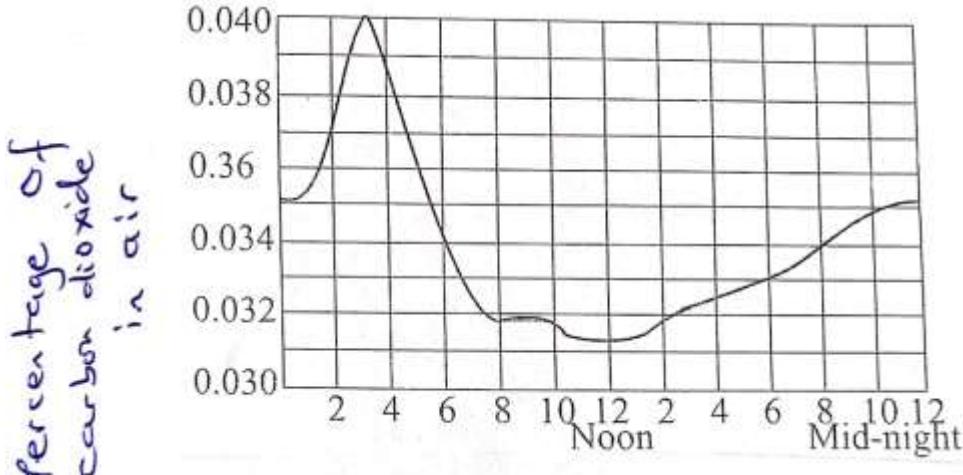


1. **Figure 1** is a diagram showing the average daily changes in carbon dioxide concentration 1 metre above an agricultural crop.



- When was the carbon dioxide concentration in the atmosphere greatest? (1 mark)
 - Name the process that was taking place in the crop which resulted in the concentration stated in a. above. (1 mark)
 - What condition in the environment caused the change in carbon dioxide concentration between 8 am and 4 pm? (1 mark)
 - If you were asked to investigate oxygen concentration in the atmosphere above the crop, during which period would you find the greatest concentration and why?
 - Period of greatest concentration: (1 mark)
 - Reason: (1 mark)
2. **Table 1** shows the results of an investigation into the effect of light intensity on the rate of photosynthesis. The number of oxygen bubbles released per minute by the cut end of the stem of the water plant *Elodea* indicates the rate at which photosynthesis was taking place. A light bulb was placed at different positions away from the plant.

Table 1

| Distance from plant (cm) | Units of light intensity | Number of oxygen bubbles per minute |
|--------------------------|--------------------------|-------------------------------------|
| 100 | 4 | 4 |
| 60 | 11 | 10 |
| 40 | 25 | 19 |
| 30 | 40 | 24 |
| 25 | 64 | 25 |
| 20 | 100 | 25 |

- Plot a graph of number of oxygen bubbles per minute, against units of light intensity. (4 marks)
- From the graph you have plotted:
 - What is the light intensity when the rate of photosynthesis is 12 bubbles of oxygen per minute? (1 mark)
 - What is the rate of photosynthesis when the light intensity is 30 units of light? (1 mark)

- c. What happens to the rate of photosynthesis between 64 and 80 units of light? **(1 mark)**
- d. From the results of this investigation, suggest how light intensity affects the rate of photosynthesis. **(2 marks)**
(1990, II)
3. **Figure 2** is a diagram representing the cross section of a dicotyledonous leaf.

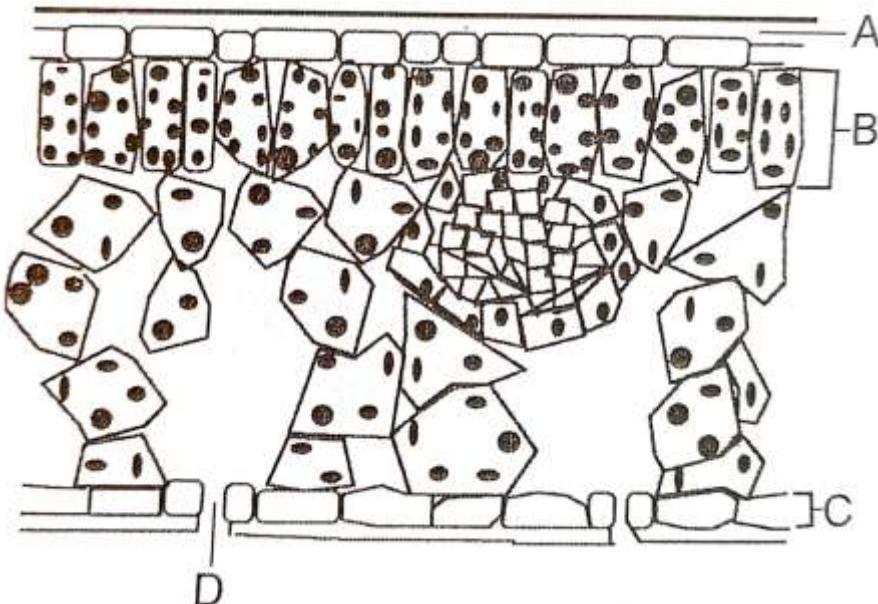
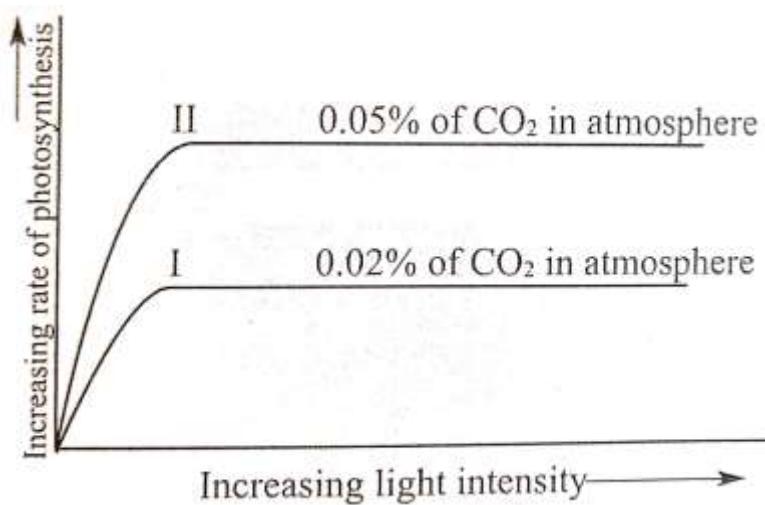


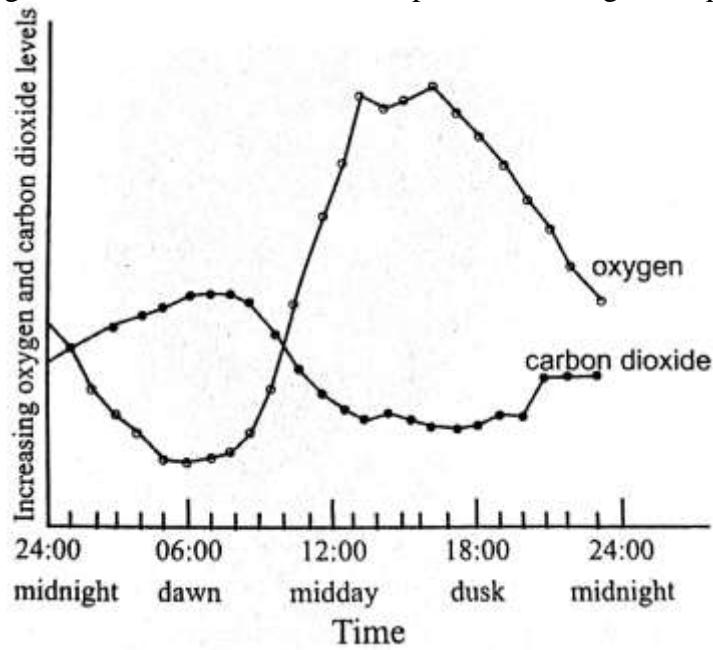
Figure 2

- a. Name the parts labelled **B**, **C**, and **D**. **(3 marks)**
- b. State the function of part labelled **A**. **(1 mark)**
- c. During day time oxygen gas diffuses out of the leaf, and carbon dioxide diffuses into the leaf.
- What process, taking place in the leaf, produces oxygen gas? **(1 mark)**
 - Name any **two** conditions which are needed for the production of oxygen gas in the leaf. **(2 marks)**
 - Explain why **not** all the oxygen produced in the process named in c.(i) comes out of the leaf. **(1 mark)**
 - Explain why a diffusion gradient for carbon dioxide exists between the atmosphere and the intercellular spaces of the mesophyll cells. **(2 marks)**
- (1991, I)**
4. a. Explain the advantages to the green plant of the following adaptations in connection with photosynthesis.
- Broad and flat leaves. **(2 marks)**
 - More chloroplasts on the upper surface. **(2 marks)**
- b. Write down a balanced chemical equation which summarises the process of photosynthesis. **(2 marks)**
- c. (i) Under what condition would a green leaf give out carbon dioxide and take in oxygen? **(1 mark)**
- (ii) Explain your answer to 4 c.(i). **(2 marks)**
(1993, I)

5. **Figure 3** shows graphs of rate of photosynthesis against light intensity.



- a. Apart from light name **three** requirements for photosynthesis. (3 marks)
 - b. From graph I describe the change of rate of photosynthesis with increasing light intensity. (2 marks)
 - c. Explain why graph II is higher than graph I. (2 marks)
- (1992, I)
6. **Figure 4** shows **two** graphs, one showing the changes in oxygen level and the other showing the changes in carbon dioxide level in a pond containing water plants.



- a. At what time does the amount of oxygen start to:
 - i. Increase? (1 mark)
 - ii. Decrease? (1 mark)
 - b. Why does the amount of oxygen increase and decrease at the times given in a. (i) and (ii)? (3 marks)
 - c. (i) What happens to the amount of CO₂ in the pond while oxygen is increasing? (1 mark)
 - (ii) Explain your observation in c.(i). (2 marks)
- (1996, I)

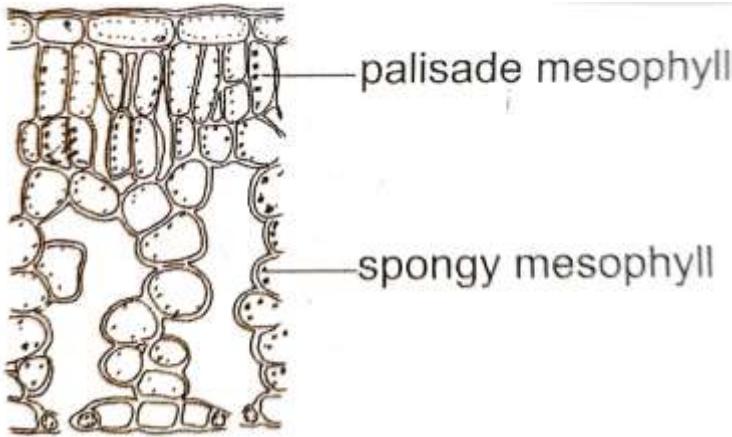
7. **Table 2** shows sugar concentration in plant leaves at different times of the day.

Table 2

| Time of day | 4.00 a.m. | 8.00 a.m. | 12.00 noon | 4.00 p.m. | 8.00 p.m. | 12.00 mid night | 4.00 a.m. |
|--------------------------------|--------------|--------------|---------------|--------------|--------------|--------------------|--------------|
| Sugar concentration (mg) | 0.45 | 0.06 | 1.75 | 2.00 | 1.40 | 0.50 | 0.45 |

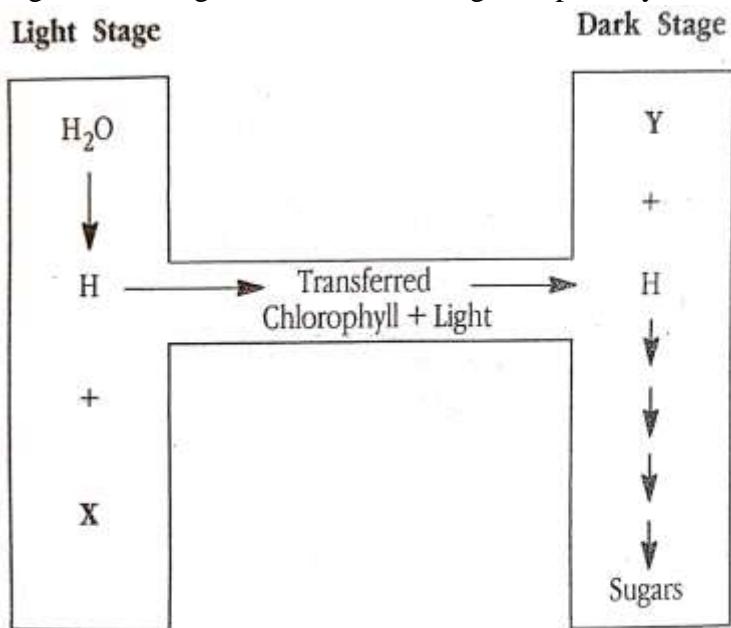
- a. Plot a graph of the data, putting sugar concentration on the vertical axis, and time on the horizontal axis. **(3 marks)**
- b. What is the concentration of sugar in the leaves at 2.00 pm? **(1 mark)**
- c. At what times would the concentration of sugar in the leaves be 0.9 mg? **(2 marks)**
- d. Explain why the concentration of sugar decreases after the maximum. **(4 marks)**
(1993, I)

8. **Figure 5** is a diagram of a cross section of a leaf.



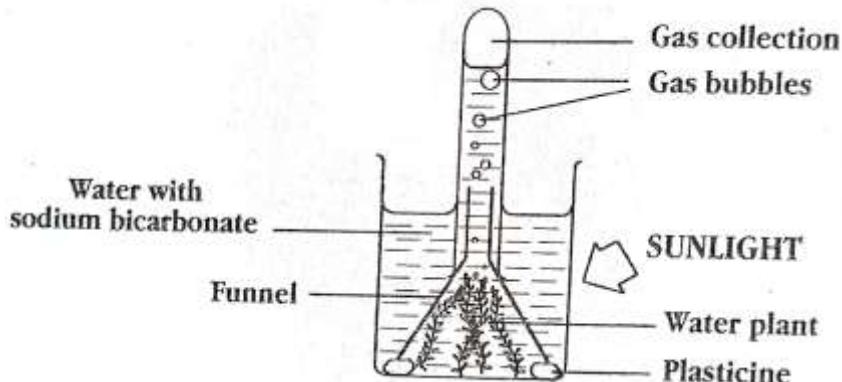
- a. Write down **two** differences that you can see between palisade mesophyll and the spongy mesophyll. **(2 marks)**
- b. At night there is diffusion gradient for oxygen from the atmosphere to the mesophyll, but during the day there is a diffusion gradient for oxygen from the mesophyll to the atmosphere.
 - (i) Which structures in the mesophyll cells maintain this gradient during the night? **(1 mark)**
 - (ii) Which structures in the mesophyll cells maintain the diffusion gradient for oxygen during the day? **(1 mark)**
- c. (i) One morning, a biologist sealed a potted plant in a glass jar and left the jar in the garden. What would happen to the amount of carbon dioxide in the jar by 4:00 pm? **(1 mark)**
 - (ii) Explain your answer to c. (i). **(2 marks)**
(1997, I)
- 9. a. Where in a plant cell does photosynthesis take place? **(1 mark)**
 - b. Give **one** way in which each of the following is adapted for process of photosynthesis.
 - (i) Spongy mesophyll **(1 mark)**
 - (ii) Palisade mesophyll **(1 mark)**
 - (iii) Leaf veins **(1 mark)**
(2000, I)

10. **Figure 6** is a diagram showing an outline of the stages of photosynthesis.



- Name the product **X** of the light stage. **(1 mark)**
- What would happen to product **X**? Give **two** points. **(2 marks)**
- What is the raw material **Y** of the dark stage? **(1 mark)**
- During which time of the day does each of the **two** stages of photosynthesis take place?
 - Light stage **(1 mark)**
 - Dark stage **(1 mark)****(1999, II)**

11. **Figure 7** is a diagram showing the apparatus used to investigate gas production in a plant.



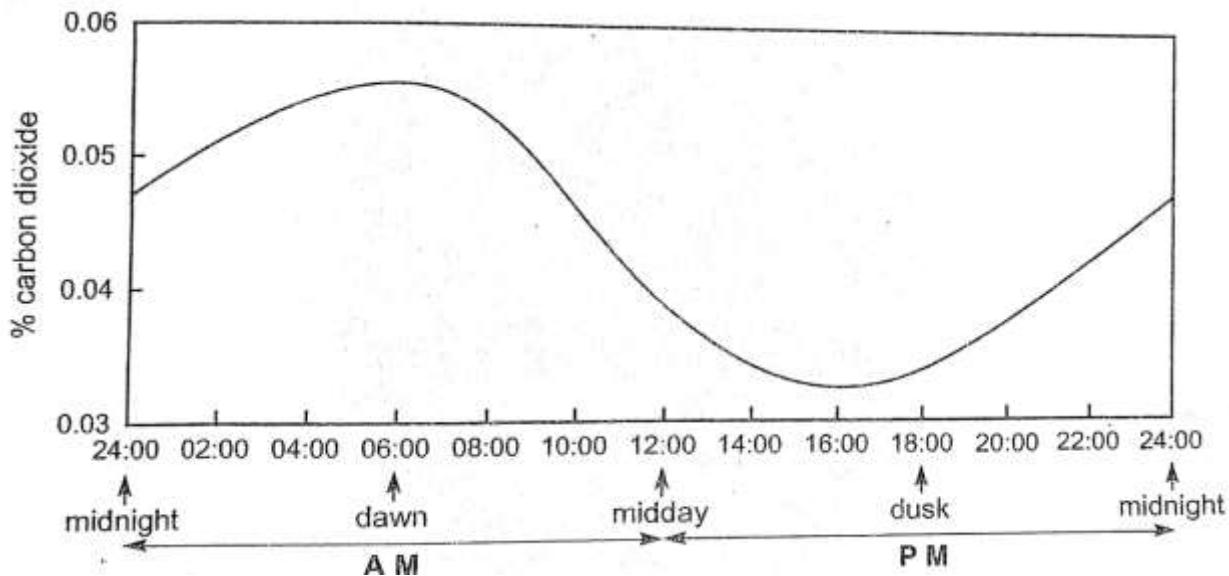
- (i) Name the gas being collected in the test tube. **(1 mark)**
 (ii) Describe how the gas mentioned in a. (i) is produced. **(3 marks)**
 - Write down a balanced chemical equation for the process in **figure 7**. **(2 marks)**
 - State any **two** factors that could limit the rate of gas production. **(2 marks)**
 - What is the function of sodium bicarbonate in the experiment? **(1 mark)**
(2001, I)
12. Explain how the following features of the green plant are adaptations to photosynthesis.
- Flat thin lamina. **(2 marks)**
 - More chloroplasts on the upper leaf surface than on the lower surface. **(2 marks)**
(2002, I)

13. **Table 3** shows results of an experiment investigating the effects of carbon dioxide on photosynthesis. Use it to answer the questions that follow.

Table 3

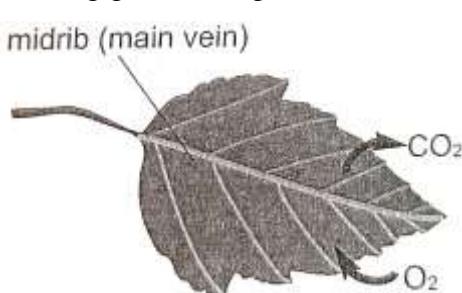
| Carbon dioxide concentration percentage by volume of water | Rate of photosynthesis bubbles of Oxygen per minute |
|--|---|
| 0.00 | 0 |
| 0.02 | 10 |
| 0.04 | 14 |
| 0.06 | 18 |
| 0.08 | 20 |
| 0.10 | 21 |
| 0.12 | 23 |
| 0.14 | 24 |
| 0.16 | 24 |
| 0.18 | 24 |
| 0.20 | 24 |

- a. Plot a graph of rate of photosynthesis against carbon dioxide concentration. **(5 marks)**
 - b. At what carbon dioxide concentration does carbon dioxide cease to be a limiting factor? Explain your answer. **(2 marks)**
 - c. What is the rate of photosynthesis when the concentration of carbon dioxide is 0.05% and 0.09%? **(2 marks)**
 - d. Apart from carbon dioxide, mention **two** other limiting factors for photosynthesis. **(2 marks)**
 - e. What is the optimum carbon dioxide concentration? **(1 mark)**
(2002, I)
14. **Figure 8** is a diagram showing the changes in carbon dioxide concentration in air in a forest over a 24 hour period. Use it to answer the questions that follow.

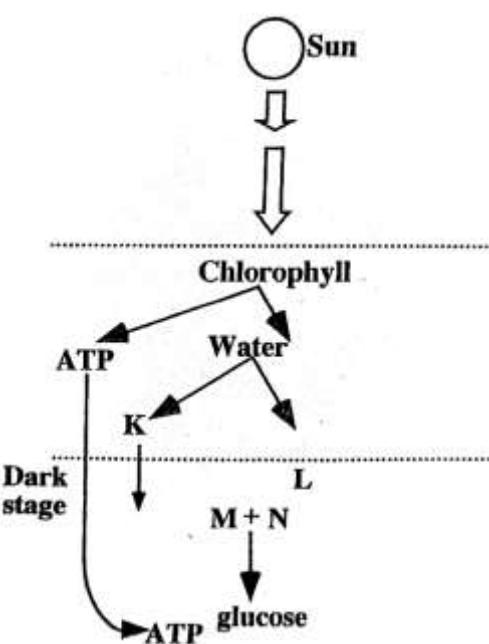


- a. Describe briefly how the concentration of carbon dioxide changed during the 24-hour period. **(3 marks)**
- b. Explain the carbon dioxide concentration changes in 14 a above. **(3 marks)**
(2003, I)

15. a. State **one** product of the following stages of photosynthesis.
- (i) Light stage: (1 mark)
- (ii) Dark stage: (1 mark)
- b. How does a green plant reduce carbon dioxide concentration in the atmosphere? (1 mark)
(2003, I)
16. a. What role does the following play in photosynthesis?
- (i) Chlorophyll (1 mark)
- (ii) Xylem (1 mark)
- b. How do plants make proteins? (1 mark)
(2005, I)
17. **Figure 9** is a diagram representing gas exchange between a leaf and the atmosphere.

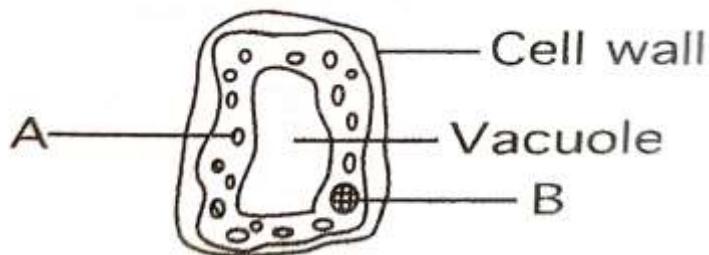


- a. What process in the leaf leads to this gas exchange shown in **figure 9**? (1 mark)
- b. List **two** characteristics of a leaf that enable gas exchange shown in **figure 9**. (2 marks)
- c. What is the function of the midrib? (1 mark)
(2006, I)
18. **Figure 10** represents a process taking place in a plant. Use it to answer the questions that follow.



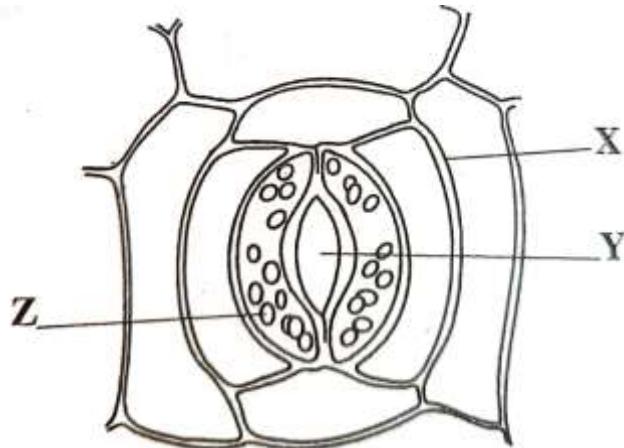
- a. Name the products marked **K** and **L**. (2 marks)
- b. Name the process by which substance **N** gets into the leaf. (1 mark)
- c. Mention **one** adaptation of a leaf that enables it to get substance **N**. (1 mark)
(2009, I)

19. a. Name any **one** chemical reaction that takes place during light stage of photosynthesis. **(1 mark)**
 b. **Figure 11** is a diagram of a plant cell as seen through a light microscope.



- (i) Give the functions of parts marked **A** and **B**. **(2 marks)**
 (ii) What is the name of the cell? **(1 mark)**
 c. State **one** way in which photosynthesis is important. **(1 mark)**
(2007, I)

20. **Figure 12** shows some structures of a leaf as seen under electron microscope.



- a. Name the parts marked **X** and **Y**. **(2 marks)**
 b. Explain how magnesium is important for the function of part marked **Z**. **(3 marks)**
(2010, I)

21. **Figure 13** shows a structure found in plant cell.

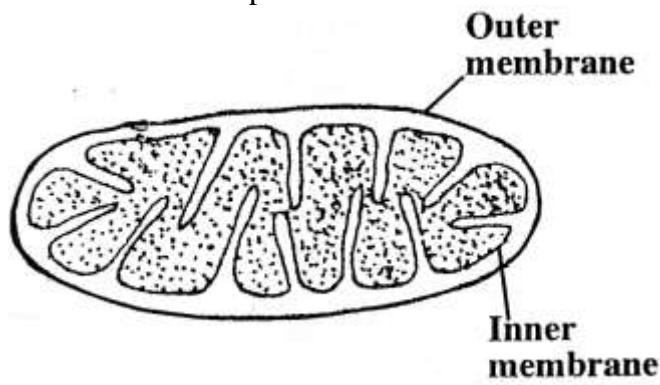
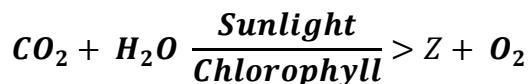


Figure 13

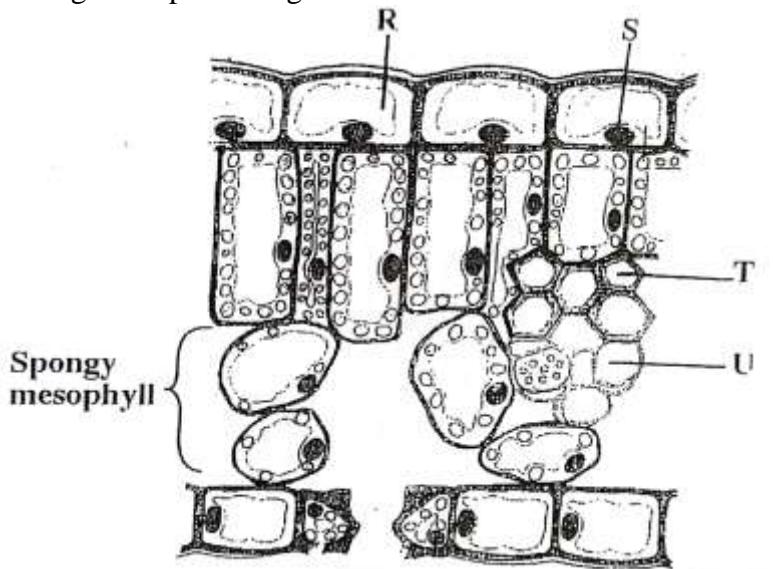
- a. Name the structure. **(1 mark)**
 b. State any **one** substance produced by the structure. **(1 mark)**
 c. Explain any **two** adaptations of the structure of its function. **(4 marks)**
(2013, I)

22. **Figure 14** shows part of a chemical equation of biological process.



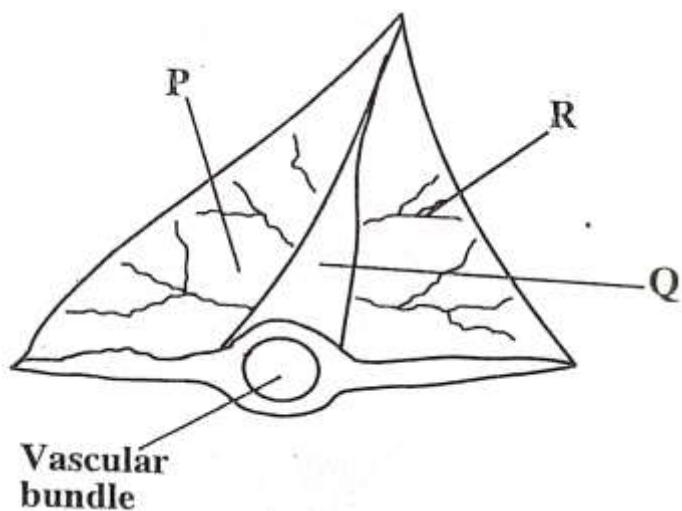
- a. Write down the chemical formula of the substance represented by **Z**. (1 mark)
- b. Explain one use of substance marked **Z** to a plant. (3 marks)
- c. Explain how the process in **figure 14** prevents global warming. (2 marks) (2011, I)

23. **Figure 15** is diagram representing a cross section of a leaf.



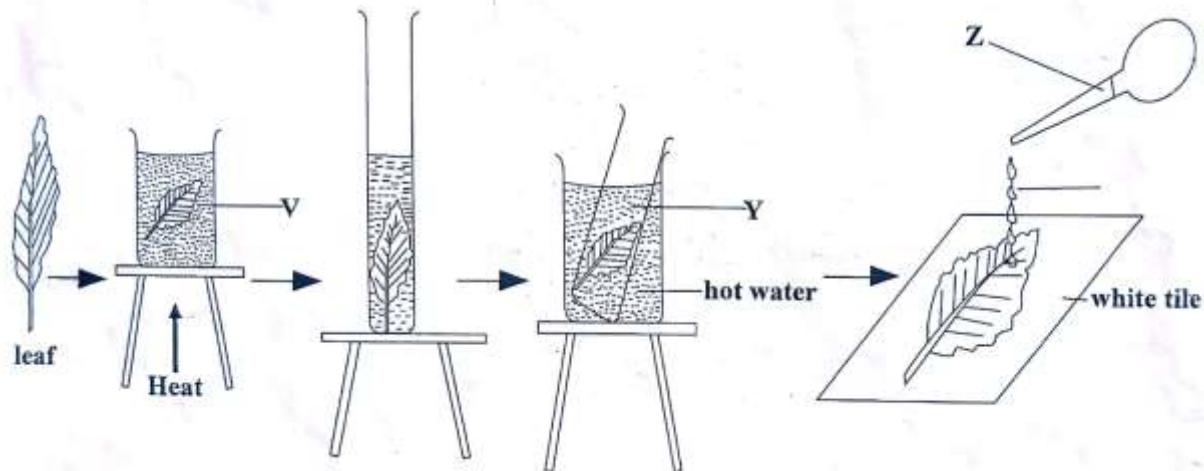
- a. Name the parts marked **R** and **S**. (2 marks)
 - b. (i) Which tissue is the main site for photosynthesis in the leaf? (1 mark)
(ii) Give a reason for your answer to 23 b. (i). (1 mark)
 - c. State two structural differences between the parts marked **T** and **U**. (2 marks)
 - d. Explain how a steady flow of carbon dioxide is maintained between the atmosphere and mesophyll cells in leaf during day time. (3 marks) (2011, I)
24. a. Define “photolysis” (1 mark)
- b. What role do the following play in photosynthesis?
(i) “potassium” (1 mark)
(ii) “nitrogen” (1 mark) (2015, I)
25. a. State any **one** function of the following parts of a leaf:
(i) vascular bundles (1 mark)
(ii) stomates (1 mark)
- b. Explain any **one** way in which each of the following leaf structures is adapted for photosynthesis:
(i) cuticle (2 marks)
(ii) lamina (2 marks)
- c. Give **one** function of each of the following organelles:
(i) mitochondria (1 mark)
(ii) chloroplast (1 mark) (2017, I)

26. **Figure 16** shows part of a leaf. Use it to answer the questions that follow.



- Name the part marked **Q**. (1 mark)
- Explain the functions of **P** and **R** in relation to photosynthesis. (4 marks)
(2012, I)

27. a. **Figure 17** is a diagram showing steps carried out during starch test. Use it to answer the questions that follow.



- Identify the liquids **Y** and **Z**. (2 marks)
 - Why is the leaf boiled in liquid **V**? (1 mark)
- b. Explain the results of testing for starch on leaf that has been put in the dark for 24 hours. (2 marks)
(2018, I)

28. a. Mention **two** adaptations of the palisade mesophyll layer for photosynthesis. (2 marks)

b. Describe the process of glucose production during dark stage of photosynthesis. (3 marks)
(2018, I)

29. a. Give **two** adaptations of the spongy mesophyll for their function. (2 marks)

b. Explain any **three** uses of glucose after photosynthesis. (6 marks)
(2020, I Leaked Paper)

- 30.** **Table 4** shows results of an investigation on the effect of light intensity on rate of photosynthesis in a water plant. The rate of photosynthesis is measured by number of air bubbles produced per minute. Use it to answer the questions that follow.

Table 4

| Distance of lamp from plant (cm) | Number of air bubbles per minute |
|----------------------------------|----------------------------------|
| 0 | 29 |
| 10 | 28 |
| 20 | 27 |
| 30 | 24 |
| 40 | 20 |
| 50 | 12 |
| 60 | 6 |

- a. Plot a graph of number of air bubbles produced per minute against distance of lamp from the plant. **(6 marks)**
- b. (i) What is the relationship between the number of air bubbles produced and the distance of the lamp from the plant? **(2 marks)**
- (ii) From the graph, find the number of bubbles produced when the distance of lamp from the plant is 35 cm. **(1 mark)**
- c. What type of gas is contained in the air bubbles produced in the investigation? **(1 mark)**
(2013, II Practical)
- 31.** You are provided with specimen **G** (a mango twig with at least six leaves) and **H** (a fresh grass leaf).
- a. State any **two** differences between leaf from specimen **G** and **H**. **(2 marks)**
- b. Using leaf from specimen **G**, state any **three** observable characteristics of leaves that facilitate photosynthesis. **(3 marks)**
- c. Describe a procedure you could use to test the leaves for starch. **(7 marks)**
(2014, II Practical)
- 32.** You are provided with a mango twig.
- a. (i) What type of arrangement is displayed by the mango twig? **(1 mark)**
- (ii) What is the advantage of this type of arrangement of the leaves on the twig? **(1 mark)**
- b. Detach **one** leaf from the twig. Draw the leaf and label any **three** parts. **(4 marks)**
- c. Calculate the magnification of your drawing. Show your working. **(4 marks)**
- d. State **three** adaptations of the leaf for photosynthesis that can be seen in the specimen. **(3 marks)**
(2004, II Practical)

33. Figure 17 shows an experimental set up to investigate the effect of light intensity on rate of gas production from submerged pondweed. Results obtained were recorded in **Table 5**.

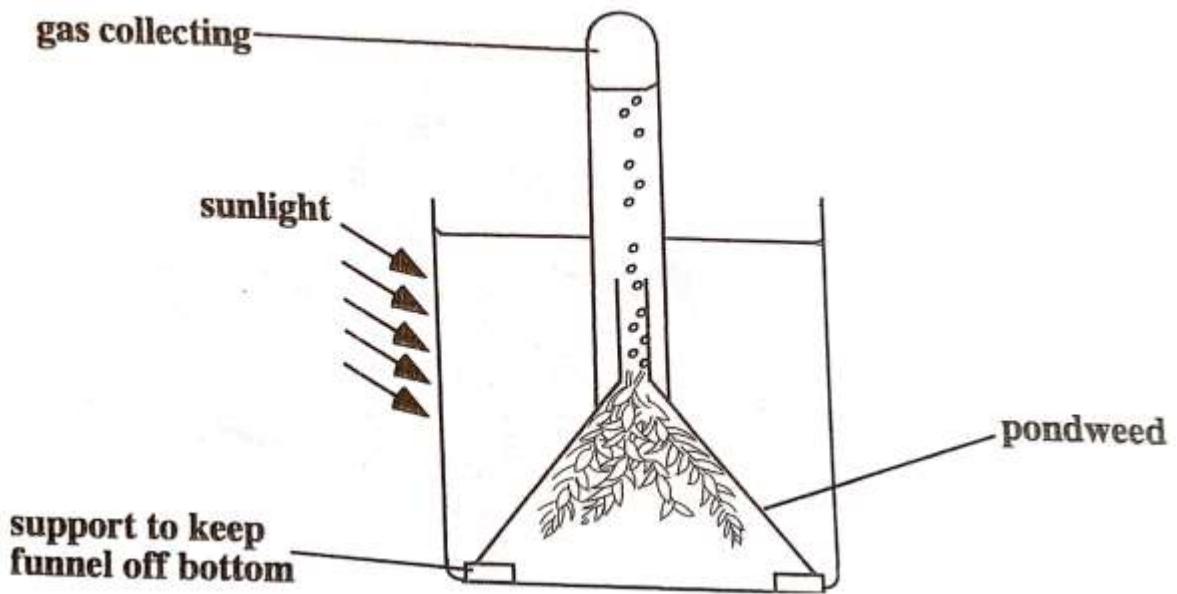


Figure 17

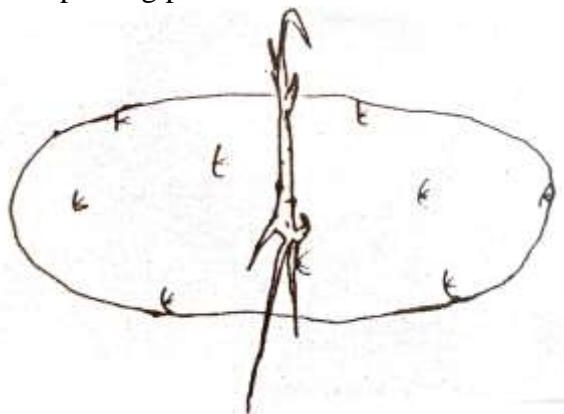
Table 5

| LIGHT INTENSITY (CANDELAS) | NUMBER OF GAS BUBBLES/ MIN |
|-------------------------------|-------------------------------|
| 0 | 0 |
| 50 | 5 |
| 100 | 9 |
| 200 | 15 |
| 250 | 17 |
| 300 | 19 |
| 350 | 20 |
| 450 | 20 |

- a. Plot a graph of rate of gas production against light intensity. (5 marks)
- b. Name the gas produced by the pond weed. (1 mark)
- c. What is the optimum light intensity for gas production? (1 mark)
- d. Explain the gas production between 350 and 450 candelas. (2 marks)

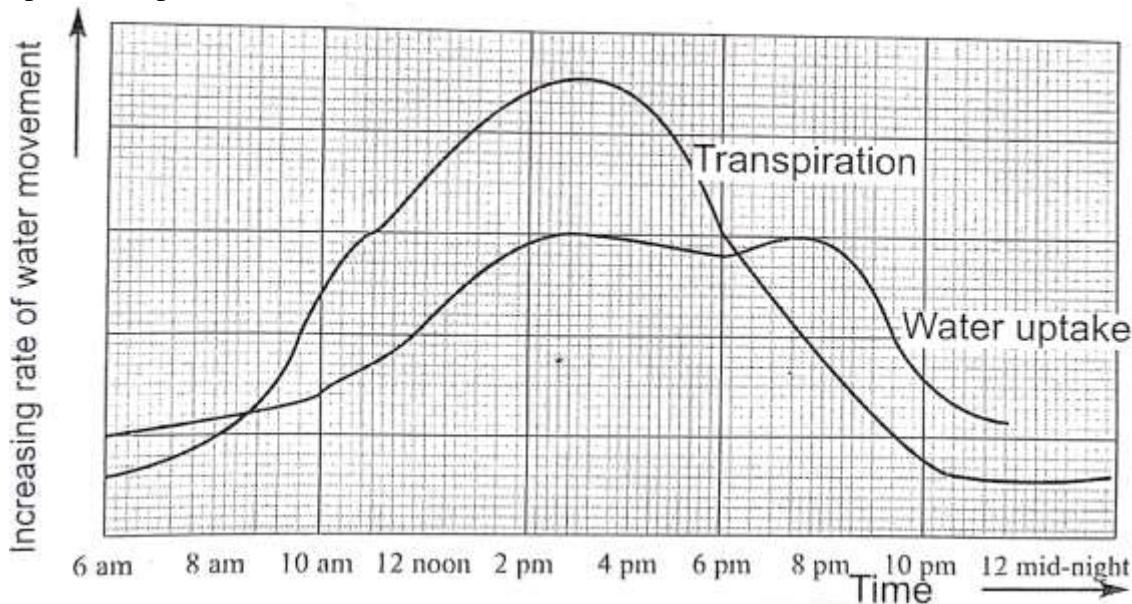
(2008, II Practical)

1. **Figure 1** is a diagram of a sprouting potato tuber.



- Name **one** food substance that is stored in the tuber. (1 mark)
 - How did the substance named in a. above reach the tuber from the leaves? (3 marks)
 - What happens to the stored substance as the tuber sprouts? (3 marks)
 - Would you classify this tuber as a stem or root? Give a reason for your answer. (2 marks)
- (1990, I)

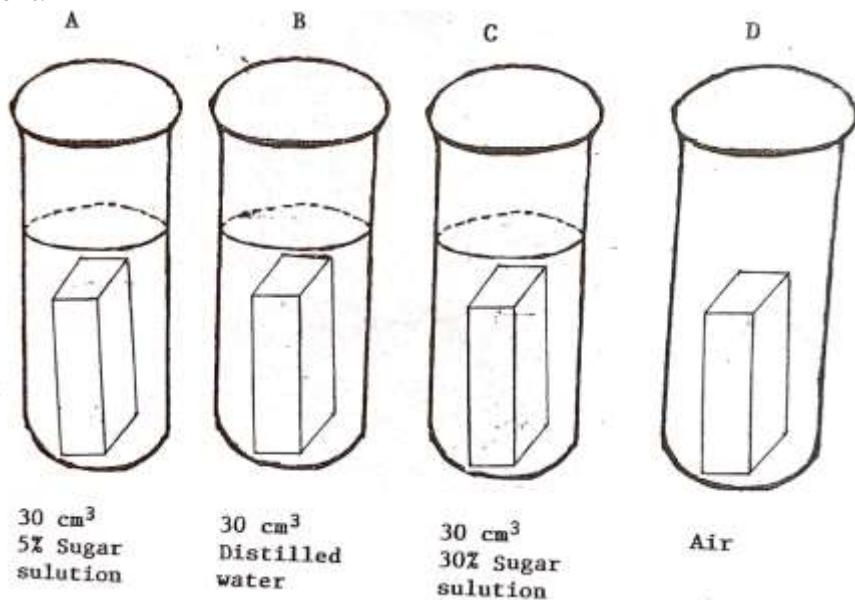
2. **Figure 2** shows two graphs, one showing the rate of transpiration and the other the water uptake in a plant.



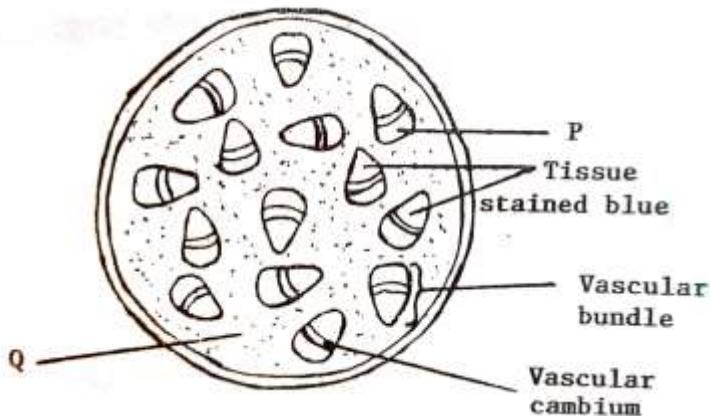
- From the graph, find the time at which each of the following occurs:
 - Maximum rate of transpiration (1 mark)
 - The rate of water uptake equals the rate of transpiration. (2 marks)
 - Between 6 pm and 12 midnight the water content of the plant increases. Suggest a reason for this. (2 marks)
 - (i) What would happen to the rate of transpiration if the lower surface of the leaves were coated with Vaseline? (1 mark)

(ii) Give a reason for your answer to c.(i). (2 marks)
- (1991, II)

3. **Figure 3** is a diagram showing four pieces of fresh Irish potato each placed in a different tube. The pieces were of the same size and each had a mass of 2.5 g at the beginning of the experiment.

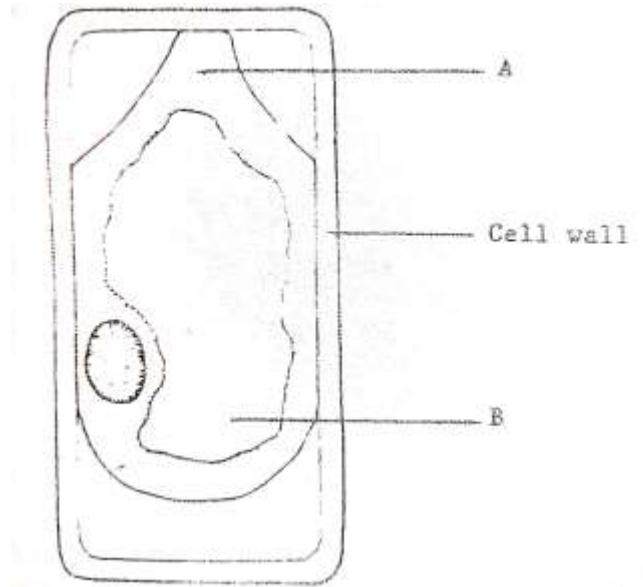


- a. (i) In tubes **A**, **B** and **C**, which piece of potato would have the smallest mass after two days? **(1 mark)**
(ii) Explain your answer to a.(i). **(3 marks)**
- b. After the same two day period, how would the mass of the piece of potato in diagram **D** compare with its mass at the beginning of the experiment? Give a reason for your answer.
Comparison: _____ **(1 mark)**
Reason: _____ **(1 mark)**
- c. **Figure 4** shows a transverse section of a fresh maize stem after it had been immersed in a solution of a blue dye for several hours.

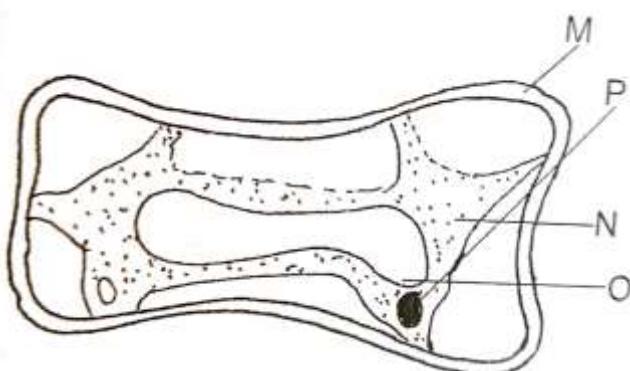


- (i) Name the parts marked **P** and **Q**. **(2 marks)**
(ii) What is the function of vascular cambium? **(1 mark)**
(iii) Suggest a reason the tissue marked **P** is not stained blue. **(1 mark)**
(iv) Give **one** way in which you would distinguish a transverse section of a maize stem from that of a bean stem. **(1 mark)**
(1992, II)

4. a. What is transpiration? **(1 mark)**
 b. Name **three** environmental conditions which could affect the rate of transpiration. **(3 marks)**
 c. Desert plants have to survive long periods of drought. State **two** ways by which these plants are adapted to survive in dry conditions. **(2 marks)**
(1992, I)
5. **Figure 5** is a diagram of a plant cell that was placed in a concentration solution of sodium chloride.

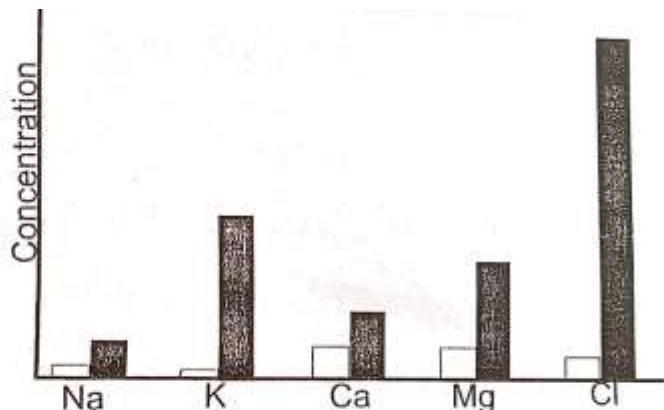


- a. Name the part of a plant cell which is
 (i) Fully permeable **(1 mark)**
 (ii) Selectively permeable **(1 mark)**
 b. Name the parts labelled **A** and **B**. **(2 marks)**
 c. (i) Draw a diagram to show what would happen to the cell in **figure 5** if it was placed in pure water. **(1 mark)**
 (ii) Explain your answer in **5 c. (i)**. **(3 marks)**
(1994, II)
6. **Figure 6** shows a diagram of plant cell, which was placed in a strong salt solution.



- a. Name the parts labelled **M**, **N** and **P**. **(3 marks)**
 b. What is present in the region marked **O**? **(1 mark)**
 c. Explain what happens to the cell while in salt solution. **(3 marks)**
(1995, I)

7. **Figure 7** shows the relative concentration of various ions in an algae plant and its surrounding pond water.



Key:

- Concentration in pond water
- Concentration in cell sap

- a. Give **one** function to plants of each of the following elements:

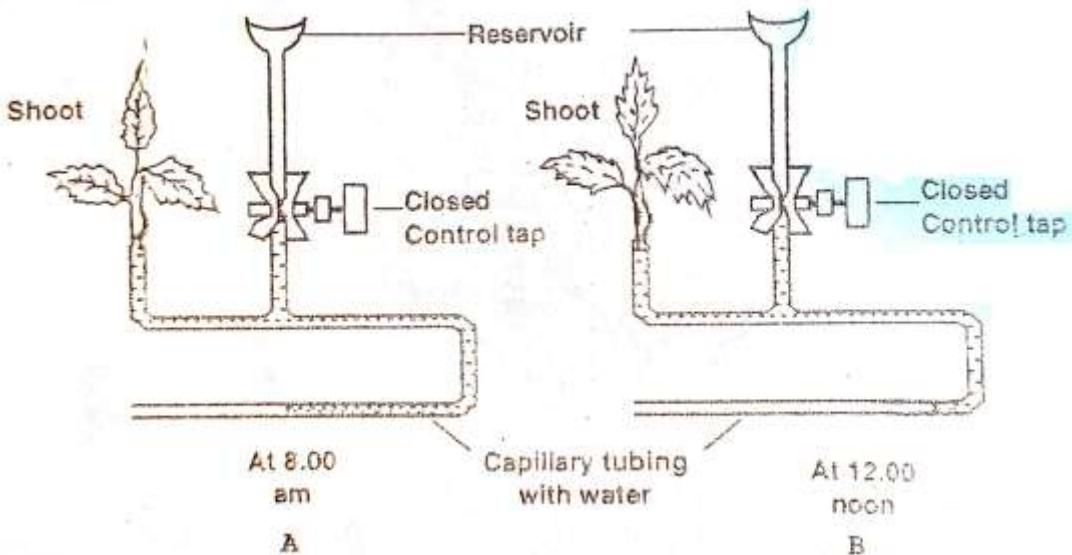
| Element | Function |
|-----------|----------|
| Magnesium | |
| Calcium | |

(2 marks)

- b. State the most obvious differences between the concentration of ions in the pond water and those in the cell sap of the algae plant. (1 mark)
- c. How is such a distribution of ions brought about? (1 mark)
- d. (i) Suppose the algae plant was killed, what would you expect the relative concentrations of ions in cell sap and pond water to be? (1 mark)
- (ii) Explain your answer to 7 d. (i). (2 marks)

(1995, I)

8. **Figure 8** is a diagram of an experiment on transpiration. A plant shoot was fixed in the photometer and kept outside a classroom for four hours. **Figure 8A** shows the experiment at the beginning and **figure 8B** shows the same after four hours.



- a. (i) Comment on the results of this experiment at 12:00 noon. (2 marks)
- (ii) Briefly explain the results you have written in 8 a.(i). above. (3 marks)

- b. (i) Suppose at the beginning of the experiment an electric fan was switched on and brought near the potometer. How would the results in this set-up compare with those in A? **(1 mark)**
(ii) Explain your prediction to b.(i). **(3 marks)**
(1996, II)

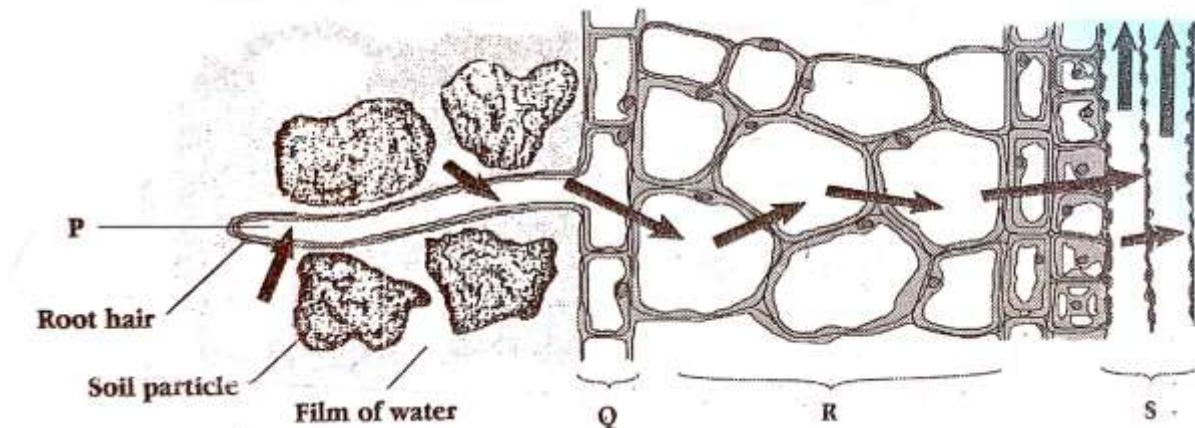
9. The **Table 1** summaries an experiment carried out with blood. The results were obtained by examining a sample of the mixture through a microscope.

| Treatment | | |
|--|--|--|
| Test tube A | Test tube B | Test tube C |
| Drop of blood plus 1 cm ³ of 0.85% sodium chloride solution | Drop of blood plus 1 cm ³ of freshly collected rain water | Drop of blood plus 1 cm ³ of 1.7% sodium chloride |

| Results | | |
|----------------------------|-------------------------|------------------------|
| Red blood cells | Red blood cells | Red blood cells |
| Remained normal (isotonic) | burst open (hypertonic) | Shrunk (hypotonic) |

- a. The relationship between the contents of red blood cells and the surrounding liquid or solution can be described by three different terms as indicated in the table. From the results in the table, what do you understand by the terms:
(i) Isotonic? **(1 mark)**
(ii) Hypertonic? **(1 mark)**
(iii) Hypotonic? **(1 mark)**
- b. Name the organ in a human body, which prevents the problem in test **tube B** from occurring. **(1 mark)**
- c. If onion cells were placed in test tube B they would not burst. Explain why? **(3 marks)**
(1997, II)

10. **Figure 9** is a diagram of vertical section of a root showing how a plant absorbs water.



- a. Name the parts labelled **Q**, **R**, and **S**. **(3 marks)**
b. State **two** functions of parts labelled **P**. **(2 marks)**
c. Describe how water moves from soil particles to part labelled **R**. **(3 marks)**
(1998, II)

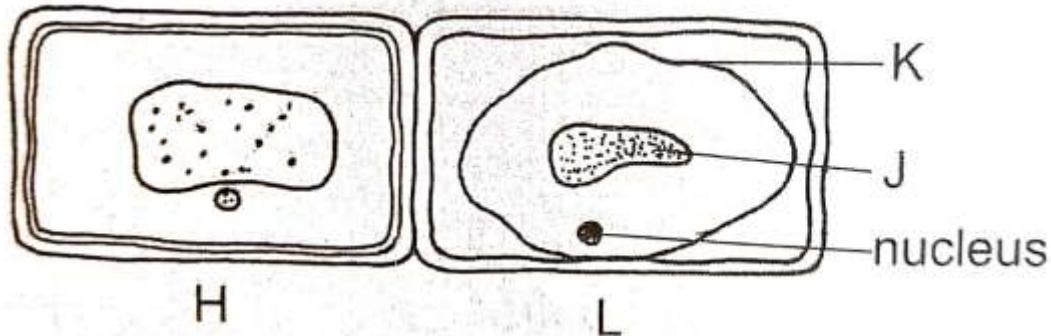
11. Six equal pieces of potatoes each weighing 2.0 g were placed into six different concentrations. After 24 hours, they were removed, the surfaces dried and then reweighed. The results are shown in **table 2**.

Table 2

| Concentration of sugar solution (g/l) | Mass of potato pieces after 24 hours(g) |
|---------------------------------------|---|
| 0 | 2.25 |
| 40 | 2.10 |
| 80 | 2.00 |
| 120 | 1.95 |
| 160 | 1.875 |
| 200 | 1.75 |
| 240 | 1.75 |

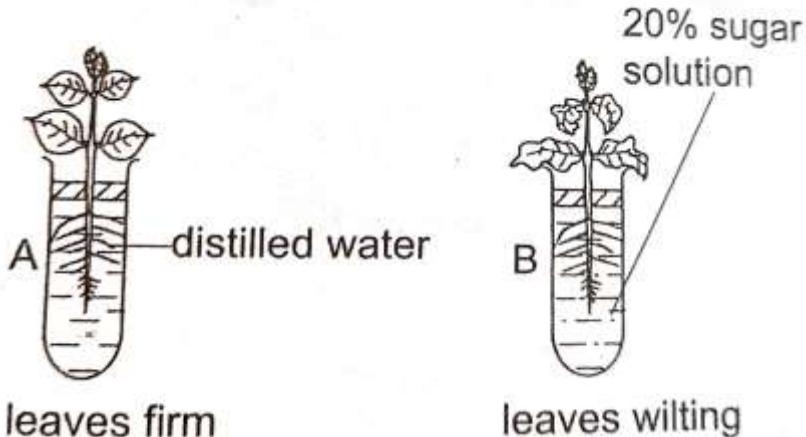
- a. Plot a graph of change of mass of potato against sugar concentration. **(4 marks)**
 b. Use the graph to estimate the following:
 (i) The mass of pieces of potato if the concentration of sugar solution were 100g/l. **(1 mark)**
 (ii) The concentration of the sugar solution if the potato pieces decreased by 10%. Show your working. **(2 marks)**
 (iii) The concentration of the sugar solution at which there would be no change in mass of the potato pieces. **(1 mark)**
(1998, II)

12. **Figure 10** is a diagram showing two adjacent plant cells **H** and **L** at different osmotic potentials. Use it to answer the questions that follow.

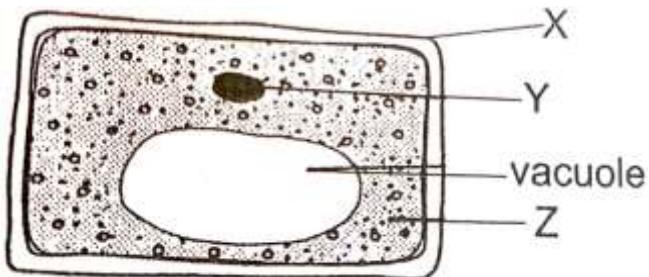


- a. Name the parts labelled **J** and **K**. **(2 marks)**
 b. (i) Which cell is plasmolysed? **(1 mark)**
 (ii) Give a reason for your answer to b. (i). **(1 mark)**
 (iii) What must happen to the plasmolysed cell to attain its normal state? **(2 marks)**
(1999, I)
13. a. (i) Why would a plant fail to carry out photosynthesis if it lacked magnesium? **(2 marks)**
 (ii) By what process does a nitrate ion move into a root hair cell when its concentration is higher in the root hair cell than in the soil? **(1 mark)**
 (b) In what way is diffusion similar to osmosis? **(1 mark)**
(2004, I)

14. A student set up an experiment on water uptake in plants as shown in **figure 11**. The results of this experiment after 24 hours are described below each drawing.



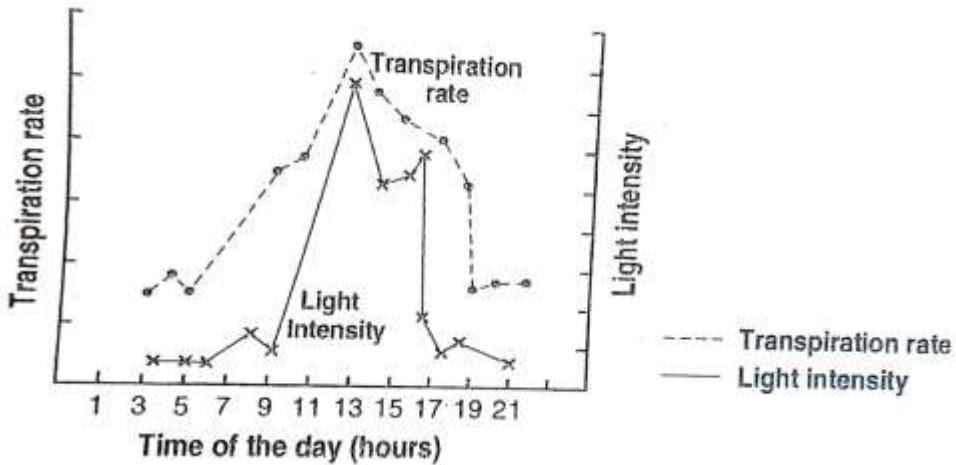
- Explain how the results came about in plants A and B. (4 marks)
- Figure 12** is a sketch of a leaf cell from **plant A** at the end of the experiment.



- Label **X**, **Y**, and **Z**. (3 marks)
- Make a sketch of a leaf cell from **plant B** at the end of the experiment. (2 marks)

(2000, I)

15. **Figure 13** has two graphs showing how the rates of transpiration and light intensity vary during the day. Study them to answer questions that follow.



- When is the transpiration rate and light intensity the greatest? (1 mark)
- (i) What is the relationship between light intensity and transpiration rate? (2 marks)
(ii) Briefly explain your answer in b. (i). (3 marks)
- Name the tissue through which water passes up the stem. (1 mark)
- Give **three** ways in which transpiration is important to plants. (3 marks)

(2001, I)

16. **Table 3** shows results of an experiment in which small potato pieces were placed in sugar solutions of varying concentration.

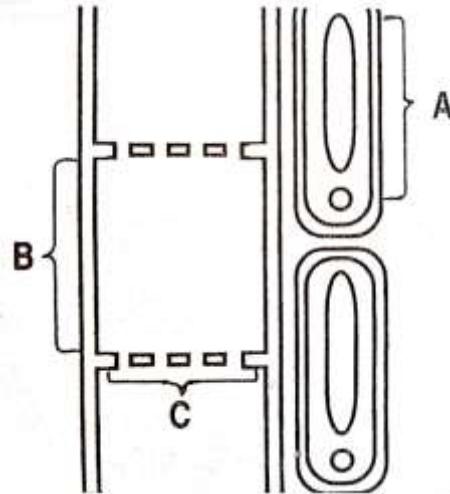
| Concentration of sugar solution (%) | Change in mass of potato pieces (%) |
|-------------------------------------|-------------------------------------|
| 5 | +6 |
| 10 | +2 |
| 15 | -2 |
| 20 | -6 |
| 25 | -10 |

Key: + = mass increase

- = mass decrease

- Plot a graph of change of mass of potato against sugar concentration. (4 marks)
 - Using the graph find the concentration of solution which is the same as the concentration of cell sap of the potato cells. Explain your answer. (2 marks)
 - (i) From the graph find the change in mass of potato in pure water. (1 mark)
(ii) Find the concentration of solution at which the mass of potato pieces could change by -8%. (1 mark)
 - Explain how some pieces of potato decreased in mass. (2 marks)
- (2001, I)

17. **Figure 14** is a diagram showing a longitudinal section of phloem tissue.

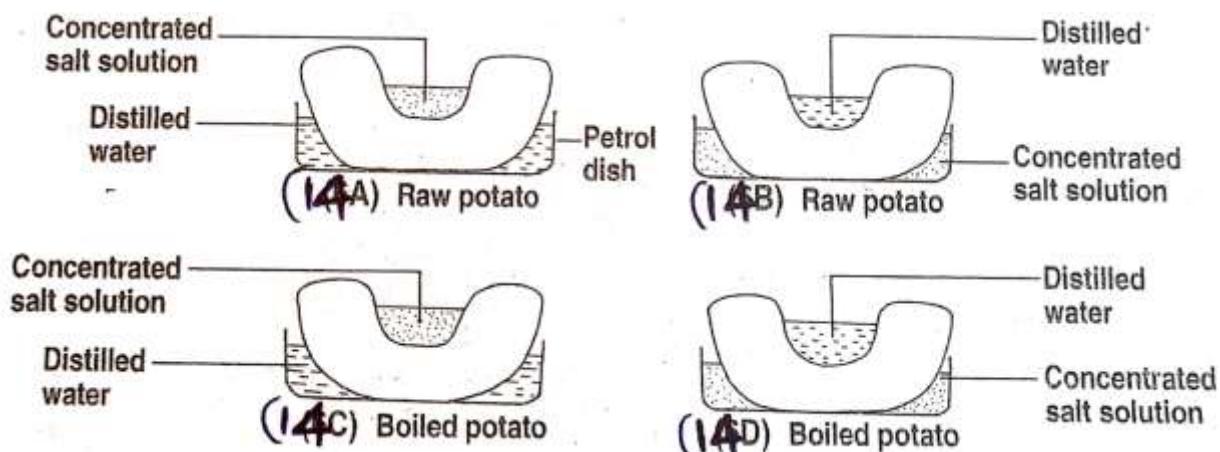


- Name the parts marked **A**, **B**, and **C**. (3 marks)
- Give **one** structural difference between **A** and **B**. (1 mark)
- Complete the table below to show the structural differences between xylem and phloem.

| XYLEM | PHLOEM |
|-------|--------|
| | |
| | |

- Xylem tissue consists of **two** sorts of cells. What are these cells? (2 marks)
 - Why do xylem vessels not collapse even when they do not contain water? (2 marks)
- (2002, I)
18. a. Give **two** differences between osmosis and diffusion. (2 marks)

- b. Figures **14A**, **14B**, **14C** and **14D** are diagrams showing an experiment that was done to demonstrate osmosis using potatoes. The potatoes were cut in half. Part of each half was peeled and a hollow was cut in the centre. The potatoes in **14A** and **14B** were raw, while those in **14C** and **14D** were first boiled.



