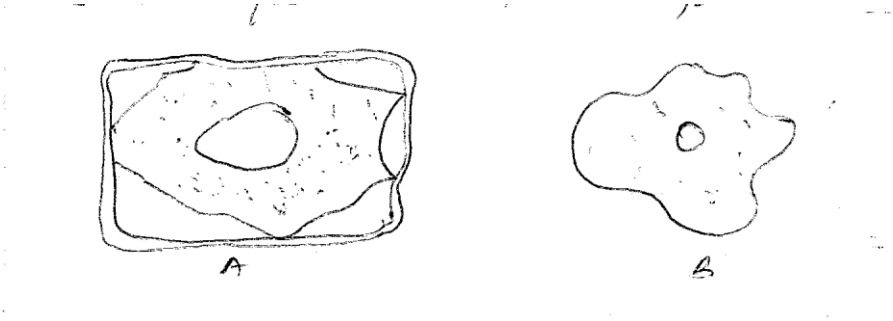
8 (a). Describe the breathing mechanism in human (12mks)

(b). State the structural adaptation of insects tracheal system (8 mks)

SERIES 16

Instructions to candidates: 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]

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

A –

B –

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

Carbon (iv) oxide + water ⟶ A + water

a. Identify substance A. [1 Mark]

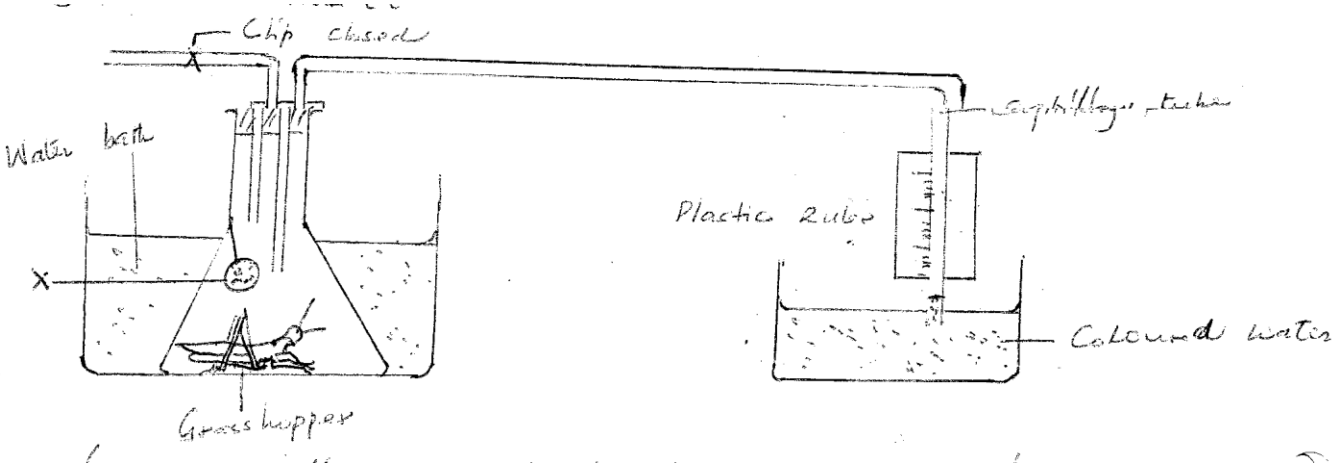
b. Name the process represented by the equation. [1 Mark]

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 –

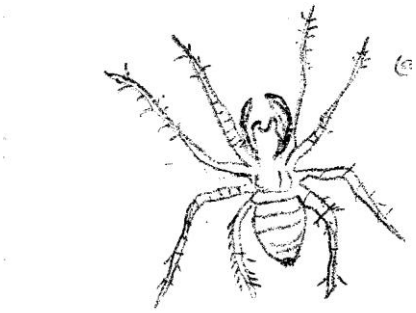
Function –

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;



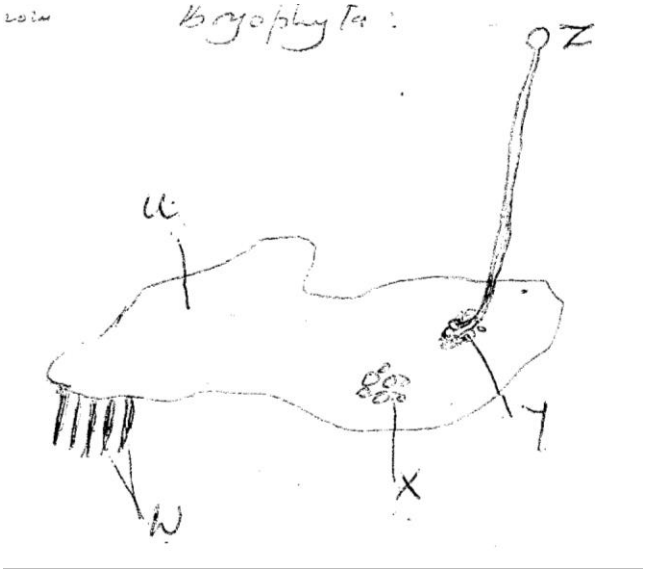
a. Name the phylum and class to which the organism belongs

i. Phylum _____ [1 Mark]

ii. Class_____ [1 Mark]

b. Give two reasons for your answer in 1 (i), (ii) above [4 Marks]

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 sprouts, where as 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]

d. State 2 structural modifications of nephrons in desert mammals. [2 Marks]

e. State a kidney disease whose symptom is coloured and turbid urine [1 Mark]

In a biological experiment; a cross was made between a tall pea plant & dwarfs 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]

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

7. 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.

	Dry weight in milligrams		
Time (days)	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]

8.

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]

9.

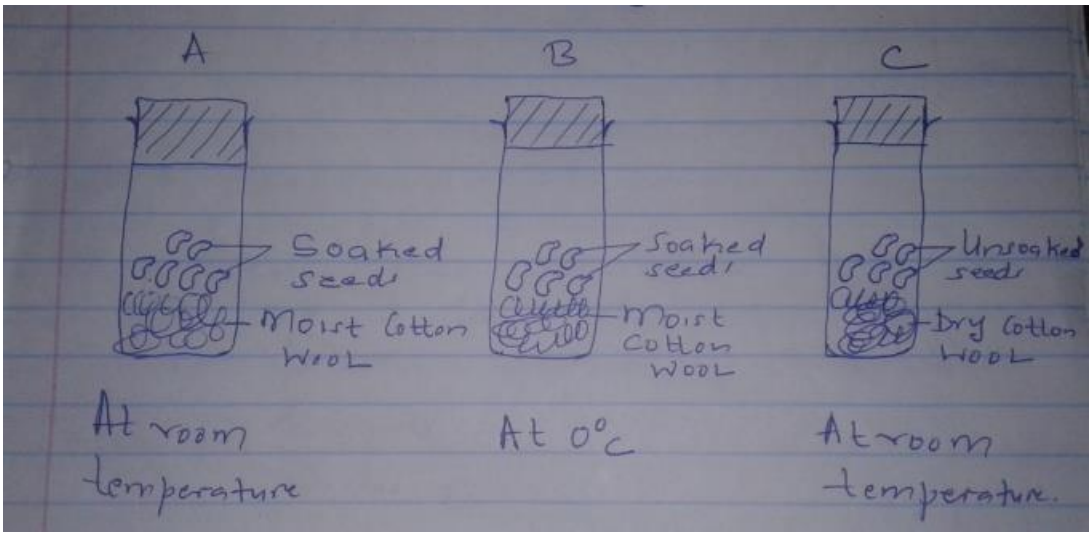
a. How is the Epidermis of a green plant adapted to its function? [6 Marks]

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]

SERIES 17
SECTION A (40MKS)
ANSWER ALL THE QUESTIONS IN THE SPACES PRIVIDED

1. The diagrams below represent a set up to investigate the conditions necessary for seed germination.



The set up was left for 7 days .

(a) What conditions were being investigated in the experiment.(2mks)

(b) State three reasons for soaking seeds in set up A and B.(3mks)

(c) What were the expected results after seven days.(3mks)

2. (a) Distinguish between disaccharide and polysaccharide(2mks)

(b) Name two common polysaccharides.(2mks)

(c)Study the equation below and then use it to answer the questions that follow.

