ATTEMPT 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: <u>FLOWERING PLANT STRUCTURE</u>

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

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	**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

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: <u>SOIL</u>

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

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	**7.** (a) Describe an experiment to show that soil contains living organisms. (b) Explain three roles of soil: (i) Micro-organisms (ii) Macro-organisms

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

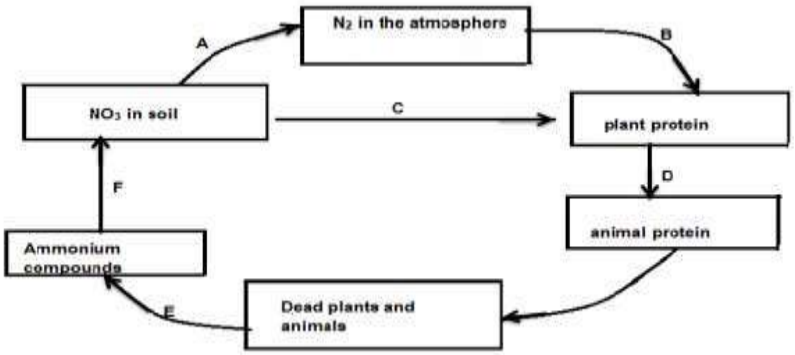
a) If all the three types of soil were mixed in equal amounts without losing any of their contents, what would be the percentage content of air in the mixture? Show you working

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;

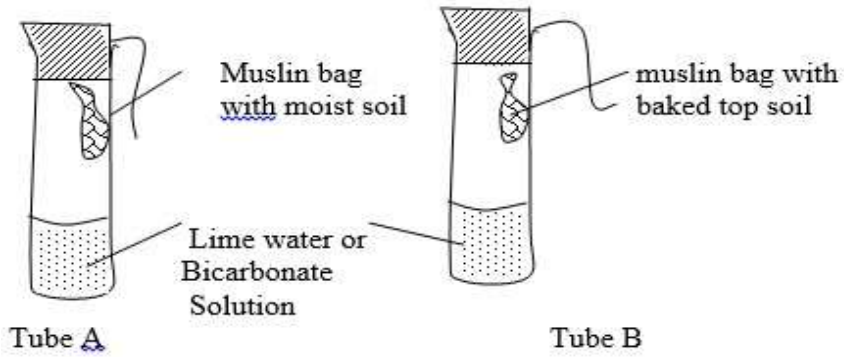
i) Capillary (ii) Leaching (iii)Soil drainage

(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 cm^3 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*)**

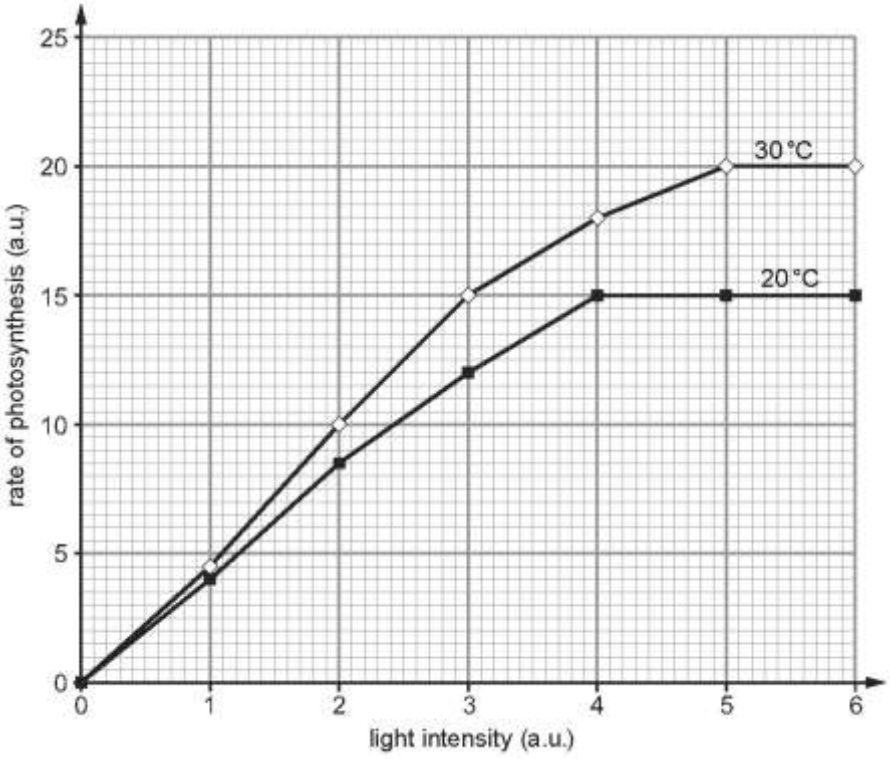
(b) Describe the trend in the rate of oxygen production. **(*03 marks*)**

(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 20^0C.

(b) Explain

(i) the effect of light intensity on the rate of photosynthesis at 20^0C.

(ii) the difference in the rate of photosynthesis at 20^0C and 30^0C.

(c) Compare the rate of photosynthesis at 20^0C and 30^0C.

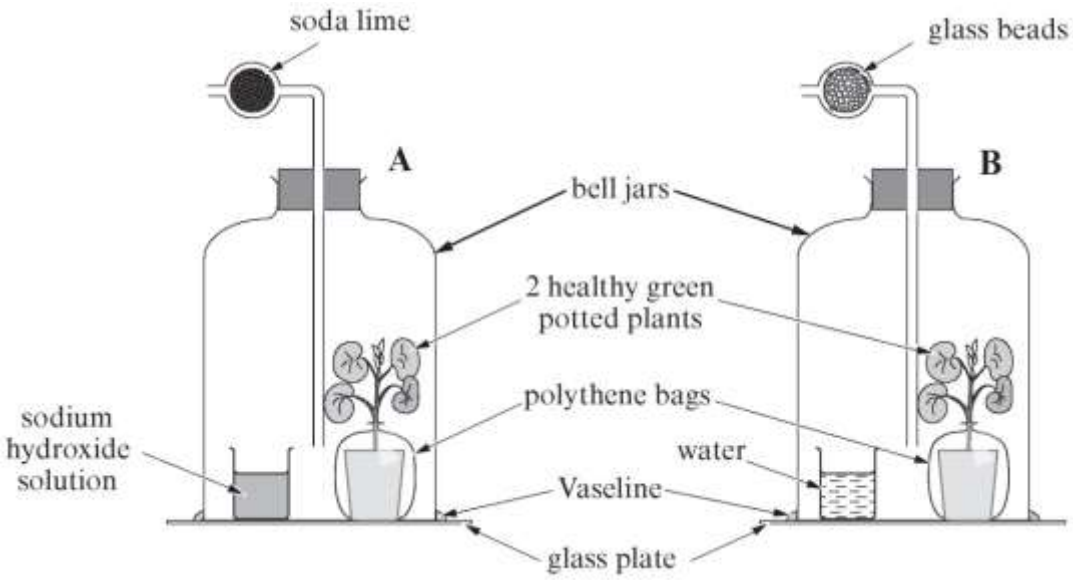
(d) Calculate the difference in the rate of photosynthesis between