- (i) What will happen to the water level in potatoes **14 A** and **14 B**? (2 marks)
 (ii) Explain your answer to potato **14 A**. (2 marks)
 (iii) What will happen to potatoes **14 C** and **14D**? (1 mark)
 (iv) Explain your answer. (1 mark)
- c. Why do animal cells burst when put in pure water while plant cells do not? (3 marks) (2002, I)

19. Figure 15 is a diagram showing a plant cell. The arrows show the movement of substances in the cell.

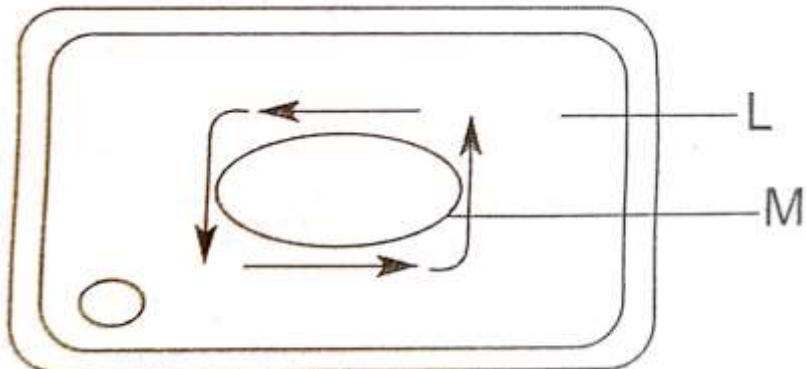
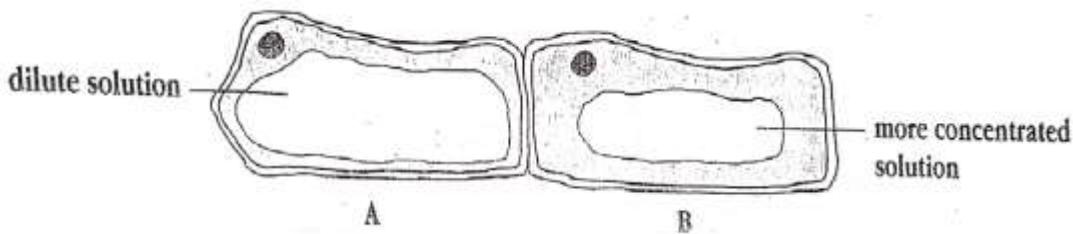


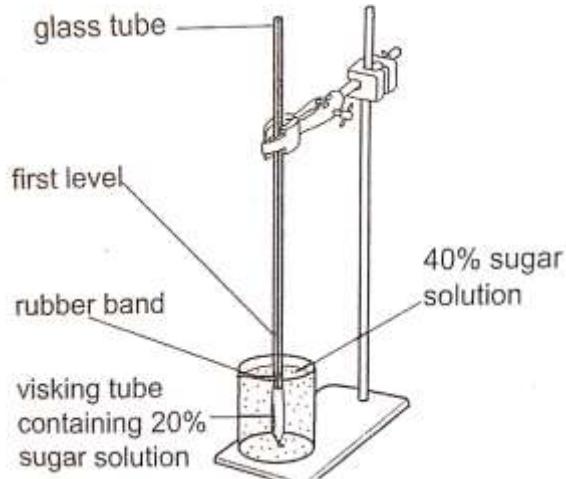
Figure 15

- a. Name the parts marked **L** and **M**. (2 marks)
 b. What name is given to movement of substances shown in figure 15? (1 mark)
 c. In what way is the movement of substances shown in figure 15
 (i) Similar to active transport? (1 mark)
 (ii) More advantageous to the cell than is diffusion? (1 mark) (2002, II)

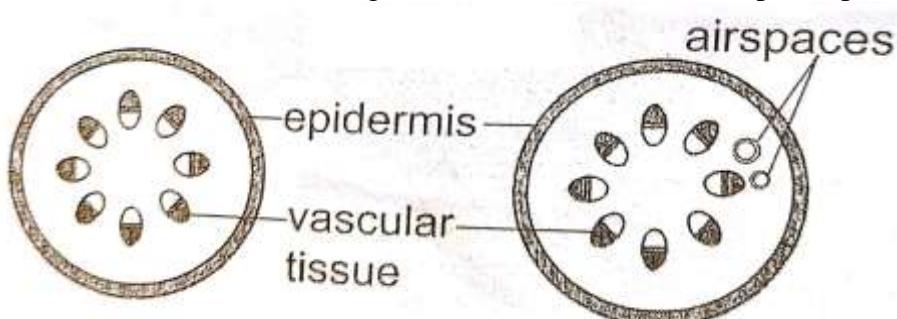
20. **Figure 16** is a diagram of two plant cells in contact. The cells are of different cell sap concentrations. Use it to answer questions that follow.



- (i) Which one of the cells **A** and **B** has a higher osmotic potential? **(1 mark)**
 (ii) Give a reason for your answer in a.(i) above. **(1 mark)**
 - Draw an arrow **in the diagram itself** to show the direction of water movement between the two cells. **(1 mark)**
(2003, I)
21. **Figure 17** is a diagram showing an experiment on osmosis.



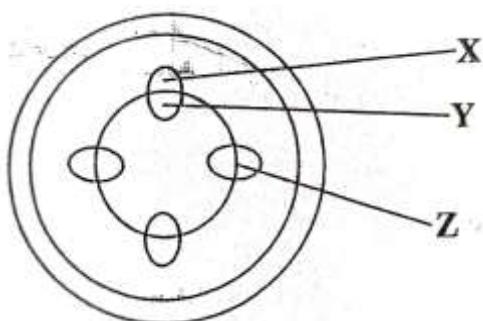
- (i) What change would occur to the level of sugar solution in the glass tubing after some time? **(1 mark)**
 (ii) Explain your answer to 21a. (i). **(3 marks)**
 - What type of membrane is the visking tubing? **(1 mark)**
(2004, I)
22. **Figure 18** shows cross-sections through stems **18A** and **18B** of two plant species.



- State **one** structural difference between figures **18A** and **18B**. **(1 mark)**

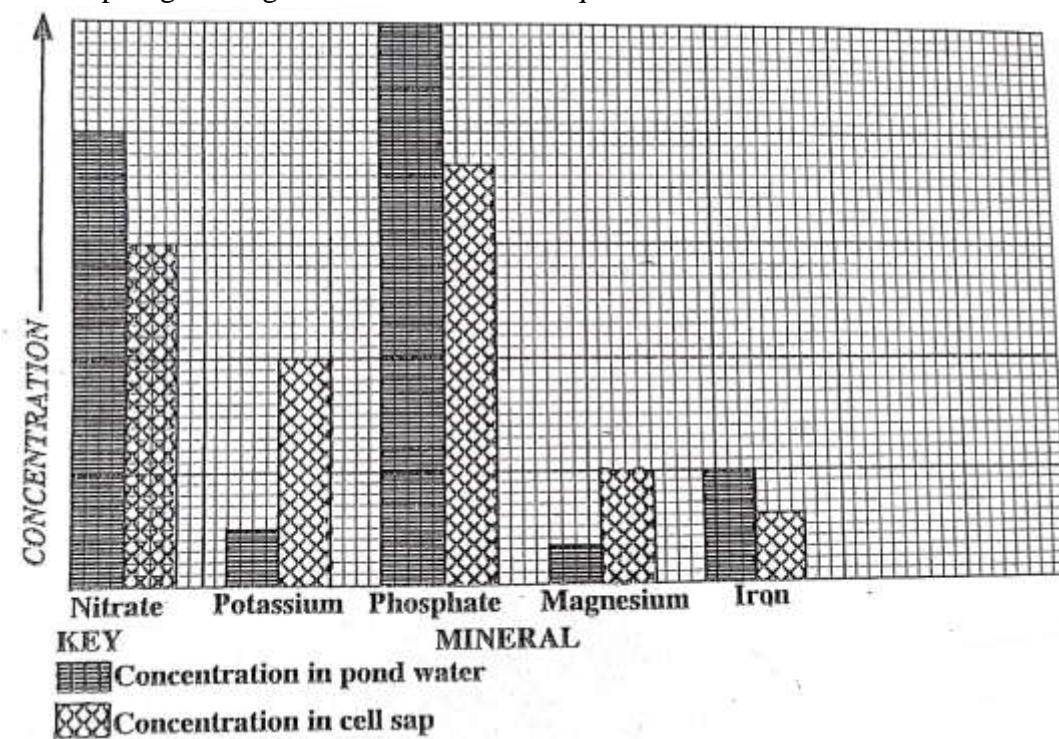
- b. (i) Which cross-section belongs to aquatic plant? **(1 mark)**
(ii) Explain your answer to **22 b. (i).** **(2 marks)**
(2004, I)

- 23.** **Figure 19** shows a cross-section of a stem from a fresh young bean plant that was dipped in coloured water. Use it to answer the questions that follow.



- a. Name the parts marked **X** and **Y** **(2 marks)**
b. (i) Which tissue could take up the coloured water? **(1 mark)**
(ii) Give a reason for your answer to **23 b (i).** **(1 mark)**
c. Explain the function of **Z** to the stem. **(2 marks)**

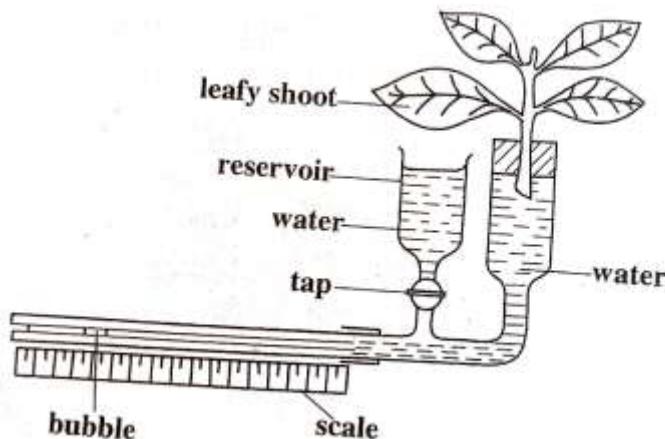
- 24.** **Figure 20** is a bar chart showing the relative amounts of different minerals in pond water and cell sap of green alga. Use it to answer the questions that follow.



- a. (i) Name any **two** minerals that would enter the alga cell sap by active transport. **(2 marks)**
(ii) Give a reason for your answer to **a.(i).** **(2 marks)**
- b. (i) What would happen to the concentration of minerals in cell sap and pond water if alga were killed? **(1 mark)**
(ii) Explain your answer in **b. (i).** **(2 marks)**

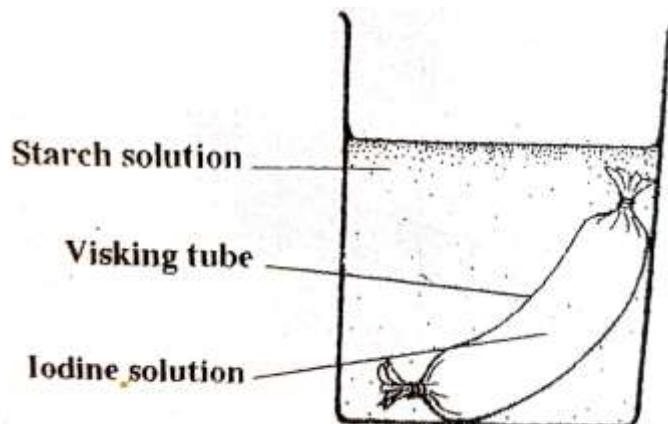
(2008, I)

25. **Figure 21** shows a potometer with leafy shoot. Use it to answer the questions that follow.



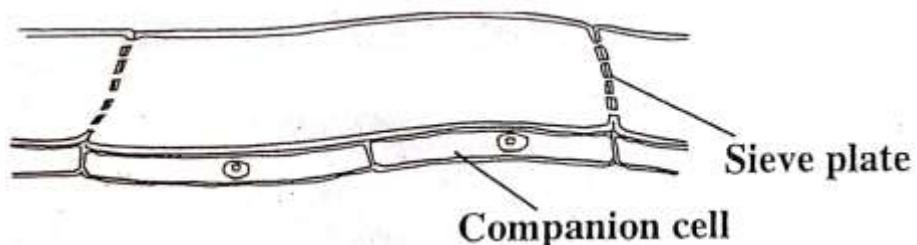
- What effect would each of the following have on the movement of the bubble?
 - increased temperature of the surrounding air (1 mark)
 - increased humidity of the surrounding air (1 mark)
- Explain how one can measure rate of transpiration in leafy shoot using the bubble. (3 marks)
(2010, I)

26. **Figure 22** shows an experimental set up in a laboratory. Use it to answer the questions that follow.



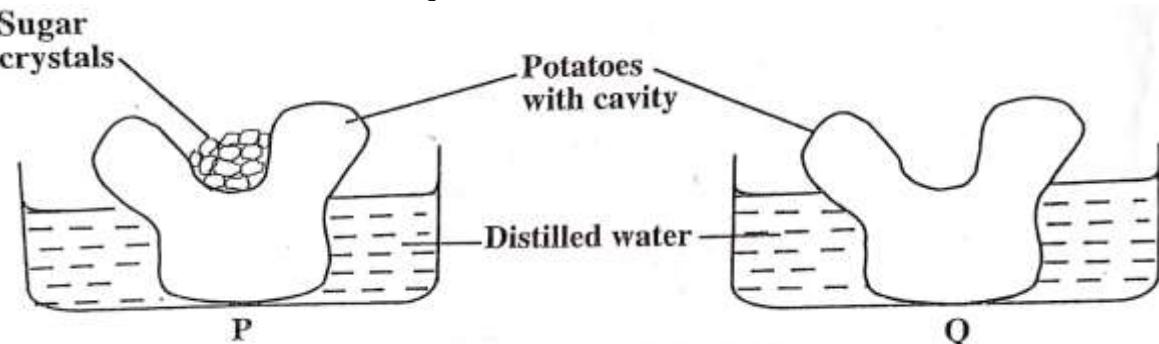
- What type of membrane is the visking tubing? (1 mark)
- (i) What results would be obtained after sometime? (2 marks)
(ii) Explain your answer to 26 b. (i). (3 marks)
(2011, I)

27. **Figure 23** shows a plant tissue obtained from a stem.

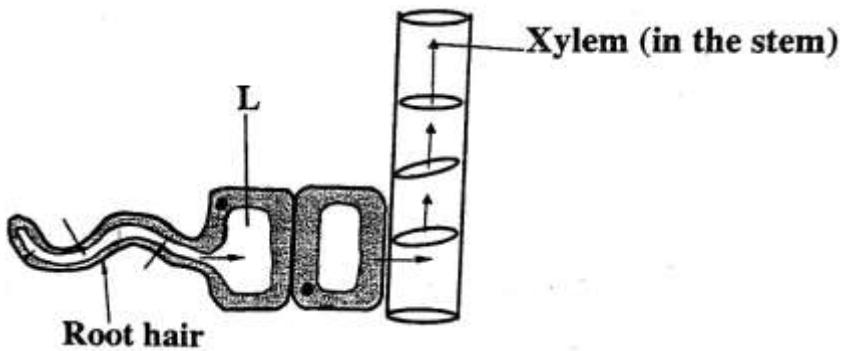


- (i) Identify the tissue. (1 mark)
(ii) Give **two** reasons to support your answer to a. (i). (2 marks)
- Explain **two** adaptations of the tissue to its function. (4 marks)
(2012, I)

28. **Figure 24** shows an experiment that was set up to investigate the movement of water in plant tissues. Use it to answer the questions that follow.

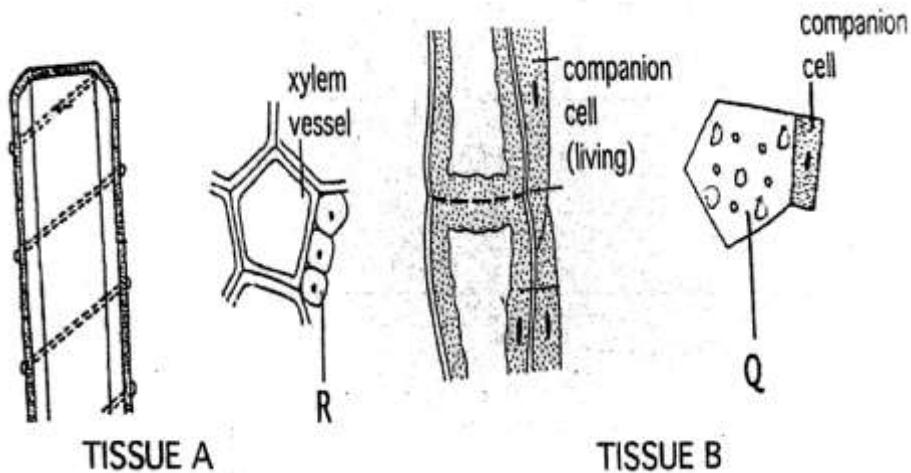


- a. (i) What would be observed in P after 1 hour? (1 mark)
 (ii) Give a reason for your answer in 28 a. (i). (2 marks)
 - b. Which set up is a control? (1 mark)
 - c. Name any **one** variable that was kept constant in the investigation. (1 mark)
 (2013, I) (3 marks)
29. a. Define "transpiration stream". (1 mark)
 b. (i) State any **two** ways in which transpiration is important to plants. (2 marks)
 (ii) Describe how the transpiration stream is caused. (3 marks)
 (2013, I) (3 marks)
30. a. Bacteria are saprophytes. What does that mean? (1 mark)
 b. Explain why honey does not easily become stale. (3 marks)
 (1998, II) (3 marks)
31. **Figure 25** shows movement of substances in a root hair.



- a. Name the part marked L. (1 mark)
 - b. How does each of the following enter the root hair?
 (i) Phosphate ions (1 mark)
 (ii) Water (1 mark)
 - c. Describe **two** processes that enable water to move up the xylem vessel. (4 marks)
 - d. Give any **two** ways in which glucose produced during photosynthesis is used.
 (2 marks)
 (2014, I) (2 marks)
32. a. Give **two** differences between diffusion and active transport. (2 marks)
 b. Mention any **two** characteristics of plasmolysed cells. (2 marks)
 c. Describe the importance of the DNA molecule to an organism. (2 marks)
 (2016, I) (2 marks)

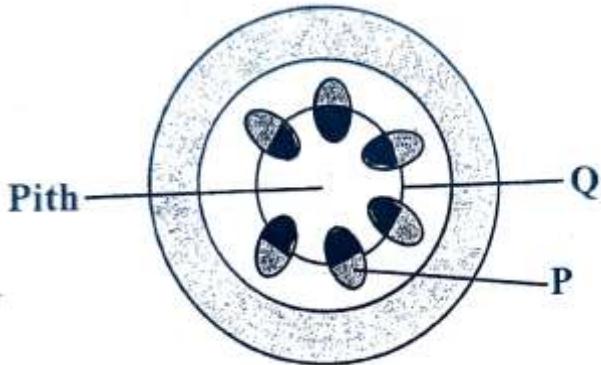
33. **Figure 26** shows sections of tissue **A** and **B** used for transport in plants. Use it to answer the questions that follow.



- Name the parts marked **R** and **Q**. (2 marks)
- State **two** structural differences between tissues **A** and **B**. (2 marks)
- (i) Which one of the tissues provides support for woody stem? (1 mark)
(ii) Give a reason for your answer in 32. b. (i). (1 mark)
- How do materials move along tissue **B**? (1 mark)

(2007, I Leaked Paper)

34. a. State **two** ways in which transpiration is important. (2 marks)
b. Explain how temperature affects the rate of transpiration. (2 marks) (2018, I)
35. a. **Figure 27** is a diagram showing a transverse section of a stem.



- (i) Name the parts labelled **P**. (1 mark)
(ii) Give any **one** function of part labelled **Q**. (1 mark)
 - Explain any **three** factors that affect the rate of diffusion in plants. (6 marks) (2019, I)
36. a. A student was conducting an experiment to find out the effect of amount of water on plant growth. Two potted plants labelled **A** and **B** were used. Plant **A** was watered everyday while plant **B** was kept unwatered for a week.
(i) What happened to plant **B** after a week? (1 mark)
(ii) Draw a labelled diagram showing any two parts of a cell from plant **B** as it might be seen under the microscope after the experiment. (3 marks)
- b. Give the importance of writing reports after a Biology experiment. (3 marks)

(2020, I Leaked Paper)

37. You are provided with the following with the following materials:
- Specimen X (potato tuber)
 - Salt solutions of the following concentration: 0%, 25% and 50%
 - Knife
 - Ruler
- (i) Using a knife
- Peel the specimen
 - Cut three small pieces that are 2 cm long, 1 cm wide and 0.5 cm thick.
- (ii) Place one piece in 0% salt solution, and the other in 25% salt solution, and the third piece in 50% salt solution. Leave to stand for 10 minutes.
- (iii) Remove the pieces.
- 1) Measure the length of each piece.
 - 2) Try to bend each piece to test its flexibility.

a. Record your results in the following table:

| Concentration of salt solution (%) | Length of Potato piece in cm | Flexibility |
|------------------------------------|------------------------------|-------------|
| 0 | | |
| 25 | | |
| 50 | | |

(6 marks)

- b. From the table, state the relationship between salt concentration and length of potato pieces. (1 mark)
- c. Explain the results observed in flexibility of the potato pieces in 0% salt concentration and 50% salt solution. (4 marks)

(2003, II Practical)

38. You are provided with the following :

- Irish potato tuber
- Solution in containers labelled **R**, **S** and **T**.
- Razor blade or scalpel

Procedure

- Cut eight equal- sized strips of irish potato, each measuring 3 mm long, 5 mm wide and 5 mm high.
- Put two strips into each of the containers labelled **R**, **S** and **T**.
- Leave for 10 minutes.

- a. (i) After 10 minutes, measure and record the length of the strips in **Table 4**.
(ii) Calculate the average length of potato strips and record.

| SOLUTION | LENGTH OF STRIPS (mm) | | AVERAGE LENGTH OF THE STRIPS (mm) |
|----------|-----------------------|--|-----------------------------------|
| R | | | |
| S | | | |
| T | | | |

(6 marks)

- b. (i) In which container did the strips decrease in length most? (1 mark)
(ii) Explain your answer to **b. (i)**. (2 marks)
- c. (i) Which solution had the highest water concentration? (1 mark)
(ii) Give a reason for your answer to **c. (i)**. (1 mark)

(2008, II Practical)

39. You are provided with the following

- a part of a stem marked **X** (a portion of a fresh maize stem, or elephant grass or sugarcane cut between two nodes with tender epidermis)
- a razor blade or scalpel or knife
- a hand lens
- 30 cm ruler

Using a razor blade or scalpel or knife, cut a cross section through the middle of specimen **X** and observe with hand lens.

- a. Draw the cross section of specimen **X** and label any **two** parts. **(3 marks)**
- b. (i) Measure the longest axis of the cross section of specimen **X** and record your answer in millimeters (mm). **(1 mark)**
- (ii) Calculate the magnification of your drawing. **(3 marks)**

(2012, II Practical)

40. You are provided with the following:

- Specimen **X** (a mature internode of fresh sugarcane)
- Specimen **Y** (a cassava tuber)
- Knife
- Iodine solution

- a. State **one** difference and **one** similarity between two specimens.
 - (i) Difference **(1 mark)**
 - (ii) Similarity **(1 mark)**

Using the knife, cut a cross-section of specimen **X** and observe the cut surface with the hand lens.

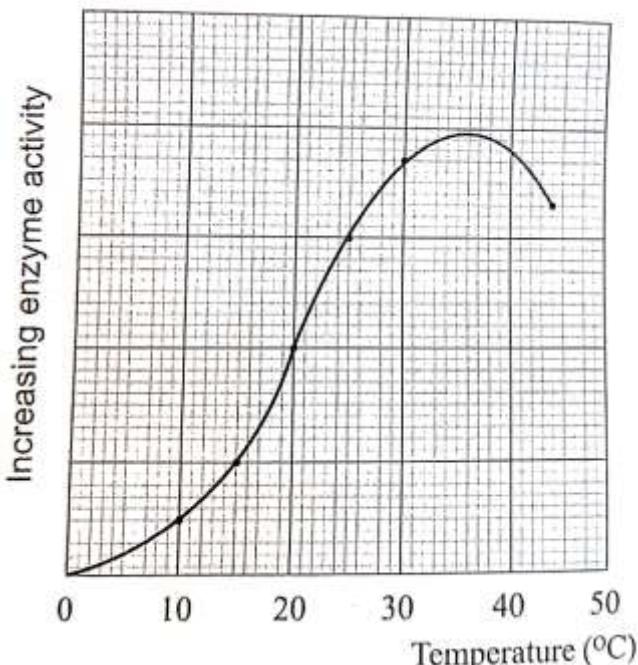
- b. Draw and label any **two** parts. **(3 marks)**

Using the knife, cut one end of each specimen. Prepare a cross-section near one end of each specimen. Add 2 drops of iodine solution on the freshy cut surfaces.

- c. Explain your observations for specimen **X** and specimen **Y**.
 - (i) Specimen **X** **(1 mark)**
 - (ii) Specimen **Y** **(1 mark)**
- d. State **one** product that could result from processing each of the two specimens.
 - (i) Specimen **X** **(1 mark)**
 - (ii) Specimen **Y** **(1 mark)**

(2015, II Practical)

1. a. (i) Name **one** enzyme produced by the pancreas. (1 mark)
 (ii) Give the food substance on which this enzyme acts. (1 mark)
 (iii) What is the end-product of the digestion of the food substance named in a. (ii)? (1 mark)
 - b. (i) State **one** digestive function of the liver. (1 mark)
 (ii) Name the blood vessel that transports digested food from the small intestine to the liver. (1 mark)
 - c. Explain what happens to excess amino acids in the liver. (1 mark) (1991, I)
2. **Figure 1** is a diagram which shows the effect of temperature on the activity of an enzyme in an experiment on digestion.



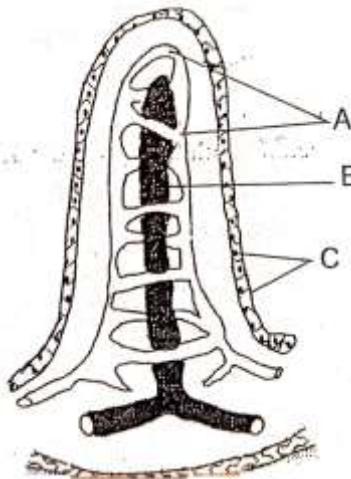
- a. What is the relationship between temperature and the activity of an enzyme between 0°C and 30°C? (1 mark)
 - b. What is the optimum temperature for the reaction of the enzyme in the graph? (1 mark)
 - c. (i) What happens to the rate of reaction when the temperature is above 40°C? (1 mark)
 (ii) Explain your answer in c. (i). (2 marks)
 - d. Besides temperature, name **one** other factor that can affect the activity of an enzyme. (1 mark) (1991, II)
3. a. Name the process through which a complex sugar is converted into a simple sugar. (1 mark)
- b. Besides glucose, give **one** other example of a monosaccharide sugar. (1 mark)
- c. Sucrose is a common example of a disaccharide.
 (i) Give **one** common source of sucrose. (1 mark)

(ii) How would you convert sucrose to glucose in the laboratory?

(1 mark)

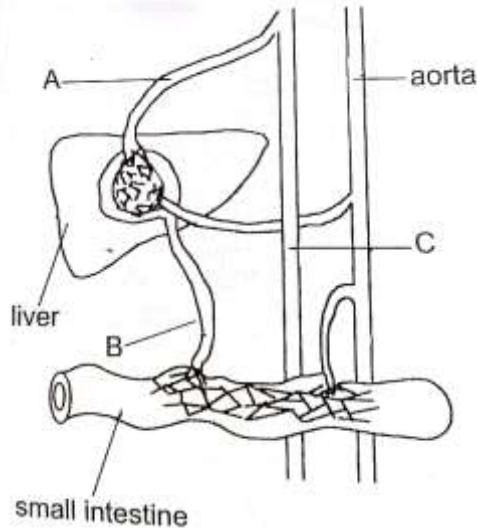
(1992, II)

4. **Figure 2** is a diagram of a villus in the small intestine of mammal.



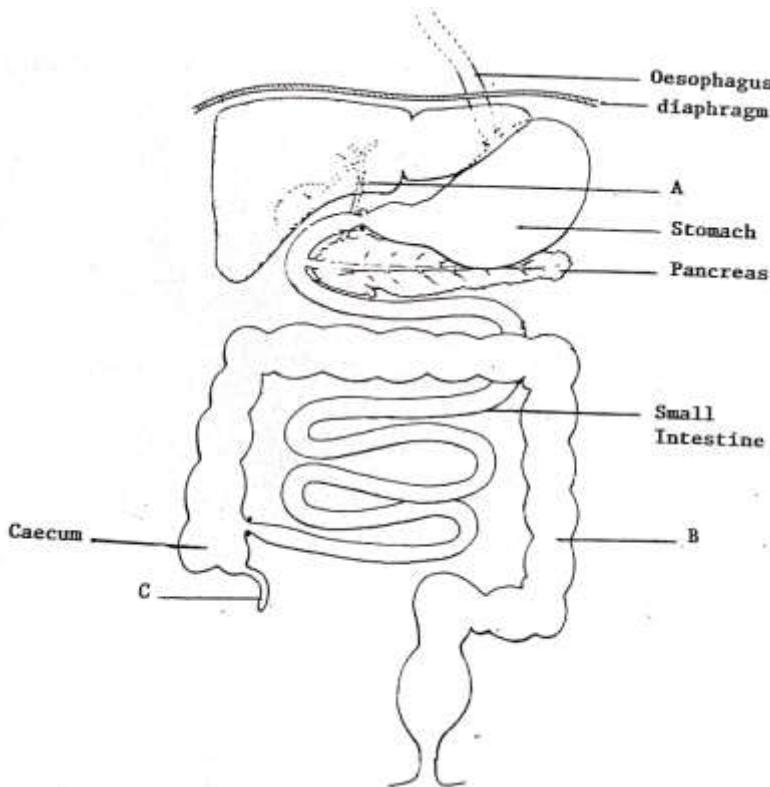
- Name the structures labelled **A**, **B** and **C**. **(3 marks)**
- The most important function of the villus is absorption.
 - From **figure 2** give **two** ways in which this structure is adapted to this function. **(2 marks)**
 - Explain how these **two** adaptations enable the villus to function efficiently. **(2 marks)**
- What substances are absorbed into structure **B** in **figure 2**? **(1 mark)**
(1992, I)

5. **Figure 3** is a diagram of the liver and its related structures.

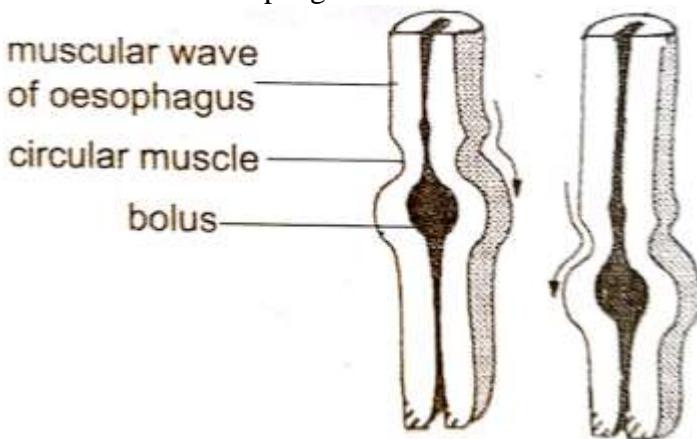


- Name the blood vessels labelled **A**, **B**, and **C**. **(3 marks)**
- On the diagram itself draw arrows to show the direction of blood flow in **A**, **B**, and **C**. **(3 marks)**
- What will be the difference in sugar levels between the blood in vessels **A** and the blood in vessels **B** soon after a meal? **(1 mark)**
 - Explain your answer to c.(i). **(2 marks)**
- What is deamination? **(1 mark)**
- Besides deamination, name **one** other function of the liver. **(1 mark)**
(1993, I)

6. **Figure 4** is a diagram of a human alimentary canal. Use it to answer the questions that follow.



- Name the parts labelled A, B, and C. (3 marks)
 - What is the function of the part labelled B? (1 mark)
 - State the effects of reducing the length of the small intestine. (1 mark)
 - State **two** functions of the pancreas. (2 marks)
- (1994, I)**
7. **Figure 5** is a diagram showing parts of a mammalian oesophagus with a bolus of food. The wall of the oesophagus has circular muscles.



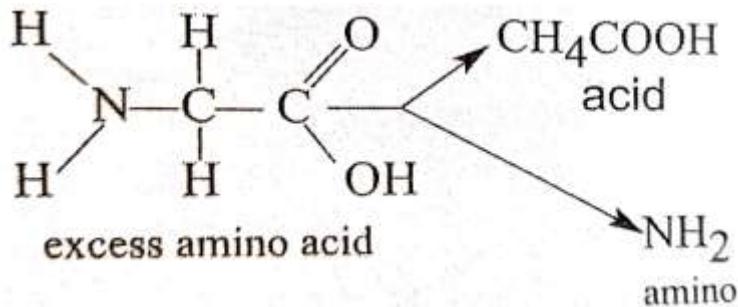
- Name the process which moves food in the oesophagus. (1 mark)
- Describe **two** ways in which the circular muscles of oesophagus differ from the biceps muscle. 2 marks
- Describe how the circular muscle of the oesophagus causes the bolus to move along the oesophagus. (3 marks)

- d. In a certain region of the alimentary tract the circular muscle is thicker and normally contracted, and prevents the contents of the gut from passing along it. Name **one** of these regions and briefly describe its importance.

- (i) Name of region: (1 mark)
(ii) Importance: (1 mark)
(1995, II)

8. a. How does chemical digestion differ from physical digestion? (1 mark)
b. (i) State **one** feature that increases the internal surface area of the ileum. (1 mark)
(ii) What is the advantage of having a large internal surface area in the ileum? (1 mark)
c. State **two** functions of bile in digestion. (2 marks)
(1995, I)

9. A certain carnivores mammal takes into its blood stream from the alimentary canal about 100 g of amino acids each day. About 20 percent of these are used for replacing used cells. The remaining amino acids enter the liver where they are chemically changed in a process represented by **Figure 6**.



- a. Name the process represented in **Figure 6**. (1 mark)
b. State what happens to
(i) The acid (1 mark)
(ii) Amino (1 mark)
c. Name **three** types of cells in a mammal that are replaced. (3 marks)
(1995, II)

10. **Table 1** shows information found on the labels of three jars of commercially produced baby food. A 100 g sample of each food was used. All food values were expressed in grammes (g).

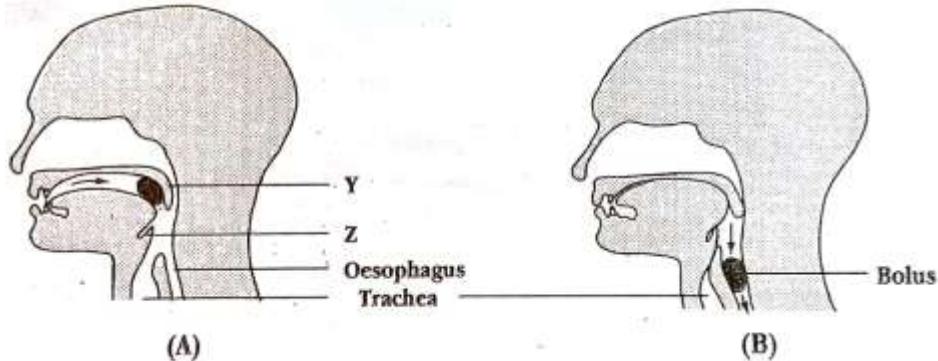
Table 1

| Jar | Carbohydrate | Fat | Protein | Energy |
|-----|--------------|-----|---------|--------|
| X | 12.0 | 1.5 | 2.0 | 250 KJ |
| Y | 15.5 | 3.0 | 3.2 | 365 KJ |
| Z | 16.5 | 2.0 | 4.5 | 420 KJ |

- a. From **Table 1**, which jar
(i) contains most sugar (1 mark)
(ii) is richest in dietary fibre (1 mark)
b. Besides water and fibre list **two** essential components of the diet not listed in the table. (2 marks)

- c. (i) Assuming all jars are sold at the same price and mass, which food is of the best value? **(1 mark)**
(ii) Give a reason for your answer to c. (i). **(2 marks)**
- d. (i) Which food constituent is the best in babies' diet? **(1 mark)**
(ii) Give a reason for your answer to d (i). **(2 marks)**
- (1996, I)**

11. **Figure 7** is a diagram of part of the human digestive system.



- a. Name the parts labelled **Y** and **Z**. **(2 marks)**
b. From **Figure 7**, what happens to structures **Y** and **Z** when the food is being swallowed? **(2 marks)**
c. Which process facilitates swallowing of the bolus? **(1 mark)**
d. Give any **two** structural differences between the trachea and the oesophagus. **(2 marks)**
- (2000, I)**

12. The **Table 2** shows the results of an experiment on protein digestion at different pH. The test tubes were set in a water bath at 37°C for 30 minutes.

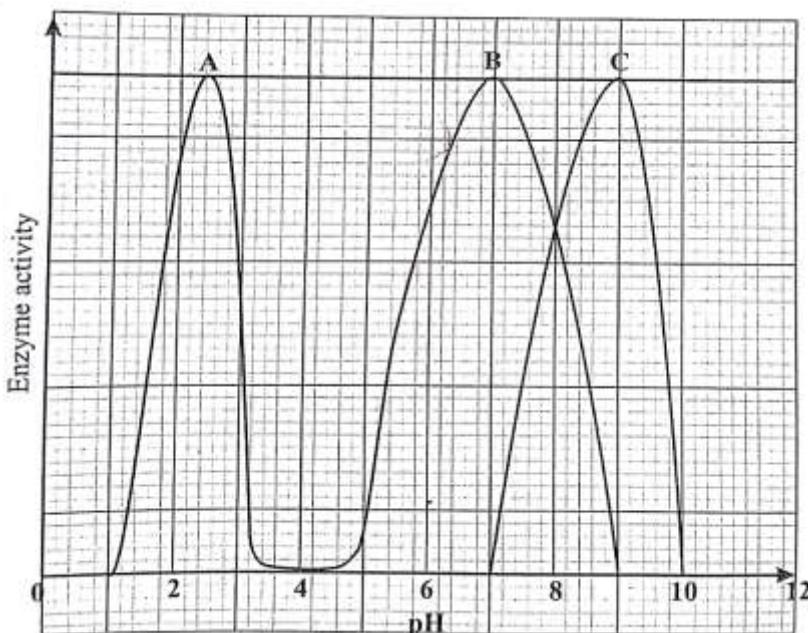
| Test Tube | pH | Observation after 30 min |
|---------------------------------------|----|--------------------------|
| A Egg white + pepsin | 2 | Clear mixture |
| B Egg white + pepsin | 7 | Cloudy mixture |
| C Egg white + pepsin | 9 | Cloudy mixture |

- a. What is the use of egg white in this experiment? **(1 mark)**
b. (i) If in setting up this experiment, 1cm³ of pepsin were added to test tube **A**, how much would be added to test tubes **B** and **C**? **(1 mark)**
(ii) Give a reason for your answer to b. (i). **(1 mark)**
c. (i) In which tube was the egg white digested? **(1 mark)**
(ii) Describe an experiment you would do to find out the optimal pH of the enzyme in the table above. **(3 marks)**
- (1996, II)**

13. a. Name **one** digestive enzyme found in each of the following juices.
(i) Gastric juice: **(1 mark)**
(ii) Saliva: **(1 mark)**
(iii) Pancreatic juice: **(1 mark)**

- b. State **one** physical condition, which affects the activity of enzymes in human body. **(1 mark)**
- c. In which part of the human alimentary canal is most water absorbed? **(1 mark)**
(1998, I)

14. **Figure 8** are graphs showing how enzyme activity varies with pH for three digestive enzymes labelled **A**, **B**, and **C**. Use it to answer questions that follow.



- a. (i) What is the optimum pH for enzyme **A**? **(1 mark)**
 (ii) Under what pH range does enzyme **B** work? **(1 mark)**
- b. (i) Which enzyme **A**, **B**, or **C** is likely to work in the stomach? **(1 mark)**
 (ii) Give a reason for your answer to b (i). **(2 marks)**
- c. In an experiment to investigate the effect of pH on an enzyme activity.
 (i) State what factors should be changed. **(1 mark)**
 (ii) Name **two** factors which should be controlled. **(2 marks)**
- d. Apart from digestion, name any **two** processes in a human body that are controlled by enzymes. **(2 marks)**
(2001, II)

15. Egg white is commonly used in testing for the activity of protein digesting enzyme. It is normally cloudy but when its protein has been digested it becomes clear.
- a. (i) What is the final product of protein digestion? **(1 mark)**
 (ii) Name **one** enzyme that digests proteins in the human alimentary canal. **(1 mark)**
- b. In an investigation on the effect of temperature on the activity of a protein digesting enzymes were mixed in a test tube and the time it took for the cloudness to disappear was recorded. Six test tubes were set up at different temperatures and the results obtained are shown in the **Table 3**.

| Tube | A | B | C | D | E | F |
|---|----|----|----|----|----|-----------------------|
| Temperature (°C) | 5 | 15 | 25 | 35 | 45 | 55 |
| Time taken for cloudness to clear (min) | 12 | 8 | 4 | 1 | 3 | Does not become clear |

- (i) Plot a graph of time taken for cloudness to clear against temperature. **(4 marks)**

- (ii) Describe the effect of temperature on the activity of enzyme. **(2 marks)**
 (iii) What is the optimum temperature of the enzyme? **(1 mark)**
 (iv) Using the graph, estimate the time taken for cloudness to clear at 20°C. **(1 mark)**
 (v) Explain why the egg white in tube F does not become clear at 55°C. **(1 mark)**
- c. (i) Apart from the temperature name any **three** other factors which could affect the activity of the enzyme in the tubes. **(3 marks)**
 (ii) How would you control these factors to ensure that you have valid results in the above investigation? **(1 mark)**
(2000, II)

16. **Table 4** shows the composition of fresh milk from different mammals.

| MAMMAL | COMPOSITION OF FRESH MILK (%) | | | |
|--------|-------------------------------|---------|-------|------|
| | FATS | PROTEIN | SUGAR | SALT |
| Cow | 4.0 | 3.2 | 5.0 | 0.7 |
| Dog | 9.5 | 11.1 | 3.0 | 0.73 |
| Horse | 1.2 | 2.0 | 5.7 | 0.4 |
| Pig | 4.5 | 7.2 | 3.1 | 1.0 |
| Man | 3.5 | 1.2 | 7.0 | 0.2 |

- a. Which milk contains the lowest percentage of energy-giving food substances? Show your working. **(4 marks)**
 b. Which milk has the highest percentage of food substances essential for growth? **(1 mark)**
 c. (i) Apart from the substances given in the table, which substance forms the highest percentage of milk? **(1 mark)**
 (ii) What is the percentage of the substance given in c.(i) above in the milk of a pig? **(2 marks)**
 d. Calculate the mass of sugar in 400 g of cow's milk. **(2 marks)**
 e. What name is given to the sugar found in milk? **(1 mark)**
(2002, I)

17. **Table 5** shows results of an experiment on the effect of temperature on enzyme activity.

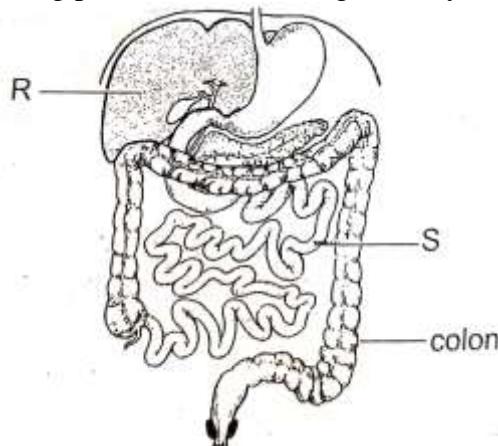
Table 5

| Temperature (°C) | Rate of reaction (mg/hour) |
|------------------|----------------------------|
| 0 | 0 |
| 10 | 9 |
| 21 | 28 |
| 30 | 41 |
| 37 | 51 |
| 50 | 40 |
| 55 | 0 |

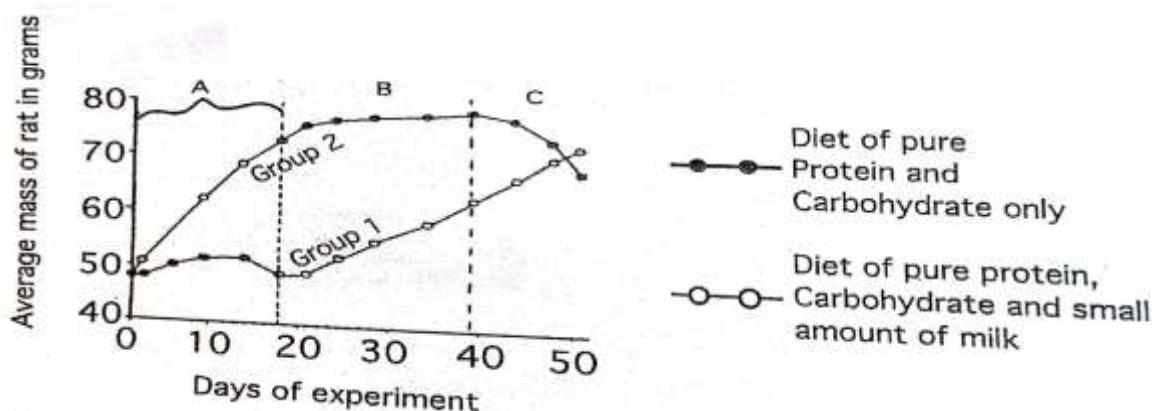
- a. Plot a graph of rate of reaction against temperature. **(3 marks)**
 b. Describe the effect of temperature on enzyme activity between 20°C and 50°C. **(2 marks)**
 c. Briefly explain the cause of the change in the rate of enzyme activity after 37°C. **(2 marks)**

- d. What is the optimum temperature of the enzyme used in this experiment? **(1 mark)**
(2003, I)

- 18.** **Figure 9** is a diagram showing part of the human digestive system.



- a. Name the parts marked **R** and **S**. **(2 marks)**
- b. Explain how part **R** ensures a steady supply of glucose to the body. **(2 marks)**
(2005, I)
- 19.** a. Explain the difference between assimilation and synthesis in animals. **(2 marks)**
- b. The sources of human proteins are animals and plants. Explain why the human protein content differs from those of its sources. **(2 marks)**
- c. Both digestion and decomposition are breaking down processes.
- (i) Write down **one** difference between decomposition and digestion. **(1 mark)**
 - (ii) Write down any **two** final products of digestion in human beings. **(2 marks)**
 - (iii) Write down any **two** final products of decomposition. **(2 marks)**
(1997, I)
- 20.** a. Give **two** differences between disaccharides and polysaccharides. **(2 marks)**
- b. Give **one** example of a polysaccharide. **(1 mark)**
(2003, I)
- 21.** **Figure 10** is a graph showing results of an experiment on the diet of two groups of rats. The graph is divided into three regions **A**, **B** and **C**.

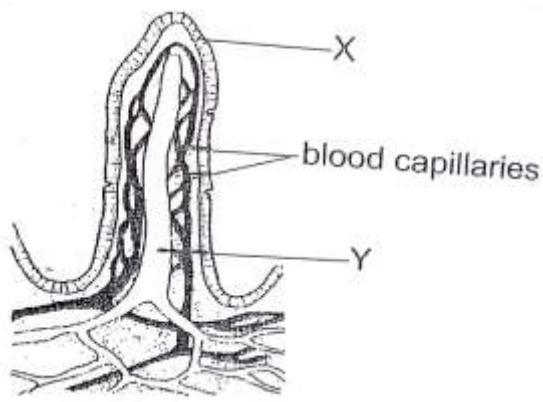


- a. Describe what happened to the mass of group 2 rats in regions **B** and **C**.
- (i) Region **B** **(1 mark)**
 Explain your observation: **(1 mark)**
 - (ii) Region **C** **(1 mark)**
 Explain your observation: **(1 mark)**

b. Mention any **two** variables that were kept constant during the experiment. **(2 marks)**

(2007, I)

22. **Figure 11** is a diagram of a longitudinal section of a villus.



a. Name the parts labelled **X** and **Y**. **(2 marks)**

b. State **one** end product of digestion which is transported by the part labelled **Y**. **(1 mark)**

c. Explain **one** adaptation of the villus which enables it to perform its function efficiently. **(2 marks)**

(2006, I)

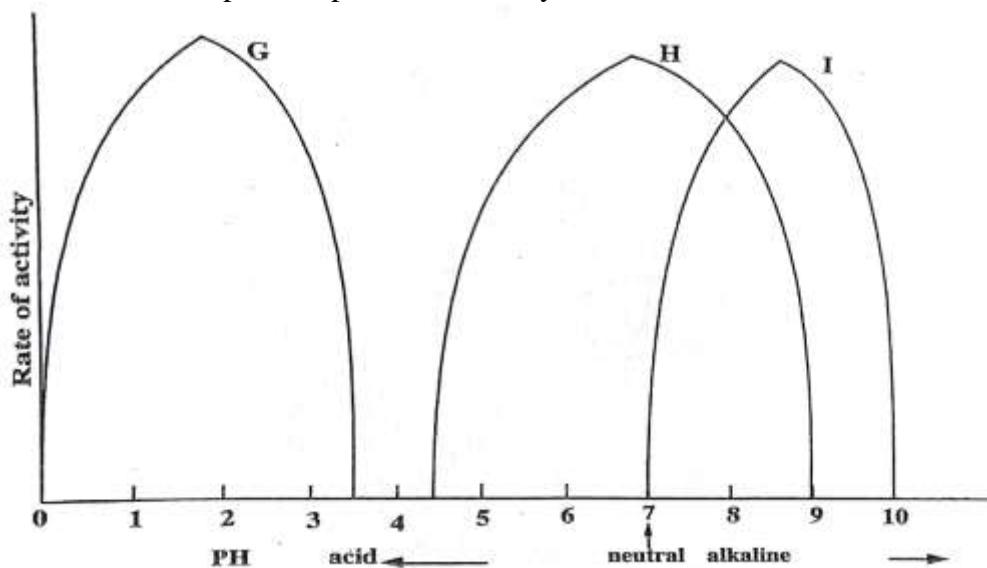
23. a. State any **two** adaptations of a villus for food absorption. **(2 marks)**

b. If the liver failed to produce bile, what two effects could this have on digestion? **(2 marks)**

c. Explain why the level of insulin increases in the blood soon after a meal of carbohydrates. **(2 marks)**

(2012, I)

24. **Figure 12** shows the optimum pH for three enzymes **G**, **H** and **I**.



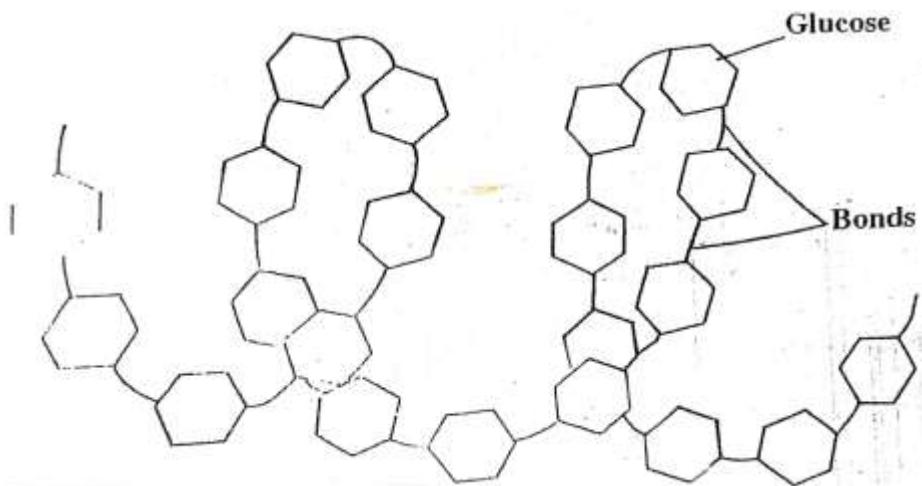
a. Which enzyme is most likely to be secreted by the stomach? **(1 mark)**

b. What would happen to activity of enzyme **H** at pH 2? **(1 mark)**

c. What conclusion can be drawn from the results shown by the graph? **(1 mark)**

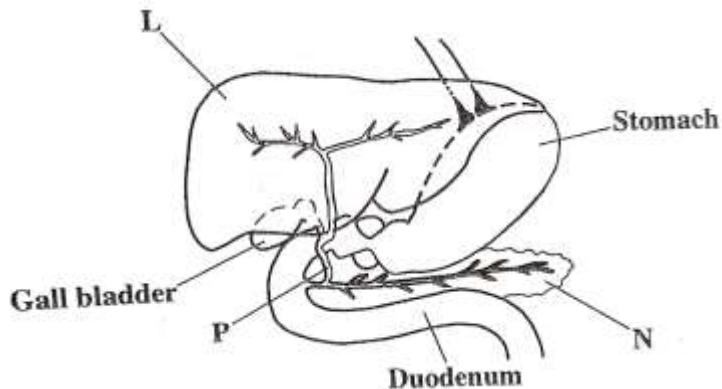
(2009, I)

25. **Figure 13** shows structure of a food substance. Use it to answer the questions that follow.



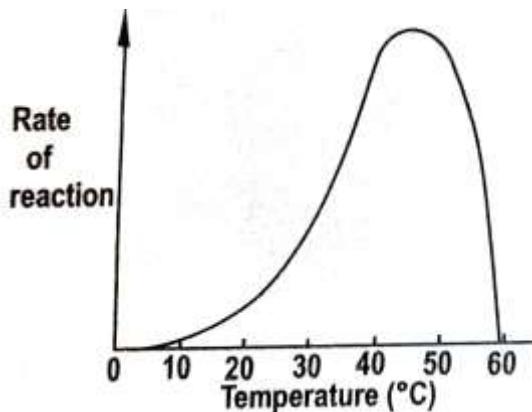
- a. Name the food substance. (1 mark)
 - b. Explain how the food substance is produced. (2 marks)
 - c. Mention **two** enzymes that could digest the food substance in humans. (2 marks) (2011, I)
26. a. State **one** function of each of the following in the human.
(i) Pepsin: (1 mark)
(ii) Bile: (1 mark)
(iii) Colon: (1 mark)
- b. What is the meaning of the following statement: the optimum pH of ptyalin is 7? (1 mark)
- c. State **three** ways in which the ileum is adapted to the process of absorption. (3 marks)
- d. (i) What is constipation? (1 mark)
(ii) State **three** ways of preventing constipation. (3 marks) (1998, I)

27. **Figure 14** shows some of organs of digestive system.

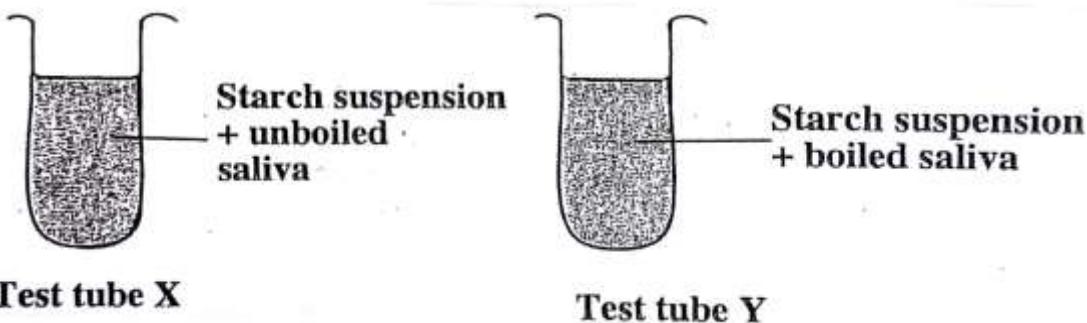


- a. Name the parts marked marked N and P. (2 marks)
- b. State any two functions of the part marked L in relation to digestion. (2 marks)
- c. Give one way in which the stomach is protected from the action of each of the following:
 - (i) Hydrochloric acid (1 mark)
 - (ii) Protein-digesting enzymes (1 mark) (2014, I)

28. **Figure 15** is a graph showing the effect of temperature on enzyme activity.



- a. What is the optimum temperature of this enzyme? (1 mark)
 - b. Why is enzyme activity decreasing as the temperature approaches 60°C? (2 marks)
 - c. Apart from temperature, name any one other factor that affects enzyme activity. (1 mark)
- (2014, I)
29. **Table 6** shows average quantities of food substances taken by three students in their meals per day. Use it to answer the questions that follow.
- Table 6**
- | Food Substance | Student A | Student B | Student C |
|----------------|-----------|-----------|-----------|
| Carbohydrates | 690 g | 750 g | 710 g |
| Proteins | 76 g | 70 g | 81 g |
| Fats | 40 g | 55 g | 47 g |
| Roughages | 15 g | 3 g | 12 g |
| Vitamins | 0.11 g | 0.14 g | 0.03 g |
| Water | 1 700 ml | 420 ml | 1 300 ml |
- a. (i) Which student is likely to suffer from constipation? (1 mark)
 (ii) Give a reason for your answer in 28 a. (i). (2 marks)
 - b. Mention two other problems of the digestive system apart from constipation. (2 marks)
 - c. If 1 g of carbohydrate gives 17 Kj of energy and 1 g of fat gives 39 Kj, calculate the energy gained by student C. Show your working. (6 marks)
- (2013, I)
30. **Figure 16** shows a set-up of an experiment to investigate properties of enzymes. Use it to answer the questions that follow.



- a. What property of enzymes is being investigated in the experiment? (1 mark)

- b. If after 10 minutes the contents of both test tubes were tested for starch, what colour would be seen in the two test tubes?

Tube X

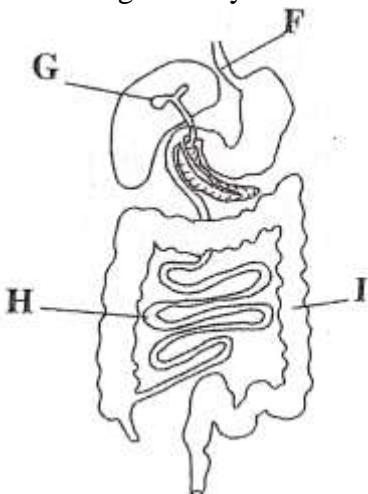
(1 mark)

Tube Y

(1 mark)

(2008, I)

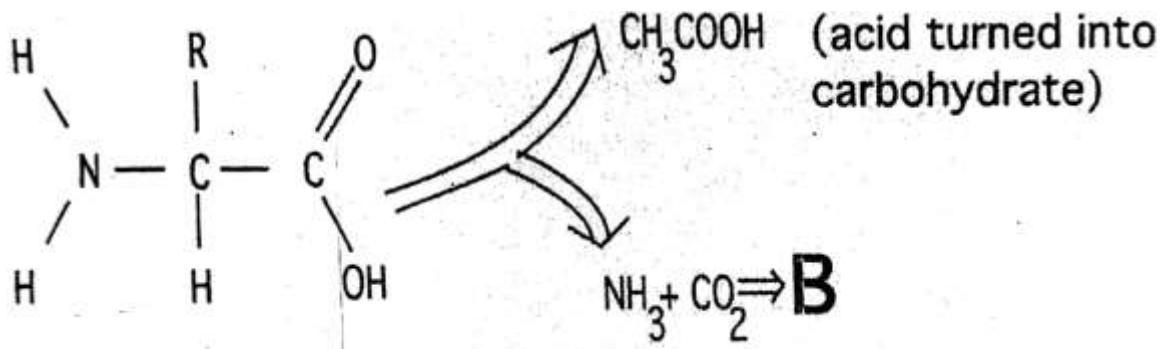
31. **Figure 17** shows part of the human digestive system.



- a. Name the parts marked **F** and **G**. (2 marks)
 b. State two observable adaptations of part marked **H** to its function. (2 marks)
 c. Describe the function of part marked **I**. (2 marks)

(2015, I)

32. **Figure 18** shows a process that takes place in one of the body organs.



- a. Identify the process. (1 mark)
 b. Where in the human body does this process occur? (1 mark)
 c. (i) Name the substance represented by letter **B**. (1 mark)
 (ii) Which organ in the human body removes substance **B** in large amounts? (1 mark)

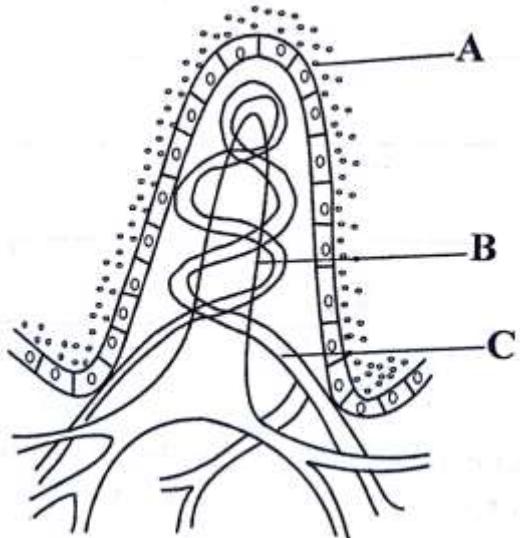
(2007, I Leaked Paper)

33. a. (i) Mention any two regions along the alimentary canal where physical digestion occurs. (2 marks)
 (ii) Explain how physical digestion occurs in each region mentioned in 33. a. (i) above. (2 marks)
- b. State **one** difference between the products of physical digestion and the products of chemical digestion. (1 mark)

(2007, I Leaked Paper)

34. a. Name the enzyme that is found in saliva. (1 mark)

- b. State any **two** properties of enzymes. **(2 marks)**
 - c. Give any **two** chemical elements that make up protein molecules. **(2 marks)**
(2016, I)
- 35.** a. Give **two** ways in which the mouth is suited for digestion. **(2 marks)**
- b. State any **one** way in which fatty acids and glycerols are used by the body after being absorbed. **(1 mark)**
(2016, I)
- 36.** a. Give the importance of peristalsis in the alimentary canal. **(1 mark)**
- b. State any two functions of the small intestines. **(2 marks)**
- c. Give any two functions of hydrochloric acid produced in the human stomach. **(2 marks)**
- d. Which vitamins help the body to absorb each of the following?
 (i) Calcium **(1 mark)**
 (ii) Iron **(1 mark)**
(2018, I)
- 37.** State any **three** problems associated with the human digestive system. **(3 marks)**
(2020, I Leaked Paper)
- 38.** a. State any **two** properties of enzymes. **(2 marks)**
- b. Explain any **three** adaptations of small intestine for food absorption. **(6 marks)**
- c. Mention any **one** function of the large intestine. **(1 mark)**
(2020, I)
- 39.** **Figure 19** is a diagram of a structure in the human digestive system. Use it to answer the questions that follow.



- a. (i) Name the structure. **(1 mark)**
 (ii) Mention parts labelled **A** and **C**. **(2 marks)**
 (iii) State the function of the part labelled **B**. **(1 mark)**
- b. State the end product of protein digestion. **(1 mark)**
(2020, I)
- 40.** You are provided with specimen labelled **M** (onion bulb) and a ruler.
- a. What type of storage organ is specimen **M**? **(1 mark)**
- b. (i) Make a drawing of the cut surface of specimen **M**. Label any **four** parts. **(5 marks)**
 (ii) Measure the length of specimen **M**. **(1 mark)**
 (iii) Calculate magnification of your drawing. Show your working. **(3 marks)**
- c. The following investigation was carried out on specimen **M**.

A sample of specimen **M** was crushed in a mortar. The resulting mash was placed in three test tubes and water was added. The mixture was stirred. **Table 8** describes how the three test-tubes were treated and results of the investigation. Use it to answer the questions that follow by filling in the last **column**.

| Test tube | Treatment | Result (Colour of mixture) | Conclusion |
|-----------|---|-------------------------------|------------|
| 1 | Iodine solution added | Brown | (i) |
| 2 | Hydrochloric acid and Benedict solution added. The mixture heated | Brick red | (ii) |
| 3 | Biurets solution added | Blue | (iii) |

(2002, III Practical)

- 41.** **Table 7** shows the required rate of protein intake for human beings from ages 1 to 60 years.

| Age (in years) | Rate of Protein intake (mg/day) |
|----------------|---------------------------------|
| 1 | 150 |
| 10 | 124 |
| 20 | 86 |
| 30 | 55 |
| 40 | 31 |
| 50 | 17 |
| 60 | 5 |

- a. Plot a graph of required rate of protein intake against age. **(5 marks)**
- b. (i) From the graph what is the relationship between age and the required rate of protein intake. **(1 mark)**
- (ii) Give an explanation for the observation in b. (i) above. **(2 marks)**
- c. Use the graph to estimate the required rate of protein intake at the age of 15 years. **(1 mark)**
- d. What disease could occur in one-year-old child who takes protein at the rate of 50 mg/day? **(1 mark)**
- e. What would happen if a 10-year-old child takes 200 mg of protein per day? **(1 mark)**

(2001, III Practical)

- 42.** **Table 9** shows the amount of energy in 100 g of each type of food. Use it to answer the questions that follow.

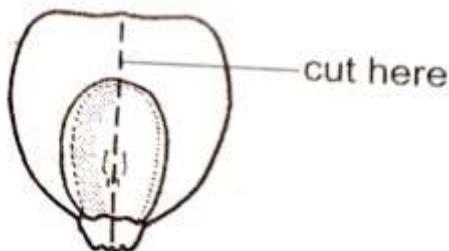
| Food | Energy (KJ/100 g) |
|-------------|-------------------|
| Potato | 90 |
| Peas | 70 |
| Boiled rice | 120 |
| Banana | 330 |
| Beef | 200 |

- a. Draw a bar graph to show amount of energy against type of food. **(7 marks)**
- b. (i) Which food is the best for man with very heavy work? **(1 mark)**

- (ii) Explain your answer to b. (i) above. (2 marks)
- c. Beef is not a carbohydrate, suggest why it has higher energy content than boiled rice. (2 marks)

(2003, II Practical)

43. You are provided with two maize seeds labelled **A** (soaked maize) and **B** (dry maize), a razor blade and a ruler. Carefully study the specimens and answer the questions that follow.
- State **two** differences between **A** and **B**. (2 marks)
 - Using a razor blade cut a longitudinal section along the narrow side of specimen as shown below.



- Draw the longitudinal section and label three parts. (4 marks)
- Calculate magnification of your drawing. Show your working. (3 marks)
- Explain why a germinating seed taste sweater than ungerminated seed. (2 marks)

(2001, III Practical)

44. **Table 10** shows results of an investigation on food tests on **A**, **B**, **C** and **D**. Use it to answer the questions that follow.

| Food | A | B | C | D |
|----------------|------|-------|----|-------|
| Food Substance | | | | |
| Starch | ✓✓✓✓ | - | ✓✓ | ✓✓✓ |
| Fats | ✓✓ | - | ✓ | ✓✓✓✓✓ |
| Protein | ✓✓✓✓ | - | ✓ | ✓ |
| Vitamin C | ✓ | ✓✓✓✓✓ | - | ✓ |

Key: - : Absence
: ✓ : Very little
: ✓✓✓✓✓ : High amounts

- Describe how the foods were tested for protein. (4 marks)
- One of the foods tested was an orange fruit. Which letter in the table could represent an orange? (1 mark)
- (i) Which food would result in scurvy if eaten as only food? (1 mark)
(ii) Give a reason for your answer in 36.c. (i). (1 mark)
- (i) What health problem would arise if one's diet consisted of too much of food **D**? (1 mark)
(ii) Give a reason for your answer in 36 d. (i). (1 mark)

(2004, II Practical)

45. **Table 11** shows the effect of storage time on the amount of vitamin C in potatoes.

| Storage Time (months) | Amount of Vitamins (mg/100g) |
|-----------------------|------------------------------|
| 0 | 30 |
| 2 | 20 |
| 4 | 15 |
| 6 | 10 |
| 8 | 8 |

- a. Plot a graph of amount of vitamin C against time. **(6 marks)**
- b. What is the effect of storage time on vitamin C? **(1 mark)**
- c. What disease is prevented by vitamin C? **(1 mark)**
- d. Apart from potatoes, mention **two** other sources of vitamin C. **(2 marks)**

(2005, II Practical)

46. You are provided with specimen **A** (onion bulb) and **B** (potato tuber)
- a. (i) Which one is a stem? **(1 mark)**
 - (ii) Give a reason for your answer to question a. (i) **(2 marks)**
 - b. Apart from shape, state any **two** structural differences between specimens A and B. **(2 marks)**
 - c. How would test specimen **B** for starch. **(4 marks)**

(2005, II Practical)

47. You are provided with a bean seed which was soaked in water.
- a. (i) Measure the longest axis of the bean seed and record its length in mm. **(1 mark)**
 - (ii) Suppose the bean seed was drawn to a magnification of **x4**, calculate the length of the diagram. **(4 marks)**
 - b. Using hands peel the seed and separate the cotyledons so that the embryo is attached to one cotyledon. Draw the cotyledon with the embryo and label any **two** parts. **(3 marks)**
 - c. Mention any one food substance stored in the seed. **(1 mark)**

(2006, II Practical)

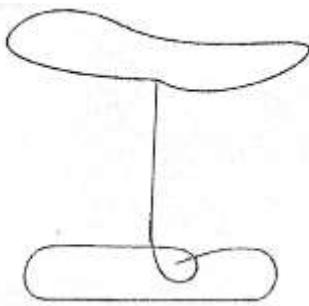
48. You are provided with the following:
- very dry groundnut seed labelled specimen B;
 - very dry maize seed labelled specimen C;
 - ruler which can measure in millimeters;
 - a match box with 10 sticks;
 - a paper clip.
- a. Measure the longest axis of each specimen and record your results in millimeters in **Table 12**.

| SPECIMEN | LENGTH (mm) |
|----------|-------------|
| B | |
| C | |

(2 marks)

- b. Draw specimen **B** with a magnification of **x5**. **(2 marks)**

- c. (i) Pierce the paper clip into specimen **B** as shown in **Figure 20**.



