**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: <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:<br>(i) Dicotyledonous and monocotyledonous stems<br>(ii) Dicotyledonous and monocotyledonous roots (b) State how the following parts differ in dicots and monocots:<br>(i) Leaves (ii) Flowers (iii) Seeds | **3.** (a) Draw a labelled diagram showing the tissues present in a dicotyledonous leaf.<br>(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:<br>(i) Physical weathering (ii) Chemical weathering<br>(iii) Biological weathering<br>(b) Explain how soil fertility can be:<br>(i) Lost (ii) Improved | **7.** (a) Describe an experiment to show that soil contains living organisms.<br>(b) Explain three roles of soil:<br>(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 |

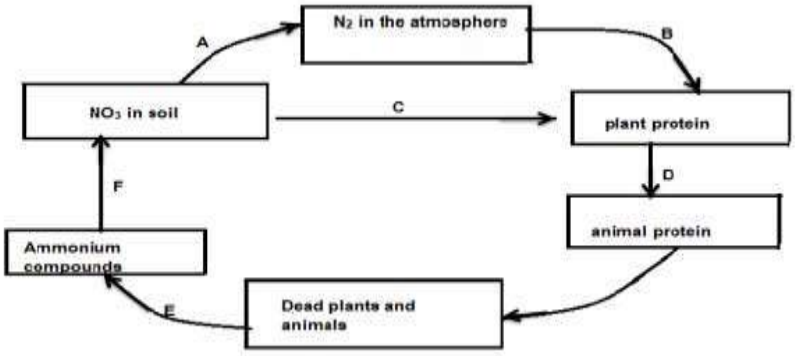
a) If all the three types of soil were mixed in equal amounts without losing any of their contents, what would be the percentage content of air in the mixture? Show you working

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;

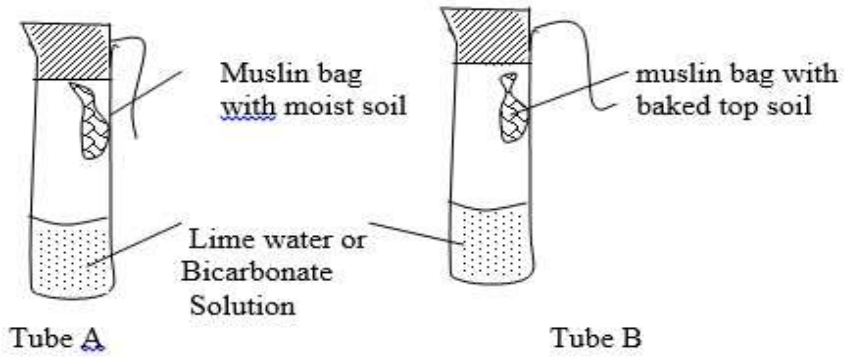
i) Capillary (ii) Leaching (iii)Soil drainage

(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*)**

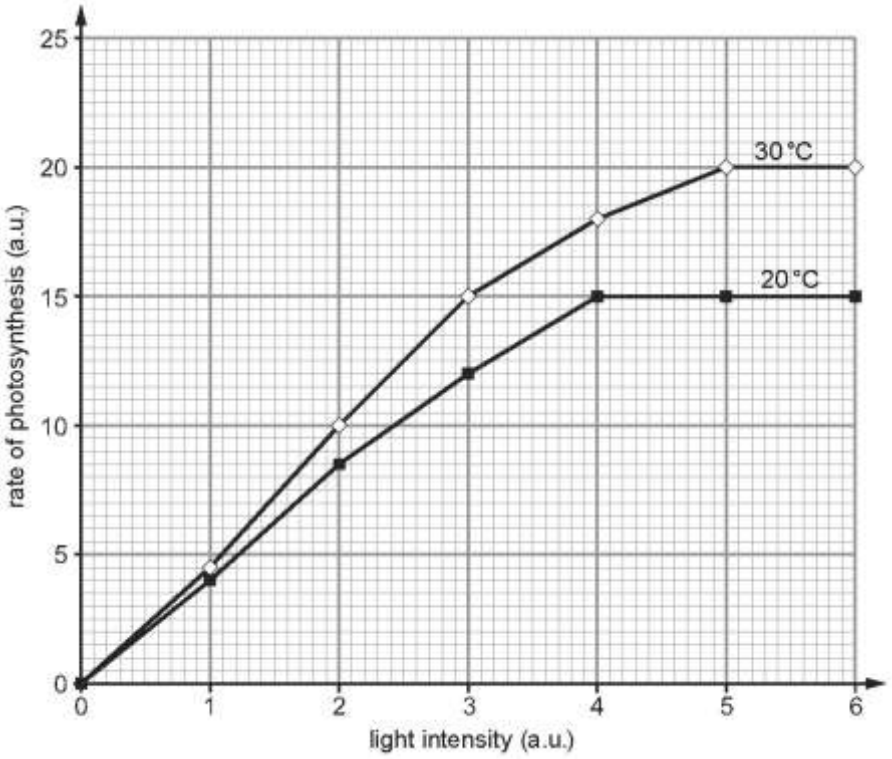
(b) Describe the trend in the rate of oxygen production. **(*03 marks*)**

(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 $20^0$C.

(b) Explain

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

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

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

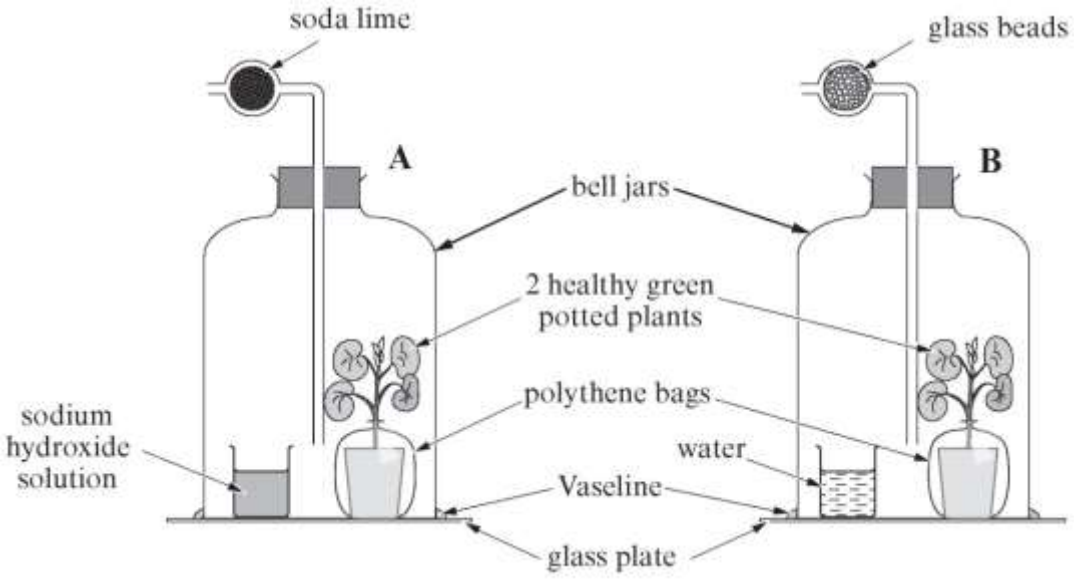
(d) Calculate the difference in the rate of photosynthesis between $20^0$C and $30^0$C at a light intensity of 3.5 a.u.

(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*)**

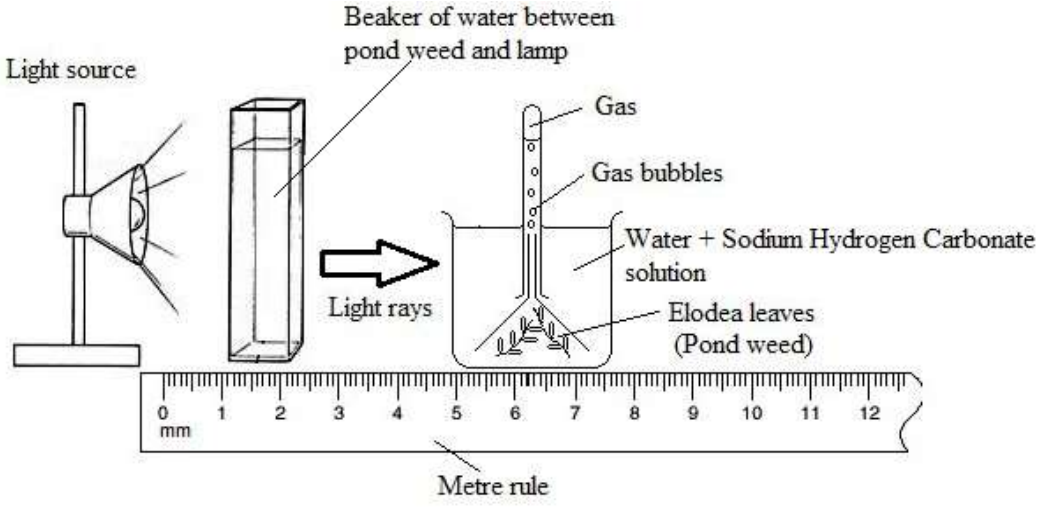
Reason **(*01 mark*)**

**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)**

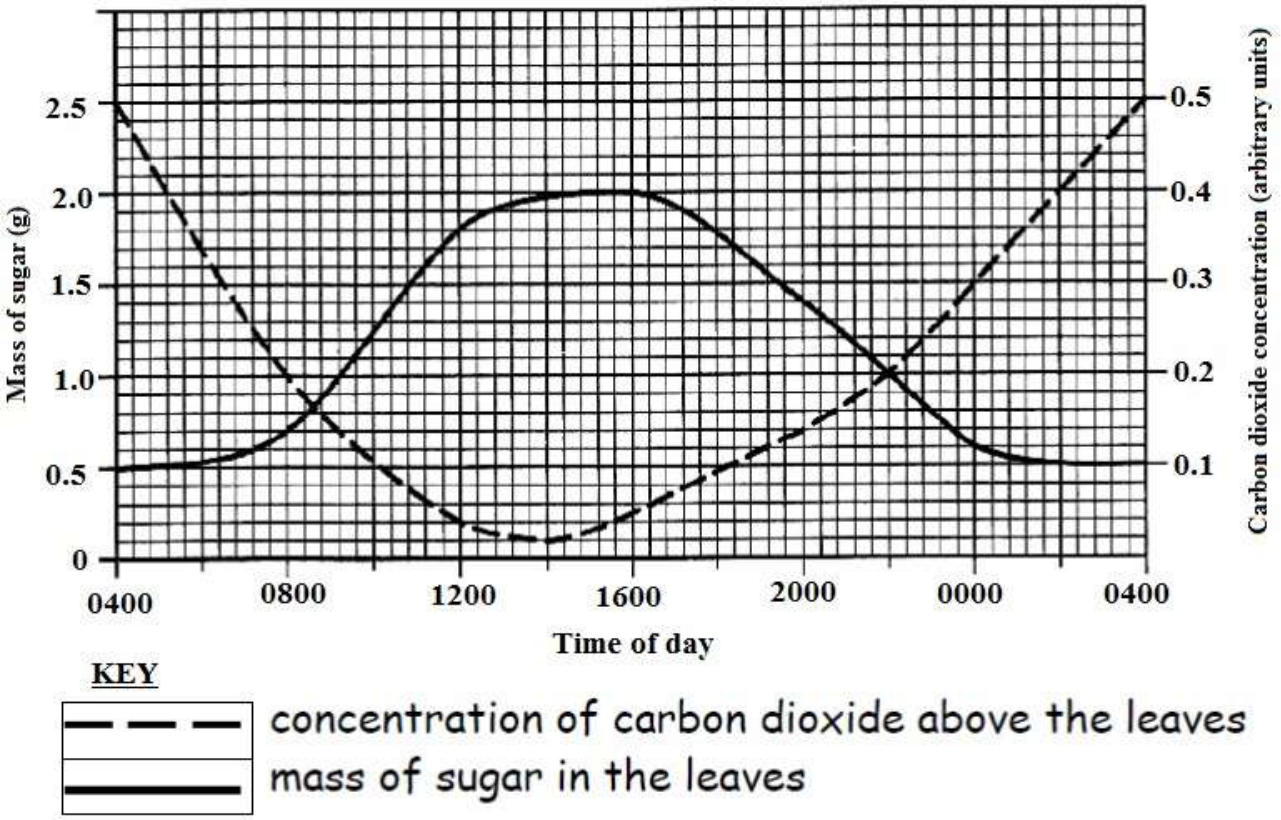
(ii) Water without sodium hydrogen carbonate solution **(2 marks)**

(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.




(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**)

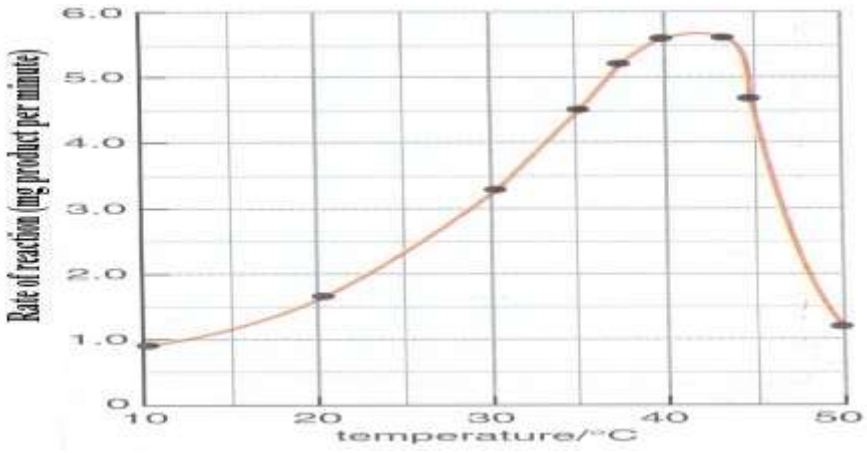
(c) State **two** ecological roles of photosynthesis. (**02 Marks**)

**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 $10^0$C to $20^0$C

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

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

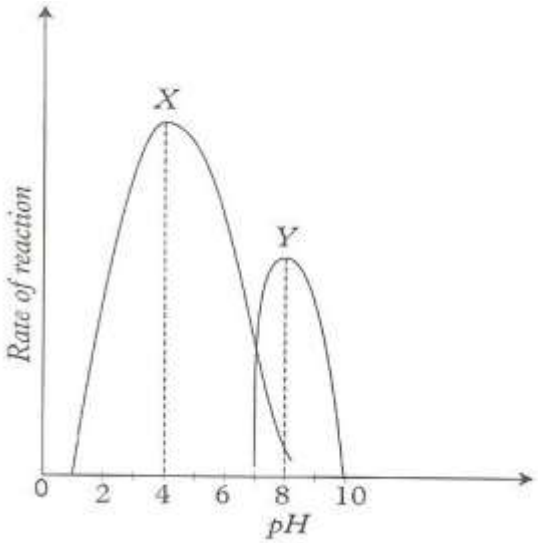
(iv) From $42^0$C to $50^0$C

(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.