Sucrose $\xrightarrow[\text{Process B}]{\text{Enzyme A}}$ Glucose +Fructose

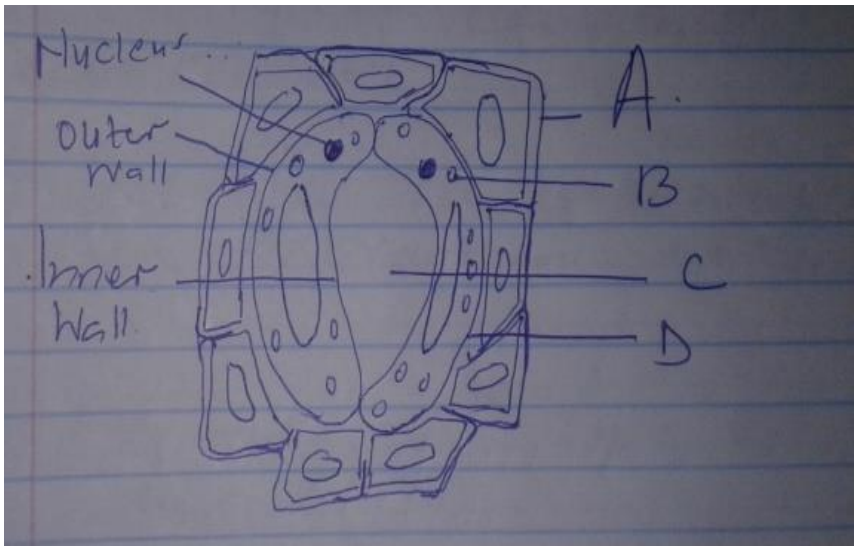
(i) Name process A (1mk)

(ii) Name process B (1mk)

(iii) Name the reagent used in process B in the laboratory.(1mk)

(iv) Why is it necessary to add sodium hydrogen carbonate ($NaHCO_3$) in the above reaction.(1mk)

3. The diagram below shows the structure of an open stomata. Study it and answer the questions that follow.



(a) Name the parts labeled A,B,C and D.(4mks)

(b) State two functions of the structure above.(2mks)

(c) State two theories that explain the mechanism of opening and closing of the stomata.(2mks)

4. In an experiment to calculate the respiratory quotient , a mouse was observed to have taken 80cm^3 of oxygen and produced 72.9cm^3 of carbon iv oxide in 12 minutes.

(a) Calculate the respiratory quotient in the experiment above.(2mks)

(b) Identify the type of food broken down.(1mk)

(c) What is the importance of respiratory quotient value.(1mk)

(d) Suppose the same mouse was exposed to insufficient supply of oxygen for a few minutes.

(i) Name the type of respiration that would have take place.(1mk)

(ii) Name the product of the type of respiration named in (i) above.(1mk)

(e)If the mouse mentioned above requires 2736 kj per gram of body weight while an elephant requires 216 kj per gram of body weight. Explain the difference.(2mks)

5. In maize the gene for purple colour is dominant to the gene for white colour. A pure breeding maize with purple grains was crossed with a heterozygous plant.

(a) (i) Using letter G to represent the gene for purple colour, work out the genotypic ratio of the offspring.(5mks)

(ii)State the phenotype of the offspring.(1mk)

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

(ii)Give an example of trait in human beings where the condition whose term is named in b(i) above expresses itself.(1mk)

SECTION B(40MKS)

ANSWER QUESTION 6 (COMPULSORY) AND EITHER QUESTION 7 OR 8 IN THE SPACES PROVIDED.

6. An experiment was carried out to investigate transpiration and absorption of water in sunflower plants in their natural environment with adequate supply of water. The amount of water was determined in two hours intervals. The results are as shown below.

TIME OF DAY	AMOUNT OF WATER IN GRAMMS	
	Transpiration	Absorption
1100 - 1300	33	20
1300 - 1500	45	30
1500 – 1700	52	42
1700 – 1900	46	46
1900 - 2100	25	32
2100 - 2300	16	20
2300 - 0100	08	15
0100 - 0300	04	11

(a) Using the same axis plot graph to show transpiration and absorption of water in grams against time of the day.(7mks)

(b) At what time of the day was the amount of water the same for transpiration and absorption.(1mk)

(c) Account for the shape of the graph of (3mks)

(i) Transpiration

(ii) Absorption

(d) What would happen to transpiration and absorption of water if the experiment was continued until 0500hours.

(e) Explain how the following contribute to the movement of water up the xylem vessels.
(a) Cohesion

(b) Adhesion

7. Explain how xerophytes are adapted to their habitats.(20mks)

8. (a) Describe the process of fertilization in a flowering plant.(14mks)

(b)State the changes that take place in a flower after fertilization.(6mks)

SERIES 18

Section A

1. Both bile and pancreatic juice are necessary secretions in animal nutrition.

a) Name the part of the digestive system where their influence is felt? (1 Mark)

…….

b) i) Identify which of the two secretions should be mixed with chyme first for efficient digestion to take place. (1 Mark)

……..

ii) Explain your answer in 1(b) i) above. (2 Marks)

……

……

c) Explain why:

i) It is not necessary to eat too much protein in the diet. (2 Marks)

……

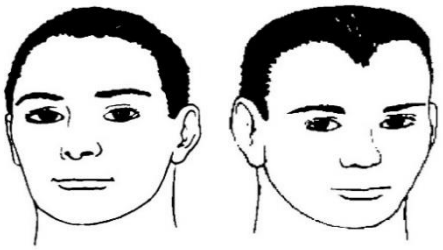
…….

ii) Liver is recommended in the diet of anaemic persons (2 Marks)

……

…….

2. The photographs below show a trait exhibited by man on the hairline.



a) The photograph show a type of variation for a trait in man. Give the type of variation shown by the photograph. (1 Mark)

……

b) Identify the variations shown on the photograph for the trait. (2 Marks)

……

……

c) State the main cause of the type of variation stated in 2 (a) above. (1 Mark)

……

d) State two processes that occur during gamete formation that lead to variation. (2 Marks)

……

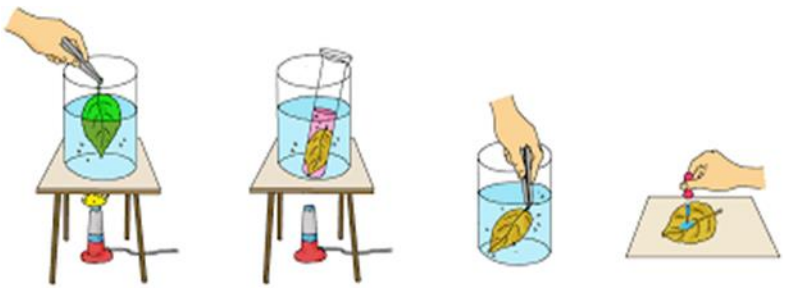
……

e) Name two phenotypic features that Mendel studied in the garden pea plant in order to derive the first law of heredity. (2 Marks)

……

……

3. The diagrams below show the procedure during test starch in a leaf. Study it and answer the questions that follow.



A. B. C. D.

a) Explain the following :

i) The plant from which the leaf was obtained was exposed to sunlight for sometime before the start of the experiment. (1 Mark)

……

……

ii) The leaf was boiled in water as shown in diagram **A**. (1 Mark)

……

iii) The leaf was boiled in a test tube containing alcohol over a water bath (2 Marks)

……

……

……

……

b) A part from rinsing out alcohol traces on the leaf, give the other reason for washing the leaf in cold water as shown in diagram **C.** (1 Mark)

……

……

c) The leaf was removed in cold water and placed on a white tile as shown in diagram **D**.

i) State the observation after addition of iodine solution on the leaf. (1 Mark)

……

……

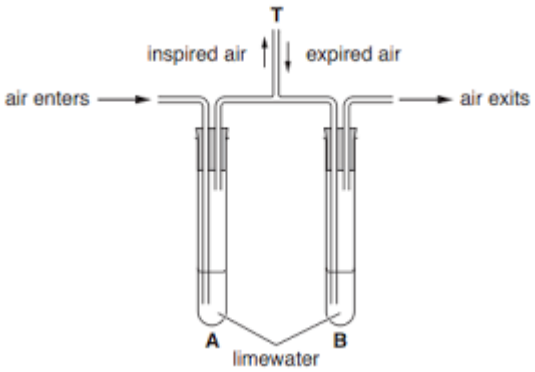
ii) Explain the observation in **C** (i) above. (2 Marks)

……

……

……

4. The set below was used by a group of students to study gaseous exchange in man.



a) State the aim of the experiment. (1 Mark)

……

……

b) State the expected observations in the test tubes. (2 Marks)

Test tube A……..

Test tube B……

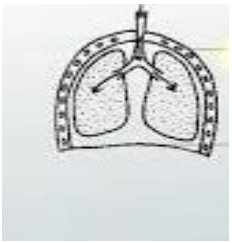
c) Explain the observation in test tube B (2 Marks)

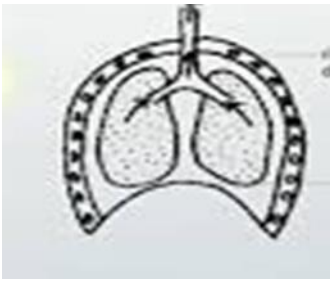
……..