- (ii) Light a match and use it to burn the specimen. Observe what happens.
 (iii) Pierce the paper clip into soft part of specimen **C** as shown in **Figure 18**.
 (iv) Light a match stick and use it to burn the specimen. Observe what happens.
 (v) Record your observation for specimen **B** and **C** in **Table 13**.

| SPECIMEN | OBSERVATION |
|----------|-------------|
| B | |
| C | |

(2 marks)

- d. Explain your observation in **Table 13**.
 e. Describe how you can test specimen **C** for lipids.

(2 marks)

(2 marks)

(2 marks)

(2006, II Practical)

- 49.** **Table 13** shows the constituents of edible portions of certain foods. Use it to answer the questions that follow.

| Food | Protein (g) | Fat (g) | Carbohydrate (g) |
|----------|-------------|---------|------------------|
| Rice | 10 | 4 | 70 |
| Potatoes | 8 | 6 | 15 |
| Peanuts | 30 | 48 | 8 |
| Corn | 10 | 5 | 67 |
| Fish | 23 | 3 | - |
| Pork | 15 | 42 | - |

Given that:

1 g of protein and 1 g of carbohydrate each gives 17 KJ of energy

1 g of gives 39 KJ of energy

- a. Calculate the energy value of rice. (8 marks)
 b. What is the advantage of eating peanuts over corn for growing children? (1 mark)
 c. (i) Which food is suitable for a person who would like to lose weight? (1 mark)
 (ii) Give a reason for your answer to c. (i). (1 mark)

(2009, II Practical)

- 50.** You are provided with specimen **X** (dry bean seed) and **Y** (dry maize seed).

- a. Give any **one** observable difference between the two specimens. (1 mark)
 b. Describe the way in which specimen **X** can be tested for protein. (6 marks)
 c. Mention any **two** food substances contained in **Y**? (2 marks)
 d. What type of storage organ is **Y**? (1 mark)
 e. Name the deficiency disease that results from lack of protein in the body. (1 mark)

(2013, II Practical)

51. You are provided with the following :

- food solution marked specimen **A** (flour solution)
- iodine solution
- copper sulphate solution
- sodium hydroxide solution
- water in a beaker (container)
- two test tubes

a. Test the food specimen for starch. Complete the table provided by filling in Procedure, Results and Conclusion.

| Food Test | Procedure | Results | Conclusion |
|-----------|-----------|---------|------------|
| Starch | | | |

(5 marks)

b. Test the food specimen for protein. Complete the table provided by filling in Procedure, Results and Conclusion.

| Food Test | Procedure | Results | Conclusion |
|-----------|-----------|---------|------------|
| Protein | | | |

(7 marks)

52. You are provided with an onion bulb and a razor blade or scalpel or knife.

- a. Make a longitudinal section of the onion bulb, draw and label any three parts.**(4 marks)**
 b. Describe how you would test specimen for presence of reducing sugars. **(6 marks)**

(2010, II Practical)

53. You are provided with the following:

- 1 bean seed marked **G**
- 1 soaked maize seed marked **H**
- 1 razor blade or scalpel
- dilute iodine solution

a. (i) Measure the longest axis of specimen **G** and record its length in millimeters.

(1 mark)

(ii) Draw specimen **G** and label any two parts. **(3 marks)**

(iii) Calculate the magnification of your drawing. Show your working. **(3 marks)**

b. Place specimen **H** flat on the bench and cut it down the middle lengthwise into two separate parts. Apply one or two drops of dilute iodine solution to one of the cut surfaces.

(i) Describe the results obtained. **(2 marks)**

(ii) What conclusion can you make from these results? **(2 marks)**

(2009, II Practical)

- 54.** **Table 14** shows results of food tests **V**, **X**, **Y** and **Z** on samples of food from different regions of the alimentary canal of a mammal.

Table 14

| FOOD TEST | REAGENT | RESULTS |
|-----------|------------|-------------------|
| V | Biuret | Blue colour |
| X | Biuret | Purple colour |
| Y | Benedict's | Blue colour |
| Z | Iodine | Blue black colour |

- a. (i) In which region did food test **X** take place? **(1 mark)**
 (ii) Give a reason for your answer. **(2 marks)**
- b. Name two regions where food test **Z** likely occurred? **(2 marks)**
- c. (i) Mention any **two** food substances that were present in the food that the mammal ate. **(2 marks)**
 (ii) Explain your answer to c. (i). **(4 marks)**

(2012, II Practical)

- 55.** **Table 15** shows results of an investigation that Precious carried out using cabbage, boiling water and a dark blue dye (DCPIP). DCPIP is an indicator that changes colour depending on concentration of vitamin C. Use it to answer the questions that follow.

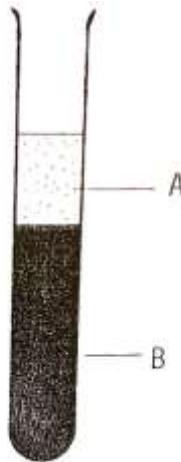
| Time cabbage was in boiling Water (in minutes) | Time taken for DCPIP to discolour (in seconds) |
|--|--|
| 0 | 10 |
| 0.5 | 25 |
| 1 | 34 |
| 4 | 42 |
| 6 | 48 |
| 10 | 46 |

- a. State the aim of the investigation. **(1 mark)**
- b. (i) Draw a graph of time taken for DCPIP to discolour against time the cabbage was in boiling water. **(7 marks)**
 (ii) What was the relationship between time the cabbage was in boiling and time taken for DCPIP to discolour? **(2 marks)**
- c. How long did it take the DCPIP to discolour after cabbage had been in boiling water for 5 minutes? **(1 mark)**

(2015, II Practical)

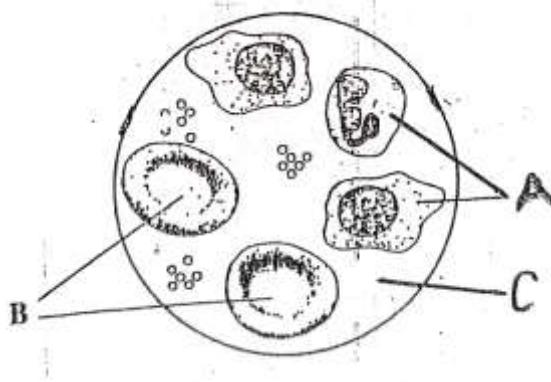
UNIT 4 THE HUMAN CIRCULATORY SYSTEM

1. **Figure 1** represents a test tube containing blood which was left to stand overnight.



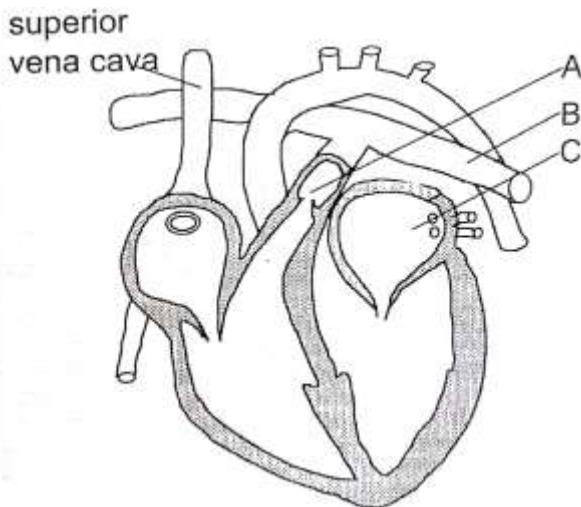
- Name the parts of blood labelled **A**. **(1 mark)**
- Name any **two** structures you would find in the part labelled **B** and state a function of each.
 - Structure **(1 mark)**
 - Function **(1 mark)**
 - Structure **(1 mark)**
 - Function **(1 mark)**
- What anticoagulant could have been added to the blood to prevent it from clotting? **(1 mark)**
- Describe how you would use the contents of the test tube in **Figure 1** to demonstrate that blood contains glucose. **(3 marks)**
(1990, I)

2. **Figure 2** is a diagram representing blood as seen under a microscope.

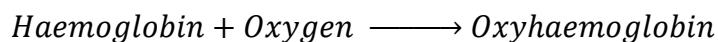


- Name the parts marked **A** and **C**. **(2 marks)**
- In what **one** way are the cells labelled **A** different from those labelled **B** in their function? **(1 mark)**
- In what **two** ways do antibodies function in the body? **(2 marks)**
- Where in the body would you expect haemoglobin to combine with oxygen to form oxyhaemoglobin? **(1 mark)**
 - Under what condition would this formation of oxyhaemoglobin take place? **(1 mark)**
(1991, I)

3. **Figure 3** is a diagram of the human heart which has been cut open to show the four chambers.



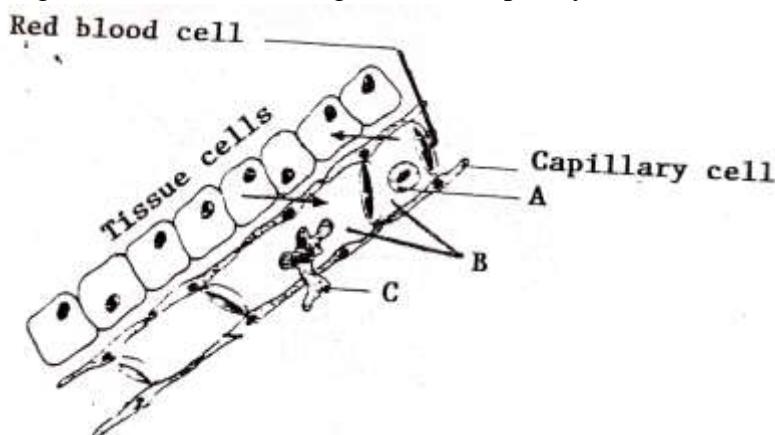
- a. Name the structures labelled **A**, **B**, and **C**. **(3 marks)**
 - b. (i) What difference do you see between the wall muscle of the left ventricle and that of the right ventricle? **(1 mark)**
 (ii) State the reason these muscles are different. **(1 mark)**
 - c. (i) What is the function of the coronary artery? **(1 mark)**
 (ii) If the coronary artery is blocked by a clot, heart failure occurs. Why? **(1 mark)** **(1991, II)**
4. **Table 1** shows the approximate values for the blood flow at rest through various organs.
- | Organ | blood flow
(cm³ per 100 g of tissue) |
|-------------------------------------|--|
| Liver | 150 |
| Heart muscle (coronary circulation) | 100 |
| Brain | 65 |
| Hand | 10 |
- a. What is a tissue? **(1 mark)**
 - b. Explain why the blood flow through the liver is so high. **(1 mark)**
 - c. (i) How many times greater is the blood flow through the heart muscle than the hand? Show your working. **(2 marks)**
 (ii) Explain why the blood to the heart muscle is greater than that to the hand. **(1 mark)**
 - d. The results in the table apply to someone at rest. Name an organ listed in the table which would receive about the same volume of blood during vigorous exercise as it does at rest. **(1 mark)** **(1992, II)**
5. The equation below is a summary of the body's oxygen transport system.



- a. In which part of the blood is haemoglobin found? **(1 mark)**
- b. Explain how haemoglobin functions as an oxygen carrier. **(4 marks)**

- c. In high altitudes, there is less O₂ due to reduced air pressure. State **two** ways in which people who live in such areas are adapted. (2 marks) (1996, II)

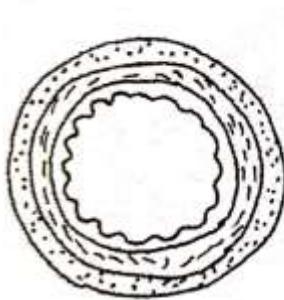
6. **Figure 4** is a diagram of a section through a blood capillary.



- Name the parts of the blood labelled **A** and **B**. (2 marks)
- How does the function of the cell labelled **A** differ from that of the cell labelled **C**? (2 marks)
- The red blood cells are biconcave in shape. What is the functional advantage of this shape? (1mark)
- Substances diffuse into and out of the capillary through the capillary wall.
 - Name **three** substances that pass from the tissue cells into the blood capillary. (3 marks)
 - From the diagram, name **two** features of the capillary wall which help the movement of these substances. (2 marks)

(1994, I)

7. **Figure 5** is a diagram showing transverse sections of two types of blood vessels.



A



B

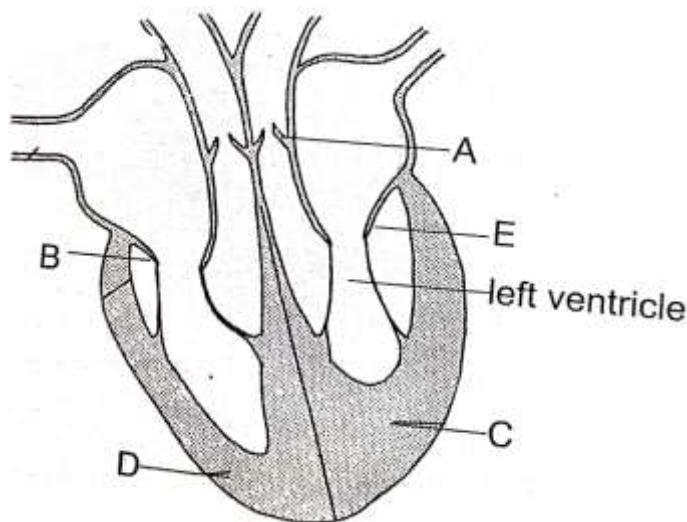
- Write down **two** differences that you can see between the blood vessels **5A** and **5B**. (2 marks)
- Name the blood vessel **A**. (1 mark)
- Write down **two** characteristics of the blood that flows in most of the blood vessels of the type shown in **A**. (2 marks)
- How is the flow of blood brought about in blood vessel **B**? (1 mark)

(1997, I)

8. a. Explain how lymph is formed. (3 marks)

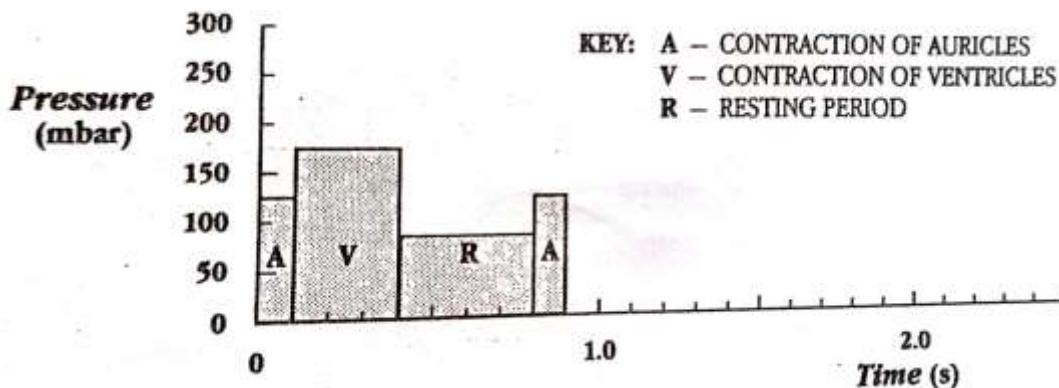
- b. State **one** structural differences and **one** similarity between lymph vessels and blood veins. **(2 marks)**
- c. Give **two** differences in the composition of blood plasma and lymph. **(2 marks)**
(2000, I)

9. **Figure 6** is a diagram of a cross section through the human heart.



- a. During systolic pressure, what happens to the parts marked **A**, **B** and **C**? **(3 marks)**
- b. What happens to the contents of the left ventricle during systolic pressure? **(1 mark)**
- c. What type of muscle is labelled **D**? **(1 mark)**
- d. Name the part marked **E**. **(1 mark)**
- e. What is the function of part marked **B**? **(1 mark)**
(1997, II)

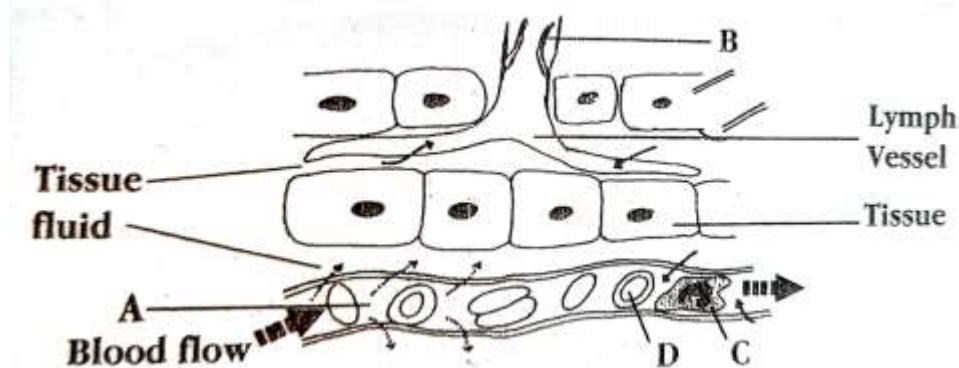
10. **Figure 7** is a graph showing the sequence of events as the heart pumps blood to various parts of the body of a person. Use it to answer the questions that follow.



- a. How much pressure does the contraction of the following structures exert on blood?
- (i) Auricles **(1 mark)**
 - (ii) Ventriles **(1 mark)**
- b. One heart-beat comprises the contraction of the auricles, and ventricles followed by a rest period.
- (i) Calculate how long the heart muscle contracts per heart-beat. **(1 mark)**
 - (ii) How long does the heart muscle rest per heart-beat? **(1 mark)**
 - (iii) Using your answer to b. (i) and b. (ii) above, calculate the length of one heart-beat. Show your working. **(2 marks)**

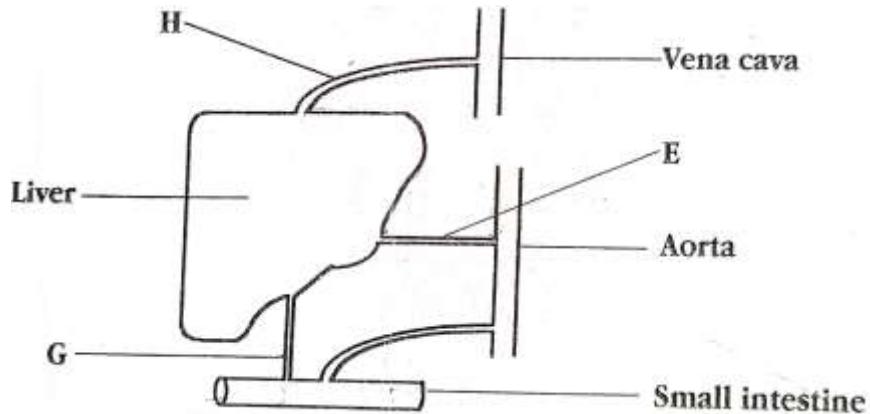
- c. A person's blood pressure is expressed as the ratio of systolic pressure to diastolic pressure.
- What is meant by systolic pressure? (1 mark)
 - From the graph in **figure 7**, what is the blood pressure of this person? (1 mark) (1999, II)

11. **Figure 8** is a diagram showing blood, tissue fluid and lymph. Use it to answer questions below.



- (i) Label parts **A** and **B**. (2 marks)
 - (ii) State the functions of **C** and **D**. (2 marks)
 - State any **two** functions of tissue fluid. (2 marks)
 - How does the lymph move along the lymph vessel? (1 mark)
 - State any **two** differences between lymph and blood plasma. (2 marks)
- (2001, I)

12. **Figure 9** is a diagram showing the liver and its related structures. Use it to answer the questions that follow.

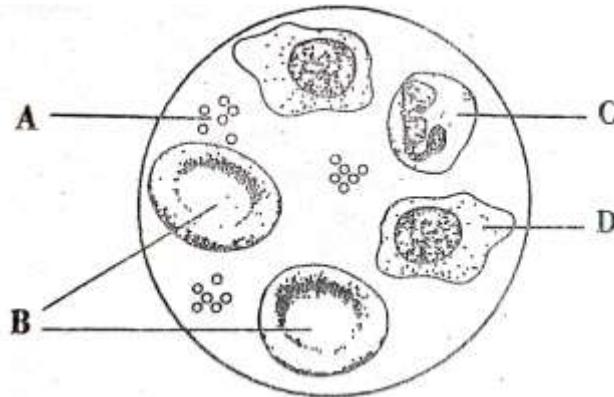


- Name the blood vessel labelled **E** and **H**. (2 marks)
- Compare the concentration of glucose and carbon dioxide in blood vessels **G** and **H** and give reasons for your answer.

| | Blood vessel G | Blood vessel H | Reason |
|----------------|----------------|----------------|--------|
| Glucose | | | |
| Carbon dioxide | | | |

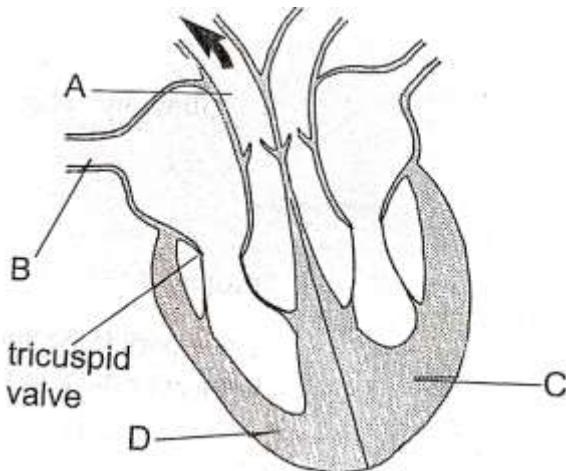
- State how the islets of Langerhans help in regulating blood sugar level. (5 marks) (2001, I)

13. **Figure 10** is a diagram representing blood as seen under a microscope. Use it to answer the questions that follow.



- Use the letters to give the parts of blood responsible for the following:
 - transport of oxygen (1 mark)
 - making antibodies (1 mark)
 - blood clotting (1 mark)
- Explain **two** ways in which the structures that transport oxygen are adapted for their function. (4 marks)
- How do **C** and **D** differ in the way they function? (2 marks)
(2003, I)

14. **Figure 11** shows a cross section of the heart and its associated blood vessels.



- Name the parts marked **A** and **B**. (2 marks)
- (i) What is the structural difference between the walls of the parts marked **C** and **D**? (1 mark)
 (ii) Give a reason for the difference stated in b.(i). (1 mark)
(2005, I)

15. As blood circulates in the capillaries some of the plasma filters through the capillary walls to form tissue fluid.

- State **two** differences in composition between blood and tissue fluid.

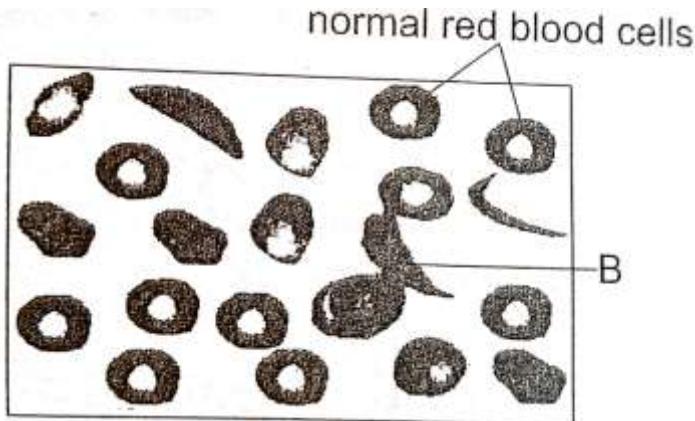
| | Blood | Tissue fluid |
|----|--------------|---------------------|
| 1. | | |
| 2. | | |

(2 marks)

- Explain how water from the tissue fluid returns to the venous end of the capillary. (2 marks)

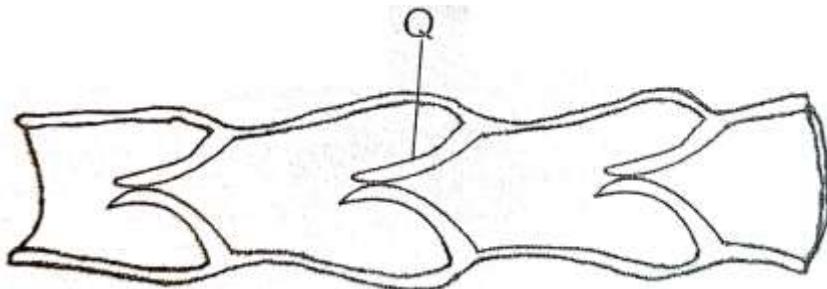
- c. In what **two** ways do lymphatic vessels resemble most veins in their structures? **(2 marks)**
- d. In addition to the lymphatic vessels, lymph is also found in the pleural cavity and in the cavity enclosed by the pericardium.
- State **two** functions of lymph in these places. **(2 marks)**
(1994, II)

16. **Figure 12** is a photograph showing blood cells.



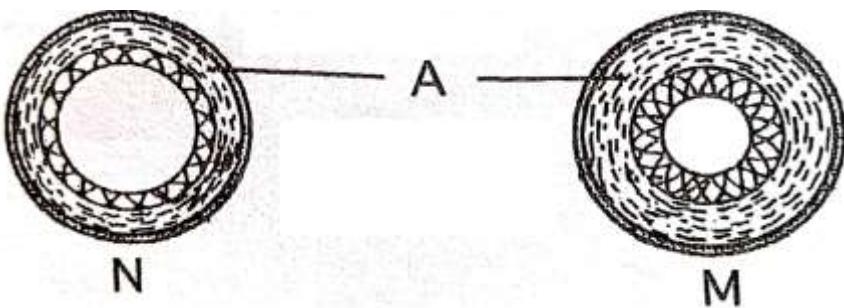
- a. (i) Name the condition of the cell marked **B**. **(1 mark)**
(ii) How are red blood cells with this condition affected? **(2 marks)**
- b. What is the cause of the condition of the cell marked **B**? **(1 mark)**
- c. Name the disease to which a person with the blood sample shown in **figure 12** is resistant. **(1 mark)**
(2006, I)

17. **Figure 13** is a diagram showing a vessel of the circulatory system. Use it to answer the questions that follow.



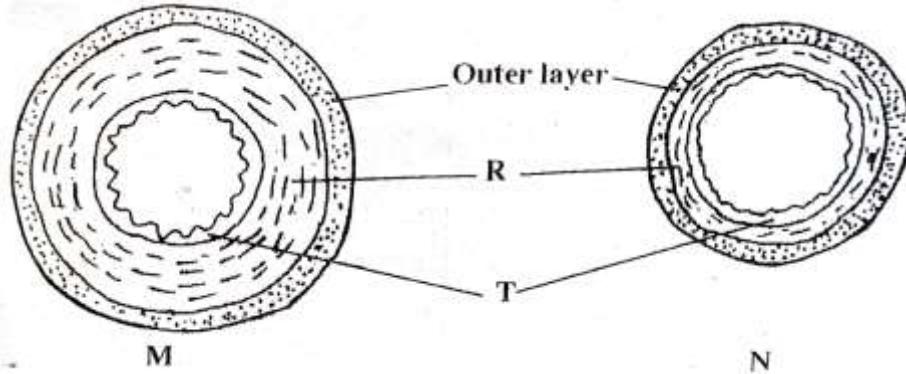
- a. Identify the structure marked **Q**. **(1 mark)**
- b. Name two vessels in human body which have structure labelled **Q**. **(2 marks)**
- c. On the diagram shown in **figure 13** put an arrow which indicates the direction of flow of blood. **(1 mark)**
- d. Describe what is likely to happen if structure **Q** were damaged. **(1 mark)**
- e. What enables blood to move along this vessel? **(1 mark)**
(2006, I)
- 18.** a. Define "lymph" **(1 mark)**
b. State any one differences between lymph and plasma. **(1 mark)**
c. Explain how inspiration movement of the chest wall helps in the flow of lymph. **(3 marks)**
(2011, I)

19. **Figure 13** shows a cross-section of blood vessels in the human circulatory system.



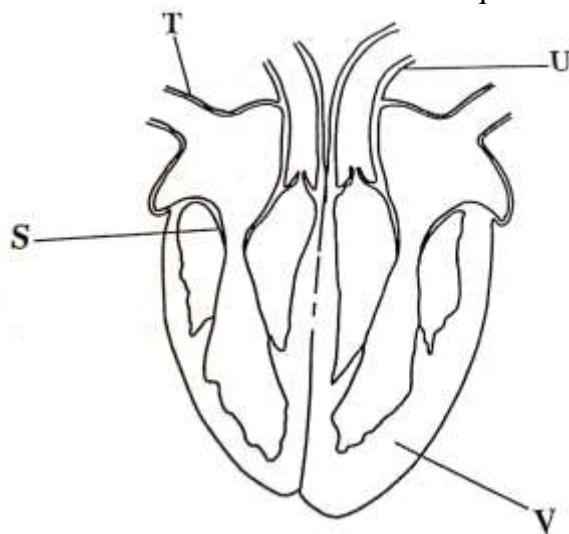
- a. Name the tissue labelled **A**. (1 mark)
- b. (i) Which section represents an artery? (1 mark)
(ii) Give **two** reasons for your answer to b.(i). (2 marks)
- c. Explain why the rate of heart beat can be measured by pulse rate. (3 marks) (2007, I)

20. **Figure 14** shows cross sections of blood vessels **M** and **N**.



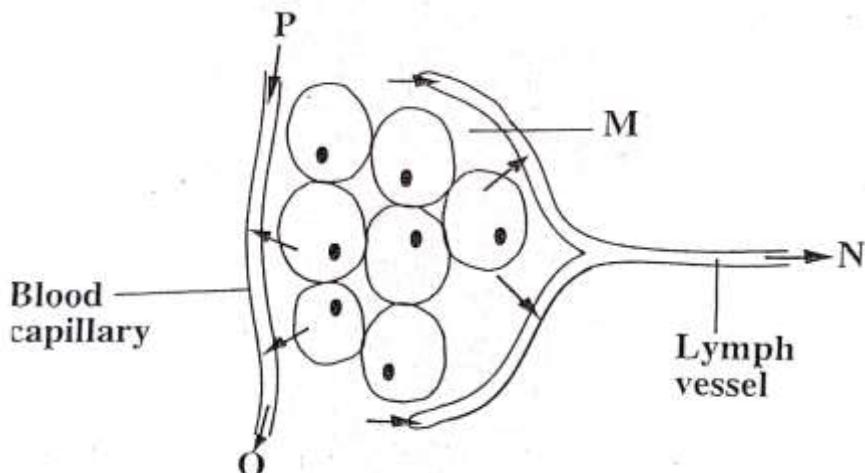
- a. Name the parts marked **R** and **T**. (2 marks)
- b. List any two structural differences between vessels **M** and **N**. (2 marks)
- c. Explain any one way in which blood is transported in vessel **N**. (3 marks) (2011, I)

21. **Figure 15** is a diagram of human heart. Use it to answer the questions that follow.

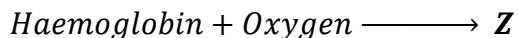


- a. Name the part marked **S**. (1 mark)
- b. Give two differences between the blood flowing through vessel **T** and **U**. (2 marks)
- c. Explain how part **V** helps to create systolic pressure. (3 marks) (2012, I)

22. **Figure 16** shows capillary bed. Use it to answer the questions that follow.

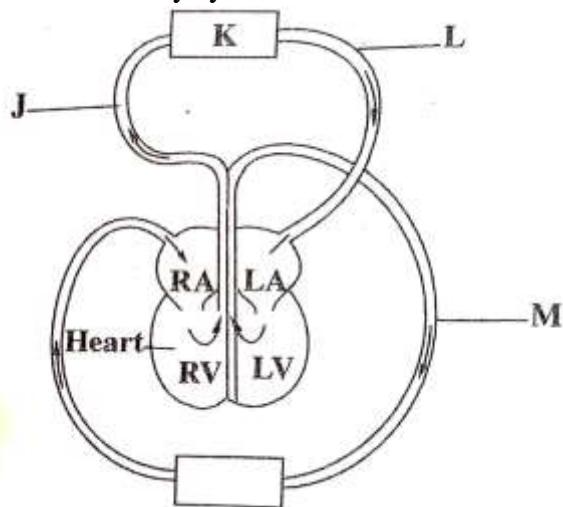


- a. (i) Name the fluid found in **M**. (1 mark)
(ii) Name any two substances found in **M** that are used by the body. (2 marks)
 - b. Name **two** adaptations of each of the following to their functions:
(i) blood capillaries (2 marks)
(ii) lymph vessels (2 marks)
 - c. which letter represents the arterial end of the capillary bed? (1 mark)
(2012, I)
23. **Figure 17** shows a summarized reaction which occurs in human body.



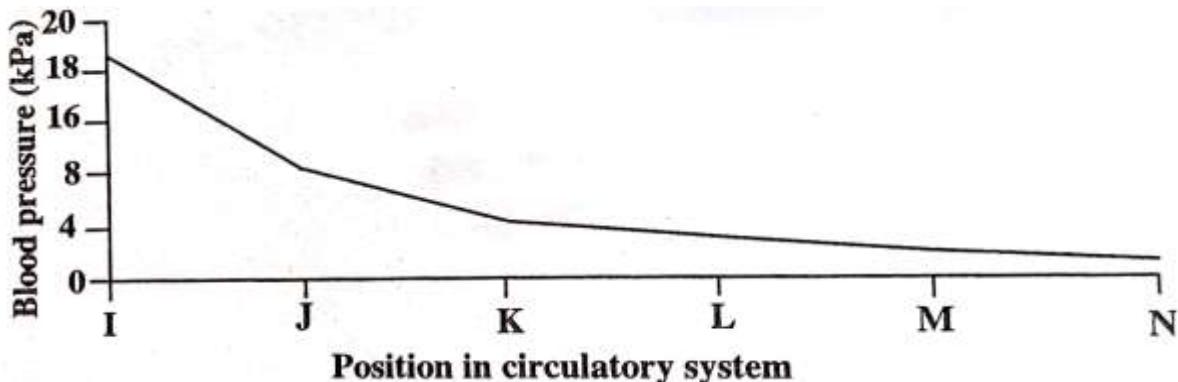
- a. (i) Name the compound represented by **Z**. (1 mark)
(ii) In which organ does the reaction take place? (1 mark)
- b. State any **two** food nutrients that are required for the formation of haemoglobin. (2 marks)
(2013, II)

24. **Figure 18** shows the human circulatory system.

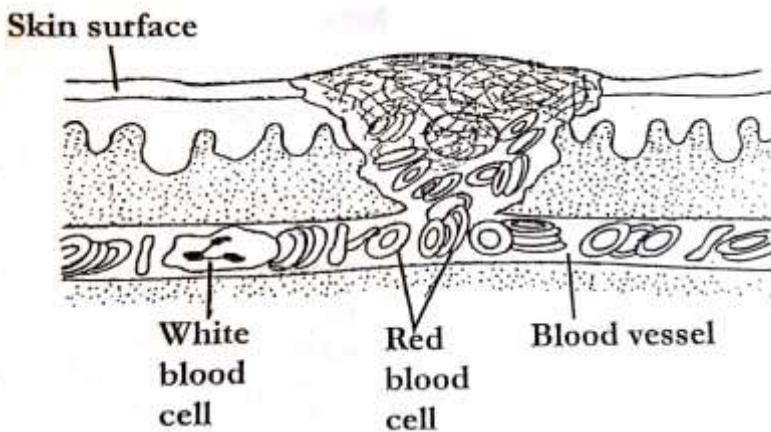


- a. Name the parts marked **K** and **L**. (2 marks)
- b. (i) Give any one difference in composition of blood in **J** and in **M**. (1 mark)
(ii) Explain your answer to 24 (b)i. (2 marks)
(2015, I)

25. **Figure 19** is a graph of average blood pressure in different blood vessels in the circulatory system. Use it to answer the questions that follow.

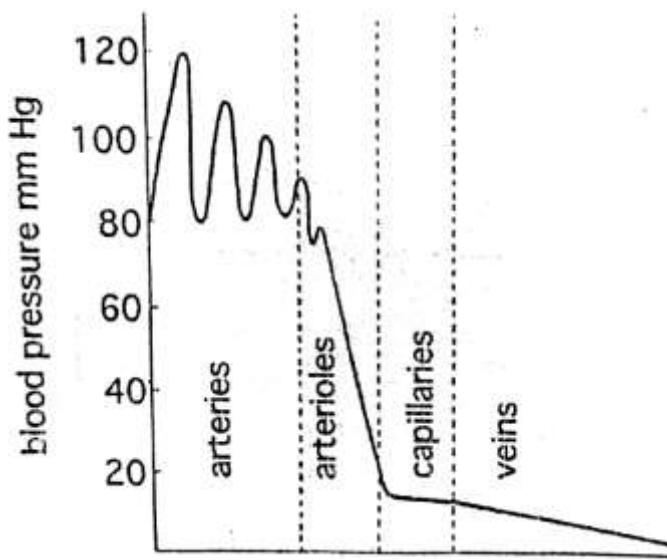


- a. Name the vessel represented by letter **I**. **(1 mark)**
 - b. Explain what would happen to the structure of vessel **I** if one's diet had a lot of fat. **(2 marks)**
 - c. (i) In which vessel is blood pressure lowest? **(1 mark)**
(ii) What is the importance of low blood pressure in **25 c (i)**. **(1 mark)**
(2014, I)
26. **Figure 20** shows a biological process taking place in the body of a person.



- a. Name the process. **(1 mark)**
 - b. State any one enzyme which is involved in the process. **(1 mark)**
 - c. Give **two** ways in which the process is important to the human body. **(2 marks)**
(2013, I)
27. a. Describe the role of platelets in blood clotting. **(3 marks)**
b. What mineral element must be available for blood clot to form? **(1 mark)**
(2007, I Leaked Paper)
28. a. State any **two** problems associated with the circulatory system. **(2 marks)**
b. Mention **two** ways of preventing problems associated with the circulatory system. **(2 marks)**
c. State **two** ways in which blood clotting is important. **(2 marks)**
(2016, I)

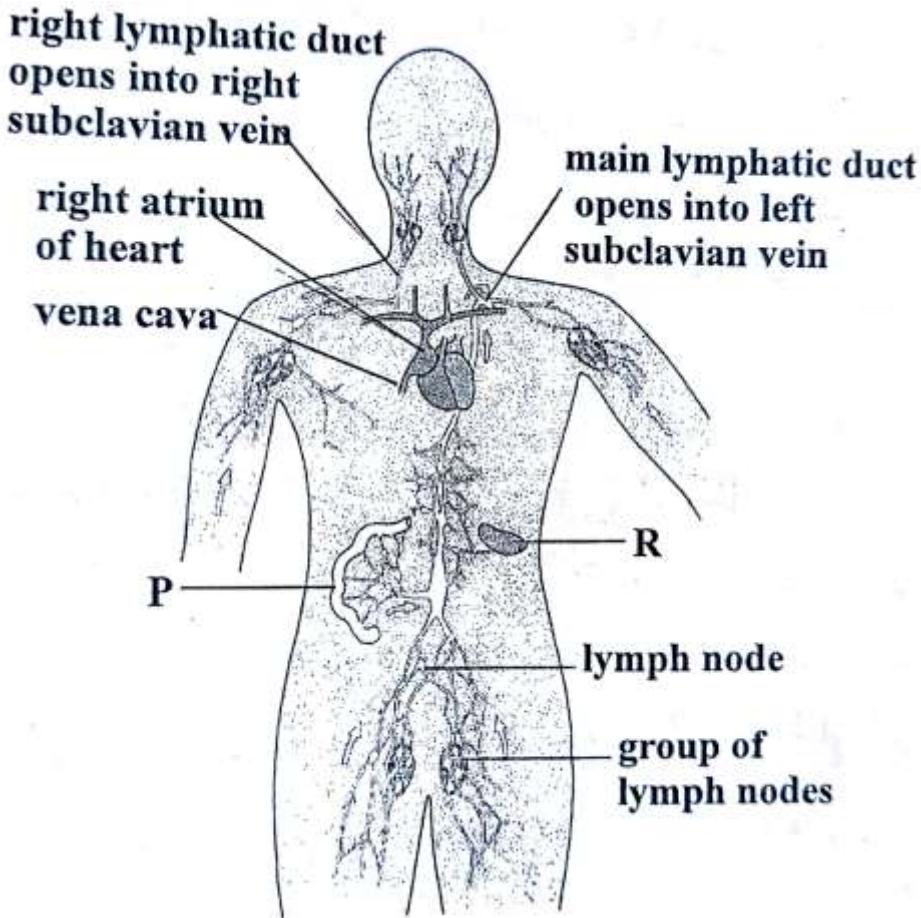
29. Figure 21 shows variations of blood pressure in blood vessels of a person.



- Find:
 - diastolic pressure
 - systolic pressure
- Give a reason why blood pressure in veins is the lowest.
- Why does blood pressure in the arteries repeatedly rise and fall?

(2007, I Leaked Paper)

30. Figure 22 is a diagram showing the lymphatic system.



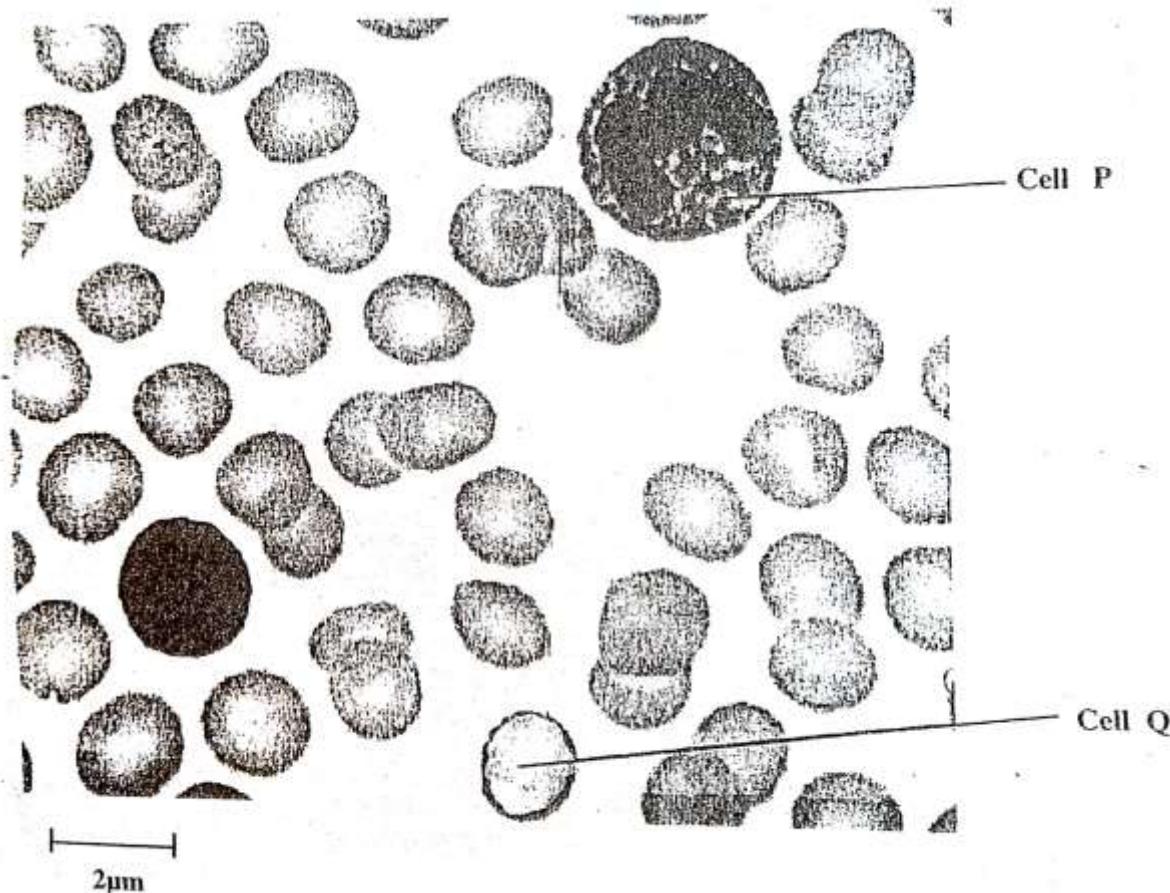
- Name the part labelled R. (1 mark)

- (ii) Name the vessels that carry digested lipids in part marked P. **(1 mark)**
- b. Give any **two** differences in composition of fluids which flow in venacava and lymphatic vessel.

| FLUID FLOWING IN VENACAVA | FLUIDS FLOWING IN LYMPHATIC VESSEL |
|---------------------------|------------------------------------|
| | |
| | |

(2 marks)
(2018, I)

31. a. State any **two** functions of blood plasma. **(2 marks)**
- b. Mention any **two** characteristics of blood capillaries. **(2 marks)**
- c. Mention the blood vessel that supplies blood to the heart. **(1 mark)**
- d. Explain any **two** adaptations of red blood cells to its function. **(4 marks)**
(2020, I)
32. a. State any **three** functions of the circulatory system. **(3 marks)**
- b. Name the muscles that make up the heart. **(1 mark)**
- c. To which group of muscles do the muscles that make up the heart belong? **(1 mark)**
- d. Give two characteristics of the muscles that make up the heart. **(2 marks)**
(2020, I)
33. **Figure 23** shows blood cells seen under a microscope. Use it to answer the questions that follow.

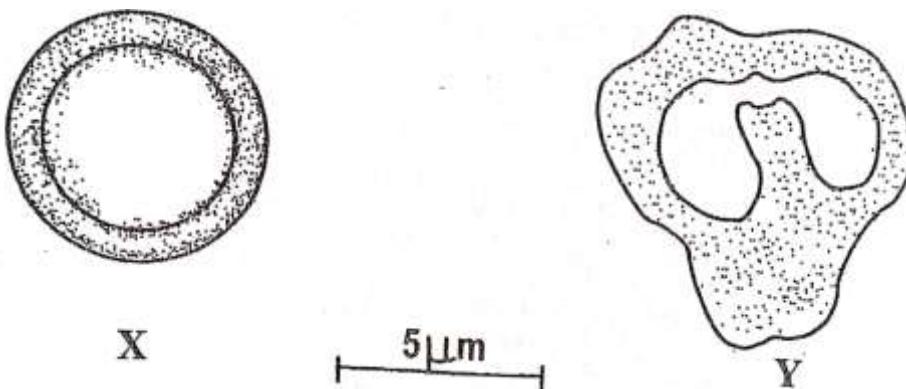


- a. Draw cell P and label any two parts. **(3 marks)**

- b. (i) Measure the longest axis of cell **P** in **Figure 22**. **(1 mark)**
(ii) Calculate the actual size of cell **P**. Show your working. **(2 marks)**
- c. Explain why cell **Q** is darker at the edges than in the middle. **(1 mark)**
- d. Explain how cell **Q** is adapted for its function. **(2 marks)**
- e. Give one structural difference between cell **P** and cell **Q**. **(1 mark)**

(2006, II Practical)

34. **Figure 22** shows blood cells **X** and **Y**. Use it to answer questions that follow.



- a. In the **Table below**, write down **two** structural differences between cell **X** and **Y**.

| Cell X | Cell Y |
|--------|--------|
| | |
| | |

(2 marks)

- b. Measure the longest axis of cell **Y** in millimeters. **(2 marks)**
c. Using the scale provided, calculate the actual size of cell **Y**. **(3 marks)**
d. What is the function of cell **X** in the human body? **(1 mark)**
e. Explain how cell **Y** perform its function. **(2 marks)**

(2012, II Practical)

UNIT 5 THE RESPIRATORY SYSTEM

1. **Figure 1** shows epithelial cells of a bronchus, greatly magnified.

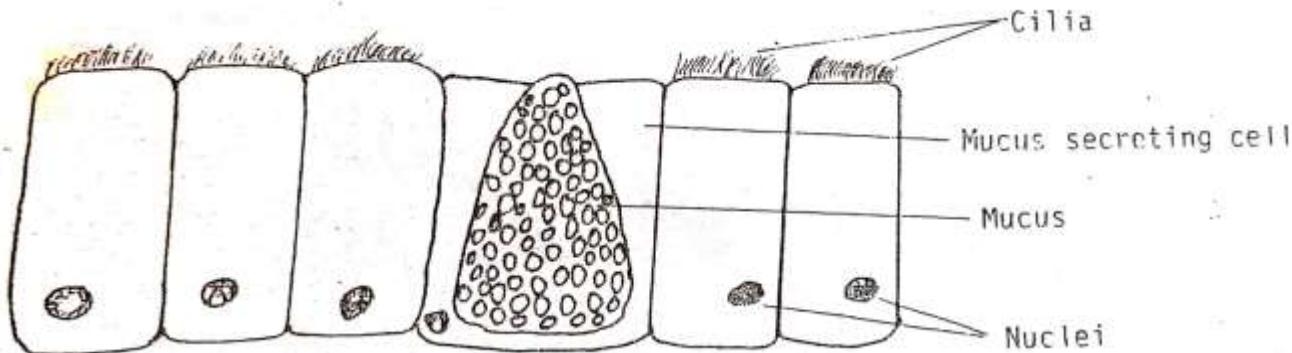
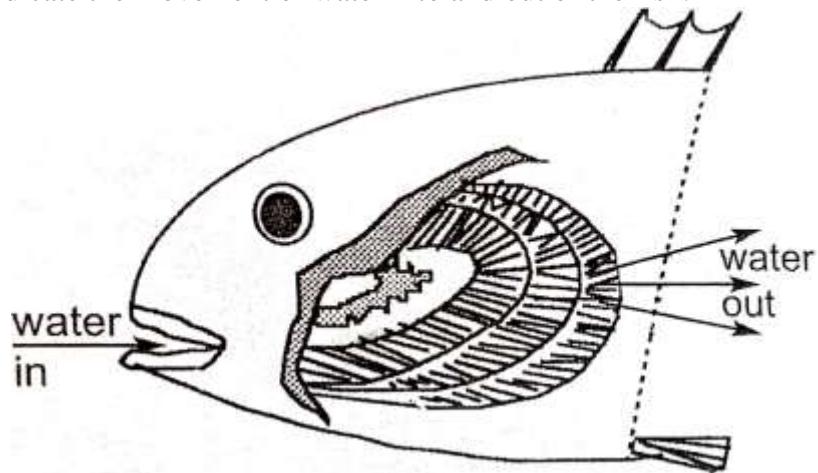


Figure 1

- a. One function of the bronchus is to filter air passing through it. Looking at **figure 1**, give **two** ways by which the bronchus carries out this function. **(2 marks)**
 - b. What is cell differentiation? **(1 mark)**
 - c. How is the bronchus kept open to allow air to enter and leave the lung? **(2 marks)**
(1990, I)
2. a. Study the following equations representing two types of respiration.
- A. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 2830Kj$
 - B. $C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_5OH + 118Kj$
- (i) Write down **two** differences that you can notice between these two equations. **(2 marks)**
 - (ii) Name the type of respiration represented by **B**. **(1 mark)**
 - (iii) Which of these **two** types of respiration **A** and **B** is more efficient? **(1 mark)**
 - (iv) Give a reason for your answer to a. (iii). **(1 mark)**
- b. Where in the cells does the process represented by the two equations take place? **(1 mark)**
(1991, I)
3. About 75% of the air in mammal's lung is tidal air which is constantly changed by breathing. Gases to and from the lung lining are diffused through the 25% of the residual air.
- a. List in order; all the parts through which tidal air passes. **(4 marks)**
 - b. Describe **two** ways in which the diffusion of carbon dioxide in the lungs is facilitated. **(2 marks)**
 - c. Describe the mechanism of inhalation in a mammal. **(4 marks)**
 - d. How is the diffusion of oxygen in a fish improved by the structure of the gill? **(2 marks)**
(1995, II)
4. a. Explain how medulla oblongata regulates breathing in the human body. **(5 marks)**
- b. Explain how inhalation occurs. **(5 marks)**
(2015, I)

5. **Figure 2** is a diagram of a head of a fish with one operculum removed to expose the gills. The arrows indicate the movement of water into and out of the fish.



- (i) What might be the difference in carbon dioxide concentration between the water entering and the water leaving the fish? **(1 mark)**
(ii) What is the cause of the difference stated in a. (i)? **(1 mark)**
- Apart from the exchange of gases, state **two** other functions of the water entering the fish. **(2 marks)**
- The gills are respiratory organs of a fish. State any **three** features which make the gills suitable for the function they perform. **(3 marks)**
(1991, II)

6. **Figure 3** is a diagram showing gaseous exchange in the alveolus

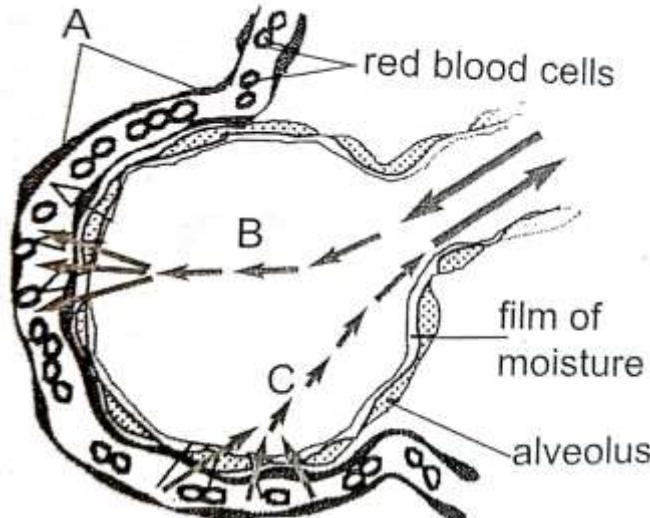
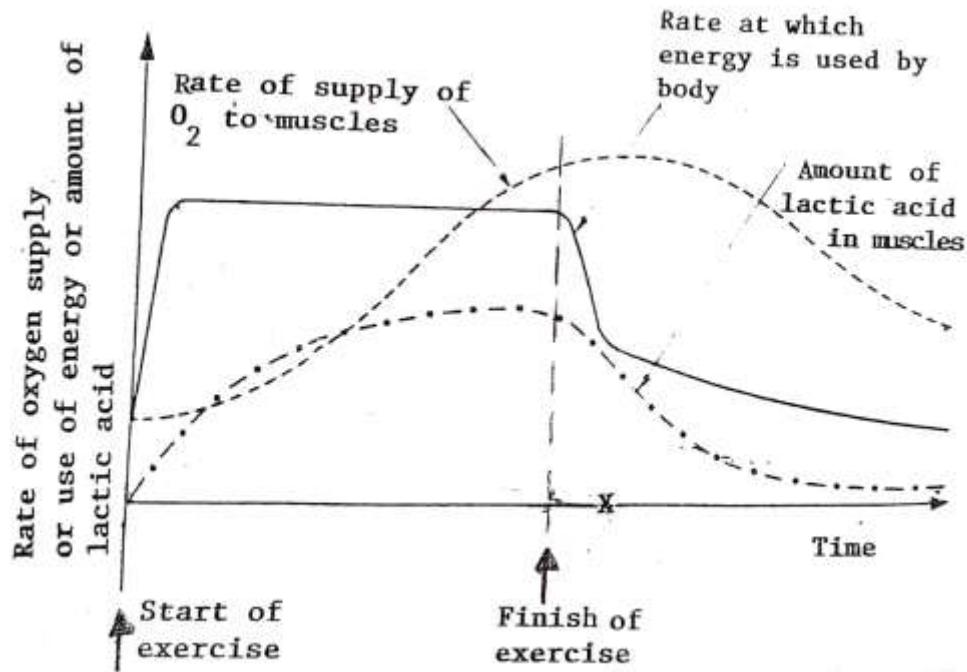


Figure 3

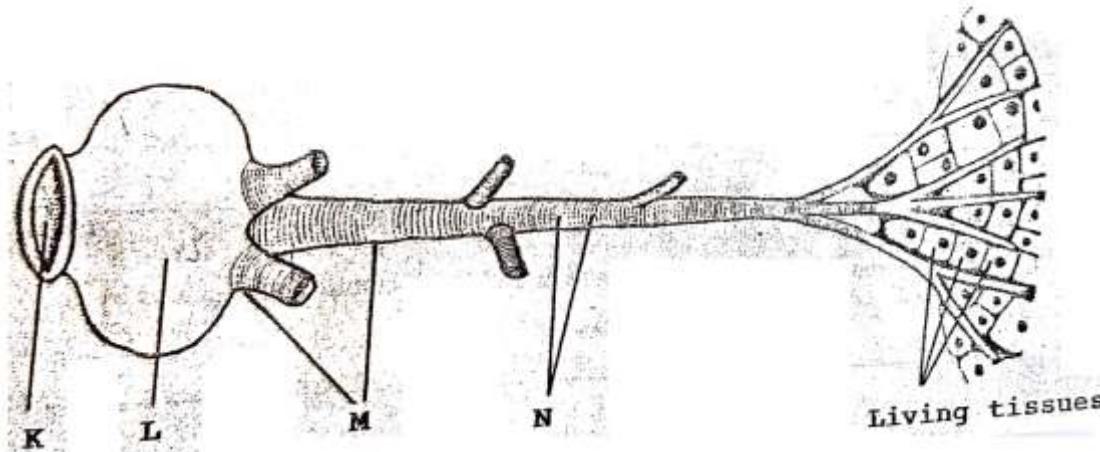
- Label **A**, **gas B** and **gas C**. **(3 marks)**
- How is the diffusion gradient for **gas B** maintained in the alveolus? **(3 marks)**
- Suggest a possible function of the thin film of moisture on the lining of the alveolus. **(1 mark)**
- Give **three** differences between the air entering and the air leaving the alveolus. **(3 marks)**
(1992, I)

7. **Figure 4** is a graph showing corresponding changes in the amount of lactic acid, the rate of oxygen supply and the rate of energy use, during and after exercise.



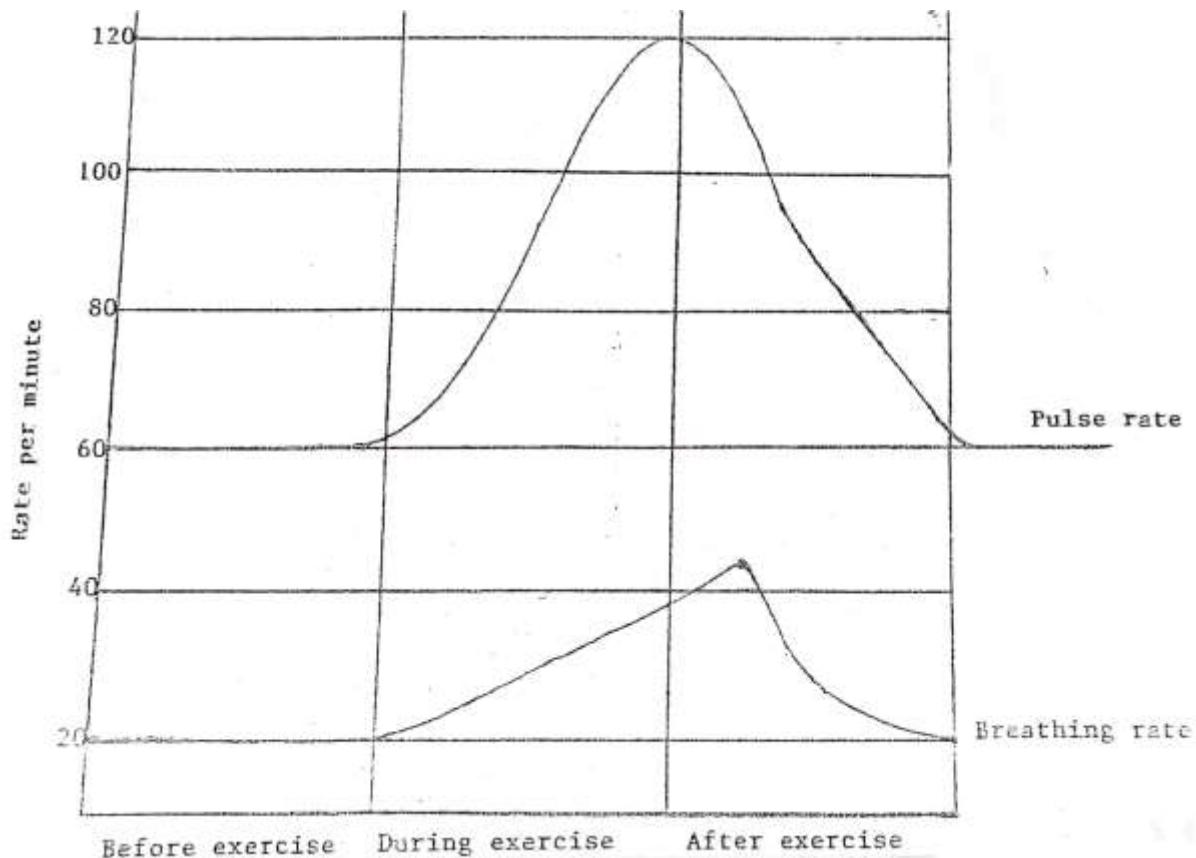
- Describe the rate at which energy is used by the body from the start of the exercise to the point marked X. (3 marks)
- What is the source of energy released during muscular activity? (1 mark)
- What causes muscle fatigue during strenuous exercise? (1 mark)
- Describe what happens to the rate of supply of oxygen to muscles after the exercise has finished. (3 marks)
- Explain why the amount of lactic acid in the muscles decreases after the exercise has finished. (2 marks) (1994, I)

8. **Figure 7** is a diagram showing part of respiratory system of an insect.



- Name the parts labelled K and M. (2 marks)
- State the functions of the structures labelled L and N. (2 marks)
- Explain how oxygen reaches the tissue cells after entering the spiracle. (2 marks)
- Suggest a reason why the blood of insects lacks haemoglobin. (1 mark) (1996, II)

9. **Figure 5** shows graphs of the effect of exercise on breathing rate and pulse rate of a 16 year old athlete.



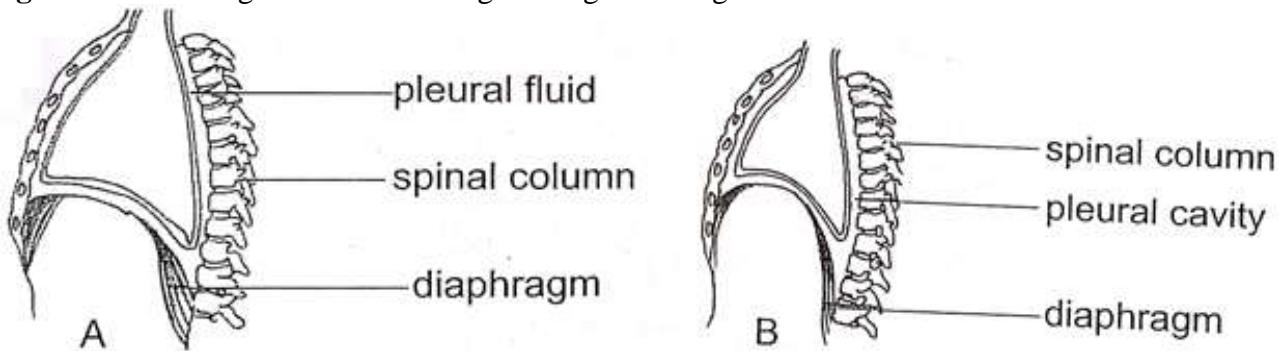
- a. From the graph.
 - (i) What is the maximum breathing rate? **(1 mark)**
 - (ii) How many times is the maximum pulse rate greater than the pulse rate before the exercise? **(2 marks)**
- b. How is pulse rate measured? **(1 mark)**
- c. Why does the pulse rate increase with exercise? **(1 mark)**
- d. In addition to exercise, state **one** other factor which affect pulse rate. **(1 mark)**
(1994, II)

10. **Table 1** shows the percentage volume composition of inhaled and exhaled air in the lungs.

| Gas | Inhaled Air | Exhaled Air |
|----------------|-------------|-------------|
| Oxygen | 20.50 | 16.50 |
| Carbon dioxide | 0.04 | 4.00 |
| Nitrogen | 79.46 | 79.50 |

- a. From the table, what evidence suggests that the lung is very efficient in the excretion of carbon dioxide? **(1 mark)**
- b. What percentage of total inhaled oxygen does the body use? Show your working. **(2 marks)**
- c. The difference in the nitrogen content between inhaled and exhaled air is very small. How do you explain this? **(2 marks)**
(1998, II)

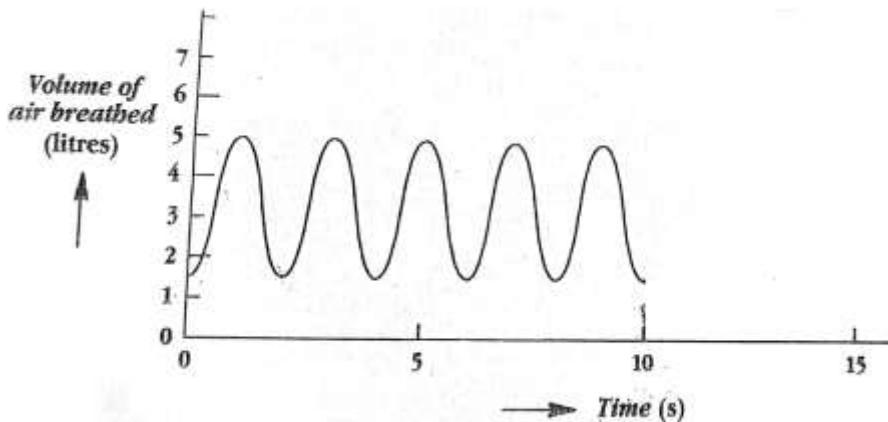
11. Figure 8 shows diagrams of the rib cage during breathing.