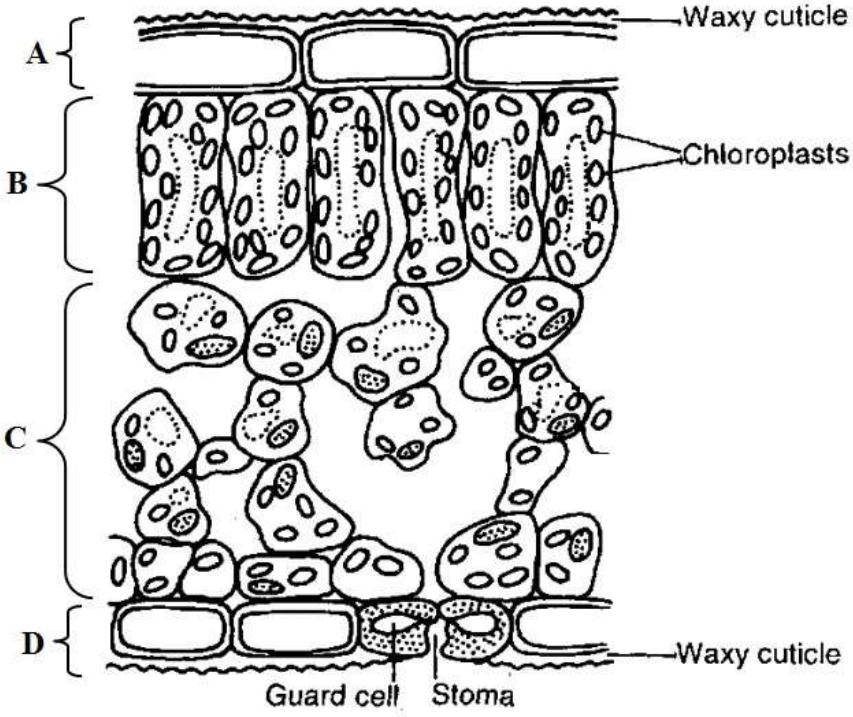

(d) With a reason, state the optimum PH for:
i )Enzyme X (ii) Enzyme Y

(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 active Boy (15-18)yrs | 12600 | 80 | 0.8 | 17 |
| (13-14)yrs | 10500 | 70 | 0.8 | 17 |
| Pregnant woman | 9250 | 85 | 1.2 | 20 |
| Girl | 10500 | 70 | 0.7 | 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 @)

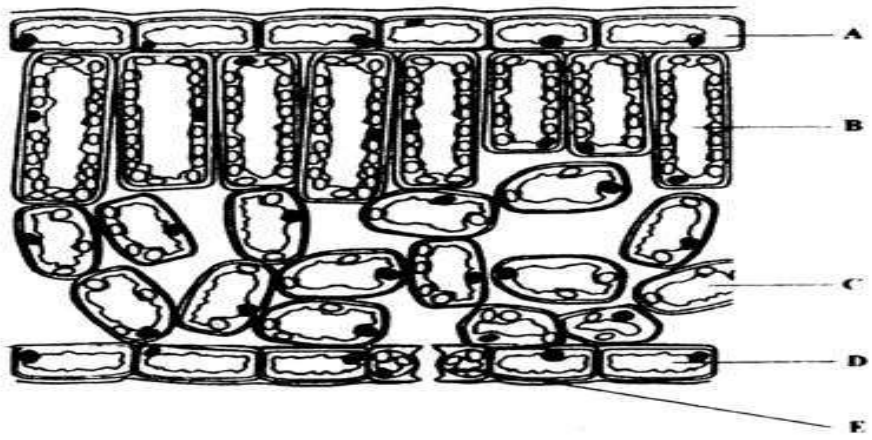
**(i) Autotrophic nutrition**

**(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?

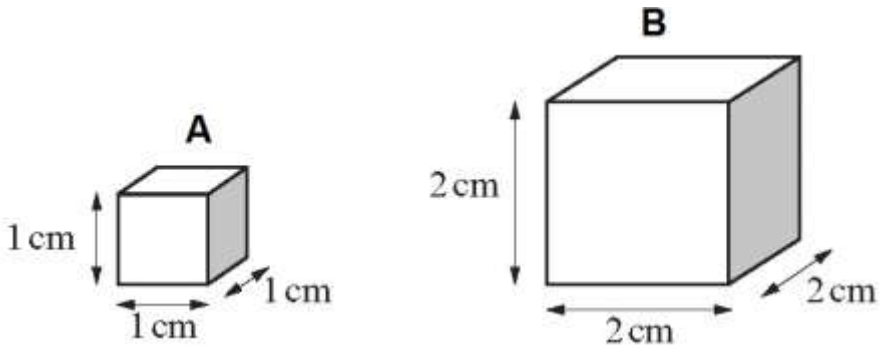
(c)Give the adaptations of the ileum to the process of absorption.

(d)Write the dental formulae of;

(i) Rabbit

**SECTION V: TRANSPORT**

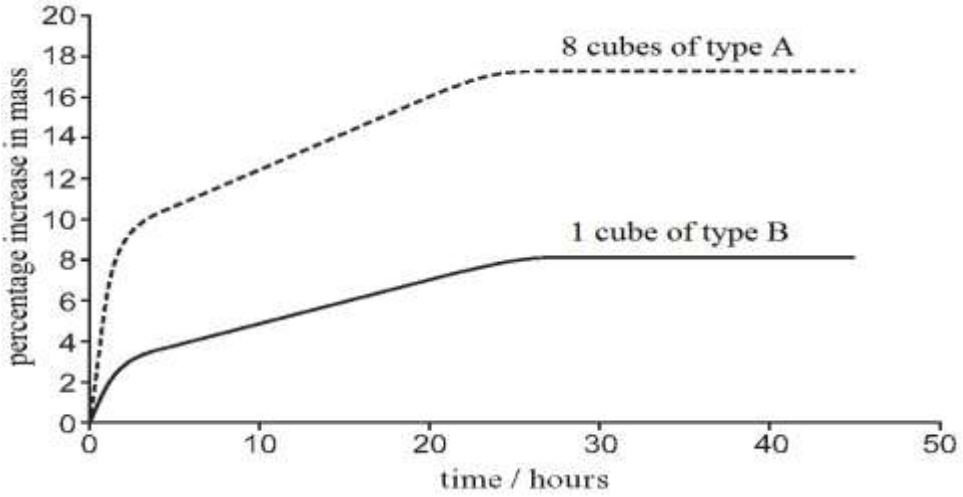
**8.** An investigation was carried out using cubes of potato to find out the effect of surface area**:** volume ratio on the rate of absorption in plants.




(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*)**

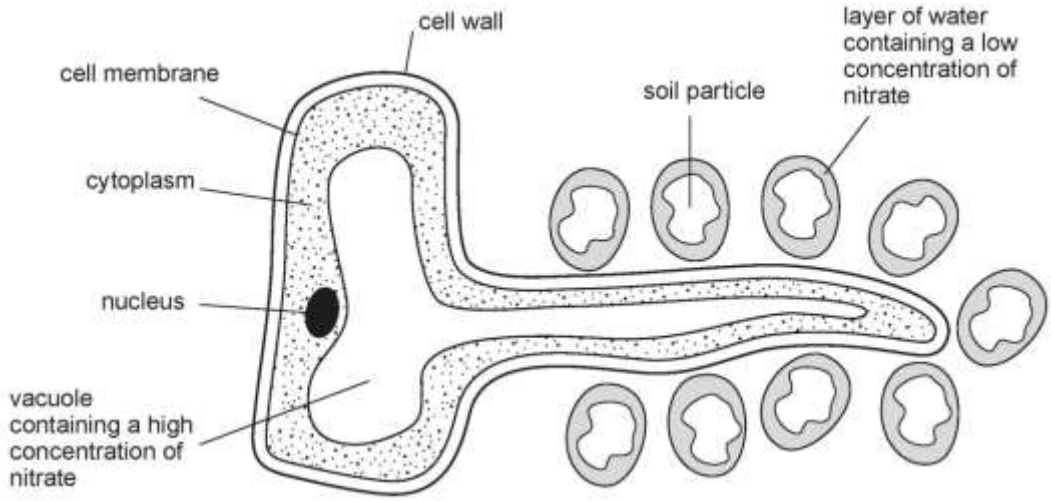
(e) Suggest two ways by which
(i) the process that caused the increase in mass of cubes benefits plants. **(*02 marks*)**
(ii) organisms have solved the problems of larger body size. **(*04 marks*)**

**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.

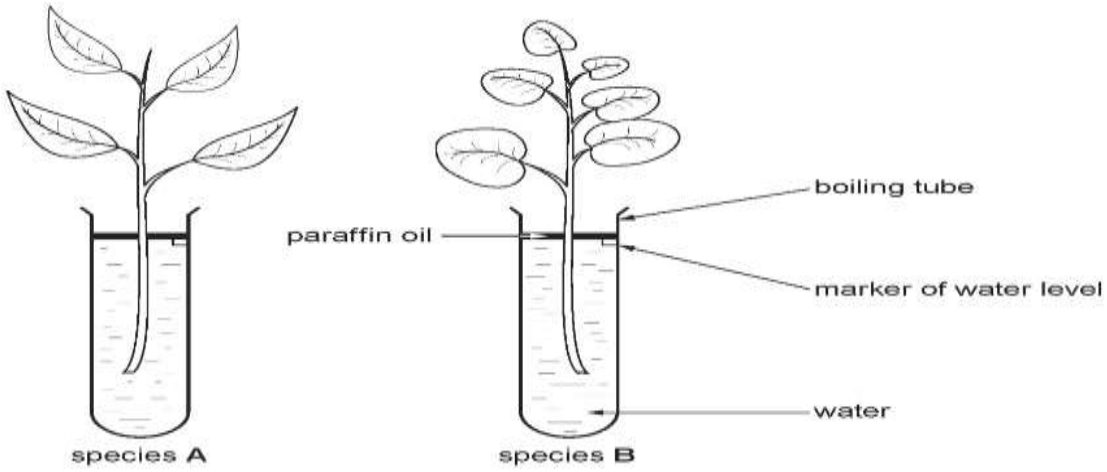


(a) (i) State the process used by the root hair cell to take up nitrate from soil.
**(*01 mark*)**

(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. 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*)**

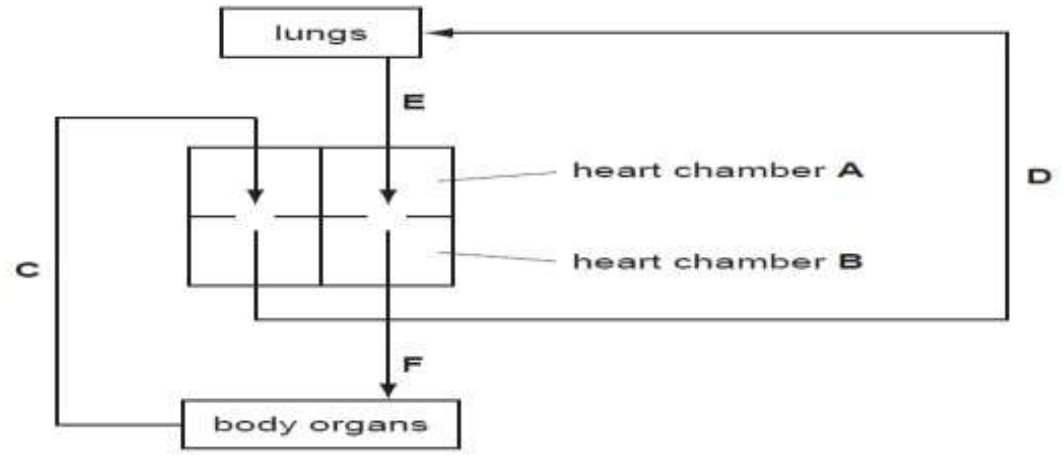
(d) Suggest

(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 |

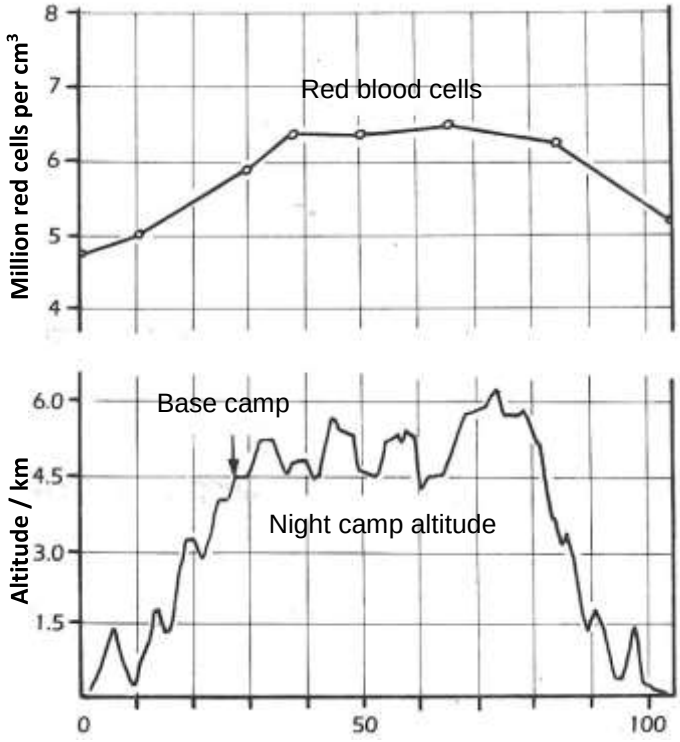
(a) Plot a graph to represent the information in the table. **(*07 marks*)**

(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*)

(ii) 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*)**

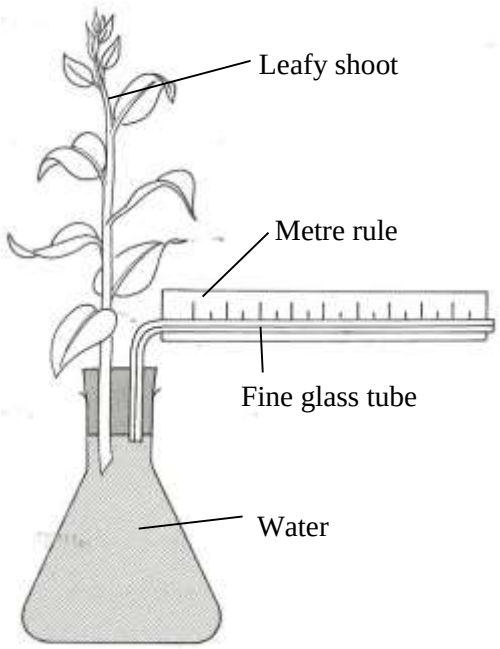
**14.** (a) Why is transport of materials necessary in plants and animal?