……

……

d) The diagrams below show changes in the chest cavity of the students as they breathe in and out through part **T** in number 4. above.





i) State the change in the ribs during breathing in. (1 Mark)

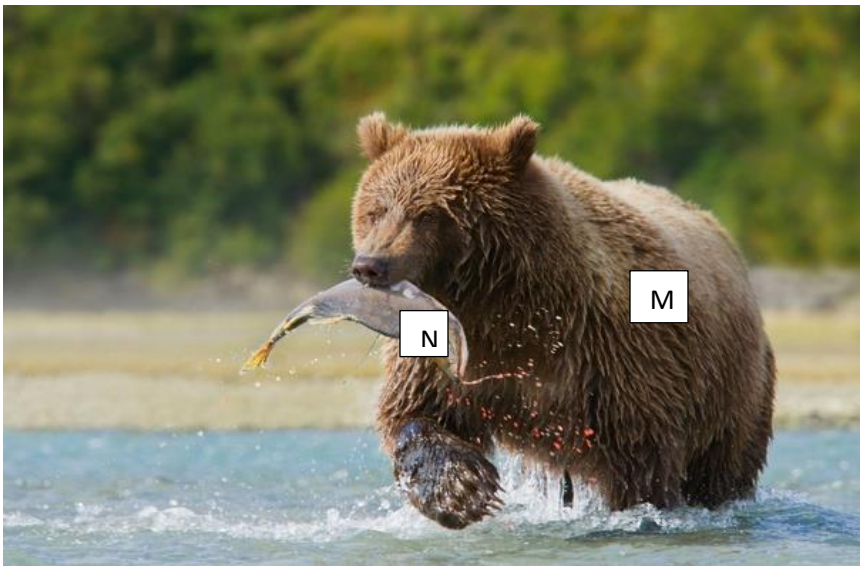
……...

ii) State the changes in the rib cage muscles during breathing out. (2 Marks)

……

……..

5. Study the photograph below which represents ecological relationship in a habitat involving two organisms (**N** and **M),** and answer the questions that follow.



a) i) Identify the biotic relationship represented above (1 Mark)

…….....

ii) With a reason, identify which organism between N and M that has lower biomass.

Identity…… (1 Mark)

Reason ……

…… (1 Mark)

b) Draw a possible food chain that has three trophic levels involving the organisms in the photograph. (1 Mark)

…….

c) State how the energy from the sun is incorporated in the food chain you have drawn in 5b) above. (1 Mark)

……

…….....

d) Using observable features of organism N, name the class to which it belongs. (2 Marks)

Class…….

Reason……..

e) Give **one** observable feature that makes organism M successful in the ecological relationship represented. (1 Mark)

……..

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

6. Some students carried out an experiment to determine the percentage change in weight of two tender stems of two different plants when placed in two different sucrose solutions of different concentrations.

Sucrose concentration (mg/ml)	0	5	10	15	20	25	30	35
Percentage change in weight for plant N	7.0	6.6	5.0	3,6	1.6	-0.8	-2.3	-2.8
Percentage change in weight for plant D	3.2	2.2	0.8	-0.6	-1.4	-2.2	-2.8	-3.4

a) On the same axes, in the graph provided below, plot a graph of percentage weight change of the plant stem tissues against sucrose concentrations. (8marks)

b) Account for the results obtained for the plant tissues at 15 mg/ml sucrose concentration. (2 Marks)

……

……

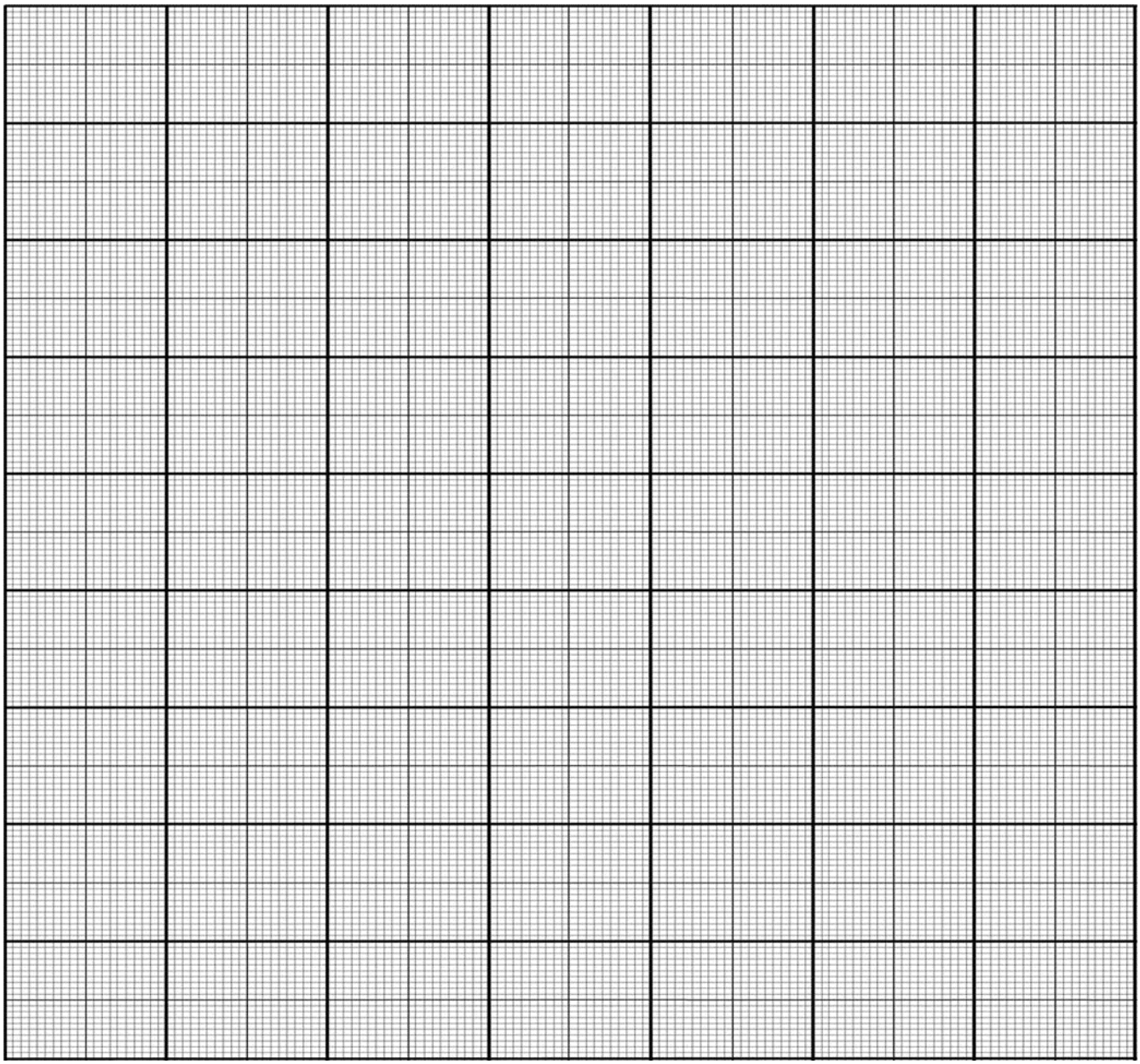
c) From the graph, determine the concentrations of the cell saps of the two plants.

Plant N. (1 Mark)

……

Plant D. (1 Mark)

……



d) i) Identify the plant that was most likely obtained from a more saline environment. (1 Mark)

……

ii) Explain your answer above. (2 Marks)

……

……

e) Suggest the likely modification in the roots of N to enhance gaseous exchange. (2 Marks)

……

f) State two roles of osmosis in plants. (4 Marks)

……..

……....

