1. a) Define the following terms:

i) Photosynthesis. (1mk)

ii) Chemosynthesis. (1mk)

iii) Heterotrophism. (1mk)

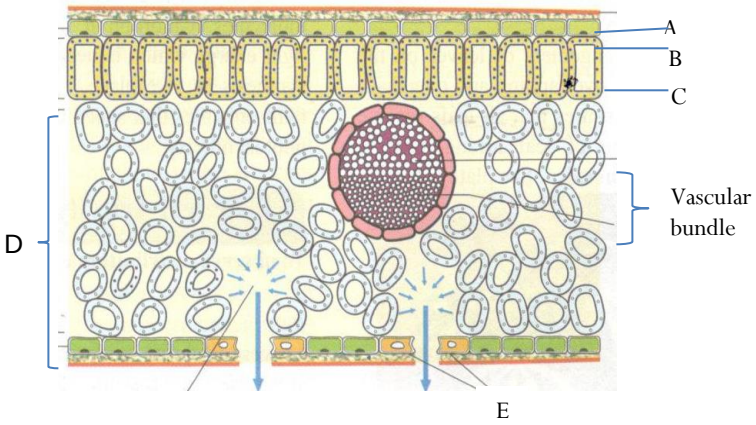
b) Explain the importance of nutrition. (1mk)

c) How does nutrition as a characteristic of living organisms differ in plants and animals? (2mks)

d) Explain why insectivorous plants such as *Drosera* species trap and digest insects. (1mk)

e) Give three structural differences between monocot and dicot leaf. (3mks)

2. The diagram below represents internal structure of the leaf. Study it and answer the questions that follow.



a) Name the parts labeled A-E. (5mks)

b) Give three functions of the part labeled A. (3mks)

c) How is part labeled B adapted to its function? (5mks)

d) Explain the structural adaptation of the cells labeled E. (2mks)

e) Explain two ways in which the cells labeled E differ from other epidermal cells. (2mks)

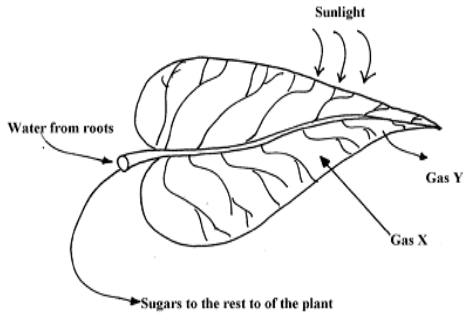
f) Explain the adaptation of the layer labeled D to its function. (2mks)

g) Explain the role of vascular bundle in nutrition. (2mks)

h) Name three cells in a leaf which contain chloroplasts/ which carry out photosynthesis. (3mks)

i) Name two plant cells that lack chloroplasts. (2mks)

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



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

b) Explain the adaptations of the leaf to photosynthesis. (8mks)

c) List three adaptations of leaves that maximize efficiency in trapping sunlight for photosynthesis. (3mks)

d) Explain two adaptations of aquatic plants to photosynthesis. (2mks)

e) Explain why most leaves are thin with broad surface. (1mk)

f) Name the tissue which:

i) Transports water from the roots. (1mk)

ii) Transports sugars to the rest of the plant. (1mk)

4. a) List two conditions necessary for photosynthesis. (2mks)

b) i) List two requirements/ raw materials for photosynthesis. (2mks)

ii) State the sources of the raw materials named in b) i) above. (2mks)

c) Describe:

i) Light stage of photosynthesis. (3mks)

ii) Dark stage of photosynthesis. (2mks)

d) Name one end product of:

i) Light stage of photosynthesis. (1mk)

ii) Dark stage of photosynthesis. (1mk)

e) Explain the fate/ end results of products of photosynthesis. (4mks)

f) Explain why plants will not photosynthesise in the dark. (1mk)

g) Explain why it's an advantage for the plant to store carbohydrates as starch rather than as sugars/ glucose. (1mk)

h) State one way in which the dark reactions of photosynthesis depends on light reaction. (1mk)

5. a) Explain the importance of the following in photosynthesis;

i) Light. (2mks)

ii) Chlorophyll. (1mk)

iii) Carbon (IV) oxide. (1mk)

iv) Guard cells. (1mk)

v) Stomata. (1mk)

b) Explain how the following processes affect the rate of photosynthesis:

i) Chlorophyll concentration. (2mks)

ii) Temperature. (2mks)

iii) Light intensity. (1mk)

iv) Carbon (IV) oxide concentration. (1mk)

c) The diagram below represents a leaf obtained from a certain plant.

i) Account for the observation made if the leaf was tested for starch. (2mks)

ii) Name two mineral elements that are necessary in the synthesis of chlorophyll. (2mks)

6. a) A leaf of a potted plant kept in darkness for 48hours was smeared with Vaseline jelly then exposed to sunlight for 8hours. Explain why the test for starch in the leaf was negative. (1mk)

b) Name two other processes that were interfered with in the plant. (2mks)

7. The chemical equation below represents a physiological process that takes place in living organisms:

$$C_6H_{12}O_6 + C_6H_{12}O_6 \longrightarrow C_{12}H_{22}O_{11} + Q$$

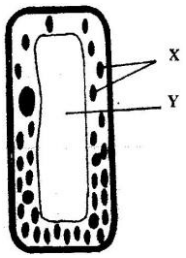
a) Name the process. (1mk)
b) Name the substance Q. (1mk)

8. The following reaction may occur in a forward and backward direction.

Water + Carbon (IV) Oxide $\rightleftharpoons$ Glucose + Oxygen + Energy

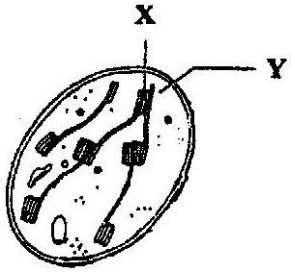
a) Name the organelle where the reaction occurs in:
(i) Forward direction. (1mk)
(ii) Backward direction. (1mk)
b) Give one difference and one similarity for the two organelles named in (a) above. (2mks)