(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**

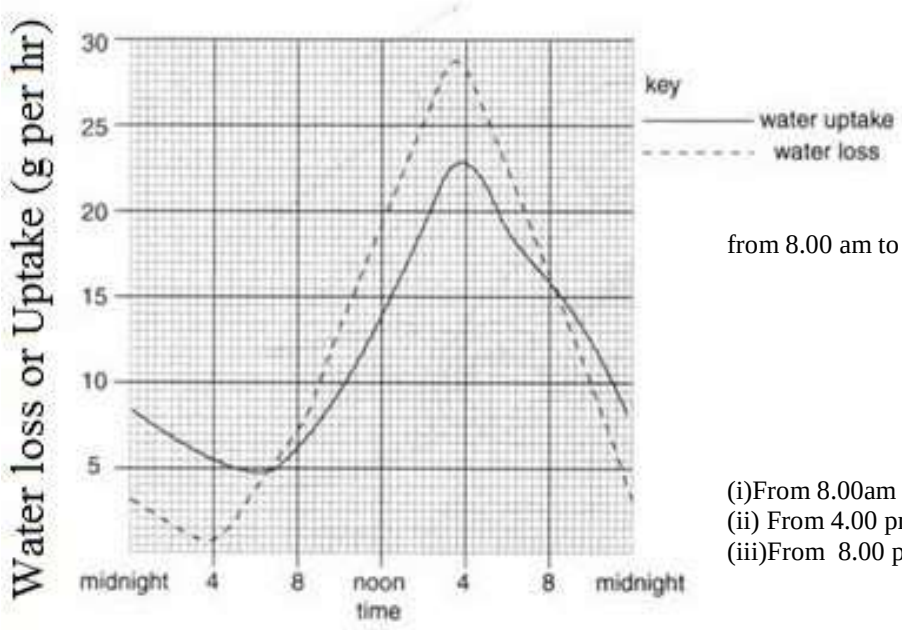
| Conditions | Day 1 | Day 2 | Day 3 | Day 4 |
|---|---|---|---|---|
| Sunlight | 0g | 11.3g | 19.1g | 26.4g |
| Heat lamp | 0g | 6.4g | 6g | 20.8g |
| Wind | 0g | 5.75g | 5.3g | 6.7g |
| Shade | 0g | 5g | 6.6g | 6.9g |

(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.




(a) Describe the change in the rate of water absorption from 8.00 am to 8.00 pm.

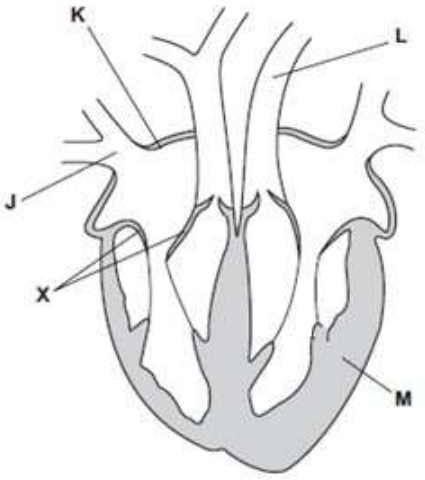
(b) What are the differences in the changes in the rate of water absorption and the rate of transpiration from 08.00am to 8.00 pm?

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

(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, stating their 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 ($mm^3 \times 10^6$) | White blood count ($mm^3 \times 10^6$) |
|---|---|---|
| 1000<br>2000<br>3000<br>4000<br>5000 | 5.0<br>5.6<br>6.2<br>7.0<br>7.8 | 0.2 0.2<br>0.2 0.2<br>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.

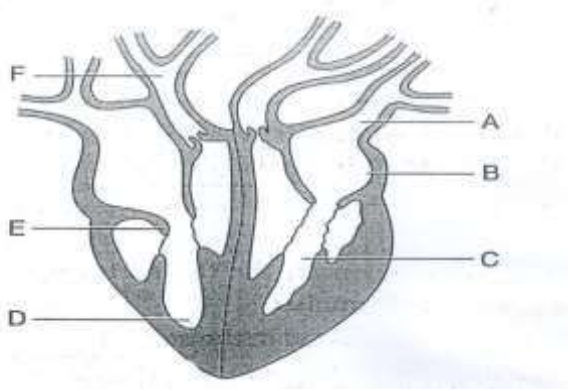
**24.** S4 students arranged an experiment to investigate the factors affecting the rate of transpiration as shown below.

**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

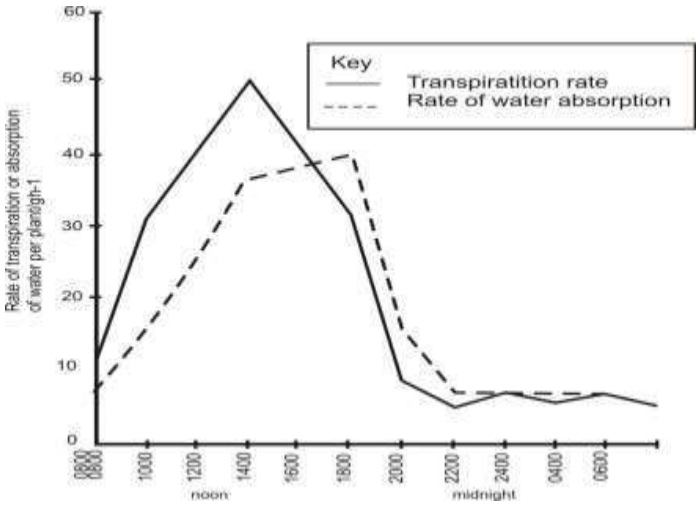
**27.** . (a) Define the term immunity
(b) With specific examples distinguish between the following immunological terms
(i) Innate immunity and acquired immunity
(ii) Natural active acquired immunity and Natural passive acquired immunity(iii) Artificial active acquired immunity and artificial passive 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.

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

(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)***

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

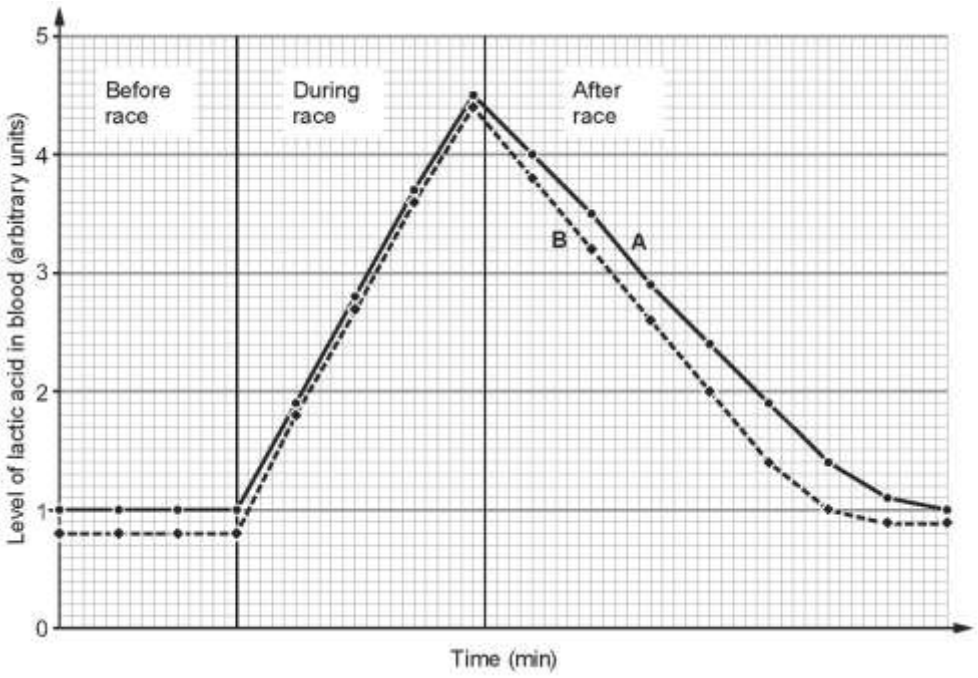
(b)State the transport functions and protective functions of blood

(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 oxygen entering blood during the race for each athlete. **(*01 mark*)**

(ii)

(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*)**

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

(e) 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.

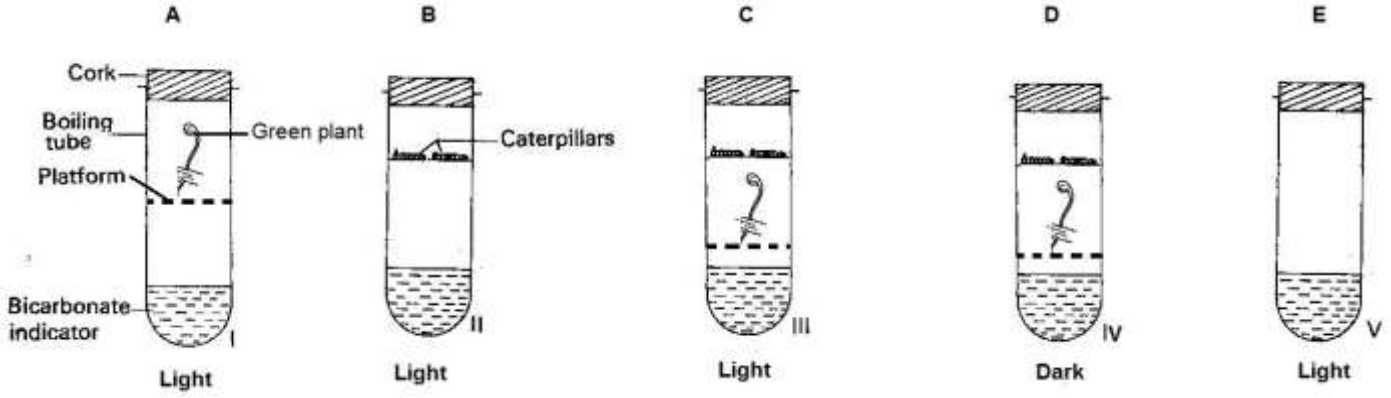
| Gas | Inhaled air | Exhaled air |
|---|---|---|
| Oxygen | 21 | 16 |
| Carbon dioxide | 0.04 | 4.0 |
| Nitrogen | 79 | 79 |

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.

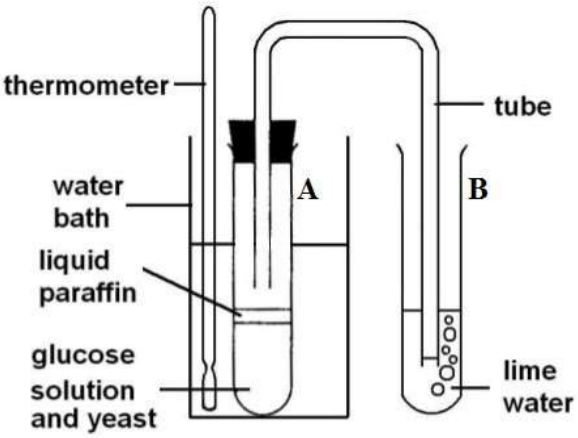
(iii) People living in high altitudes have a higher red blood cell count and more haemoglobin than peopleliving in low altitudes.

**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.




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

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 $15^0$C.

| 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 |

(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 $27^0$C.

(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

**30.** .a) Outline the mechanism of:

(i) Inspiration

(ii) Expiration, in a bony fish. ***(12marks)***

b) How are gills adapted for gaseous exchange in a bony fish?***(03marks)***

**31.** (a) Give five differences between respiration and photosynthesis (b)Give three ways in which respiration is important to living organisms.

(c)Name two commercial uses of anaerobic respiration.

**32.** A study was carried out on a human being who was under an exercise. The changes in the breathing rate and rate of heart beat were monitored. The results are shown in figure 3 (a) and (b).

