

ATTEMPT ONLY ONE QUESTION FROM EACH TOPIC

CELLS AND TISSUE ORGANISATION

1. (a) What is cell specialization?
(b) Using illustrations, give four examples of specialized cells in:
(i) Plants, and state the function of each. (ii) Animals, and state the function of each.
(c) Draw shapes to illustrate four major types of bacteria, and state one disease caused by each type.

2. (a) What is meant by specialization of cells?
(b) Give three examples of specialized cells in:
(i) Plants, (ii) Animals.
(c) State one function of each of the cell mentioned in (b) above
(d) (i) With aid of a well labeled diagram, describe the structure of a plant cell. (ii) State how the structures that make up a plant cell are related to their functions
e) Give three structural differences between an animal cell and a plant cell (3 mks)

DIVERSITY & INSECT LIFE CYCLES

1. (a) Compare
(i) insects and arachnids, using **structural** features. *(05 marks)*
(ii) the lifecycles of Housefly and Grasshopper. *(05 marks)*
(b) How do mouthparts of insects in different orders suit them to their functions?
(05 marks)

INSECT LIFE CYCLES

5. (a) State three features you would use to recognize insects. *(03 marks)*
(b) Give four economic importance of insects. *(04 marks)*
(c) Using your knowledge of the life cycle and habitat of the housefly, explain how this pest can be controlled. *(9 marks)*
(d) Give the economic importance of a housefly.
6. (a) What is meant by the term metamorphosis;
(b) Describe the life history of a;
(i) Butterfly
(ii) Grass hopper
(c) Give reasons for the success of the class insecta. *(15 marks)*

INSECT LIFE CYCLES

5. (a) Describe the lifecycle of either:

- (i) Housefly or Mosquito or Butterfly (ii) Cockroach or Grasshopper
 (b) Give the economic importance of insects.
 (c) What are the commonly used methods of breaking lifecycles of insects?

SECTION II: FLOWERING PLANT STRUCTURE

2. (a) Compare monocotyledons and dicotyledons, using **structural** features. (09 marks)

(b) How are the following parts suited to perform **primary** functions in plants?

- (i) Leaves (ii) Stems (iii) Roots (06 marks)

FLOWERING PLANT STRUCTURE

<p>2. (a) Compare the internal structures of: (i) Dicotyledonous and monocotyledonous stems (ii) Dicotyledonous and monocotyledonous roots (b) State how the following parts differ in dicots and monocots: (i) Leaves (ii) Flowers (iii) Seeds</p>	<p>3. (a) Draw a labelled diagram showing the tissues present in a dicotyledonous leaf. (b) Explain the functions of the different tissues of a leaf</p>
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4. (a) What are the important features commonly used in identifying the following plant parts?

- (i) Fruits (ii) Seeds (iii) Leaves

(b) With examples, state what is meant by the following:

- (i) Succulent fruits (ii) Dehiscent fruits (iii) Indehiscent fruits

(c) Explain the different mechanisms of fruit and seed dispersal.

2.(a) Define pollination and fertilization. Give the main difference between them

(b) Give the adaptations of

- (i) Insect pollinated flowers (ii) Wind pollinated flowers

(c) Describe the various mechanisms by which; (09 marks) (i) Self-pollination may be prevented.

(ii) Cross pollination can be promoted.

(d) Describe the types of dry dehiscent fruit? (05 marks)

- 3.a) Compare the internal structure of a monocot root to that of a dicot root.
- b) Describe the different types of; **(15 marks)**
- (i) Stem modifications
- 4.(a) With examples, state what is meant by the following:
- (c) Explain the different mechanisms of fruit and seed dispersal.