9. The diagram below represents a plant cell.



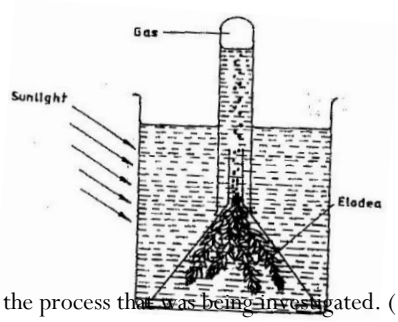
Identify the cell. (1mk)
a) Name the parts labelled X and Y. (2mks)
b) Suggest why the structures labelled X would be more on one side than the other. (1mk)

10. The diagram below represents a cell organelle.



a) Identify the organelle. (1mk)
b) State the role of the organelle. (1mk)
c) Name the part labeled X and Y. (2mk)
d) State the function of each of the part labeled X and Y. (2mks)
e) Explain three adaptations of the organelle shown above to its function. (3mks)
f) Name the part of the organelle where the following processes take place;
i) Carbon (IV) oxide fixation. (1mk)
ii) Photolysis. (1mk)

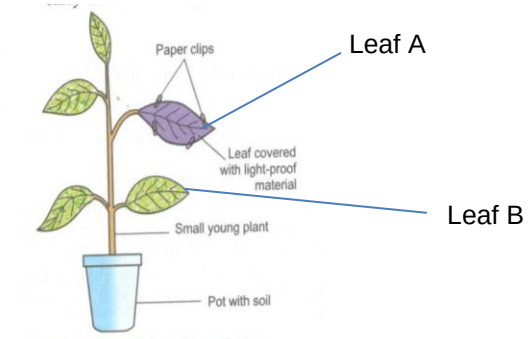
11. The diagram below represents a set up that was used to investigate certain process in a plant.



a) State the process that was being investigated. (1mk)
b) Why was sodium hydrogen carbonate used during the experiment?
c) Why was aquatic plant (elodea) plant used instead of terrestrial plant? (2mks)
d) i) Name the gas produced. (1mk)
ii) State the confirmatory test of the gas identified in c) i). (1mk)
e) State two factors that would affect the process investigated. (2mks)
f) Name two other factors that can be tested using the set up above. (2mks)

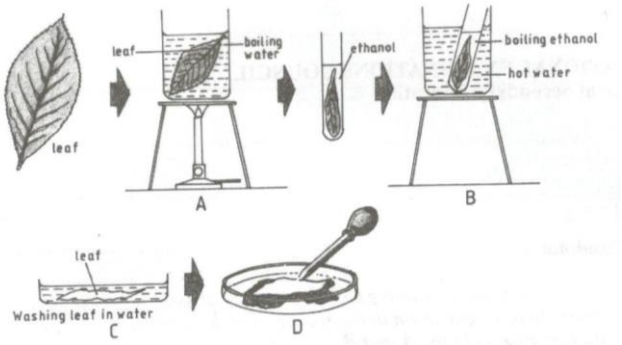
12. A group of students placed a fresh leaf in warm water. They observed that air bubbles formed on the surface of the leaf.
a) What biological process were they investigating? (1mk)
b) Name the structures from which the air bubbles were coming from. (1mk)
c) Explain the distribution of the structures named in b) above on the leaf surfaces of a land plant. (2mks)

13. Students set up the experiment as shown below.



Leaf A was covered with aluminum foil while leaf B was left uncovered. The plant was put in the dark for 48 hours then transferred to the light for 3 hours after which a food test was carried out on the leaf.
a) Which process was being investigated? (1mk)
b) Which factor was being investigated in the experiment? (1mk)
c) What food test was carried out on the leaf? (1mk)
d) Why was the leaf placed in the dark for 48 hours? (1mk)
e) Why was the plant transferred to the light? (1mk)
f) Why was leaf B left uncovered? (1mk)
g) Explain the results obtained in leaf A and B when tested for starch. (4mks)

14. The set-up below illustrates a procedure that was carried out in the laboratory with a leaf plucked from a green plant that had been growing in sunlight.



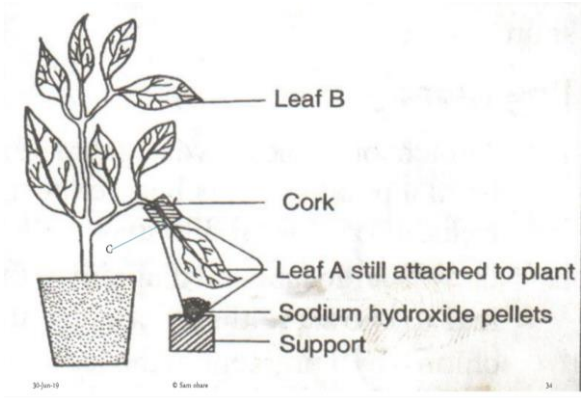
a) What was the purpose of the procedure? (1mk)

b) Give reasons for carrying out steps A, B and C in this procedure? (3mks)

c) Name the reagent that was used at the step labeled D. (1mk)

d) State the expected result on the leaf after adding the reagent named iii) above. (1mk)

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



a) Why was the potted plant kept in the dark overnight? (1mk)

b) Which factor was being investigated in the experiment?(1mk)

c) i) Which test did the students perform to confirm photosynthesis in the leaves labeled A and B? (1mk)

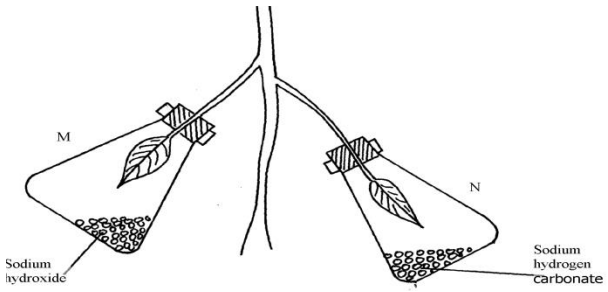
ii) State the results obtained in the leaves labeled A and B. (2mks)

iii) Explain the results obtained in the leaves labeled A and B. (2mks)

d) What is the purpose of leaf B in the experiment? (1mk)

e) Explain the expected result for starch in leaf A if sodium hydrogen carbonate is used instead of sodium hydroxide? (2mks)

16. A healthy plant was kept in the dark for 24hours following which two of its leaves were enclosed in glass flasks as shown below. The set up was the exposed to sunlight for a number of hours.