20^0C and 30^0C 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*)**

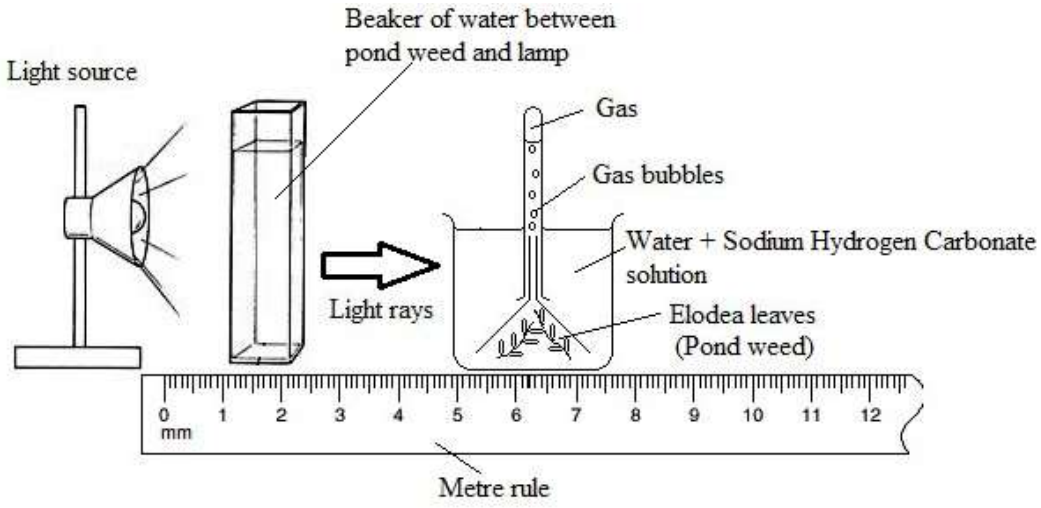
Reason **(*01 mark*)**

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)**

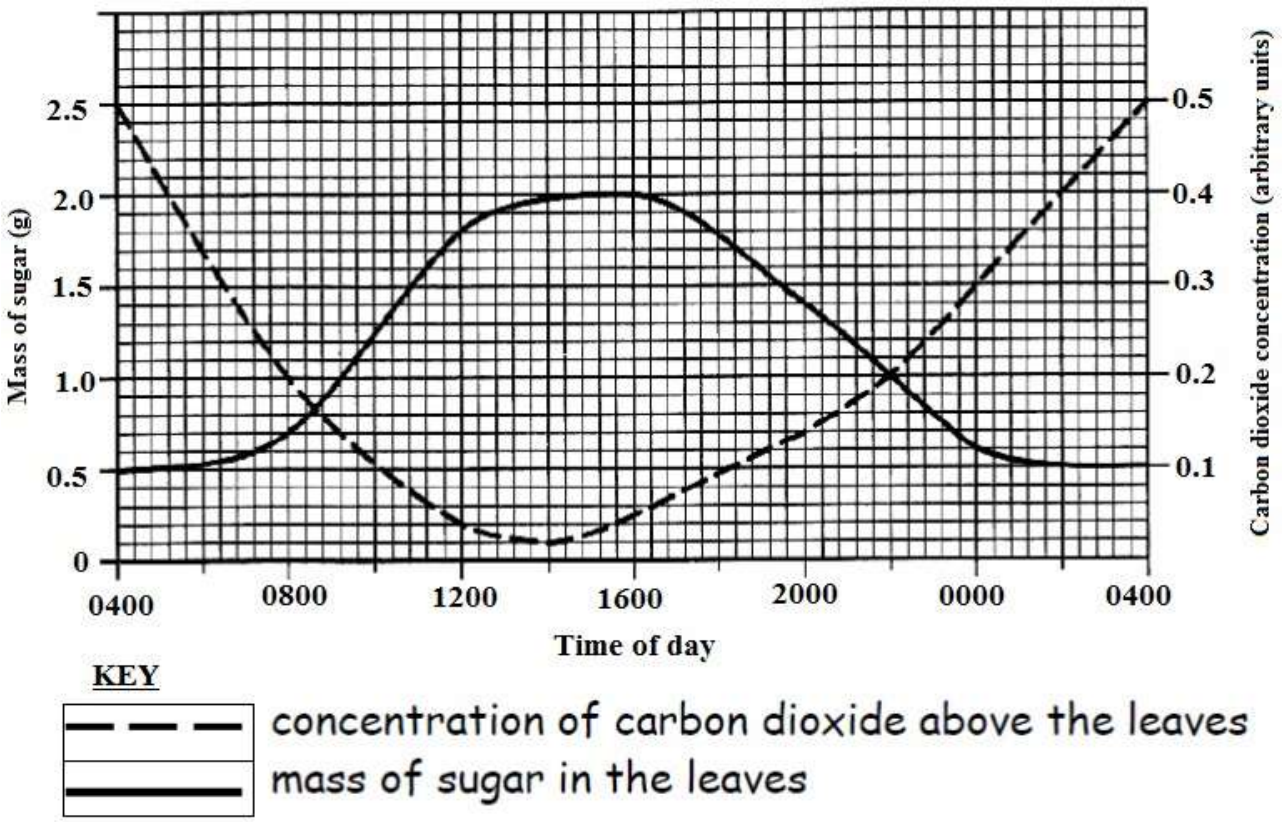
(ii) Water without sodium hydrogen carbonate solution **(2 marks)**

(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.



(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.

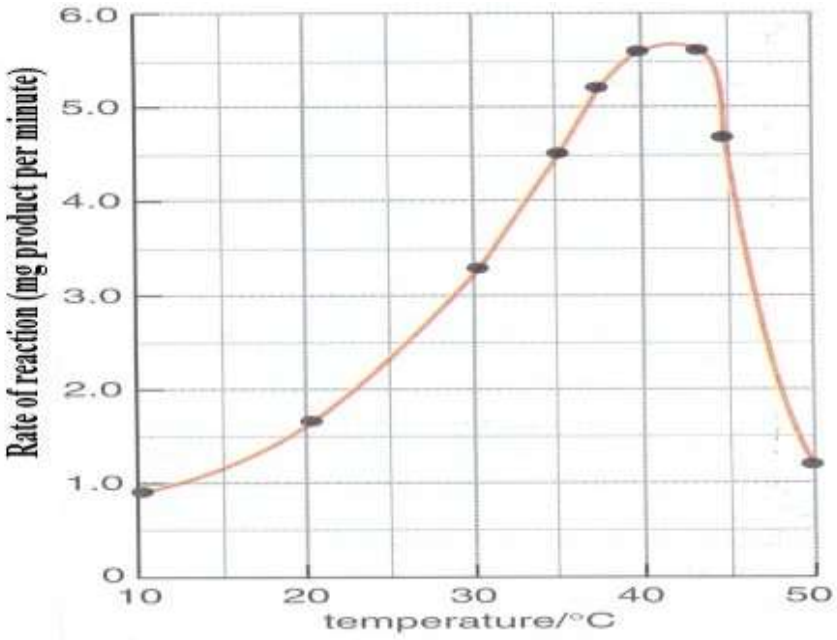
Time	**24 (midnight)**	**3**	**6**	**9**	**12 (noon)**	**15**	**18**	**21**	**24 (midnight)**
% CO_2 in the air	0.042	0.037	0.031	0.029	0.028	0.030	0.032	0.035	0.042