- a. (i) Which diagram shows expiration? (1 mark)
 (ii) Give a reason for your answer in a. (i). (1 mark)
 - b. Using arrows, show the movement of the chest wall during inspiration. (1 mark)
 - c. Explain why there is always about 1.5 litres of residual air in the lungs during expiration. (1 mark)
 - d. Which gas is responsible for the change in the breathing rate? (1 mark)
 - e. Which part of the brain is stimulated by the increase in the level of the gas named in 9. d. above? (1 mark)
 (1997, I)
12. a. Describe the sequence of events, which lead to the intake of water into the mouth of a fish during breathing. (5 marks)
- b. What is the importance of respiration to fish? (2 marks)
- c. Write a balanced chemical equation, which represents aerobic respiration. (2 marks)
 (1997, II)
13. a. Briefly explain why a person breathes faster and deeper soon after heavy exercise. (2 marks)
- b. What substance in the body initiates the rate of breathing in a person? (1 mark)
 (1999, I)
14. a. Mention any two effects of smoking on human health. (2 marks)
- b. State any two effects of exercise on breathing. (2 marks)
- c. Mention any two adaptations of alveoli to their function. (2 marks)
 (2012, I)
15. a. State three differences between aerobic and anaerobic respiration. (3 marks)
- b. Why does anaerobic occur in muscles of mammals during vigorous exercise? (2 marks)
 (2000, I)
16. a. Where does gaseous take place in fish? (1 mark)
- b. Why should the volume of mouth cavity and pharynx be increased in fish during inhalation? (2 marks)
- a. Give two adaptations of the respiratory surface in fish. (2 marks)
- b. Give a reason why fish die when taken out of water. (1 mark)
 (2016, I)
17. a. Name any two respiratory diseases. (2 marks)
- b. Explain any two adaptations of the alveolus for gas exchange. (4 marks)
 (2019, I)

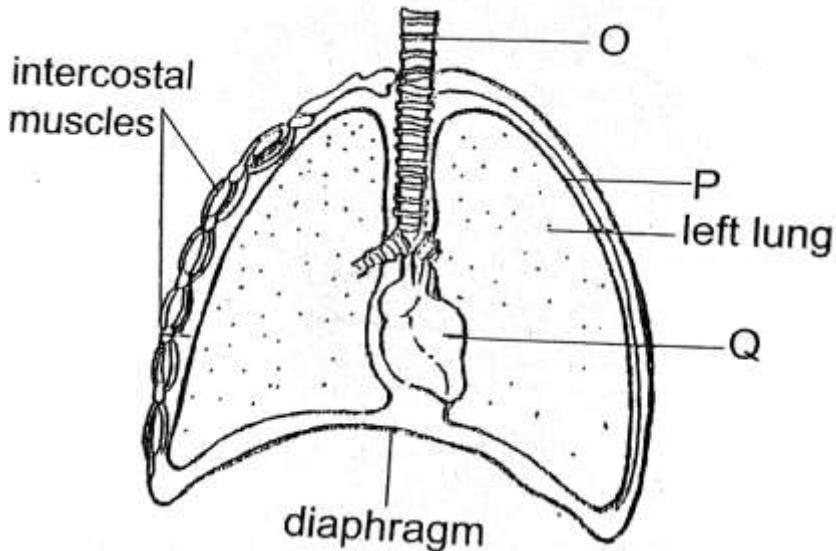
18. a. State **two** properties of an effective and efficient gaseous exchange surface. **(2 marks)**

- b. **Figure 9** is a graph showing changes in the volume of air breathed by a person soon after exercise. Use it to answer the questions that follow.



- (i) Calculate the number of breaths the person takes per minute. Show your working. **(2 marks)**
- (ii) What volume of air remains in the lungs? **(1 mark)**
- (iii) How much air is exchanged per breath? **(2 marks)**
- (iv) Calculate the volume of air that is exhaled in one minute. Show your working. **(2 marks)**
(1999, II)

19. **Figure 10** is a diagram showing the rib cage cut open to show the internal structures.



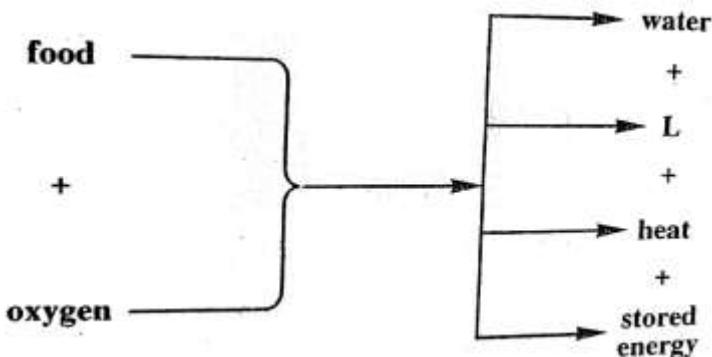
- a. Name the parts marked **O** and **Q**. **(2 marks)**
- b. (i) Name the liquid found in the region marked **P**. **(1 mark)**
(ii) What role is played by the fluid in b. (i)? **(1 mark)**
- c. State the role played by each of the following structures during inspiration.
(i) Diaphragm **(3 marks)**
(ii) Intercostal muscles **(3 marks)**
(2002, II)

20. In an experiment, five petri dishes with nutrient agar were sterilized and then exposed to air in the laboratory for 30 minutes, after which they were placed in areas of different temperatures. **Table 2** shows the results of the experiment after 2 days.

| Dish | Temperature | Number of colonies of Bacteria |
|------|----------------------------|--------------------------------|
| 1 | Freezer (below 0°C) | 0 |
| 2 | Refrigerator (3-5°C) | 5 |
| 3 | Room temperature (20-25°C) | 15 |
| 4 | In an incubator (37°C) | 30 |
| 5 | In an oven (130°C) | 0 |

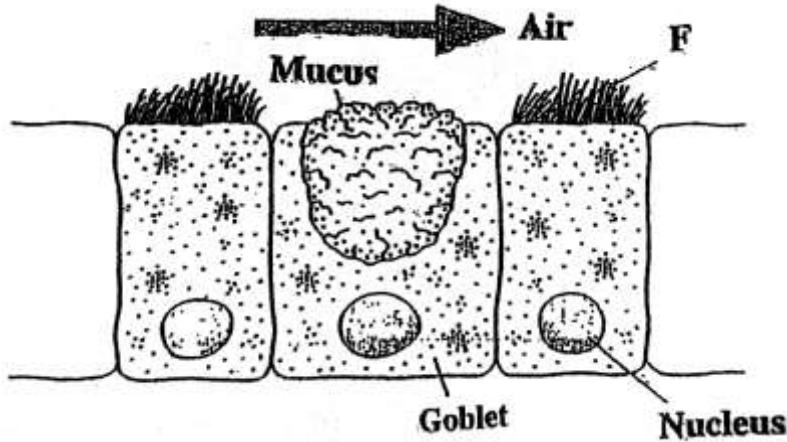
- a. What was the aim of the experiment? (1 mark)
 b. At what temperature did the bacteria grow most rapidly? (1 mark) (2003, I)

21. **Figure 11** is a diagram showing a summary of the process of respiration.



- a. Name the product represented by the letter L. (1 mark)
 b. (i) What of respiration is shown in **figure 11**? (1 mark)
 (ii) Give a reason for your answer to b. (i). (1 mark)
 c. State any two ways in which the stored energy may be used. (2 marks) (2005, I)

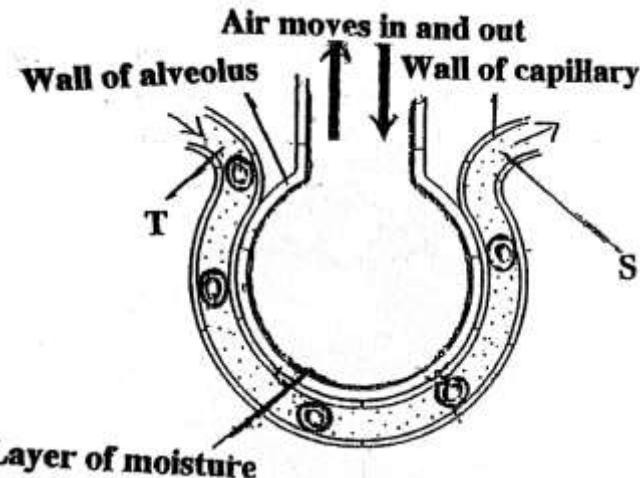
22. **Figure 13** shows part of the lining of the trachea. Use it to answer the questions that follow.



- a. Name the parts marked F. (1 mark)

- b. What is the function of each of the following? (1 mark)
 (i) Mucus released by the goblet cell (1 mark)
 (ii) Pleural fluid (1 mark)
- c. Explain how the trachea is kept open during breathing. (2 marks) (2009, I)

23. **Figure 14** is a diagram of an alveolus surrounded by a blood capillary.



- a. To which chamber of the heart does blood flow from point S? (1 mark)
 b. Explain why there is a difference in the amounts of oxygen in the blood between points T and S. (2 marks)
 c. Explain the role of the thin layer of moisture in the alveolus. (2 marks) (2009, I)

24. **Figure 15** shows the respiratory structure of an insect. Use it to answer the questions that follow.

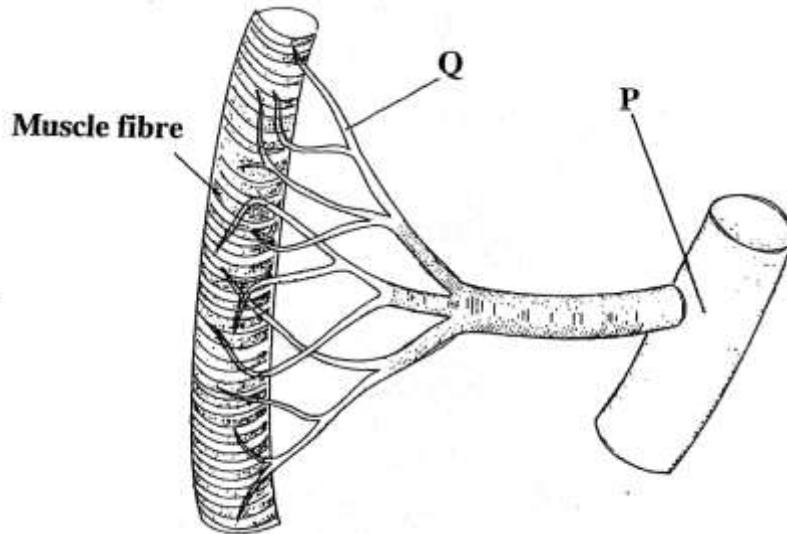
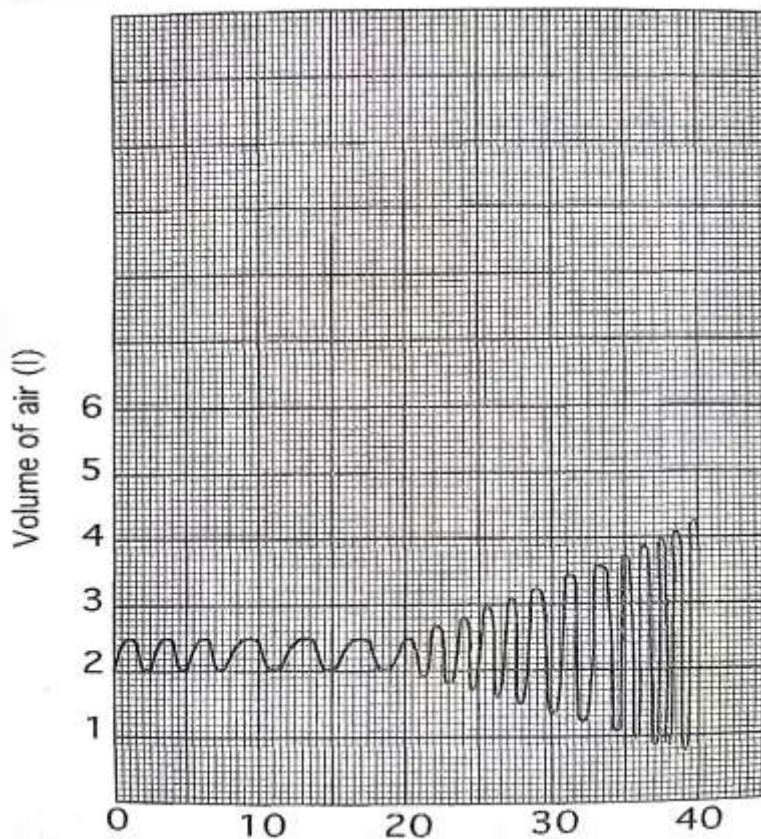


Figure 15

- a. Name the part marked P. (1 mark)
 b. State one adaptation of the part marked Q to its function. (1 mark)
 c. Explain how oxygen moves from part marked Q to the muscle fibre. (2 marks) (2010, I)

25. **Figure 12** shows volume of air in the lungs of a child at rest to the start of an exercise.



- At what time does the child start the exercise? **(1 mark)**
- What is the maximum volume of air inspired during the exercise? **(1 mark)**
- Calculate the number of breaths per minute
 - At rest **(2 marks)**
 - After exercise **(2 marks)**
- Explain why there is an increased breathing rate between 20-40 seconds? **(2 marks)**
(2007, I)

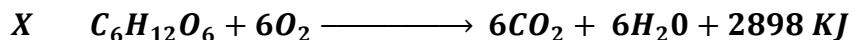
26. **Figure 16** is a diagram of a fish gill. Use it to answer the questions that follow.



- Name the part marked **T**. **(1 mark)**
- What is the function of part marked **R**? **(1 mark)**
- Give any **two** adaptations of part marked **S** to its function. **(2 marks)**
(2013, I)

27. Give any **two** differences between aerobic and anaerobic respiration. (2 marks)
(2015, I)

28. **Figure 17** shows chemical equations for two types of respiration in human beings.



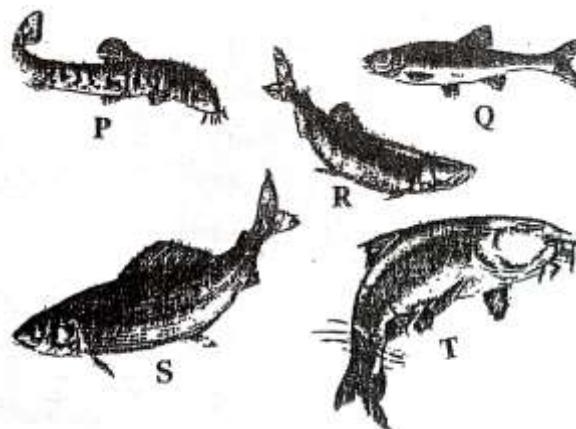
- c. (i) Give any **two** differences between **X** and **Y**. (2 marks)
(ii) Mention **one** similarity between **X** and **Y**. (1 mark)
d. Explain why a person left in a poor ventilated room breathe at a faster rate. (5 marks)
(2016, I)

29. a. Give any **one** importance of gaseous exchange in living organisms. (1 mark)
b. Explain the reason for increase in volume of chest cavity during inhalation. (2 marks)
c. State **two** causes of the increase in volume of the human chest cavity. (2 marks)
(2017, I)

30. a. State **two** food nutrients that provide energy to the body. (2 marks)
b. Describe how medulla oblongata regulates breathing rate in humans. (5 marks)

(2020, I Leaked Paper)

31. **Figure 18** represent five different types of fish. Use the key provided to identify the fish.



Key:

1. Tail fin undivided.....Noemacheilus barbatulus
Tail fin divided.....See 2

2. Tail fin evenly divided.....Phoxinus phoxinus
Tail fin unevenly divided.....See 3

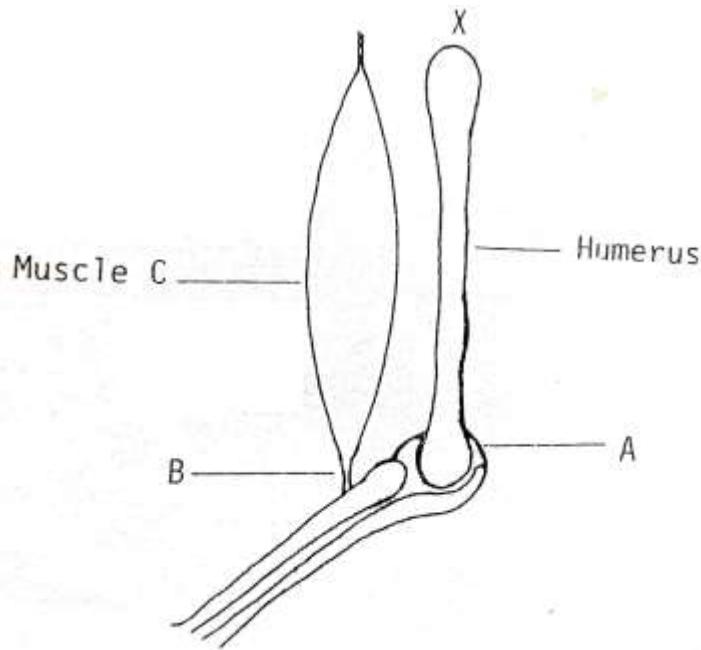
3. Has barbels (fleshy extensions)
at corner of mouth.....Barbus barbus
Has no barbels at corner of mouth.....See 4

4. Has prominent dorsal fins.....Thymallus thymallus
Has less prominent dorsal fins.....Osmerus esmerlamus

- a. Write down the name of the fish represented by each letter. (5 marks)
b. Name the structure used for gaseous exchange in organism **T**. (1 mark)

(2009, II Practical)

1. **Figure 1** is a diagram of part of the human upper limb.

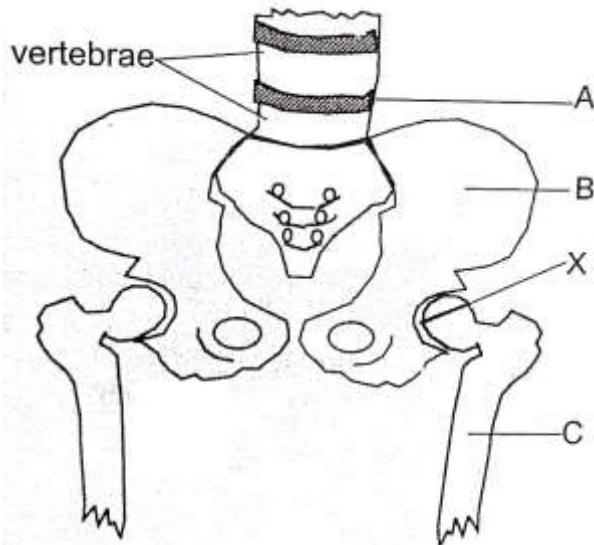


- a. The human skeleton is divided into two main parts. To which of the parts do the bones in **figure 1** belong? (1 mark)
 - b. (i) Name the parts labelled **B** and **C**. (2 marks)
(ii) What is the difference in function between structures **B** and **C**? (1 mark)
 - c. What bone makes a joint with the humerus at **X**? (1 mark)
 - d. Name **two** other bones in the human body which make a joint similar to that at **X** in **figure 1**. (2 marks)
 - e. Name the muscle that relaxes when muscle **A** contracts. (1 mark)
 - f. What general term is given to muscles which work in pairs to bring about movement? (1 mark)
 - g. Apart from structural differences, mention **one** other difference between muscle **A** in **figure 1** and the cardiac muscle. (1 mark)
- (1990, I)
2. Unlike mammals, arthropods have an exoskeleton.
 - a. Name **two** disadvantages of an exoskeleton to arthropods. (2 marks)
 - b. In what **two** ways is the structure of a bone different from that of the exoskeleton tissue?

| | Bone: | Exoskeleton tissue: |
|----|--------------|----------------------------|
| 1. | | |
| 2. | | |

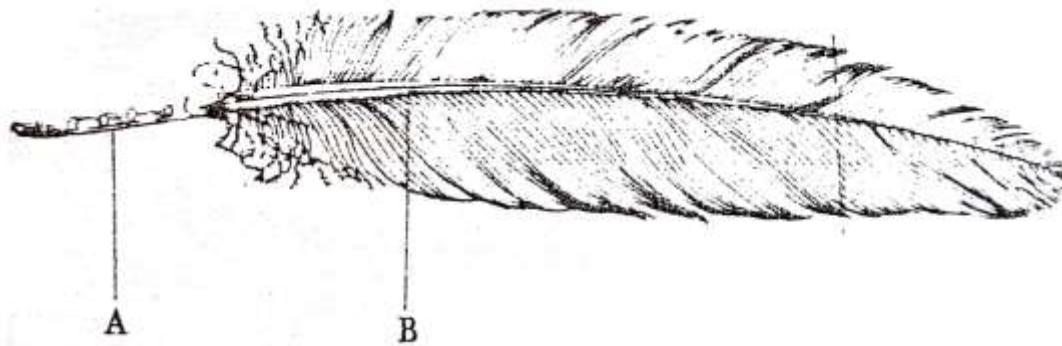
(2 marks)
(1992, II)

3. **Figure 2** is a drawing of part of the human skeleton.



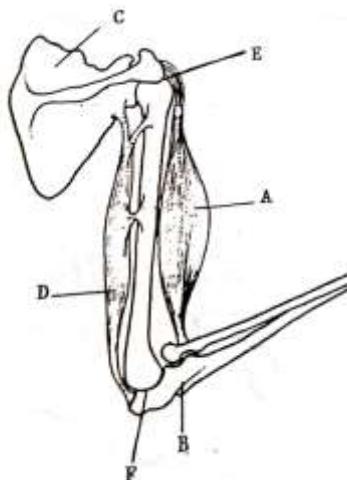
- Name the parts labelled **A**, **B** and **C**. (3 marks)
 - What property does the part labelled **A** have which makes it suitable for the position it occupies. (1 mark)
 - Apart from support, give **two** other functions of the skeleton. (2 marks)
 - Name the type of joint formed between structures **B** and **C** at **X**. (1 mark)
- (1991, I)

4. **Figure 3** is a diagram of a feather.

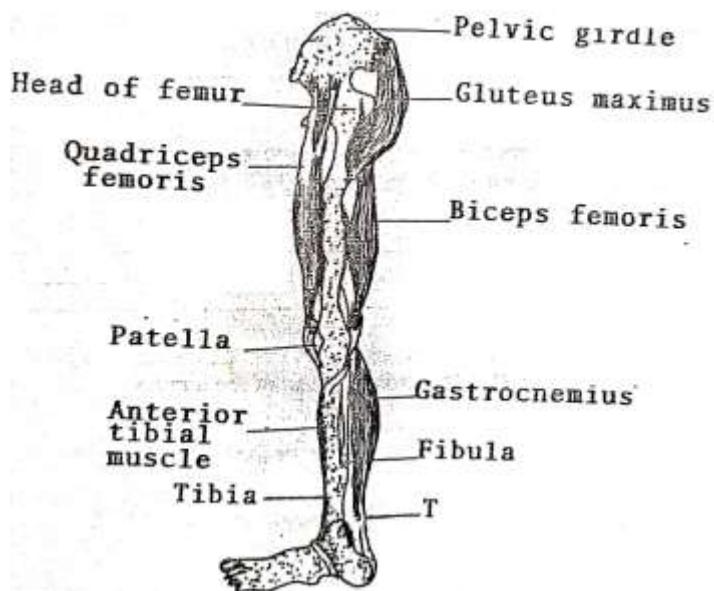


- Name the parts labelled **A** and **B**. (2 marks)
 - What type of feather is shown in **figure 3**? (1 mark)
 - Give **two** ways in which a bird's wing is adapted for flying. (2 marks)
 - One of the forces which a bird experiences during flight is drag.
 - Explain how drag is caused. (2 marks)
 - State how a bird overcomes the drag during flight. (1 mark)
- (1993, I)
5. a. Flying birds have to maintain an exceptionally high body temperature because flying birds demands a considerable amount of energy. Explain **one** physiological and **one** structural way, which help the birds to maintain high body temperature. (4 marks)
- b. Each wing-beat of a bird comprises a downward-stroke and an upward stroke.
 - Which stroke provides lift and forward thrust to the bird? (1 mark)
 - What happens to the wing, and to the wing feathers during the stroke mentioned in b(i)? (2 marks)
- (1999, I)

6. **Figure 4** is a diagram of part of a human forearm.

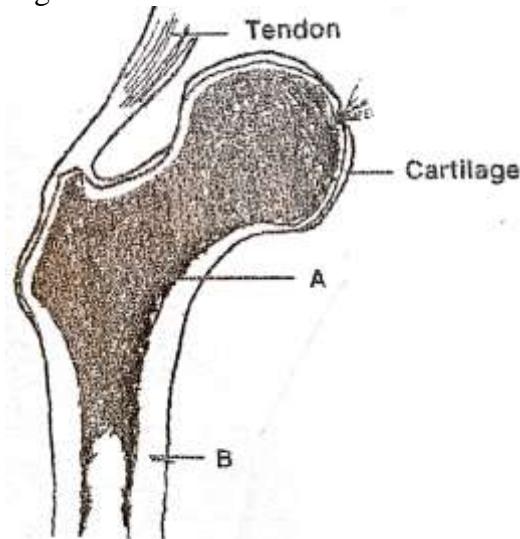


- a. Name the parts labelled **A**, **B** and **C**. (3 marks)
 - b. What type of joint is found at **E**? (1 mark)
 - c. How do parts labelled **A** and **D** bring about movement of the arm? (2 marks)
 - d. Name the fluid found at **F**. (1 mark)
 - e. State the function of the fluid at **F**. (1 mark)
 - f. Name the disease that affects joints. (1 mark)
(1994, I)
7. **Figure 5** is a diagram showing muscles which cause movement in human leg.



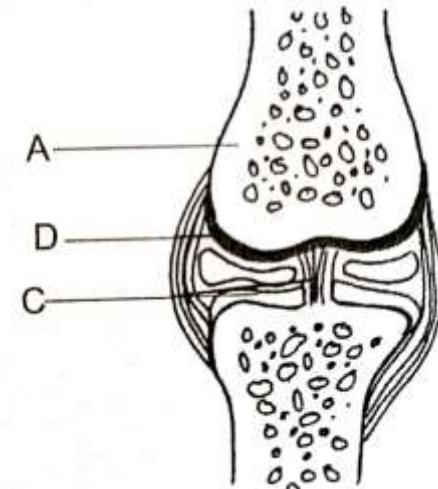
- a. Which muscle must contract to:
 - (i) Bend the leg from the position shown in **figure 5**? (1 mark)
 - (ii) Move the foot upwards? (1 mark)
- b. From **figure 5**, name **two** muscles which are acting as extensors. (2 marks)
- c. Suggest a reason why the gastrocnemius muscle is much larger than the anterior tibia muscle. (1 mark)
- d. (i) Name the structure labelled **T**. (1 mark)
 - (ii) Suppose structure marked **T** was damaged or torn, how would this affect the movement of the foot? (1 mark)**(1996, I)**

8. **Figure 6** is a section through the head of femur bone.



- a. Name structures marked **A** and **B**. (2 marks)
- b. What is the function of
 - (i) the structure marked **A**? (1 mark)
 - (ii) the tendon? (1 mark)
- c. (i) In which part of the bones is calcium deposited? (1 mark)
(ii) What is the effect of calcium deficiency on the bones? (1 mark)
- d. What type of joint is found between femur and pelvis? (1 mark)
(1996, I)

9. **Figure 7** is a diagram of a typical movable joint.

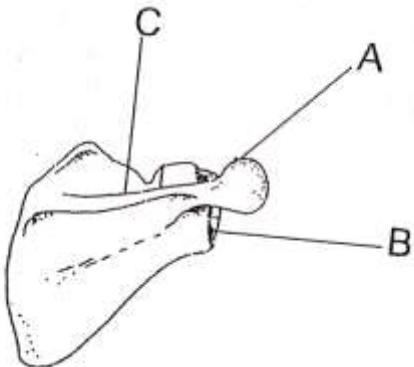


- a. (i) Name the structures **C** and **D**. (2 marks)
(ii) One of the functions of structure **D** is to prevent shock at the joint. What property does it have which enables it to carry out this function? (1 mark)
(iii) What property has the synovial fluid, which enables it to perform its function at the joint? (1 mark)
- b. How is part **A** of the bone adapted to be able to withstand the stresses exerted by muscles as they contract and pull the bone? (1 mark)
(1997, I)

10. a. What type of muscles cover bones?

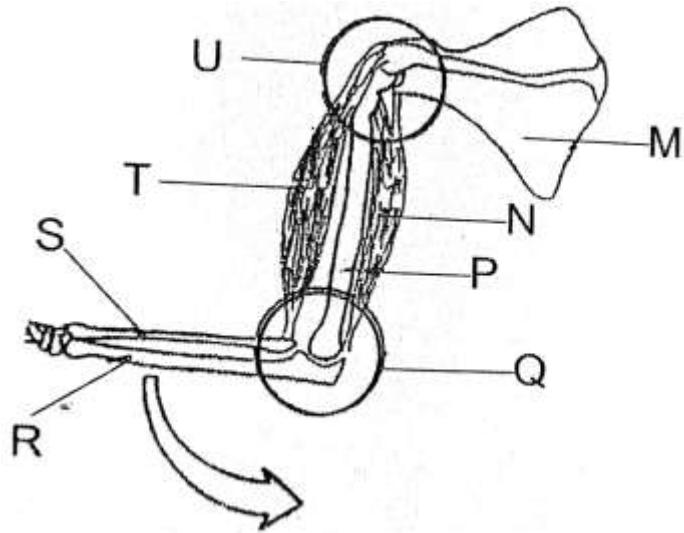
(1 mark)

b. **Figure 8** is a diagram showing a human bone.



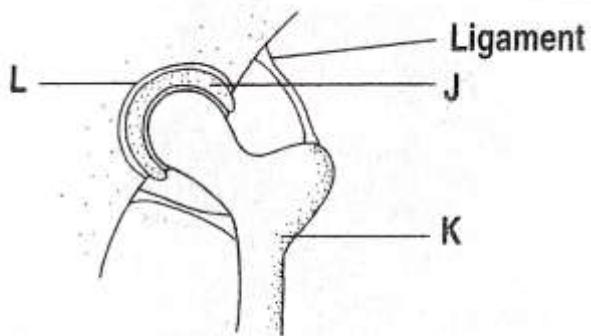
- (i) Name the bone. (1 mark)
(ii) What is the function of the part marked C? (1 mark)
(iii) Name **two** bones that articulate with this bone at places marked A and B. (2 marks)
(1997, II)

11. **Figure 9** is a diagram showing muscles and bones of a human arm. Use it to answer questions that follow.



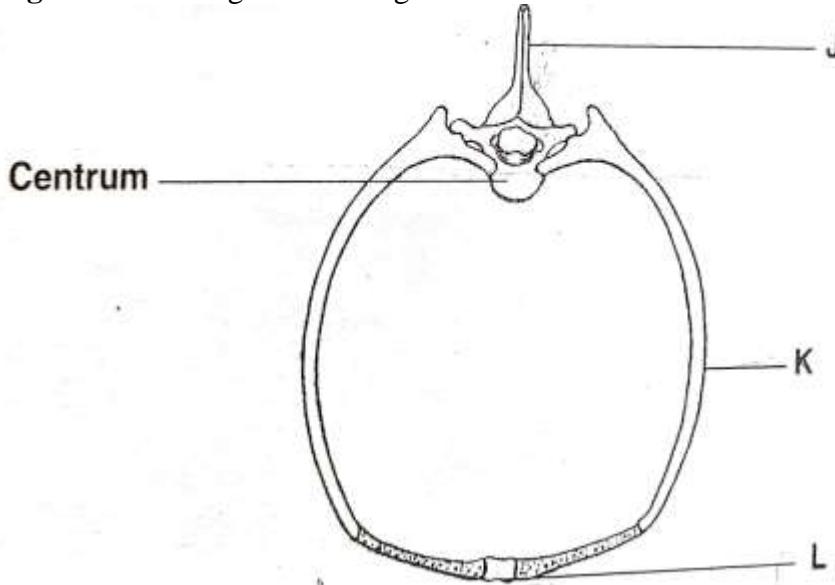
- a. Name the bone labelled P and S. (2 marks)
b. Describe the type of movement possible at joint Q. (1 mark)
c. How is the shape of the bones at joint U related to the movement it can perform? (3 marks)
d. Which muscle is relaxed when the lower arm moves in the direction of the arrow? (1 mark)
e. What name is given to a pair of muscles at a joint arranged in such a way as to bring about opposite movement? (1 mark)
(2001, II)
12. a. Give one example of antagonistic muscles in a human body. (1 mark)
b. Mention **two** structures in a human body which contain involuntary muscles (2 marks)
(1998, I)

13. **Figure 10** is a diagram showing a section of a ball and socket joint in the human hip.



- Name the parts marked **J**, **K** and **L**. (3 marks)
 - What is the function of **J**? (1 mark)
 - Long bones like **K** have to resist considerable forces and at the same time be light so that muscles can move them quickly. Looking at the structure of the long bones, how is this possible? (2 marks)
- (2002, I)**

14. **Figure 11** is a diagram showing a human vertebra and its associated structures.



- Name the structures marked **J** and **L**. (2 marks)
 - Name **two** organs that are protected by the structure marked **K**. (2 marks)
- (2002, II)**

15. a. Name **one** locomotory structures in

- Bird
- Fish

b. State **two** adaptations for locomotion common in both birds and fish.

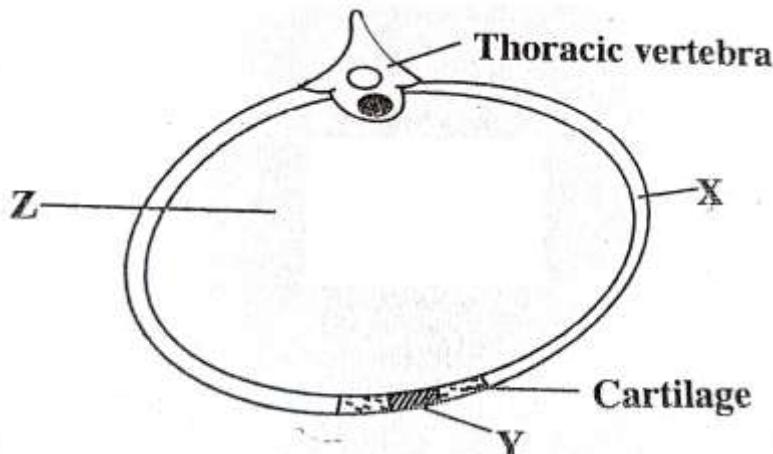
(1 mark)
(1 mark)
(2 marks)
(2004, I)

16. What is the advantage of the following in locomotion?

- Overlapping of scales in fish
- Hollow bones in birds

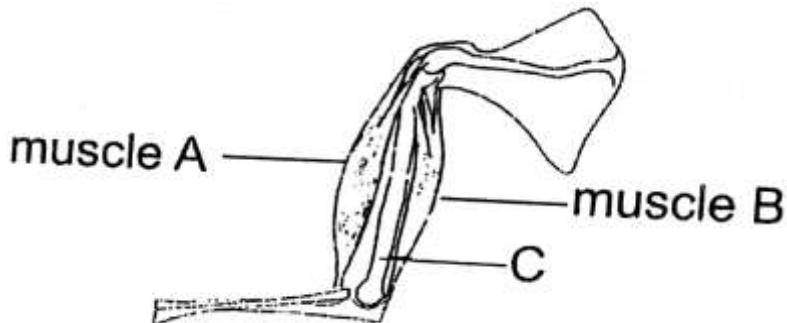
(1 mark)
(1 mark)
(2005, I)

17. Figure 13 shows a cross-section of the thorax. Use it to answer the questions that follow.



- Name the parts marked **X** and **Y**. (2 marks)
 - State any **one** vital organ found in the cavity marked **Z**. (1 mark)
 - Give any **one** region within the cavity marked **Z** where lymph is found. (1 mark)
- (2008, I)**

18. Figure 12 is a diagram showing antagonistic muscles of the arm.



- (i) What is the name of muscle **A**? (1 mark)
(ii) Name the part marked **C**. (1 mark)
 - How does contraction of muscle **B** affect the arm? (1 mark)
 - State **two** physical changes that occur in muscle **A** when contracted. (2 marks)
- (2006, I)**

19. Flight in birds involves an upward beat and a downward beat of the wings.

- Which **one** of the two is a recovery stroke? (1 mark)
 - Explain the significance of each of the following during downward beat of the wing:
 - Spreading of the wing (3 marks)
 - Overlapping of the wing feathers. (3 marks)
- (2008, I)**

20. a. What are antagonistic muscles?

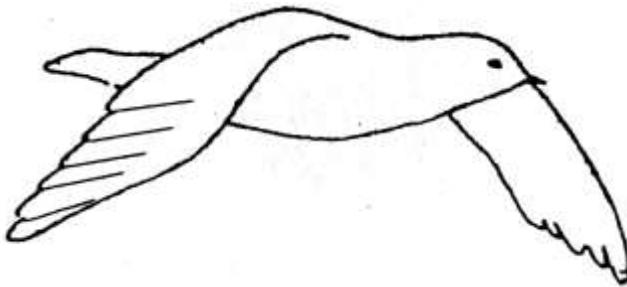
- Apart from antagonistic muscles name any **two** types of muscles and places where they are found in the body.

| Type of Muscle | Place where it is found |
|----------------|-------------------------|
| | |
| | |

(4 marks)

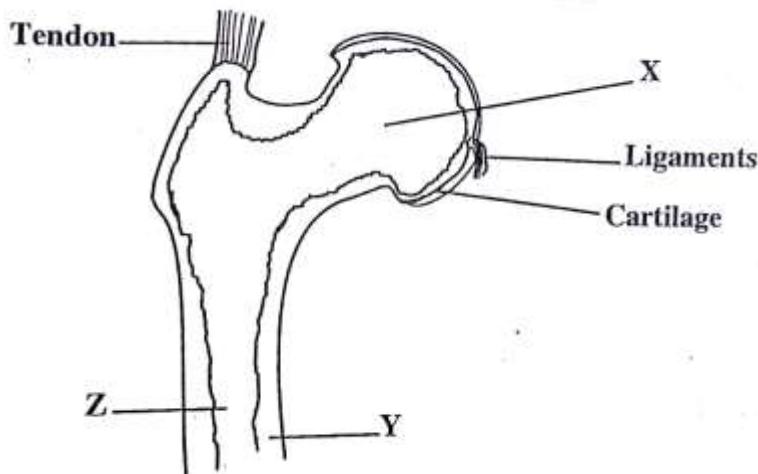
- c. Name any **two** bones which make up the axial skeleton of the human beings. **(2 marks)**
d. In which part of the human skeleton are the following joints found?
(i) Ball and socket **(1 mark)**
(ii) Suture **(1 mark)**
e. Name **two** nutrients which must be available in human diet in order to prevent the occurrence of rickets in children. **(2 marks)**
(2000, II)

21. **Figure 14** shows a bird in flight. Use it to answer the questions that follow.



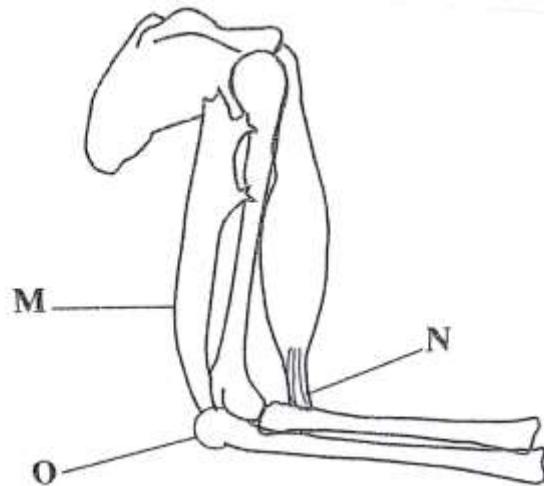
- a. (i) Identify the stroke shown by bird. **(1 mark)**
(ii) Explain how the stroke named in 21a. (i) occurs. **(2 marks)**
b. Explain how the shape of the wing helps to generate lift in the bird. **(2 marks)**
(2010, I)

22. **Figure 15** shows the structure of a bone. Use it to answer the questions that follow.



- a. Name the parts marked **X** and **Y**. **(2 marks)**
b. State the function of part marked **Z**. **(1 mark)**
(2013, I)
- 23.** a. State any **two** types of skeletons. **(2 marks)**
b. Why do insects moult? **(1 mark)**
c. State any one function of cartilage. **(1 mark)**
(2017, I)
- 24.** a. Give two causes of drag when fish is moving in water. **(2 marks)**
b. Explain any one way in which the swim bladder controls depth of swimming in fish **(3 marks)**
c. (i) State **two** uses of the paired fins in fish when swimming. **(2 marks)**
(ii) Explain **two** ways in which the caudal fin helps the fish to move forward. **(4 marks)**
(2016, I)

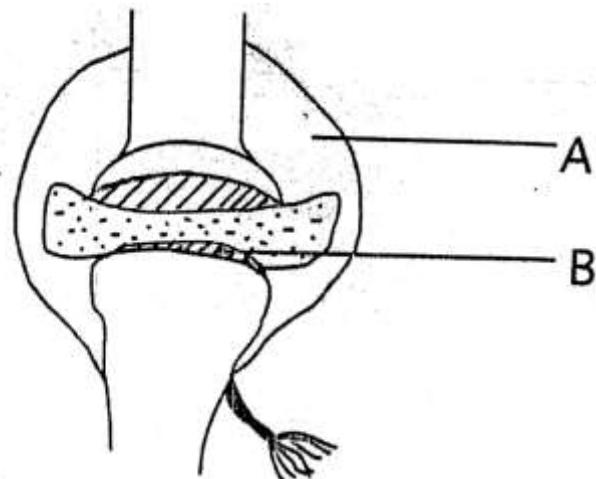
25. Figure 16 shows muscles and joints of the human arm.



- Name the parts marked **M** and **N**. (2 marks)
- State one adaptation of the part marked **N** to its function. (1 mark)
- What type of a joint is found at **O**? (1 mark)
- Explain how bending of the lower arm occurs. (3 marks)

(2015, I)

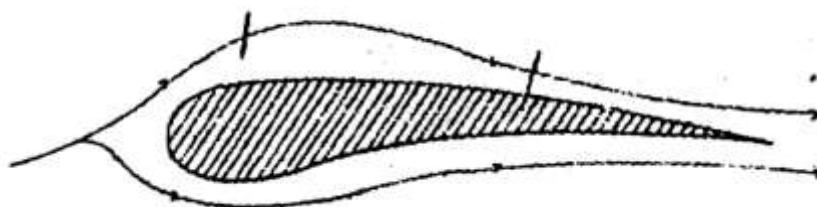
26. Figure 17 is a diagram showing a joint. Use it to answer the questions that follow.



- Give the function of **A** and **B**. (2 marks)
- What type of movable joint is shown in the above diagram? (1 mark)

(2007, I Leaked Paper)

27. Figure 18 is a diagram showing a cross section of a bird wing.



- Explain **two** ways in which this shape of the wing helps the bird to fly efficiently. (4 marks)
- (i) What happens to the wing feathers during up stroke? (1 mark)
- (ii) Give a reason for your answer in **b. (i)** (2 marks)

- c. Give **two** ways in which birds overcome gravitational force. **(2 marks)**
d. During which stroke does the bird gain height? **(1 mark)**

(2017, I)

- 28.** Explain any **three** adaptations of birds for locomotion. **(6 marks)**

(2019, I)

- 29.** a. Give any **two** functions of bones in a human body. **(2 marks)**

- b. Name the type of muscles to which the biceps muscles belong. **(1 mark)**

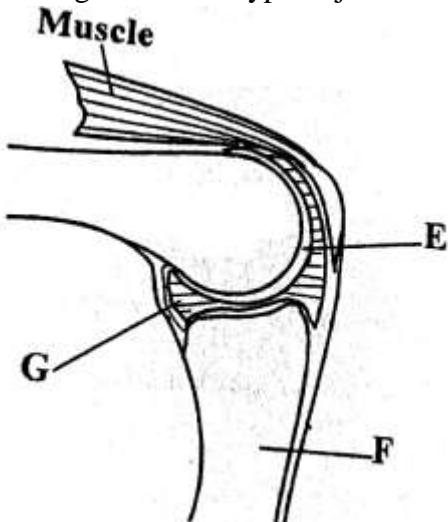
- c. State any **two** differences between muscles of the heart and triceps muscles. **(2 marks)**

(2019, I)

- 30.** Explain any **three** adaptations of fish for locomotion. **(6 marks)**

(2020, I Leaked Paper)

- 31.** a. **Figure 19** is a diagram showing a movable type of joint.



- (i) Name the parts labelled **E** and **F**. **(2 marks)**

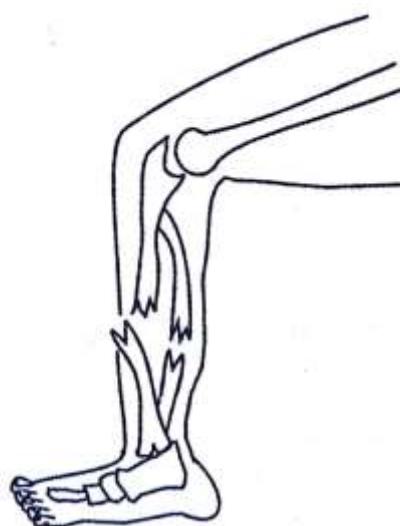
- (ii) What is the function of the part marked **G**? **(1 mark)**

- b. State any **two** injuries which may occur at a joint. **(2 marks)**

- c. Mention any **one** organ which is protected by the skull. **(2 marks)**

(2020, I Leaked Paper)

- 32.** **Figure 20** is a diagram showing a type of bone injury. Use it to answer the questions that follow.



- a. State the type of injury illustrated in **Figure**. **(1 mark)**

b. Describe the first aid that can be given to a person with the fracture shown in 32. a.

(6 marks)

(2020, I)

33. You are provided with a wing feather of a bird labelled specimen A.

a. Draw specimen A and label any **three** parts. (4 marks)

b. (i) Measure the longest axis of your drawing in millimeters and record your finding. (1 mark)

(ii) Calculate the magnification of your drawing. Show your working. (3 marks)

c. (i) What is the main use of specimen A to a bird? (1 mark)

(ii) State **two** ways in which specimen A is adapted to its function. (2 marks)

(2003, II Practical)

34. You are provided with a small fish.

a. (i) Draw the fish and label any two locomotory structures. (4 marks)

(ii) Calculate the magnification of your drawing. (2 marks)

b. (i) Describe the shape of the fish. (1 mark)

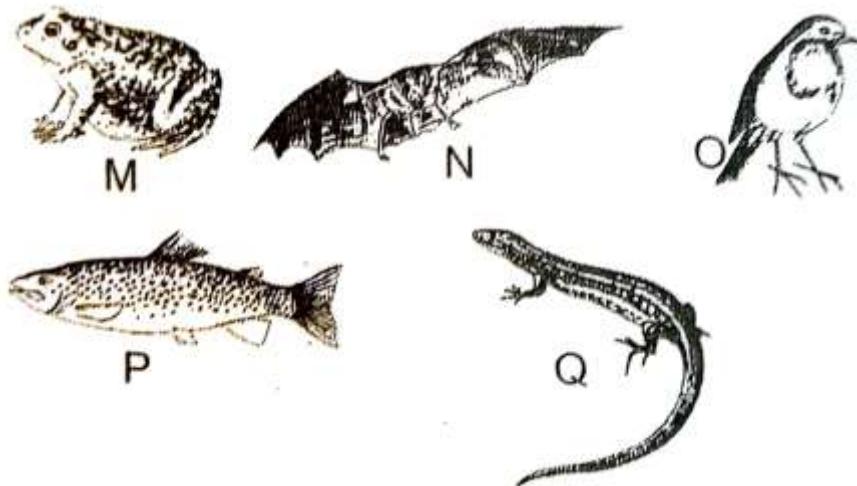
(ii) What is the advantage of this shape to the fish? (1 mark)

c. How does drying preserve the fish (1 marks)

d. State **two** nutrients that human beings get from fish. (2 marks)

(2005, II Practical)

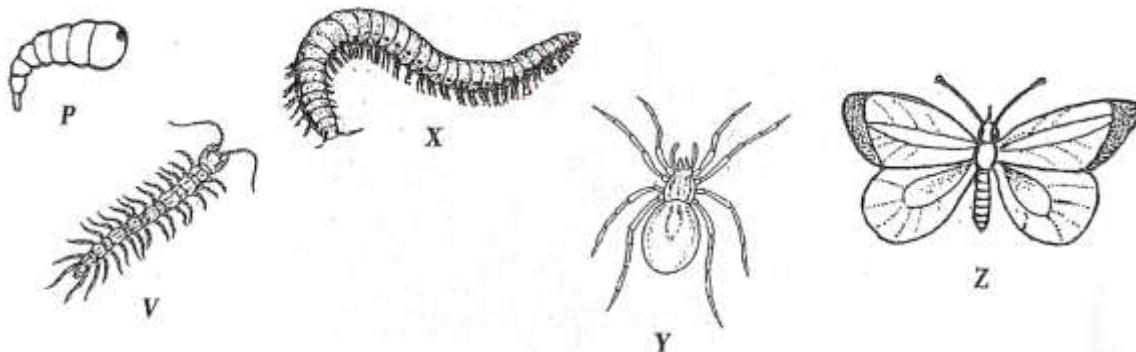
35. Figure 20 shows diagrams of some common animals of the vertebrate group.



- a. Construct a dichotomous key that can be used to identify the above animals. (8 marks)
- b. To which groups of vertebrates do N and Q belong? (2 marks)
- c. State one way in which M and Q differ in their mode of reproduction. (1 mark)
- d. State **one** structural adaptation in P for its mode of locomotion. (1 mark)

(2003, II Practical)

36. Figure 18 shows five invertebrates and a dichotomous key. Use it to answer the questions that follow.



1. Wings absent.....See 2
Wings presentButterfly
 2. Legs present.....See 3
Legs absent.....Larvae
 3. More than eight legs.....See 4
Eight legs present.....Tick
 4. Long antennae.....Centipede
Short antennae.....Millipede
- a. Identify the invertebrates **P, V, X, Y and Z.** **(5 marks)**
 b. What two features are common to organisms in **X** and **V?** **(2 marks)**
 c. (i) Which of the organisms in a. is still in the developmental stages? **(1 mark)**
 (ii) Which of the organisms in a. can transmit diseases in a. can transmit diseases to tamed animals. **(1 mark)**
(2005, II Practical)

37. You are provided with flight feather. Use it to answer the questions that follow.

- a. (i) Draw the feather and label any **three** parts. **(4 mark)**
 (ii) Calculate the magnification of your drawing. Show your working. **(3 marks)**
 b. State **two** adaptations of the feather for flight. **(2 marks)**

(2007, II Practical)

38. **Table 1** shows an increase in length of a grasshopper nymph over a period of time. Use it to answer the questions that follow.

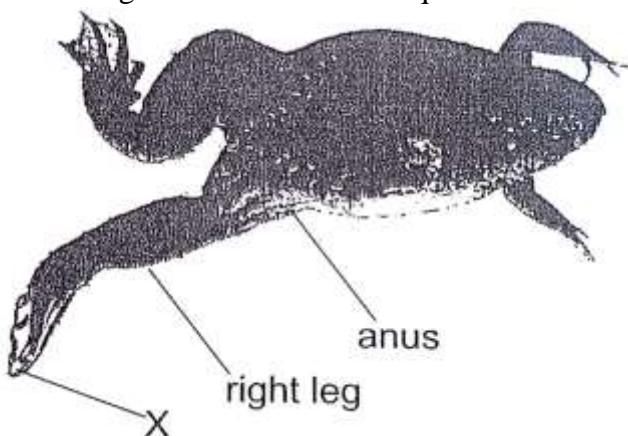
| | | | | | | |
|--------------------------------|---|---|----|----|----|----|
| Number of Days | 1 | 4 | 7 | 10 | 13 | 16 |
| Length of Nymph in (mm) | 8 | 8 | 20 | 20 | 50 | 50 |

- a. Plot graph of length of the nymph against time of growth in days. **(6 marks)**
 b. From the graph:
 (i) Which period had lowest increase in length apart from 0? **(1 mark)**
 (ii) Describe the relationship between the period of growth and length of the nymph. **(2 marks)**

- c. Explain why the grasshopper has this pattern of growth. **(2 marks)**

(2007, II Practical)

- 39.** Figure 19 is a diagram of a frog. Use it to answer the questions that follow.



- If the diagram was made from an actual length of 11 cm from the tip of the head to the anus, calculate its magnification. Show your working. **(4 marks)**
- Using your answer in a., calculate actual length of the right hind leg from the anus to point X. Show your working. **(4 marks)**
- What proportion of the body is hind leg? Show your working. **(3 marks)**

(2007, II Practical)

- 40.** You are provided with specimen Q (a dry utaka fish of ranging between 50mm to 100 mm) and a 30 cm ruler.

- Using a pencil, draw specimen Q and label any **three** parts. **(4 marks)**
- Measure the length of the longest axis of specimen Q. Your answer should be in millimeters (mm). **(1 mark)**
- Calculate the magnification of your drawing in a. **(3 marks)**
- Mention any **two** human activities that affect the population growth of specimen Q. **(2 marks)**
- Explain any **one** way in which the shape of specimen Q helps in its mode of locomotion. **(2 marks)**

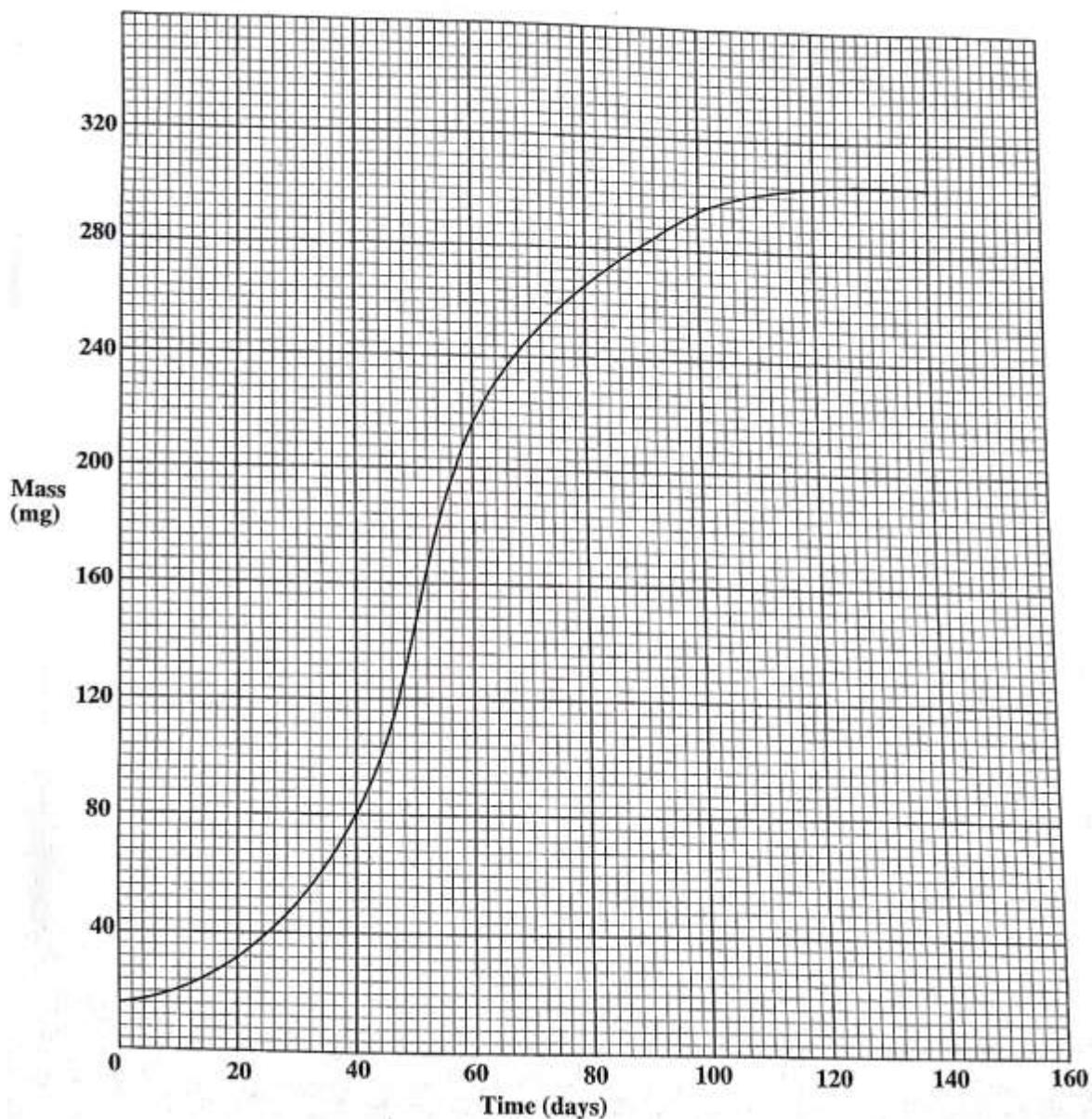
(2014, II Practical)

- 41.** You are provided with the following:

- specimen P (flight feather of ranging between 40 mm to 150 mm)
 - specimen Q (down feather)
 - a 30 cm ruler
- Mention **one** functional difference between P and Q. **(1 mark)**
 - Draw specimen P and label any **three** parts. **(4 marks)**
 - Measure the length of specimen P. Give your answer in millimeters (mm). **(1 mark)**
 - Calculate the magnification of your drawing. **(3 marks)**
 - Explain any one adaptation of specimen P to its function. **(2 marks)**

(2013, II Practical)

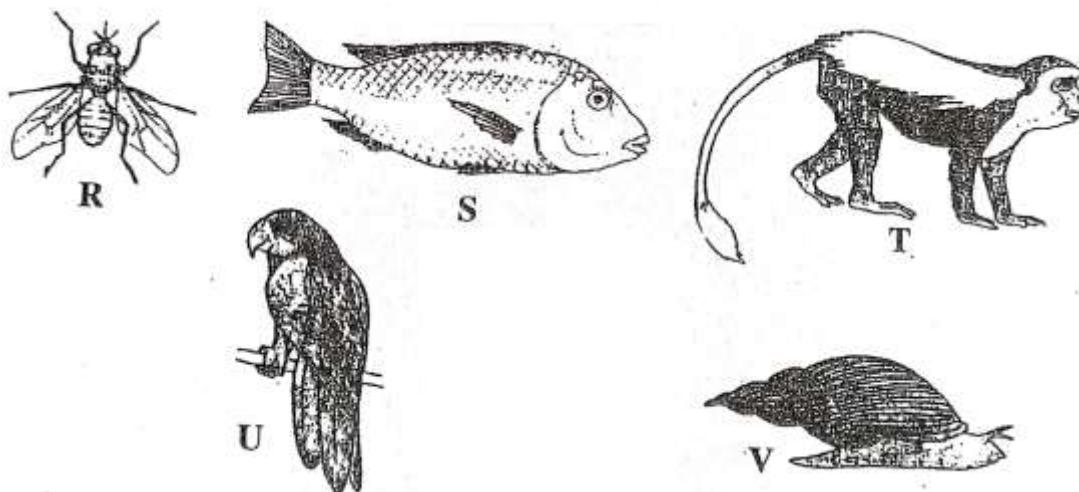
42. Figure 20 is a graph showing pattern of growth of an invertebrate over period of time.



- a. Describe the growth pattern of the organism. (3 marks)
- b. What was the mass of the invertebrate on day 60? (1 mark)
- c. Calculate the average growth rate per day of the organism between days 40 and 120. (3 marks)
- d. Name the type of cell division that is responsible for growth in an organism. (1 mark)
- e. Explain how availability of food can affect the growth rate of an organism. (2 marks)

(2014, II Practical)

43. Figure 20 shows diagrams of five animals **R, S, T, U** and **V**.



- a. Use the biological key provided to identify the animals.

Key

| | |
|-------------------|------------|
| 1. Has wings..... | See 2 |
| Has no wings..... | See 3 |
| 2. Has beak..... | Parrot |
| Has no beak..... | Drosophila |
| 3. Has legs..... | Colobus |
| Has no legs..... | See 4 |
| 4. Has fins..... | Tilapia |
| Has no fins..... | Lamnnea |

- b. Write down the names of the animals.

(5 marks)

- c. What type of skeleton does **V** possess?

(1 mark)

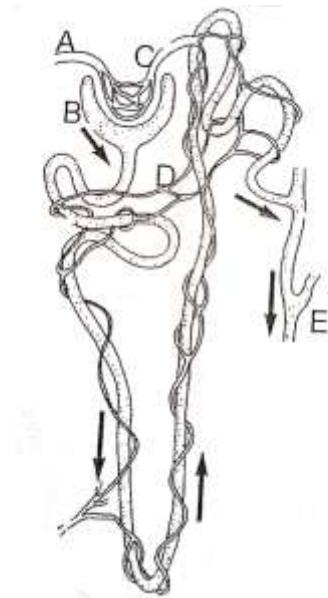
(2014, II Practical)

1. **Table 1** shows the average amounts of urine collected from the same group of students in the hot season and then in the cold season. In both parts of the experiment the diet and activity of the students were the same.

Table 1

| | Average volume of urine (cm ³) | | | | |
|--------------------|--|-------|-------|-------|-------|
| | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
| Hot Season | 890 | 895 | 905 | 880 | 910 |
| Cold Season | 1280 | 1340 | 1330 | 1290 | 1295 |

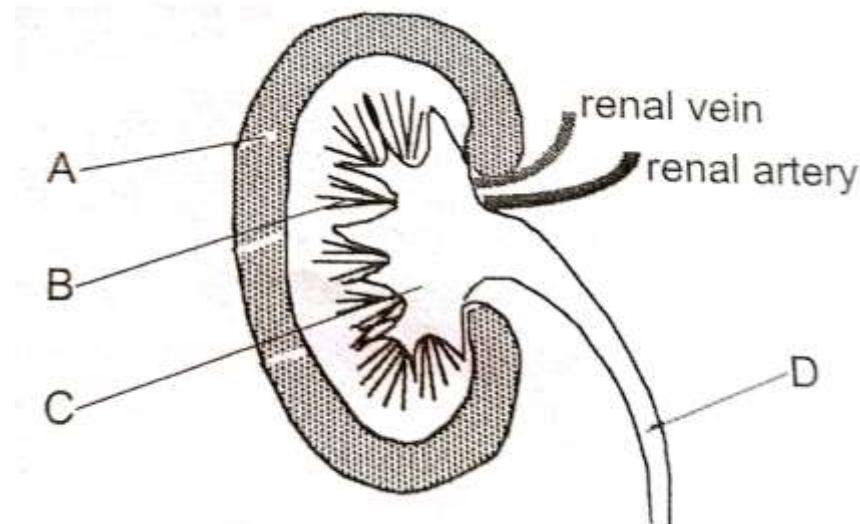
- a. (i) Compare the average volume of urine for both experiments. **(1 mark)**
 (ii) Explain your answer to a. (i). **(2 marks)**
 - b. Why is it important to keep the diet and activity the same during both experiments? **(1 mark)**
 - c. If you were told that some of the students from the group were suffering from diabetes (diabetes mellitus), describe how you would test the urine to confirm the presence of diabetes in the group. **(3 marks)**
(1992, I)
2. **Figure 1** is a diagram of a nephron, a structure in the kidney.



- a. Name the parts labelled **B**, **C**, and **E**. **(3 marks)**
- b. Mention **two** functions of the kidney. **(2 marks)**
- c. Mention **one** difference between blood-vessels **A** and **C** as seen in the diagram, which results in the creation of high pressure in the part labelled **B** in **figure 1**. **(1 mark)**

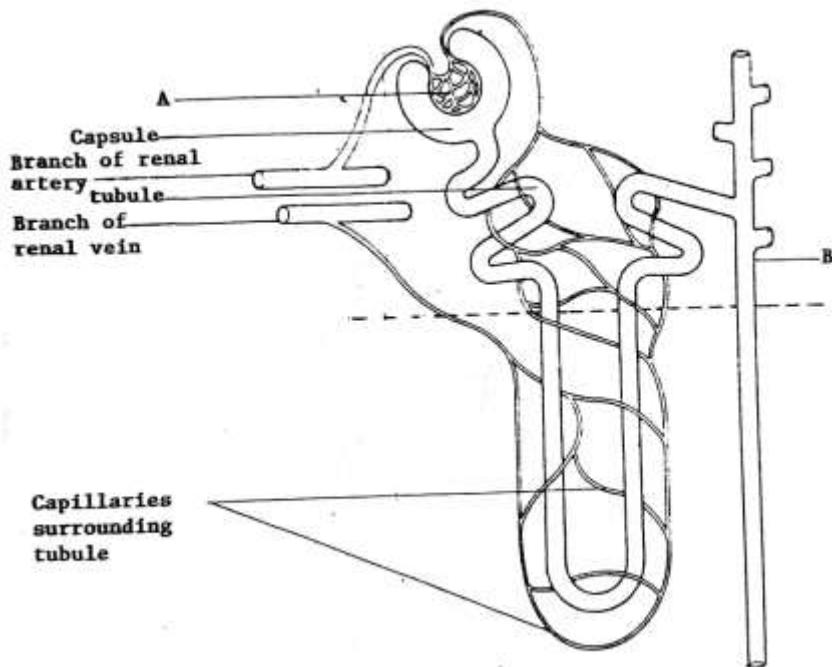
- d. Name any **two** useful substances that may be filtered into structure **B**. **(2 marks)**
- e. The reabsorption of these useful substances into the blood is sometimes against a concentration gradient.
- What do you understand by the term concentration gradient? **(1 mark)**
 - How are these useful substances reabsorbed into the blood against a concentration gradient? **(1 mark)**
- (1990, II)**

3. **Figure 2** is a diagram of a longitudinal section of a human kidney.



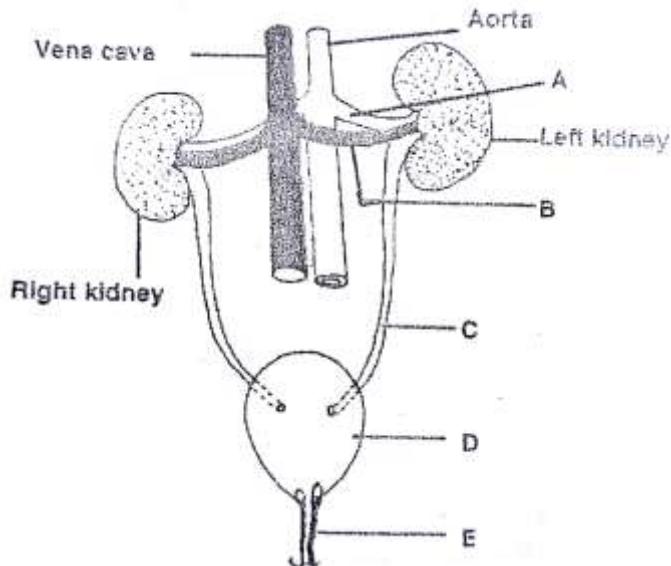
- a. Name the parts marked **A**, **B**, and **C**. **(3 marks)**
- b. In which region of the kidney as shown in **figure 2**, does filtration take place? **(1 mark)**
- c. Give the function of the structure labelled **D**. **(1 mark)**
- d. (i) Which of the renal vessels has a higher concentration of urea? **(1 mark)**
(ii) Explain your answer to d. (i). **(2 marks)**
- e. Useful substances such as glucose are in higher concentration in the blood than in the kidney tubules. Suggest how these substances are reabsorbed from the tubules. **(1 mark)**
(1993, II)
4. 100 litres of fluid is filtered by the kidneys from the blood in 24 hours. Out of the 100 litres 1.5 litres is removed as urine. The blood plasma contains about 0.03 per cent urea in solution and urine contains about 2 per cent urea in solution.
- How much fluid is reabsorbed in 24 hours? Show your working. **(2 marks)**
 - Where in the body is urea formed? **(1 mark)**
 - How many times to the nearest whole number is urea more concentrated in urine than it is in blood plasma? Show your working. **(2 marks)**
 - Other than filtration, mention **two** functions of the kidneys. **2 marks)**
(1995, I)

5. **Figure 3** is a diagram of a nephron with its blood supply.