(a) Why was it necessary to keep the plant in the dark for 24 hours? (1mk)

(b) Give the function of each of the following in the experiment:

(i) Sodium hydroxide. (1mk)

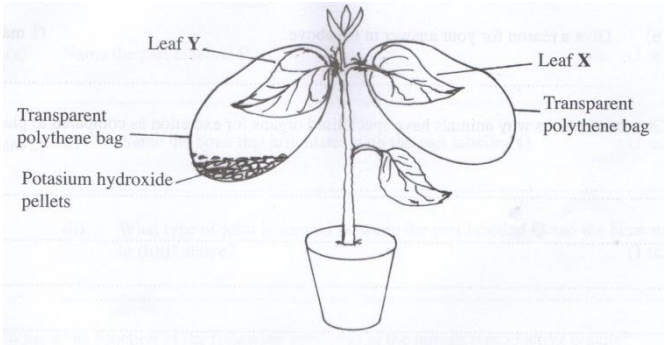
(ii) Sodium hydrogen corbonate. (1mk)

(c) Explain the expected results:

(i) When leaf M is tested for starch? (2mks)

(ii) When leaf N is tested for starch? (2mks) (d) Suggest a suitable control for this experiment. (1mk)

17. A potted plant was kept in the dark for 48 hours. The two leaves X and Y were treated as shown in the diagram below.



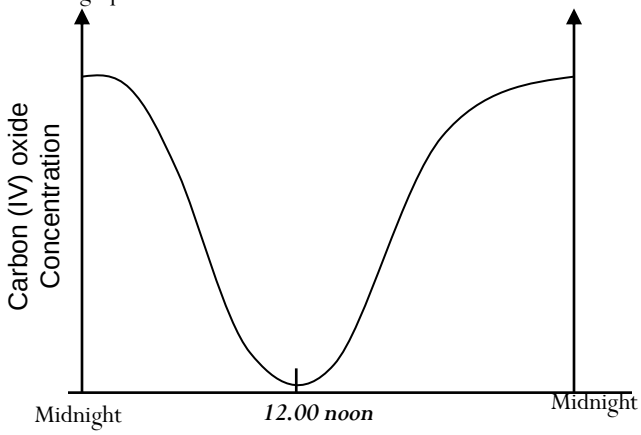
The experiment set-up was kept in sunlight for 6 hours after which a starch test was carried out on the two leaves.

a) What was the role of potassium hydroxide in the set up/ (1mk)

b) What were the results of the starch test on leaves X and Y? (2mks)

c) Give reasons for your answers in b) above. (2mks)

18. The concentration of carbon IV oxide in a tropical forest was measured during the course of 24 hour period from mid-night. The graph below shows the results obtained.

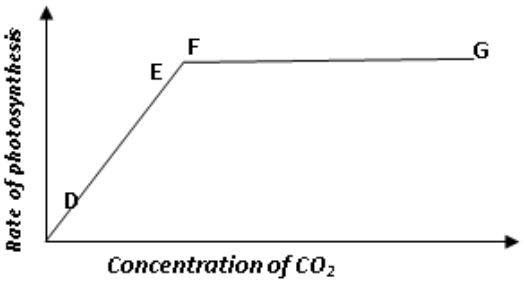


Account for the results obtained at:

a) Midnight. (2mks)

b) At 12.00 noon. (2mks)

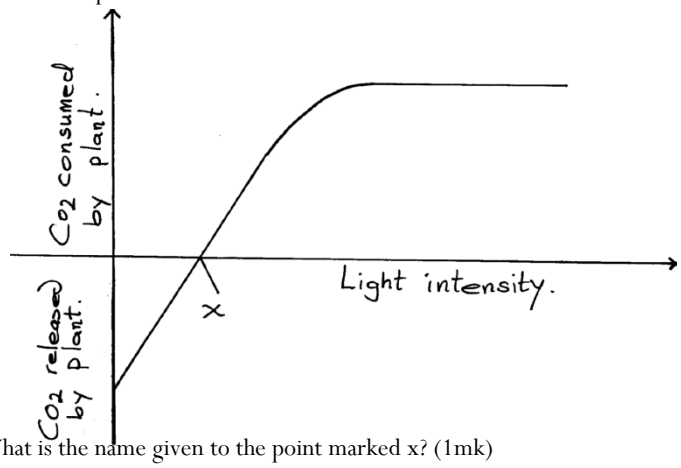
19. The chart below shows the relationship between concentration of CO_2 around the plant and the rate of photosynthesis.



(a) Account for the rate of photosynthesis between D-E. (2mks)

(b) Account for the rate of photosynthesis between F-G . (2mks)

20. The diagram below shows the effect of varying light intensity on the exchange of carbon IV oxide between the leaves of a green plant and the atmosphere.



a) What is the name given to the point marked x? (1mk)

b) i) With reference to carbon IV oxide exchange, state what happens at point x. (1mk)

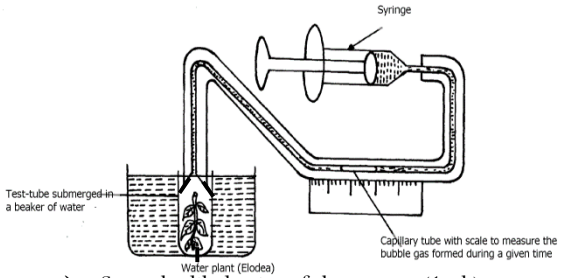
ii) Explain how the effect observed at point x occurs. (1mk)

c) Explain why there is a net uptake of carbon IV oxide at light intensity above x. (2mks)

d) What would happen to the plant if light intensity falling on it were maintained at x throughout? (2mks)

e) What can you say about the exchange of oxygen between the plant and the surrounding air at intensities below x? (2mks)

21. Form one students from Enkinda School arranged their apparatus as shown below, to investigate a certain phenomenon. The set up was placed in light.



a) State the likely aim of the set up. (1mk)

b) State the role of the syringe in the set-up above. (1mk)

c) (i) Name gas X

(ii) Write an equation to show how gas X was formed in the set-up. (1mk)

d) Give a reason why the test tube is immersed in a beaker of water. (1mk)

22. In an investigation, two potted plants G and H belonging to the same species were exposed to increasing light intensities at different temperatures, 30°C and 20°C respectively. The rate off photosynthesis was measured for each plant and results recorded as shown in the table below.