Rate of Breathing heart beat

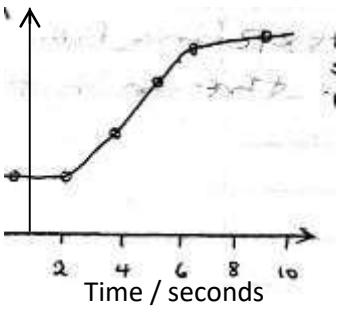



Figure (a)

rate breaths

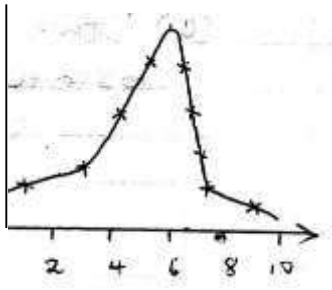



Figure (b)

min$^{-1}$

(a) What was the purpose of this study? *(03 marks)*

(b) Describe what is happening in each figure;

(i) Figure (a). *(03 marks)*

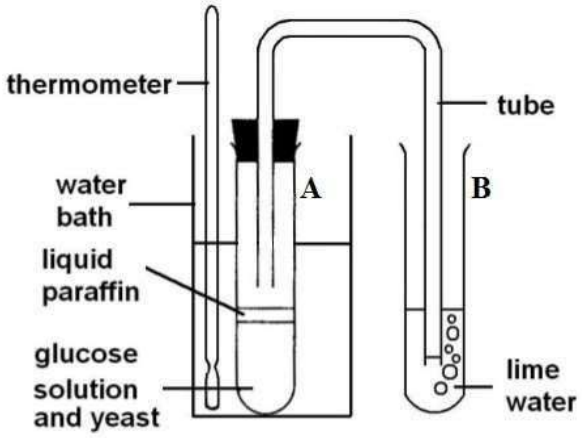
(ii) Figure (b) *(04 marks)*

(c) Give an explanation for the observation shown in figure (a). *(03 marks)*

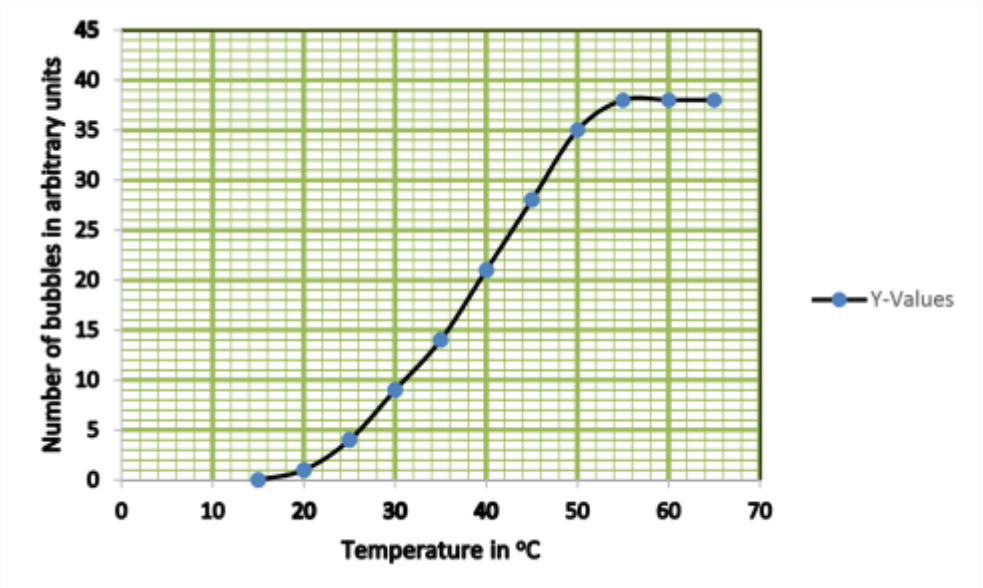
(d) From figure (b), explain why the rate of heart beat increases during exercise. *(05 marks)*

(e) Apart from those in figures (a) and (b), what else would occur in human body during exercise? *(02 marks)*

**33.** 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 $15^0$C.
At each temperature, tube A was immersed in a water bath for two minutes before counting the bubbles began.
A graph of changes in the number of bubbles released by yeast with temperature was plotted as shown below.

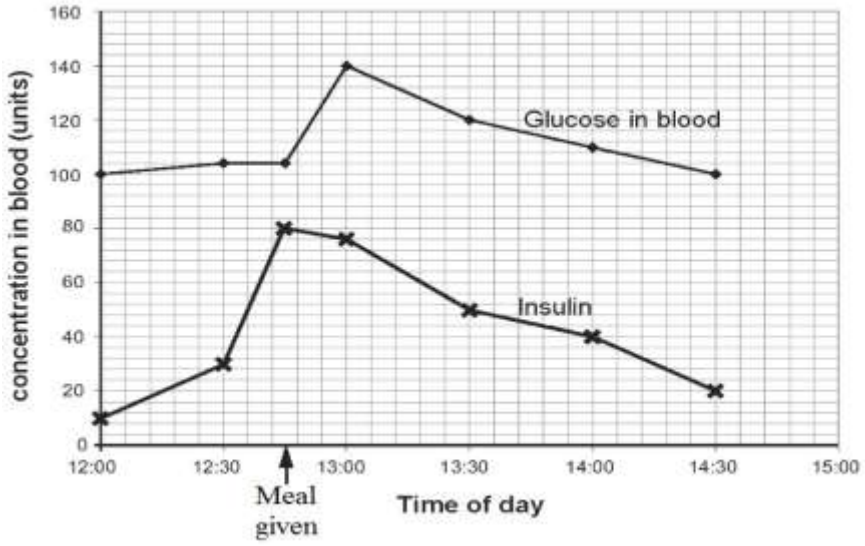



(b) From the graph, explain the changes in the number of bubbles produced with temperature.

(c) (i) Determine the rate of bubbling at $27^0$C.
(ii) What process was investigated in the experiment above?
(d) (i) What observations would you make in lime water a few minute 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
(f) List any two industrial uses of the process that is being demonstrated by the experiment

## SECTION VII: <u>HOMEOSTASIS, EXCRETION AND OSMOREGULATION</u>

**17.** The graph below shows the levels of glucose and insulin in the blood of a person, before and after feeding on carbohydrate, which was given at 12:45 hours.




(a) Describe the pattern of concentration of blood glucose. **(*04 marks*)**

(b) Explain the changes in the concentration of blood glucose. **(*05 marks*)**

(c) (c) Suggest the

(i) normal blood glucose concentration of this person. **(*01 mark*)**

(ii) fate of blood glucose level if the person starves over the next 24 hours. **(*03 marks*)**

(iii) health status of this person, in relation with blood sugar regulation. Explain your answer **(*03 marks*)**

(d) What type of carbohydrate

(i) was eaten by this person? Explain your answer. **(*02 marks*)**

(ii) is more suitable for this person? Give a reason. **(*02 marks*)**

**18.** (a) (i) What are the major ways by which water is gained and lost from bodies of mammals? *(*04 marks*)*

(ii) How are structures in bodies of mammals suited for water conservation? **(*04 marks*)**

(b) Explain how the anti-diuretic hormone enables the kidneys to regulate the water content of ***blood.*** *(*07 marks*)*

**19.** The table below shows the changes in temperature of air in the atmosphere and the body temperature of two animals **A** and **B** during the course of the day in the desert.

| Time of day (hours) | | 6:00 | 9:00 | 12:00 (noon) | 15:00 | 18:00 | 21:00 |
|---|---|---|---|---|---|---|---|
| Temperature ($^0$C) | Air | 15 | 25 | 36 | 41 | 41 | 20 |
| | **A** | 37 | 37 | 37 | 37 | 37 | 37 |
| | **B** | 12 | 19 | 10 | 10 | 10 | 19 |

(a) Plot graphs on the same axes to represent the information in the table. **(*08 marks*)**

(b) What is the effect of changes in air temperature on the temperature of

(i) animal **A**? **(*01 mark*)**

(ii) animal **B**? **(*01 mark*)**

(c) Suggest the means by which bodies of animals **A** and **B** respond to changes in air temperature between 9:00 hours and 18:00 hours **(*05 marks*)**

(d) (i) State the classes to which animals **A** and **B** belong. **(*02 marks*)**

(ii) How does animal **A** benefit from the trend of its body temperature? **(*02 marks*)**

***24.****(a) Distinguish between* ***excretion*** *and* ***osmoregulation****.* ***(02 marks)***

(b) Describe the contribution of the following parts to urine formation in mammals:

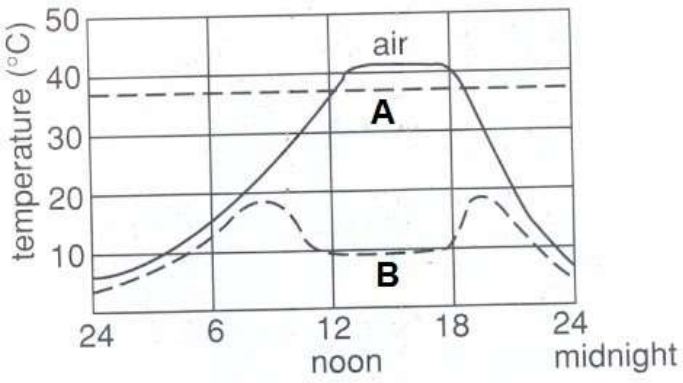
(i) Bowman's capsule **(03 marks)**

(ii) Proximal convoluted tubule **(04 marks)**

(iii) Loop of Henle **(03 marks)**

(iv) Collecting duct **(03 marks)**

**25.** The figure below shows the variation in atmospheric temperature and the body temperature of two animals **A** and **B** during the course of the day in the desert.




( a) Describe the observed patterns in temperature of animals **A** and **B** through the different hours of the day.

(b) What behavioural and physiological mechanisms explain the observed temperature of animals **A** and **B** through the different hours of the day?

( c) Suggest the classes of animals to which animals **A** and **B** belong.

**26.** The table below shows the effect of exercise on the secretion of insulin and glucagon hormones in a human being. The exercise lasted 6 minutes.

| Time | (Minutes) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Concentration of hormone in blood in arbitrary units | Glucagon | 3 | 4 | 6 | 9 | 15 | 20 | 26 |
| | Insulin | 18 | 14 | 11 | 10 | 9 | 8 | 7 |

(a) Draw an appropriate graph to represent the information in the table. **(08 marks)**

(b) Explain the variations in insulin and glucagon during the exercise.

(i) Insulin **(04 marks)** (ii) Glucagon **(04 marks)**

(c) Explain how the concentration of the two hormones would vary if the individual swallowed much glucose after the exercise.

*(i) Insulin* ***(02 marks)*** ***(****ii) Glucagon*** ***(02 marks)***

**27.** The table below shows changes in the amount of ammonia excreted by a tadpole during development.

| Age of tadpole or frog(days) | **50** | **55** | **65** | **75** | **90** | **95** | **100** | **110** |
|---|---|---|---|---|---|---|---|---|
| Ammonia as % of total excretory material | 92 | 88 | 84 | 83 | 68 | 20 | 13 | 12 |

(a) Plot a graph of the data above. **(07 marks)**

(b) Describe the changes in percentage of ammonia excreted with time. **(05 marks)**

(c) With a reason, identify the period when the animal leaves water. **(02 marks)**

(d) Explain the importance of excretion by animals. **(03 marks)**

(e) State two structural changes that accompany the change in excretory product **(02 marks)**

(f) From the data what is the importance of metamorphosis in the animal? **(01 marks)**

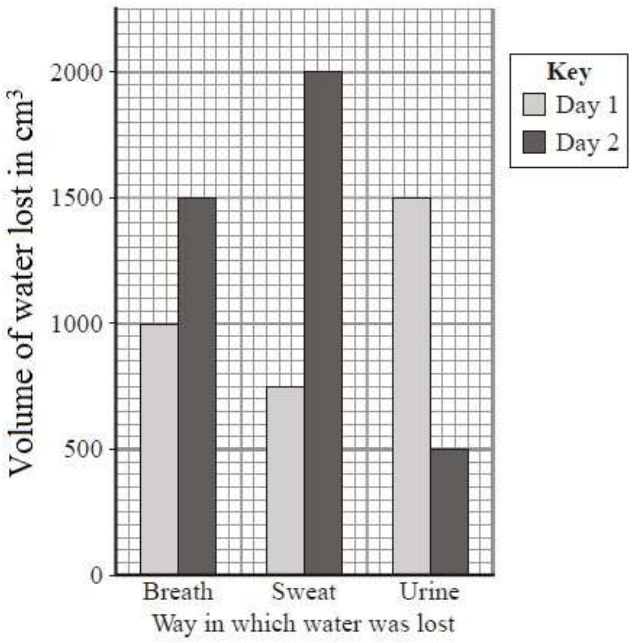
**28.** The kidney controls the amount of water in the body.

The table shows the volume of water filtered from the blood and the volume of urine produced in one day.

| | **Volume in $dm^3$** |
|---|---|
| Water filtered from blood | 180 |
| Urine | 2 |

**(a)** Calculate the volume of water reabsorbed into the blood. Show clearly how you work out your answer.

**(b)** The bar chart shows the amount of water lost from the body of a student on two different days. The student ate the same amount of food and drank the same amount of liquid on the two days. The temperature of the surroundings was similar on the two days.




**(i)** The total volume of water lost on day 1 was 3250 $cm^3$. How much water was lost on day 2? Show your working.

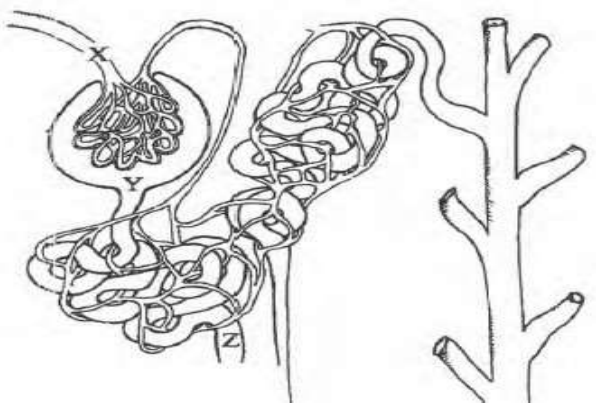
**(ii)** The student did much more exercise on one of the days than on the other.
On which day did he do more exercise?
Day? Give **two** reasons for your answer.

**(b) (i)** State **one** chemical reaction that produces water in the body.

**(ii)** Briefly explain how sweating is important to the body

**(iii)** If the body loses more water than it gains, it becomes dehydrated and the concentration of the solution surrounding the body cells increases. Briefly explain how this affects body cells.