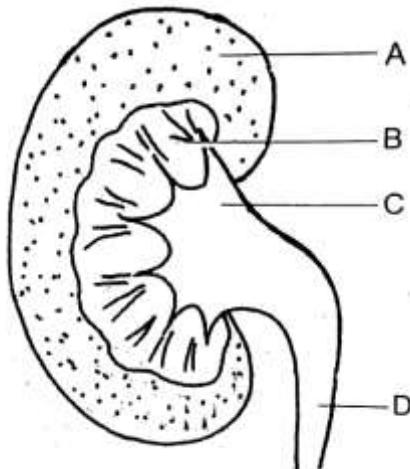
- Name the parts labelled **A** and **B**. (2 marks)
 - Indicate using arrows how the filtrate flows in the nephron. (1 mark)
 - Explain how pressure is built up in the structure marked **A**. (1 mark)
 - The concentration of urea in the urine excreted from the human body is about 60 times greater than the concentration in blood plasma. Name **two** processes that bring about this difference in concentration. (2 marks)
- (1994, I)

6. **Figure 4** is a diagram showing the human urinary system



- Using an arrow, indicate the direction of the blood flow in the aorta. (1 mark)
- (i) Name parts labelled **A** and **B**. (2 marks)
- (ii) State **two** differences in comparison between blood in **A** and **B**. (2 marks)

- c. What is the function of the structures labelled **D** and **E**? **(2 marks)**
 d. Name the process that forces urine down structure labelled **C**. **(1 mark)**
 e. Explain the effect on the quantity and composition of urine of eating a very salty meal. **(2 marks)**
(1996, I)
7. Give a biological explanation for this statement:
 • “The production of urine decreases in the human body during hot weather”. **(3 marks)**
8. **Figure 5** is a diagram of a vertical section of a human kidney.



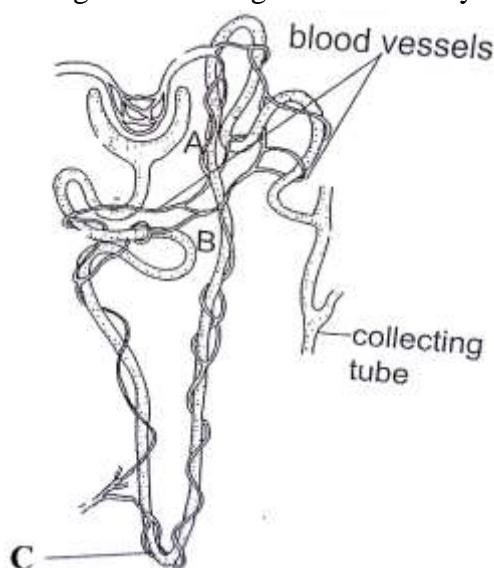
- a. Name the parts labelled **A**, **B**, and **C**. **(3 marks)**
 b. Which letter in **figure 5** shows the part where Bowman's capsules are located? **(1 mark)**
 c. Name the **two** structures which increase the surface area of the kidney for its efficient functioning. **(2 marks)**
 d. Describe how filtration occurs in glomerulus. **(3 marks)**
(1998, I)
9. A dialysis machine is an artificial kidney which is used when a person has kidney failure
 a. How is the loss of glucose and other important substances from the blood prevented when a patient is on the dialysis machine? **(2 marks)**
 b. State **one** similarity between the dialysis tube and the tubule of the nephron. **(1 mark)**
 c. Name **two** substances which diffuse out of the dialysis tube when it is in operation. **(3 marks)**
(2004, I)
10. a.(i). Where is urea produced? **(1 mark)**
 (ii) Describe how urea is produced. **(3 marks)**
 b. **Table 2** shows the concentration of protein and chloride ions in blood plasma and urine.

| Substance | Concentration | (g/l) |
|---------------|---------------|-------|
| | Blood plasma | Urine |
| Protein | 73.00 | 0.00 |
| Chloride ions | 3.60 | 6.00 |

- (i) Explain why protein is found in blood plasma and not in urine. **(2 marks)**

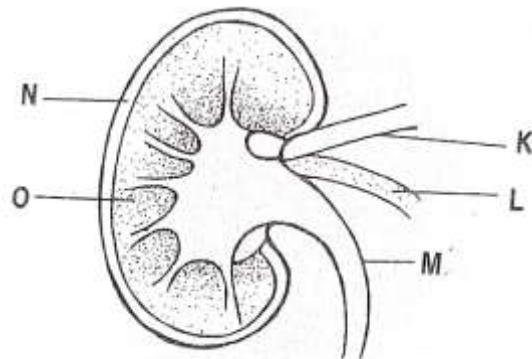
- (ii) Explain why there is a higher concentration of chloride ions in urine than in blood plasma. (2 marks)
(1998, II)

11. **Figure 6** is a diagram showing a functioning unit in a kidney.



- a. Name the structure. (1 mark)
- b. Name the part labelled **C**. (1 mark)
- c. What process takes place at:
 - (i) A? (1 mark)
 - (ii) B? (1 mark)
- d. (i) Which **one** of the above processes requires expenditure of energy? (1 mark)
 (ii) Give a reason for your answer to d. (i). (1 mark)
- e. Explain why smaller amounts of urine are produced in hot weather than in cold weather. (3 marks)
(2000, II)

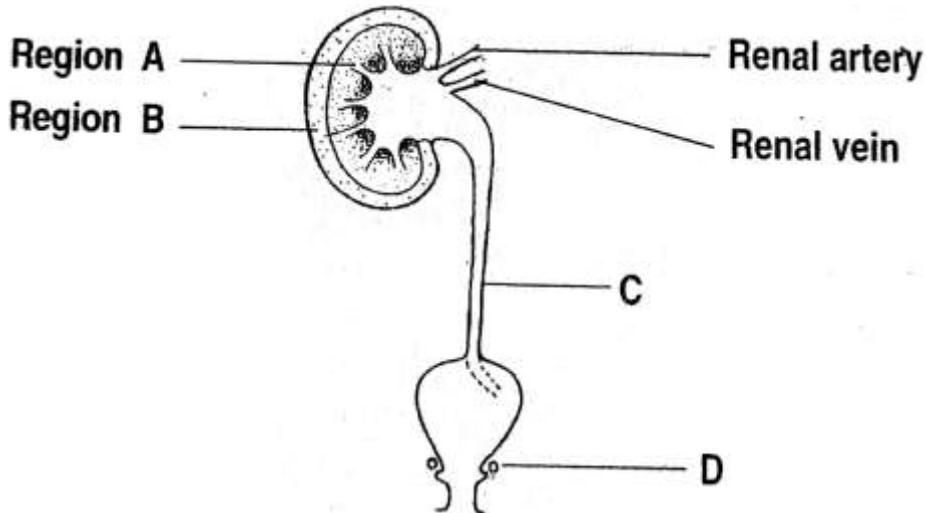
12. a.(i) Define the term “excretion” (1 mark)
 (ii) How does excretion differ from defecation? (2 marks)
- b. One excretory product in human body is urea.
 (i) Where is urea made in the body? (1 mark)
 (ii) Briefly describe how urea is made. (3 marks)
- c. **Figure 7** is a diagram showing a vertical section through a human kidney.



- (i) Name the parts marked **N** and **O**. (2 marks)

- (ii) Which **one** of the blood vessels **K** and **L** is the renal vein? **(1 mark)**
 (iii) Give a reason for your answer to c. (ii). **(1 mark)**
 (iv) Name **two** substances found in the blood plasma which are not found in the part marked **M** in a health person. **(2 marks)**
(2002, I)

13. **Figure 8** is a diagram showing the kidney and its associated organs.



- a. Name the parts marked **C** and **D**. **(2 marks)**
 b. In which region is the Bowman's capsule located? **(1 mark)**
 c. State **two** differences in the composition between the blood in the two renal vessels shown in **figure 8**. **(2 marks)**
(2002, I)

14. a. Define "Deamination". **(1 mark)**
 b. State **one** substance that is excreted in each of the following excretory organs:
 (i) Lungs: **(1 mark)**
 (ii) Kidneys: **(1 mark)**
(2003, I)

15. **Table 3** shows the composition of human blood and urine.

Table 3

| Substance | Blood (%) | Urine (%) |
|------------|-----------|------------|
| Water | 90 | 96 |
| Protein | 9 | 0 |
| Glucose | 0.1 | 0 |
| Urea | 0.03 | 2 |
| Uric acid | 0.003 | 0.05 |
| Creatinine | 0.001 | 0.1 |
| Chloride | 0.37 | 0.6 |
| Sodium | 0.35 | 0.35 – 0.6 |
| Potassium | 0.02 | 0.15 |

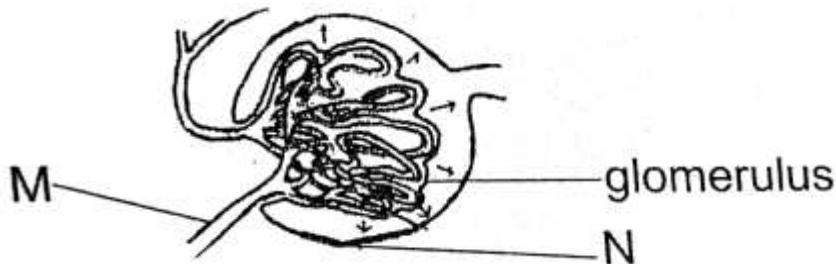
- a. (i) Give **one** substance which is present in blood but is completely absent in urine.

(1 mark)

- (ii) Apart from urea and water, mention **two** substances which are more concentrated in urine than in blood. (2 marks)
- b. Which hormone regulates water concentration in the blood? (1 mark)
- c. Why is urea excreted in large quantities? (2 marks)

(2005, I)

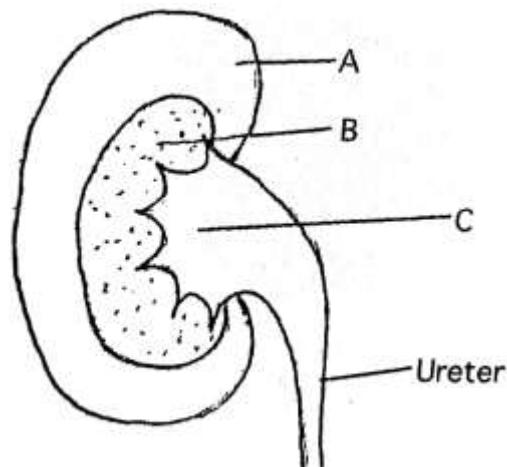
16. **Figure 10** is a diagram showing part of a nephron.



- a. Name the parts marked **M** and **N**. (2 marks)
- b. (i) Mention the process represented by the arrows. (1 mark)
- (ii) Describe **one** adaptation of the figure to the process mentioned in b.(i). (2 marks)
- c. Give **one** example of active transport which occurs in the nephron. (1 mark)

(2006, I)

17. **Figure 11** is a section of a kidney. Use it to answer the questions that follow.



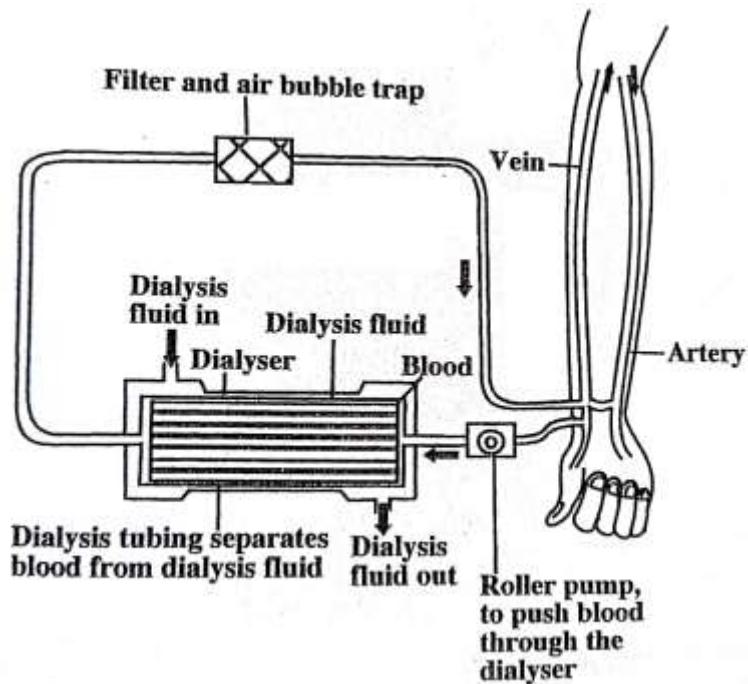
- a. Name **one** structure of the nephron found in each of the following parts of the kidney.
- (i) **A** (1 mark)
- (ii) **B** (1 mark)
- b. What is the function of the part labelled **C**? (1 mark)
- c. (i) What is the effect of an intake of salt solution on urine production? (1 mark)
- (ii) Explain how the effect in 17 c. (i) is brought about. (3 marks)

(2007, I)

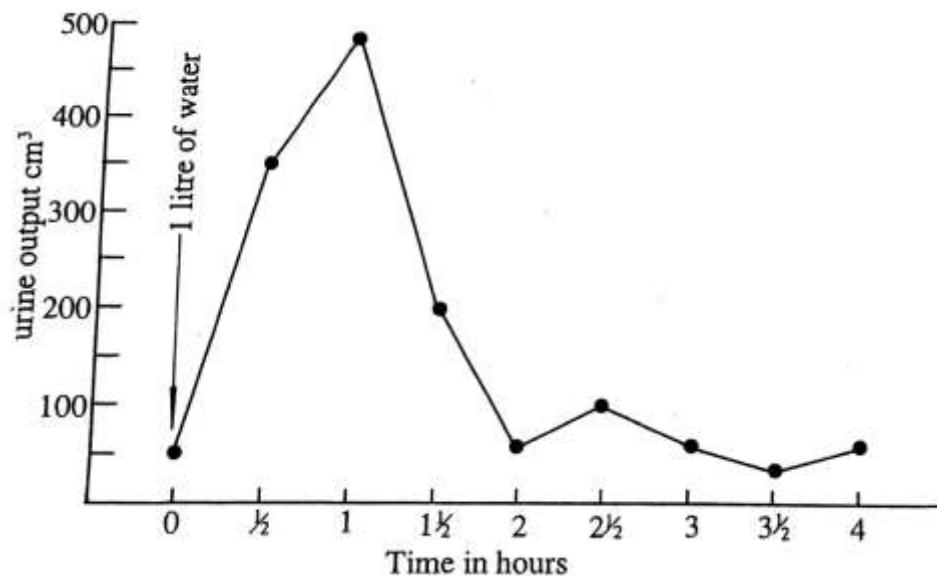
18. a. (i) Name the **main** nitrogenous waste excreted by the kidneys. (1 mark)
- (ii) Describe how the nitrogenous waste mentioned in 20. a. (i) is formed. (3 marks)
- b. Name two substances found in blood plasma that are **not** found in the urine of a healthy person. (2 marks)

(2012, I)

19. **Figure 12** shows a dialysis machine. Use it to answer the questions that follow.



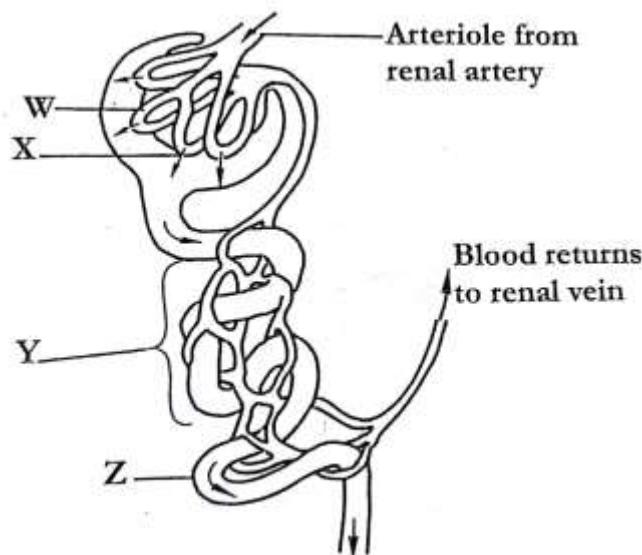
- Explain why patient's blood and the dialysis fluid move to opposite directions in the dialyser. **(2 marks)**
 - Why are there many smaller channels in the dialyser rather than one large one? **(2 marks)**
 - Explain why it is dangerous for an air bubble to get into the patient's blood while on the dialysis machine. **(2 marks)**
(2009, I)
20. **Figure 13** is a graph showing urine output in a person soon after drinking 1 litre of water.



- What was the maximum amount of urine produced? **(1 mark)**
- What effects did drinking of water have on urine output during the first hour of the investigation? **(1 mark)**

- c. Explain how Anti- Diuretic Hormone (ADH) affected results of urine output between 1 hour and 2 hours. **(3 marks)**
(2010, I)

21. **Figure 14** shows part of a nephron. Use it to answer the questions that follow.



- a. Name the parts marked **W** and **Z**. **(2 marks)**
 b. Name the process that occurs in region **Y**. **(1 mark)**
 c. State any two substances that become part of the fluid shown by **X**. **(2 marks)**
 d. Name the condition associated with the presence of glucose in urine. **(1 mark)**
(2013, I)

22. **Table 4** shows the percentage composition of substances taken from a sample of blood plasma and urine. Use it to answer the questions that follow:

| | Blood Plasma | Urine |
|---------------|--------------|-------|
| Glucose | 0.1 | 1.0 |
| Urea | 0.03 | 2.0 |
| Mineral salts | 0.4 | 0.6 |
| Water | 93 | 94 |
| Protein | 7.0 | 0 |

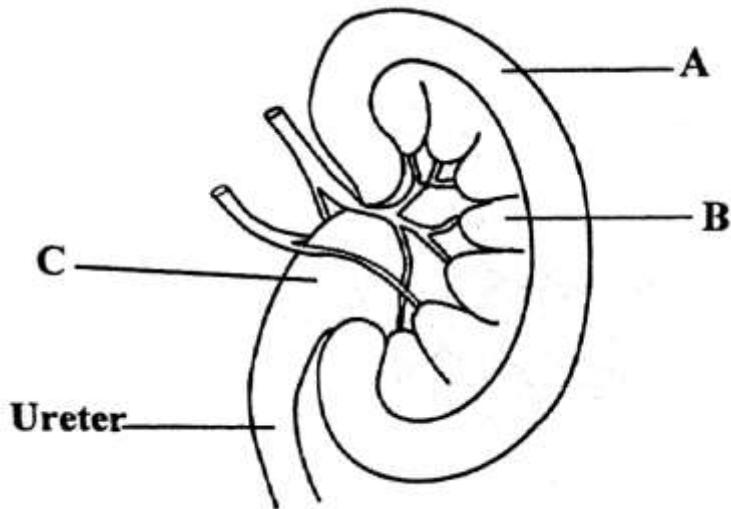
- a. Name **one** substance that is absent in urine. **(1 mark)**
 b. State **one** evidence that shows the sample was taken from a person suffering from diabetes. **(1 mark)**
(2017, I)
23. a. Give any **one** problem that can lead to kidney failure. **(1 mark)**
 b. State the permanent treatment that can be given to an individual with a kidney failure. **(1 mark)**
 c. Name any **one** excretory product from the human body. **(1 mark)**
 d. In which region of the kidney is each of the following located?
 (i) Bowman's capsule **(1 mark)**
 (ii) Loop of Henle **(1 mark)**
(2017, I)

24. a. Name any **two** excretory organs in the human body. **(2 marks)**
 b. Give any **two** differences in terms of composition between blood flowing in the dialysis tubing and dialysis fluid.

| Blood flowing in the dialysis tubing | Dialysis fluid |
|--------------------------------------|----------------|
| | |
| | |

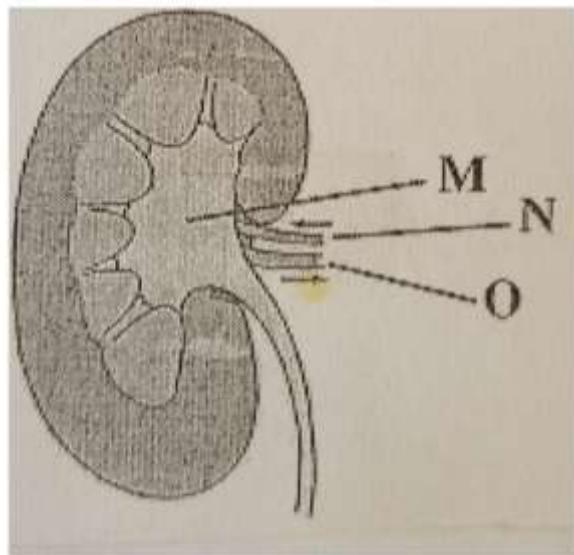
(2 marks)
(2018, I)

25. a. (i) State any **two** processes involved in urine formation in kidneys. **(2 marks)**
 (ii) State any two substances contained in urine. **(2 marks)**
 b. Which hormone regulates water concentration? **(1 mark)**
(2018, I)
26. a. Define each of the following terms:
 (i) Excretion **(1 mark)**
 (ii) Homeostasis **(1 mark)**
 b. Name any **two** excretory products from the kidney. **(2 marks)**
 c. Give any **two** similarities between a dialysis machine and the kidneys. **(2 marks)**
(2019, I)
27. a. **Figure 15** is a diagram showing a cross section of the kidney. Use it to answer the questions that follow.



- (i) Name the parts labelled **A** and **B**. **(2 marks)**
 (ii) What is the function of the part labelled **C**? **(1 mark)**
 (iii) Name the process that helps in the movement of urine down the ureter. **(1 mark)**
- b. Give the structural difference between an afferent arteriole and an efferent arteriole. **(1 mark)**
(2020, I Leaked Paper)

28. **Figure 16** is a diagram of a kidney. Use it to answer the questions that follow.



- a. State the function of part marked M. (1 mark)
- b. State any two differences in composition of blood flowing in N and in O. (2 marks)
- c. Explain the condition that would cause presence of glucose in urine. (2 marks)
(2014, I)

1. Trypanosoma is a protozoa that causes sleeping sickness in humans.
 - a. Name the vector of the Trypanosoma. (1 mark)
 - b. Name **one** reservoir animal of Trypanosoma. (1 mark)
 - c. In the case of Trypanosoma infection, what is the difference between the reservoir and the vector? (1 mark)
 - d. Give **two** ways of controlling sleeping sickness. (2 marks) (1991, I)

2. **Table 1** shows cases of Malaria which were treated at a health centre in 1999.

Table 1

| Time (months) | Jan | Feb | Mar | Apr | May | June |
|------------------|-----|-----|-----|-----|-----|------|
| No of cases | 704 | 612 | 861 | 705 | 666 | 393 |

- a. Draw a bar chart of number of cases against time (months) (6 marks)
 - b. (i) From the bar, in which month was the incident of malaria highest? (1 mark)
 - (ii) Suggest a possible reason for your answer to 2 b.(i). (2 marks)
 - c. List **three** methods of preventing malaria. (3 marks) (1993, I)
3. Acquired Immune Deficiency Syndrome (AIDS) is a disease caused by the Human Immuno deficiency Virus (HIV).
 - a. Which part of the blood is attacked by HIV? (1 mark)
 - b. Name any **two** symptoms of AIDS. (2 marks)
 - c. Why is a person infected with HIV more liable to catch other diseases? (2 marks) (1994, I)
 4. a. Name a disease caused by plasmodium. (1 mark)
 - b. Give **two** differences between AIDS and Tuberculosis in relation to the type of causative agent and the part of the human body attacked:

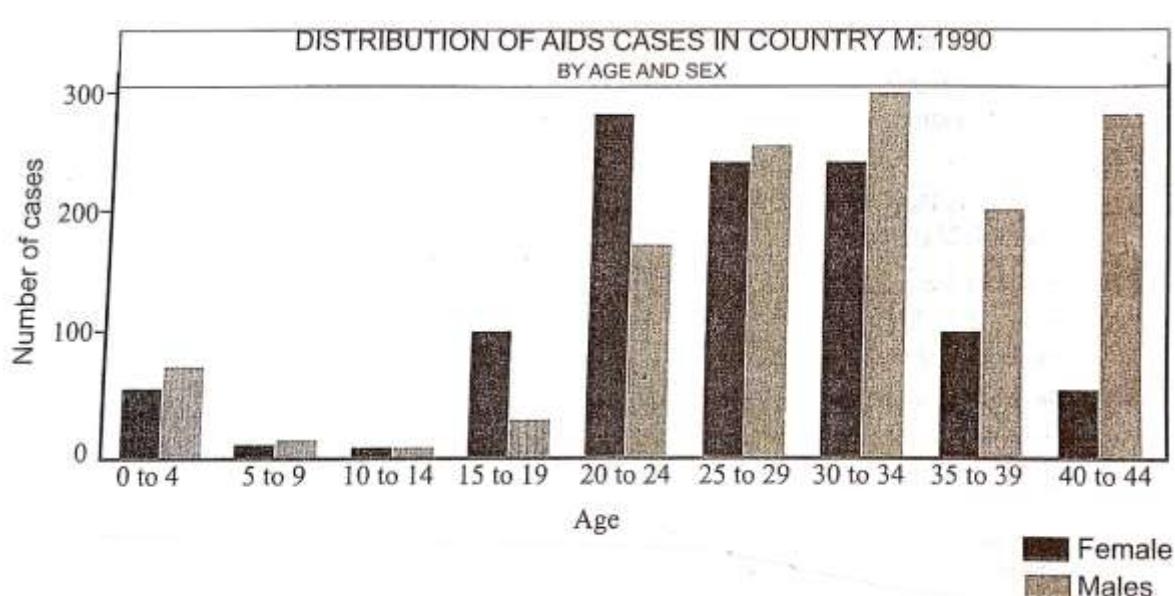
Table 2

| | Tuberculosis | AIDS |
|---------------------------|--------------|------|
| Causative agent | | |
| Part of the body attacked | | |

(4 marks)

- c. Explain how each of the following AIDS preventive measure works:
 - (i) Blood screening (1 mark)
 - (ii) Use of condoms (1 mark)
 - (iii) Monogamous partner-relationship (1 mark)
 - (iv) Abstinence (1 mark) (1996, I)
5. a. What is meant by “asymptomatic HIV carrier”? (1 mark)
- b. What is the difference between an HIV infected person and a person with AIDS? (2 marks) (1997, I)

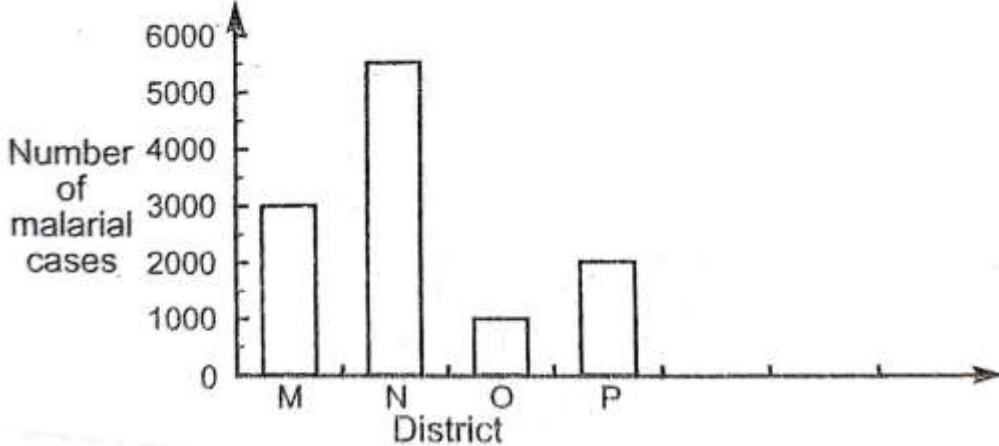
6. AIDS is a life-threatening disease and a public health crisis in the world.
- Suggest a reason AIDS is referred to as a life-threatening disease. **(2 marks)**
 - Name the virus that causes AIDS. **(1 mark)**
 - State any **two** high-risk behaviors that would increase the chances of contracting HIV. **(2 marks)**
(1997, II)
7. a. Sexual intercourse is the most common method for transmitting HIV. Give **two** possible reasons for this. **(2 marks)**
- b. Explain why a woman has a greater chance of being infected by HIV than a man through sexual intercourse. **(2 marks)**
(1998, I)
8. a. State **two** diseases whose main symptoms is diarrhoea. **(2 marks)**
- b. How would you treat a child suffering from diarrhoea if medical help is not readily available? **(1 mark)**
- c. State **one** way of reducing the likelihood of diarrhoea in the home. **(1 mark)**
(1998, II)
9. a. What is the most common method by which AIDS virus is transmitted in Malawi? **(1 mark)**
- b. What are the causes of the following conditions in man?
 - High blood pressure **(1 mark)**
 - Heart attack **(1 mark)****(1999, I)**
10. **Figure 1** is a graph showing the distribution of AIDS cases in country M in 1990.



- In which age group was the largest number of male AIDS patients? **(1 mark)**
- In which age group was the largest number of female AIDS patients? **(1 mark)**
- Suggest **two** reasons why AIDS cases are lowest between the range 5 – 14 years. **(2 marks)**
- Give **two** ways in which children between the ages of 0 – 4 years could become HIV positive. **(2 marks)**
- Besides using condoms as a preventive measure, name **three** other ways of preventing HIV infection. **(3 marks)**
(2000, I)

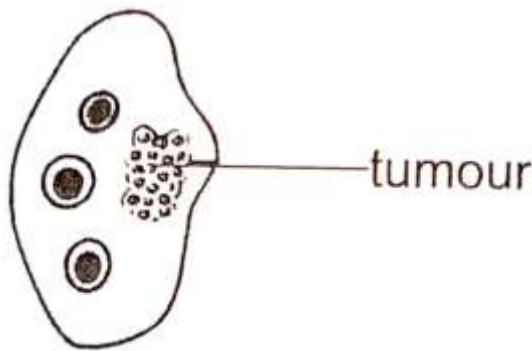
11. a. Name the organism that cause AIDS. **(1 mark)**
- b. The results of an HIV test can be seropositive or seronegative. What does seropositive mean? **(1 mark)**
- c. Although AIDS as a “disease” cannot be cured, it can be prevented from spreading. List **three** ways of preventing AIDS from spreading. **(3 marks)**
- d. State **two** practices that can promote good health to a person living with AIDS. **(2 marks)**
(2001, I)

12. The ministry of health conducted a research to study malarial cases in four randomly selected districts **M, N, O** and **P** in Malawi. The study was done in some health centres for three months and the results were presented in a bar graph as in **figure 2**.



- a. Which district had the highest number of cases of malarial infection? **(1 mark)**
- b. How many cases were registered during the whole research period? Show your working. **(2 marks)**
- c. Suggest **two** reasons why it is not correct to conclude that these were the only malarial patients in the studied districts. **(2 marks)**
- d. Mention any **two** signs of malaria. **(2 marks)**
(2003, I)

13. **Figure 3** is a diagram showing a lymph node which has a tumour beginning to develop.



- a. Name the type of disease shown in **figure 3**. **(1 mark)**
- b. State **two** ways in which the cells of the tumour might affect cells surrounding it. **(2 marks)**
- c. Suggest any **two** factors that would increase the risk of developing the disease named in 13a. **(2 marks)**
(2004, I)

14. a. Cancerous cells carry out many cellular functions as normal cells. What characteristics distinguish them from normal cells? **(1 mark)**
b. Why is cancer contagious? **(1 mark)**
c. Explain **two** ways of reducing the risk of developing cancer. **(4 marks)**
(2006, I)

15. a. How does each of the following methods work in preventing malaria?
(i) Spraying a layer of oil on stagnant water **(2 marks)**
(ii) Breeding fish in slow running water **(2 marks)**
b. Why does a malarial patient become anaemic? **(2 marks)**
(2006, I)

16. **Figure 4** shows the head of a child with a skin infection. Use it to answer the questions that follow.



- a. Name the infection. **(1 mark)**
b. Mention the causative agent of the infection. **(1 mark)**
c. Give **one** way of preventing spread of the infection. **(1 mark)**
(2008, I)

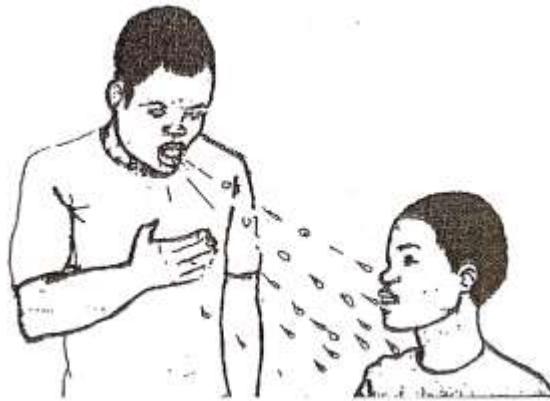
17. **Figure 5** shows legs of a person with a skin disease. Use it to answer the questions that follow.



- a. Name the disease. **(1 mark)**
b. To which group of organisms does the causative agent of this disease belong? **(1 mark)**
c. Describe the life cycle of the causative agent of the disease. **(4 marks)**
d. Give any **two** ways of preventing the disease. **(2 marks)**
(2008, I)

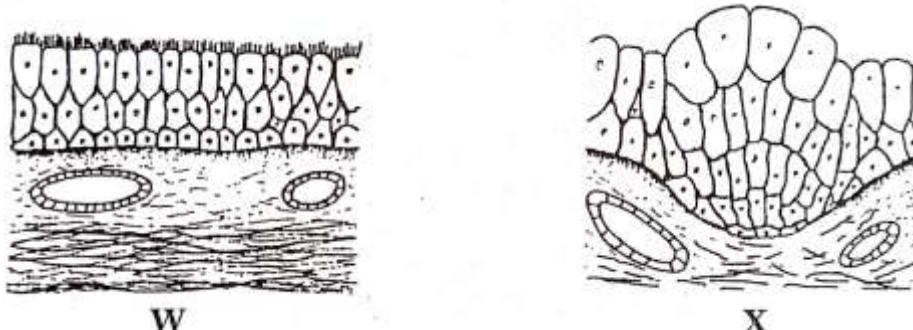
18. a. (i) Give any **one** way of contracting HIV besides sexual intercourse. **(1 mark)**
(ii) What sort of precautions would prevent the spreading of the virus in the method you have given in a. (i)? **(1 mark)**
b. State any **two** practices that an HIV and AIDS patient can follow to live longer. **(2 marks)**
(2009, I)

19. **Figure 6** shows a mode of transmission of some diseases. Use it to answer the questions that follow.



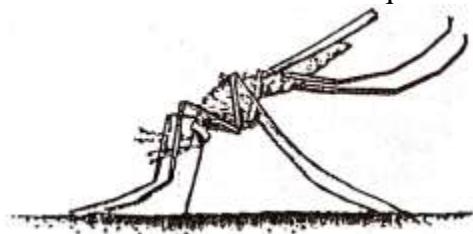
- a. Identify the mode of transmission. **(1 mark)**
b. Name any two diseases that can be transmitted by the mode shown in **figure 6**. **(2 marks)**
c. Explain one way of preventing transmission of diseases through the mode shown in the **figure 6**. **(2 marks)**
(2010, I)
20. At a certain school students developed rash on the skin and high fever. A doctor diagnosed them positive for diarrhoeal disease.
- a. (i) Name the disease. **(1 mark)**
(ii) What is the causative agent of the disease? **(1 mark)**
(iii) Mention any two ways in which the disease could have been transmitted. **(2 marks)**
b. Explain what happens during the incubation period of a disease. **(2 marks)**
(20011, I)
21. a. What causes sleeping sickness? **(1 mark)**
b. Explain any two ways of preventing transmission of sleeping sickness. **(4 marks)**
(2011, I)
22. a. State any two ways in which vectors transmit diseases. **(2 marks)**
b. Mention any two signs of athlete foot. **(2 marks)**
(2012, I)
23. A child developed the following signs and symptoms: high fever, rash inside the mouth and a cough.
- a. (i) Name the disease that the child could be suffering from. **(1 mark)**
(ii) How is the disease transmitted? **(1 mark)**
b. Explain one way of preventing the disease in 23 a. (i). **(2 marks)**
(2013, I)

24. **Figure 7** shows the normal lining of a lung in **W** and an infected lining in **X**. Use it to answer the questions that follow.



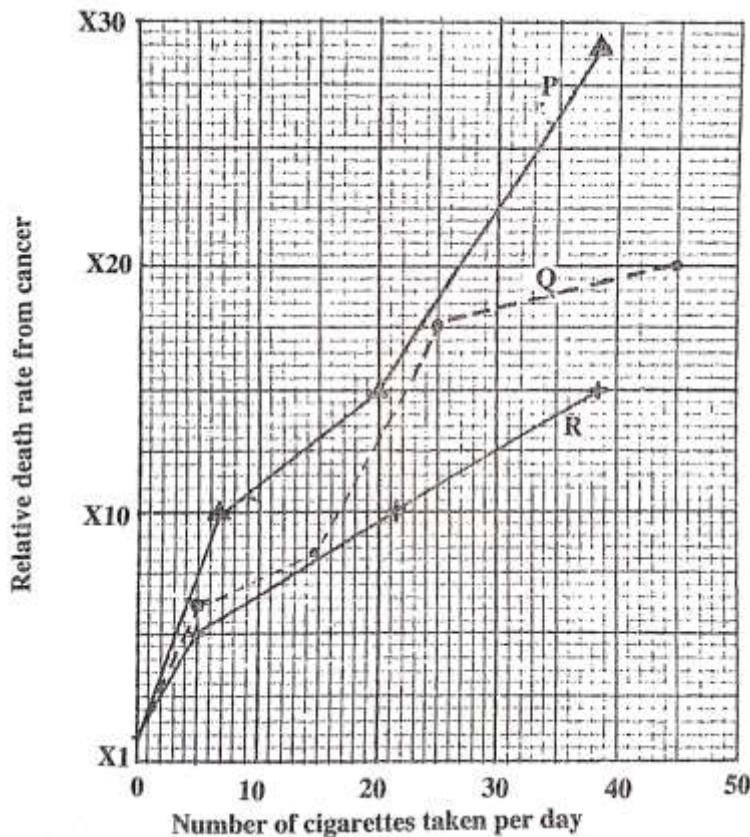
- a. Name the disease that causes the condition in **X**. (1 mark)
 - b. Explain how the disease is caused. (2 marks)
 - c. State any two ways of preventing the disease. (2 marks) (2013, I)
25. a. Define the following terms:
 - (i) "vector" (1 mark)
 - (ii) "incubation period" (1 mark)
 b. Give **two** ways by which parasitic bacteria cause diseases. (2 marks) (2007, I Leaked Paper)
26. a. State the importance of immunity to the human body. (1 mark)
- b. Classify the following diseases according to their causative agents in the table below:
Ringworm, Pneumonia, Cholera, Athlete's foot
- | Fungal diseases | Bacterial diseases |
|-----------------|--------------------|
| | |
| | |
| | |
| | |
- (4 marks)
(2016, I)

27. **Figure 8** is a diagram of a vector. Use it to answer the questions that follow.



- a. Name the disease that is transmitted by this vector. (1 mark)
 - b. (i) How does the vector transmit the disease? (2 marks)
 - (ii) Explain any one way in which the disease in 25 b. (i) can be controlled. (2 marks) (2013, I)
28. a. Name the organelle in which mutation takes place in the human body. (1 mark)
- b. State any **two** effects of cancerous cells in the human body. (2 marks)
- c. (i) Give any **two** reasons for blood transfusion. (2 marks)
- (ii) Explain the reason for considering syphilis before donating blood. (2 marks)
- (iii) Explain the reason for universal recipient to receive blood from any donor. (2 marks) (2017, I)

29. A young man developed a headache, high fever and severe diarrhea after drinking water from a river. Use this information to answer the questions that follow:
- Name the disease. (1 mark)
 - Name the causative agent of the disease named in a. (1 mark)
 - Give any one way of controlling the disease. (1 mark) (2018, I)
30. Explain any **three** factors that increase the risk of cancer. (6 marks) (2020, I)
31. **Figure 9** is a graph showing relative death rate from cancer against cigarettes taken per day in three countries marked P, Q and R.



- Which country has lowest relative death rate from cancer. (1 mark)
- Complete **Table 3** which has information for country Q.

| NUMBER OF CIGARETTES TAKEN PER DAY | RELATIVE DEATH RATE FROM CANCER |
|------------------------------------|---------------------------------|
| 0 | X1.0 |
| 5 | |
| | X20.0 |

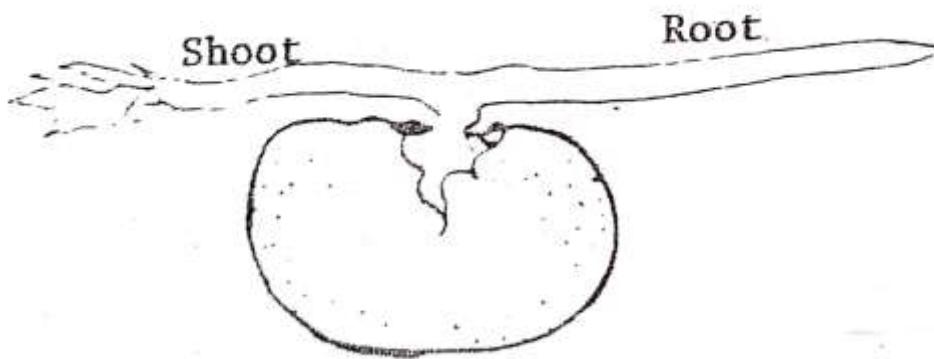
- What is the relationship between cigarettes taken per day and relative death rate? (2 marks)
- (i) State **two** effects of cancerous cells in the body. (2 marks)
- (ii) Give two reasons why some non-smokers suffer from cancer. (2 marks)
- Which country would register highest death rate if the number of cigarettes taken per day exceeds 30? (1 mark) (2006, II Practical)

1. Ten maize seedlings were grown and their tips cut off. The lengths of seedlings were then measured. A mixture of Vaseline and auxin was applied to the cut surface of five of the seedlings, and Vaseline only to the remaining five. After three days the seedlings were measured again. The results were summarized in the **Table 1**.

Table 1 (length in mm)

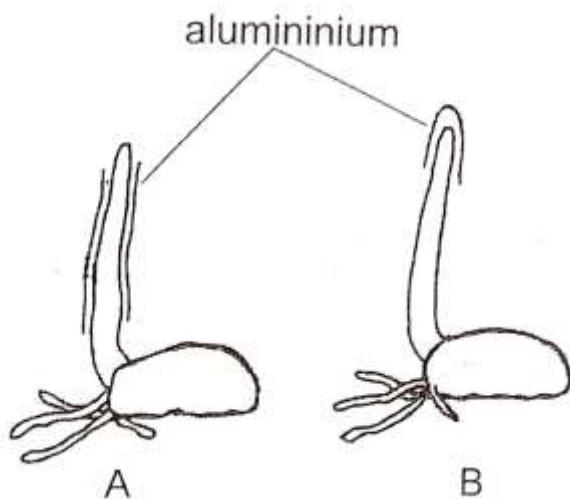
| Vaseline | | Vaseline with auxin | |
|----------------|--------------|---------------------|--------------|
| Initial Length | Final Length | Initial Length | Final Length |
| 22 | 29 | 22 | 36 |
| 20 | 26 | 23 | 37 |
| 26 | 33 | 18 | 34 |
| 23 | 29 | 26 | 40 |
| 21 | 25 | 20 | 35 |

- a. Calculate the average increase in length of the seedlings for each treatment. Show your working. **(6 marks)**
- b. What is the aim of the experiment? **(1 mark)**
- c. Explain the results in the two treatments. **(3 marks)**
- d. What is the control in this experiment? **(1 mark)**
(1993, II)
2. **Figure 1** is a diagram of bean seedlings which was placed horizontally in a pot. The pot was left in darkness for two days.

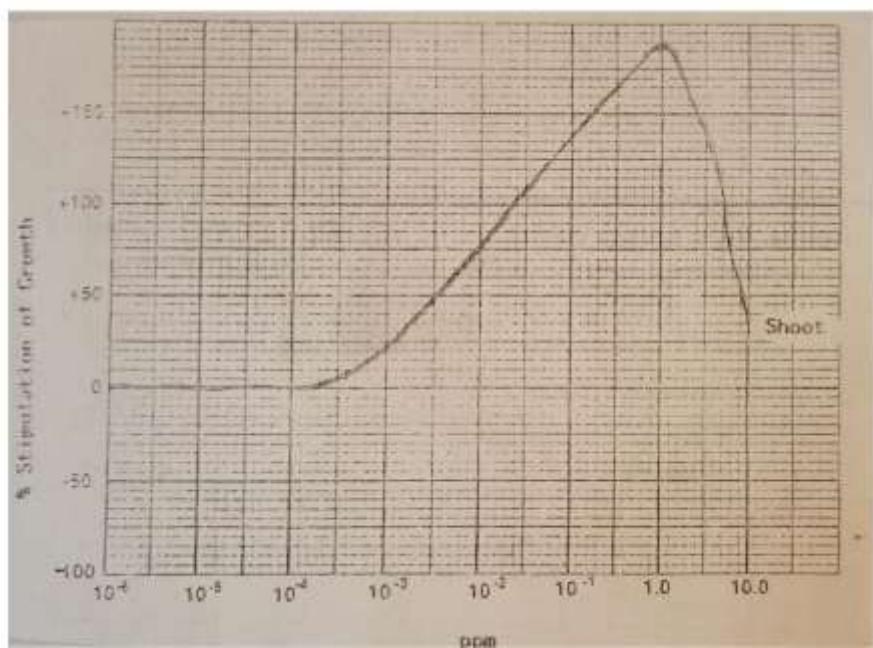


- a. (i) Draw a diagram of the seedling to show results after two days. **(2 marks)**
(ii) Give a reason for your answer to 2 a. (i). **(2 marks)**
- b. Explain how the auxins make shoots grow towards light. **(3 marks)**
(1994, II)

3. **Figure 2** shows an experimental set-up used to study the growth of seedlings.

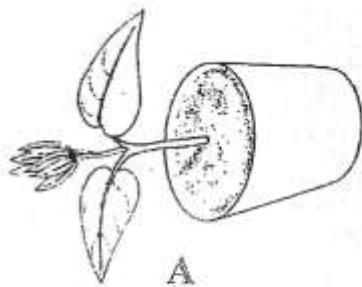


- a. By means of diagrams only, show the appearance of the seedlings after several hours. **(2 marks)**
 - b. (i) Name the chemical substances responsible for plant responses you have given in question a. **(1 mark)**
(ii) Explain how the response in seedling A is brought about. **(3 marks)**
 - c. Suggest a control for this experiment. **(1 mark)**
(1995, II)
4. **Figure 3** is a graph showing the effects of different concentrations of auxin to the growth of shoots of pear seedlings. The results are expressed as the percentage of stimulation of growth compared with untreated control shoots which receive no auxin.

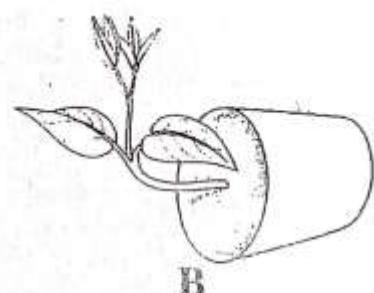


- a. What is the optimal concentration of auxin for shoot growth stimulation? **(1 mark)**
- b. What is the effect of auxin concentration on shoot growth between
(i) 10^{-6} to 10^{-1} ppm **(1 mark)**
(ii) 10^{-6} to 10^{-4} ppm **(1 mark)**
- c. How would you use the results shown in figure 3 to explain phototropism of a shoot? **(5 marks)**

5. **Figure 4** shows response in potted plant which was placed horizontally. Use it to answer the questions that follow.

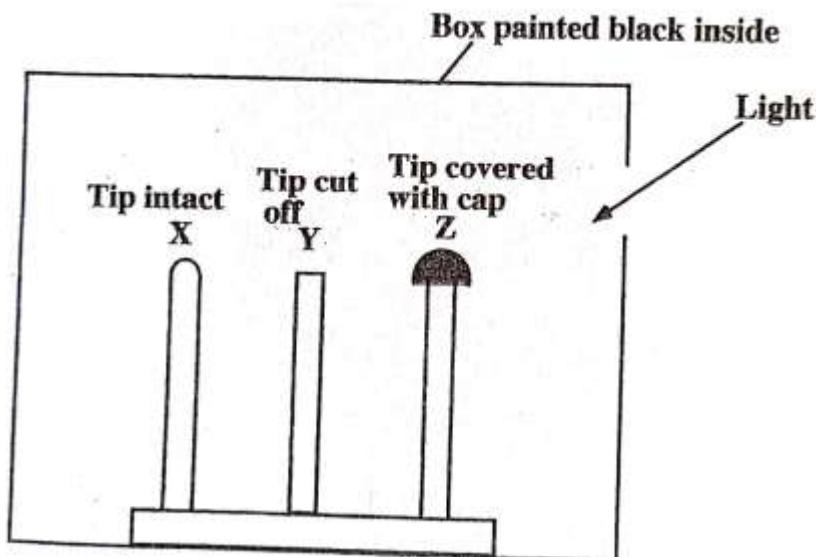


**At the beginning
of experiment**



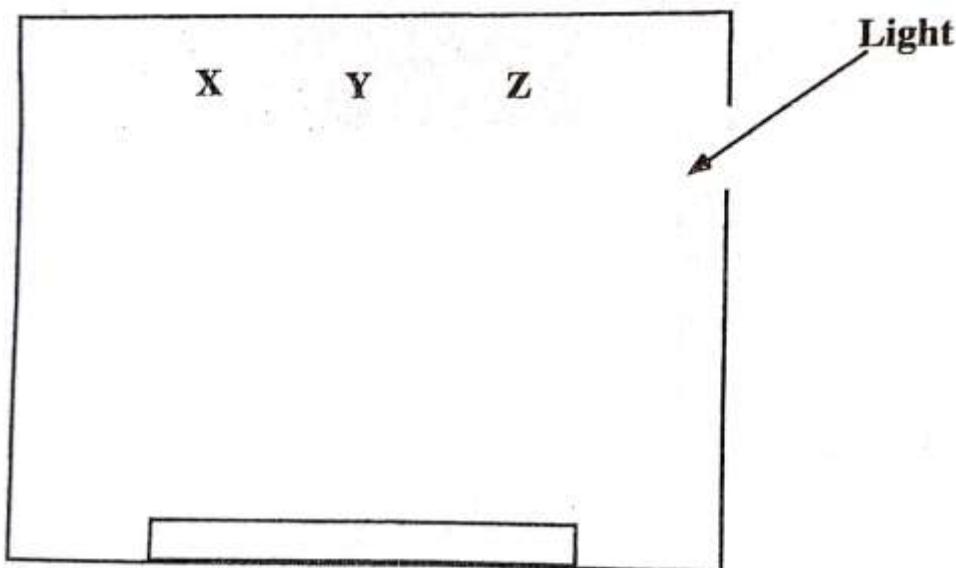
Response after sometime

- a. What was the stimulus in this experiment? (1 mark)
 - b. (i) Describe the response in B. (1 mark)
 - (ii) Explain how the response in b. (i) above was brought about. (3 marks) (2003, I)
6. a. What are “auxins”? (1 mark)
- b. How does high auxins concentration affect growth of the following parts of the plants?
- (i) Shoots (1 mark)
 - (ii) Roots (1 mark)
- (2005, I) (2005, I)
7. a. Define “tropisms”. (1 mark)
- b. Name the stimulus in geotropism. (1 mark)
- (2014, I)
8. **Figure 5** shows three seedlings X, Y and Z placed in a box painted black and with a hole on one side. The seedlings were treated differently.



- a. Why was the box painted black inside? (1 mark)

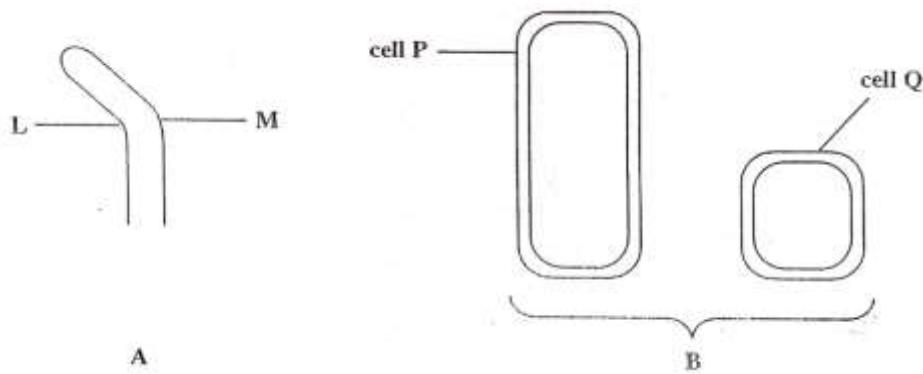
- b. In the box provided below, draw the seedlings to show the results at the end of the experiment.



(3 marks)

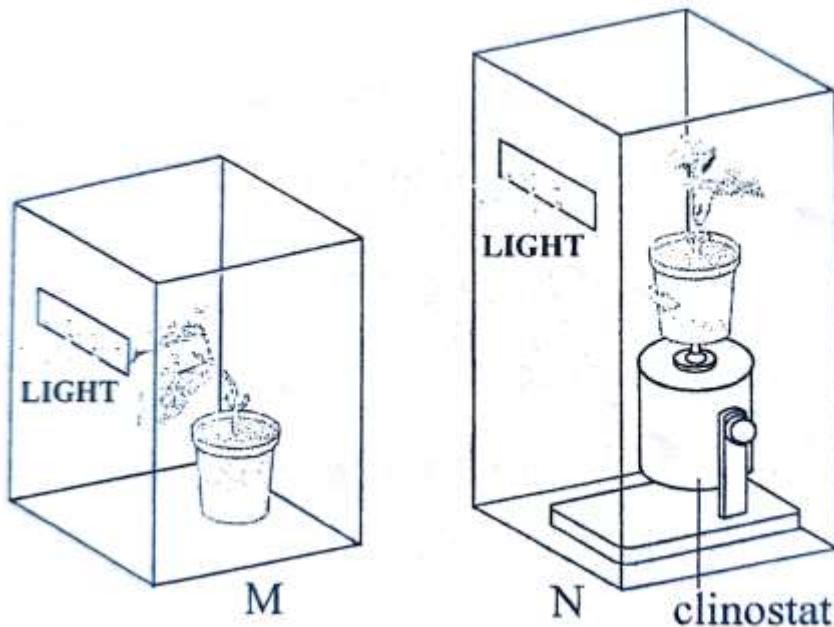
- c. Explain the results in seedling Y. (2 marks) (2009, I)
9. a. State any one function of plant hormones. (1 mark)
- b. Explain the effect of high auxin concentration on each of the following plant parts:
- (i) shoot tip (2 marks)
 - (ii) root tip (2 marks) (2017, I)

10. **Figure 6** shows diagrams A and B. Diagram A shows the results of what happened when a shoot was illuminated from one side for 48 hours. Diagram B shows cells P and Q which were taken from parts of the shoot in diagram A.



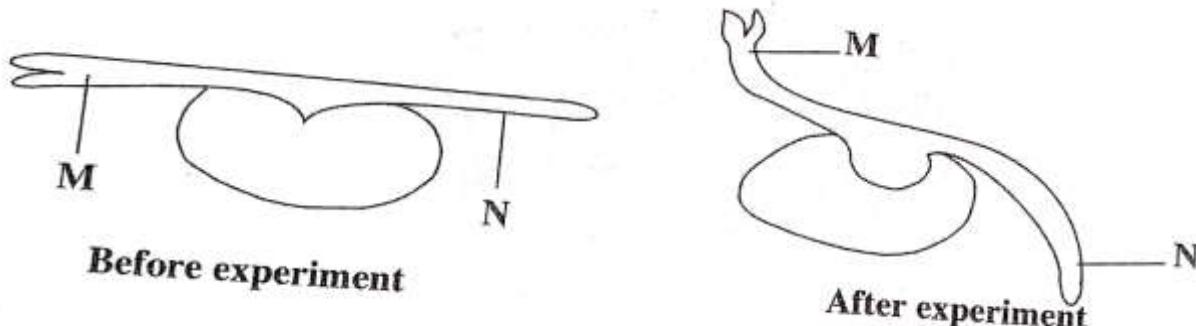
- a. Which side of the shoot was illuminated? (1 mark)
- b. (i) Which cell was taken from part marked M. (1 mark)
- (ii) Explain your answer to b. (i). (2 marks) (2005, I)

11. **Figure 7** shows a diagram of two potted seedlings placed in a cardboard box with an opening on one side. **N** is on rotating clinostat while **M** is stationed. Use it to answer the questions that follow:



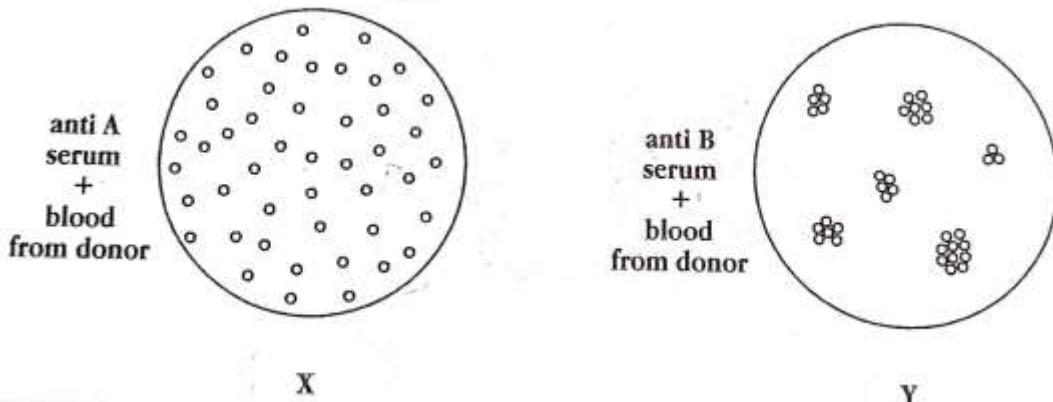
- Explain one reason for including set-up **N** in this experiment. **(2 marks)**
- Describe the results of the experiment in set-up **M**. **(2 marks)**
(2017, I)

12. **Figure 8** is a diagram of an experiment on effect of auxins on growth of a bean seedling. The bean seedling was placed on a moist surface horizontally for two days.



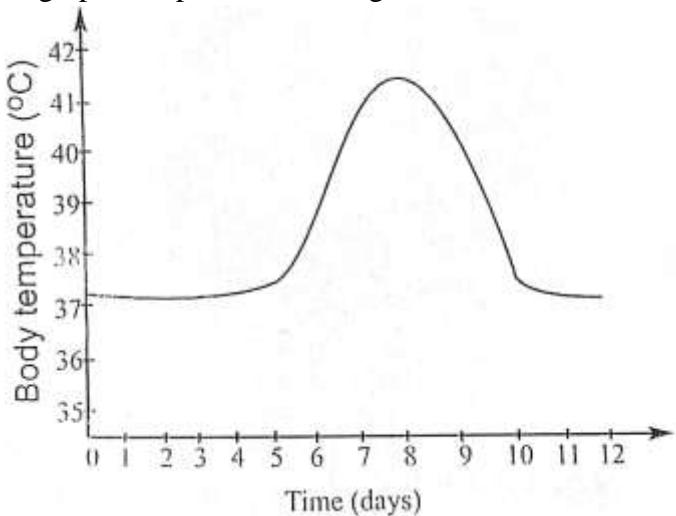
- Apart from gravity, mention **two** other stimuli to which the seedling could respond. **(2 marks)**
- Explain the effects of auxins on **N**. **(4 marks)**
(2015, I)

1. Differences in blood type involve antigens on the surface of red cells. Type A blood has A antigens, type B blood has B antigens. Before blood is given to a patient, the patients' blood group must first be identified by mixing small samples of his blood with sera containing anti-B and anti-A antibodies. **Figure 1** is a diagram showing the results of such a test.

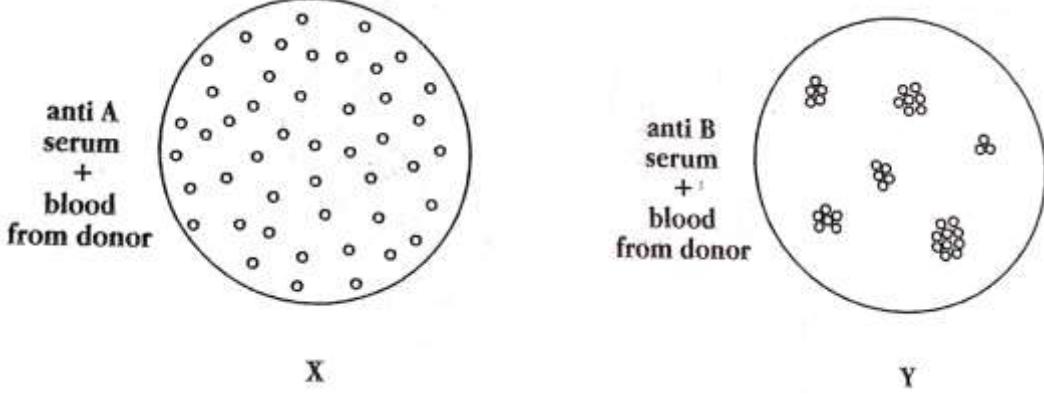
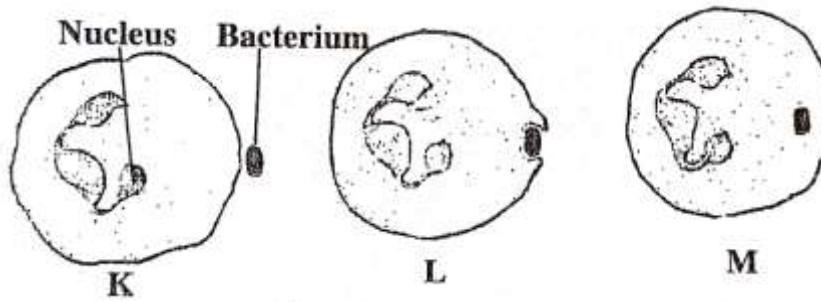


- a. (i) To which blood group does the patient's blood in the above test belong? (1 mark)
 (ii) Explain your answer to a. (i). (3 marks)
 - b. What is the difference between blood plasma and serum? (1 mark)
 - c. (i) To which blood group do universal donors belong? (1 mark)
 (ii) Explain why agglutination does not occur in a person receiving blood from a universal donor. (2 marks) (1990, II)
2. a. What do the following terms mean?
 (i) Blood transfusion? (1 mark)
 (ii) Compatible blood groups? (1 mark)
- b. Give **two** examples of incompatible groups under the ABO blood group system. (2 marks)
- c. Why is it important to give a blood donor a drink and iron tablets immediately after donating blood? (2 marks) (1998, I)
3. Explain **one** way in which each of the following blood cells perform its function in infection prevention:
 a. Phagocytes (2 marks)
 b. Lymphocytes (2 marks) (2015, I)
4. Diarrhoea is one of the signs of cholera. It should be treated immediately as it may be fatal if left untreated.
 a. Explain why diarrhoea may be fatal. (2 marks)
 b. What first aid should be given to someone with diarrhoea? (1 mark)
 c. The immunity acquired from cholera vaccine is an example of passive immunity.
 (i) Name another form of immunity given in a vaccine. (1 mark)
 (ii) Explain how it works. (2 marks)

d. **Figure 2** shows a graph of a person suffering from an infectious disease.



- (i) What was the incubation period of the disease? (1 mark)
- (ii) What was the highest body temperature reached? (1 mark)
- (iii) How do you account for the shape of the graph between:
5 and 8 days? (2 marks)
8 and 10 days? (2 marks) (1992, I)
5. In order to determine the blood group of a patient, some drops of her blood were mixed with anti-A serum on a plate marked **U**, while some drops were mixed with anti-B serum on plate marked **V**. The mixtures in the two plates were then stirred with a clean glass rod. The results obtained were as illustrated in **figure 3**.
-
- From the results shown in the figure,
- a. What was the blood group of the patient? (1 mark)
- b. Explain your answer. (2 marks) (1999, I) (2 marks)
6. a. Define a “vaccine”. (2 marks)
- b. Children under five years of age are vaccinated against diseases such as tetanus and tuberculosis.
- (i) Explain how vaccination protects children against infection. (3 marks)
- (ii) Why can a vaccine for tetanus not be used against tuberculosis? (1 mark) (2003, I)
7. a. State **two** factors which must be considered before a blood transfusion is done. (2 marks)
- b. Describe how an individual could acquire natural active immunity. (3 marks) (2004, I)

8. a. What is the function of helper T-cells in the body? **(1 mark)**
 b. Explain the effect of HIV on helper T-cells in the body. **(2 marks)**
(2005, I)
9. To determine the blood group of a donor, a drop of blood was added to plates containing anti-A serum and anti-B serum, respectively. **Figure 4** shows results of the test.
- 
- a. What is "serum"? **(1 mark)**
 b. (i) State the results shown in **X** and **Y**. **(2 marks)**
 (ii) What was the blood group of the donor? **(1 mark)**
 (iii) Give a reason to support your answer in b. (ii). **(2 marks)**
 c. Why is it necessary to test the blood group of the donor before transfusion? **(2 marks)**
(2005, I)
10. a. Name the agglutinating proteins in plasma of a person with blood group **O**. **(1 mark)**
 b. Explain why a person with blood group **O** is a universal donor. **(2 marks)**
(2006, I)
11. Explain the role of each of the following in body's defence.
 a. Phagocytes **(3 marks)**
 b. Antibodies **(2 marks)**
 c. Killer T-cells **(2 marks)**
(2007, I)
12. **Figure 5** shows stages of a process marked **K**, **L**, and **M** carried out by a type of blood cells. Use it to answer the questions that follow:
- 
- a. Name the process. **(1 mark)**
 b. Where does this process take place in the body? **(1 mark)**
 c. What could happen to the bacterium at stage **M** of the process? **(1 mark)**
(2018, I)
13. a. Define "passive immunity" **(1 mark)**
 b. Explain how each of the following helps the body to defend itself against infection.
 (i) platelets **(2 marks)**
 (ii) stomach **(2 marks)**

- c. How does the “Human Immunodeficiency Virus” (HIV) weaken immunity of the human body? **(2 marks)**
(2010, I)

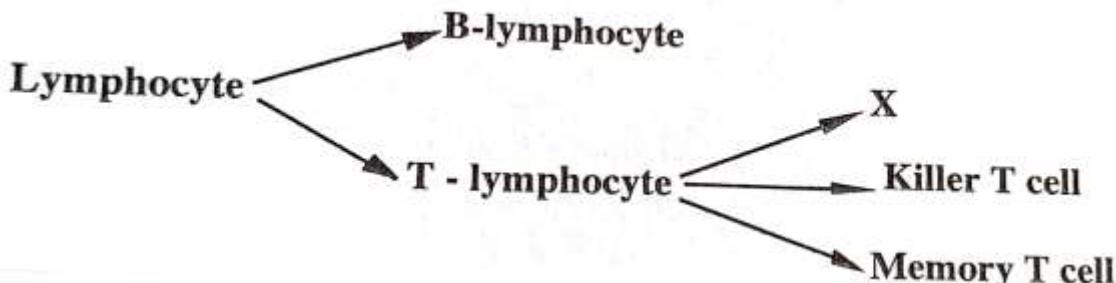
- 14.** Table 1 shows the number of children that were infected by tuberculosis after being exposed to two different treatments. Use it to answer the questions that follow.

Table 1

| Treatment | Number of Children | Number of Infected Children |
|--------------|--------------------|-----------------------------|
| vaccinated | 500 | 20 |
| unvaccinated | 500 | 350 |

- a. Calculate the percentage of vaccinated children that were not infected. Show your working. **(3 marks)**
b. Explain how the vaccine protected some children from tuberculosis. **(2 marks)**
(2011, I)

- 15.** **Figure 6** shows types of lymphocytes in a flow diagram. Use it to answer the questions that follow.