……

……

7. a) Give the practical applications of Auxins and Gibberellins in Agriculture. (10 Marks)

b) Describe the role of the following factors in the process of seed germination. (10Marks)

i) Water

ii) Oxygen

iii) Temperature

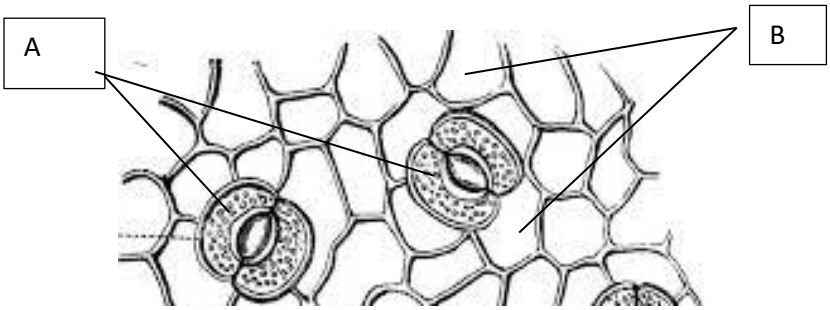
iv) Viability

8. Describe the various evidences for organic evolution. (10Marks)

SERIES 19

Section A (40 marks)

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



(a) Explain what would happen to the cells labelled a sunny day. (3marks)

……

……

……

……

……

(b) State structural differences between cells labelled **A** and **B**. (3marks)

……

……

……

……

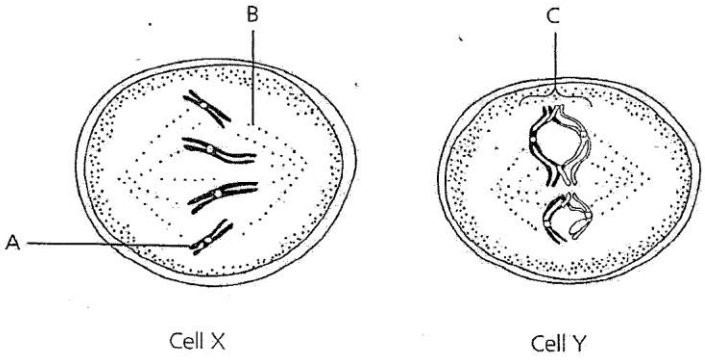
(c) Name the plant hormone that promotes the closure of the stomata. (1mark)

……

(d) Name the site where light independent stage occurs. (1mark)

……

2. The diagram below show two cells, **X** and **Y** from the organism. Study the diagrams and answer the questions that follow.



(a) Name the parts labelled **A**, **B** and **C**. (3 marks)

A ……..……..

B ……

C ……

(b)(i) Which cell is dividing by meiosis? (1 mark)

…….

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

……

……

(c) How are frogs adapted to carry out fertilisation? (2 marks)

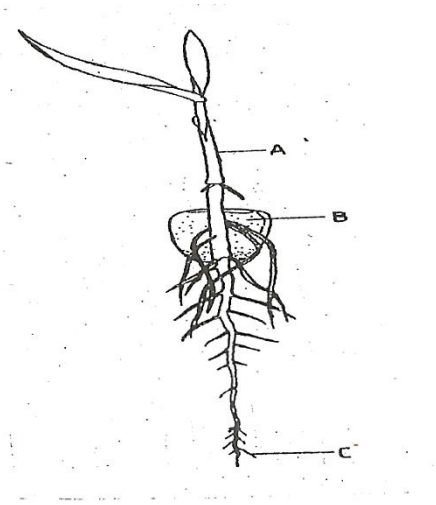
……

……

……

……

3. The diagram below represents a certain seedling.



(a) Name the parts labelled **A** and **C**. (2 marks)

A ……

C ……

(b) State the functions of the parts labelled **A**, **B** and **C**.

A. (1 mark)

……..

B. (2 marks)

……

……

C. (1mark)

……

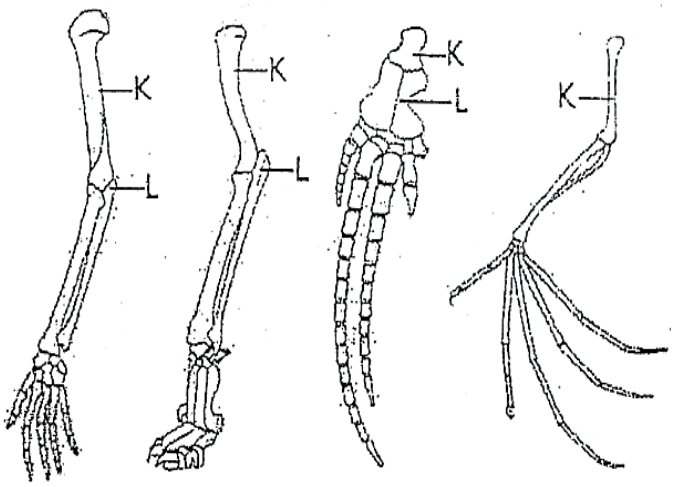
(c) Why is seed dormancy necessary? (2 marks)

……

……

……

4. Study the diagrams below and answer the questions that follow.



(a) Explain the type of evolutionary evidence illustrated above. (4 marks)

……

(b) Name the parts labelled **K** and **L**. (2 marks)

K ……...……

L ……

(c) Name the joint formed:

(i) At the proximal end of bone **K**. (1 mark)

....……

(ii) At the distal end of bone **K**. (1 mark)

……

5. Afia and Kalisha were carrying out a field activity during Biology lesson. They accidentally injured themselves and they were given First Aid to stop bleeding. Afia stopped bleeding after 10 minutes while Kalisha continued bleeding regardless of further medical attention.

(a)Name the condition that Kalisha was likely suffering from. (1 mark)

……

(a) Explain the process that occurred to stop Afia's bleeding. (3marks)

……

(b) Kalisha's mother was phenotypically normal for the condition that she was suffering from. Work out a genetic cross between Kalisha's parents (4marks

SECTION B (40 Marks)

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

6. An investigation was carried out in a terrestrial ecosystem. The population size and species biomass were determined and recorded as follows.

Species	Population size	Species biomass(tons)
A	1×10^3	1×10^3
B	1×10^3	1×10^{-1}
C	1×10^5	1×10
D	1×10	1×10^4

(a) What is a food chain? (1 marks)

……

……

(b) If all the organisms in the table had a feeding relationship, construct a food chain involving all the organisms. (1 mark)

……

……

(c) From the food chain, identify the part of the biotic component to which each of the species belongs. (4 marks)

A.....

B .....

C .....

D .....

(d) State the effect on the other species if species **C** was removed from the ecosystem (2 marks)

A .....

……

B .....

……

(e) From the data construct in the species below a labelled diagram of:

(i) Pyramid of numbers; (1 mark)

(ii) Pyramid of biomass; (1 mark)

(f) How would you describe the pyramid of numbers? (3 marks)

……

(g) What possible feeding relationship exists for this ecosystem between the species of:

(i) The first and second trophic level; (1 mark)

……

(ii) The second and third trophic level. (1 mark)

……

(h) Explain why water logging of soil may lead to death of plants. (3 marks)

……

(b) State **two** protozoan diseases in man. (2 marks)

……

……

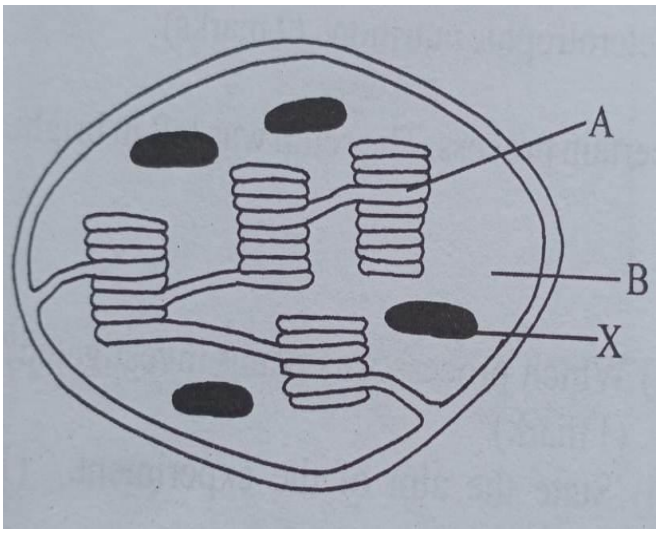
7. Describe the process of hearing in man. (20 marks)

8. (a) Explain how high blood sugar is regulated in the body (4marks)

(b) Describe secondary thickening in flowering plants. (16marks)

SERIES 20
SECTION A(40 MARKS)

1. The diagram below represents a plant cell organelle;



a) Name the organelle (1mk)

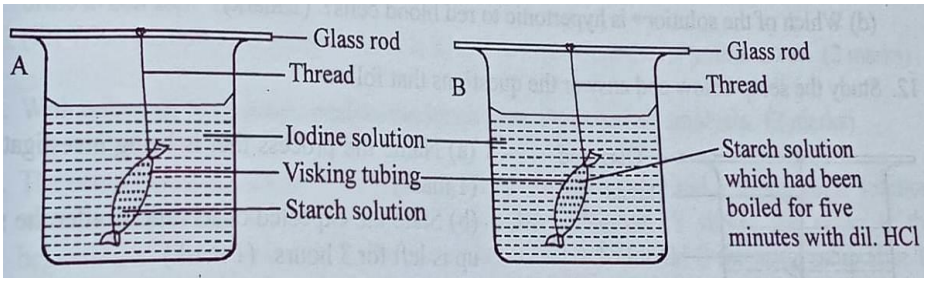
b) In which of the labeled parts does carbon(IV)oxide fixation occur? (1mk)

c) Name the parts labeled A and B and state how each is adapted to its function(4mks)
A