Light intensity (in arbitrary units)	1	2	3	4	5	6	7	8
Rate of photosynthesis for plant G at 30°C	0	84	148	196	232	260	284	296
Rate of photosynthesis for plant H at 20°C	0	72	115	148	170	186	204	216

a) On the same axis, plot graphs of rate of photosynthesis against light intensity for plants G and H. (8mks)

b) State the aim of the investigation. (1mk)

c) Account for the difference in the rate of photosynthesis in the two plants. (3mks)

d) Account for the difference in the rate of photosynthesis in the two plants between the following light intensities:

i) 1-4 units. (2mks)

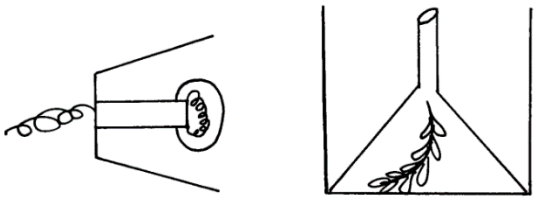
ii) 4-8 units. (2mks)

e) i) Predict the rate of photosynthesis at light intensity of 16 units. (1mk)

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

f) State one internal and one external factor that could be limiting the investigation. (2mks)

23. The diagram below shows an experiment that was carried out to measure how fast were plant such as <u>Elodea</u> photosynthesizes.



The shoot was exposed to different light intensities and the rate of photosynthesis estimated by counting the number of bubbles of gas leaving the shoot in a given time and the results are given below;

Number of bubbles per minute	7	14	20	24	26	27	27	27
Light intensity in arbitrary units	1	2	3	4	5	6	7	8

a) Plot a graph of number of bubbles per minute against light intensity. (6mks)

b) At what light intensity did the shoot produce:
i) 18 bubbles per minute. (1mk)
ii) 25 bubbles per minute. (1mk)
c) Give two better ways of measuring the rate of photosynthesis than counting bubbles. (2mks)
d) What is the role of light intensity in photosynthesis? (1mk)
e) Account for the expected results of doing this experience at the following temperature;
i) 4°C (1mk)
ii) 34°C. (1mk)
iii) 60°C. (1mk)
f) Other than light intensity and temperature, name two factors that affect the rate of photosynthesis. (2mks)

24. In an investigation, equal amounts of water was placed in three test tubes labeled G,H and J. Pond weeds of equal length were dropped in each test tube. The test tubes were then placed in identical conditions of light and carbon (IV) oxide at different temperatures for five minutes. After five minutes, the bubbles produced in each test tube were counted for one minute. The results were as shown in the table below.

Test tube	Temperature (^{0}c)	Number of bubbles
G	20	28
H	35	42
J	55	10

a) i) Name one requirement for this process that is not mentioned in the investigation. (1mk)
ii) Name the gas produced in this investigation. (1mk)
b) Account for the results in test tubes H and J. (2mks)

25. You are provided with a sample of food substance labeled X (Mixture of wheat flour and glucose), solution J (Iodine solution), solution K (Benedict's solution) and solution L (Biuret's reagent). Carry out tests on the food sample to identify the type of food substances present. (9mks)

Food substance	Procedure	Observation	Conclusion

26. You are provided with a food substance labeled solution C (mixture sucrose and milk). Using the reagents provided (Benedict's solution, Hcl, $NaHCO_3$, copper II sulphate and Sodium hydroxide), carry out the tests to identify the food substances present in the sample. (12mks)

Test for	Procedure	Observation	conclusion
Reducing sugars			
Non- reducing sugars			
Proteins			

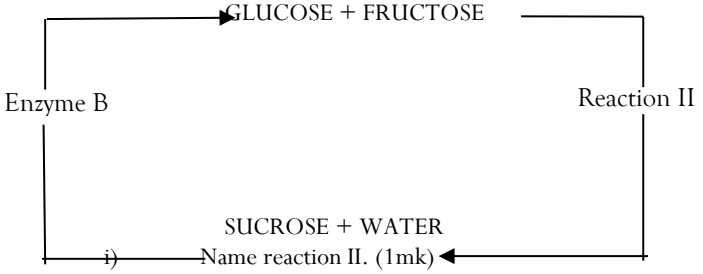
27. You are provided with a 250ml beaker, 4 test tubes solution D (starch), solution E (Amylase), iodine and benedict's solution.
Half fill the beaker with hot water provided to create a hot water bath.
(I) Label the four test tubes as follows:
i) Test tube 1, D + Iodine.
ii) Test tube 2, D + E + Iodine.
iii) Test tube 3, D + Benedict's solution.
iv) Test tube 4, D + E + Benedict's solution.
(II) Put 1 cm^3 of solution D in each of the four test tubes.
(III) To the D + Iodine test tube, add one drop of iodine and shake to mix.
(IV) To the D + E + Iodine test tube, add 1 cm^3 of solution E and two drops of iodine solution. Shake to mix.
(V) To the D + Benedict's solution test tube, add 1 cm^3 of benedict's solution and shake to mix.
(VI) To the D + E + Benedict's solution test tube, add 1 cm^3 of solution E and 1 cm^3 of Benedict's solution. Shake to mix.
(VII) Observe the changes in each of the four test tubes.
(VIII) Put all the four test tubes in the hot water bath and observe carefully for 5 minutes.
a) Record the observation and conclusion for each of the four test tubes in the table below.