(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 10^0C to 20^0C

(ii) From 20^0C to 37^0C

(iii) From 37^0C to 42^0C

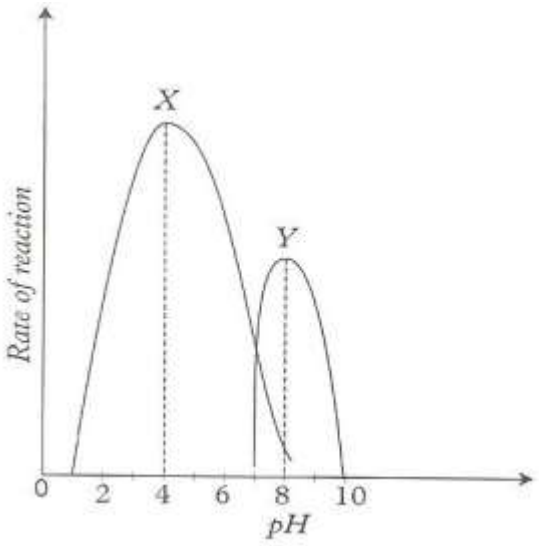
(iv) From 42^0C to 50^0C

(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.



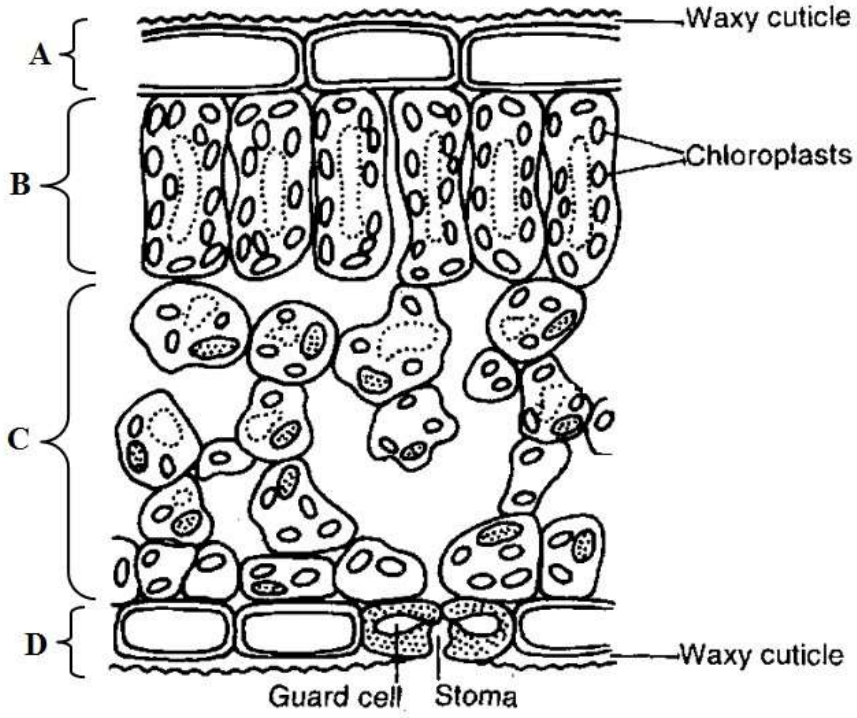
(d) With a reason, state the optimum PH for:
i)Enzyme X (ii) Enzyme Y

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

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 @)

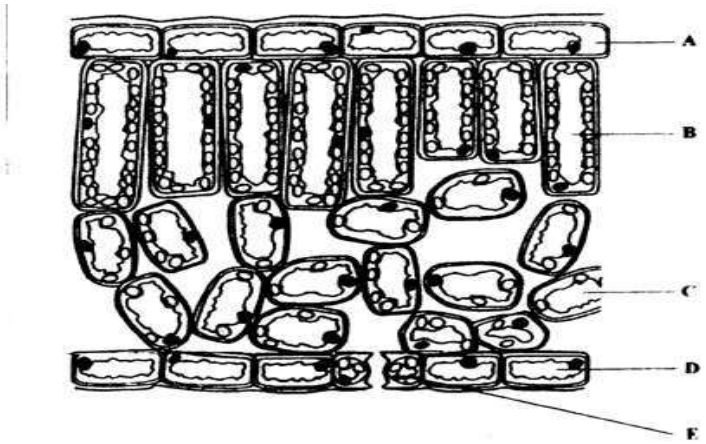
(i) Autotrophic nutrition

(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 ^{o}C	Pond weed and water snail at 25 ^{o}C	Pond weed at 10^{o}C	Pond weed tube enclosed in an aluminium foil at 25^{o}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?

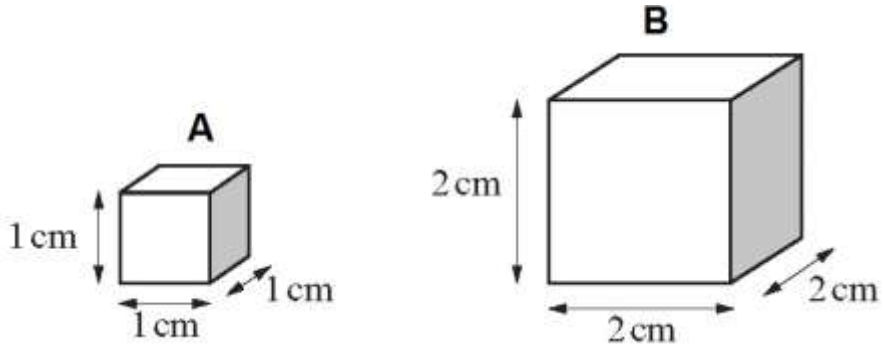
(c)Give the adaptations of the ileum to the process of absorption.

(d)Write the dental formulae of;

(i) Rabbit

SECTION V: TRANSPORT

8. An investigation was carried out using cubes of potato to find out the effect of surface area**:** volume ratio on the rate of absorption in plants.



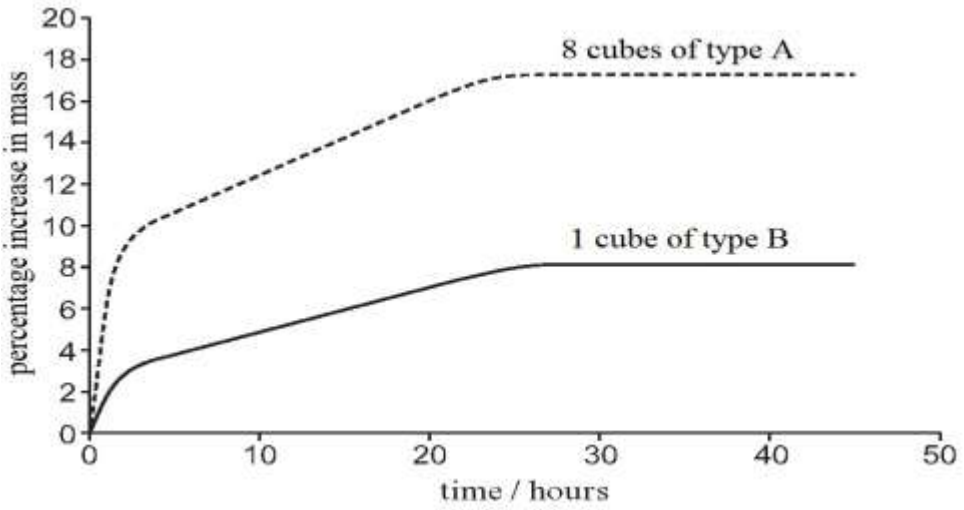
(a) Work out the surface area, volume and surface area**:** volume ratio for each cube. **(*03 marks*) -** After wiping the surface dry, the cubes were weighed and their masses recorded.