B

d) Explain what would have happened to the structure labeled X had the plant been kept in darkness for 48 hours (2mks)

2. A group of students set up an experiment as shown below. The experimental set ups were left for 20 minutes.



The observation after 20 minutes were as shown in the table below;

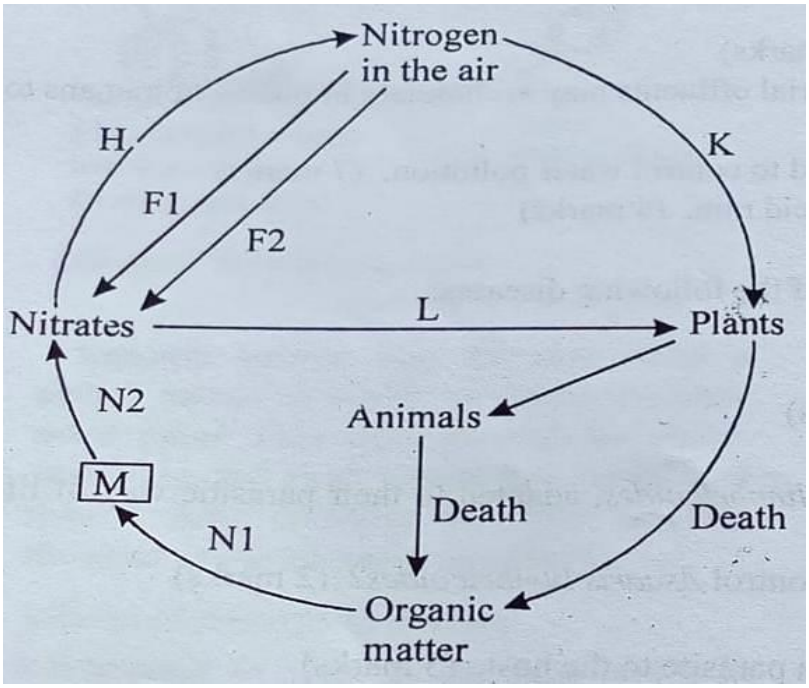
Set up	**Observations**	
	Inside tubing	Outside tubing
A	Blue black colour	Colour of iodine
B	Colour of iodine	Colour of iodine

a) State the process being demonstrated in this experiment. (1mk)

b) Explain the results in set up A; (4mks)

c) Why was there no blue black colour inside the visking tubing in set up B; (2mks)

3. The diagram below represents the nitrogen cycle;



a) Name the process labeled; (2mks)
   i) L

   ii) N_1 and N_2

b) Name the organisms that convert M into nitrates. (1mk)

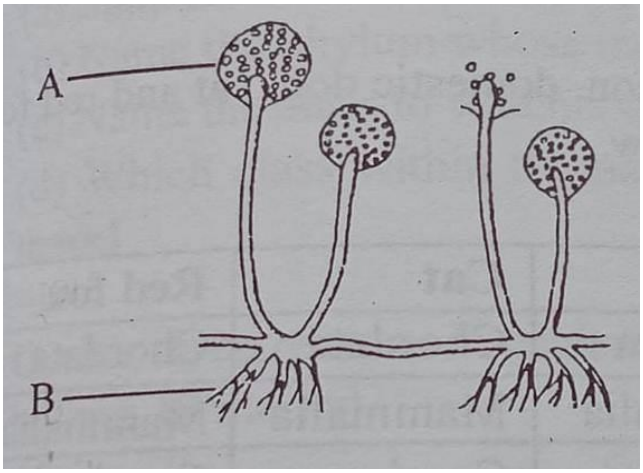
c) Name the organism in plants which promotes process K(1mk)

d) State the relationship between the organisms stated in (c) above and the plant;(1mk)

e) How would excess pesticides in the soil interfere with process K;(2mks)

f) If F_1 is nitrogen fixation by free-living bacteria, $F_2$is nitrogen fixation by what? (1mk)

4. The diagram below shows a mould of the genus Rhizopus;



a) Name the kingdom to which it belongs; (1mk)

b) Name the structures labeled A and B (2mks)

A

B

c) Give the functions of the structure labeled B (2mks)

d) How do the structures labeled B differ from plant roots(1mk)

e) Give two ways in which members of the kingdom you stated in (a) above are useful to man. (2mks)

5. (a) Name the two types of variations. (2mks)

(b) In a garden with pea plants, 625 plants had tall stems while 205 had short stems in the F_2 generation;
i) Work out the ratio of tall to short plants (give your answer correct to the nearest whole number) (1mk)

ii) Using letter T to represent the dominant gene, work out a cross between an F_1 offspring and a short plant. (4mks)

iii) What is the genotypic ratio from the cross in b (ii) above (1mk)

SECTION B:

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

6. An experiment was carried out to investigate transpiration and absorption of water in a certain plant species. The plants were potted and supplied with adequate water. The amount of water lost and absorbed was determined. The results are shown in the table below;

Time of the day	**Amount of water in grams**	
	Transpiration	**Absorption**
0700-0900	30	15
0900-1100	40	25
1100-1300	48	34
1300-1500	56	45
1500-1700	40	50
1700-1900	25	40
1900-2100	15	28

2100-2300	10	21

a) Using the same axes, plot graphs to show transpiration and absorption of water in grams against time of the day. (7mks)

b) At what time of the day was the amount of water the same for transpiration and absorption;(1mk)

c) Explain the shape of the graphs of:-
   i) Transpiration (3mks)

   ii) Absorption (3mks)

d) Suggest what would happen to transpiration and absorption of water if the experiment was continued for another 2 hours; (2mks)

e) Name two factors and explain how they would affect transpiration and absorption at any given time. (4mks)

7. (i) Describe the process of fertilization in flowering plant. (10mks)

   (ii) How is the human male reproductive system adapted to its functions? (10mks)

8. (i) Explain the methods of excretion in plants. (10mks)

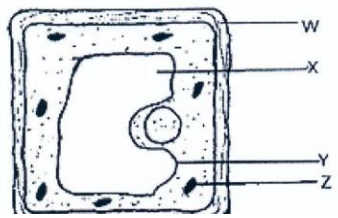
   (ii) Explain how the nephron is adapted to its functions. (10mks)

SERIES 21

SECTION A (40 MARKS)

Answer all the questions in this section.

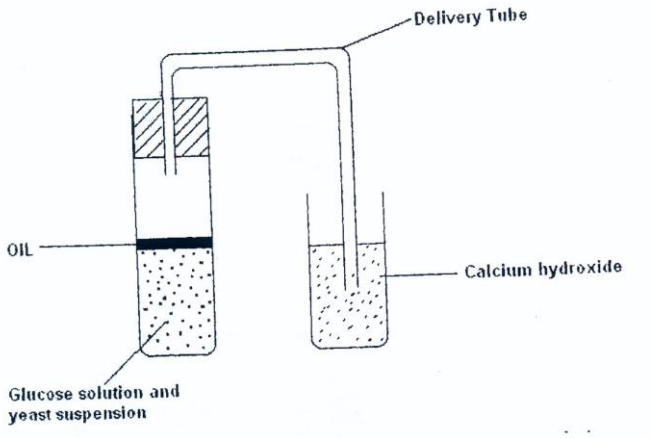
1. Examine the diagram below carefully and use it to answer the questions that follow.



(a) Name the parts X, Y and Z. (3 marks)
X: …….
Y: …….
Z: …….
(b) State the main substance which make-up the part labeled W. (1 mark)
…….
(c) Name the process through which mineral salts move into the structure labeled X. (1 mark)
……
(d) Explain what happens to a red blood cell when placed in distilled water. (3 marks)
……
……
……
……

2. (a) What is meant by natural selection? (4 marks)
……
……
……
……
……
(b) State four sources of evidences that support the theory of organic evolution. (4 marks)
……
……
……
……

3. The diagram below shows a set up that was used to demonstrate a certain physiological process.



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

(a) Identify the physiological process that was being investigated using the above set up. (1 mark)

……..