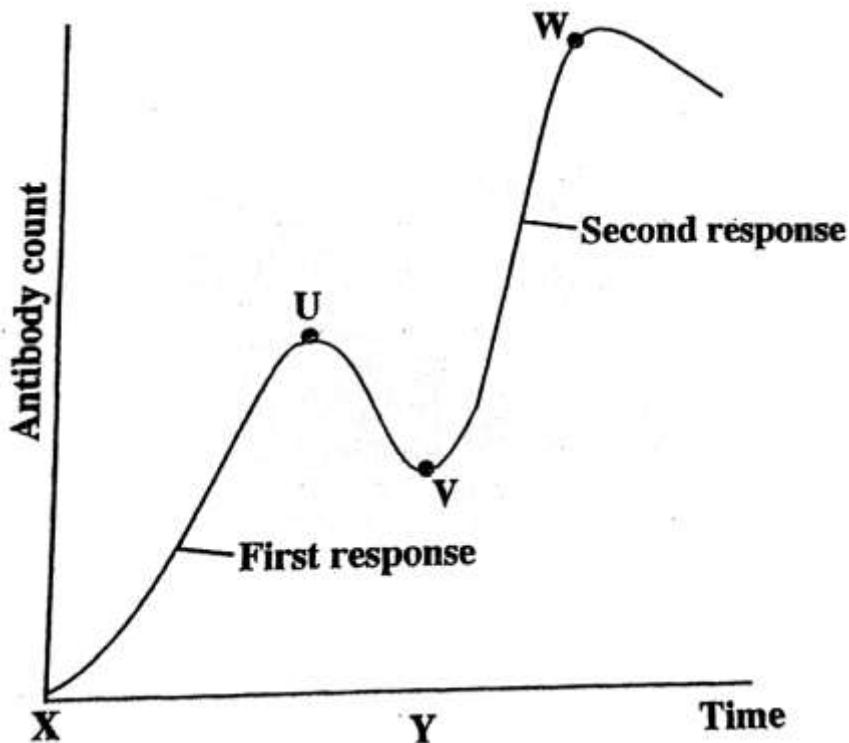
- a. Name the T- lymphocyte **X**. **(1 mark)**
b. State the difference between “B-lymphocytes” and “T-lymphocytes”. **(1 mark)**
c. Explain what happens if T-lymphocyte **X** has been weakened by HIV. **(2 marks)**
(2014, I)
- 16.** a. (i) Define the term “organ transplant” **(1 mark)**
(ii) Name any **two** organs in the human body that can be transplanted. **(2 marks)**
b. (i) What problem is likely to occur if organ transplant is carried out without considering blood groups? **(1 mark)**
(ii) Explain **one** way in which the problem in **b. (i)** would occur. **(3 marks)**
(3 marks)

- 17.** The **Table** below shows blood groups of members of a certain family. Use it to answer the questions that follow:

| Family Members | Type of blood group |
|----------------|---------------------|
| Father | B |
| Mother | A |
| Son | AB |
| Daughter | O |

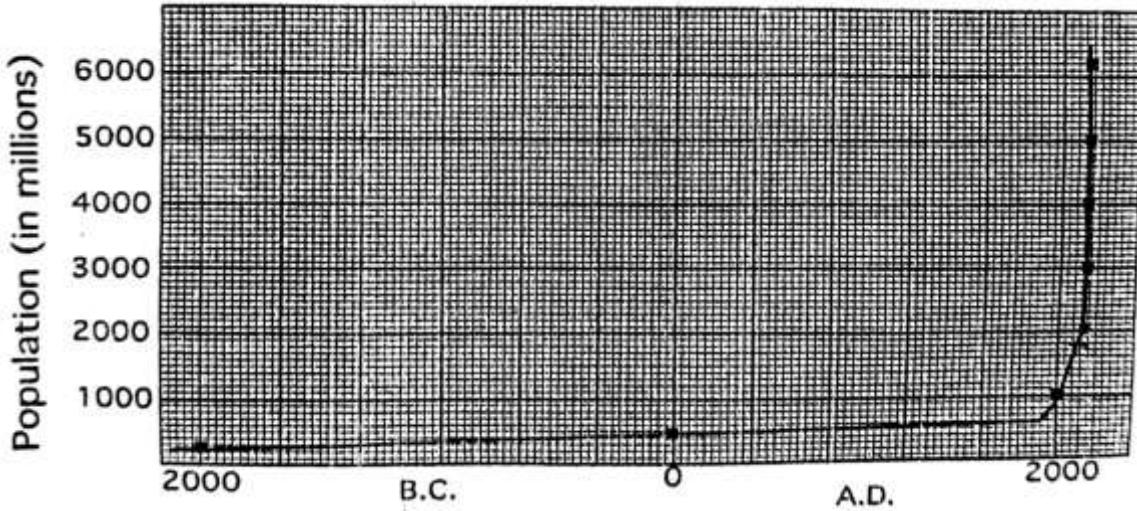
- a. (i) Which member cannot donate blood to the family? **(1 mark)**
(ii) Explain the problem that would arise if the mother received blood from the member named in **a. (i)**. **(2 marks)**
b. Give a difference between red blood cells in group B^+ and group B^- . **(1 mark)**
c. State any **two** ways in which blood of healthy person defends the body against infections. **(2 marks)**
(2018, I)

18. a. Explain one way in which a baby would acquire immunity from its mother after birth. (2 marks)
- b. Name the organ in the body that removes excess proteins in the body. (1 mark)
- c. (i) What happens to the protein before being removed from the body? (1 mark)
- (ii) Where does the process named in 18. c. (i) occur? (1 mark)
- (2018, I)
19. a. What type of immunity does a child acquire through recovering from a disease? (1 mark)
- b. Why is a person with anaemia not allowed to donate blood? (2 marks)
- c. Explain how vaccination works. (2 marks)
- (2019, I)
20. a. Define blood transfusion. (1 mark)
- b. State any **two** types of blood donors. (2 marks)
- c. State any **three** factors to be considered before blood transfusion. (3 marks)
- (2020, I)
21. **Figure 8** is a graph showing the response of antibodies in human body at different times.



- a. Why does the level of antibodies decrease between points U and V? (1 mark)
- b. State what happens in the human body at points X and Y. (1 mark)
- c. Why is there a rapid change in response between points V and W? (2 marks)
- (2009, I)

1. The world's population growth is ever increasing at a frightening rate. By the year 1930 it had reached 2,000 million and by the year 2,000 some people estimate that the world population will have reached 7.5 billion.
 - a. What type of growth curve would represent the information stated above? **(1 mark)**
 - b. What is the biological definition of the word population? **(1 mark)**
 - c. Give **three** reasons for such an increase in the human population growth trend. **(3 marks)**
(1996, II)
2. The growth rate of human population on a certain island is 3.0% per annum.
 - a. Explain what the growth of 3.0% means. **(1 mark)**
 - b. Apart from birth and death rates, state **two** other factors that may affect population growth rate on the island. **(2 marks)**
 - c. In January 1998, the population of the island was estimated at 100,000. Assuming the growth rate of the island is constant at 3.0% per annum, what will be the population of the island in January 2000? Show your working. **(3 marks)**
(1998, I)
3. **Figure 1** is a graph showing the growth of human population in the world. Use it to answer the questions that follow.



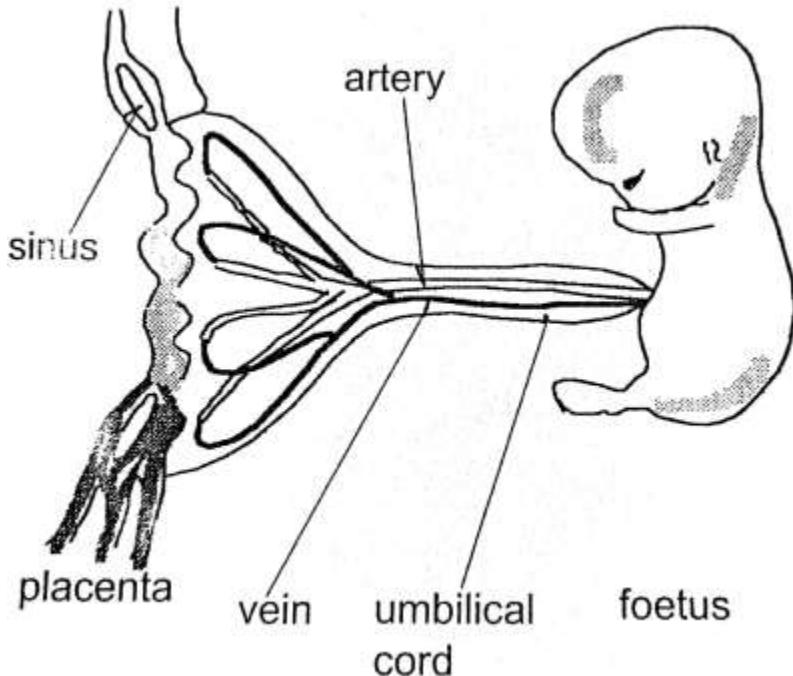
- a. What was the population of the world in 1800 AD? **(1 mark)**
- b. (i) Describe the change in population between 1800 AD and 2000 AD. **(1 mark)**
 (ii) Write down two factors that caused the change described in 3. b. (i). **(2 marks)**
(2007, I Leaked Paper)
4. a. Give **one** difference between birth rate and fertility rate. **(1 mark)**
- b. Explain how the following affects fertility rate:
 - (i) using contraceptives **(2 marks)**
 - (ii) average age of marriage **(2 marks)****(2016, I)**

5. a. What is the difference between population density and population size? **(1 mark)**
 b. How may the populations of snakes and of mice control each other in a field where there are no other animals?
 c. The table below shows a model of population growth in mice starting with one male and one female in first generation. Study the table carefully and answer the questions that follow.

| GENERATION | Nr BORN | Nr DEAD | TOTAL Nr OF MICE |
|-----------------|---------|---------|------------------|
| 1 ST | 0 | 0 | 2 |
| 2 nd | 8 | 4 | 6 |
| 3 rd | 24 | 12 | 18 |
| 4 th | 72 | ? | ? |

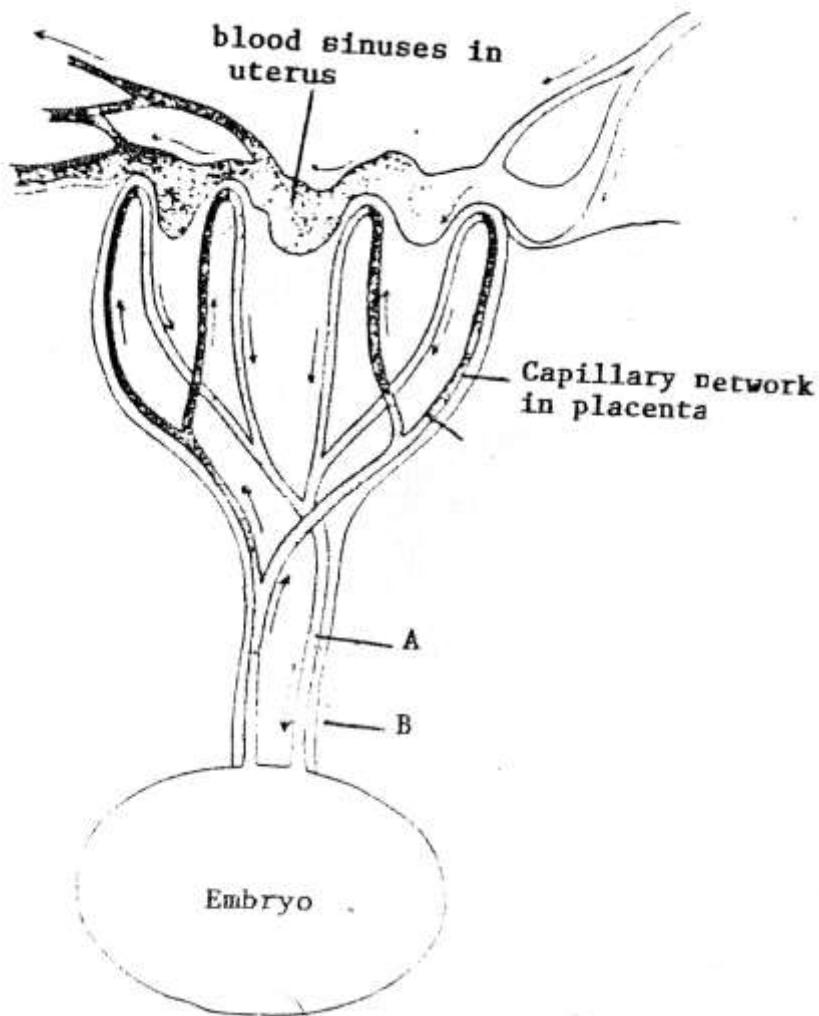
- (i) Complete the table by filling in appropriate numbers in the gaps for the 4th generation. **(2 marks)**
 (ii) What was the birth rate and death rate of this population? **(2 marks)**
 d. Name any **two** methods, which are used in family planning in Malawi. **(2 marks)**
(1999, I)

1. **Figure 1** is a diagram showing the relationship between the placenta and the foetus in mammal. The foetal heart pumps blood through blood vessels of the umbilical cord.



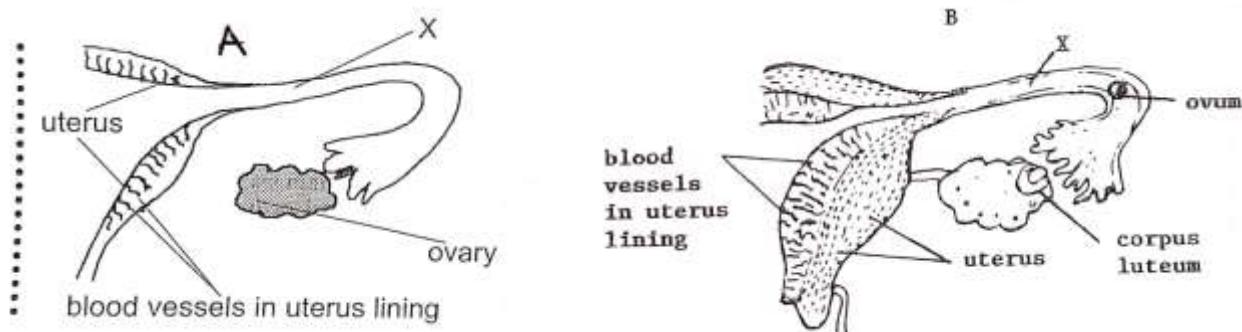
- a. On the diagram indicated with arrows the direction of blood flow in the
 - (i) artery (1 mark)
 - (ii) vein (1 mark)
 - b. which of the blood vessels will have:
 - (i) the greater concentration of amino acid? (1 mark)
 - (ii) the greater concentration of oxygen? (1 mark)
 - (iii) the greater concentration of carbon dioxide? (1 mark)
 - c. Looking at **figure 1**, suggest why there is no mixing of maternal and foetal blood. (2marks)
 - d. What is found in the sinus? (1 mark)
(1990, II)
2. a. State **two** differences between haploid and diploid cells (2 marks)
- b. Give an example of a haploid cell. (1 mark)
- c. What is the essential feature of sexual reproduction in both plants and animals (1 mark)
- d. State **two** factors that determine the phenotype of an organism. (2 marks)
- e. Give a short biological explanation to refute the following claim made by Monica Chaphamtengo Mkandawire: "My son, Precious, and daughter, Tabitha are identical twins"----- (2marks)
(1998, II)

3. **Figure 2** is a diagram to show the relationship between the blood supply of embryo, placenta and uterus. The arrows indicate the direction of blood flow.



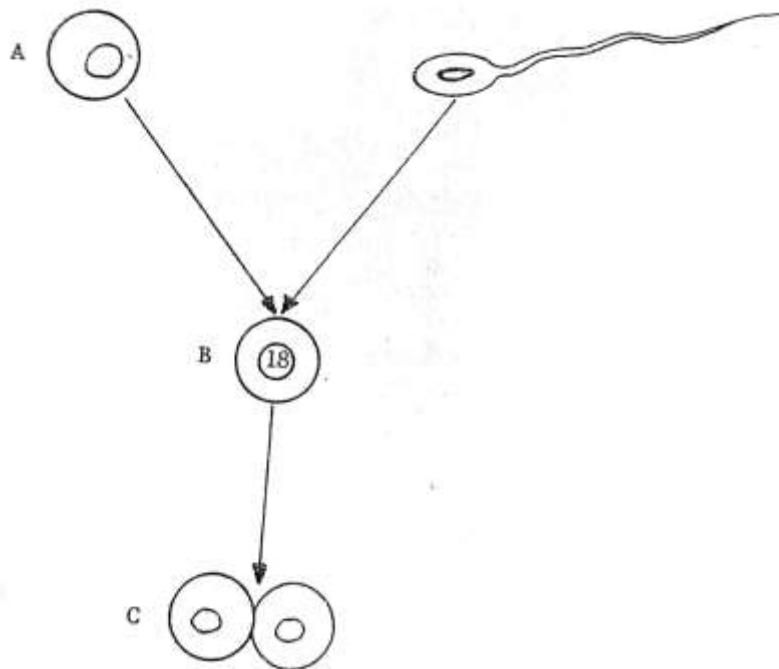
- Name the parts marked **A** and **B**. (2 marks)
- Mention one substance which passes from the;
 - Embryonic blood to maternal blood; (1 mark)
 - Maternal blood to embryonic blood. (1 mark)
- Explain how the substances named in 3 d.(i) moves from maternal blood to embryonic blood. (2 marks)
- (i) State **two** ways in which placenta is adapted to its function. (2 marks)
(ii) Explain how **one** of the adaptations mentioned in 3 d. (i) enables the placenta to perform its function efficiently. (1 mark)
(1994, II)

4. Figure 3 shows some of the stages which occur in female reproductive system of a mammal.



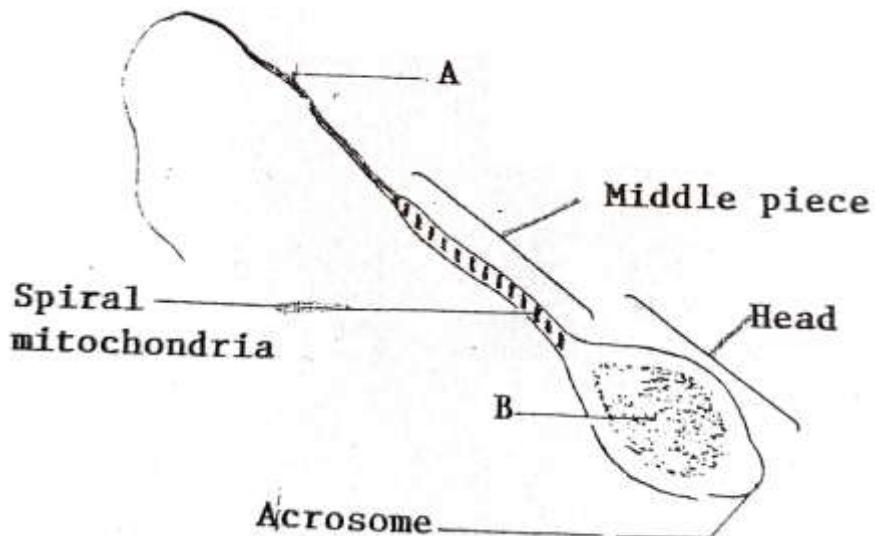
- Give **one** structural adaptation of the part marked X. (1 mark)
- Write down two structural differences shown in **A** and **B**. (2 marks)
- (i) Which gland in the brain secretes a follicle stimulating hormone (FSH)? (1 mark)
(ii) State one function of follicle stimulating hormone (1 mark)
- Progesterone is one of the essential hormones during pregnancy.
 - What happens to the level of progesterone to cause the changes seen in **figure 2 B**? (1 mark)
 - Give a reason for your answer to **d. (i)** (1 mark) (1992, II)

5. Figure 4 shows a diagrammatic outline of the process of sexual reproduction.



- (i) What name is given to the cell formed at **B**? (1 mark)
(ii) What name is given to the taking place in the cell formed at **B** that gives rise to the cells at **C**? (1 mark)
(iii) Write down the number of chromosomes present in each of the cells at **A** and **C**. (2 marks))
- State the importance of the process leading to the formation of the cell at **B**. (1 mark)
- In what part of the flowering plant does the process leading to the formation of the cell at **B** take place? (1mark) (1993, I)

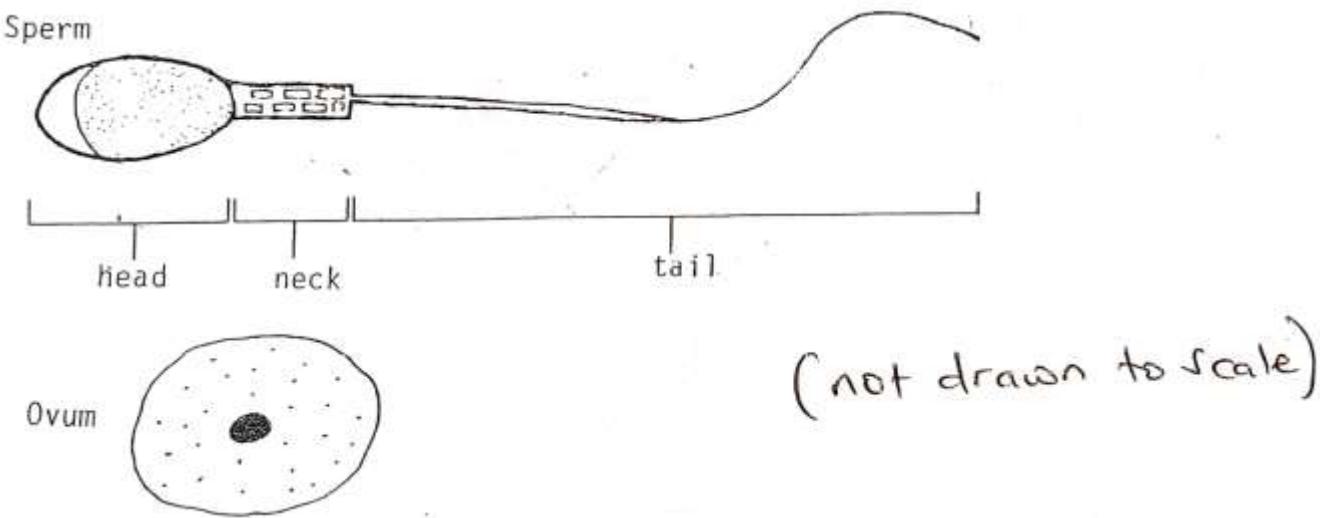
6. Figure 5 is a diagram showing the general structure of a sperm cell.



- Name the parts labelled **A** and **B**. (2 marks)
- What is the function of:
 - Enzymes found in acrosome; (1 mark)
 - Mitochondria in the middle piece? (1 mark)
- State **two** ways in which mammalian sperm differs from mammalian egg. (2 marks)

(1994, I)

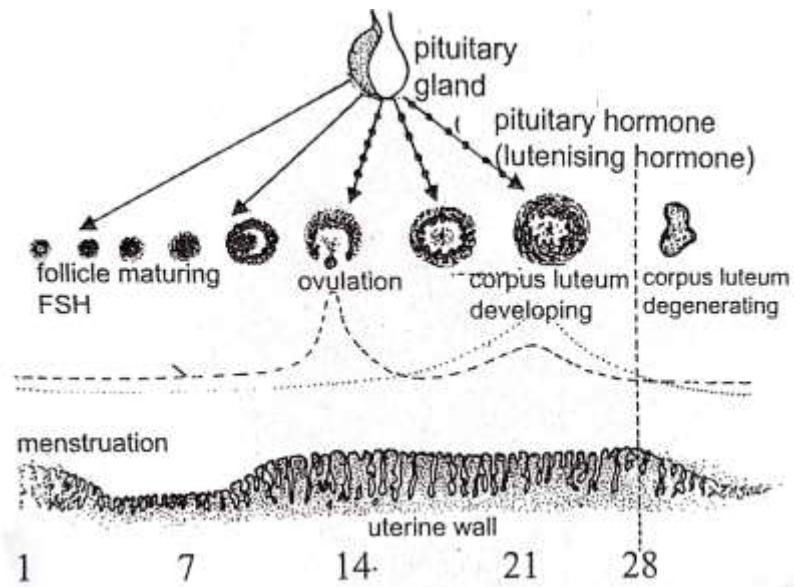
7. Figure 6 is a diagram of human gametes. Use it to answer the questions that follow.



- Besides size and shape, in what two other ways are sperm and ovum different? (2 marks)
- Explain why the neck part of the sperm contains a large number of mitochondria. (2marks)
- Name the structure in a flowering plant which is responsible for the production of:
 - Female gametes; (1 mark)
 - Male gametes; (1 mark)
- What process takes place in the structures named in c. above that leads to production of gametes? (1 mark)

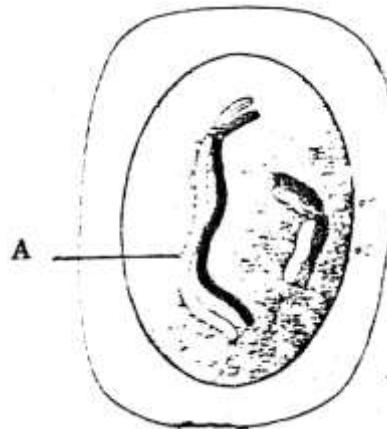
(1990, I)

8. **Figure 7** is a diagram showing levels of oestrogen, progesterone, follicle stimulating hormone (FSH) in blood and events leading to menstruation and ovulation in human female.



- What happens to development of follicles when the following changes occur:
 - Oestrogen level increases? (1 mark)
 - Progesterone level increases? (1 mark)
 - Follicle stimulating hormone (FSH) is at its lowest level? (1 mark)
- What happens to the levels of three hormones when fertilization takes place? (3 marks)
- Contraceptives act as oestrogen and progesterone to prevent pregnancy. With reference to **figure 7** explain how they work. (2 marks) (1997, II)

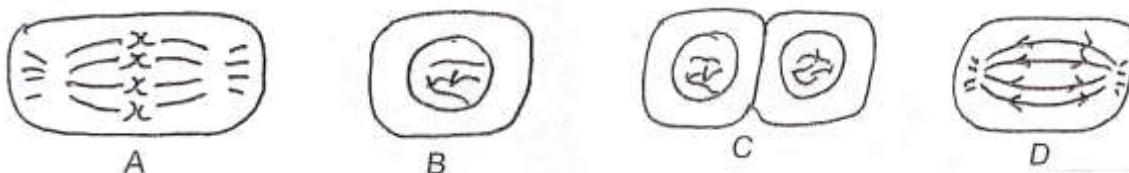
9. **Figure 8** is a diagram showing a cell undergoing cell division.



- (i) What type of cell division taking place in this cell? (1 mark)
 (ii) Give a reason for your answer to 8.a (i). (1 mark)
 - Draw one daughter cell which would result from this cell division. (2 marks)
 - What important molecule is found in structure A? (1 marks) (1994, I)
10. a. Give two fundamental features of meiosis. (2 marks)
- b. What is deoxyribonucleic acid (DNA)? (1 mark)

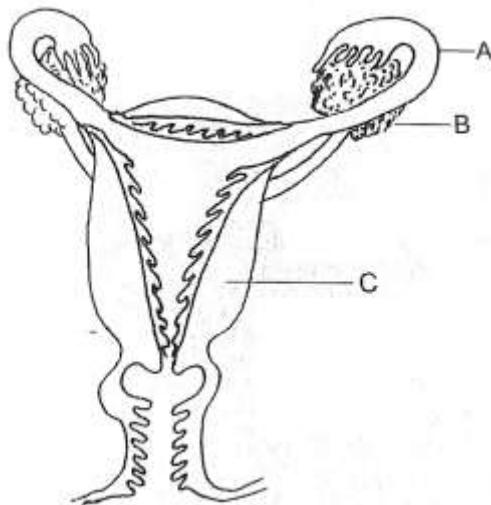
c. **Figure 9** shows some stages in the process of mitosis arranged in a wrong order. Using letters **A**, **B**, **C** and **D**, only arrange the stages in correct sequence to show the proceeds.

(2 marks)



(1998, I)

11. a. **Figure 10** is a diagram showing the female reproductive system of a mammal.



(i) Name the parts labeled **A** and **C**. (2 marks)

(ii) State two functions of part labeled **B**. (2 marks)

(iii) What changes takes place in structure labeled **C** during pregnancy? (2 marks)

b. a. Mammalian foetus exchanges dissolved substances with its mother through the placenta.

(i) Name **two** substances which pass a cross the placenta to mother. (2 marks)

(ii) In the placenta the blood of the mother does not mix with blood of the foetus. What **two** problems would arise if the maternal and foetal blood mixed? (2 marks)

(2000, II)

12. A mammalian foetus exchanges dissolved substances with its mother through the placenta.

a. State **two** features of the placenta, which are important for efficient exchange of substances. (2 marks)

b. Mention **two** metabolic substances, which pass from the foetus to the mother. (2 marks)

c. State **two** functions of amniotic fluid during pregnancy. (2 marks)

(1998, I)

13. a. State the process that bring growth in animals. (1 mark)

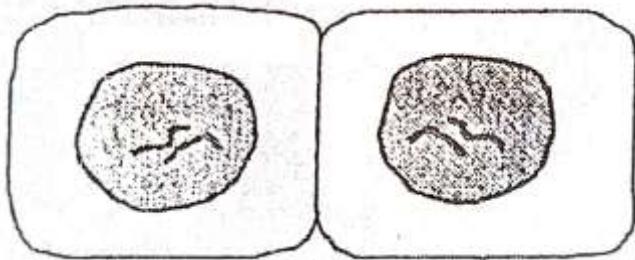
b. Complete **Table 1** to show some of differences between mitosis and meiosis using the given clues.

| Clue | Mitosis | Meiosis |
|---|---------|---------|
| Number of daughter cells produced per division. | | |
| Type of cells in which process occurs | | |
| Significance of process | | |

(6 marks)

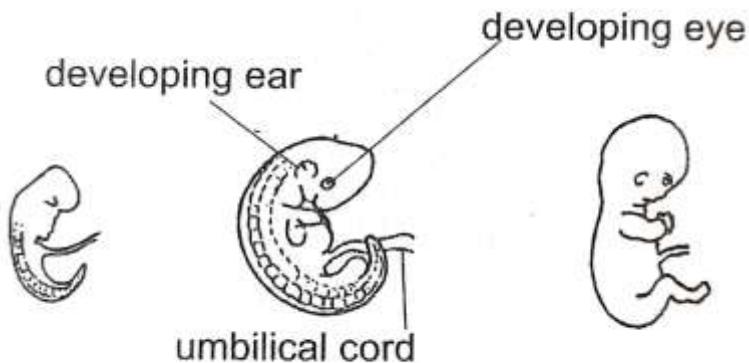
(1999, II)

14. Figure 11 is a diagram showing one of the stages of a cell undergoing mitosis.



- Name the stage shown (1 mark)
- Draw a similar cell at metaphase stage. (2 marks) (2000, I)

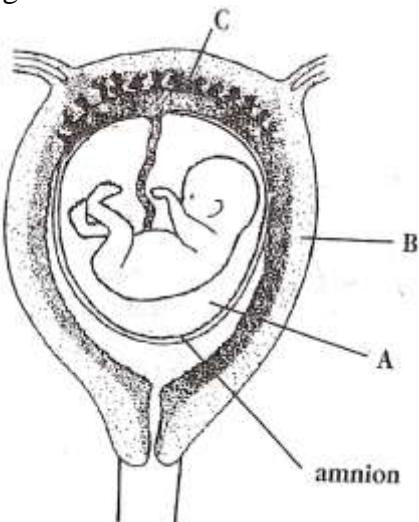
15. Figure 12 is a diagram showing a human embryo at different stages of development.



(a) After 2 weeks (b) About five weeks (c) 8 weeks

- How old is the embryo by the time a circulatory system develops? (1 mark)
- (i) Apart from the head and tail name the structure which is present in all the three stages shown in **figure 12**. (1 mark)
(ii) Explain **two** ways in which the structure named in **15 b (i)** is important to embryo. (2 marks)
- What type of cell division contributes to increase in size of the embryo? (1 mark) (2004, I)

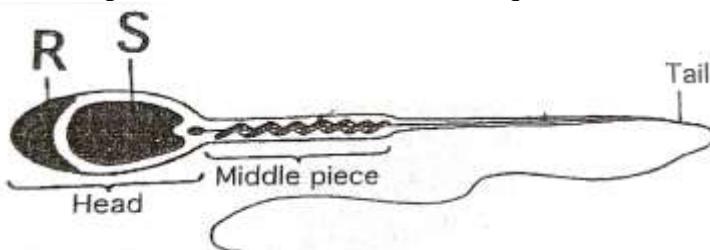
16. Figure 13 shows a developing human foetus inside the womb.



- Name the part marked **B** and **C**. (2 marks)

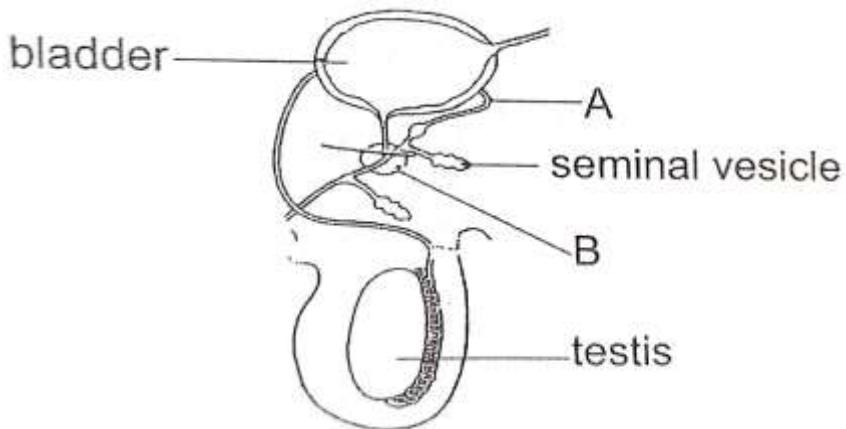
- b. State two roles played by the part marked A during development of the foetus. **(2 marks)**
(2005, I)

17. Figure 14 is a diagram of sperm cell. Use it to answer the questions that follow.



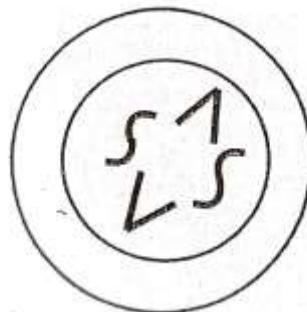
- a. (i) What is contained in the part marked S? **(1 mark)**
(ii) What is the function of enzymes produced by part marked R? **(1 mark)**
b. How does the middle piece assist the sperm cell in movement? **(2 marks)**
(2007, I)

18. Figure 15 is a diagram showing part of the male reproductive system.



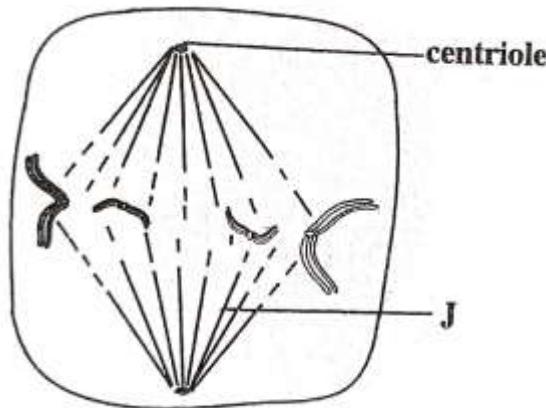
- a. Name the parts labelled A and B. **(2 marks)**
b. Name the hormone produced by the testis **(1 mark)**
c. Explain the contraceptive method which involves cutting of part labelled A is more effective. **(2 marks)**
(2006, I)

19. Figure 16 shows an animal cell at an early stage of division.



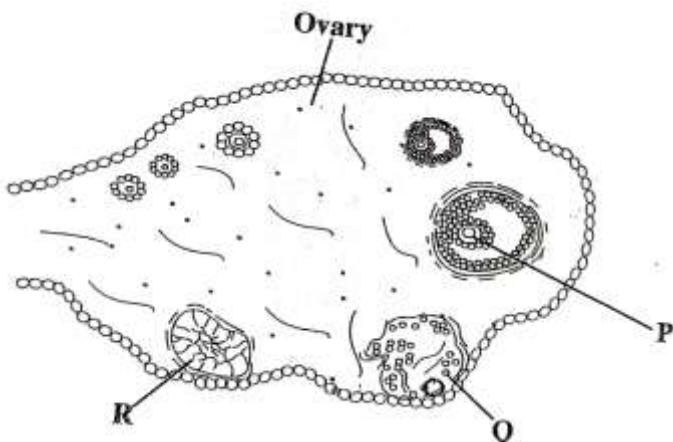
- a. What term is used to describe the number of chromosomes in the cell? **(1 mark)**
b. If the cell divided by meiosis:
(i) How many daughter cell would be formed at the end of the first meiotic division? **(1 mark)**
(ii) How many chromatids would each daughter cell contain at the end of Telophase II? **(1 mark)**
(2008, I)

20. Figure 17 shows a cell undergoing mitotic division.



- a. (i) Identify the stage (1 mark)
 (ii) Give a reason for your answer to 20 a (i). (1 mark)
- b. What is the role of J? (1 mark)
(2009, I)

21. Figure 18 shows the development of an ovum in the ovary of a woman.



- a. Name the part marked P and R. (2 marks)
- b. Name the process taking place at Q. (1 mark)
- c. (i) What hormone is produced by the part marked R? (1 mark)
 (ii) Explain the role of hormone in 21c. (i) in women. (2 marks)
(2009, I)

22. Describe the behavior of chromosomes during mitosis and meiosis at the stated stages.

| Stage | Chromosome behavior during mitosis | Chromosome behavior during meiosis |
|-----------|------------------------------------|------------------------------------|
| Prophase | | |
| Metaphase | | |

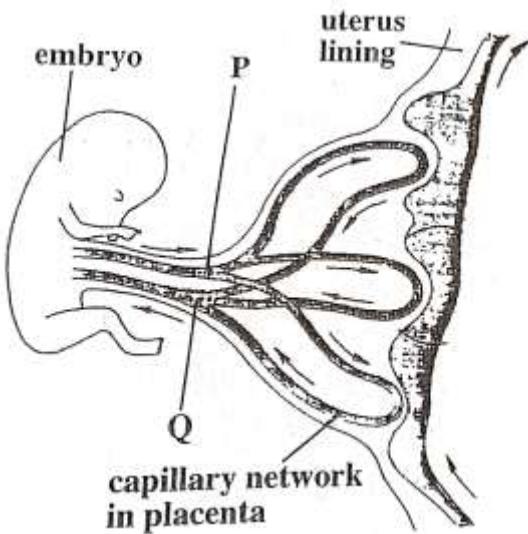
(4 marks)
(2013, I)

- 23.** a. State any two things that happen during the first stage of birth? (2 marks)
 b. Mention two advantages of breastfeeding. (2 marks)

(2007, I Leaked Paper)

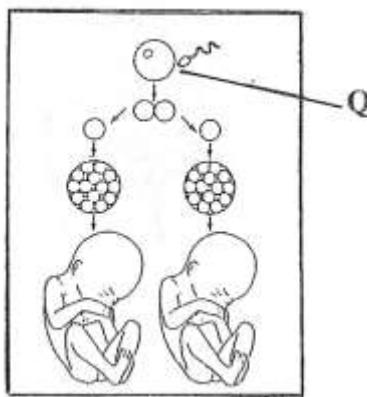
- 24.** a. State two things that happen during the first stage of birth. (2 marks)
 b. Mention two advantages of breast feeding. (2 marks)

25. Figure 19 is a diagram showing blood supply between an embryo and placenta.



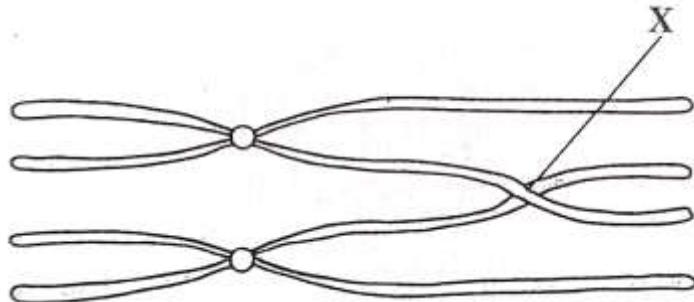
- a. Name the blood vessels marked **P** and **Q**. (2 marks)
 - b. Mention any two substances transported by blood vessel marked **P**. (2 marks)
 - c. Name the organ that starts to function immediately the child is born. (1 mark)
 - d. Explain one adaptation of placenta to its function. (2 marks)
- (2010, I)

26. Figure 20 shows processes in human production. Use it to answer the questions that follow.



- a. Name the process represented by letter **Q**. (1 mark)
 - b. (i) What type of twins are produced in **figure 20**? (1 mark)
 - (ii) Give a reason for your answer in **26b. (i)**. (1 mark)
- (2010, I)

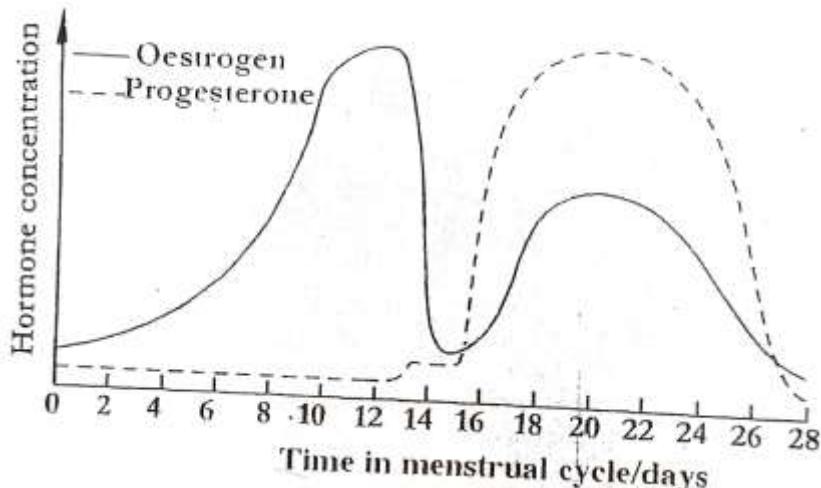
27. Figure 21 shows a stage during meiosis. Use it to answer the questions that follow.



- a. Name the process taking place at part marked **X**. (1 mark)

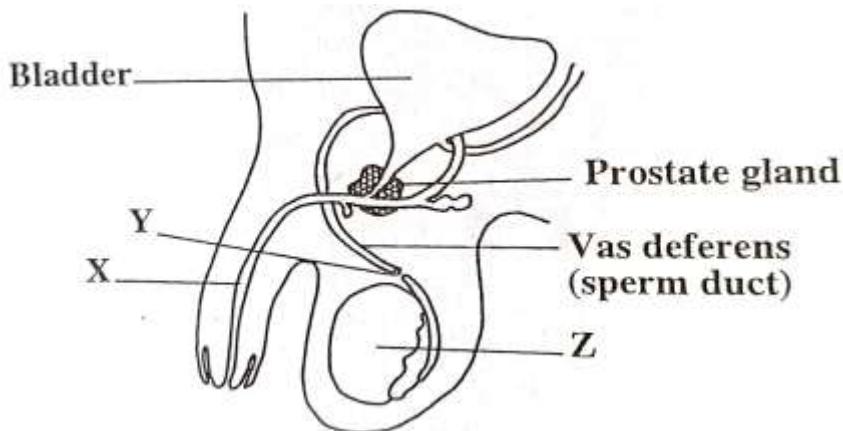
- b. Name any one organ in human body in which process **X** takes place. **(1 mark)**
 c. Explain the importance of the process taking place at **X**. **(2 marks)**
(2012, I)

28. Figure 22 shows levels of some hormones during the menstrual cycle.



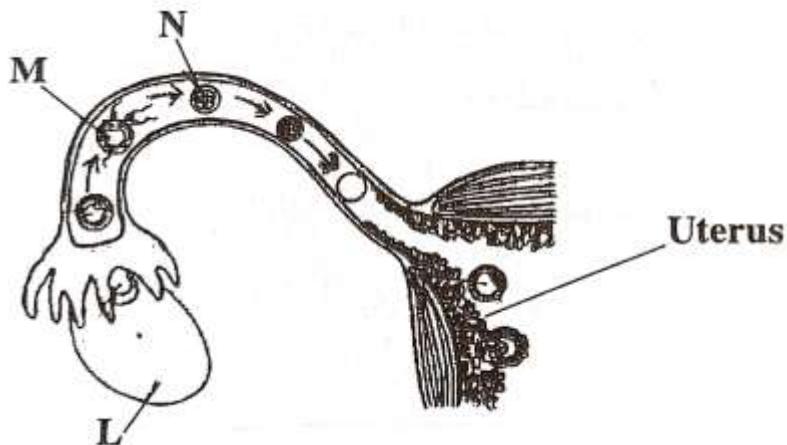
- a. (i) During which period is fertilization more likely to occur? **(1 mark)**
 (ii) Give a reason for your answer to **28 a. (i)**. **(1 mark)**
 b. State any **two** things that may happen to the wall of uterus between days 5 and 10. **(2 marks)**
 c. Explain why the level of progesterone increases from day 16 to 20. **(3 marks)**
(2011, I)

29. Figure 23 is a diagram of male reproductive system.



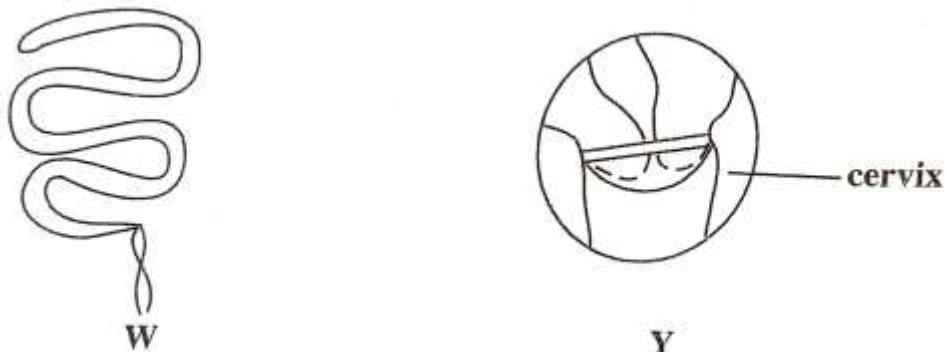
- a. Name the parts marked **X** and **Z**. **(2 marks)**
 b. Mention the contraceptive method shown at **Y**. **(1 mark)**
 c. Mention any **two** advantages of using this contraceptive method. **(2 marks)**
(2012, I)
- 30.** a. Give any **two** structural differences between “a sperm” and “an ovum”. **(2 marks)**
 b. State **two** functions of testes. **(2 marks)**
 c. State any **two** causes of maternal death. **(2 marks)**
(2019, I)
- 31.** a. Give any **two** accessory glands in the male reproductive system. **(2 marks)**
 b. Explain any **two** adaptations of the placenta for its function. **(4 marks)**
(2020, I Leaked Paper)

32. Figure 24 shows part of the female reproductive system in humans.



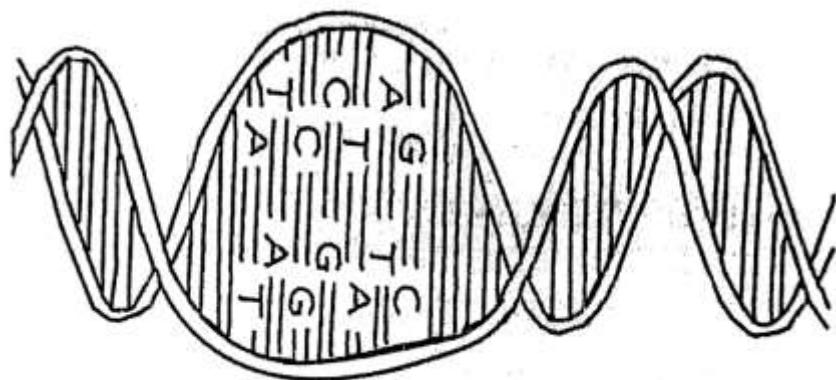
- Name the part marked **L**. (1 mark)
- What is the name of the process taking place at **M**? (1 mark)
- (i) What type of cell division is taking place at **N**? (1 mark)
(ii) Give a reason for your answer in 29 c. (i). (2 marks)
- Name the hormone that promotes the thickening of the uterus during ovulation. (1 mark) (2014, I)

33. Figure 25 shows two contraceptive methods.



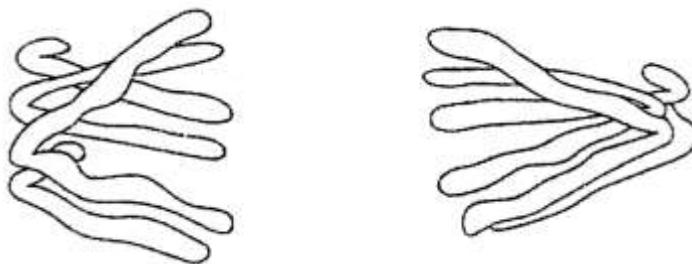
- Name the contraceptive methods **W** and **Y**. (2 marks)
- State how each of the contraceptive methods in a. works. (2 marks) (2015, I)

34. Figure 26 is a diagram showing part of a complex molecule found in living cells.



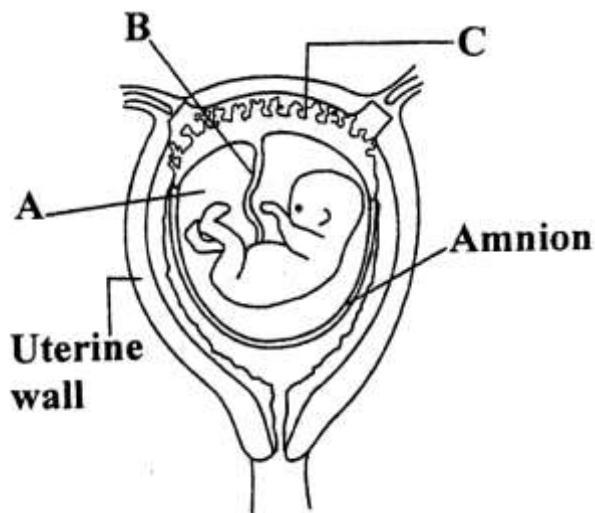
- Name the molecule. (1 mark)
- In which part of a cell is the molecule normally found? (1 mark)
- State **one** function of the molecule in living organisms. (1 mark) (2007, I Leaked Paper)

35. **Figure 27** is a diagram showing a cell undergoing mitosis. Use it to answer questions that follow:



- a. (i) Name the stage of mitosis shown. **(1 mark)**
(ii) Give a reason for your answer in a. (i). **(2 marks)**
b. How many chromosomes are in the cell? **(1 mark)**
(2017, I)

36. a. **Figure 28** is a diagram showing a human embryo in the uterus.

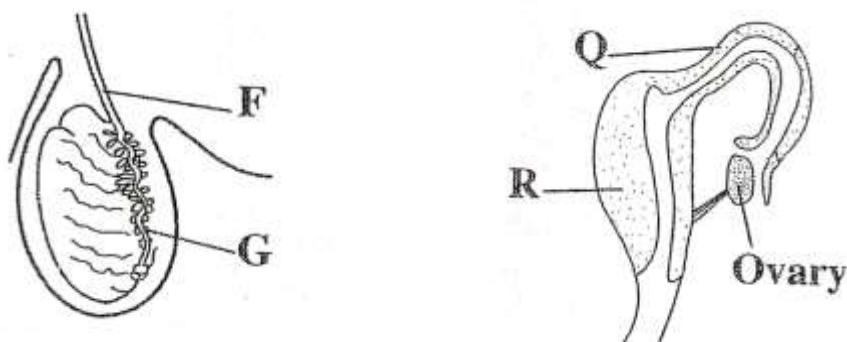


- (i) Name the parts labelled **B** and **C**. **(2 marks)**
(ii) State any **two** functions of the part labelled **A**. **(2 marks)**
b. Mention the **two** permanent methods of birth control. **(2 marks)**
(2019, I)

37. Give any **three** advantages of exclusive breast feeding. **(3 marks)**

(2020, I Leaked Paper)

38. **Figure 29** shows part of the human male and female reproductive systems.



- a. Name the parts marked **F** and **R**. **(2 marks)**

- b. State **one** function of each of the following parts:

G:

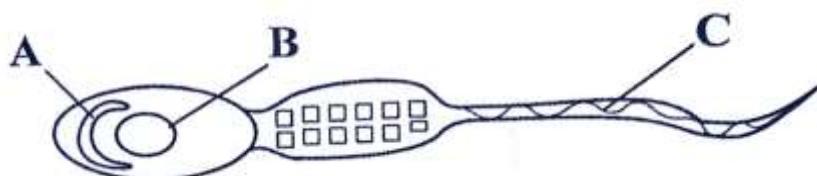
(1 mark)

Q:

(1 mark)

(2015, I)

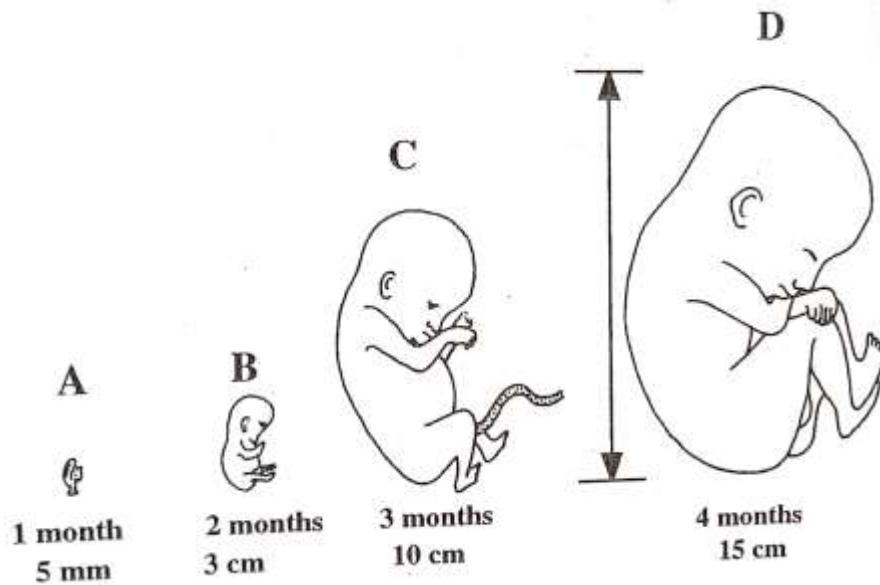
39. **Figure 30** is a diagram of a mammalian sperm. Use it to answer the questions that follow.



- a. Name the part labelled **B**. **(1 mark)**
- b. State the function of the part labelled **C**. **(1 mark)**
- c. Explain what happens to part labelled **A** during fertilization. **(2 marks)**
- d. Explain any two adaptations of the sperm for movement. **(4 marks)**

(2020, I)

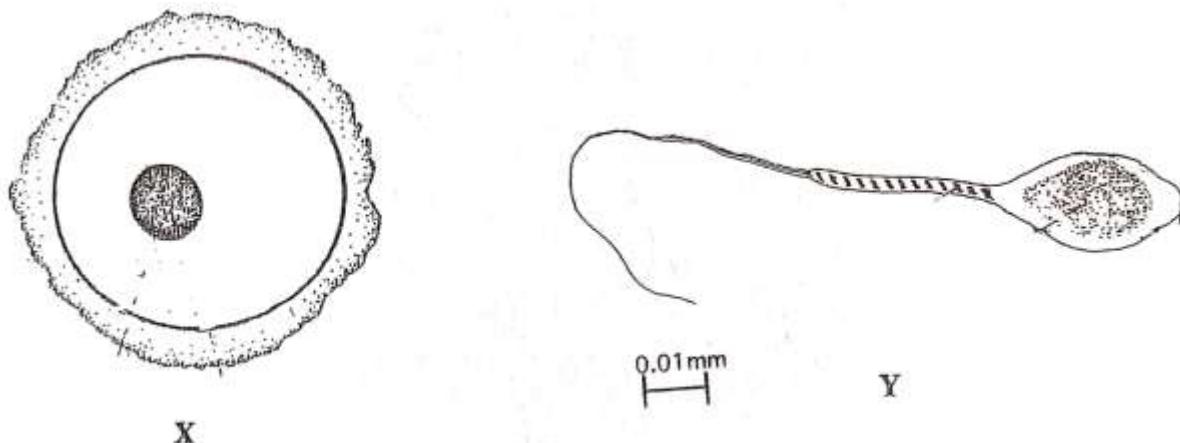
40. **Figure 31** is a diagram showing a human embryo at different stages of development in terms of age and corresponding length. Use the information to answer the questions that follow.



- a. (i) Measure the length of embryo **D** along the axis shown. **(1 mark)**
(ii) Calculate the magnification of embryo **D**. Show your working. **(3 marks)**
- b. (i) Plot a graph of length of embryo against age. **(4 marks)**
(ii) From your graph, estimate the length of embryo at the age of $3\frac{1}{2}$ months **(1 mark)**
- c. Apart from the umbilical cord, state the major difference between **C** and **D**. **(1 mark)**

(2004, II Practical)

41. Figure 32 shows diagram of two cells, **X** and **Y**. Use it to answer the questions that follow.



- a. In the table provided, write down **two** structural differences between two cells.

| Cell X | Cell Y |
|--------|--------|
| | |
| | |

(2 marks)

- b. State any **two** possible causes of genetic variation in the two cells. (2 marks)
c. Explain any **two** adaptations of cell **Y** to its function. (4 marks)
d. Using the scale provided, calculate the actual length of cell **Y**. (4 marks)

(2009, II Practical)

1. Warfarin is a poison used against rats. Some rats have evolved which are resistant to Warfarin. The resistant rats are pure breeding and have two recessive genes.
- If N represent the normal gene and n represent the resistant gene, state the genotype of resistant rats. **(1 mark)**
 - Show by using the box below, a cross between two rats are heterozygous for this condition.

| Gametes | | |
|---------|--|--|
| | | |
| | | |

(4 marks)

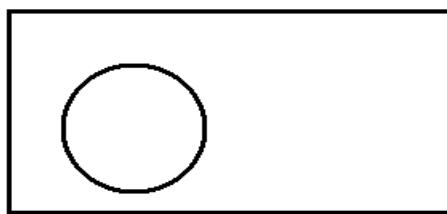
- (ii) How many rats would you expect to be resistant in a litter of 16? **(2 marks)**
- How might a resistant gene evolve in a rat population? **(1 mark)**
 - Rats are pests and need to be controlled. Since the use of chemicals may results in the evolution of resistant genes, suggest the best way of controlling the rat population. **(1 mark)**
(1990, I)
2. a. What do the following terms mean:
- reduction division **(1 mark)**
 - phenotype **(1 mark)**
- b. What is fertilization? **(1 mark)**
- c. (i) What is meant by variation of species? **(1 mark)**
- (ii) State any **three** processes that may bring about variation in a species. **(3 marks)**
(1991, I)

3. A rat from a pure breeding strain with grey fur was crossed with a rat from a pure breeding strain with black fur. All the F₁ were grey. Use A for dominant alleles and a for the recessive alleles.

- Give the genotypes of the
 - two parents;

| | | |
|-------|-------|-----------------|
| Grey | _____ | (1 mark) |
| Black | _____ | (1 mark) |
 - F₁ rats _____ **(1 mark)**
- The F₁ rats were allowed to mate. They produced a total of 48 offsprings
 - What will be the ratio of grey to black rats? **(1 mark)**
 - How many rats were black? Show your working. **(2 marks)**
(1991, II)

4. **Figure 1** is an outline diagram of an animal cell. Use it to answer the questions that follow.



- a. In the diagram draw and label
- (i) two pairs of chromosomes (2 marks)
 - (ii) one mitochondria (1 mark)
- b. If the cell in **figure 1** underwent meiosis, how many chromosomes would each daughter cell have? (1 mark)
- c. In humans, the allele for brown eyes is dominant to the allele for blue eyes. However, a blue-eyed baby may be produced by a brown-eyed father and brown-eyed mother.
- (i) Using **B** for a dominant allele and **b** for recessive allele for blue eyes, what would be the genotype of such parents?
Father: _____
Mother: _____ (2 marks)
 - (ii) Using the genotypes you have given in (i) above, show with the aid of a labeled diagram how a brown eyed parents can produce a blue-eyed child. (4 marks)
(1992, I)
5. White flowers (genotype **WW**) and red flowers (genotype **RR**) of pure bred balsam plants were cross-pollinated. The resulting flowers were all pink.
- a. What is the genotype of the pink flowers? (1 mark)
 - b. If the pink flowers were self-pollinated, what would be the ratio of white, pink and red flowers? Show your working. (5 marks)
(1993, II)
6. In Cattle, the presence or absence of horns is controlled by a single gene which has two forms, one for presence of horns and the other for the absence of horns. Pure breeding cattle with horns were crossed with pure breeding cattle without horns. All F_1 Cattle were hornless.
- Using **H** for dominant form and **h** for the recessive form in answering the questions below
- a. Give the genotypes of the two parents and the F_1 cattle.
Parent with horns: _____ (1 mark)
Parent without horns: _____ (1mark)
F₁ cattle: _____ (1 mark)
 - b. F₁ cattle were mated amongst themselves. Write down the results of such a cross showing the genotypes and phenotypes of the offsprings. (3 marks)
 - c. The F₁ cattle were crossed with pure breeding cattle with horns. What proportion of offspring were hornless. Show your working. (4 marks)
(1994, II)

7. The genotypes of children resulting from a marriage between parents with blood group B are as shown in **Table 1**.

Table 1

| | |
|------|------|
| 1 OO | 2 OB |
| 3 BB | 4 BO |

B represents a gene for blood group **B** while

O represents a gene for blood group **O**.

Gene **O** is recessive to gene **B**.

- a. Give the genotype of the parents. **(1 mark)**
- b. What is the ratio of children with blood group B to those with blood group O? **(1 mark)**
- c. Draw a labeled diagram to show what would happen if 4 married 1. **(4 marks)**
- d. Give **two** factors that made the study of genetics in humans difficult. **(2 marks)**

(1995, I)

8. The colour of balsam flowers is determined by a single pair of genes. One type of gene (**R**) is responsible for red colour while the other type (**r**) is responsible for white colour.
- a. Using the symbols **R** and **r** to represent the two genes complete the table below.

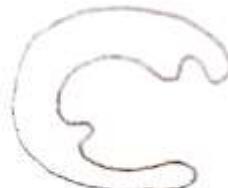
| | Red flowers | White flowers |
|----------------------------|-------------|---------------|
| Genotype of parent | | |
| Genotype of gamete | | |
| Genotype of F ₁ | | |

(6 marks)

- b. The F₁ flowers are all pink. Suggest the relationship between two genes. **(1 mark)**

(1995, II)

9. **Figure 2** is a diagram showing a red blood cell from a person suffering from sickle cell anaemia



- a. Suggest **two** reasons why this cell in **figure 2** may be less efficient than normal red blood cells in transporting oxygen. **(2 marks)**
- b. (i) Sickle cell anaemia is caused by an allele of a single gene. Using the symbols: **Hb^A** for normal allele and **Hb^S** for the sickle cell allele, write down the crossings between the two parents who are heterozygous for sickle cell gene indicating parent genotype, gametes genotype and first offspring genotype. **(7 marks)**
- (ii) What is the ratio of offspring with sickle cell anemia? **(1 mark)**
- c. Most people with sickle cell anaemia die in infancy but sickle gene still exist in high frequency in Africa. Explain why. **(3 marks)**

(1996, I)

10. a. Mention any **one** principle of mendelian genetics. **(1 marks)**
- b. State any **two** causes of mutations. **(2 marks)**
- c. Give **two** examples of characteristics that are produced by mutations. **(2 marks)**

(2014, I)

11. a. For the following definitions give the correct genetic terms:

| Definition | Term |
|--|-------------|
| (i) The appearance of an organism | _____ |
| (ii) Genetic constitution of an organism | _____ |
| (iii) Carrying two contrasting alleles | _____ |
| | (3 marks) |
| b. A plant breeder carried out cross-pollination between two pure breeds of beans, one with purple flowers and another with white flowers. Purple flower colour in beans is due to a dominant allele (R) while white flower colour is due to recessive allele (r). | |
| (i) Using the symbols R and r show the cross between the pure breeds to produce the first generation. | (4 marks) |
| (ii) If the first generation were crossed with another white-flowered plant, what would be the expected results? | (4 marks) |
| d. Suppose the flower colour in beans is due to incomplete dominance such that a cross between the pure breeds in 10 b. produce first generation plants that have pink flowers. What colour would the expected F_2 generation have? Show your working. | (4 marks) |
| | (1997, II) |

12. An experiment was carried out to study the genetics of body colour in the fruit-flies (*Drosophila melanogaster*). The following observations were made:

| Cross A | Cross B |
|-------------------------------------|-------------------------------|
| White –bodied X White-bodied | Black-bodied X Black – bodied |
| 300 white – bodied:100 black-bodied | 350 black-bodied |

- On the basis of the above information, what can you say about the alleles for white and black body colour? (2 marks)
- What would be expected phenotypes among the offspring between a heterozygous male and a female which is homozygous for the white body colour allele? Use appropriate symbols and show your working. (4 marks)

(1997, II)

13. a. Thokozanie with a family history of blood group A (genotype **AA**) married Monica of blood group O (genotype **OO**). The family had two sons (Precious and Parosh) of blood group **A**.

- What was the genotype of the Precious and Parosh? (1 mark)
- If Precious marries a lady of blood group O, how many possible blood groups will their children have? Draw a gene diagram to show your working. (5 marks)

(5 marks)

b. Owing to occurrence of a large number of blood sucking ticks in Jeje game reserve, 99.8% of the population of zebra was affected by a disease carried by ticks. The unaffected population had slightly thicker fur.

- What biological operation is occurring amongst the population of Zebra? (1 mark)
- What environmental force is bringing about the operation named in **b.(i)** above? (1 mark)
- How would you explain how the Zebra with thick fur have arisen in the population? (1 mark)

(1999, II)

14. In an experiment, a scientist crossed pure line pea plant with green seeds and pure line pea plants with yellow seeds. All the F₁ plants had green seed. When F₁ plants were crossed, the F₂ plants had green and yellow seeds in ratio 3:1.

a. What can be deduced about the dominance of the genes for yellow and green seed colour?

- (i) yellow seed colour _____
(ii) green seed colour _____

(2 marks)

b. Using the symbols: **G** for dominate gene and **g** for recessive gene, write down the genotypes of the parents and F₁ generation

- (i) yellow _____
(ii) green _____
(iii) F₁ _____

(3 marks)

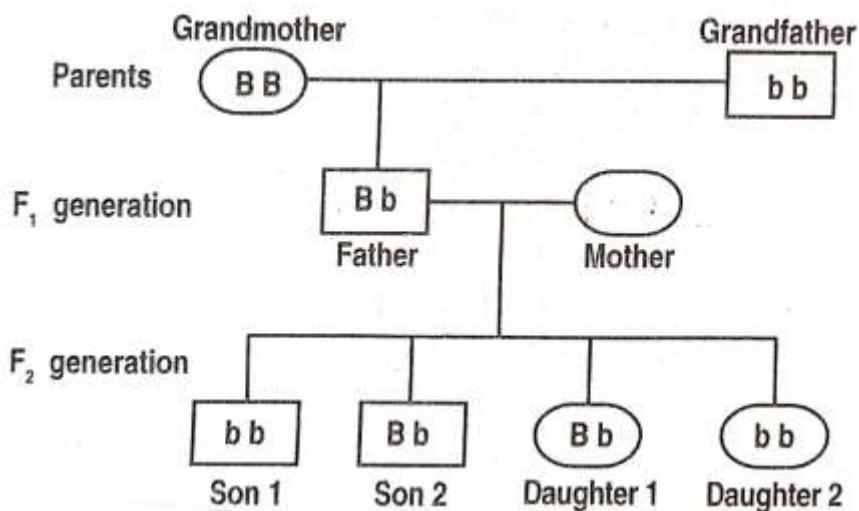
c. What would be obtained from a cross of F₁ plants and plants with yellow seed colour? Show your working.