No	Test tube	Observation	Conclusion
1.	D + Iodine.		
2.	D + E + Iodine.		
3.	D + Benedict's solution.		
4.	D + E + Benedict's solution.		

b) What was the role of each of the following in the experiment;
i) Solution E. (1mk)
ii) Hot water bath. (1mk)
c) Give the identity of E in human beings. (1mk)
d) Explain the observation made on the reagents tested with benedict's solution. (2mks)

28. a) Give two differences between monosaccharides and polysaccharides. (2mks)
b) List two roles of each of the following:
i) Carbohydrates. (2mks)
ii) Proteins. (2mks)
iii) Lipids. (2mks)
c) State the form in which carbohydrates are:
i) Transported in animals. (1mk)
ii) Transported in plants. (1mk)
iii) Stored in animal tissues/ muscles. (1mk)
iv) Stored in plant cells. (1mk)

29. a) The diagram below shows chemical reactions I, and II which are controlled by enzymes



i) Name reaction II. (1mk)

ii) Name the enzyme labeled B. (1mk)

b) A solution of sugar cane was boiled with hydrochloric acid and sodium hydrogen carbonate was added to the solution, which was then boiled with Benedict's solution. An orange precipitate was formed.

i) Why was the solution boiled with hydrochloric acid and then sodium hydrogen carbonate added in it? (2mks)

ii) To which class of carbohydrates does sugar cane belong? (1mk)

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

Temperature (oC)	Rate of reaction in mg of products 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) Plot a graph of rate of reaction against temperature. (6mks)

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

c) Account for the shape of the graph between:

i) 5 °C and 40 °C. (2mks)

ii) 45 °C and 60 °C. (3mks)

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

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

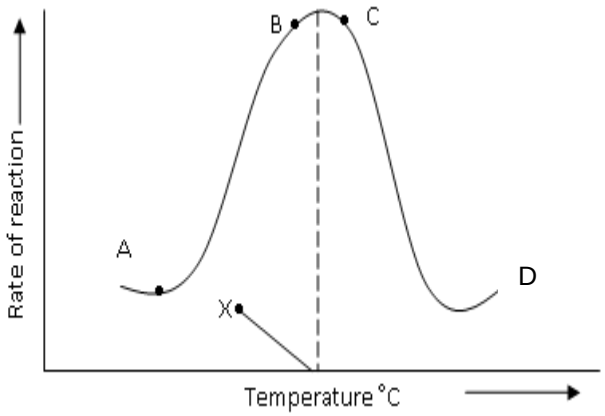
ii) How is the acidic condition for the enzyme in e) i) above attained? (2mks)

f) The acidic condition in e) ii) above is later neutralized.

i) Where does the neutralization take place? (1mk)

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

31. The figure shows the effect of temperature on an enzyme catalyzed reaction.



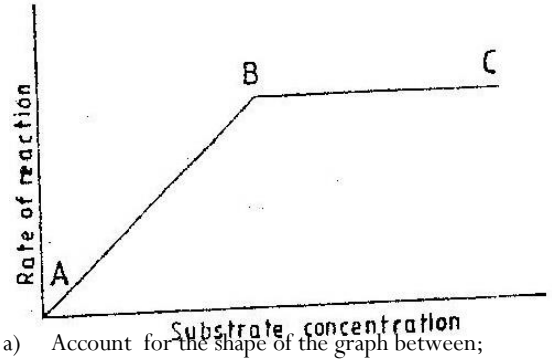
a) Explain what happens between;

i) A and B. (2mks)

ii) C and D. (2mks)

b) What is X? (1mk)

32. The graph below shows the effect of substrate concentration of the rate of enzyme reaction.



a) Account for the shape of the graph between;

i) A and B. (2mks)

ii) B and C. (2mks)

b) How can the rate of reaction be increased after point B? (1mk)

c) State two other factors that affect the rate of enzyme reaction. (2mks)

33. a) State two factors that denature enzymes. (2mks)

b) Give three properties of enzymes. (3mks)

c) Explain four factors that affect enzyme activity. (4mks)

d) i) State the function for co-factors in cell metabolism. (1mk)

ii) Give one example of a metallic co – factor. (1mk)

e) State three ways by which the rate of enzyme controlled reactions can be increased. (3mks)

f) State the collective name of the enzymes that work on:

i) Carbohydrates. (1mk)

ii) Proteins. (1mk)

iii) Lipids. (1mk)

g)) Name the food substrate for the following enzymes:

i) Pepsin. (1mk)

ii) Amylase. (1mk)

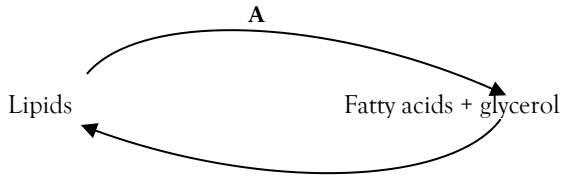
iii) Lipase. (1mk)

h) A biological washing detergent contains enzymes which remove stains like mucus and oils from clothes which are soaked in water with the detergent.

i) Name two groups of enzymes that are present in detergent. (2mks)

ii) Explain why stains would be removed faster with the detergent in water at 35°C rather than at 15°C. (1mk)

34. Below is a process that takes place along the mammalian digestive system:



(a) Name the processes represented by A and B. (2mks)

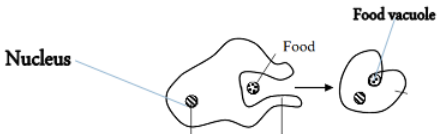
b) Name the enzyme that catalyzes the process labeled a. (1mk)

c) Name the part of alimentary canal where the process labeled A takes place. (1mk)

d) What happens to excess fatty acids and glycerol in the body? (1mk)

e) In an investigation, the pancreatic duct of a mammal was blocked. It was found that the blood sugar regulation remained normal while food digestion was impaired. Explain these observations. (2mks)

35. The diagram below illustrates a mode of nutrition in amoeba. Study it and answer the questions that follow.



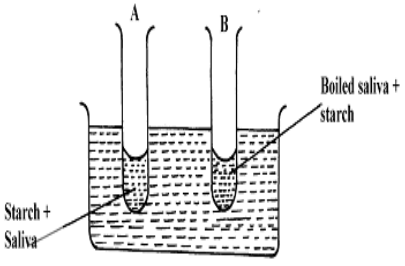
Pseudopodium

a) Name the type of nutrition illustrated. (1mk)

b) Explain the type of nutrition named in a) above. (2mks)

c) Name four other heterotrophic modes of nutrition. (4mks)