(b) Why was glucose boiled during the experiment? (1 mark)

……
……
……
……

(c) What was the importance of cooling the glucose before adding the yeast suspension? (1 mark)

……
……
……

(d) What observation would be made in test tube at the end of the experiment? (1 mark)

……
……
……

(e) How would the observation made in (d) above be affected if oil was not added on top of the yeast suspension during the experiment? (1 mark)

……
……
……
……
……

(f) In another investigation, a bird was found to use 10 litres of oxygen to give a respiratory quotient of 0.7 during period of flight. Name the type of food that was being respired by the bird and determine the amount of carbon (IV) oxide produced during the same flight.

Type of food …….. (1 mark)

Volume of carbon (IV) oxide produced. (2 marks)

……
……
……
……
……
……

4. Pure breed of red cows and pure breed of white bulls were crossed to give F_1 calves which had a mixture of red and white coat known as roan. The F_1 were selfed.

(a) Using letter R to represent gene for red colour and W to represent gene for white colour work out the phenotypic ratio of F_2. (4 marks)

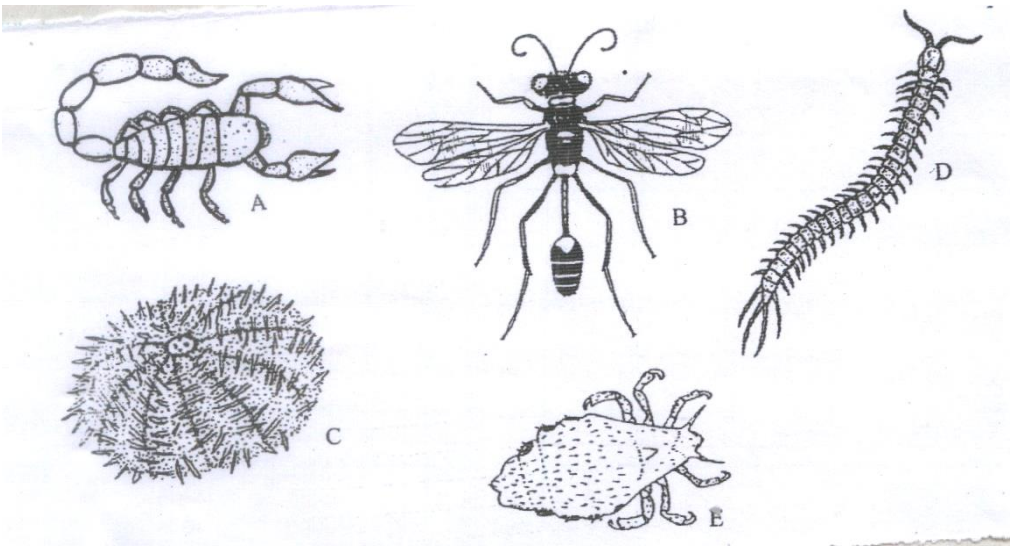
(b) Work out the genotypic ratio of a cross between F_1 offspring and white bull. (3mks)

(c) Comment on the gene(s) controlling the colour of coats in cattle mentioned above. (1mk)

……

……

5. You are provided with photographs of animals. Study the photographs and the dichotomous key below to enable you identify the taxonomic group to which each animal belongs.



KEY

1. a) Jointed legs present ……go to 2
   b) Jointed legs absent……..go to 7
2. a) Three pairs of legs ……..go to3
   b) More than 3 pairs of legs…….go to5
3. a) Wings present …….go to4
   b)Wingabsent……Anoplura
4. a) One pair of wings……Diptera
   b)Two pairs of wings……Hymenoptera
5. a) Four pairs of legs ……Arachnida
   b) More than ten pairs of legs …… go to 6
6. a) One pair of legs in each body segment…… Chilopoda
   b) Two pairs of legs in each body segment …… Diplopoda
7. a) Body partially enclosed in a shell…… Mollusca
   b) Body surface has spiny projection…….Echinodermata

a) Using the key, identify the following organisms to their taxonomic groups. In each case, give the sequence of steps which you followed in identifying them. (4 marks)

Animal	Identity	Steps followed
A		
B		
D		
E		

b) i) Using observable features only, state the class to which the animal labeled A and B on the photographs above belong (2 marks)

A …….

B…….

State two observable features on B, that enabled you to arrive at that answer in (b (i) above.(2mks)

i)……..

…….....

ii) ……

……

SECTION B

Answer question 6 and either question 7or 8

6. Two sets of a pea seeds were germinated, set A was placed in normal daylight conditions in the laboratory while set B was placed in a dark cupboard. Starting a few days later the shoots lengths were measured twice daily and their means lengths recorded as shown in the table below.

Time in hours	0	12	24	36	48	60	72	84
Set A length(mm)	12	14	20	23	28	31	47	54
Set B length (mm)	17	23	28	35	48	62	80	94

a. Using suitable scale draw the graphs of the mean lengths in set A and B against time on the grid provided (8marks)

……
……
……...

b. State three external conditions which should be constant for both set ups (3marks)

……7.

Describe the role of the following parts in human reproduction

i. Testes (4marks)
ii. Ovary (6marks)
iii. Sperm and ovum (6marks)
iv. Uterus wall/endometrium (4marks)

8.Discuss how the mammalian heart is adapted to its functions (20marks)

SERIES 22

SECTION A (40 MARKS)

Answer all questions in this section in the spaces provided

1. The figure below represents structures located in plant leaves. Use them to answer the questions that follow.

Figure I

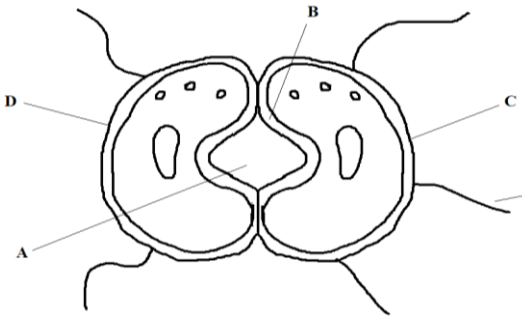
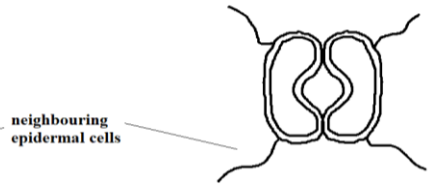


Figure II



(a) How is the structure, labelled **D**, adapted to its function? (2 marks)

……..

……..

(b) Name the parts labelled (2 marks)

A …….

B …….

(c) Using photosynthesis theory, briefly explain how the part marked **A** in the **Figure II** changes to part marked **A** in the **Figure I**. (4 marks)

……..

……..

……..

……..

2. In an experiment, black mice were crossed with brown mice. All the offspring had patches of black and brown in equal proportion. Using letter **B** to represent the gene for **black colour**, and **b** to represent the gene for **brown colour**:

(a) Work out the phenotypic ratio of **F2** generation (3 marks)

(b) What is genetic engineering? (1 mark)

……..

……..

(c) Explain why ***drosophila melanogaster*** is suitable for use in genetic experiment. (2 marks)

……..

……..

……..

(d) State **two** advantages of polyploidy in wheat farming (2 marks)

……

……

……

……

3. The photograph below shows an organism from a certain class of organisms

a. Name the class from which the organism belongs (1mk)

……

……

b. Using observable features from the photograph state two reasons for your answer in (a) above (2mks)

……

……

……

c. State **two** ways in which the organism is important to the environment (2 mks)

……

……

……

d. Name the kingdom to which bacteria belongs (1 mks)
……
……

e. State **two** bacterial diseases in humans (2 mks)
……
……
……..

4. A freshly obtained dandelion stem measuring 5 cm long was split lengthwise to obtain two similar pieces. The pieces were placed in solutions of different concentrations in petri dishes (L1 and L2) for 20 minutes. The appearance after 20 minutes is shown below.

a. Account for the appearance of the pieces in solutions L1 and L2 (6 marks)
……
……
……
……
……
……
……

b. State the significance of the biological process involved in the experiment (2 marks)
……
……
……
……

5. a. State **two** adaptations of the frogs skin to gaseous exchange (2 marks)
……
……
……
……

c. Explain how the human nasal cavity is adapted to gaseous exchange (3 marks)
……
……
……

d. Explain why amoeba does not require an elaborate gaseous exchange system (2 marks)
……
……
……
……..

e. Name the respiratory disease caused by ***Bordetellapartusis***(1 mark)
……
……..