- One (**01**) cube of type **B** and eight (**08**) cubes of type **A** were put in separate beakers and the two beakers completely covered with distilled water.
- At regular intervals for a period of 45 hours, the cubes were repeatedly put and removed from the beakers, wiped dry and re-weighed to determine the percentage increase in mass for the eight cubes of type **A** and one cube of type **B**.

Study the results shown in the graphs below to answer the questions that follow.

(b) State why **eight** (**08**) cubes of type **A** were used in this investigation. **(*01 mark*)**

(c) Describe the trend in the percentage increase in mass of the cubes. **(*03 marks*)**



(d) Explain the

(i) trend in the percentage increase in mass of the cubes. **(*04 marks*)**

(ii) difference in the increase in mass of cubes of types **A** and **B**. **(*03 marks*)**

(e) Suggest two ways by which

(i) the process that caused the increase in mass of cubes benefits plants. **(*02 marks*)**

(ii) organisms have solved the problems of larger body size. **(*04 marks*)**

9. The table below shows the results from an investigation of the uptake and loss of water by a plant over 24 hours.

Time of day (hours)	04:00	07:00	10:00	13:00	16:00	19:00	22:00

Water uptake (**g** per **hour**)	7	11	18	24	24	20	11
Water loss (**g** per **hour**)	2	8	24	30	24	13	5

(a) Plot graphs using the same axes to represent the data in the table. **(*07 marks*)**

(b) Describe the relationship between water loss and water uptake? **(*05 marks*)**

(c) Suggest explanation for the changes in water loss. **(*04 marks*)**

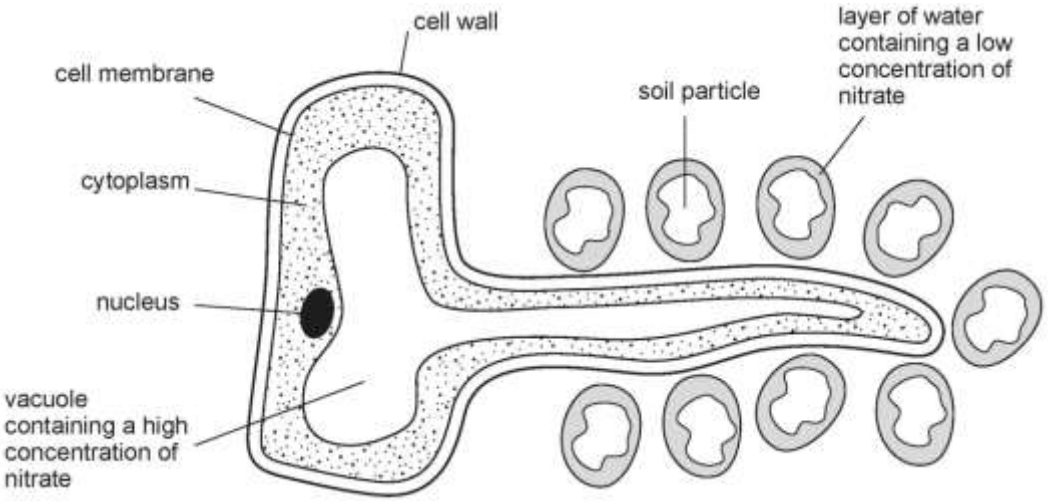
(d) Explain what is happening to the cells which take part in transpiration

(i) at 04:00 hours. **(*01 mark*)**

(ii) at 13:00 hours. **(*01 mark*)**

(e) Describe the effect of **one** environmental factor, **other than temperature** and **light intensity** on water loss from plants. **(*02 marks*)**

10. The diagram below shows the section through a root hair cell in a well-watered soil.



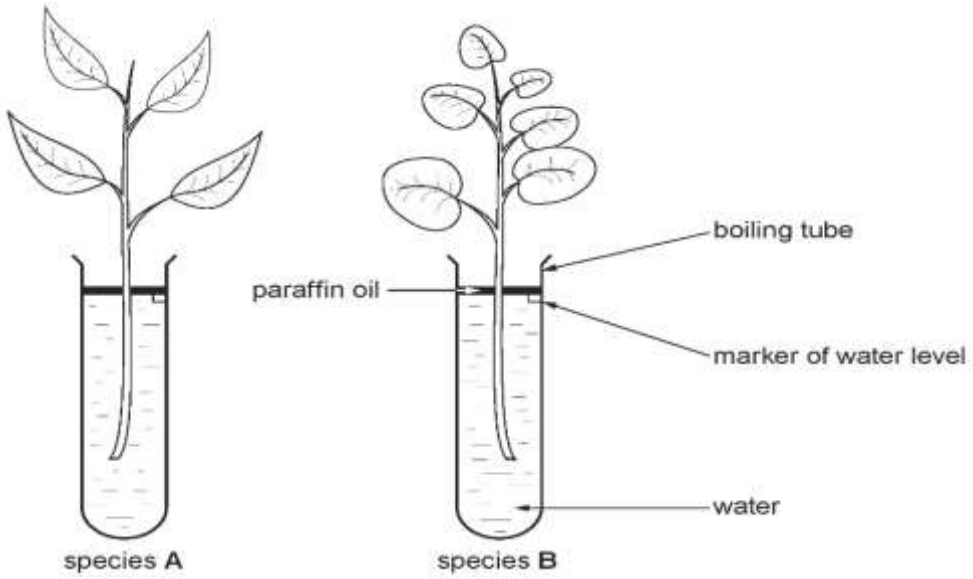
(a) (i) State the process used by the root hair cell to take up nitrate from soil. **(*01 mark*)**

(ii) Gardeners dig soil to let more air into it. Explain how this affects the uptake of nitrate by root hair cells. **(*03 marks*)**

(b) Explain what happens to the uptake of nitrate by the root hair cell if soil is contaminated with a metabolic poison. **(*03 marks*)**

(c) With evidence from the diagram above, state how the root hair cell is suited for uptake of water and mineral ions. **(*03 marks*)**

11. Shoots from two different species of plants, **A** and **B**, were placed in water in boiling tubes as shown below.



12. Both species were kept under the still-air conditions for the first eight hours and windy-air conditions for the ninth hour. Their masses were recorded at hourly intervals, as shown in the table below.