**29.** The diagram below represents a single kidney nephron:




Two experiments were carried out to analyse fluid from different regions of the kidney.

In experiment one, samples were taken using a micropipette from the three regions, **X, Y** and **Z**.

These were then tested using Benedict's (for reducing sugars) and Biuret reagents (for protein). The results are shown in the table below.

| Sample | Benedict's | Biuret |
|---|---|---|
| **Experiment one** | | |
| X (blood plasma) | Red precipitate | Intense purple |
| Y (glomerular filtrate) | Red precipitate | Very pale purple |
| Z (start of loop of Henlé) | Blue (unchanged) | Blue (unchanged) |
| **Experiment two – chilled kidney** | | |
| Z | Yellow/green ppt. | Purple tinge |

**(a) (i)** Explain the difference in the Biuret result between samples X and Y (in experiment one).

**(ii)** Account for the difference between the Benedict's result between samples Y and Z (in experiment one).

**(iii)** In experiment two, the kidney was **chilled (placed in freezing temperature)** and a sample was taken from region Z using a micropipette. Explain the results of the Benedict's and Biuret tests shown above.

**(b)** Describe the effect of ADH on the functioning of the kidney nephron.

**30.** The kidneys regulate the concentration of substances in the blood.

(a) Glucose is found in the blood but not in the urine. Describe the processes that prevent glucose beingexcreted in the urine.

(b) The table shows the concentrations of dissolved substances in the urine of a healthy person and the urine ofa person with one type of kidney disease.

| **Substance** | **Concentration in g/dm$^3$** | |
|---|---|---|
| | Urine of a healthy person | Urine of a person with kidney disease |

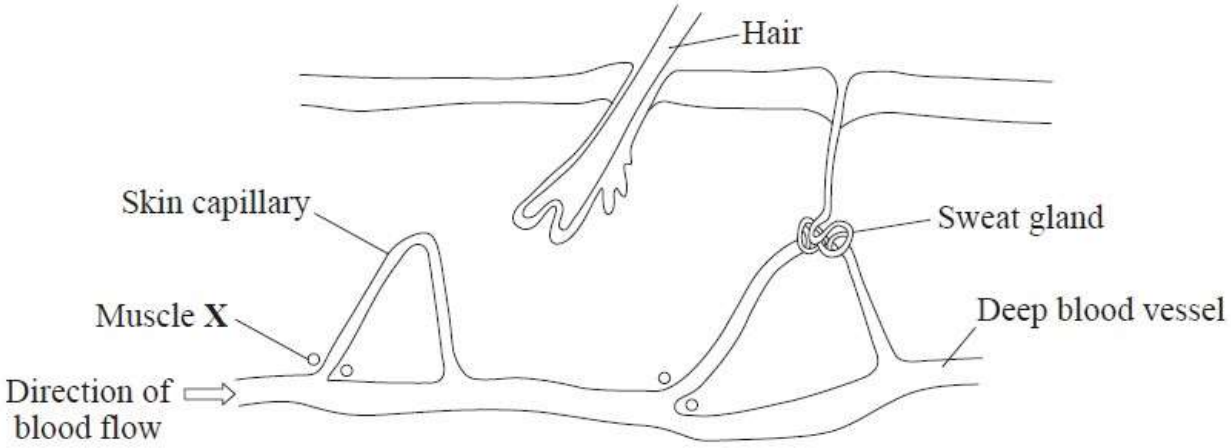
| | | |
|---|---|---|
| Protein | 0 | 6 |
| Glucose | 0 | 0 |
| Amino acids | 0 | 0 |
| Urea | 21 | 21 |
| Mineral ions | 19 | 19 |

**31.** (b) (i) Suggest an explanation for the difference in composition of the urine between the healthy person and the person with kidney disease.

(ii) The person with the kidney disease could be treated either by using a dialysis machine or by a kidney transplant operation. Compare the **advantages** and **disadvantages** of these two methods of treatment. Use your knowledge and understanding of the two methods in your answer.

**32.** The brain and the skin are involved in monitoring and controlling body temperature.
(a) Describe the parts played by the brain and the skin in monitoring body temperature.
(i) The brain (ii) The skin

(b) The diagram shows a section through part of the skin.
The muscle labelled **X** controls the flow of blood into the skin capillary. When muscle **X** contracts, the flow of blood into the skin capillary is reduced.

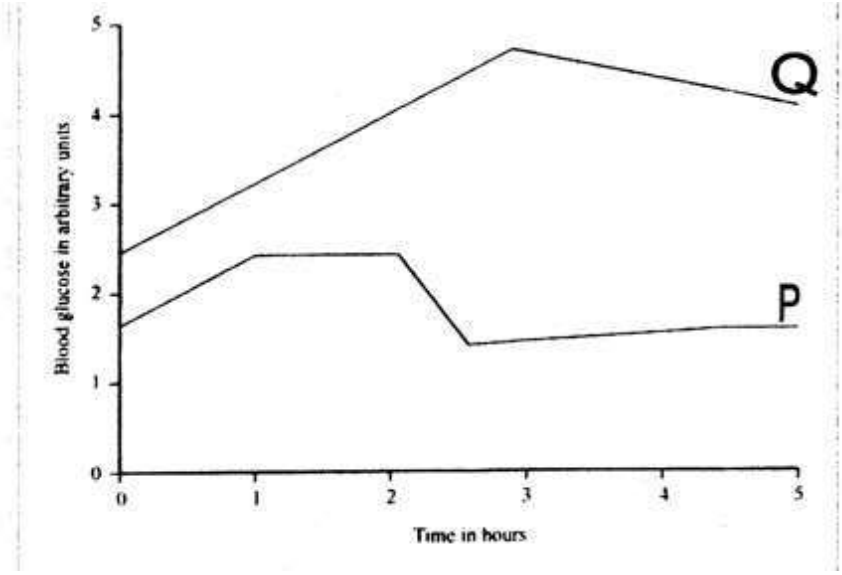



Explain the role of the following parts in the control of mammalian body temperature:
**(i)** Muscle **X** **(ii)** Sweat gland **(iii)** Hair

**34.** . a) Explain how
i) Ectotherms regulate temperature variation. ii) Endotherms
regulate temperature variation b) Give reasons why,
i) It is necessary to maintain body temperature in mammals. ii) It is necessary
to expel out carbon dioxide in a mammal.
c) State the advantages of ectotherms have over the Endotherms in regulating the body temperature

(d).Briefly explain three ways by which the skin helps in temperature regulation during cold conditions. *(06 marks)*

**35.** Two people **P** and **Q** each drunk a solution of glucose. The graph below show the changes in the concentration of their blood glucose after having the drink.




(a)Describe the changes in blood glucose during the five hours after the glucose drink for;
(i) Person Q
From 0 hours to 3 hours; the blood glucose concentration increases rapidly; from 3 hours to 5 hours; blood glucose concentration decreases gradually.
(ii)Person P
(b) Compare changes in blood glucose levels of person Q and P during the five hours.
(05 marks)
(c)(i) One of the people has a condition known as diabetes. Suggest which person has diabetes and give reason for your choice. (03 marks)

(c) Name the hormones produced in the body that regulate blood glucose concentration. State their roles and where they are produced from (04 marks)

**36.** (a) What is excretion?

(b) Describe the process of urine formation in humans.

(c) Explain why plants do not have complex organs of excretion like mammals.

**37.** What is Homeostasis?

(b)Briefly explain the regulation of glucose concentration in blood
(c)Briefly explain the regulation of the blood water potential in man

## SECTION VIII: <u>COORDINATION</u>

**20.** The table below shows the changes in the diameter of the pupil of the eye in different light intensities

| Light intensity (a.u.) | 0 | 5 | 10 | 15 | 20 | 25 |
|---|---|---|---|---|---|---|
| Diameter of pupil (mm) | 8.0 | 8.0 | 7.1 | 6.3 | 5.4 | 4.5 |

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

(b) Describe the effect of increasing light intensity on the diameter of the pupil. **(*02 marks*)**

(c) Explain how increasing light intensity affects the diameter of the pupil. **(*05 marks*)**

(d) The changes in the diameter of the pupil are because of a nervous response. State

(i) the type of nervous response to which the pupil responds. **(*01 mark*)**

(ii) **two** features of the nervous response to which the pupil responds. **(*02 marks*)**

(iii) **three** benefits to the organism of eyes responding to light. **(*03 marks*)**

**21.** (a) Explain **three** ways in which the body benefits from effects of adrenaline. **(*03 marks*)**

(b) Compare **nervous** and **hormonal** control systems. **(*05 marks*)**

(c) (i) Describe an experiment which can be set up to investigate the response of plant shoots to light coming from one direction. **(*06 marks*)**

(ii) How do shoots benefit from responding to unidirectional light? **(*01 mark*)**

**33.** A biologist carried out an experiment to determine how auxins affect root and shoot growth. Different amounts of auxins in (ppm) were supplied to roots and shoots. The resulting growth responses of both shoots and roots are as follows in the table below.(Negative values are as a result of growth inhibition, while positive values are as result of growth stimulation).

| Concentration of auxin /ppm | $10^{-6}$ | $10^{-5}$ | $10^{-4}$ | $10^{-3}$ | $10^{-2}$ | $10^{-1}$ | $10^{0}$ | $10^{1}$ | $10^{2}$ | $10^{3}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Percentage growth response of shoots | 0 | 0 | 0 | 0 | 20 | 100 | 200 | 100 | 0 | -75 |
| Percentage growth response of roots | 0 | 25 | 30 | 10 | -20 | -60 | -80 | -100 | -100 | -100 |

(a) Using an appropriate scale(s) and on the same graph, draw graphs to represent the percentage growth response of shoots and roots with varying auxin concentration. **(07 marks)**

(b) From your graph, describe the growth response of shoots and roots at different concentrations of auxin. **(05 marks)**

**(i)** Shoots **(ii)** Roots

(c) How does light influence the distribution of auxins, and what effect does this induce in shoots and roots?

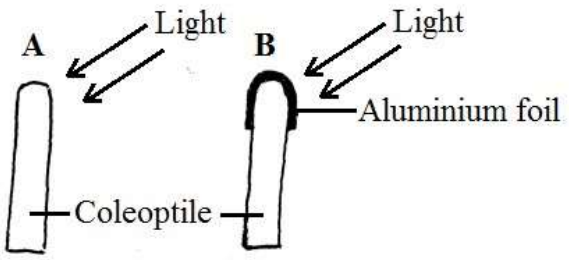
**(i)** Shoots **(ii)** Roots **(04 marks)**

(d) (i) Give the significance of the plant responses you have stated in (c) (i) above to plants. **(02 marks)**

**(ii)** State any two properties of hormones? **(02 marks)**

***34.*** *(a) Distinguish between* ***coordination*** *and* ***irritability****.* ***(02 marks)***

(b) An experiment was set up as shown below to investigate the effect of unidirectional light on the growth of a coleoptile.




Explain the response of plant shoots **A** and **B** after exposure to unidirectional light for 6 hours. **(05 marks)**

(c) Explain how the response you have stated in (b) above can be important to plants. **(03 marks)**

**35.** (a) (i) With examples, distinguish between **endocrine** and **exocrine** glands. (b) Make a drawing to show the location of endocrine glands in a human male.

(c) State one function of at least one hormone secreted by each endocrine gland in (b) above.

**36.** (a) What is **accommodation** of the eye?

(b) Explain how eyes adjust to see:

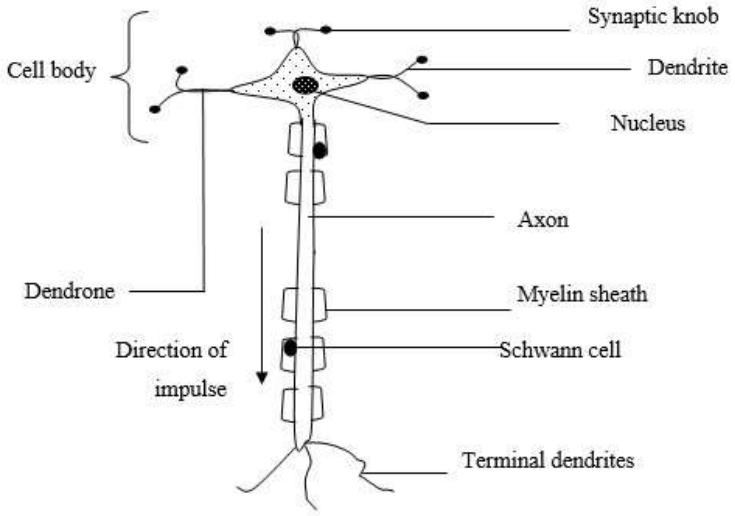
(i) Nearby objects

(ii) Far objects

(c) State the causes of at least two eye defects among humans.

**38.** In the space below, make a labelled diagram of a motor nerve

**DRAWING OF MOTOR NERVE**




(d) Give the function(s) of any four (4) parts indicated on your diagram.

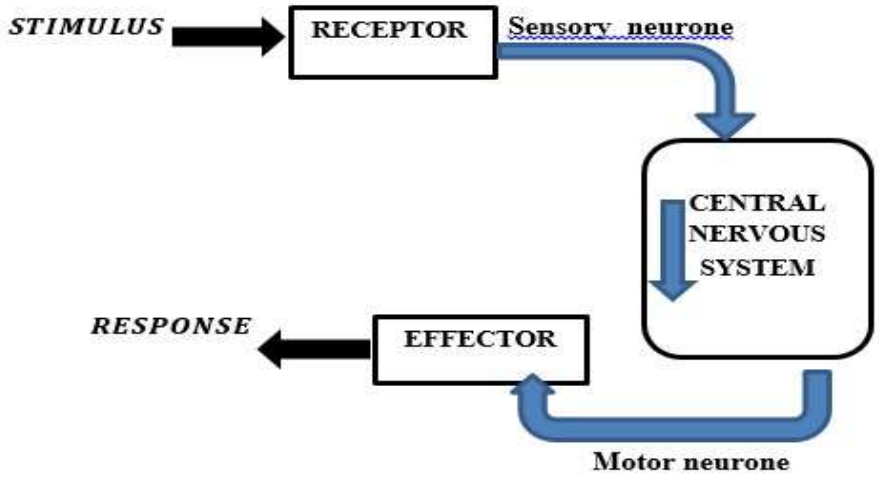
(c)State any 3 structural differences between motor and sensory nerve fibres

**39.**(a) a) What is a hormone? ***(02marks)***

b) How does hormonal control differ from nervous control?***(04marks)***

(c)With the help of a simple diagram, identify the main components of a reflex arc.