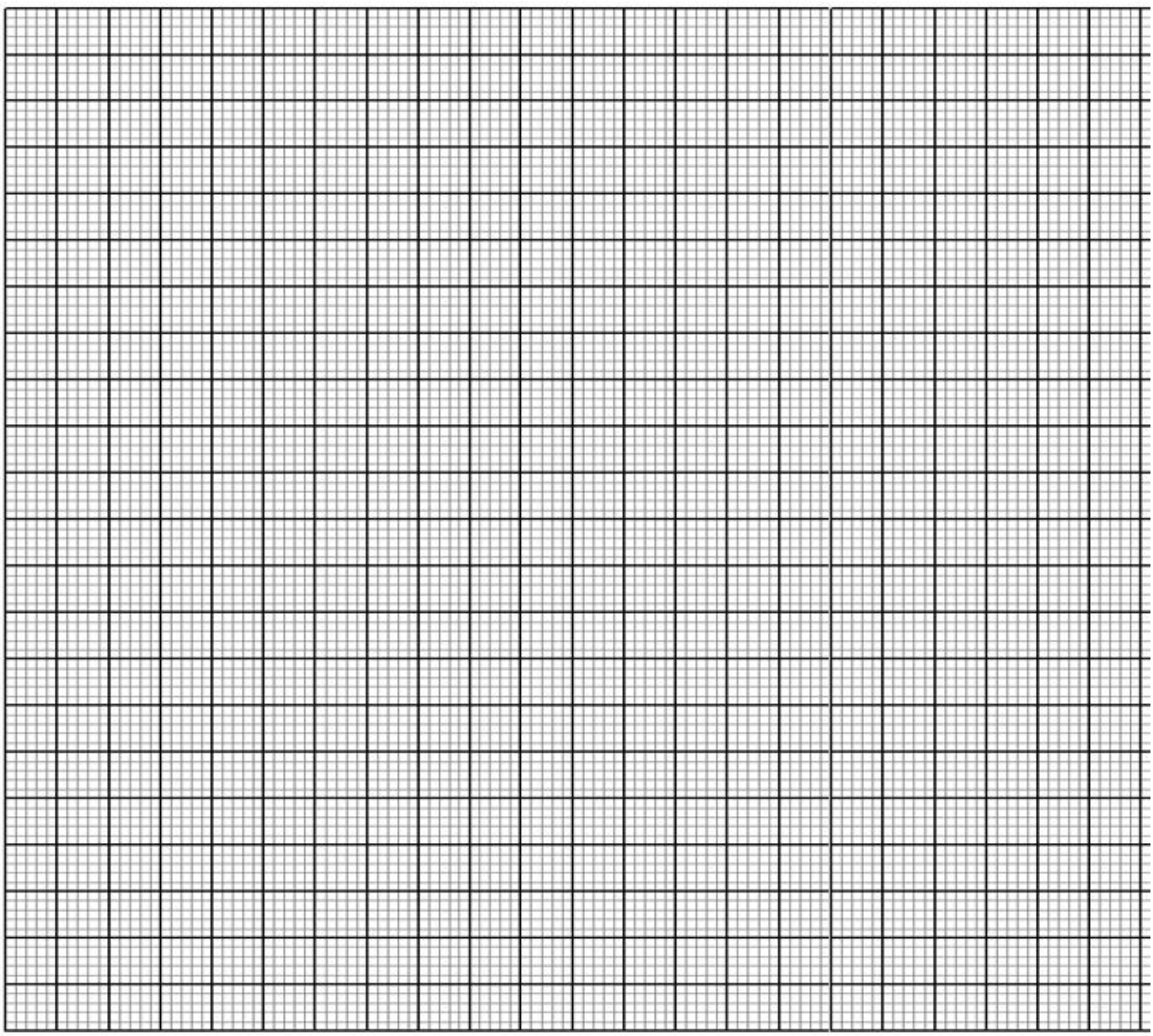
SECTION B (40 MARKS)

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

6. A culture of bacteria was taken at intervals in order to estimate the number of bacteria in the population. The data is as provided in the table below.

Time in hours	0	5	15	20	25	30	35	40	45
Number of living cells (millions)	10	20	1000	1000	1000	800	400	250	50

(a) On the grid provided, draw a graph of the number of living cells against time (6 marks)



(b) Account for the shape of the graph below:

i) 0 – 5 hours (2 marks)

……

……

……

ii) 5 – 15 hours (2 marks)

……

……

iii) 15 – 25 hours (2 marks)

……

……

……

(c) When was the population of bacteria 750 million? (2 marks)

……..

……..

(d) Give **two** reasons for the trend between 25 – 45 hours (2 marks)

……..

……..

……..

(e) Suggest what would happen to the population of bacteria if the temperature was lowered to 0^oC after incubating for 12 hours. (1 mark)

……..

……..

(f) Give a reason for your answer in **e) (i)** above (1 mark)

……..

……..

(g) To obtain the observed results, state **two** variables that were kept constant during the investigation. (2 marks)

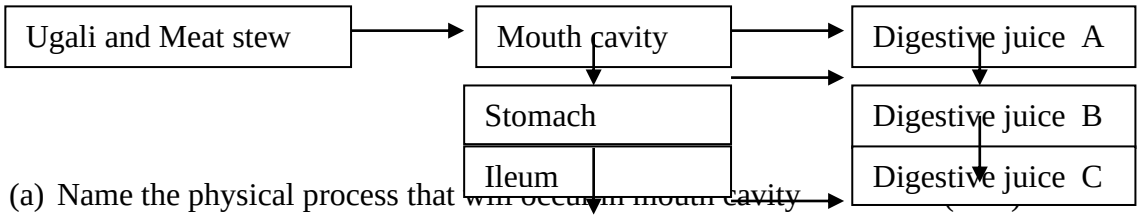
……..

7. a. Describe the functions of human blood in the human body (10 marks)
   b. How are respiratory surfaces in mammals adapted to their functions (10 marks)

8. Describe various evidences which show that evolution has taken place (20 marks)

SERIES 23
SECTION A (40 MARKS)
Answer ALL the questions in this section in the spaces provided.

1. The flow diagram below represents passage of a meal through the human digestive system. Study the diagram and answer the questions that follow.



(a) Name the physical process that will occur in mouth cavity (1mk)

……

(b) Name the digestive juices **B** and **C** (2mks)
B…….
C…….

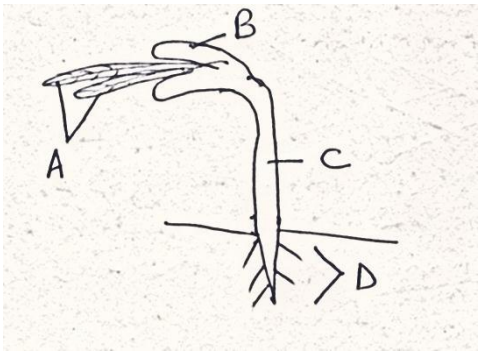
(c) Explain **two** ways in which the digestive system is protected from corrosive effects of digestive juices. (2mks)
……
……
……

(d) Name the hormone that stimulate secretion of juice **B**. (1mk)
……

(e) Identify **two** contents of digestive juice **A** (2mks)

……
……..

2 Examine the diagram below and answer the questions that follows



Name the parts labeled A-D

(4mks)

A……..
B……
C…….
D……..

b) State the type of germination exhibited by the seedling above (1mk)

…….

c) State and explain three environmental conditions necessary for germination. (3 marks)

……

……

……

……

3. A cross between a red flowered plants and white flowered plants produced plants with pink flowers. Using letter R to represent the gene for red color and W for white.

a) What were the parental genotypes? (2mks)

……

……

b) Work out the cross between f1 generations (4mks)

c) State the phenotypic and genotypic ratios of the f2 generations (2mks)

……

……

4. (a) What is meant by:

i) Autecology (1mk)

……

ii) Synecology (1mk)

……

(b) Using the table below, answer the questions that follow

	Number of stomata	
Leaf	**Upper epidermis**	**Lower epidermis**
A	300	0
B	150	200
C	02	13

c) Suggest the possible habitat of the plants from the leaves were obtained (3mks)

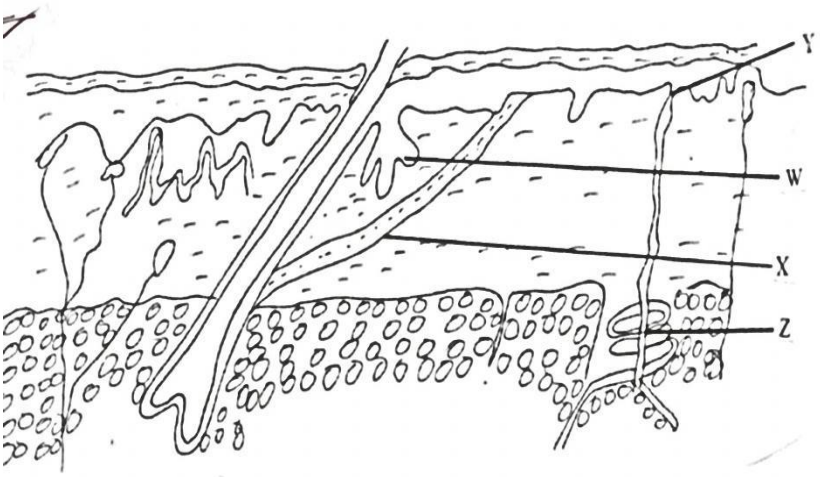
A

B

C

d) State the modifications in the stomata of leaf C (3mks)

5. The diagram below shows a section through the mammalian skin



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

…X……

…Y……

b. State the function of the parts labeled W and Z (2mks)

……W……

.....