SECTION III: SOIL

3. (a) Describe an experiment to show that soil contains living organisms.
(06 marks)
- (b) Explain how
- (i) nitrogen is recycled through the activity of soil bacteria and fungi to make it available to plants. **(06 marks)**
- (ii) human activity can maintain soil fertility. **(03 marks)**

SOIL

<p>6. (a) Describe soil formation from the following processes: (i) Physical weathering (ii) Chemical weathering (iii) Biological weathering (b) Explain how soil fertility can be: (i) Lost (ii) Improved</p>	<p>7. (a) Describe an experiment to show that soil contains living organisms. (b) Explain three roles of soil: (i) Micro-organisms (ii) Macro-organisms</p>
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7. (a) Describe how the following processes lead to soil formation: **(i) Physical weathering**

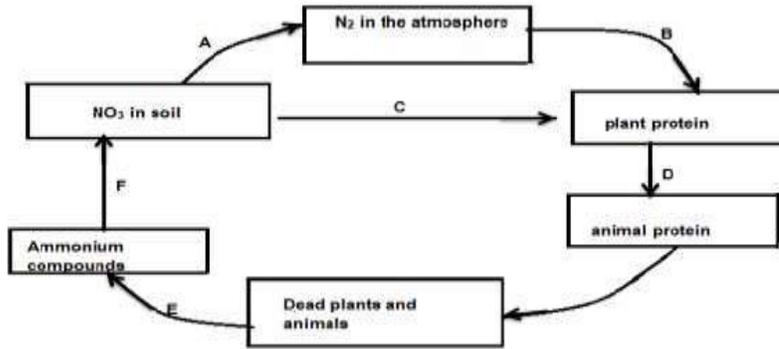
(ii) Chemical weathering (iii) Biological weathering

8. A class of students carried out an experiment to investigate the percentage of air in three types of soil. The class results are summarized in the table below. Study the table and answer all questions that follow.

Type of soil	Percentage of air by volume
Sandy soil	25
Clay soil	09
Loam soil	17

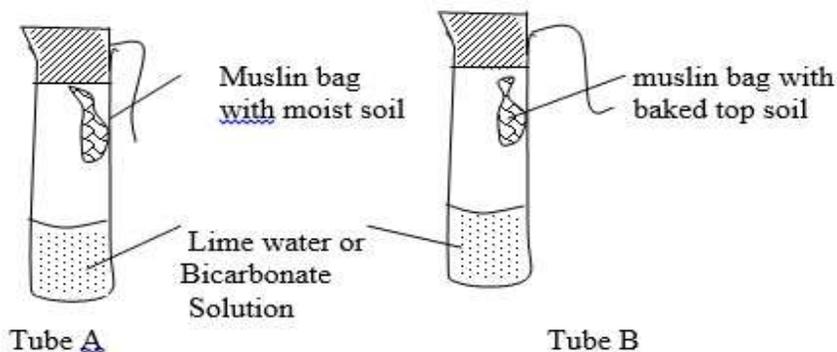
- a) If all the three types of soil were mixed in equal amounts without losing any of their contents, what would be the percentage content of air in the mixture? Show you working

- b) Why does clay soil contain the least amount of air as compared to the other two types?
- c) Which of these types of soil would drain best?
- d) Which of these types of soil would be most suitable for plant growth? Why?
9. The figure below shows the nitrogen cycle. Study it carefully and answer the questions that follow.



- (a) Name the processes represented by letters A-F (03 marks)
- (b) Name the bacteria responsible for. (02 marks)
- (c) Give three ways through which nitrogen from the soil may be lost (d) State three importance of nitrogen to plants.
- (e) What do you understand by the following terms;
- i) Capillary (ii) Leaching (iii) Soil drainage
- (iv) Water retaining capacity (v) Soil erosion.
- (f) Give the difference between manure and humus.
- (h) Give the economic importance of fungi

10. (a) A student arranged an apparatus in a biological experiment. Study it and answer the questions that follow



- (i) Write a suitable title for the experiment
- (ii) What is the purpose of lime water or bicarbonate solution?
- (iii) What change takes place in the lime water after the experiment in tubes A and