36. In an experiment to investigate on aspect of digestion, two test tubes A and B were set-up as shown in the diagram below. The test tubes were left in the bath for 30minutes. The content of each test tube was then tested for starch using iodine solution



a) What was the aim of the experiment? (1mk)

b) What results were expected in test-tube A and B? (2mks)

c) Account of the results you have given in (b) above in test tube A and B. (2mks)

37. The table below shows three enzymes A, B and C and their respective optimum pH.

Enzyme	Optimum pH
A	6.8
B	2.0
C	8.0

a) Name the most likely region of the alimentary canal of a mammal where enzyme B would be found.(1mk)

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

38. a) Differentiate between homodont and heterodont. (2mks)

b) A certain animal has no incisors, no canines, 6 premolars and 6 molars in its upper jaw. In the lower jaw there are 6 incisors, 2 canines, 6 Premolars and six molars. Write its dental formula. (2mks)

c) Write the dental formula of human beings. (1mk)

d) i) Identify the mode of feeding of the animal whose dental formula is given below. (1mk)

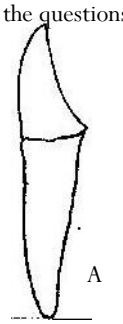
$$I\frac{0}{2}, C\frac{0}{0}, PM\frac{3}{3}, M\frac{2}{2}$$

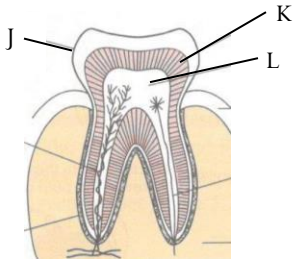
ii) Give two reasons for your answer in (a) (i) above. (2mks)

iii) Give the total number of teeth for the animal whose dental formula is illustrated above. (1mk)

e) Which sets of teeth would be used in chewing sugarcane for maximum extraction of sap? (2mks)

39. The diagrams below illustrate mammalian teeth. Study them and answer the questions that follow.





B

a) With a reason, identify the teeth named A and B above. (4mks)

b) Explain one adaptation of each tooth to its function. (4mks)

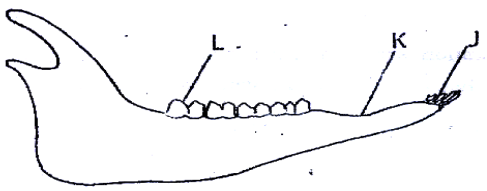
c) Name the parts labeled J, K and L in tooth B. (3mks)

d) Give one function of the parts labeled J, K and L. (3mks)

e) Name the substance that is responsible for hardening of teeth. (1mk)

f) Name two dental diseases. (2mks)

40. The diagram below represents the lower jaw of a mammal



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

b) State one structural and one functional difference between the teeth labelled J and L. (2mks)

c) i) Name the toothless gap labeled K. (1mk)
ii) State the function of the gap named in c) i) above. (1mk)

d) Explain the adaptation of carnassial teeth. (2mks)

e) State two adaptations of herbivores which enable them to digest cellulose. (2mks)

41. a) Define the term digestion. (1mk)
b) Name three salivary glands in human beings. (3mks)
c) List five roles of saliva in man. (5mks)
d) The action of ptyalin stops in the stomach. Explain. (1mk)
e) In an investigation, the pancreatic duct of a mammal was blocked. It was found that the blood sugar regulation remained normal while food digestion was impaired. Explain these observations. (2mks)
f) Explain how the stomach adapted to:
i) Churning. (2mks)
ii) Protein digestion. (2mks)
g) State two functions of large intestines in humans. (2mks)
h) State two functions of bile juice in the digestion of food. (2mks)
i) Name the features that increase the surface area of small intestines. (2mks)
j) State the role of emulsification in the digestion of fats in the alimentary canal. (1mk)
k) What is the function of the following in the alimentary canal?
i) Muscles. (2mks)
ii) Hydrochloric acid. (1mk)
iii) Mucus. (1mk)
l) Describe how the mammalian small intestine is adapted to its function. (20mks)

m) Describe what happens to a meal rich in protein along the alimentary canal from ingestion to egestion. (20mks)

n) Describe digestion of carbohydrate in human body. (20mks)

o) Describe the digestion of lipids/ fats/ oils in human body. (10mks)

42. a) State four uses of digested food in the bodies of animals. (4mks)
b) State four uses of water in the bodies of animals. (4mks)
c) Give two groups of food which are reabsorbed along the mammalian digestive system without undergoing digestion. (2mks)
d) Name the disease caused by deficiency of:
i) Iodine. (1mk)
ii) Vitamin C. (1mk)
iii) Vitamin D. (1mk)
iv) Iron. (1mk)

d) Name a fat soluble vitamin manufactured by the human body. (1mk)

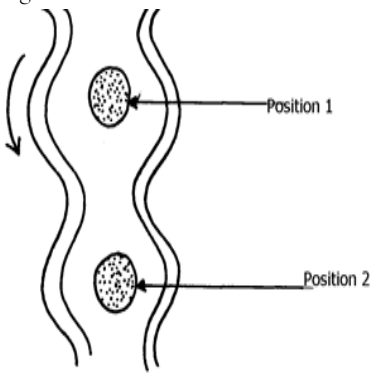
e) State the role of the following vitamins in human body:
i) Vitamin C. (3mks)
ii) Vitamin K. (1mk)
iii) Vitamin A. (1mk)

f) State the role of the following minerals:
i) Potassium. (1mk)
ii) Calcium. (1mk)

g) State the symptoms of the following diseases in human beings:
i) Pellagra. (1mk)
ii) Scurvy. (3mks)
iii) Beriberi. (3mks)

h) Explain four factors that determine energy requirements in human beings. (4mks)