(4 marks)

(2000, I)

15. In humans the gene for blue eyes (**b**) is recessive to the gene for brown eyes (**B**).

Figure 3 below represents part of a family tree in which some have brown and others have blue eyes.



a. What is the phenotype of the grandfather? **(1 mark)**

b. What is the ratio of individuals with brown eyes to those with blue eyes in the F₂ generation? **(1 mark)**

c. What is the genotype of the mother in F₁ generation? **(1 mark)**

d. Write down the genotype of an individual in the F₂ generation who is homozygous and one who is heterozygous

Homozygous _____

Heterozygous _____

(2 marks)

(2002, I)

16. a. If a sperm cell of insect has 22 chromosomes, how many chromosomes are there in an ordinary cell of the same insect? **(1 mark)**

b. A certain wing abnormality in an insect is caused by a single gene which is recessive to the normal gene. Using **A** to represent the normal gene and **a** to represent the abnormality gene:

- (i) Classify the following genotypes as homozygous and heterozygous.

AA _____ (1 mark)

Aa _____ (1 mark)

aa _____ (1 mark)

- (ii) Work out the genotype and phenotype of the following from the following cross:

Aa X **AA** (5 marks)

(2001, I)

17. a. State **two** functions of DNA (2 marks)

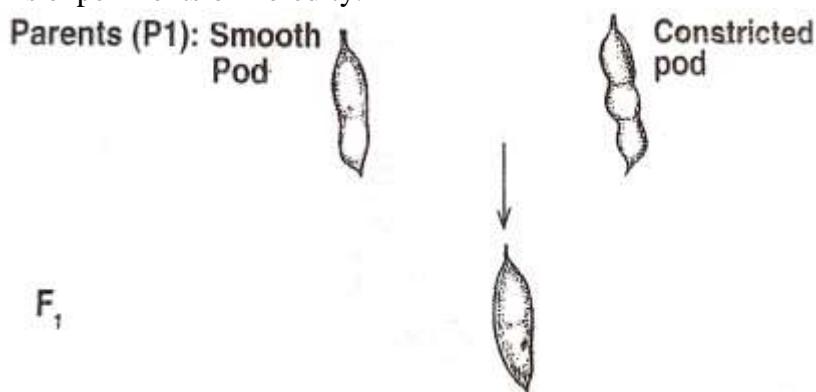
b. Albinism in human beings is caused by a recessive gene which can be represented by

(b) to normal pigmentation gene which can be represented by (**B**). Using the symbols **B** and **b** explain how two normal pigmented parents can have albino children. Your answer should show the genotype of parents, their gametes, the offspring and phenotypes of children.

(5 marks)

(2001, II)

18. **Figure 4** is a diagram showing two pure lines of peas that Gregor Mendel cross-pollinated in his experiments on heredity.



- a. (i) Which of the two pure lines has recessive characteristic? (1 mark)

(ii) Explain your answer to a.(i). (2 marks)

- b. What is meant by "pure line peas" (1 marks)

- c. When the F₁ are selfed, 25% of the F₂ generation have constricted pods. Using the symbol **B** for dominant gene and **b** for the recessive gene, the gene for F₁ parent is **Bb**. Work out the genotype and phenotype of F₂ generation. Show your working.

(5 marks)

(2002, II)

19. A scientist crossed a red flowered plant with a white flowered plant, all the F₁ generation had pink flowers.

- a. Explain how the F₁ plants had produced pink flowers. (1 mark)

- b. Using **R** to represent gene for red colour and **r** to represent gene for white colour, write down genotype of

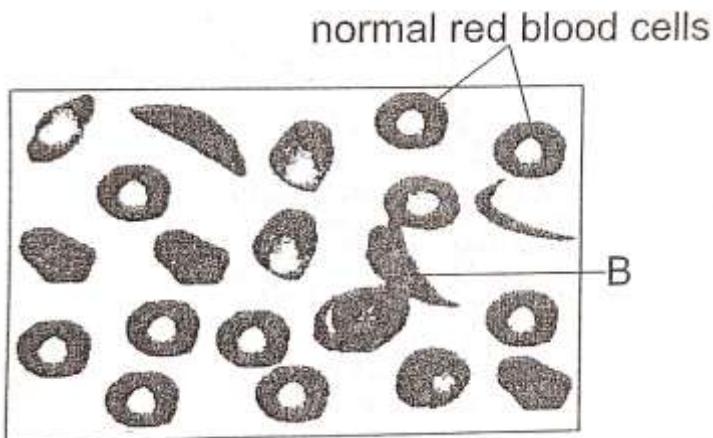
(i) red flowered plants (1 mark)

(ii) F₁ plants (1 mark)

- c. State **one** advantage of cross pollination in plants (1 mark)

(2004, I)

20. **Figure 5** is a photograph showing blood cells.



- (i) Name the condition of the cell marked **B**. **(1 mark)**
(ii) How are red blood cells with this condition affected? **(2 marks)**
- What is the cause of the condition of the cell marked **B**? **(1 mark)**
- Name the disease to which a person with the blood sample shown in **figure 5** is resistant. **(1 mark)**
(2006, I)

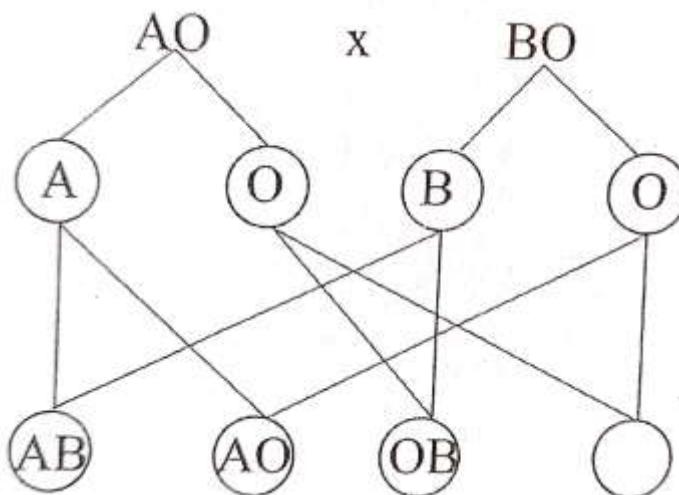
- 21.** a. Give **two** examples of sex linkage characteristics. **(2 marks)**
- b. Complete **Tables 2** by indicating the categories of the given genotypes

Table 2

| Genotype | Category |
|----------|---------------------|
| Gg | |
| GG | Homozygous dominant |
| gg | |

(2 marks)

- c. **Figure 6** shows a cross diagram between a woman of blood group **A** married to a man of blood group **B**.



- Complete the cross diagram by filling the genotype of the remaining offspring. **(1 mark)**
- What is the total number of blood groups of the offspring? **(1 mark)**
(2006, I)

22. In a certain plant species, the leaves may be pure green, pure white or variegated (white and green patches).

When two plants with variegated leaves were crossed, a total of 84 offsprings were produced of which 21 were green, 42 were variegated and the remaining 21 died soon after germination.

- a. (i) Using **G** to represent allele for green colour, **H** to represent allele for white colour, draw a genetic diagram of the cross between two parents with variegated leaves. Indicate the genotypes of parents and offsprings. **(4 marks)**

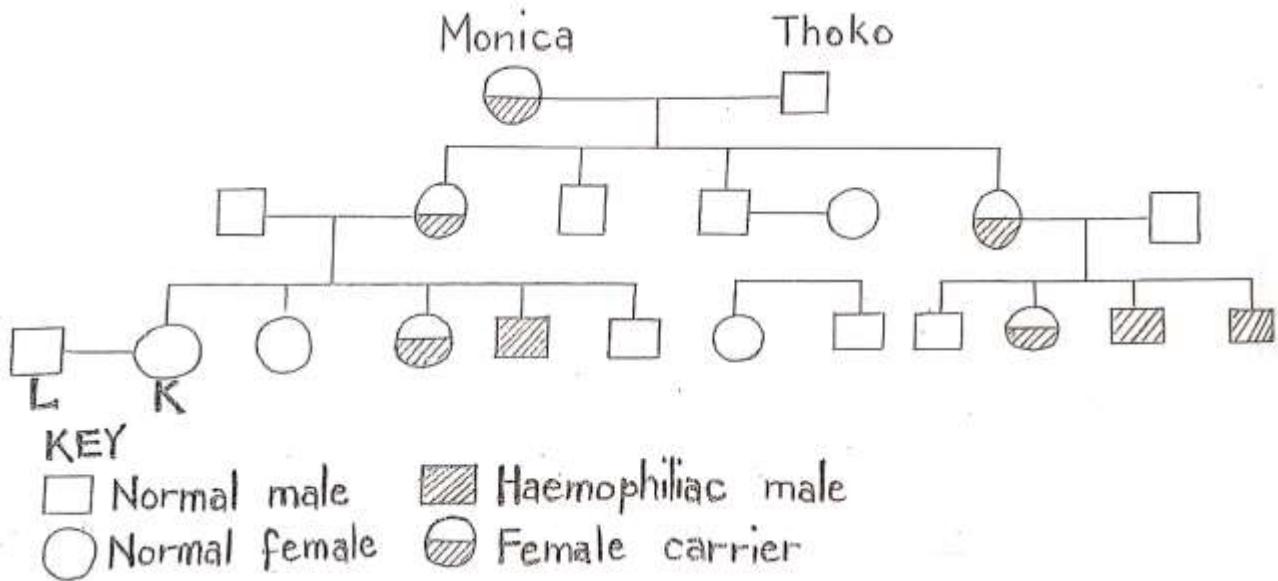
- (ii) State the genotype and phenotype of offspring that died soon after germination

Genotype _____
Phenotype _____ **(2 marks)**

- (iii) Explain why these offspring died. **(2 marks)**

- b. What term is used to describe the behavior of allele **G** and **H** in the cross? **(1 mark)**
(2007, I)

23. **Figure 7** shows a family tree in which there is inheritance of a recessive gene that causes haemophilia. Males with a single recessive gene suffer from the disease while females are carriers of the gene.



- a. How many individuals with recessive gene are there in the three generations? **(1 mark)**
- b. How many of Thoko's grandsons have haemophilia? **(1 mark)**
- c. What type of children with regard to haemophilia would **L** and **K** produce? **(1 mark)**
- d. State **two** disorders in haemophiliac person. **(2 marks)**
- e. Name the Chromosome where the gene for haemophilia is located. **(1 mark)**
- f. How does a gene for haemophilia arise in a population? **(1 mark)**
(2008, I)

24. Data below are birth masses of 12 babies (in Kg)

| | | | |
|-----|-----|-----|-----|
| 3.1 | 3.4 | 3.5 | 3.5 |
| 2.5 | 2.5 | 3.4 | 2.0 |
| 3.0 | 2.6 | 3.0 | 3.5 |

- a. Calculate the average birth mass. **(2 marks)**

- b. (i). Using the above information, complete the table below.

| Birth Mass(kg) | 2.0-2.4 | 2.5-2.9 | 3.0-3.4 | 3.5-3.9 |
|------------------|---------|---------|---------|---------|
| Number of Babies | | | | |

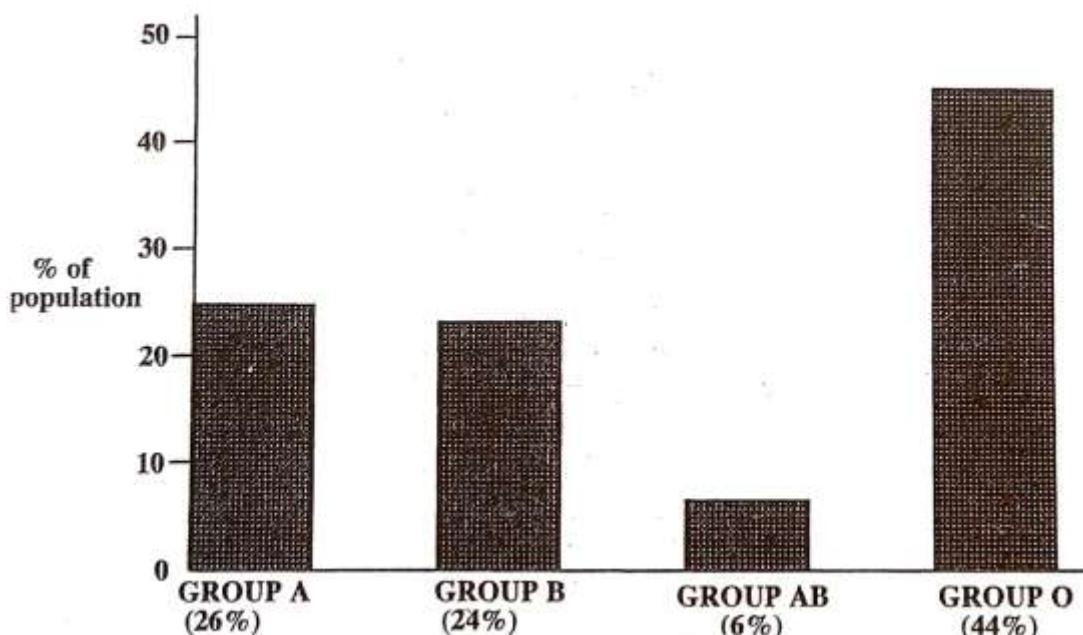
(2 marks)

- (ii) Using the table in b.(i) draw a histogram to compare the mass and number of babies of each range. **(3 marks)**

- c. What is the mode of birth mass range? **(1 mark)**
d. What type of variation is birth mass? **(1 mark)**

(2005, I)

25. Figure 8 shows a bar graph of human blood groups.



- a. (i) What type of variation is shown by blood groups in the bar graph? **(1 mark)**
(ii). Give a reason for your answer to 25 a. (i). **(1 mark)**

- b. In a population of 200 people, what would be the number of people with blood group **O**? Show your working. **(3 marks)**

(2009, I)

26. William with blood group **A** was married to Takondwa with blood group **B**. The first born son was of blood group **O** while the second born son was of blood group **AB**.

- a. Give the genotypes of the two parents. **(2 marks)**
b. Explain how the genotypes of the second born son came about. **(3 marks)**

(2012, I)

27. Table 3 shows a cross between a pure breeding red Cow and a pure breeding white bull.

| Parents | | red | |
|---------|--|-----|----|
| | | RR | |
| Gametes | | R | R |
| r | | Rr | |
| r | | Rr | Rr |

- a. Complete the table by filling the genotype of the offspring marked **P**. **(1 mark)**
- b. What term is used to describe the genotype of the offspring? **(1 mark)**
- c. If **R** and **r** are co-dominant, determine the phenotype of the offspring. **(1 mark)**
(2011, I)

28. Figure 9 shows two parent animals with their offspring. Use it to answer the questions that follow.



- a. What is the phenotype ratio of the offspring? **(1 mark)**
- b. If the allele **B** for black fur is dominant over the allele **b** for white fur, what would be the possible genotypes of parents?
 - (i) white parent _____ **(1 mark)**
 - (ii) black parent _____ **(1 mark)**
- c. If these animals feed at night, explain how natural selection would operate on recessive allele in an environment where wild cats are predators. **(3 marks)**
(2009, I)

29. When a grey cock was mate with grey hen, grey and white chicks were produced.

- a. Using **G** for grey colour and **g** for white colour draw a genetic diagram to determine the genotype of the offsprings. **(3 marks)**
- b. Give the genotypic ratio of the chicks. **(2 marks)**
- c. If the parents produced 12 chicks, how many were white? Show your working. **(2 marks)**
(2012, I)

- 30.** a. Albino maize plants have white leaves. Explain why these plants die a few days after germination. **(3 marks)**
b. Explain any one way in which mutation may be beneficial to an organism. **(2 marks)**
c. Give any **two** ways in which knowledge of genetics is used in plant and animal breeding. **(2 marks)**

(2015, I)

- 31.** Using a genetic diagram, explain how sex of a baby is determined at fertilization. **(7 marks)**

(2015, I)

- 32.** Albinism is an inherited condition that affects the skin. It is caused by a recessive allele.

Use **N-** to represent allele for normal skin.

n – to represent allele for albinism

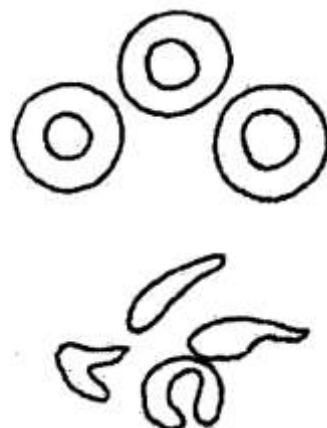
- a. Give **two** possible genotypes of a person with normal skin. **(2 marks)**
b. A man and his wife both have normal skin but their first born child is an albino.
(i) Using this information, draw a cross diagram to show genotypes of parents, gametes and possible offsprings. **(5 marks)**
(ii) Write down the genotypic ratio of offsprings resulting from the cross. **(1 mark)**
(iii) What is the genotype of the child who is an albino? **(1 mark)**

(2007, I Leaked Paper)

- 33.** State any **one** principle of mendelian genetics. **(1 mark)**

(2016, I)

- 34.** **Figure 10** shows a sample of human blood cells. Use it to answer the questions that follow.



- a. (i) What genetic disease is shown in **Figure 10**? **(1 mark)**
(ii) Give a reason for your answer in **35. a. (i)**. **(1 mark)**
- b. What advantage do people with this kind of genetic disease have over normal people? **(1 mark)**
- c. Explain how nature operates to remove genes responsible for this disease. **(3 marks)**

(2016, I)

35. A black rabbit was mated to a white rabbit. All the offsprings were black. Four pairs of these offsprings **X**, **Y**, **Z**, **N** were mated. The results of their offsprings are given below in **Table 4**.

Table 4

| Pairs | Number of black offspring | Number of white offspring |
|--------------|---------------------------|---------------------------|
| X | 8 | 2 |
| Y | 7 | 1 |
| Z | 6 | 3 |
| N | 6 | 3 |
| Total | | |

- a. Complete the table. **(3 marks)**
 - b. (i) What is the ratio of black young rabbit to white? **(2 marks)**
 - (ii) Which allele for colour is dominant? **(1 mark)**
 - (iii) State the genotypes of the parents. **(2 marks)**
 - c. Give any **two** evidences of evolution. **(2 marks)**
- (2017, I)**

36. **Table 5** shows the heights of form one students. Use it to answer the questions that follow:

Table 5

| Student | H | I | J | K | L | M | N | O | P | Q |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Height (cm) | 110 | 100 | 140 | 135 | 120 | 142 | 140 | 116 | 115 | 125 |

- a. Find the mean height. **(3 marks)**
 - b. Find the mode. **(1 mark)**
- (2017, I)**

37. In a breeding experiment, a pure black mouse was crossed with a pure-bred white mouse. All the **F₁** offspring were black. Given that the allele for black colour in mice is **A** and that for white colour is **a**.

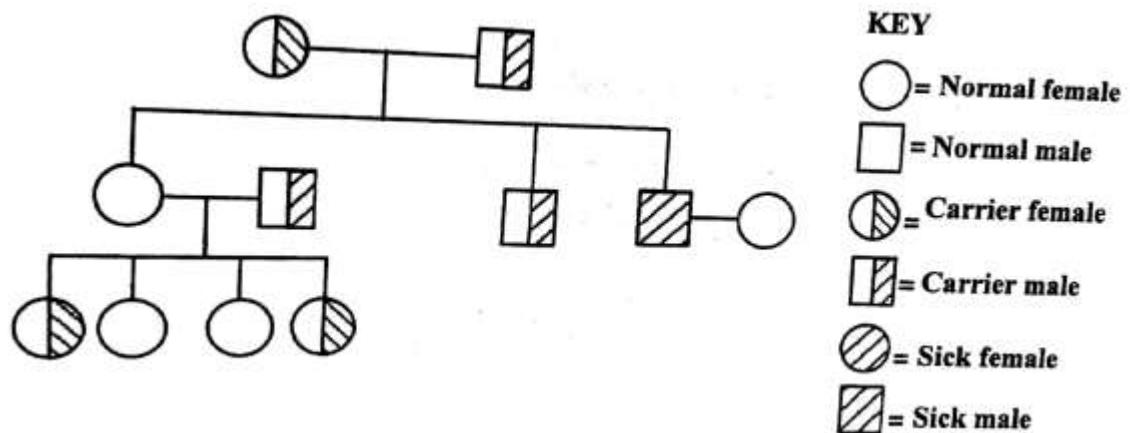
- a. Write the genotypes of the parents:
 - (i) black mouse **(1 mark)**
 - (ii) white mouse **(1 mark)**
 - b. (i) Give the genotype of the **F₁** generation. **(1 mark)**
 - (ii) State the genetic term that can be used to describe the **F₁** offspring. **(1 mark)**
 - c. (i) Using genetic cross diagram, work out the phenotypic ratio of the **F₂** generation. **(6 marks)**
 - (ii) If the number of mice produced in **F₂** generation were 32. Calculate the number of white mice produced in the **F₂** generation. **(4 marks)**
- (2018, I)**

38. a. (i) Explain how albinism is caused. **(2 marks)**

 (ii) Give any two negative biological effects of albinism in humans. **(2 marks)**

- b. Colour blindness is one of the sex-linked characters in humans. Allele for normal colour vision is dominant over allele for colour blindness. Use **R** for dominant allele **r** for recessive allele.
- Write the genotype for a male with normal colour vision. **(1 mark)**
 - Using a punnet square to show the genotype of the offspring when a man with normal colour vision marries a colour blind woman. **(5 marks)**
 - Why is a female with heterozygous condition of sex-linked character called a carrier? **(2 marks)**
- c. State any **two** uses of bacteria in biotechnology. **(2 marks)**
(2019, I)

39. Figure 11 is diagram showing how haemophilia was inherited in a certain family. use to answer the questions that follow.



- Give the genotype of the parents. **(2 marks)**
- How many offsprings were carriers of haemophilia? **(1 mark)**
- Calculate the percentage of grandchildren that were normal. **(3 marks)**

(2020, I Leaked Paper)

40. You are provided with 14 beans.

- Measure the length of each seed and record the result in millimeters in **Table 5** provided. Indicate the number of seeds under each length.

Table 5

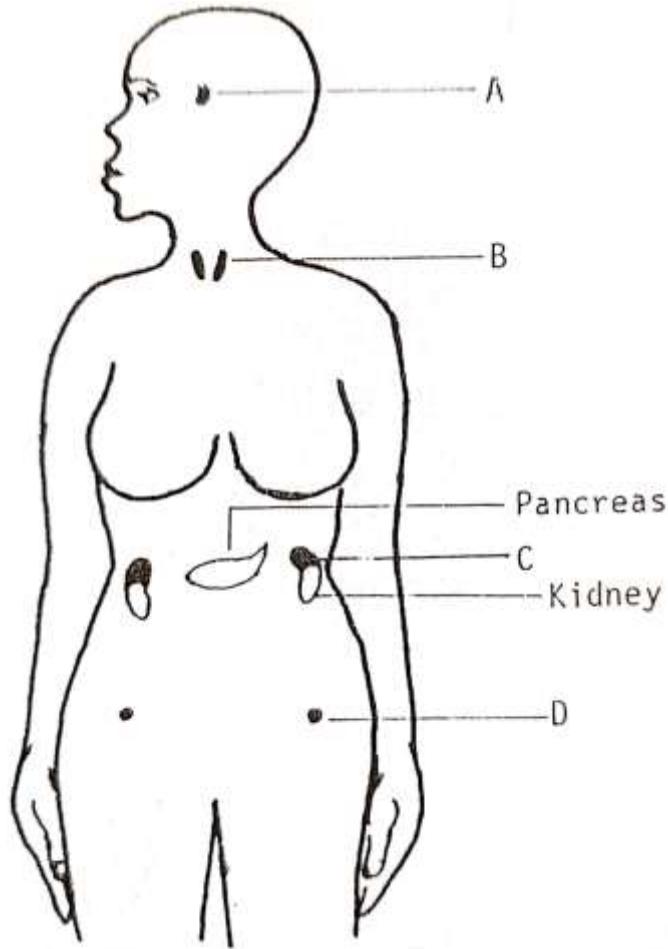
| Length (mm) | 7 | 8 | 9 | 10 | 11 | 12 |
|-----------------|---|---|---|----|----|----|
| Number of beans | 1 | 2 | 4 | 4 | 2 | 1 |

(2 marks)

- Plot a graph of number of beans against length. **(6 marks)**
- (i) What type of variation is shown by plotted graph? **(1 mark)**
(ii) State two possible causes of this variation. **(2 marks)**

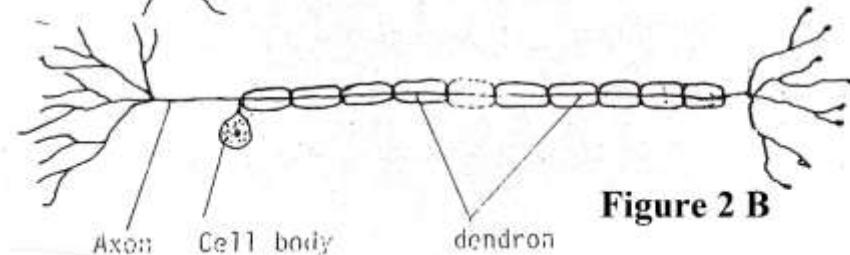
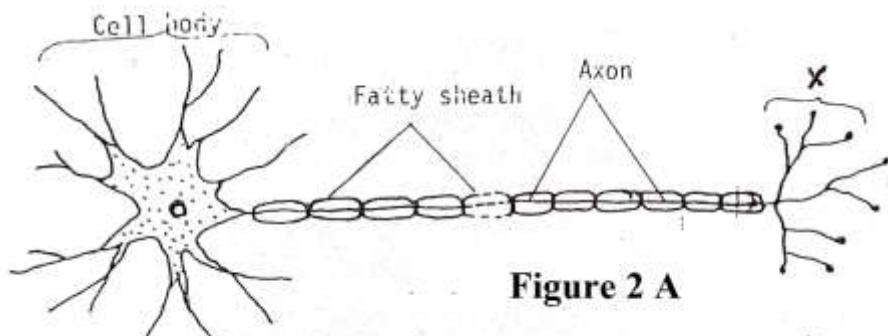
(2011, II Practical)

1. Figure 1 is a diagram showing location of some endocrine glands in human body.



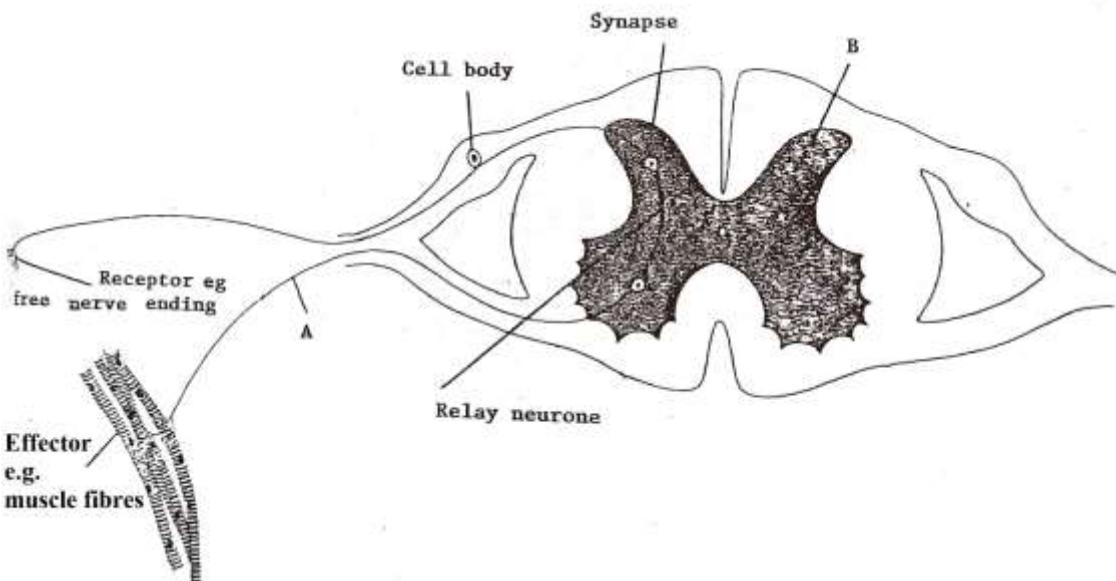
- a. Name the gland marked **A** and **D**. (2marks)
 - b. Endocrine glands have no ducts. How do their secretions reach their target area? (1 mark)
 - c. Name the hormone produced by gland **B** and **C**. (2marks)
 - d. (i) What effect will the removal of the pancreas from an individual have on food composition of his blood? (1 mark)
(ii) Give a reason for your answer to d. (i) above. (2marks)
 - e. What is the difference between secretion and excretion? (2 marks)
(1990, I)
2. a. What is the linking (together) of various processes in an organism of the body. (1 mark)
 - b. Name two systems that link the processes of the body. (2 marks)
 - c. State the difference in the direction the impulse travels in an axon and a dendrite. (1 mark)
 - d. Explain why the nerve impulses do not jump from one fibre to another even though the fibres are close to one another. (2 marks)
(1992, I)

3. Figure 2A and 2B shows two different diagrams representing two types of neurons.



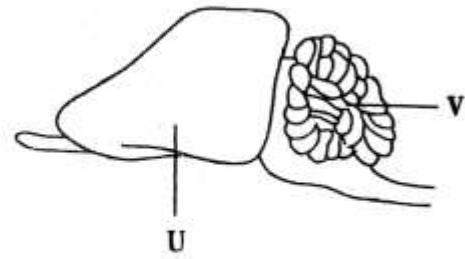
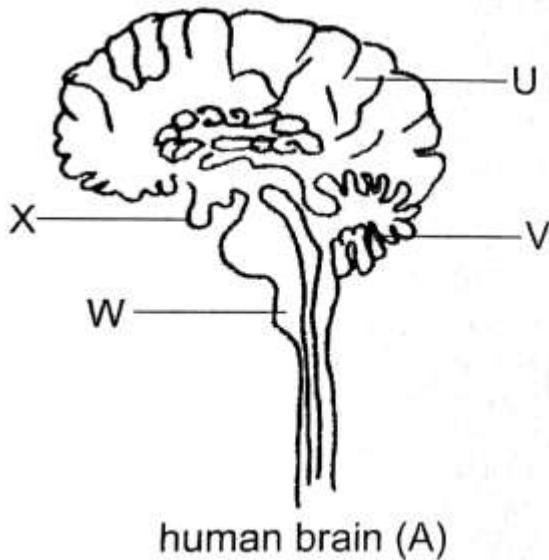
- Identify the nerve cell in figure 2A and 2B? (2 marks)
- What is the functional difference between the cells in figure 2A and 2B? (1 mark)
- Give one structural difference between check cells and the cells in figure 2A and 2B. (1 mark)
- Name any one structure in a human body in which structures labeled X in figure 2A may be located. (1 mark)
- Give one function of the fatty sheath. (1 mark)

4. Figure 3 shows a diagram of a reflex arc.



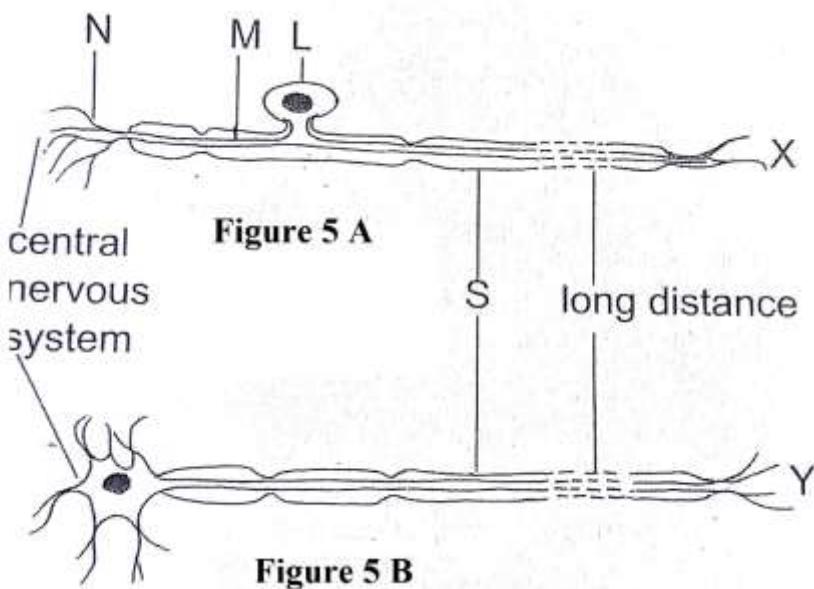
- Name the parts labeled A and B. (2 marks)
- (i) Give an example of a reflex action. (1 mark)
(ii) State the importance of the reflex action named in 4 b. (i). (1 mark)
- How are the impulses transmitted across the synapses? (1 mark)
- On the diagram, mark with an X the part affected by leprosy. (1 mark)

5. a. Draw a diagram of a typical neurone and label: axon, myelin sheath and dendrites. **(4 marks)**
 b. State **two** functions of the myelin sheath. **(2 marks)**
 c. Describe the path taken by the nerve impulse during a knee – jerk reflex action. **(4 marks)**
(1996, I)
6. a. What are endocrine glands? **(1 mark)**
 b. Where in human body is insulin produced? **(1 mark)**
 c. What role does insulin play in regulation of blood sugar? **(2 marks)**
 d. Name one hormone that opposes the effect of insulin. **(1 mark)**
 e. Name one disorder in man that can be rectified by the administration of a hormone? **(1 mark)**
 f. What nutrient is essential for production of the hormone thyroxine? **(1 mark)**
(1997, I)
7. **Figure 4A and 4B** are diagrams of vertical sections of human and corresponding parts in the diagram.



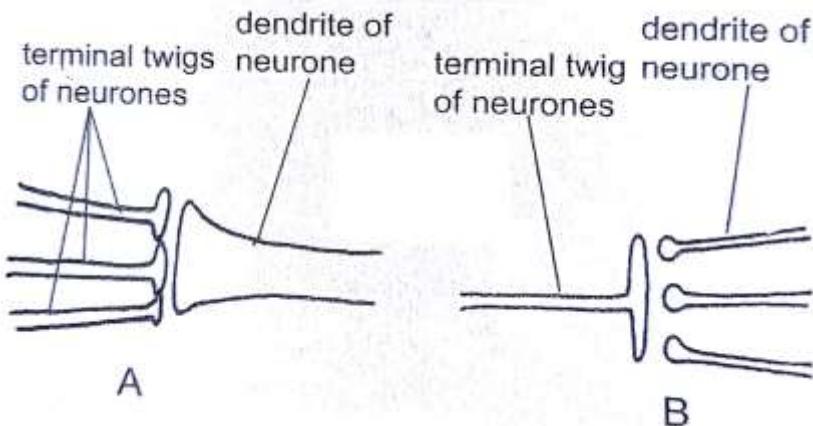
- a. Name the parts labelled **U**, **V** and **W** in the human brain. **(3 marks)**
 b. (i) Apart from size, in what way is part labelled **U** in the human brain different from that in a rabbit brain? **(1 mark)**
 (ii) Of what advantage to human being is the difference mentioned in b. (i)? **(2 marks)**
 c. State **two** effects of removing part labelled **X** from an adult human being. **(2 marks)**
(1998, I)

8. Figure 5A and 5B are diagrams showing two different types of neurones.



- a. (i) Which of the neurones in figures 5A and 5B is a sensory neurone? (1 mark)
 - (ii) Give a reason for your answer in 8. a. (i) above. (1 mark)
 - b. Name the parts labelled L, M and N. (3 marks)
 - c. In which direction do nerve impulses move in neurone 5B. (1 mark)
 - d. (i) Name a specific organ that might be connected at X. (1 mark)
 - (ii) Name a specific organ that might be connected at Y. (1 mark)
 - e. (i) What is the structure labelled S made of? (1 mark)
 - (ii) What function does the structure labelled S have? (1 mark)
- (2000, II)

9. Figure 6 shows diagrams of two synapses at two different places in the body of a mammal.



- a. (i) Use an arrow to indicate the direction of nerve impulse transmission in 6A. (1 mark)
 - (ii) How many neurones are synapsing in 6A? (1 mark)
 - b. What is a conditioned reflex action? Give one example. (2 marks)
- (1999, I)
10. a. (i) Under what conditions is adrenaline secreted in a human body. (2 marks)
- (ii) Which gland in the body secretes the hormone in a. (i). (1 mark)
- (iii) What effect does the hormone have on the circulatory and breathing systems? (4 marks)

- b. Why should adrenaline be broken down quickly in the body? **(1 mark)**
 c. What mineral element is needed for the formation of thyroxine? **(1 mark)**
 d. Why is the pituitary gland called master gland? **(1 mark)**
(2002, I)

11. a. Compare nervous and hormonal coordination by filling the table below.

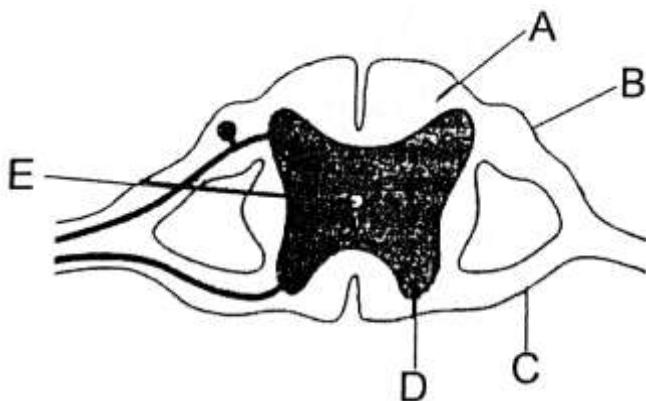
| | Nervous coordination | Hormonal coordination |
|------------------------------|----------------------|-----------------------|
| 1. speed | | |
| 2. Duration of effect | | |
| 3. Target organs | | |

(3 marks)

b. Name any **two** hormones secreted by the pituitary gland and state their functions.

(4 marks)

12. **Figure 7** is a diagram showing transverse section of the spinal cord.



- a. Name the parts labelled **B** and **C**. **(2 marks)**
 b. State the structural difference between parts labelled **A** and **D**. **(1 mark)**
 c. What is the function in part labelled **E**. **(1 mark)**
(2004, I)

13. a. Define a “conditioned reflex action”. **(1 mark)**

b. Mention the three main steps in conditioning an organism.

Step 1: _____

Step 2: _____

Step 3: _____

(3 marks)

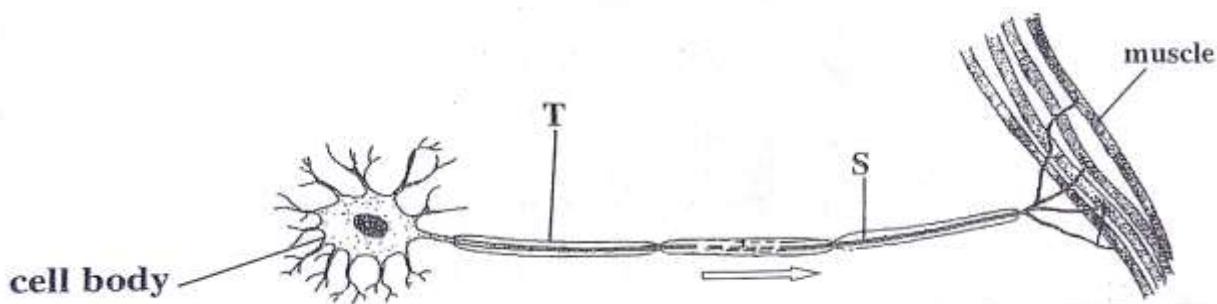
c. What is the difference between “a conditioned reflex” and “a simple reflex action”? **(1 mark)**

(2007, I)

14. An athlete involved in a cross-country competition, was running at a speed of 2 meters per second. As she passed through a forest, she met a lion and her speed immediately rose to 6 meters per second.

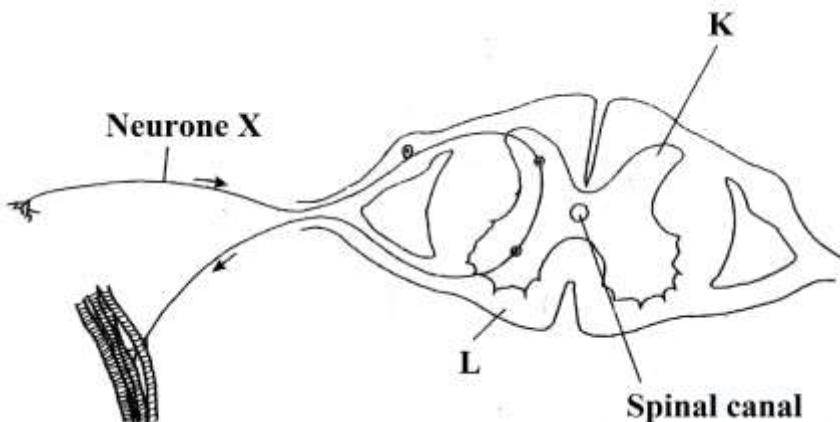
- a. Name the hormone that caused a change in speed. **(1 mark)**
 b. Explain how the hormone led to the change in speed in a. **(3 marks)**
(2008, I)

15. Figure 8 is a diagram of nerve cell. Use it to answer the questions that follow.



- Name the parts marked T and S. (2 marks)
- Name the type of nerve cell shown in figure 8. (1 mark)
- Explain what could happen if the cell body was damaged. (2 marks)
- Explain any one adaptation that enables the nerve cell to conduct impulses at high speed. (2 marks) (2010, I)

16. Figure 9 shows a cross section of spinal cord. Use it to answer the questions that follow.



- Name the part marked K. (1 mark)
- Mention one disease that attack neurone X. (1 mark)
- Give one function of the fluid found in the spinal canal. (1 mark) (2011, I)

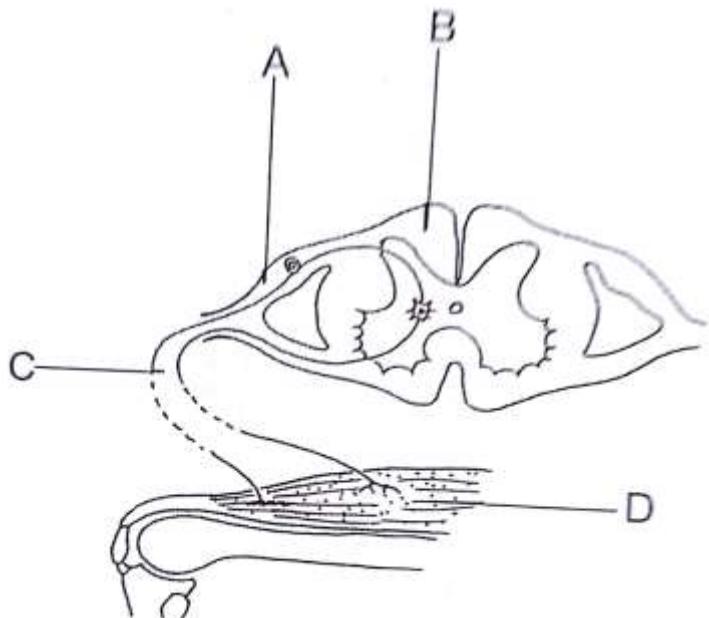
17. A laboratory technician analysed urine samples collected from one of the patients. A brick red precipitate was observed after testing the urine for glucose. From the results, it was concluded that the patient was suffering from a certain disease.

- Name the disease. (1 mark)
- Which hormone was lacking in the patient? (1 mark)
- Explain how the hormone mentioned in 24.b. functions to protect the disease. (3 marks) (2007, I Leaked Paper)

18. a. Explain the effects of each of the following structure on movement of an impulse in neurones.

- Myelin sheath (2 marks)
 - Node of Ranvier (2 marks)
- b. Explain how alcohol affects the speed of impulses in a neurone. (2 marks) (2014, I)

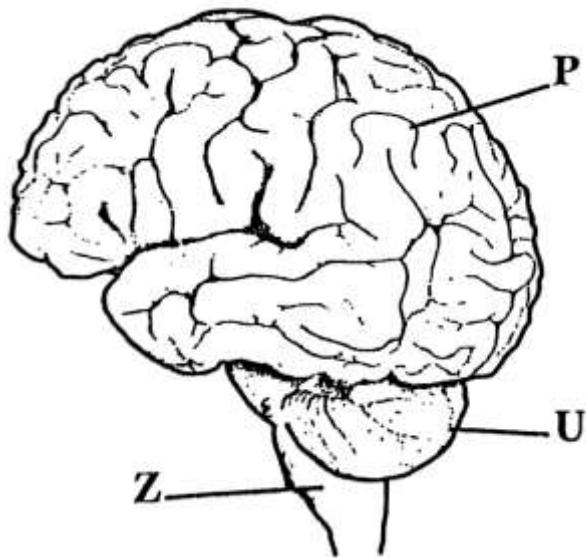
19. Figure 10 is a diagram showing reflex arc. Use it to answer the questions that follow.



- a. Name the parts marked **A**, **B** and **C**. (3 marks)
- b. What is reflex action? (1 mark)
- c. What happens to structure **D** when the skin is pricked? (1 mark)
- d. What is the role of spinal cord in a reflex action? (1 mark)
- e. What is contained in the grey matter of the spinal cord? (1 mark)

(1997, I)

20. Figure 11 is a diagram of the human brain. Use it to answer the questions that follow.



- a. State any **one** function of part marked **P**. (1 mark)
- b. Why is part marked **P** highly folded? (2 marks)
- c. State any two differences in structure between parts **Z** and **U**. (2 marks)
- d. Explain why injury to part **Z** may cause death. (2 marks)

(2013, I)

21. a. Name the hormone that is produced by adrenal glands. (1 mark)
- b. (i) State any one condition under which the hormone in 20. a. is produced. (1 mark)
- (ii) Explain your answer to 20 b. (i). (2 marks)
- c. Why is the pituitary gland also called the ‘master gland’? (1 mark)
- d. How is that hormonal co-ordination is slower than nervous co-ordination? (2 marks)

(2014, I)

22. **Table 1** shows secretory organs, hormones and their effects.

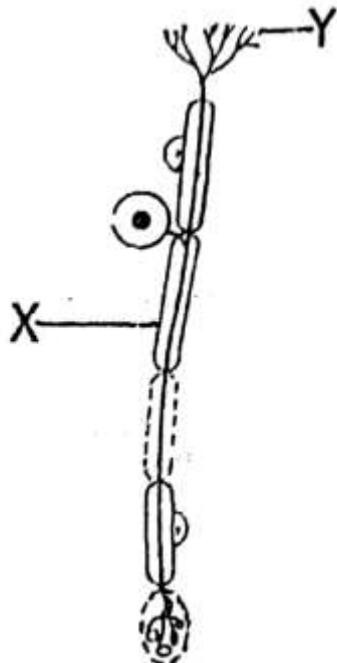
Table 1

| Secretory organ | Name of hormone | Effect |
|-----------------|-----------------|--|
| (i) R | Thyroxine | Regulates metabolic reactions |
| Pancreas | (ii) S | Stimulates conversion of glucose into glycogen |
| Oestrogen | Ovary | (iii) T |

- a. Fill the parts marked **R**, **S** and **T** in the table. (3 marks)
- b. Which food nutrient is required for formation of thyroxine? (1 mark)

(2015, I)

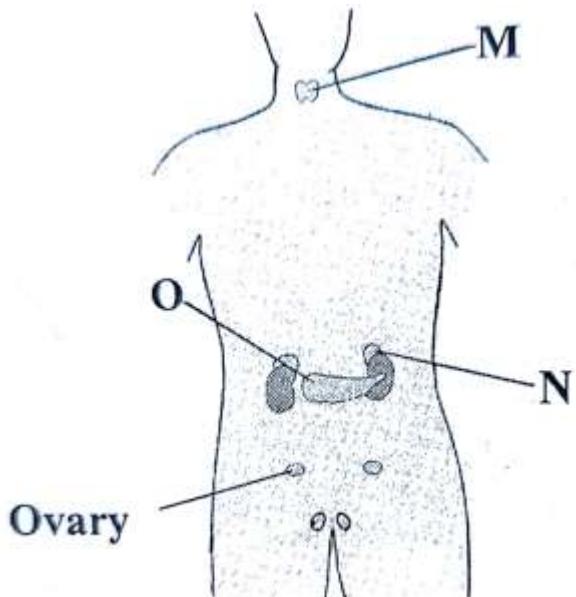
23. **Figure 12** is a diagram of a neurone. Use it to answer the questions that follow.



- a. (i) Name the type of neurone shown in **Figure 12**. (1 mark)
- (ii) Give **two** features that have enabled you to come up with your answer to 22. a. (i). (2 marks)
- b. State **one** function of the part marked X. (1 mark)
- c. Part marked Y helps to form synapses.
- (i) What is a “synapse”? (1 mark)
- (ii) Explain how impulses are transmitted across the synapse. (3 marks)

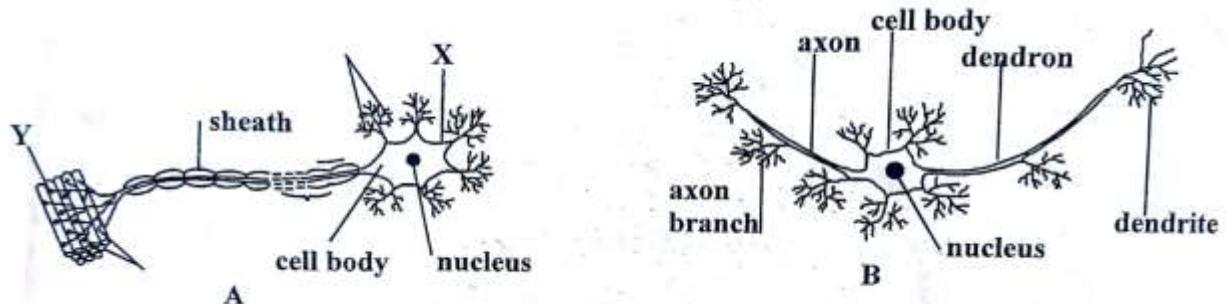
(2007, I Leaked Paper)

24. Figure 13 shows position of endocrine glands in the human body. Use it to answer the questions that follow.



- Name the hormone produced by part marked **M**. (1 mark)
 - Explain why hormone produced by part marked **N** is called the flight or fight hormone. (2 marks)
 - (i) What would happen to the levels of glucose in the body if part marked **O** was removed. (1 mark)
(ii) Explain your answer in **24. c. (i)**. (3 marks)
- (2016, I)**

25. Figure 14 are diagrams showing two different types of neurones. Use them to answer questions that follow:



- Name the parts labelled **X** and **Y**. (2 marks)
 - Give the function of the dendron. (1 mark)
 - State any **two** structural differences between neurones **A** and **B**. (2 marks)
 - State **two** functions of synapses. (2 marks)
- (2018, I)**

- 26.** a. Give any **two** structural differences between a motor neurone and a sensory neurone. (2 marks)
- b. State the function of each of the following parts of a neurone.
- dendrites (1 mark)
 - axon (1 mark)
- (2018, I)**

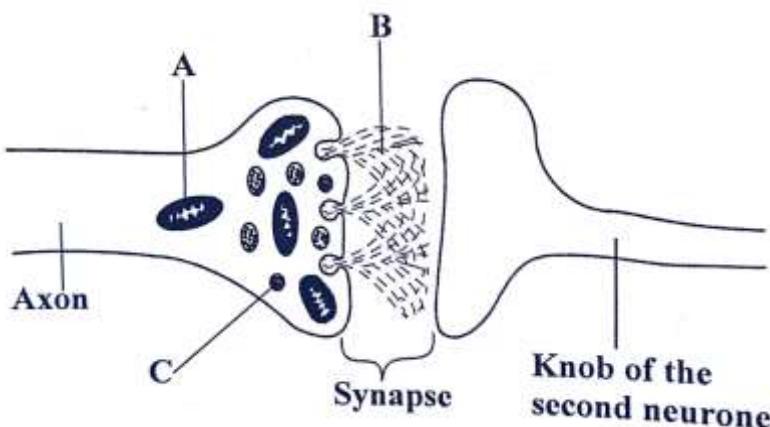
27. In a certain school students rushed back to class after hearing the ringing of the bell at the end of break time. Use the information to answer the questions that follow:

- Identify the following:
 - stimulus
 - receptor
 - response

(1 mark)
(1 mark)
(1 mark)
- (i) What type of reflex action was demonstrated by the students? (1 mark)
(ii) Which reflex centre controls the action demonstrated by the students? (1 mark)
- Define the following terms:
 - neurone
 - synapse

(1 mark)
(1 mark)
(2017, I)

28. Figure 15 is a diagram showing a synaptic junction.



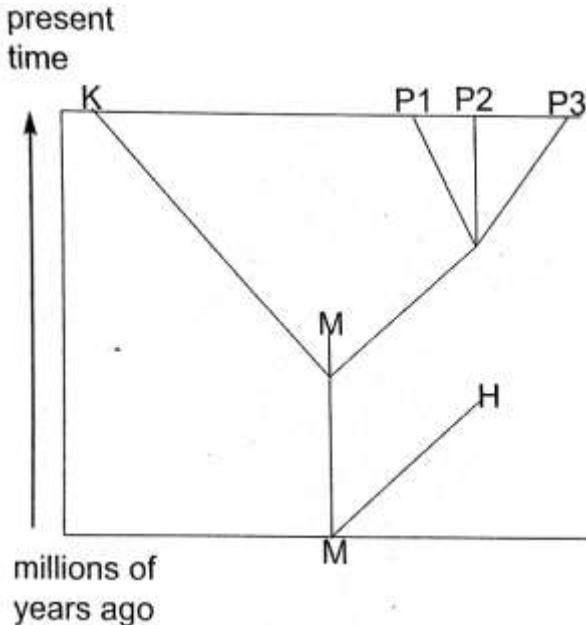
- (i) Name the parts labelled **B** and **C**. (2 marks)
(ii) Explain the importance of having part **A** at synaptic knob? (2 marks)
- Which chemical influences movement of vesicles at the synaptic knob? (1 mark)
(2020, I)

29. **Table 2** shows blood alcohol level (BAL) in a person over sometime during an experiment.

| Time (hours) | BAL mg/ 100 cm ³ |
|--------------|-----------------------------|
| 0.0 | 0.0 |
| 0.5 | 70 |
| 1.0 | 120 |
| 1.5 | 140 |
| 2.0 | 115 |
| 3.0 | 75 |
| 4.0 | 50 |
| 5.0 | 40 |

- Plot a graph of blood alcohol level (BAL) against time. (6 marks)
- What was the blood alcohol level at 2.5 hours? (1 mark)
- Explain why there was decrease in the blood alcohol level from 1.5 hours to 5.0 hours. (2 marks)
- Explain how a person who is driving a car under the influence of alcohol is likely to be involved in a road accident. (3 marks)
(2010, II Practical)

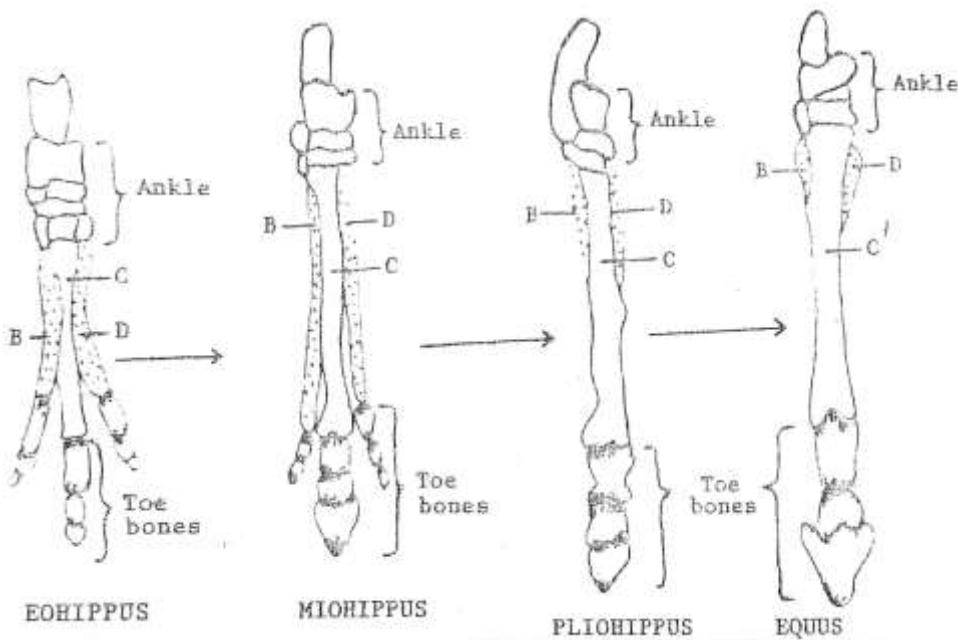
1. **Figure 1** represents a family of organisms in the process of evolution.



In **figure 1** each letter, **M**, **H**, **K**, and **P** represents a species.

- By using the diagram, select:
 - those species which have become extinct; (2 marks)
 - a common ancestor to more than one species. (1 mark)
 - State the relationships that exist among the organisms **P1**, **P2** and **P3**. (2 marks)
 - Suggest **two** factors that may have caused all the organisms in **figure 1** to evolve into different species. (2 marks) (1990, II)
2. a. What is variation? (1 mark)
- b. Name **two** factors which may bring variation within species. (2 marks)
- c. Pest control campaigns in some tropical areas were mounted in the 1950s using DDT in order to eradicate malarial mosquitoes. The mosquito's population was considerably reduced and numbers remained low for several years. Then in the 1960s the numbers began to rise again in spite of the repeated application of DDT.
 - Explain these results (3 marks)
 - From your answer to 2 c. (i), suggest how variation may be beneficial to a species. (2 marks) (1993, I)
3. In a natural population there is a variation amongst individual organisms and the number of organisms born greatly exceeds the number that survive to reproductive age.
 - What is population? (1 mark)
 - Name any **one** source of variation amongst organisms in a population. (1 mark)
 - Name **two** factors that may result in the number of organisms born being greater than that of those that survive to reproductive age. (2 marks)
 - Explain the part played by a changing environment in the evolution of species. (2 marks)
 - State **one** way in which fossils provide evidence of evolution. (1 mark) (2000, II)

4. **Figure 2** show structures of the fossil hind feet of three extinct horses (Eohippus, miohippus and pliohippus), and the hind foot of the modern horse Equus. All the diagrams are drawn to scale.



- a. (i) What are fossils? (1 mark)
 - (ii) State **two** conditions under which fossils are formed. (2 marks)
 - b. From **figure 2**, list **two** ways in which the hind foot of **miohippus** differs from that of **Equus**.
- | Hind foot of Miohippus | Hind foot of Equus |
|------------------------|--------------------|
| | |
| | |
- (2 marks)
- c. How did the changes in the horse's foot come about? (1 mark)
 - d. (i) Suggest what happened to the horse's size over time. (1 mark)
 - (ii) Give a reason for your answer to 4.d. (i). (1 mark)
- (1994, II)

5. **Table 1** shows changes in population size of three groups of birds living in a certain area between 1982 and 1988. Use it to answer the questions that follow.

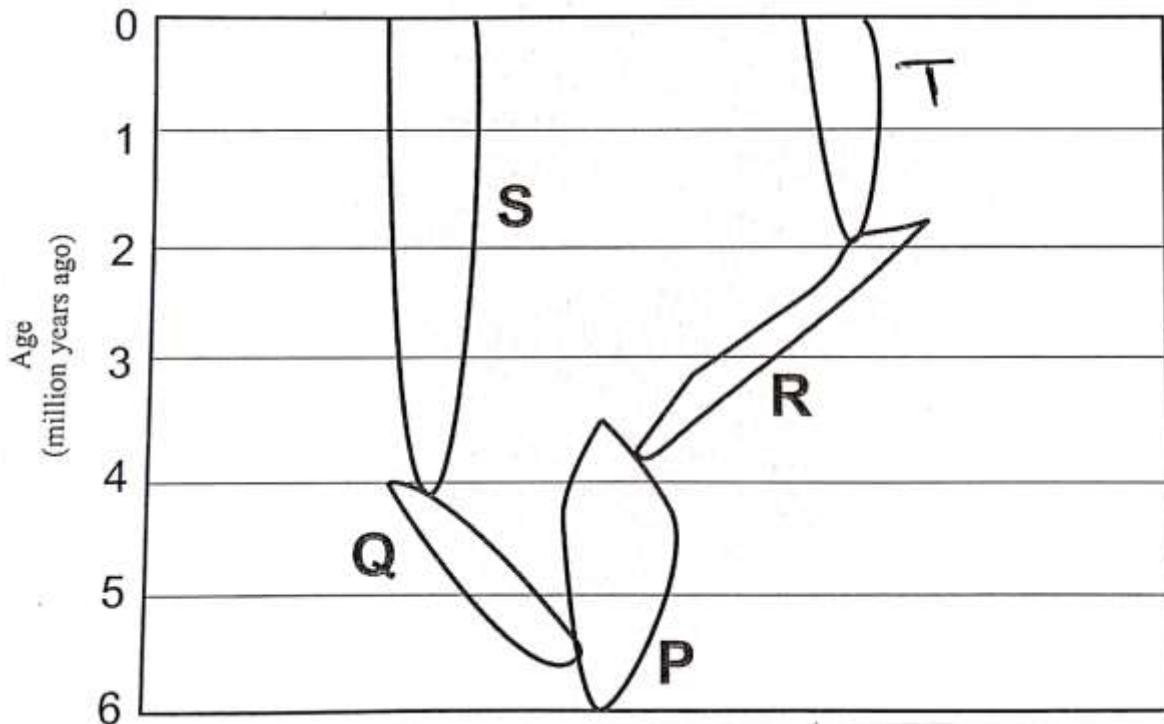
Table 1

| YEAR | POPULATION OF | | |
|------|-----------------|------------------|-------------------------------|
| | FRUIT EATERS | INSECT EATERS | FRUIT AND INSECT EATERS |
| 1982 | 110 | 240 | 450 |
| 1984 | 80 | 225 | 430 |
| 1986 | 30 | 190 | 410 |
| 1988 | 10 | 180 | 405 |

- a. (i) Plot a graph of number of fruit eaters against time. (4 marks)

- (ii) Describe what has happened to the population of fruit eaters. **(1 mark)**
- (iii) Suggest **two** possible reasons for the trend in the population of fruit eaters. **(2 marks)**
- b. Calculate the percentage decrease in population of insect eaters, and fruit and insect eaters by using the following formula:
- $$\frac{\text{Population in 1982} - \text{Population in 1988}}{\text{Population in 1982}} \times 100\%$$
- (i) Insect eaters **(2 marks)**
(ii) Fruit and insect eaters **(2 marks)**
- c. (i) Which group of the birds decreased the least? **(1 mark)**
(ii) Suggest **one** possible reason that could have lead to this group having the least decrease. **(2 marks)**
(iii) How does the data in **Table 1** suggest that the environment was changing? **(1 mark)**
(2000, I)

6. a. Define the following biological terms.
- (i) Evolution **(1 mark)**
(ii) Speciation **(1 mark)**
- b. State any **three** evidences in support of the theory of evolution.
- c. **Figure 3** is a diagram showing the evolutionary fossil record of theoretical organisms, **P, Q, R, S, and T**. The width of each band indicated the relative abundance of the organisms at the time. Use the diagram to answer questions that follow.



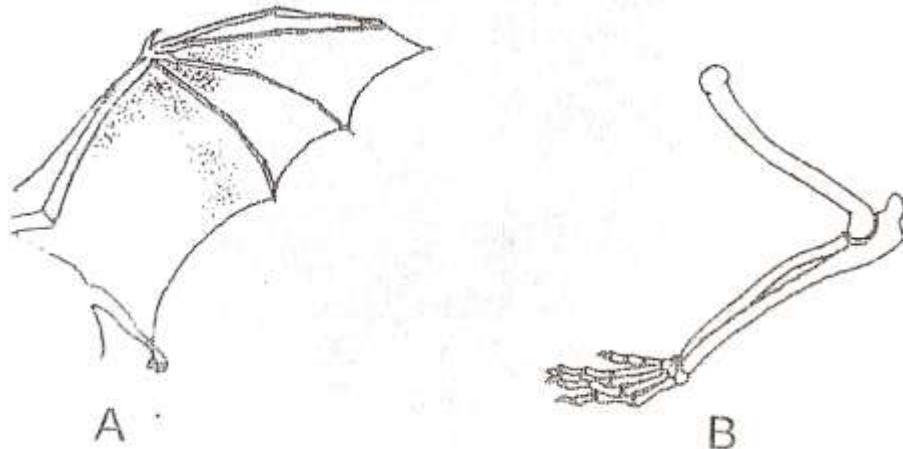
- (i) Which letter stands for the oldest group of organism? **(1 mark)**
(ii) Which organisms are still in existence? **(2 marks)**
(iii) About when did organisms **Q** and **T** evolve? **(2 marks)**
(iv) Which organisms are more abundant today? **(1 mark)**
(1999, I)

7. **Figure 4** is a diagram of two adult dogs labeled **L** and **K** of the same age and produced from a common ancestor by artificial selection.



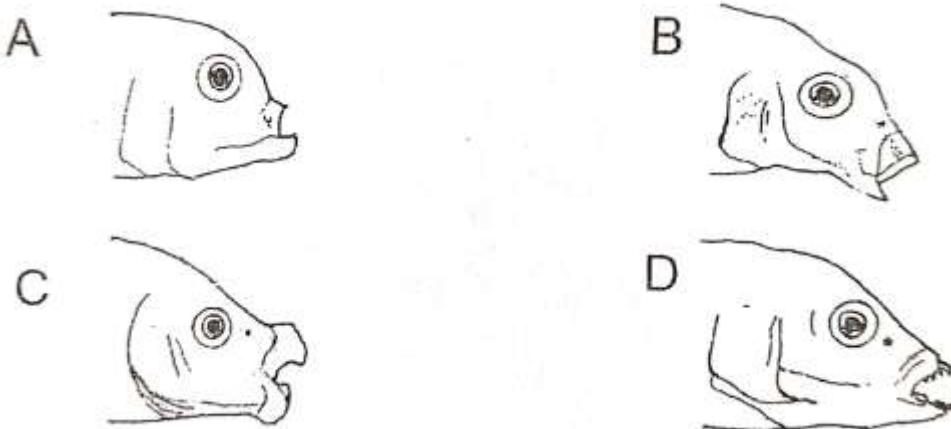
Figure 4

- Write down **two** variations that you can see between dogs **L** and **K**. **(2 marks)**
 - Suggest the cause of the variations between the two dogs. **(1 mark)**
(2003, I)
8. In Malawi, during the 1980s, DDT was a common pesticide that was used to kill weevils. This pesticide was very effective for a number of years but later weevils that were resistant to this pesticide began to appear: In the 1990s, a new pesticide had to be introduced because the majority of weevils could not be killed by DDT.
- How weevils could become resistant to DDT? **(1 mark)**
 - Explain how natural selection would help the population of weevils to become resistant to DDT. **(4 marks)**
(2003, I)
9. **Figure 5** is a diagram showing the wing of a bat labelled **A** and the front leg of rabbit labelled **B**. Use it to answer the questions that follow.