B

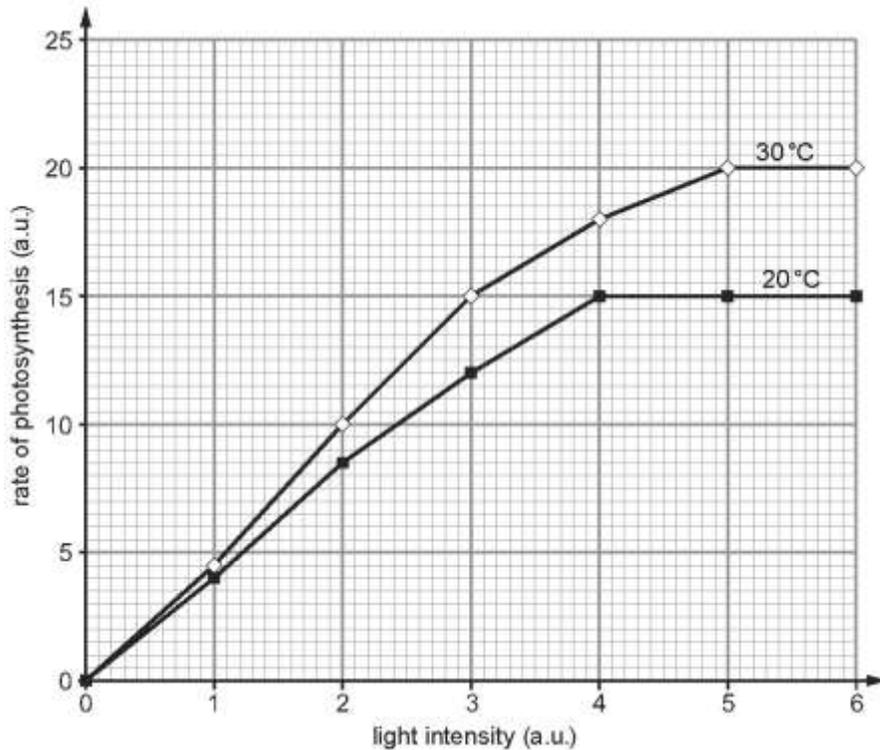
- (iv) What do you conclude from your observations in a (iii) above?
(b) Give the function(s) of or each of the following soil fractions
(i) Humus (ii) Air (iii) Water (iv) Living organisms; b) ii) Macro organisms;

SECTION IV: ENZYMES & NUTRITION

4. The table below shows the results of an investigation carried out to study the effect of pH on the decomposition of hydrogen peroxide by the enzyme in living Irish potato tubers. The rate of reaction was determined by measuring the time in minutes, taken to collect 10 cm³ oxygen.

pH	4	5	6	7	8
Rate of oxygen production (cm ³ min ⁻¹)	0.5	0.8	1.0	0.7	0.6

- (a) Plot a graph to represent the data in the table. **(06 marks)**
- (b) Describe the trend in the rate of oxygen production. **(03 marks)**
- (c) Explain the changes in the rate of oxygen production. **(05 marks)**
- (d) What is the biological benefit of decomposing hydrogen peroxide in bodies? **(03 marks)**
- (e) How does temperature affect the activity of enzymes? **(03 marks)**
5. The graph below shows the rate of photosynthesis at different light intensities and temperature.



(a) Describe how light intensity affected the rate of photosynthesis at 20°C.

(b) Explain

(i) the effect of light intensity on the rate of photosynthesis at 20°C.

(ii) the difference in the rate of photosynthesis at 20°C and 30°C.