Time (hours)		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Mass (g)	**A**	15	14.8	14.4	14.2	13.9	13.7	13.5	13.3	13.1	
	B	15	14.6	14.0	13.5	13.0	12.8	12.4	11.8	11.4	

(a) (i) Plot graphs on the same set of axes to represent the information recorded under still-air conditions. **(*08 marks*)**

(ii) On the same graph, predict and indicate the trend of change in mass for each plant under windy-air conditions. **(*01 mark*)**

(b) Explain the trend of change in the mass of the two plants. **(*03 mark*)**

(c) Calculate the difference in the loss in mass between species A and B at 8 hours. **(*02 marks*)**

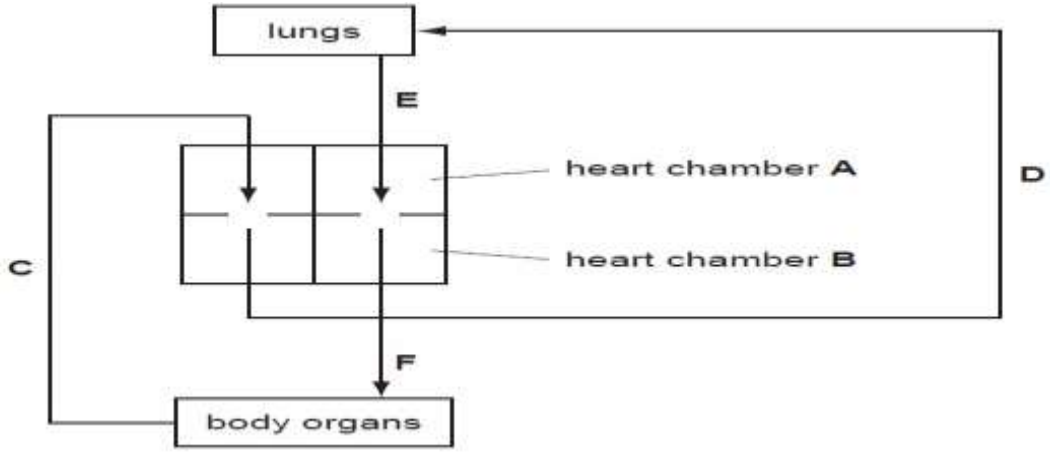
(d) Suggest

(i) two reasons for the difference in loss of mass between the two plants. **(*02 marks*)**

(ii) and explain what you would expect to happen to the rate of loss in mass if species **A** and **B** had roots. **(*02 marks*)**

(iii) the purpose of using paraffin in the boiling tubes. **(*02 marks*)**

12. The figure below shows the route taken by blood around the mammalian body.



(a) Using information shown in the figure above, identify the **type** of blood vessel **C**. Give a reason for your answer. **(*02 marks*)**

(b) Compare the

(i) contents of the blood flowing in vessels **C** and **E**. **(*03 marks*)**

(ii) structures of blood vessel types **C** and **F** **(*03 marks*)**

(c) How does the structure of chamber **B** suit it for functioning? **(*02 marks*)**

13. (a) Describe the processes in blood vessels which form a blood clot. **(*05 marks*)**

(b) Explain **three** major precautions that must be considered before a successful blood transfusion. **(*07 marks*)**

(c) Outline any three lines of defense against bacteria entering the blood system. **(*03 marks*)**

14. The table below shows the volume of blood in a woman's left ventricle at different times during **one** second.

Time (seconds)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Volume of blood in left ventricle (cm^3)	112	120	95	65	50	55	82	90	100	112	120

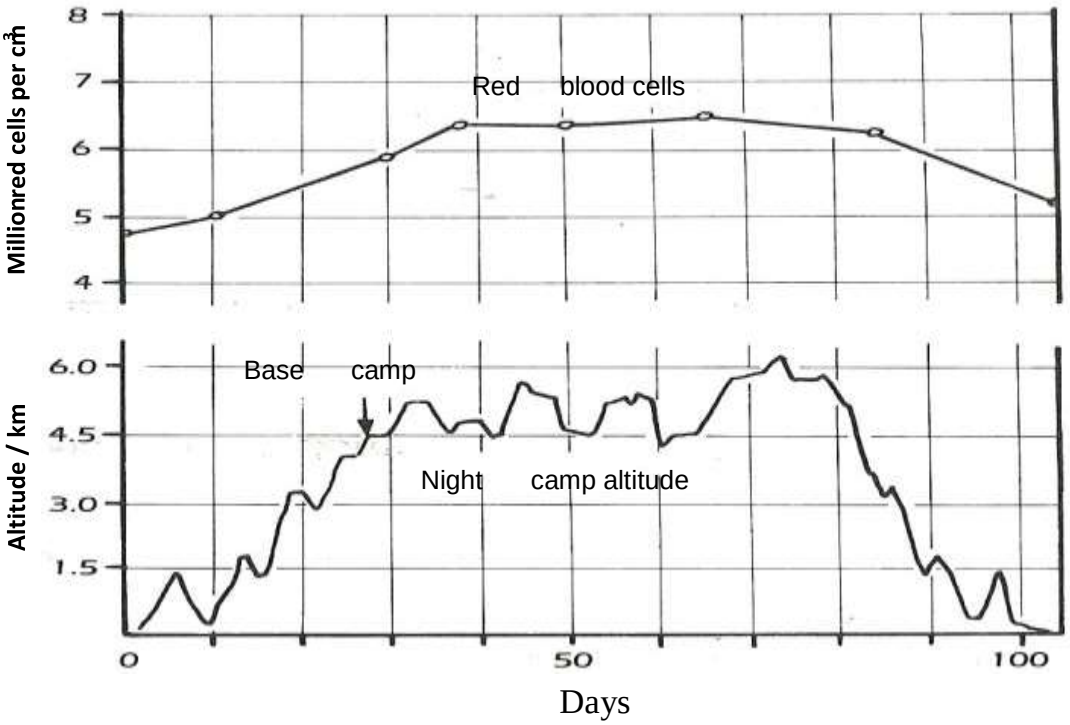
(a) Plot a graph to represent the information in the table. **(*07 marks*)**

(b) Explain the changes in the volume of blood in a woman's left ventricle. **(*08 marks*)**

(c) Outline two characteristics of blood moving out of the left ventricle. **(*02 marks*)**

(d) How does the body of a mammal benefit from blood circulation? **(*03 marks*)**

15. The graphs below show the average red blood cell count in ten members of a climbing expedition.



(a) (i) What the relationship between red cell count and altitude?

(*02 marks*)

(iii) Suggest the advantage of the change in red-cell numbers. (*03 marks*)

(b) How long did it take for the redcell count to reach its maximum

(i) from the start of the expedition? **(*01 mark*)**

(ii) from reaching base camp? (*01 mark*)

(c) What are the adaptations of a red blood cell to its functions? **(*03 mark*)**

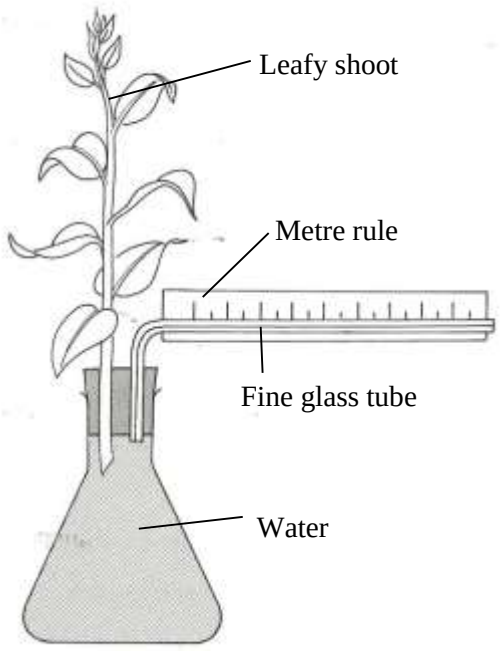
14. (a) Why is transport of materials necessary in plants and animal?