……Z……

.....

c. Explain the changes that occur on the skin when it is cold (4mks)

……

……

……..

……

……

……

……

SECTION B: (40MKS)

QUESTION 6 is COMPULSARY: *Answer either question 7 or 8.*

6. In an experiment, three healthy rabbits were fed with equal amounts of carbohydrates. After 1 hour their blood sugar glucose concentration was measured at 30 minutes intervals for 3 hour. The results are as shown in the table below.

Glucose conce Mg/ml Rabbit	**Initial time(minutes)**	**30 Minutes**	**60Minutes**	**90 Minutes**	**120 Minutes**	**150 Minutes**	**180 Minutes**
P	1.6	1.55	1.43	1.36	1.3	1.19	1.11
Q	1.49	1.39	1.34	1.32	1.27	1.2	1.09
R	1.59	1.39	1.33	1.27	1.18	1.1	0.99
Mean	1.56	1.44		1.32	1.25	1.16	-

a.(i) Calculate the **mea**n glucose concentration 1mg/ml of blood at 60 and 180 minutes. (2mks)

(ii) On the grid provided plot a graph of mean glucose concentration against time. (6mk)

(iii) What was the mean concentration in the blood after 75minutes? (1mks)

……

(iv)Why was it necessary to use 3 rabbits in the experiment? (1mks)

……

……

……

(v) Account for differences in mean glucose concentration between initial time and 180 minutes. (3mks)

……

……

……

(b) Name three products of digestion other than glucose (3mks)

……

……

……

……

(c) What is the fate of excess glucose in:

(i) Plants? (2mks)

……

……

……

(ii) Animals ? (2mks)

……

……

……....

7.Describe how the male reproductive system is adapted to its functions.(20mks)

8(a) How are structures of the human eye adapted to their functions (14 marks)

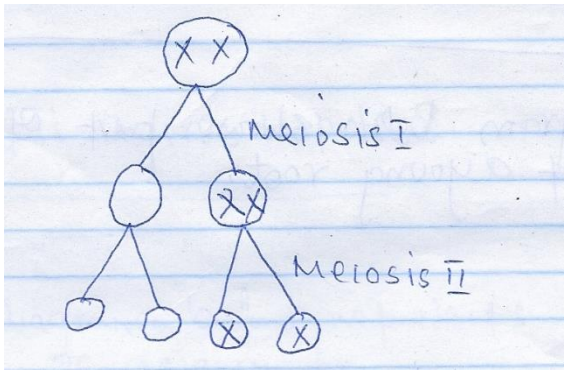
(b) State three defects of the eye and how each can be corrected (6 marks)

SERIES 24

SECTION A (40MKS)

Answer ALL questions in this section in the spaces provided.

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



(a) (i) Identify the type of chromosome mutation illustrate above. (1mk)

……..

(ii) State two examples of disorders in humans that are caused by the mutation named in a(i) above. (2mks)

(i)

……..

(ii)

……..

(iii) Name a disorder of blood that is caused by gene substitution. (1mk)

……..

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

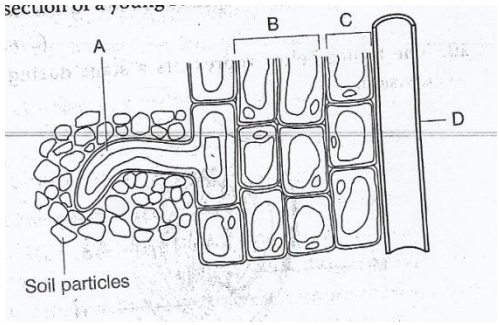
DNA	RNA
i) ……..	……
…….	……
ii)……..	……
…….	……
iii)…….	…….

…… ……

c) Define the term mutation ……

……(1mk)

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



(a) Name he parts labeled A, B, C and D. (4mks)

A - C -

B - D –

(b) State the importance of the cell labeled A. (1mk)

……

……

(c)How is the tissue labeled D adapted to the function it performs. (3mks)

……

……

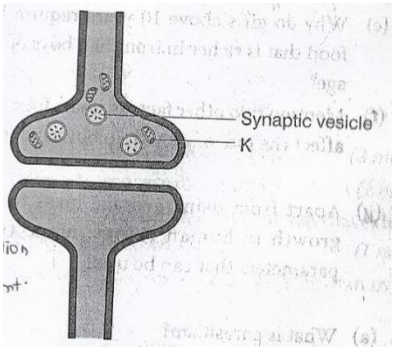
……

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

……

……

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



On the diagram, indicate with an arrow the direction of impulse transmission. (1mk)

(c) Name the chemical substance that is contained in the synaptic vesicle. (1mk)

……

(d) State the function of the part labeled K in the diagram. (1mk)

……

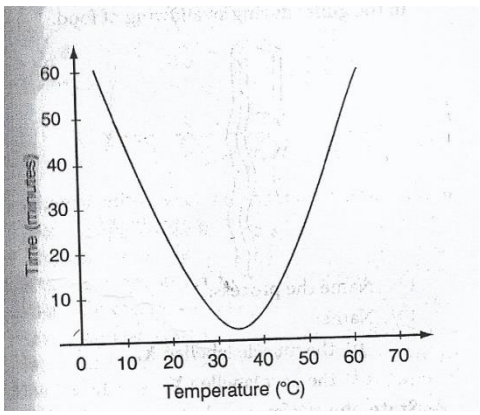
……

(e) Name two mineral ions that are involved in the transmission of nerve impulses. (2mks)

(i)

(ii)

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



(a) (i) What is the optimum temperature for the enzyme? (1mk)

……

……

(ii) Account for the time taken to digest egg albumen at 60^0C. (2mks)

……

……

……

……

(b) By giving a reason, name the form in which pepsin enzyme is secreted. (2mks)

……

……

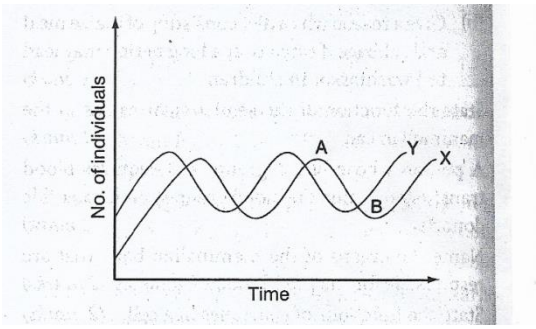
(c) State three other factors that affect enzyme controlled reactions. (2mks)

(i)

(ii)

(iii)

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



(a) Identify the cure that represent carnivores. Give a reason for your answer. (2mks)

……

……

(b) Suggest a reason for the slope of curve X between points A and B. (2mks)

……

……

(c) (i) Name the type of relationship that exist between herbivores and carnivores as indicated in the graphs. (1mk)

……

……

(ii) State the significance of the relationship you have stated in C(i) above. (1mk)

……

……

(d) What will be the long term effect on the park ecosystem if all carnivores were eliminated from the park. (1mk)

……

……

……

……

……

SECTION B (40MKS)

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

6. Research was carried out to determine the growth rate of some boys and girls. Their average mass in Kilograms was taken separately for 20 years. Their weight are tabulated as shown in the table below.

Age	Average Mass of (Boys(Kg)	Average mass of girls Kg.
0	2.5	2.5
2	11.1	11.5
4	15.00	16.0
6	18.5	19.3

8	22.1	27.1
10	25.1	27.2
12	27.00	30.00
14	37.00	36.00
16	44.00	44.00
18	47.0	52.00
20	48.5	55.00

(a) On the same axis, plot graphs of the average mass of the boys and the girls against their age. (7mks)

(b) From the graph, determine the

(i) Mass for boys at the age of 11 years. (1mk)

……

……

(ii) Growth rate for girls between ages 13 and 15. (2mks)

……

……

(c) Account for the change in the mass of girls during the age stated in (ii) above. (2mks)

……

……

……

……

……

……

……

…

(d) Explain the trend observed in the curves for both boys and girls. (3mks)

……

……

……

……

(e) Why do girls above 10 years require intake of food that is richer in iron than boys of the same age? (1mk)

……
……

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

(2mks)

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

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

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

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