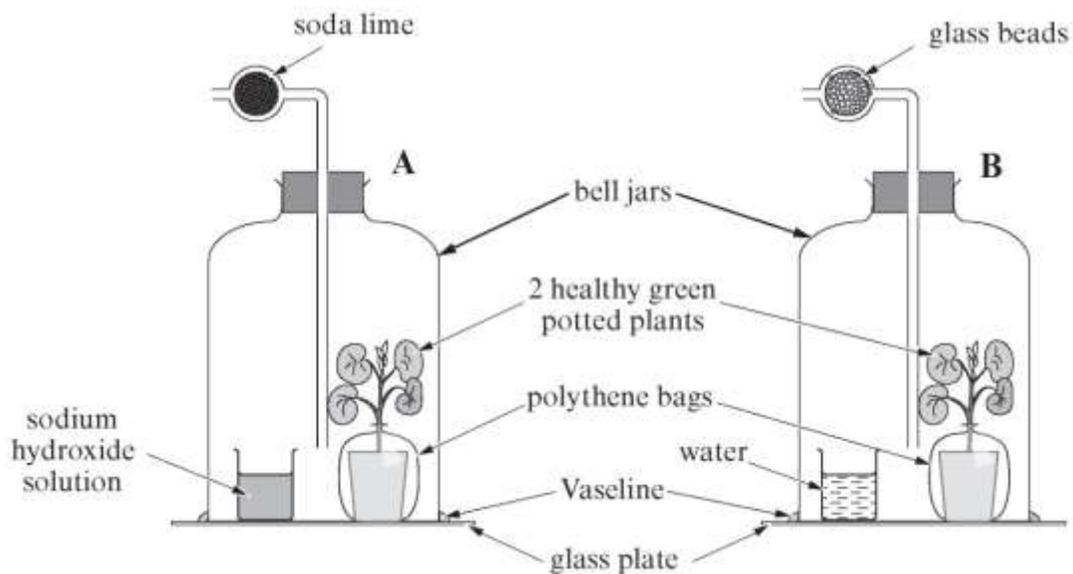
(c) Compare the rate of photosynthesis at 20°C and 30°C.

(d) Calculate the difference in the rate of photosynthesis between 20°C and 30°C at a light intensity of 3.5 a.u.

(e) Name one other environmental factor which can affect the rate of photosynthesis.

6. The diagrams below show the setup of an experiment used to investigate a physiological process in plants.

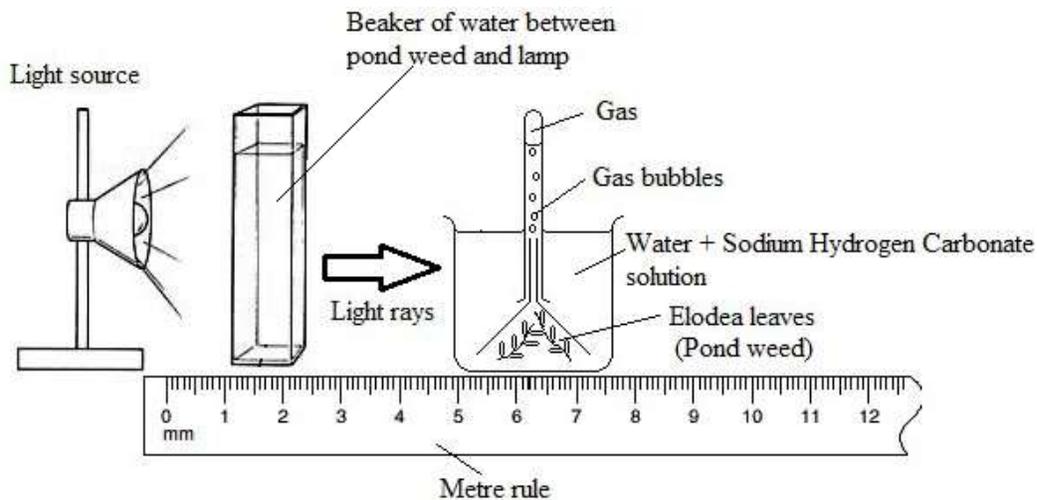
- The plants were placed in the dark for 48 hours prior to the experiment
- The two well-watered potted green plants were placed in glass bell jars, which were sealed with Vaseline onto glass plates.
- The soil in each pot was covered with a polythene sheet.
- The setup was left near a window for 4 days.