**Diagram illustrating generalized scheme of a reflex arc**




(d)Briefly describe Pavlov's experiment on a conditioned reflex action. ***(06 marks)***

(e)Define

(i) Synapse (ii) Voluntary action (iii)Reflex action

**40.** (a)What is meant by the following terms?

(i) Irritability (ii)Tropism

**Tropisms;** this is a growth movement of part of the plant towards or away in response to a unidirectional stimulus.

(b) Explain the effect of the following treatments on the growth of different plant parts.

(i) Exposure to unidirectional light on growth of the shoot and root system (6marks)

(ii) Removal of the shoot tip on growth of the shoot. (01mark)

**41.** (a)Using labelled diagrams, indicate how you would show by experiment the effect of gravity on roots of bean seedlings?

(b)Name TWO types of responses found in plants, giving an example for each.

Nastic response / movement. E.g flowering

Tropisms e.g phototropism

(c)Give **four** differences voluntary and reflex actions.

(d) Give three advantages of reflex actions to animals

**42.** (a) (i) Distinguish between **endocrine** and **exocrine** glands, giving examples in each case.

(e) Make a drawing to show the location of endocrine glands in a human male.

(f)State one function of at least one hormone secreted by each endocrine gland in (b) above.

**43.** (a) What is **accommodation** of the eye? (b) Explain how eyes accomodates:

(i) Nearby objects (ii) Far objects

(c) State the various eye defects among humans and give the causes in each case.

SECTION IX: LOCOMOTION

**22.** (a) How do animals benefit from locomotion? **(*04 marks*)**

(b) Describe how the action of muscles causes movement of the human arm at the elbow joint. **(*06 marks*)**

(c) Explain how birds minimise the challenges of air resistance during flight. **(*05 marks*)**

**37.** (a) What are **antagonistic muscles**?

(b) Describe how the action of antagonistic muscles causes movement at the:

(i) Insect hind limb.

(ii) Human fore limb.

**38.** (a) Explain the importance of locomotion to animals.

(b) Describe how flapping flight occurs in birds. (c) How are birds suited for flight?

**39.** (a) Distinguish between parasitism and commensalisms. (04 marks)

(b) Explain the adaptations of the tapeworm for its parasitic mode of life. (11 marks)

**44.** a) Distinguish between locomotion and movement.

b) Explain the importance of skeleton to a mammal.

c) Describe the instabilities that occur in a fish during locomotion in water; and state howeach is over came.

**45.** (a) How are birds adapted to locomotion by flight?

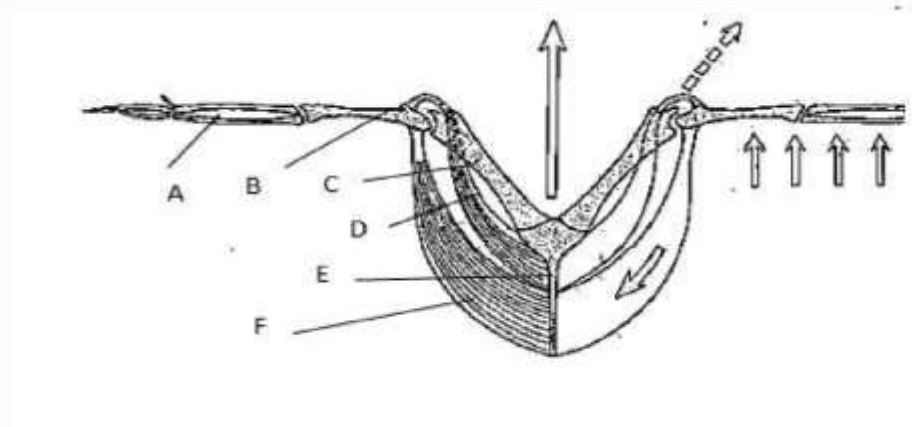
(b)Give the different types of skeletons and explain what is meant by each

**46.** a) Define the term locomotion. (01 mark)

b)Give a detailed description of the mechanism of flight in insects. (10 marks)

c) What makes an insect are suited for flight. (04 marks)

**47.** Figure below shows one of the regions of bird.




| Time after planting (days) | Dry weight of endosperm | Dry weight of embryo (mg ) | Total dry weight (mg) |
|---|---|---|---|
| 0 | 43 | 2 | 45 |
| 2 | 40 | 2 | 42 |
| 4 | 33 | 7 | 40 |
| 6 | 20 | 17 | 37 |
| 8 | 10 | 25 | 35 |
| 10 | 6 | 33 | 39 |

(a)Which region of the bird is represented in the diagram above? (1mark)

(b) (i) Name parts labeled A to F: (3marks)

(ii) Explain how part B is moved upwards during flight. (3marks)

(c)State three requirements for locomotiom (3marks)

**48.**(a)What is a joint?

(a)With examples describe the different type of joints in man.

(c ) With the aid of the diagram describe the process of active flight in birds

## SECTION X: GROWTH & DEVELOPMENT

**23.** The table below shows the relative changes in dry mass of the endosperm and embryo during germination of maize seeds in a well illuminated environment.

| Time after planting (days) | Dry weight of endosperm | Dry weight of embryo (mg ) | Total dry weight (mg) |
|---|---|---|---|
| 0 | 43 | 2 | 45 |
| 2 | 40 | 2 | 42 |
| 4 | 33 | 7 | 40 |
| 6 | 20 | 17 | 37 |
| 8 | 10 | 25 | 35 |
| 10 | 6 | 33 | 39 |

(a) Plot a graph to represent the information in the table, on the same axes. *(*09 marks*)*

(b) Explain the changes in each of the following during germination of maize:

(i) Dry mass of endosperm. **(*04 marks*)**

(ii) Dry mass embryo **(*04 marks*)**

(iii) Total dry mass **(*03 marks*)**

**24.** (a) How does growth differ in the following organisms?

(i) plants and animals. **(*04 marks*)**

(ii) arthropods and mammals. **(*03 marks*)**

(c) Describe an experiment to show the region of rapid growth in a seedling. **(*08 marks*)**

**40.** The table below shows the relative changes in dry mass of the endosperm and embryo during germination of maize seeds in a well illuminated environment.

(a) Compare the changes in dry mass of the endosperm and embryo **(02 marks)**

(b) Explain the changes in each of the following during germination of maize:

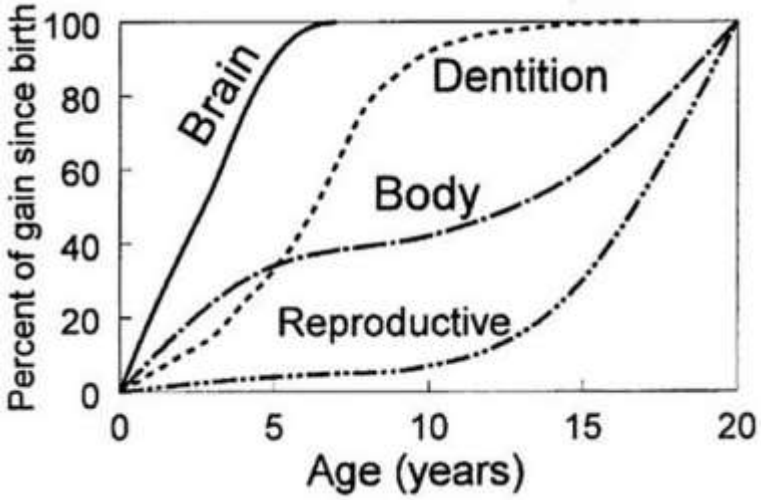
(i) Dry mass of endosperm **(06 marks)**

(ii) Dry mass embryo **(06 marks)**

(iii) Total dry mass **(06 marks)**

**41.** The figure below shows the relative growth rates of the brain, teeth (dentition), whole body and reproductive organs of humans.

(a) Describe the pattern of growth of the reproductive organs. **(03 marks)**

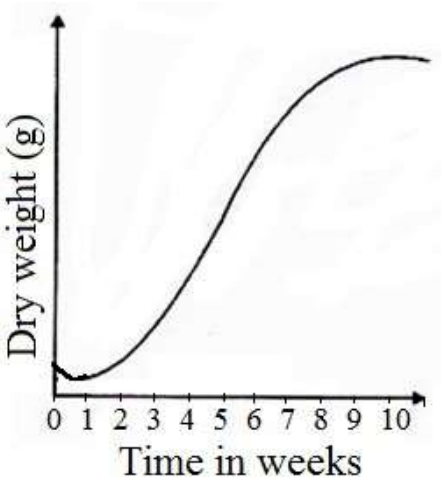



(b) Explain the rate of growth of the:
*(i) Teeth.* ***(06 marks)***
(ii) Brain. **(06 marks)**
(iii) Whole body. **(05 marks)**

(c) (i) State the name of growth pattern illustrated in the figure. **(01 mark)**
(ii) Give **three** differences between the growth pattern in the figure and that of *fish.* ***(03 marks)***
(iii) Name the growth pattern of fish

**(01 mark)**

**42.** The figure below shows the growth curve of maize plant.




(a) Describe the growth pattern of maize plant.

**(05 marks)**

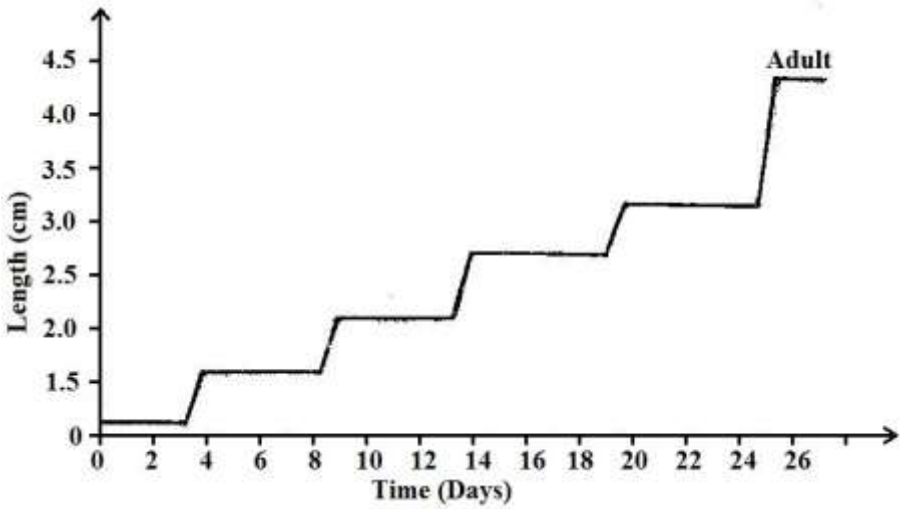
(b) Account for observed pattern of growth. **(9 marks)**

(c) Name the growth pattern illustrated in the figure.

**(01 mark)**

(d) (i) What is seed dormancy? **(01 marks)**
(ii) Give the causes of seed

**43.** The figure below shows the growth curve of the short-horned grasshopper showing increase in length.




(a) Name the growth pattern illustrated in the figure.
**(01 mark)**

(b) Explain the observed pattern of growth of the grasshopper.
**(13 marks)**

**44.** (a) Distinguish between **growth** and **development**. **(04 marks)**
(b) Describe an experiment to show the region of rapid growth in a seedling **(08 marks)**
(c) Explain how growth is important to living organisms **(03 marks)**

***49.*** (a) Distinguish between growth and development ***(01 mark)***
(d)Describe an experiment to show that geminating seeds produce heat energy.

***50.*** a). What is meant by the term seed germination? ***(01marks)***
b). State how any three external conditions favor seed germination.*(05mark)* (d) Under what circumstances may a viable seed fail to germinate under favorable conditions? ***(04 marks)***
b) State any two importance of seed dormancy
c). Describe an experiment to show that oxygen is essential for seed germination ***(09 marks)***

**51.** (a)Discuss epigeal and hypogeal germination (include illustrations).

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

| Time after planting (days) | Dry weight of endosperm (mg) | Dry weight of embryo (mg) | Total dry weight (mg) |
|---|---|---|---|
| 0 | 43 | 2 | 45 |
| 2 | 40 | 2 | 42 |
| 4 | 33 | 7 | 40 |
| 6 | 20 | 16 | 37 |
| 8 | 10 | -- | 35 |
| 10 | 6 | -- | 39 |

(a) Complete the table above by filling in the weight of embryo on day 8 and day 10. (b)On the same axes, plot a suitable graph to show the above information

***(11 ½ marks)***

(c)What was the total dry weight on day 5? ***(½ mark)***

(d)Explain the changes in dry weight of endosperm, weight of embryo and total dry weight with time.