43. The diagram below shows how food boles move along the human oesophagus and the intestine

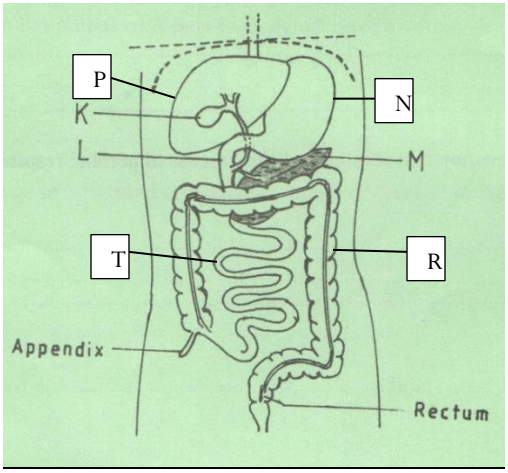


a) Identify the process illustrated in the diagram. (1mk)

b) Briefly explain how the movement of food boles from position 1 to position 2 is achieved. (2mks)

c) i) Name one component of a person's diet that assists in the movement of food described in (b) above. (1mk)
ii) Explain the effect of lack of the component named in c(i) above. (2mks)

44. The diagram below represents part of the human digestive system.



a) Name the parts labeled K, L, M, N, P, R, T (7mks)

b) i) Name the substance stored in the organ labeled K. (1mk)
ii) State the function of the substance named in b) i) above. (1mk)

c) State two functions of the organ labeled N. (2mks)

d) i) Name two enzymes produced in the organ labeled N. (2mks)
ii) State the role of each of the enzyme named in d)i) above. (2mks)

e) State the part off the alimentary canal shown above where the following processes take place;
i) Churning. (1mk)
ii) Emulsification. (1mk)

f) i) State two roles of the part labeled T. (2mks)
ii) Explain two adaptations of the part labeled T. (4mks)

iii) Explain the role of three enzymes secreted in the part labeled T. (3mks)

g) i) Name two enzymes secreted by organ labeled M. (2mks)

ii) State one role of each of the enzymes named in g)i) above. (2mks)

45. The diagram below illustrates a process that takes place in the alimentary canal. Study it and answer the questions that follow.

Lipids ⟶ Small fat droplets

a) Identify the process shown above. (1mk)

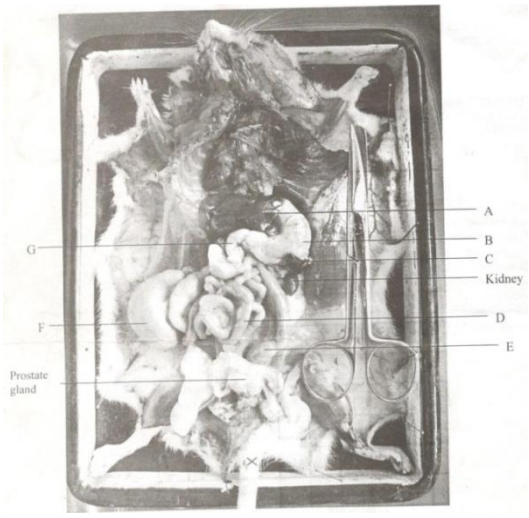
b) Name the part of alimentary canal where the process identified above takes place. (1mk)

c) Name the substance which brings about the process named in a) above. (1mk)

d) What is the significance of the process identified above? (1mk)

e) Is the process identified above physical or chemical digestion? (1mk)

46. Below is a photograph of a dissected mammal. Examine the photograph.



(a) Name the parts labelled A, B, C D and G. (5mks)

(b) State the function of the structures labelled E and F. (1mk)

(c) In the photograph label the structure where vitamin K is produced. (1mk)

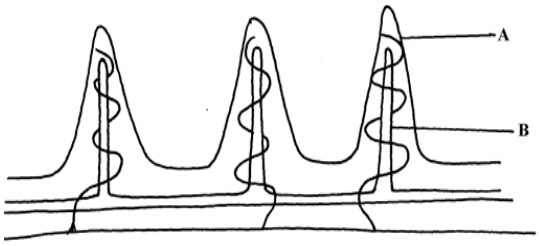
(d) (i) Name the sex of the mammal in the photograph. (1mk)

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

(e) (i) The actual length of the dissecting scissors in the photographs is 15 cm. Calculate the magnification of the photograph. (2mks)

(ii) Calculate the actual length of the mammal from the tip of the nose to point X on the tail. (2mks)

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



a) Name the structures labeled A and B. (2mks)

b) State the function of part labeled B. (1mk)

c) Explain how the structure labeled A is structurally adapted to its functions. (4mks)

48. An experiment was carried out to investigate the nutritional value of two dry powder animals feeds X and Y over a period of six months. Twenty 5 month's old castrated goats were use. The goats were divided into two equal groups A and B. The animals in group A were fed on feed X throughout the experiment while those of group B were fed on feed Y. The feeds were supplemented with dry hay and water. The average body weight of each group of goats and the weight of the dry powder feeds were determined and recorded each month. The faeces produced by each group was dried and weighed and the average dry faecal output per month was also recorded. The results are as shown below

	GROUP A			GROUP B		
Months since commencement of the experiment	Average total weight of goats (kg)	Average weight of total feed (kg)	Average monthly dry faecal output (kg)	Average total weight of goats (kg)	Average weight of total feed (kg)	Average monthly dry faecal output (kg)
0	20.4	26.7	10.5	20.5	35.4	16.5
1	22.5	27.5	10.7	19.5	34.3	17.7
2	24.5	25.8	10.3	19.0	35.2	17.2
3	26.3	18.5	8.8	18.5	36.1	17.5
4	28.0	16.6	7.2	17.1	36.0	16.9
5	29.4	16.3	6.0	16.3	35.8	16.8
6	29.5	16.1	5.6	15.6	35.5	16.6

a) What is the relationship between the amount of feed and the faecal output? (1mk)

b) Work out the average increase in weight for the animals in group A during:

i) The first four months. (2mks)

ii) The last two months. (2mks)

c) Account for the average increase weight in goats in group A during the:

d) i) First four months. (2mks)

ii) The last two months. (2mks)

e) i) Which of the two feeds is more nutritious? (1mk)

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

49. You are provided with a visking tubing, solution L *(mixture of starch and glucose)* Iodine solution, Benedict's solution and a piece of thread. Tie one end of the visking tubing tightly using the thread provided. With the help of a syringe, put 10 ml of the solution labeled L into the visking tubing. Tie the other end of the visking tubing tightly.