- (a) State the aim of the experiment. (01 mark)
- (b) State the function of
- (i) The polythene bag. (01 mark)
 - (ii) The sodium hydroxide solution. (01 mark)
 - (iii) The apparatus labelled **B**. (01 mark)
 - (iv) The Vaseline. (01 mark)
- (c) Explain why the plants were placed in the dark for 48 hours prior to the experiment. (01 mark)
- (d) At the end of the experiment, a leaf was taken from each plant and tested for starch. State the colour observed for each leaf and the reason.
- (i) Apparatus **A**.
 Colour observed (01 mark)
 Reason (01 mark)
 - (ii) Apparatus **B**.
 Colour observed (01 mark)
 Reason (01 mark)

7. (a) Describe the digestive processes which occur at the following parts of the human alimentary canal.
- (i) Mouth (ii) Stomach (ii) Duodenum
- (b) How is the human ileum suited for its functions?

The set up below investigates the factors affecting the rate of photosynthesis.



As the light bulb of 60 Watts was placed at varying distances from the water weed, the number of bubbles given off was counted at each distance. The table below shows the results recorded.

Distance between light bulb and pond weed (Metres)	Light intensity (arbitrary units)	Number of bubbles given off in 1 minute
1.0	8	8
0.5	32	28
0.25	127	105
0.125	510	105

- (a) Using the same axes, plot graphs of light intensity and number of bubbles given off in 1 minute against distance between light bulb and pond weed (place light intensity and number of bubbles given off in 1 minute *vertical*-axis, distance between light bulb and pond weed on *horizontal*-axis) **(8 marks)**
- (b) From the graph, explain the relationship between:
- (i) Distance of light bulb from the pond weed and light intensity. **(3 marks)**
- (ii) Light intensity and number of bubbles given off. **(3 marks)**

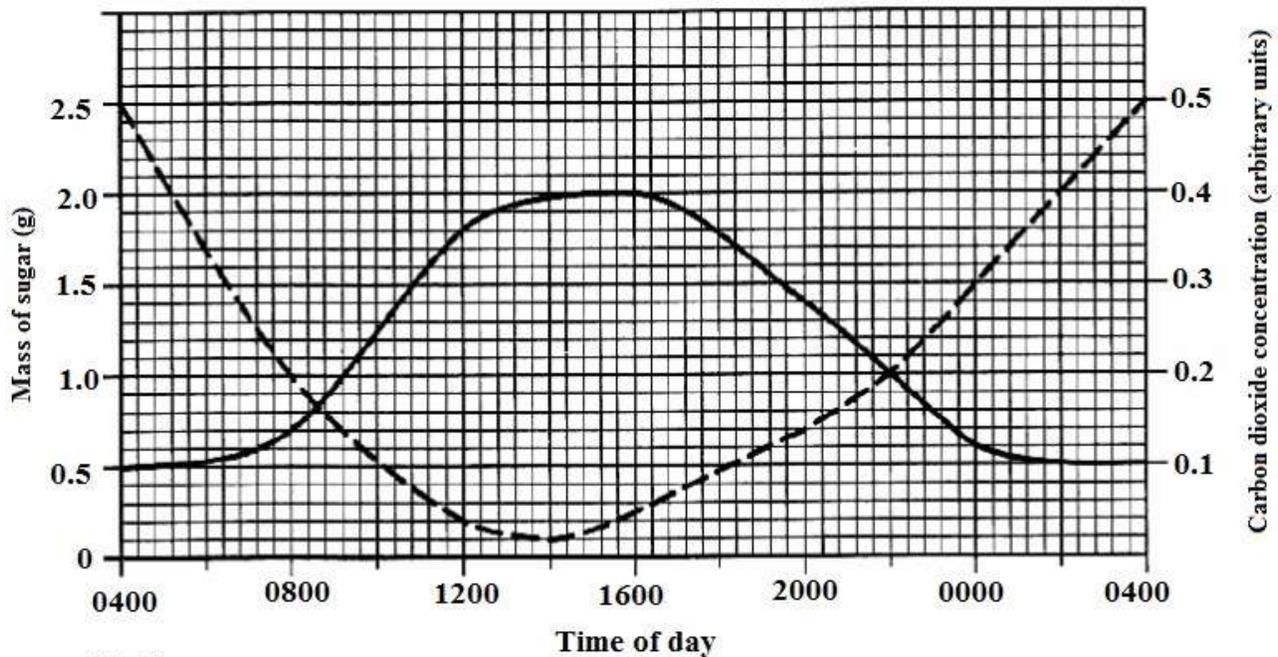
(c) Predict and explain your answer the expected results assuming the experiment was repeated using:

- (i) Light bulb of 100-watts at a distance of 0.5 metres away from the pond weed. **(2 marks)**
- (ii) Water without sodium hydrogen carbonate solution **(2 marks)**

(d) Explain why the following were used in the experiment:

- (i) Sodium hydrogen carbonate solution **(1 mark)**
- (ii) Beaker of water between lamp and pond weed **(1 mark)**

9. The graph below shows changes in the concentration of carbon dioxide above the leaves and mass of sugar in a photosynthesising leaves through 24 hours of the day.



KEY

- concentration of carbon dioxide above the leaves
- mass of sugar in the leaves

(a) For the period shown, describe the changes in the:

- (i) Concentration of carbon dioxide **(03 Marks)**
- (ii) Mass of sugar **(03 Marks)**

(b) For the period shown, explain the changes in the:

- (i) Concentration of carbon dioxide **(06 Marks)**

(ii) Mass of sugar

(06 Marks)

(c) State **two** ecological roles of photosynthesis.

(02 Marks)

10. At an agricultural research station, a group of scientists measured the amount of carbon dioxide in the air in the middle of a wheat field every three hours for 24 hours. The table below shows their results.

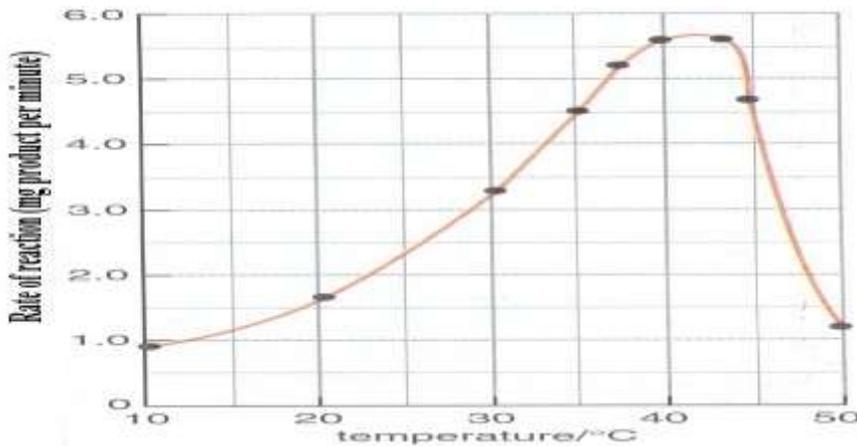
Time	24 (midnight)	3	6	9	12 (noon)	15	18	21	24 (midnight)
% CO ₂ in the air	0.042	0.037	0.031	0.029	0.028	0.030	0.032	0.035	0.042

(a) Plot the results on graph paper.

(b) From the graph, explain the changes in carbon dioxide with time.

(c) How would you expect oxygen to change during the same period?

11. The graph below shows the rate of enzyme catalysed reaction at different temperatures but constant pH.



From the graph:

(a) Describe the changes in the rate of enzymereaction.