(i)Dry weight of endosperm (ii)Weight of embryo (iii)Total dry weight

**53.** In an experiment maize grains were soaked in different concentrations of solutions X and Y for 24 hrs. In the control experiment the seeds were soaked in distilled water for the same period of time. The seeds were placed on moist cotton wool in different petri dishes. They were left to germinate and grow for ten days after which the percentage germination was

determined. The average lengths of the shoot and roots were also determined. The results were as shown below ***Table A***

| CONCENTRATION OF SOLUTION X% | % GERMINATION | GROWTH OF SEEDLINGS AFTER 10 DAYS (AVERAGE LENGTH IN MM) | |
|---|---|---|---|
| | | SHOOTS | ROOTS |
| 80 | 33 | 3 | 8 |
| 60 | 52 | 5 | 9 |
| 40 | 75 | 7 | 17 |
| 20 | 87 | 16 | 38 |
| 10 | 92 | 18 | 40 |
| Distilled Water | 95 | 28 | 64 |

***Table B***

| CONCENTRATION OF SOLUTION Y% | % GERMINATION | GROWTH OF SEEDLINGS AFTER 10 DAYS (AVERAGE LENGTH IN MM) | |
|---|---|---|---|
| | | SHOOTS | ROOTS |
| 80 | 0 | 0 | 0 |
| 60 | 0 | 0 | 0 |
| 40 | 12 | 3 | 4 |
| 20 | 42 | 4 | 5 |
| 10 | 90 | 12 | 42 |
| Distilled Water | 95 | 29 | 63 |

(a) What was the effect of solution X on;

(i) Germination of the maize grains ***(2mks)***

Germination is low at high conc. of X; and increases with decreasing concentration. High conc. inhibits germination while low conc. promotes

(ii) Growth of maize seedlings ***(4mks)***

(b) Compare the growth of seedlings whose grains were previously soaked in 80% and 10% of solution Y. ***(3mks)***

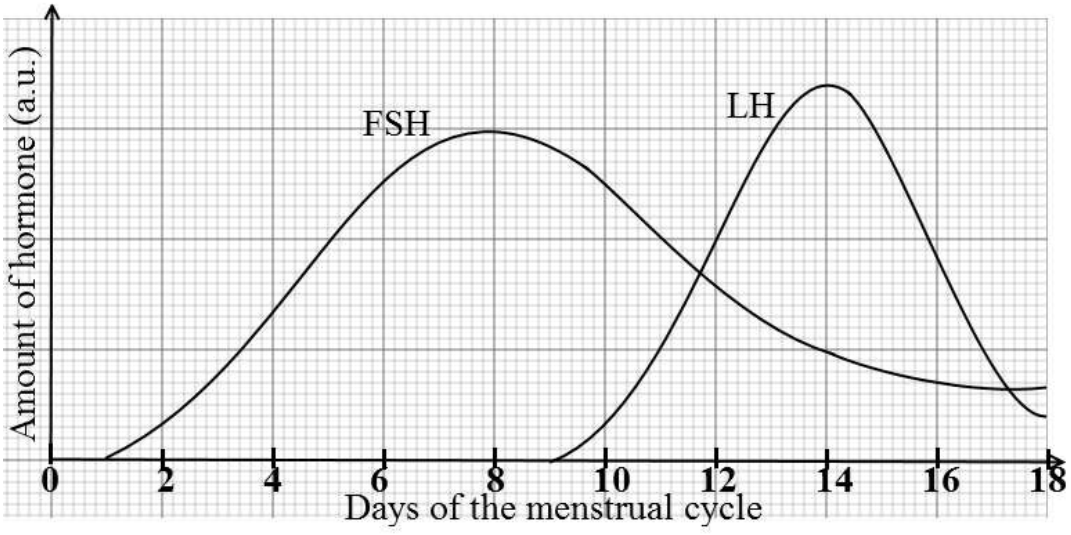
(c) Explain how percentage germination was determined in this experiment.(d) From the results shown in the table A and B what conclusion can be drawn about solution X and Y. ***(2mks)***

(f) State **three** ways in which indoleacetic acid (IAA) influences growth in plants.

(g) Name **one** other factor apart from X and Y that might have contributed to a decrease in **percentage germination.** *(1mk)*

## SECTION XI: REPRODUCTION

**25.** The graph below shows the relative amounts of follicle stimulating hormone (FSH) and luteinising hormone (LH) in the blood stream of a woman during the first 18 days of the menstrual cycle.




(a) Describe how the amounts of the two hormones change during the period shown. **(*05 marks*)**

(b) State the organ which

(i) secretes the two hormones. **(*01 mark*)**

(ii) is affected by the two hormones. **(*01 mark*)**

(c) Describe the effects of the two hormones on their target organ. **(*04 marks*)**

(i) Why is it important for human menstrual periods to stop during pregnancy? **(*03 marks*)**

(e) (i) Explain how women can use the knowledge of menstrual cycle to avoid conception. **(*04 marks*)**

(ii) Comment on the reliability of natural methods of family planning. **(*02 marks*)**

**26.** (a) (i) State the difference between **pollination** and **fertilisation**. **(*02 marks*)**

(ii) What are the adaptations of flowers for pollination by insects? **(*05 marks*)**

(b) Describe events which occur in a flower from pollination to fertilisation. **(*08 marks*)**

**45.** The composition of blood passing through the uterine vessels during pregnancy was analyzed and the results presented in the table as shown below.

| **SUBSTANCE ANALYSED** | **% COMPOSITION** | | | |
|---|---|---|---|---|
| | **Uterine artery** | **Umbilical artery** | **Uterine vein** | **Umbilical vein** |
| Oxygen | 90 | 10 | 10 | 70 |
| Carbon dioxide | 8 | 75 | 80 | 12 |
| Glucose | 90 | 2 | 2 | 80 |
| Urea | 20 | 60 | 80 | 12 |
| Amino acids | 75 | 15 | 20 | 75 |

(a) (i) Name the structure that allows exchange of substances between uterine vessels and umbilical vessels.(ii) State three adaptations of the structure mentioned in (a) (i) for exchange of substances by diffusion.

(b) State five functions of the structure in (a) (i) above. (2½ marks)

(c) State the directions of blood flow in the: (02 marks)

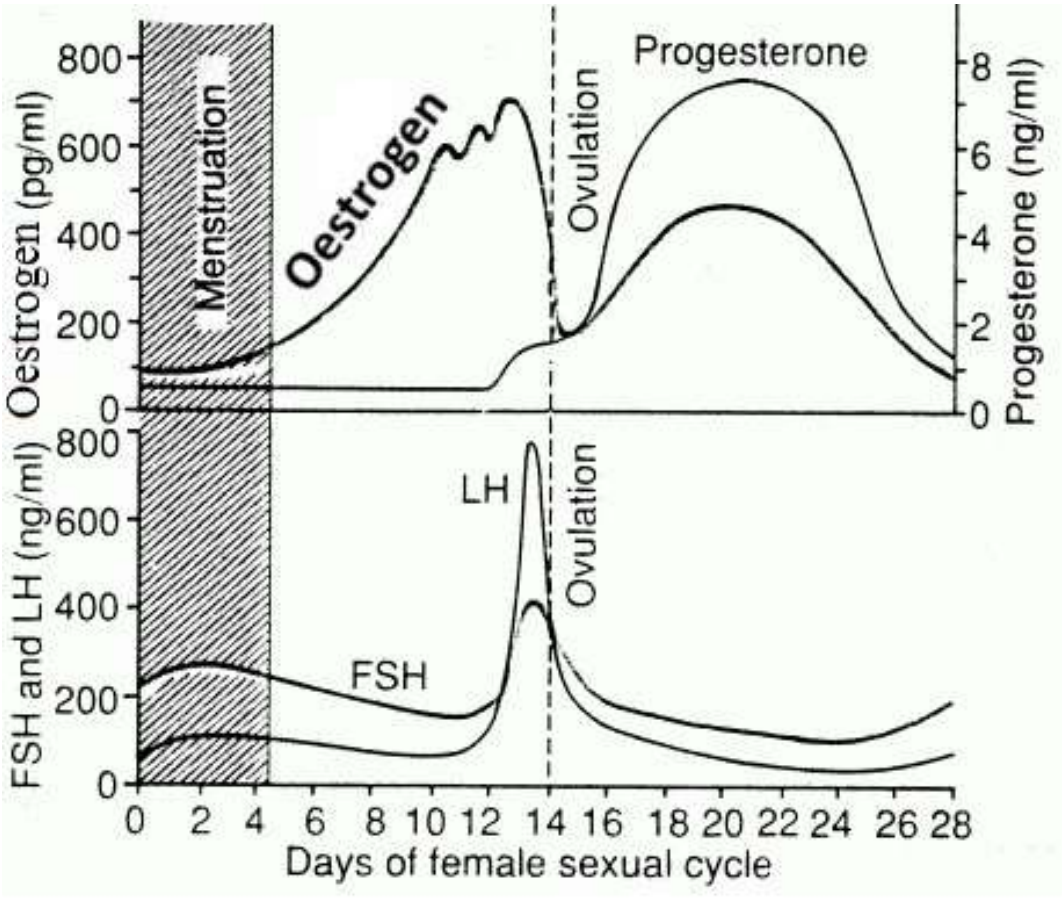
(i) Uterine Artery(ii) Uterine vein (iii) Umbilical artery (iv) Umbilical vein

(d) State five differences between the composition of blood in the umbilical artery and umbilical vein.

(e) Give reasons for each of the differences stated in (e) (i) above. (05 marks)

(f) (i) Explain why the uterine vein has a higher concentration of carbon dioxide than the uterine artery.(ii) Explain why the uterine vein had the highest content of urea than all other blood vessels.(02 marks)

**46.** The graph below shows the changes in the concentration of hormones in the blood stream of a woman during 28days of the menstrual cycle.




***O-LEVEL BIOLOGY REVISION QUESTIONS***

(a) Describe how the amounts of Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) change during the period shown. **(05 marks)**

(b) Explain the effects of the following hormones during the menstrual cycle:

(i) Luteinizing Hormone (LH)

(ii) Follicle Stimulating Hormone (FSH)

(iii) Oestrogen **(02 marks)**

(iv) Progesterone **(02 marks)**

(c) What is meant by the terms?

(i) Menstruation **(01 marks)**

(ii) Ovulation **(01 marks)**

(d) Name the organs which secrete the hormones. **(01 mark)**

(e) Explain the circumstances under which the following may occur:

(i) Failure of menstruation **(02 marks)**

(ii) Failure of fertilisation after unprotected sexual intercourse in a fertile lady of 25 years. **(02 marks)**

**48.** (a) What is meant by double fertilization as observed in plants? **(02Marks)**

(b) Describe events that lead to fertilization after the pollen grain lands on flower stigma. **(11 Marks)**

(c) What is the fate of the ovary and its parts in the flower after fertilization? **(02 Marks)**

**REPRODUCTION IN PLANTS AND ANIMALS**

**54.**(a) Explain the hormonal changes leading to the female menstrual cycle.

**(f)How can a married couple avoid unwanted pregnancies?**

**55.a) Define the term double fertilization in plants.**

b) Outline the events that take place after pollination, leading to the formation of a mature seed. **(10 Marks)**

(c) What is the fate of the ovary and its parts in the flower after fertilization? **(02 Marks)**

**56. a). Distinguish between sexual and asexual reproduction.** ***(02mark)*** **b) State the advantages of;**

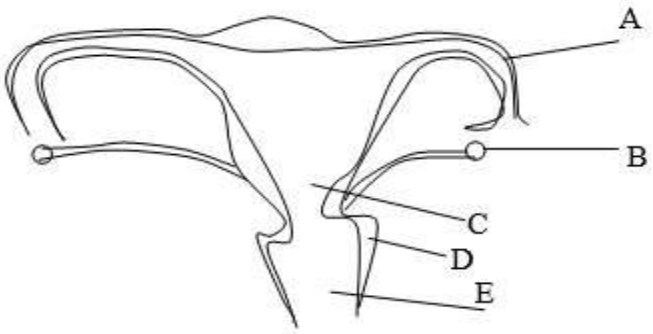
i) Asexual reproduction has over sexual reproduction

ii) Internal fertilization has over external fertilization

c).With illustrations, describe how Rhizopus (mucor) reproduces sexually.*(11marks)*

(d)Briefly describe the different forms of a sexual reproduction; stating one example where it occurs.

**57.** (a) The figure below shows the longitudinal section through the female reproductive system of a mammal.




(a)Name the parts labelled A,B,C,D and E

(b)State any two functions of B
(c)In what ways are the parts A and C adapted to their functions?
(d)Give two modifications developed by the uterus that makes it suitable for implantation.

## SECTION XII: HEREDITY

**27.** In mice the allele for black eye colour, ***B*** is dominant to the allele for red eye colour, ***b***.

(a) What is the description for each of the following genotypes of mice? **(*1½ marks*)**

Mouse 1 **BB**
Mouse 2 **Bb**
Mouse 3 **bb**

(b) If mouse 1 and mouse 3 were mated together and had 12 offspring, how many of these would be expected to have black eyes? Show your working. **(2½ *marks*)**

(c) If mouse 2 and mouse 3 were mated together and had 50 offspring over several litters, how many of their offspring would be expected to have red eyes? Show your working. **(*03 marks*)**

(d) Explain how humans benefit from the knowledge of genetics. **(*03 marks*)**

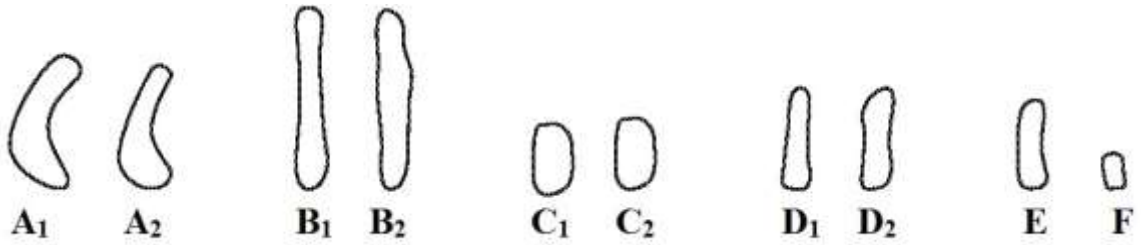
**28.** (a) With examples, distinguish between **sex linked genes** and **sex limited genes**. **(*04 marks*)**

(b) Colour blindness is a sex linked trait which is controlled by an allele that is recessive to the allele for normal colour sight in human beings.

A colour blind man married a woman who was a carrier for the defective allele. Use suitable symbols to work out the possible phenotypes of their children. **(*08 marks*)**

(c) Explain why colour blindness is more common in human males than in females. **(*03 marks*)**

**29.** The diagram below shows all the chromosomes in a body cell of an animal.




(a) State the number of chromosomes in one

(i) body cell of this animal. **(*0½ mark*)**

(ii) gamete of this animal. **(*0½ mark*)**

(b) State the sex of this animal, with a reason. **(*02 marks*)**

(c) Explain

(i) why for any pair of chromosomes which look alike, the genetic properties differ. **(*03 marks*)**

(ii) how differences in genetic properties of chromosomes which look alike contribute to evolution. **(*04 marks*)**

**49.** In a breeding experiment, when plants with red flowers were crossed with those with white flowers, all the plants produced had pink flowers.