    Ensure that there is no leakage at both ends of the visking tubing. Wash the outside of the visking tubing with water. Place the visking tubing upright in a 100 ml beaker. Add distilled water into the beaker to reach the level of the liquid in the visking tubing. Allow the set up to stand for 30 minutes or more.

(a) Using 2ml in a test-tube in each case test for the food substance in the liquid outside the visking tubing using. (6mks)

TEST	Procedure	Observations	Conclusion
Iodine solution			
Benedict's solution			

(b) Using 2ml in a test-tube in each case, test for the food substance in the contents of the visking tubing using (6mks)

TEST	Procedure	Observations	Conclusion
Iodine solution			
Benedict's solution			

(c) Account for your results in *(a)* and *(b)* above. (3mks)

50. You are provided with the following materials and reagents.
    3 test tubes on a rack
    Dilute egg albumen
    Dilute hydrochloric acid with a dropper
    Sodium hydroxide solution with a dropper
    Solution P *(protease)*
    2 droppers
    Three 10ml measuring cylinders
    Stop watch
    Water bath maintained at 50°C to 60°C
    3 labels

    i) Label the test tubes A, B and C.
    ii) Put 2cm^3 of egg albumen into each of the test tubes A, B and C.
    iii) Add 1 ml of solution P (Protease) in each of the test tubes.
    iv) Into test tube A, add two drops of sodium hydroxide.
    v) Into test tube B, add two drops of hydrochloric acid.
    vi) Into test tube C, add 2 drops of water.
    vii) Place all the three test tubes in the water bath for 10 minutes.

    a) i) State the observations made in test tubes A and B. (2mks)

ii) Account for the observations made in;

Test tube A. (3mks)

Test tube B. (3mks)

b) Explain why the investigation was carried out at a specific temperature range. (1mk)

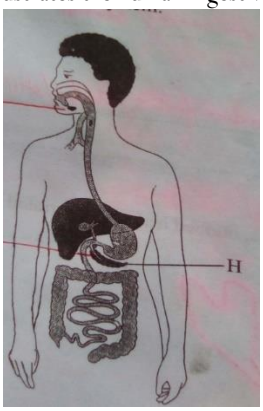
c) State the purpose of test tube C. (1mk)

d) i) With a reason, identify solution P. (2mks)
ii) Name the likely part of the alimentary canal where the process in this experiment occurs. (1mk)
iii) Give a reason for your answer in (d) (ii) above. (1mk)

51. Distinguish between chemical and mechanical digestion. (1mk)

52. Name the type of tooth in carnivores mainly used for piercing and killing the preys. (1mk)

53. The diagram below illustrates the human digestive system.



a) Label with Y on the diagram where enzyme amylase is produced. (2mks)

b) Besides the digestive role, explain one other function of the part labelled H. (2mks)

54. The table below shows the rate of product formation for two enzymes, H and J over a range of pH values.

pH	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Rate of product formation for enzyme H (mg/hr)	34.5	40.5	33.5	15.0	-	-	-	-	-	-
Rate of product formation for enzyme J (mg/hr)	-	-	-	15.0	20.0	30.0	40.5	23.5	11.0	6.0

a) On the same axis, plot graphs of the rate of product formation against pH. (8mks)

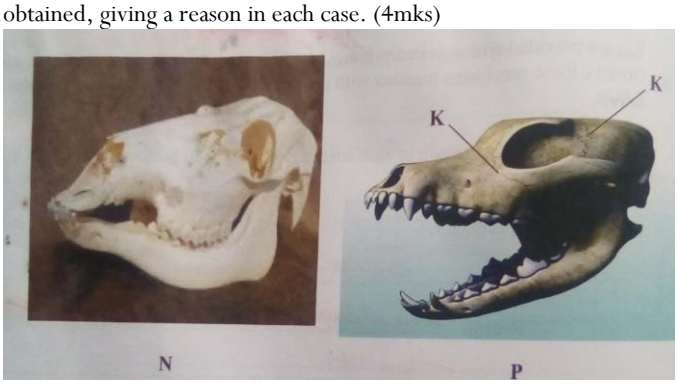
b) Account for the rate of product formation for enzyme H between:
i) pH 1.0 and 3.0 (3mks)
ii) pH 3.0 and 7.0 (3mks)

c) From the graph, determine:
i) the pH value at which the rate of product formation of the two enzymes was the same. (1mk)
ii) the value of the rate of the product formation for enzymes H and J at the pH value stated in c) i) above. (1mk)
iii) the optimum pH value for enzyme J. (1mk)

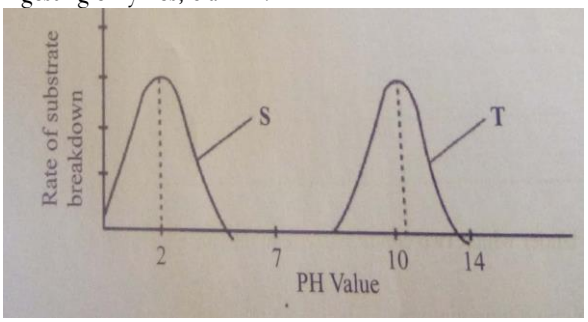
d) State one variable that may lead to the change in the optimum rate of product-formation of the two enzymes. (1mk)

e) Suggest with a reason, the likely part of the human alimentary canal where enzyme H would be found. (2mks)

55. The diagrams below illustrate the photographs of mammals. State the diet of the mammals from which the photographs N and P were obtained, giving a reason in each case. (4mks)



56. The graph below illustrates the effect of pH on certain protein-digesting enzymes, S and T.



a) Name the enzymes S and T. (2mks)

b) i) Name the part of the alimentary canal where enzyme T is likely to be found. (1mk)

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

57. Describe how various environmental factors affect the rate of photosynthesis. (20mks)