(b) Explain the effect of each of the following four factors on the rate of transpiration. Draw sketch graphs to show exactly how these affect transpiration rate.

(i) Wind speed / air movements (ii) Humidity (water content of the air)

(iii) Temperature (iv) Light intensity

15. The figure below represents a design for a potometer.



A pot plant was watered and the pot enclosed in a plastic bag tied securely round the base of the stem.
The plant was weighed at 9 a.m. and 4 p.m. During this time it lost 32g in weight.

(a) From these results, work out the plant's rate of transpiration.

(b) Why might the calculated rate in (a) above be slightly inaccurate:

(i) In daylight?

(ii) In darkness?

(c) What was the purpose of:

(i) Watering the plant,

(ii) Enclosing the pot in a plastic bag?

(iii) Using a leafy shoot?

16. (a) What is meant by the terms:

(i) Active transport
(ii) Diffusion
(iii) Osmosis

(b) Explain the factors that affect the process of diffusion.

(c)Briefly outline the significance of the following processes to living organisms:

(i) Active transport
(ii) Diffusion and
(iii) Osmosis

17. The table below shows results from an investigation on how different environmental factors affect the rate of transpiration in a certain plant species. Transpiration rate was assumed to be equivalent to grams of plant lost per day.

Transpiration: grams lost per day

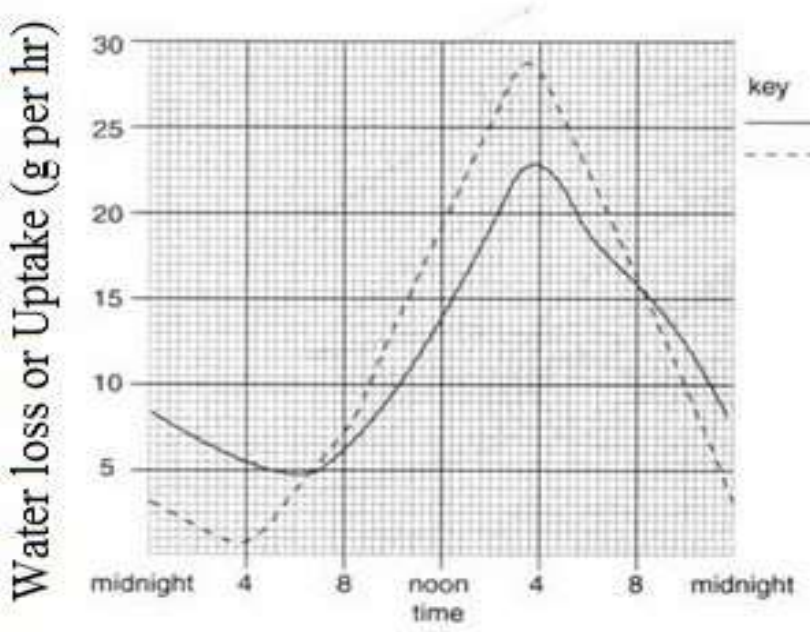
Conditions	Day 1	Day 2	Day 3	Day 4
Sunlight	0g	11.3g	19.1g	26.4g
Heat lamp	0g	6.4g	6g	20.8g
Wind	0g	5.75g	5.3g	6.7g
Shade	0g	5g	6.6g	6.9g

(a) Plot a graph of the changes in the rate of transpiration under different environmental conditions with time.

(b) Describe the differences in the rate of transpiration under different environmental conditions.

(c) Explain the differences in the rate of transpiration under different environmental conditions.

18. The graph below shows results from an investigation carried out to establish the relationship between the rate of water absorption and the rate of transpiration in sunflower plants at various times of the day.



fro m 8.00 am to 8 .00 pm .

(i)From 8.00am to 4.pm .
(ii) From 4.00 pm to 8.00 pm
(iii)From 8.00 pm to midnight

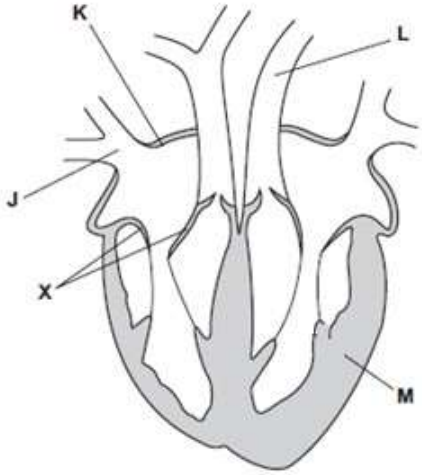
(a) Describe the change in the rate of water absorption

(b) What are the differences in the changes in the rate of water absorption and the rate of transpiration from 08.00am to 8.00 pm?

(c) Account for the changes in the rate of transpiration that took place during the experiment:

(d) Explain the relationship between the changes in the rate of water absorption and the rate of transpiration.

19. The figure below shows a vertical section through the heart. Use it to answer all the questions that follow.



(a) State **one** role of the following parts during heart beat: (**2½ Marks**)
J, K, L, M, X.

(b) Draw a series of arrows to show the direction of blood flow through the heart from the lungs to the rest of the body. (**0½ Mark**)

(c) From the figure above, state how the mammalian heart structure
relates to its functioning. **(02 Marks)**

(d) Compare the structural and functional features between blood vessels of type **J** and type **L**. **(02 Marks)**

20. (a) Explain the relationship between the structure and function of arteries, capillaries and veins.

(b) State the roles of the following in the human body:

(i) Blood circulatory system

(ii) Lymphatic system

TRANSPORT IN PLANTS AND ANIMALS

18. The table below shows the transpiration rates of a group of plants under different environmental conditions of temperature and relative humidity.

Air temperature (^oC)	Transpiration rate (arbitrary units)	
	20% relative humidity	70% relative humidity
5	15.0	5.0
10	17.5	6.5
15	21.0	7.0
20	23.5	7.5
25	26.0	9.5
30	30.0	10.0

a) Using the same axes, represent the information given in the table graphically.

b) Explain the effect of:

(i)Increasing temperature on the transpiration rate. ***(05marks)***

(ii) Lowering relative humidity on the transpiration rates. ***(03marks)***

c)(i) What is meant by the term water stress in plants? ***(02marks)***

(ii) State two effects of water stress in plants. ***(02marks)***

19. What is an artery? ***(01mark)***

b) Give three structural differences between an artery and vein. ***(03marks)***

c) Explain how the number of red blood cells in blood changes with increased altitude.

d) Briefly explain the effect of malaria on the number of red blood cells in human blood.

20. .(a) Distinguish between double and single circulatory systems.(1 mark)

(b) Explain how each one of the following blood vessels are adapted for their function;

(i) Capillaries (ii) Veins (iii) Arteries

(c). Describe the route taken by blood from the Kidney until it is oxygenated.