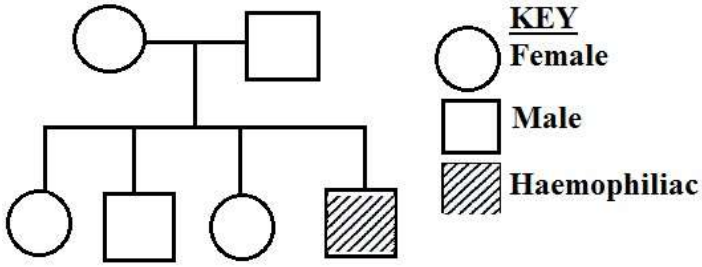
(a) Suggest an explanation for the occurrence of the pink flowers. **(02 marks)**

(b) When one of the offspring of the above experiment was crossed with a plant with red flowers, 862 plants were produced.

(i) Using suitable genetic symbols, work out the expected genotypic and phenotypic ratios. **(06 marks)**

(ii) Calculate the number of offspring with red flowers. **(02 marks)**

**50.** (a) A recessive sex-linked gene prolongs the blood clotting time, resulting in the condition known as haemophilia. Haemophilia frequently appears in the human population, but occurs very rarely in women. The gene responsible is situated on the *X* chromosome. Use the family tree shown below to answer the questions.




(i) What are the genotypes of the parents?

(ii) Determine the offspring of a marriage between the affected son and a female with no history ofhaemophilia in her family:

(iii) Determine the offspring of the marriages of the daughters with affected males.

(b) Work out the possible blood groups of children, when a man heterozygous for blood group **A** marries a woman of blood group **AB**.

**51.** In a breeding experiment, when plants with round seeds were crossed, a total of 898 plants were produced out of which 325 had wrinkled seeds, and the rest had round seeds.

(a) (i) What was the recessive character? (01 mark)

(ii) Give two reasons for your answer in a) (i) above. (02 marks)

(b) Using suitable symbols, work out the expected phenotypic ratio of the experiment (05 marks)

(c) Were the observed results in agreement with Mendel's laws of monohybrid inheritance? Show your working. (02 marks)

**52.** (a) what is meant by the following terms

(i) Sex linked genes (01 Mark)

(ii) Recessive allele (01 Mark)

(b) Colour blindness is a sex linked trait, and recessive to normal colour sight in human beings. A colour blind man married a woman who was a carrier for the defective allele. Use suitable symbols to work out the possible phenotypes of their children. (06 Marks)

(c) Give any two ways man has applied the knowledge of studying genetics. (02 Marks)

**53.** (a) Describe the mechanism of evolution according to Lamarck. **(05 marks)**

(b) Explain:

(i) the role of natural selection in evolution. **(05 marks)**

(ii) evidence of evolution based on palaeontology. **(05 marks)**

**54.** (a) What do you understand by the following terms as applied to evolution

(i) Fossils **(02 marks**

(ii) Vestigial organs **(02 marks)**

(iii) Variation **(02 marks)**

(b) Give two causes of variation in organisms. **(02 marks)**

(c) How can a person who studied genetics help farmers to improve their production? **(02 marks)**

**55.** (a) State four characteristics of mutations. **(04 marks)**

(b) Describe the causes of mutation. **(05 marks)**

(c) Explain the role of mutation in evolutionary changes. **(06 marks)**

**56.** (a) Explain the importance of:

(i) Mitosis. **(05 marks)** (ii) Meiosis. **(04 marks)**

**66.** (a)What is meant by the following terms ***( 01mark @ )***

(i)Allele. (ii)Monohybrid inheritance. (iii)Recessive allele.

b) In a breeding experiment, a farmer crossed pure breeding garden pea plants with yellow seeds with those of green seeds. All the F1 generation had yellow seeds. (i) Using suitable symbols, show the $F_1$ and $F_2$ generation. ***(09marks)***

**67.**(a)(i) What is mutation?

(ii) Give three causes of mutation. (4 marks)

(b) Sickle cell anaemia is a trait controlled by a recessive gene. If a woman heterozygous for sickle cell anemia marries a sickler, illustrate using suitable symbols, the possible genotypes and phenotypes of their off springs. (7 marks)

(ii) What is the ecological advantage of such genes? (2 marks)

(iii) Name two other mutant traits in man. (2 marks)

(a) State four characteristics of mutations. **(04 marks)**

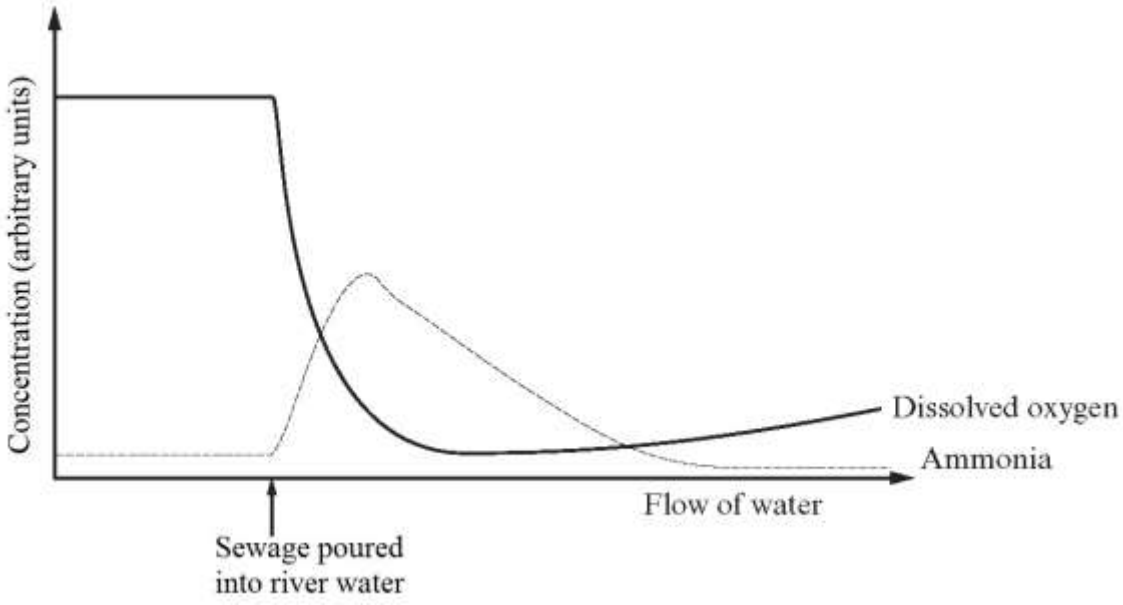
**68.** a). What is variation? *(01mark)*

b). Give two causes of variations in nature. *(02marks)*

c). Distinguish between discontinuous and continuous variations. *(12marks)*

## SECTION XIII: ECOLOGY

**30.** The graph below shows the levels of chemical factors in the river at points before and after untreated sewage was poured into water.




(a) Describe the changes in the concentration of dissolved oxygen and ammonia in the water after pouring sewage into the river.
**(*05 marks*)**

(b) Explain the effect of pouring sewage into the river on

(i) Dissolved oxygen concentration **(*04 marks*)**

(ii) Ammonia concentration **(*03 marks*)**

(c) Suggest how the following are affected by pouring sewage into the river

(i) Population of fish. **(*03 marks*)**

(ii) Population of anaerobic bacteria. **(*03marks*)**

(d) Suggest and explain **two** physical indicators of water quality that can be monitored in the river.

**(*02 marks*)**

**31.** The table below shows information about some of the organisms present in a grassland food web and the flow of energy through the web.

| Feeding level | Name of organism | Number of organisms | Mass of organisms (kg) | Energy flow through the food web (kJ) |
|---|---|---|---|---|
| **X** | Grass | 300 000 | 350.0 | 20 000 |
| **Y** | Grasshoppers | 25 600 | 5.12 | 1 353 |
| | Seed-eating birds | 45 | 1.08 | 2 567 |
| | Field mouse | 42 | 1.05 | 1 941 |
| **Z** | Kestrel (bird of prey) | 2 | 0.34 | 412 |

(a) (i) Calculate the percentage of energy which passes from feeding level "**X**" to feeding level "**Y**". Show your working. **(*02 marks*)**

(ii) State two ways in which energy can be lost from the food chain. **(*02 marks*)**

(b) (i) Identify the feeding levels indicated as **X, Y, Z**. **(*1½ marks*)**

(ii) Using a food chain consisting of grass, grasshoppers and kestrel, construct a pyramid of biomass. **(*1½ marks*)**

(c) Explain why the number of organisms decreases along the feeding levels X, Y, Z. **(*02 marks*)**

(d) Grasses can be sprayed with a pesticide which kills large numbers of grasshoppers. Explain how spraying grasses with a pesticide affects other living things in this food chain. **(*01 mark*)**

(b) What are the differences between mitosis and meiosis **(11 marks)**

**ECOLOGY**

**57.** Describe the circulation of the following elements in nature:

(a) Nitrogen (09 Marks)

(b) Carbon (06 Marks)

**58.** (a) Name the major living components of ecosystems.

(b) By means of a linear illustration, show the flow of energy through an ecosystem.

(c) (i) Write a chemical equation for the process by which energy enters an ecosystem.

(ii) Explain how energy is lost between lower and higher feeding levels.

**59.** A culture of bacteria was set up in a nutrient solution d kept at $30^0$C. From time 0 hours, and at the times indicated in the table, a count was made of the number of living bacterial cells in the culture.

| Number of living bacterial cells in millions | 20 | 50 | 300 | 550 | 600 | 600 |
|---|---|---|---|---|---|---|
| Time (hours) | 0 | 5 | 10 | 15 | 20 | 30 |

(a) Study the data and make a graph. **(06 marks)**

(b) Describe the shape of the graph. **(05 marks)**

(c) With your theory of population patterns, give an explanation for the changes in (b) above. **(07 marks)**

(d) List four methods that can be used to control microbial growth. **(02marks)**

**58.** .(a) What is pollution? *(02 marks)*

(b)Name **any four** water pollutants and how they affect aquatic life. *(08 marks)*

(c).Give **five** ways in which water pollution can be controlled. *(05 marks)*

**59.** On a 120 meter square sheep farm, where daily food production is 0.5kg per $m^2$ are 40 animals. Each animal consumes 8kg of food daily. The total organisms and their masses were estimated as shown below.

| Organisms | Masses |
|---|---|
| Green plants | 13,000 |
| Sheep | 40 |
| Bacteria and Fungi | 02 |
| Lady birds | 08 |
| Carnivores Birds | 150 |
| Cows | 350 |

Using the information above, answer the questions below.

a) What is the total biomass?

b) Construct three food chains involved in the farm.

c) How is a food web related to a food chain?

d) Name the possible saprophytes mentioned

**60.** (a) Distinguish between a food chain and a food web in an ecosystem

(b) Define the following ecological terms

(i) Community

(ii) carrying capacity

(iii) Population

(c) A group of students from RINES S.S. did an experiment to estimate the population ofTilapia Zilli (fish) in the school fish pond. The following recordings were made:

Number of Tilapia Zilli (fish) captured, marked and released = 120

Number of Tilapia Zilli caught the next week = 180 Number of those recaptured with marks = 80

Calculate the number of Tilapia Zilli in a population from the above results.

**61.** a) In an attempt to clear water hyacinth from lake Victoria, beettles have been introduced on them. What is the term given to this method of control? (1mk)

b) State two advantages of the control method named in a) above as opposed to the use of herbicides. (2mks)

**62.** What is a parasitic mode of nutrition?

(b) Describe the life cycle of *Plasmodium falciparum*

(c) Outline the adaptations of parasites to their mode of life.

**63.** Describe **a method** you would use in carrying out a study of the distribution of a **named** animal species in a habitat. What assumptions would you make if any?

**64.** Study the following organisms

Rabbits, Green plants, wolf

(a) Write down the food chain of the organisms. (1 Mk)

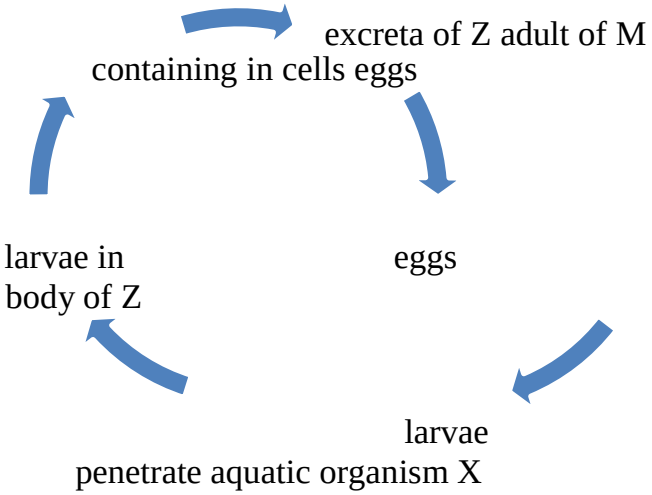
(b) For every 1000 Units of energy in plants, only 100 Units are transferred to the rabbitwhich in turn transfers 10 Units to the wolf.

(i) Give **two** reasons why the rabbit does not get all the energy from the plants (2 Mks)

(ii) Name **two** processes that contribute to loss of energy from rabbits. (2 Mks)

(c) Draw a possible labelled pyramid of biomass to show the relationship between plants, rabbits and wolfs. (3 Mks)

**65.** The diagram below represents the life cycle of parasite M.




(a)Name the primary host for parasite M?

(b)What is the secondary host of the parasite?

(c)Suggest two ways in which Z can be infected by M,

(d)Using man as the host, name the stages of M, which can cause damage to the tissue of Z and state how the damage can be caused.

(e)What steps would you advice your community to take so as to eradicates parasite M? (f)Suggest the actual primary and secondary hosts in real life, which are represented by Z and X in the diagram.

THE END.