(04

Marks)

(b) Explain the changes in the rate of reactionduring the following temperatures ranges:

(i) From 10⁰C to 20⁰C

(ii) From 20⁰C to 37⁰C

(iii) From 37⁰C to 42⁰C

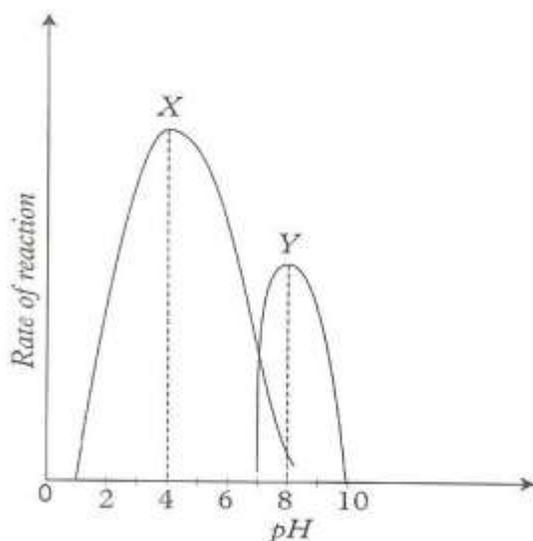
(iv) From 42⁰C to 50⁰C

(c) Assuming that the enzyme involved in the reaction was amylase, state:

(i) The name of the substrate

(ii) The products formed

The graph below shows the rates of reaction for two different enzymes, **X** and **Y**, working on the same type of substrate. The reaction is carried out at different PH and at room temperature.



(d) With a reason, state the optimum PH for:

i)Enzyme X (ii) Enzyme Y

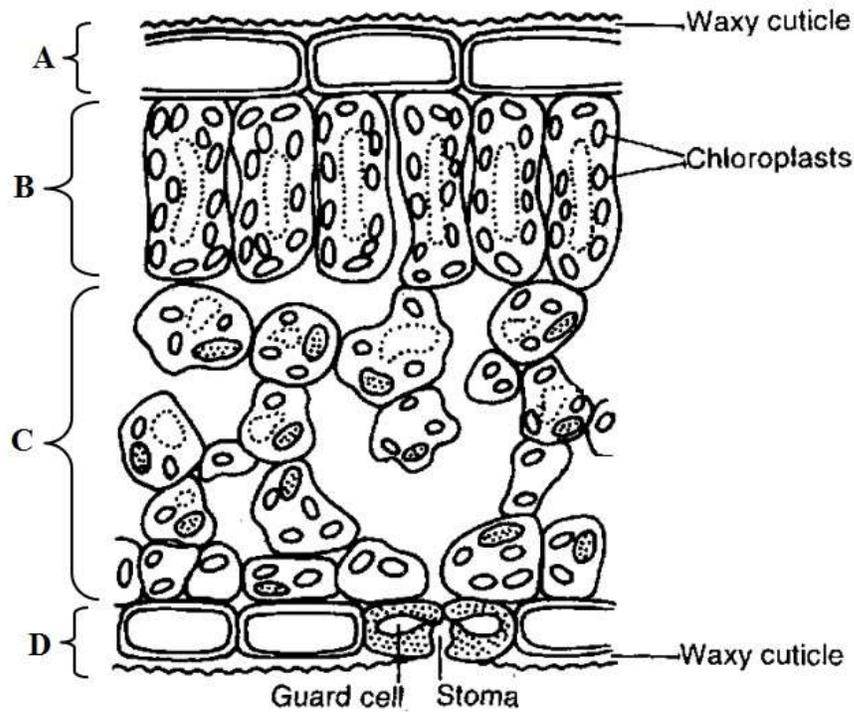
(e) With a reason in each case, suggest the:

(i) Part of alimentary canal where enzymes X and Y can be found.

(ii) Substrate on which the enzymes worked.

12. (a) Describe the role of enzymes in the digestion of proteins, carbohydrates and lipids in humans.

(b) What are the adaptations of the ileum to absorption of digested food.



13. The diagram on the left shows the vertical section through the leaf of a dicotyledonous plant.

(a) Name the tissues labelled **A**, **B**, **C**, **D**.

(b) From the diagram, identify three differences between tissues **B** and **C**.

(c) Explain how tissues labelled **A**, **B**, **C** and **D** are suited

for their functions.