21. .(a) Define the term blood transfusion ?

(ii) With relevant examples, distinguish between a universal donor and recipient, statingtheir possible blood groups

(iii) Briefly explain how blood clotting occurs 3marks

22. The table below shows the results of blood cell counts (red and white blood cells) taken on people living at different altitudes.

Altitude(m)	Red blood cell count (mm^3 x 10^6)	White blood count (mm^3 x 10^6)
1000	5.0	0.2
2000	5.6	0.2
3000	6.2	0.2
4000	7.0	0.2
5000	7.8	0.2

(a) Using appropriate scales, plot a graph of Blood cell count against altitude

(b) Describe the relationship between altitude and

(i)red blood cell count (ii)white blood cell count

(c). Give an explanation for the above relationships (i)red blood cell count (ii)white blood cell count (d) What were the red blood cell counts at:

(i) 500m (ii) 6000m

(e) How are red blood cells adapted to carry out their function?

(f) What happens to old red blood cells in the body?

23.(a)What is plasma?

(b) Give the structural adaptations of the xylem and the phloem for their functions

(c) Explain why plants do not have excretory organs.

24. S4 students arranged an experiment to investigate the factors affecting the rate of transpiration as shown below.

25. (a) Name the constituents of the mammalian blood

(b)Describe the sequence of events during one heartbeat. (09 marks)

(c) What are the differences in blood contents between the blood carried by hepatic portalvein and hepatic vein?

26. (a) What is transpiration?

(b) State the environmental factors that affect the rate of transpiration. (c) Describe an experiment to show that a plant transpires.

(d) In what ways are desert plants adapted to conserve water

27. . (a) Define the term immunity

(b) With specific examples distinguish between the following immunological terms

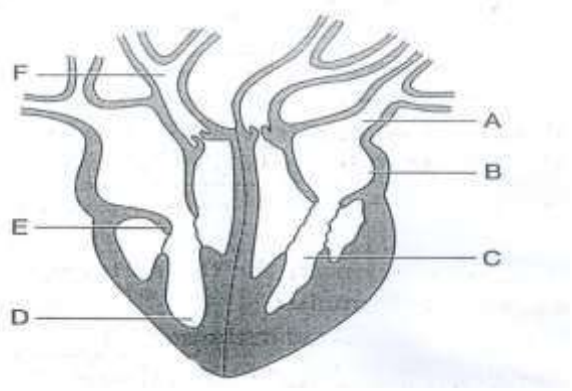
(i) Innate immunity and acquired immunity

(ii) Natural active acquired immunity and Natural passive acquired immunity(iii) Artificial active acquired immunity and artificial passive acquired immunity.

(c)Outline the different causes of diseases.

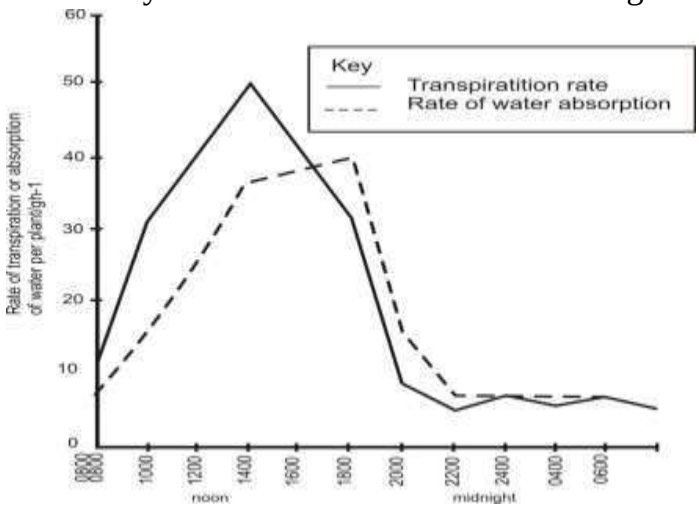
d) How does the human body defend itself from disease causing germs?

28. The diagram below shows a vertical section through a mammalian heart.



a) Name the parts labelled A, B, E and F ***(02marks)***
b) Using arrows, show the direction in which blood flows in the heart.
c) Explain the difference in the thickness of the walls of chamber C and D
d) Describe two factors that affect the rate of heart beat. ***(03marks)***

29. An investigation was carried out into the relationship between the rate of water absorption and the rate of transpiration in sunflower plants at various times of the day. The results are shown in the diagram below:



Time of the day / 24 hour clock

(a) Describe the change in the rate of water absorption from 08.00 hours to 20.00 hours.
(b) Account for the changes in the rate of transpiration that took place during the experiment:
(i) From 08.00 hours to 14.00 hours. ***(04 marks)***
(i) From 14.00 hours to 20.00 hours ***(04 marks)***
(i) From 20.00 hours to 06.00 hours ***(03 marks)***

(c) Explain the relationship between the changes in the rate of water absorption and therate of transpiration. ***(03 marks)***

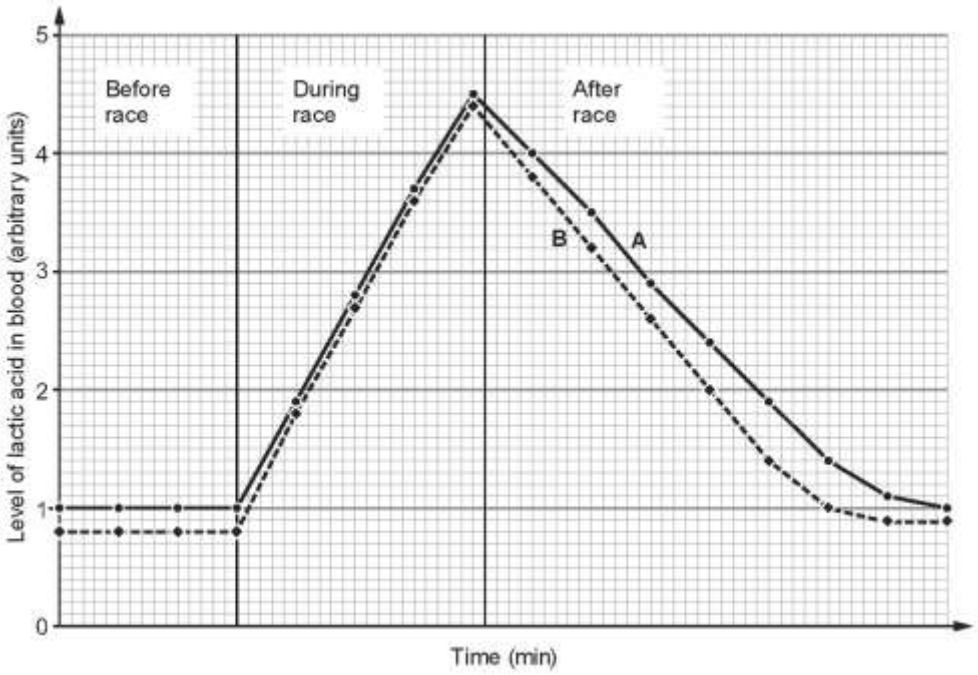
(b)State the transport functions and protective functions of blood

(c)State the functions of the lymphatic system

SECTION VI: GAS EXCHANGE AND TISSUE RESPIRATION

15. The concentration of lactic acid in the blood of an athlete was measured before, during and after a race.

The athlete then followed a two weeks period of increased regular exercise. The lactic acid measurements were then repeated, as before, for a race of the same distance. The graph below shows the results.