(d) Briefly describe an experiment that can be performed to test a green leaf for starch.

NUTRITION IN PLANTS AND ANIMALS

11. a) Describe an experiment you would carry out to test a leaf for the presence of starch. *(10marks)*

b) How is the structure of a dicotyledonous leaf suited to absorb sunlight?

12. (a) Describe an experiment to show that carbon dioxide is necessary for photosynthesis to take place.

(b) Explain how the following environmental factors affect the rate of Photosynthesis:

(i) Sunlight intensities (ii) Temperature

13. . Table below contains recommended daily intakes of nutrients from different persons.

	Energy(KJ)	Protein(g)	Calcium(g)	Iron(g)
Man	9250	60	0.5	12
sedentary	12600	70	0.5	16
Very	12600	80	0.8	17
active Boy	10500	70	0.8	17
(15-18)yrs	9250	85	1.2	20
(13-	10500	70	0.7	19
14)yrs				
Pregnant				
woman				
Girl				

- a) Why does a boy age 15-18 years require the same number of Kilojoules as a very active man? (1mk)
- b) Comment on the quality of protein required by a pregnant woman and a very active man. (2mks)
- c) Comment on the quality of calcium needed by a pregnant woman. (2mks)
- d) Why does the girl require more iron than the boy? (1mk)

14. . (a) What is meant by the following? (02 marks @)

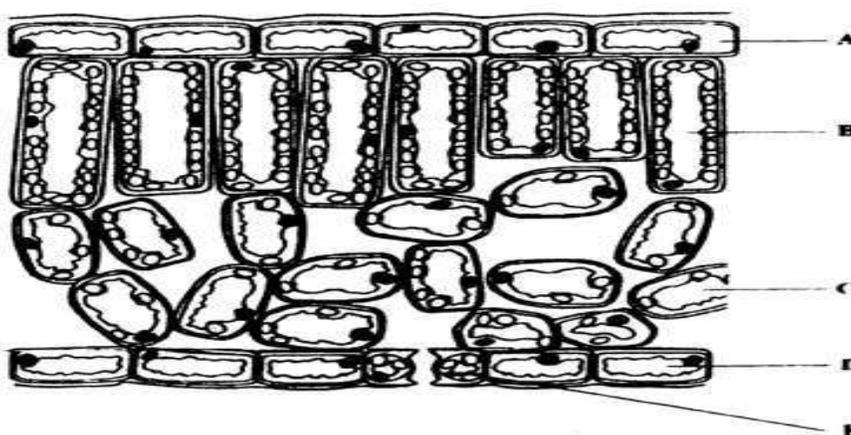
(i) **Autotrophic nutrition**

(ii) **Heterotrophic nutrition**

(iii) **Holozoic nutrition**

- (b) Using illustrations describe how amoeba feeds. (09 marks)

15. The diagram below shows a cross section from a typical leaf



- (a) Name the cells labelled A, B, C and D. (04 marks)
- (b) Which of these cells has the highest rate of photosynthesis? Give two reasons for your answer. (03 marks)

(c) (i)Structurally distinguish between cell D from E. (02 marks)

(iii)What is the role of cell E. (01 mark)

16. .Four test tubes A,B,C and D where filled with pond water, prepared as shown below and then place under bright light.

Tube A	Tube B	Tube C	Tube D
Pond weed at 25°C	Pond weed and water snail at 25 °C	Pond weed at 10°C	Pond weed tube enclosed in an aluminium foil at 25°C

(a)Which tube would produce the most oxygen (01 mark)

(b)Explain why each of the other tubes would produce less oxygen.(07 marks)

(c)Explain the role of each of the following factors in photosynthesis

(i)Chlorophyll (ii) Light

17. .(a)Describe the process of digestion of posho and proteins from the mouth until they are observed in the blood stream.

(b)What happens to carbohydrates and proteins after absorption?

(c)Give the adaptations of the ileum to the process of absorption.

(d)Write the dental formulae of;

(i) Rabbit