(a) Describe the pattern in the levels of lactic acid in blood. **(*04 marks*)**

(b) Explain the observed pattern in the levels of lactic acid in blood. **(*05 marks*)**

(c) Which of the two curves, **A** and **B**, represents the lactic acid level after undertaking regular exercise? Give a reason for your answer. **(*03 marks*)**

(d) What other changes occur to the concentration of the components of blood during a race? **(*03 marks*)**

(e) (i) Why is aerobic respiration more efficient than anaerobic respiration? **(*02 marks*)**

(ii) How do humans benefit from anaerobic respiration of organisms?

(*03 marks*)

16. The table below shows a comparison of two athletes who ran in in races of different distances.

Athlete	**Distance of race (m)**	**Oxygen needed in the race (dm^3)**	**Oxygen entering blood during the race (dm^3)**
A	100	10	0.5
B	10 000	150	134.0

(a) (i) Calculate the difference between the oxygen needed and the actual
(ii) oxygen entering blood during the race for each athlete. **(*01 mark*)**

(b) What name is given to the difference between the oxygen needed and the oxygen actually entering blood during the race? **(*01 mark*)**

(c) Explain why, even after the race, both athletes continued to breathe more rapidly and more deeply than normal for some time. **(*01 mark*)**

(d) What can be concluded about the type of respiration taking place in each athlete, from the data shown in the table? **(*02 marks*)**

(e) Which of the two athletes respires more efficiently? Explain. **(*02 marks*)**

(f) Describe briefly the mechanism used by humans in obtaining oxygen.

(*03 marks*)

21. (a) The table below shows the composition of three gases during breathing in humans.

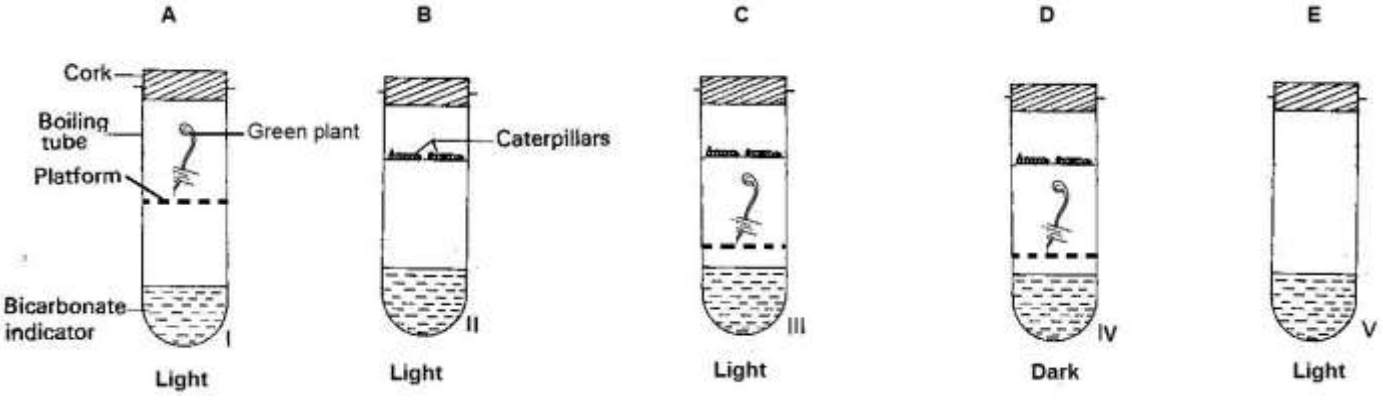
Gas	**Inhaled air**	**Exhaled air**
Oxygen	21	16
Carbon dioxide	0.04	4.0
Nitrogen	79	79

Explain the differences in the composition of the gases between inhaled air and exhaled air

(b) A bicarbonate indicator changes colour depending on the amount of carbon dioxide present as follows:

Yellow	**Red**	**Purple**
Much carbon dioxide	Normal amount of carbon dioxide	Very little carbon dioxide

Five test tubes were set up as shown in the figure below. Each one contained red bicarbonate indicator at first, and they were left for **four** hours. Study them carefully and answer the questions that follow.



With a reasons in each case, state the colour you would expect the indicator to be in each test tube.

(c) **Explain the following observations:**

(i) Waterlogging of the soil may lead to death of plants.

(ii) Mouth-to-mouth resuscitation is more effective with breathed out air than with breathed in air.

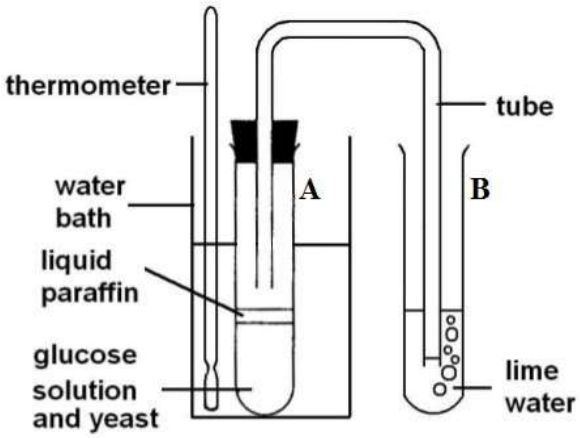
(iii) People living in high altitudes have a higher red blood cell count and more haemoglobin than peopleliving in low altitudes.

22. (a) Explain how respiratory surfaces are suited for gaseous exchange. **(04 marks)**

(b) Describe a laboratory experiment to demonstrate the breathing mechanism in humans. **(08 marks)**

(c) How does respiration differ from photosynthesis? **(03 marks)**

23. The figure below illustrates an experiment to demonstrate a certain biological process in yeast cells. Before addition of yeast suspension, the glucose solution was first boiled and then cooled.



The gas produced in tube **A** passed through the delivery tube and formed bubbles in lime water in **B**.

The number of bubbles produced during the period of 5 minutes intervals, at each temperature starting at 15^0C.

Temp. in ^{0}C	15	20	25	30	35	40	45	50	55	60	65
No. of bubbles	0	1	4	9	14	21	28	35	38	38	38

At each temperature, tube A was immersed in a water bath for two minutes before counting the bubbles began.

(a) Plot a graph of changes in the number of bubbles released by yeast with temperature.

(b) From the graph, explain the changes in the number of bubbles produced with temperature. (c) (i) Determine the rate of bubbling at 27^0C.

(ii) What process was investigated in the experiment above?

(d) (i) What observations would you make in lime water a few minutes after the experiment has begun?

(ii) Explain the observations made in (d) (i) above.

(e) Explain why:

(i) Glucose was boiled

(ii) Glucose was cooled before adding yeast

(iii) Oil seal was placed over the reaction mixture in the vacuum flask

(e) List any two industrial uses of the process that is being demonstrated by the experiment.

GASEOUS EXCHANGE AND RESPIRATION