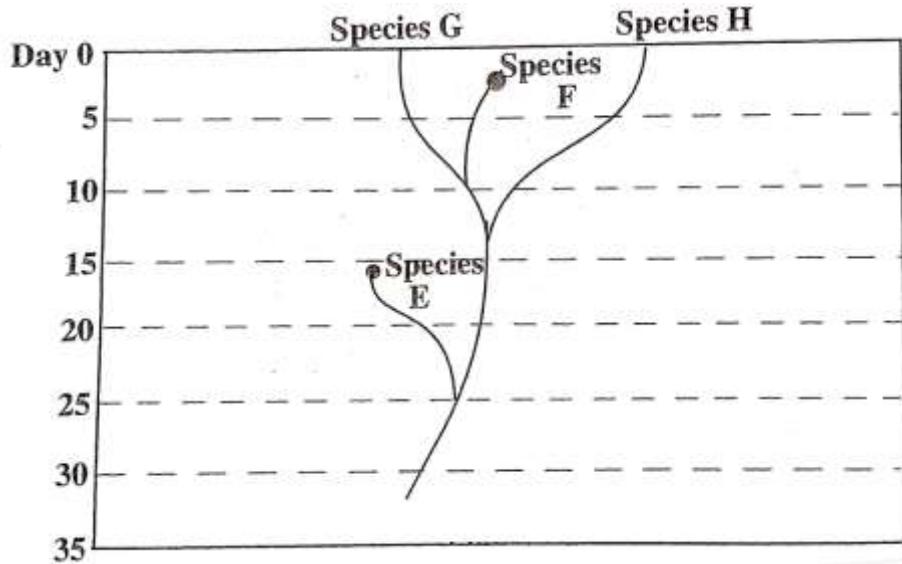
- Give **two** structural differences between wing **A** and leg **B**. **(2 marks)**
- (i) What type of evidence of evolution is shown in **figure 5**? **(1 mark)**
(ii) Give a reason for your answer to b.(i). **(1 mark)**
(2004, I)

10. **Figure 6** is a diagram showing some of the varieties of cichlid fish (mbuna) found in Lake Malawi. Use it to answer the questions that follow.



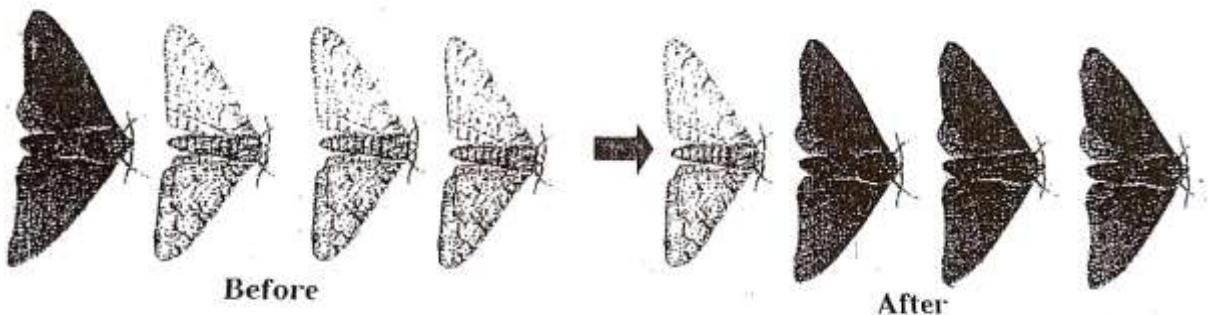
- a. (i) Which cichlid fish is adapted for carnivores feeding habits? (1 mark)
(ii) Explain your answer to a. (i). (1 mark)
 - b. Explain briefly how the four varieties of the cichlid fish may have arisen from a common ancestor. (3 marks) (2006, I)
11. a. What is “evolution”? (1 mark)
- b. Explain how each of the following helps to support the theory of evolution:
(i) Comparative anatomy (2 marks)
(ii) Embryology (2 marks)
- c. How does meiosis cause variation among offspring? (2 marks) (2008, I)

12. **Figure 7** is an evolutionary tree of an organism. Use it to answer the questions that follow.



- a. Name two species that have become extinct. (2 marks)
- b. At what time did species E evolve? (1 mark)
- c. Explain how fossils records can be used to show that the species in the diagram have a common ancestor. (3 marks) (2010, I)

13. **Figure 8** shows occurrence of light and dark varieties of peppered moth in an industrial area before and after industrial revolution in England. Use it to answer the questions that follow.



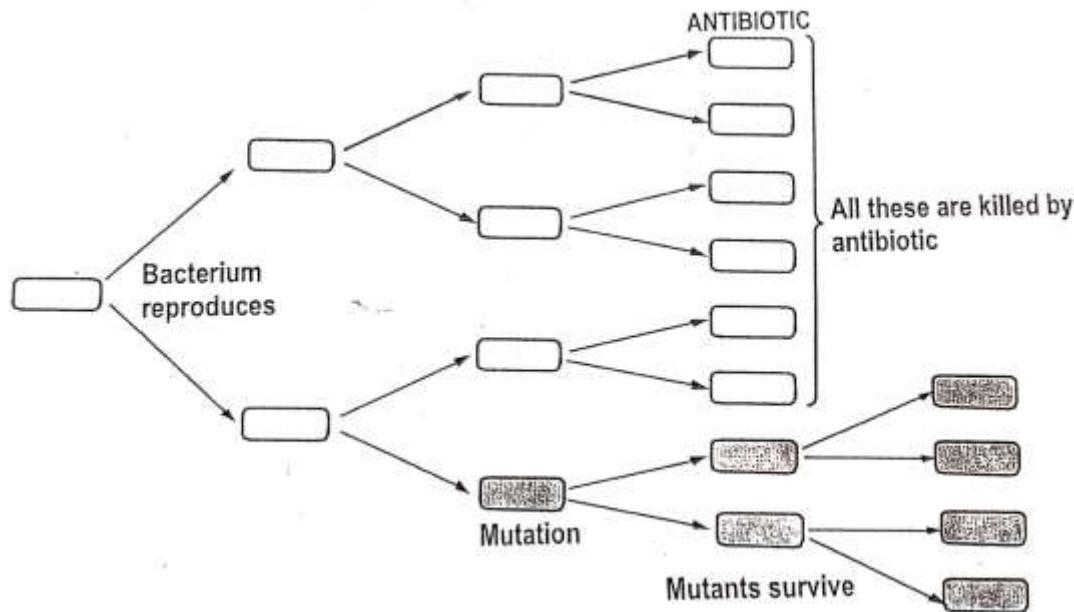
- a. In the table provided, state **two** differences in the population of moths before and after industrial revolution.

| Before | After |
|--------|-------|
| | |
| | |

(2 marks)

- b. Explain how the population of dark peppered moth could have risen before industrial revolution. **(3 marks)**
(2011, I)

14. **Figure 9** shows one of the examples of natural selection in action. Use it to answer the questions that follow.

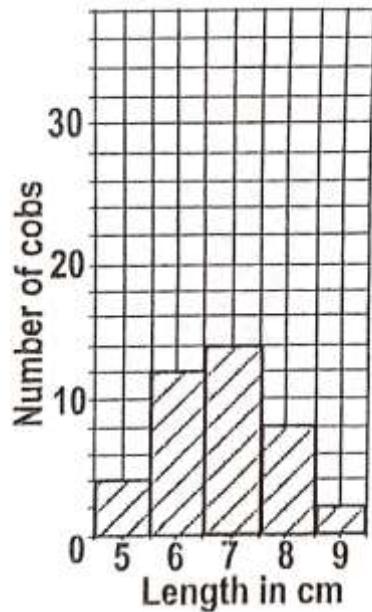


- a. (i) Name the example of natural selection shown. **(1 mark)**

(ii) Describe what led to the survival of some of the bacteria while the others got killed. **(2 marks)**

- b. What will happen to the antibiotic after sometime? **(1 mark)**
(2012, I)

15. **Figure 10** is a graph of number of Maize cobs against their length. Use it to answer the questions that follow.



- a. What is the range of the lengths of the maize cobs? **(1 mark)**
b. Calculate the median length of the cobs. Show your working. **(4 marks)**
c. Mention the type of variation shown by maize cob length. **(1 mark)**
(2013, I)
16. **Figure 11** shows skull fossils **E**, **F** and **G** of primates that evolved from a common ancestor. Use it to answer the questions that follow.
-
- E** **F** **G**
- a. State any **two** differences between skulls **E** and **F**. **(2 marks)**
b. By showing arrows, arrange the letters representing the skulls to show order of their evolution. **(1 mark)**
c. State any **two** ways in which new species of organisms are formed. **(2 marks)**
(2014, I)

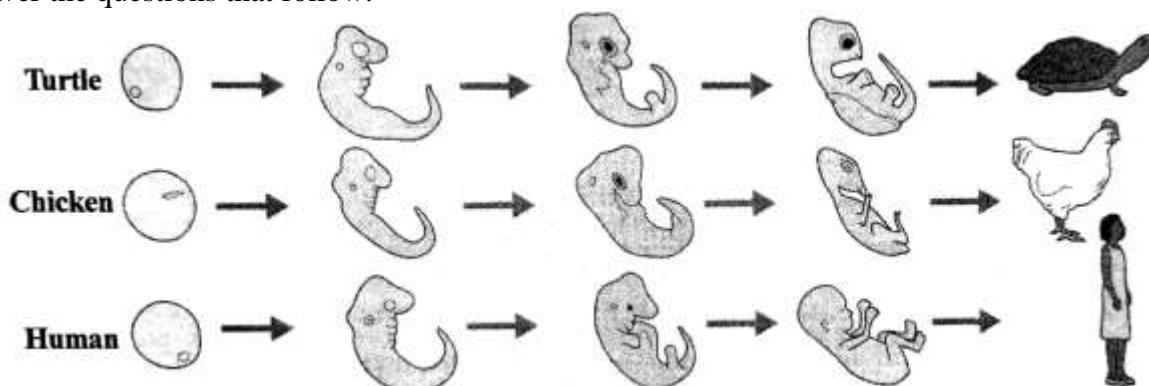
17. a. Give **one** function of genes. **(1 mark)**
- b. One breed of goats was found to have resistance to diseases but its milk production was low while another breed had high milk production but not resistance to diseases.
- (i) Explain one way in which a new breed of goats with high milk production and high resistance to diseases would be produced from the two breeds. **(2 marks)**
(ii) Explain how natural selection would operate to maintain resistance to diseases in the goats. **(4 marks)**
(2014, I)

18. **Table 2** shows results of an investigation on melanism where equal numbers of red and white ground beetles were put on red clay in a mesh cage. Insect-eating birds were then introduced in the cage. Use it to answer questions that follow.

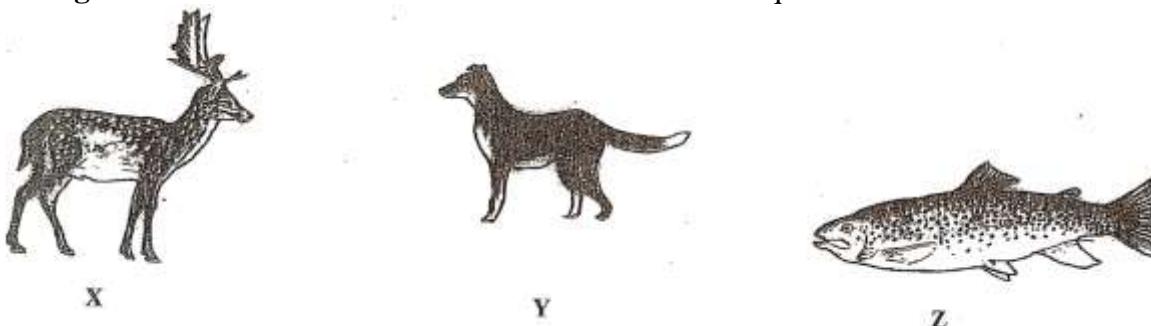
Table 2

| Types of beetles | Number of beetles before experiment | Number of beetles after experiment |
|----------------------|-------------------------------------|------------------------------------|
| Red ground beetles | 500 | 475 |
| White ground beetles | 500 | 123 |

- a. How many red ground beetles were eaten by the birds? (3 marks)
 - b. Calculate the percentage of white beetles that survived. (3 marks)
 - c. Explain the results of this investigation. (2 marks) (2009, I)
19. **Figure 12** shows different stages of development in turtle, chicken and human. Use it to answer the questions that follow.

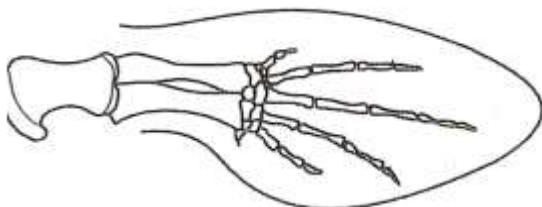


- a. What name is given to this evidence of evolution? (1 mark)
 - b. Explain how this evidence proves the theory of evolution. (2 marks) (2016, I)
20. **Figure 13** shows some vertebrates. Use it to answer the questions that follow.

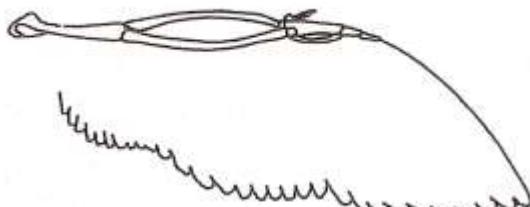


- a. (i) Which vertebrate would easily become extinct (wiped out) in an area where there are prolonged dry conditions? (1 mark)
- (ii) Explain your answer to a. (i). (3 marks)
- b. Due to insufficient rainfall in desert areas, water is found in holes and some of which are small in size. Explain how natural selection would operate on vertebrate X in such an environment. (3 marks) (2011, II Practical)

21. **Figure 13** shows diagrams of forelimbs of two vertebrates **M** and **N**. Use to answer the questions that follow.



M



N

- Give **one** observable feature that shows that the two vertebrates may have evolved from ancestor. **(1 mark)**
- Explain how isolation may have resulted in the evolution of the two vertebrates. **(4 marks)**
- Explain how crossing over brings about evolutionary change. **(5 marks)**

(2015, II Practical)

1. **Figure 1** is a photograph of *Brachystegia* woodland on the slopes of Hora Mountain.



Source: Medi I.K. and Meredith H.M. (1989) *The Senior Certificate Biology*. pp. 232, Fig. 11.1

- Considering the slope of the area, suggest **two** ways in which this land can be conserved. (2 marks)
 - Give **two** advantages to humans of conserving this land. (2 marks)
 - Suggest any **two** types of plants that are likely to grow on the rocky part of the mountain. (2 marks) (1990, I)
2. The lakes or rivers in which fish live may have warm water discharged into them from nearby industries. **Table 1** shows the relationship between water temperature and its ability to dissolve oxygen.

| Water Temperature °C | Amount of oxygen dissolved (mg/litre) |
|----------------------|---------------------------------------|
| 0 | 14.5 |
| 5 | 12.5 |
| 10 | 11.0 |
| 15 | 10.0 |
| 20 | 9.0 |
| 25 | 8.0 |
| 30 | 7.5 |

- Plot a graph of amount of dissolved oxygen against temperature. (4 marks)
- What is the relationship between water temperature and the amount of dissolved oxygen in the water? (2 marks)

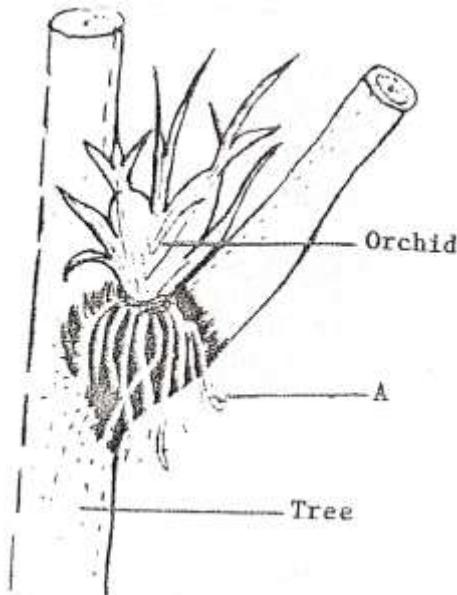
- c. In a certain river in which the water had become warmed, the number of fish present dropped. Give **two** possible reasons for the drop in the fish population. (2 marks)
- d. (i) What name is given to the contamination of the environment by human activities? (1 mark)
(ii) Apart from heat, give another example of environmental contamination. (1 mark)
- (1992, I)
3. A few weeks after heavy rains the algae population in a dam below some maize fields increased excessively. After some time it was discovered that fish in the dam were dying at night.
- a. What could have caused the increase in the algae population? (1 mark)
b. Suggest why fish in the dam were dying at night. (2 marks)
c. Suggest **two** ways in which the situation stated in b. could be prevented. (2 marks)
- (1991, I)
4. A student found many caterpillars feeding on the leaves of a mango tree in a school fruit garden. Some birds were picking up caterpillars.
- a. Draw a labelled diagram of a pyramid of numbers to show this relationship. (2 marks)
b. (i) What type of data would you use to get a differently shaped pyramid? (1 mark)
(ii) How would you obtain the information (data) named in b.(i)? (2 marks)
(iii) What name is given to the pyramid drawn from the data collected in b. (ii)? (1 mark)
- (1993, II)
5. **Table 2** shows the estimated numbers of organisms recorded per m² in a fish pond of total surface area of 400m².

Table 2

| Organism | Estimated number |
|------------------------|------------------|
| Small fish | 20 |
| Microscopic algae | 900 |
| Snails | 10 |
| Carnivorous large fish | 5 |
| Mosquito | 200 |

- a. From **Table 2** above
- (i) Which organism has the least population density? (1 mark)
(ii) Calculate the total estimated population of small fish for the whole pond.
Show your working. (3 marks)
- b. Construct a food web consisting of three organisms from the fish pond mentioned above. (2 marks)
- c. What name is given to:
- (i) The pond together with all the organisms it contains? (1 mark)
(ii) All the organisms found in the pond? (1 mark)
- (1993, II)

6. **Figure 2** is a diagram showing an orchid growing on a branch of a tree high off the ground.



- a. (i) Name the part labelled A. (1 mark)
(ii) State the function of the part labelled A. (1 mark)

b. What type of symbolic relationship exists between the orchid and the tree as shown in figure 2? (1 mark)

c. Why is it advantageous for orchids to grow on trees? (1 mark)

7. Figure 3 is a food chain found in a lake: (1994, II)

Phytoplankton → *Zooplankton* → *Fish* → *Fish Eagle*
 (1 ppm) (10 ppm) (100 ppm) (1000 ppm)

Figure 3

The lake was sprayed with an insecticide in order to kill mosquitoes which breed in it. The numbers indicate the concentration of the insecticide found in the bodies of the organisms. The insecticide is 950 parts per million (ppm) or above.

- a. Name the primary consumer. (1 mark)

b. State **one** way in which the insecticide may have got into fish eagle. (1 mark)

c. Many fish eagles died but fish survived. Explain why fish survived. (1 mark)

d. Explain what would happen to the numbers of fish and zooplankton as a result of fish eagles dying. Give reason for your answer.

(i) Fish: _____ (1 mark)
Reason: _____ (1 mark)

(ii) Zooplankton: _____ (1 mark)
Reason: _____ (1 mark)

e. Why is the concentration of the insecticide in zooplankton greater than the concentration of insecticide in phytoplankton? (1 mark)
(1994, II)

a. What is meant by a population crash? (1 mark)

- b. At the beginning of 1971, the birth rate in Malawi was 50 and the death rate was 30. Calculate the percentage increases of the population at the end of the year. Show your working. **(3 marks)**

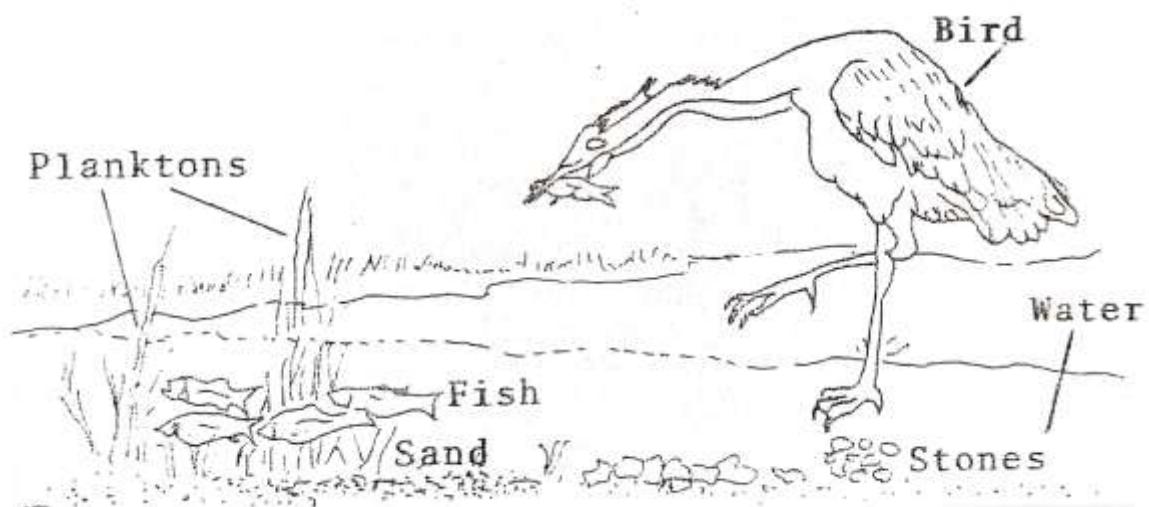
- c. Briefly describe how the population of a weed plant can be estimated. **(5 marks)**
(1995, I)

- 9.** a. In an aquarium, what role would the following organisms play? **(1 mark)**
 (i) Tadpoles **(1 mark)**
 (ii) Algae **(1 mark)**

- b. Under what condition would the aquarium be kept to sustain the organisms living in it. **(1 mark)**
(1995, II)

- 10.** a. Leguminous plants have nodules in their roots.
 (i) Give an example of a leguminous plant. **(1 mark)**
 (ii) What organisms live in the nodules? **(1 mark)**
 (iii) There is a symbiotic relationship between the organisms in the nodules and the plant. State how each one benefits from the relationship. **(2 marks)**
 b. State **two** roles of saprophytes. **(2 marks)**
(1996, I)

- 11.** **Figure 3** shows a diagram of a section of an aquatic ecosystem.



- a. Construct a possible food chain from **figure 4** above. **(3 marks)**
- b. Which organism would be:
 (i) part of a population having the greatest biomass? **(1 mark)**
 (ii) on top of the pyramid of numbers? **(1 mark)**
- c. (i) State **two** activities that the secondary consumer should be able to do in order to survive in this ecosystem. **(2 marks)**
 (ii) Using the diagram, describe the adaptations that the bird shows in order to accomplish activities mentioned in c.(i). **(2 marks)**
(1996, II)

- 12.** a. What is the difference between a community and a population? **(2 marks)**

b. Which of the following are **not** populations?

Mushrooms in Machinga Forest?

Tubercle bacilli in lungs?

Bidens pilosa in a garden?

Frogs in Lake Malawi?

Chambo in Lake Malawi?

(2 marks)

(1997, I)

13. Classify the following associates as parasitism, mutualism, or commensalism. Give a reason for your answer.

a. Nectar-sucking insects and flowers they visit.

Association: _____ (1 mark)

Reason: _____ (1 mark)

b. Aphids living and feeding on bean stems.

Association: _____ (1 mark)

Reason: _____ (1 mark)

c. The population of bacteria in the human gut.

Association: _____ (1 mark)

Reason: _____ (1 mark)

(1998, I)

14. **Figure 5** shows a food chain in a forest where a pesticide was applied to control the spread of aphids.

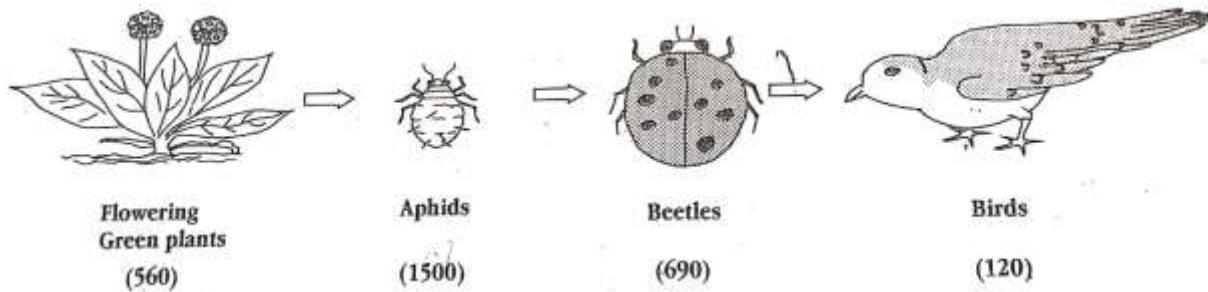


Figure 5

- How many trophic levels are presented in **figure 5**? (1 mark)
- Sketch and label a horizontal bar diagram to show the numerical relationship in the populations of the organisms in the food chain in **figure 5**. (2 marks)
- State *two* changes, which could happen in the food chain if all aphids were killed by the pesticide. (2 marks)
- (i) Suppose the amount of pesticide in birds and beetles were measured. What would be the results? (1 mark)
(ii) Give a reason for your answer to d (ii). (1 mark)

(1998, II)

15. To estimate a population of grasshoppers in a field, a sample of 200 grasshoppers were captured and marked with harmless quick drying paint and released. After 2 hours another sample of 150 grasshoppers were captured from the same field. Upon counting 50 of the grasshoppers in the second sample had paint marks.
- Calculate the total population of grasshoppers in the garden. **(2 marks)**
 - Describe how you would estimate the population size of a plant species in a given field. **(4 marks)**
 - State **two** ways in which the population size of grasshoppers can be controlled using biological methods. **(2 marks)**

16. a. What are the biological terms for the following definitions?

| DEFINITION | TERM |
|--|------|
| Feeding relationship based on the masses of organisms | |
| The interaction of living things and their physical environment in an area | |

(2 marks)

- b. State **one** example of each of the following in a plant.

- Organ **(1 mark)**
 - System **(1 mark)**
 - Tissue **(1 mark)**
- (1999, I)**

17. **Table 3** shows the distribution of stomata on surfaces of leaves of the named plants. Study the table and use it to answer the questions that follow.

Table 3

| PLANT | NUMBER OF STOMATA PER MM ² | |
|---------|---------------------------------------|---------------|
| | Upper surface | Lower surface |
| Pumpkin | 28 | 269 |
| Tomato | 12 | 125 |
| Oats | 25 | 23 |
| Pine | 50 | 7 |

- What difference can be noticed in the distribution of stomata on the upper and lower surfaces of the leaves of tomato and oats? **(1 mark)**
- The distribution and number of stomata on a leaf greatly influence the rate of water loss from a plant. Explain how tomato and oats plants are adapted to reduce the problem of water loss.

Tomato: _____ **(1 mark)**

Oats: _____ **(1 mark)**

- (i) Between pine and pumpkin, which would survive better in dry conditions? **(1 mark)**
- Give a reason for your answer to c.(i) above. **(1 mark)**

18. a. Construct **two** possible food chains that exist in Lake Malawi.

Food chain 1: _____ (3 marks)

Food chain 2: _____ (3 marks)

- b. Explain why in a food chain there is loss of energy from one trophic level to the next. (2 marks)

- c. The population of fish in Lake Malawi is decreasing. State any **two** causes of the decrease. (2 marks)

- d. Describe any two possible measures that could be taken to maintain fish population in Lake Malawi and explain how the measures could work.

(i) Measure: _____ (1 mark)

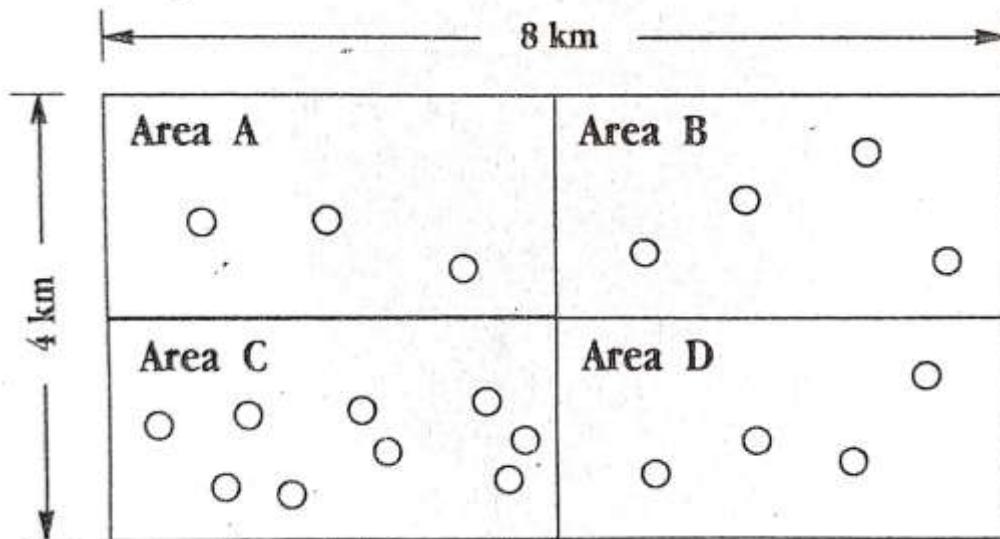
Reason: _____ (1 mark)

(ii) Measure: _____ (1 mark)

Reason: _____ (1 mark)

(2001, I)

19. **Figure 6** is a diagram showing the distribution of a population of buffaloes in a 32 km^2 park. The park has been divided into four equal areas. Each circle (o) in the diagram represents a group of 1000 buffaloes.



- a. What is the total population of buffaloes in the park? (2 marks)

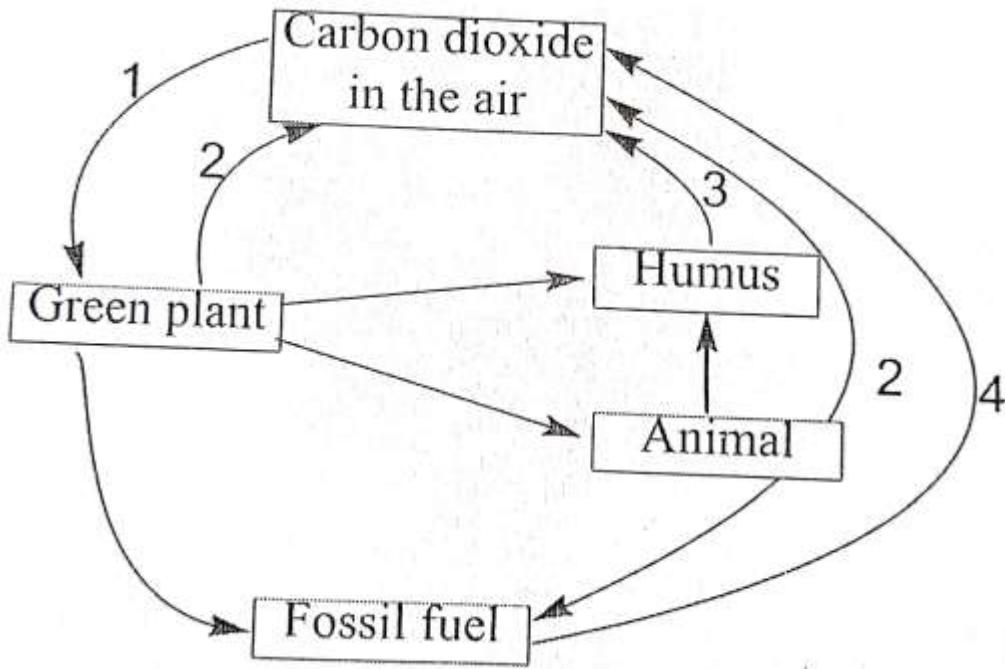
- b. Calculate the population density of buffaloes in area C. Show your working. (2 marks)

- c. Suggest **two** reasons why population density of buffaloes would be higher in one area than another. (2 marks)

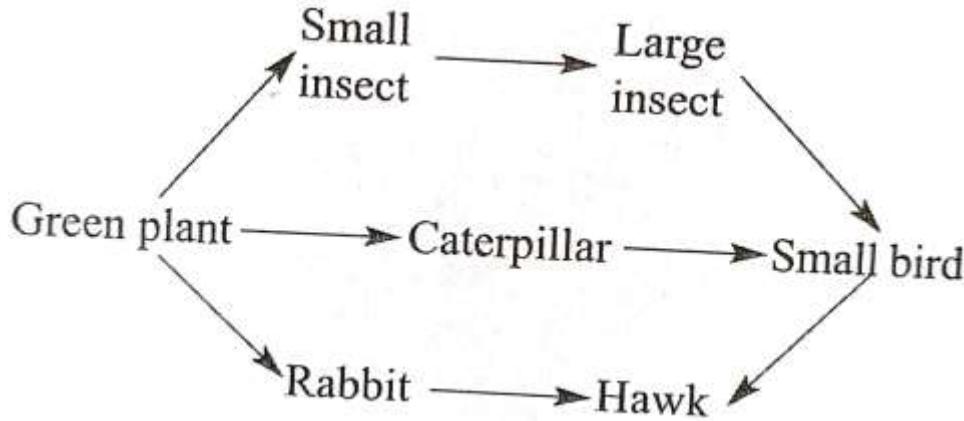
- d. How would the population of buffaloes in the park become extinct due to human activity? Give **two** points. (2 marks)

(1999, II)

20. **Figure 7** is a diagram showing the carbon cycle. Use it to answer the questions that follow.



- Name the process labelled **1, 2 and 4**. (3 marks)
 - Name **two** groups of organisms that play a major role in process **3**. (2 marks)
 - Where does process **3** normally occur? (1 mark)
 - Name **one** common fossil fuel. (1 mark)
 - Suggest how deforestation could affect the carbon cycle. (2 marks)
- (2001, II)
21. **Figure 8** is a diagram showing a food web in a woodland ecosystem. Use it to answer the questions below.



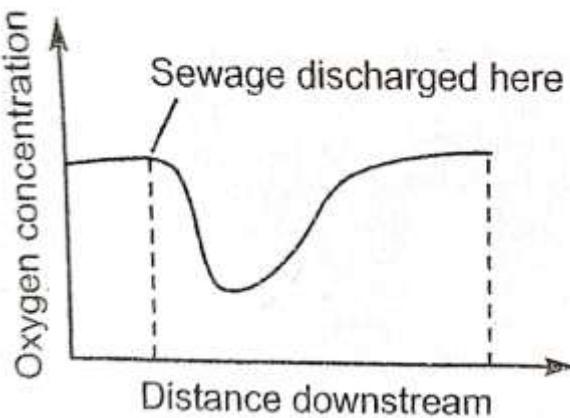
- State any **three** major components of an ecosystem. (3 marks)
 - Which organisms is the producer? (1 mark)
 - Give an example of tertiary consumer in the food web. (1 mark)
 - (i) If all small birds died, what effect would this have on the small insects? (1 mark)
(ii) Explain your answer to d.(i). (3 marks)
- (2001, II)

22. A student estimated the population of five species of fish in a pond. **Table 4** shows the results obtained. Use it to answer the questions that follow.

Table 4

| SPECIES | E | F | G | H | I |
|----------------|------|------|-----|-----|-----|
| Number of fish | 2250 | 1000 | 250 | 125 | 400 |

- a. (i) Draw a bar chart to compare number of fish of each species in the pond. **(4 marks)**
(ii) Which is the least abundant fish species in the pond? **(1 mark)**
- b. Apart from fertilizer, mention **two** factors that may affect growth of fish population. **(2 marks)**
- c. How can a fish population in a pond be estimated without counting all the fish? **(4 marks)**
(2002, II)
23. a. Describe how bacteria and leguminous plants benefit from their symbiotic relationship in a root nodule.
Bacteria: _____ **(1 mark)**
Leguminous plants: _____ **(1 mark)**
- b. State **two** advantages and **two** disadvantages of being an epiphyte.
Advantages: _____ **(2 marks)**
Disadvantages: _____ **(2 marks)**
24. a. Mention **one** abiotic factor that affects plant growth. **(1 mark)**
b. Give **two** ways in which the activities of man can affect an aquatic ecosystem. **(2 marks)**
25. **Figure 9** is a diagram showing the effect of untreated sewage on concentration of oxygen in a stream. Use it to answer the questions that follow.

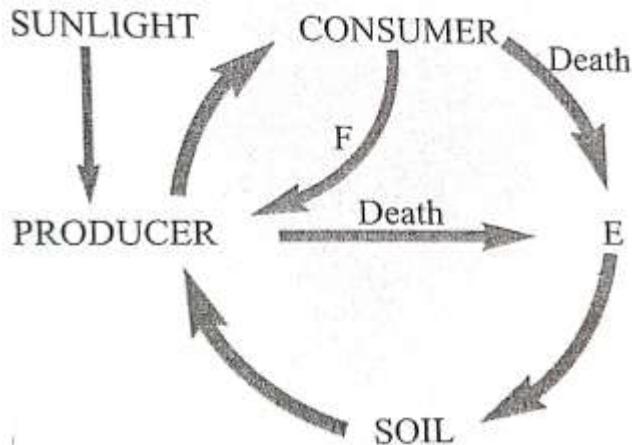


- a. Describe the effect of untreated sewage on oxygen concentration from the point of sewage discharge as a distance increases downstream. **(2 marks)**
- b. Explain why there is a change in oxygen concentration from the point where sewage is discharged into the stream. **(2 marks)**
- c. Suppose there were fish in the stream, what effect would untreated sewage have on the population of fish? Explain your answer.

Effect: _____ **(1 mark)**

Explanation: _____ **(1 mark)**
(2003, I)

26. **Figure 10** is a diagram showing recycling of materials in an ecosystem. Use it to answer the questions that follow.

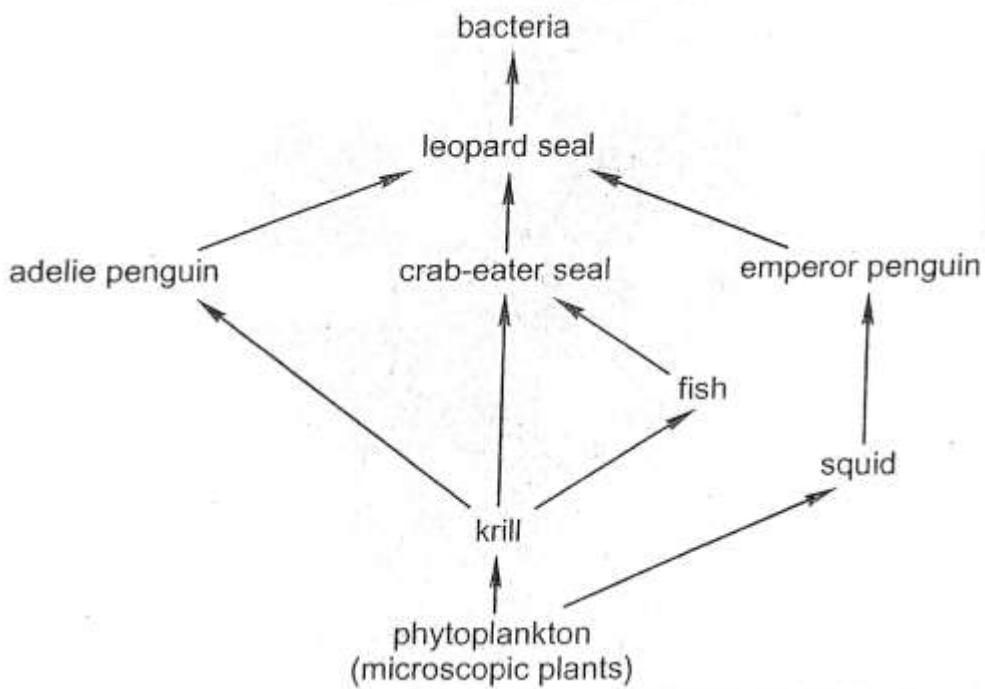


- a. What does the letters **E** and **F** represent? (2 marks)
 - b. Explain how the consumer would be affected if **E** was absent in the cycle. (3 marks)
 - c. How would a worm using the soil as a habitat benefit the producer? (2 marks)
(2004, I)
27. a. Define the following terms:
(i) "Ecosystem" (1 mark)
(ii) "community" (1 mark)
(iii)
- b. Suppose a particular ecosystem has 2 shrubs, 100 caterpillars and 3 birds, construct a pyramid of:
(i) Numbers (2 marks)
(ii) Biomass (2 marks)
(2004, I)
28. **Figure 11** is a photograph of plant known as cactus. Use it to answer the questions that follow.

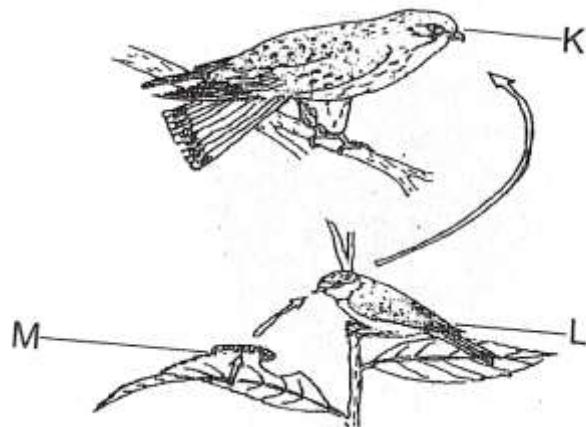


- a. Suggest a possible environment where the plant in **figure 11** would grow. (1 mark)
- b. State **one** adaptation shown in the photograph which would assist the plant to survive in its habitat. (1 mark)
- c. Explain how the adaptation in **28 b.** would help the plant to survive in its habitat. (1 mark)
(2004, I)

29. **Figure 12** is a diagram showing a food web in an aquatic ecosystem.

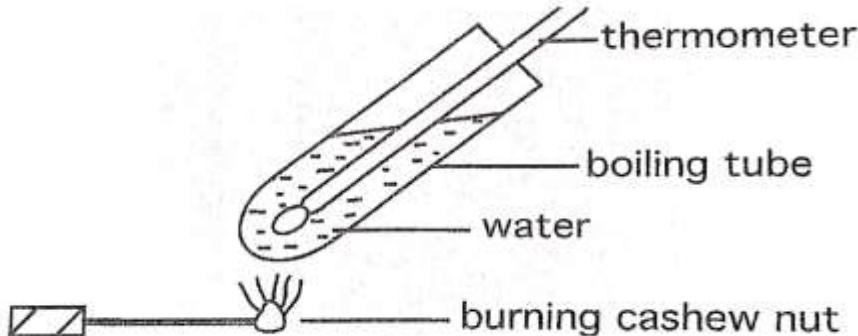


- Name **one** organism which represent a:
 - Herbivore
 - Decomposer(1 mark)
(1 mark)
 - From the food web, draw **one** food chain consisting of **six** organisms.
 - Why would bacteria **not** belong to a specific feeding level?
- (2 marks) (1 mark)
(2005, I)
30. **Figure 13** is a diagram showing one of the relationships that exist among organisms in an ecosystem. Use it to answer the questions that follow.

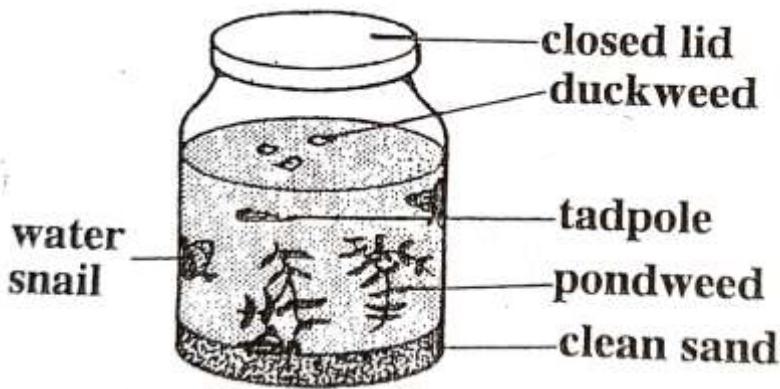


- (i) Name the type of relationship shown in **figure 13**.
(1 mark)
 - (ii) State **two** adaptations of organism **K** to survive in this relationship.
(2 marks)
 - Explain briefly how organism **K** would be affected if the population of organism **M** was reduced.
(3 marks)
 - Apart from pesticide application, mention **one** way of reducing the population of organism **M**.
(1 mark)
- (2006, I)

31. Precious and Parosh caught 64 grasshoppers in a school garden of area 32m^2 and marked them with nail varnish. They released them into the same garden. After two hours Precious and Parosh captured 60 grasshoppers in the same area of which 12 had marks of nail varnish.
- Name the sampling technique used by the students. **(1 mark)**
 - Calculate the total number of grasshoppers for this area. **(3 marks)**
 - Calculate the population density of the grasshoppers. **(2 marks)**
(2007, I)
32. **Figure 14** is a diagram of an experiment that was used to find the energy value of cashew nuts. The result obtained was 1800 kg per 100 g of cashew nuts.

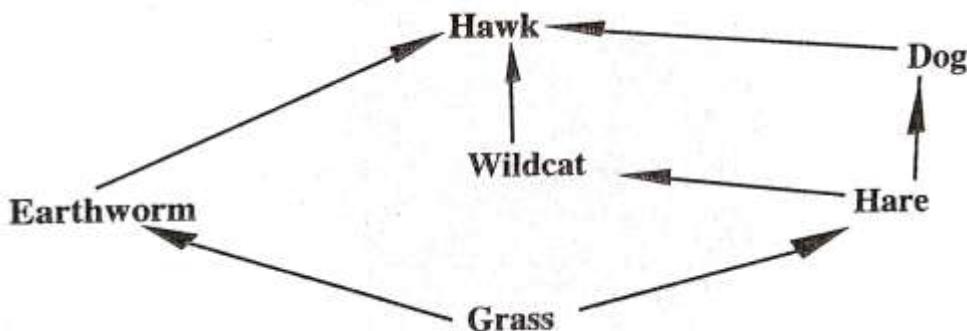


- If the exact energy value for the cashew nut is 2500 kg per 100 g.
 - Give **two** reasons why a lower result was obtained. **(2 marks)**
 - What **two** things can be done to improve the accuracy of the result? **(2 marks)**
 - If this method was used to find out energy value of beans, state **two** experimental conditions that must be kept constant in order to make a fair comparison of energy values of cashew nuts and beans. **(2 marks)**
(1997, I)
33. **Figure 15** shows a closed aquarium which was set up in the sum by a group of students. Use it to answer the questions that follow.



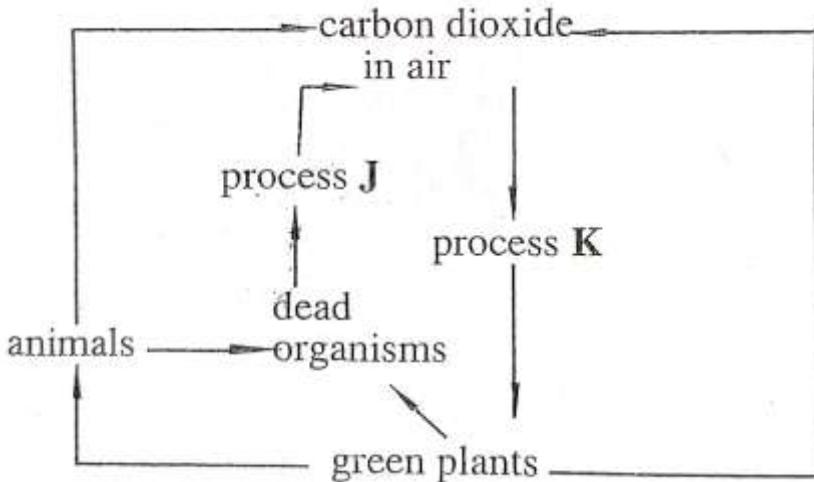
- Besides feeding relationship, explain how the pond weeds and snails depend on each other in the aquarium. **(4 marks)**
- If the following morning students observed that tadpoles and water snails had died, explain the cause of death. **(3 marks)**
(2008, I)

34. **Figure 16** is a diagram of feeding relationship in savanna woodland ecosystem.



- Name any **one** primary consumer in this ecosystem. **(1 mark)**
- Construct any **one** food chain with four organisms from the feeding relationship. **(1 mark)**
- Describe **one** way in which a pyramid of biomass can be constructed by using a food chain. **(3 marks)**
(2014, I)

35. **Figure 17** shows the carbon cycle. Use it to answer the questions that follow.



- Name the processes **J** and **K**. **(2 marks)**
 - Mention one environmental problem that is caused by increased amount of carbon dioxide in the atmosphere. **(1 mark)**
(2010, I)
36. **Table 5** shows results of an analysis of water in a stream and the organisms present in it. The stream was sprayed annually with an insecticide to kill larvae of mosquitoes.

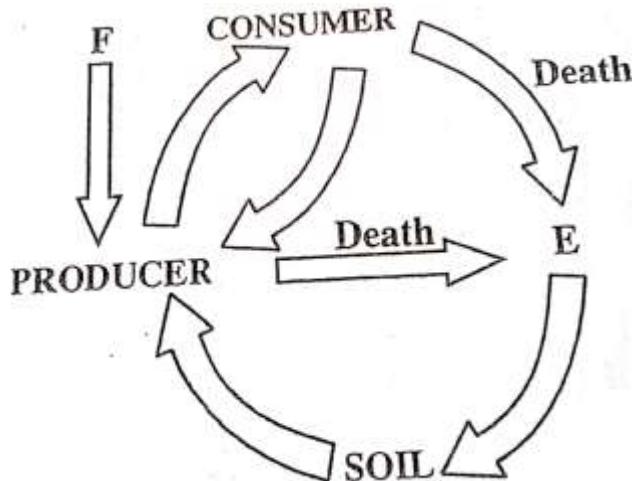
Table 5

| Analysis | Concentration of pesticide |
|--------------|----------------------------|
| Stream water | 2 |
| Water plants | 500 |
| Fish type A | 27000 |
| Fish type B | 115000 |
| Fish eagles | 160000 |

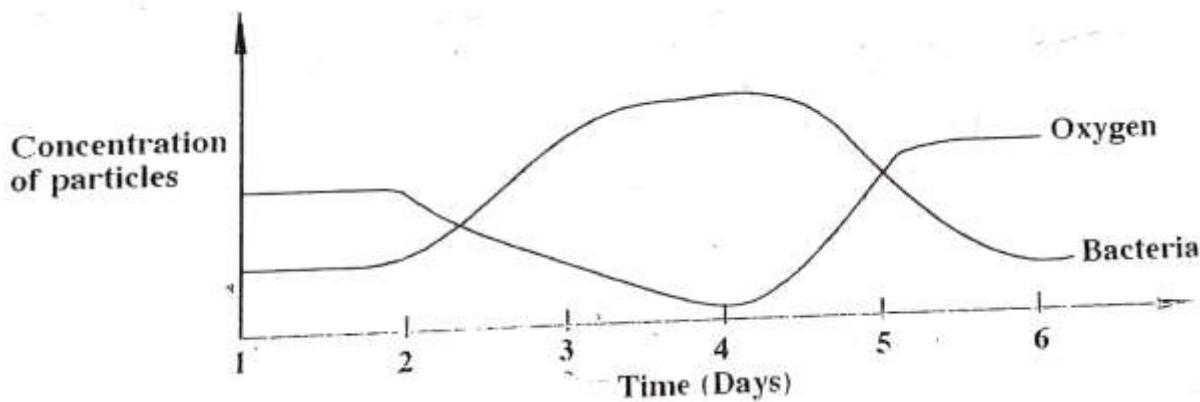
- Write down a food chain that includes all the organisms shown in the table. **(3 marks)**

- b. Why is the insecticide concentration in the fish eagles higher than in the water plants?
(2 marks)
(2009, I)

37. **Figure 18** is diagram showing recycling of materials in an ecosystem.

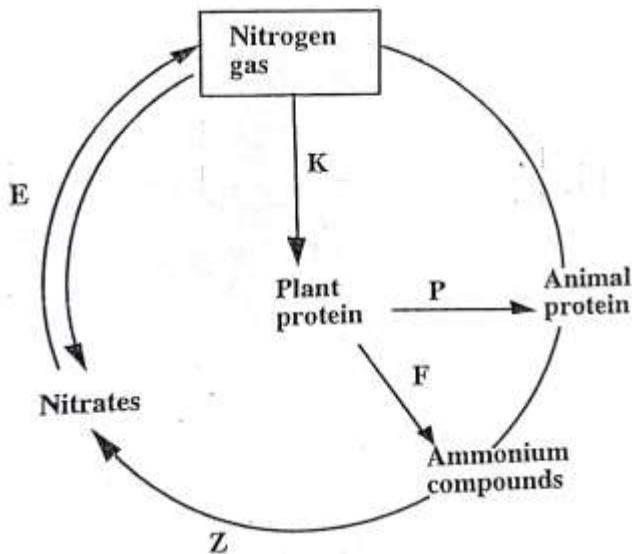


- a. What does **F** represent? **(1 mark)**
- b. Explain how the producer benefits from the activities of organisms represented by letter **E**. **(3 marks)**
(2010, I)
38. a. Mention any **one** factor that affects primary productivity in fresh water ecosystems. **(1 mark)**
 b. Explain how deforestation could affect a fresh water ecosystem. **(3 marks)**
(2014, I)
39. **Figure 19** is a graph showing the population of bacteria and amount of oxygen in stream water after sewage discharge into it. Use it to answer the questions that follow.

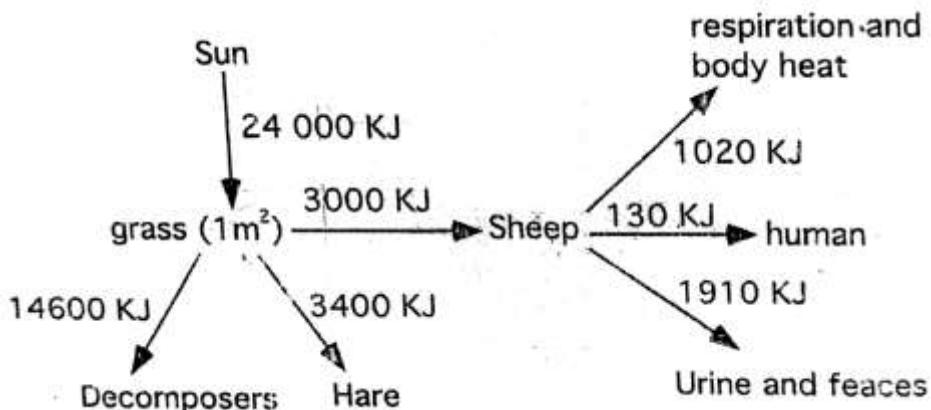


- a. When was sewage discharged into the stream? **(1 mark)**
- b. (i) What results would be obtained after sometime? **(2 marks)**
 (ii) Explain your answer to 39. b. (i). **(3 marks)**
(2010, I)

40. **Figure 20** shows one of nutrient cycles in nature. Use it to answer the questions that follow.



- Name the processes taking place at **F**, **Z** and **P**. (3 marks)
 - Explain how the process at **K** takes place. (3 marks)
 - Under what condition does the process at **E** take place? (1 mark)
- (2012, I)**
41. a. State any **two** physical factors of fresh water ecosystem that may affect aquatic animals. (2 marks)
- b. Explain any **one** way in which resources could be managed in a fresh water ecosystem. (2 marks)
- (2015, I)**
42. In an ecosystem, a Parosh split a log of dead wood and he found many termites feeding on it. Soon after he had left, birds came to pick the termites. Use this information to answer the questions that follow.
- Draw a well labelled pyramid of numbers to represent this information. (4 marks)
 - Why does the pyramid in 42(b)i. have such a shape? (3 marks)
- (2015, I)**
43. **Figure 21** is a diagram showing the energy flow through living things in a habitat.



- Name the process in grass that uses energy from the sun. (1 mark)

- b. (i) Calculate the difference between energy absorbed by the grass and energy passed on to other living things. Show your working. (3 marks)
(ii) Give a reason for the difference in 43. b. (i). (1 mark)

(2007, I Leaked Paper)

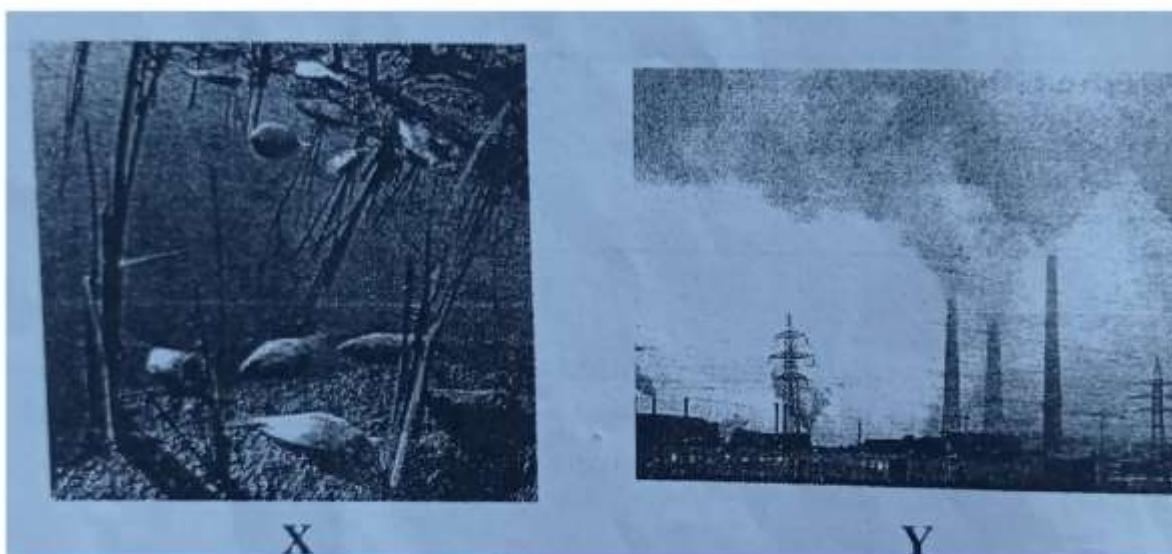
44. a. Define the term “environmental stress”. (1 mark)
b. Explain how floods could be caused in an ecosystem. (3 marks)
c. Explain the impact of alien species of plants and animals on local environment. (2 marks)

(2016, I)

45. State any two components of an ecosystem. (2 marks)

(2016, I)

46. **Figure 21** shows two different types of pollution on the environment. Use them to answer the questions that follow:



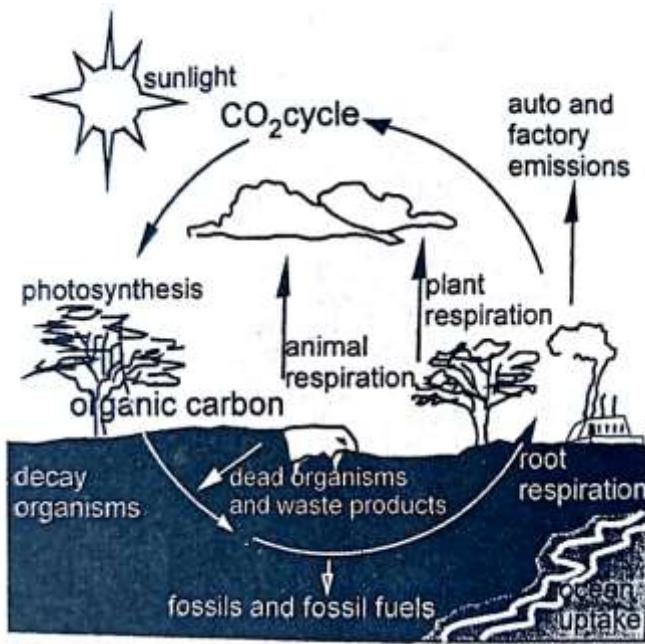
- a. Identify the types of pollution in X and Y. (2 marks)
b. State one effect of pollution as observed in diagram X. (1 mark)
c. State the cause of pollution as observed in diagram Y. (1 mark)

(2017, I)

47. a. State any two advantages of the quadrat method of estimating population. (2 marks)
b. Describe how each of the following physical factors influence the distribution of organisms in fresh water ecosystem.
(i) temperature (2 marks)
(ii) light intensity (2 marks)

(2020, I Leaked paper)

48. **Figure 22** is a diagram showing carbon cycle. Use it to answer the questions that follow.



- Mention any **two** processes shown in the diagram that lead to increase in the atmosphere. **(2 marks)**
- Describe the transfer of carbon from the atmosphere to an animal. **(3 marks)**

(2020, I Leaked Paper)

49. Explain any **four** adaptations of camels to their habitat. **(8 marks)**
(2020, I)

50. You are provided with the following specimens:

- 1 maize seed labelled specimen **K**
- sorghum/ millet seed labelled specimen **L**
- 1 bean seed labelled specimen **M**
- 1 groundnut seed labelled specimen **N**

- a. Apart from colour, use **one** physical characteristic to put the seeds into two groups.

Write down the physical characteristic that you have used to put the seeds into two groups. **(1 mark)**

- b. Using the letters, **K, L M** and **N** to represent the seeds, construct a simple dichotomous key that can be used to identify the seeds. **(6 marks)**
c. State one way in which groundnuts contribute to the nitrogen cycle. **(1 mark)**

(2004, II Practical)

51. You are provided with the following fresh leaves.

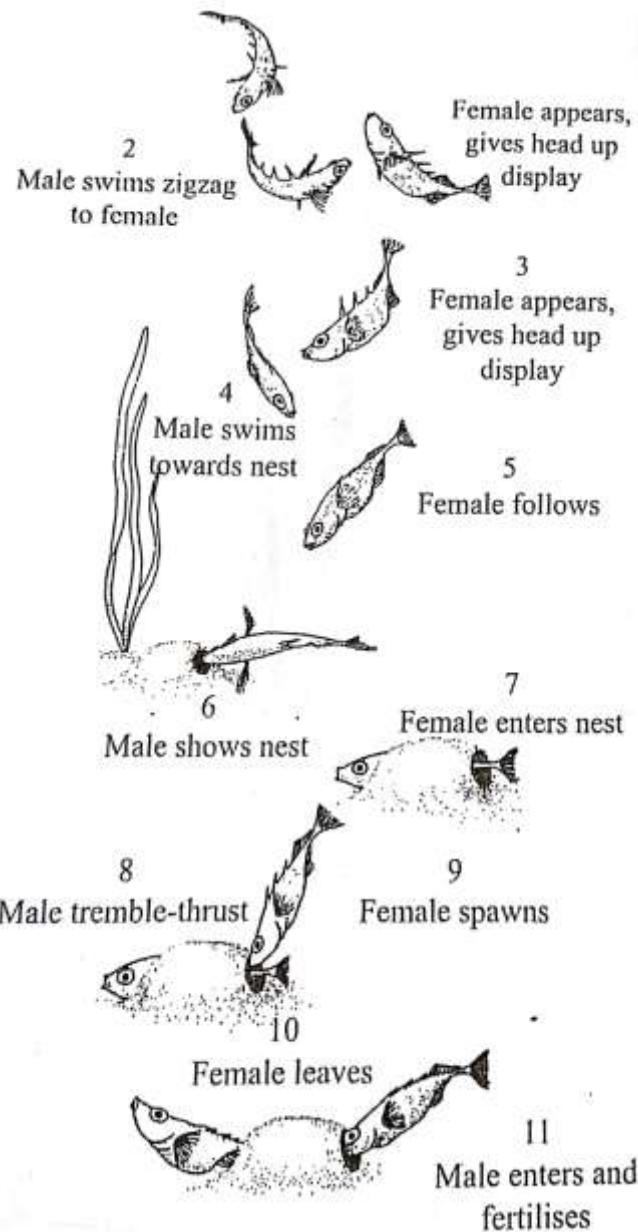
- Specimen **A** (mango leaf);
- Specimen **B** (cassava leaf);
- Specimen **C** (grass leaf)
- Specimen **D** (*tridax procumbens* leaf)
- Specimen **E** (cassia leaf)

Use the specimens to construct a dichotomous key that can be used to identify them.

(8 marks)

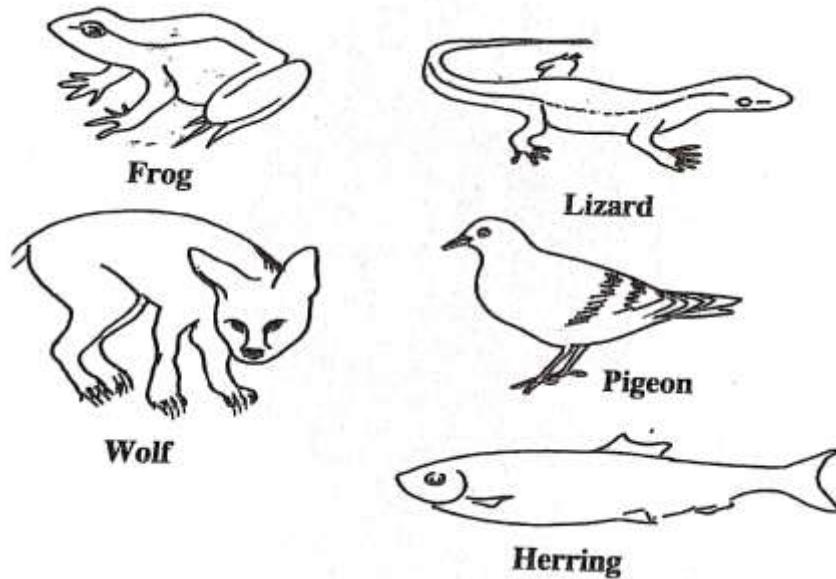
(2007, II Practical)

52. **Figure 23** is a diagram showing the courtship behavior in sickleback. Use it to answer the questions that follow.



- a. (i) To which group of animals does a sickleback belong? (1 mark)
- (ii) Name **one** feature in the diagram that has enabled you to identify the organism in
a. (i) (1 mark)
- b. (i) What type of fertilization occurs in sickleback? (1 mark)
- (ii) Give the evidence of this from the diagram? (1 mark)
- c. Give **two** physical differences between male and female sickleback that can be seen in the diagram. (2 marks)
- d. From the diagram describe **two** activities of a male sickleback that lead to fertilization of the eggs. (2 marks)
- e. Describe how you would estimate the size of sickleback population in a pond. (5 marks)
(2000, III Practical)

53. **Figure 22** shows diagrams of five animals.

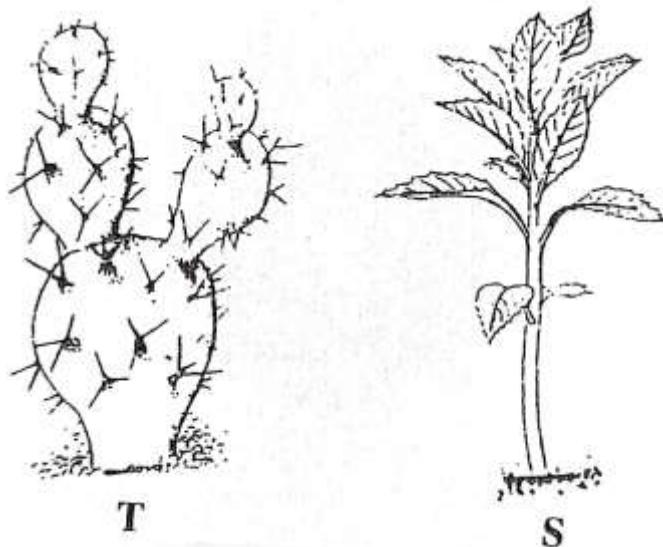


Using the diagrams in **Figure 22** construct a dichotomous key that can be used to identify the animals. (8 marks) (2008, II Practical)

54. You are provided with specimen X (a piece of fresh sisal leaf) and Y (whole grass leaf)
- Draw specimen Y and label any **three** parts. (4 marks)
 - Calculate the magnification. (3 marks)
 - (i) Which one of the two specimens could withstand dry conditions? (1 mark)
(ii) Explain your answer to c. (ii). (2 marks)
 - Give any one product of specimen X. (1 mark)
 - To which group of plants does the plant of specimen Y belong? (1 mark)

(2008, II Practical)

55. **Figure 23** shows diagrams of two plants. Use it to answer the questions that follow.

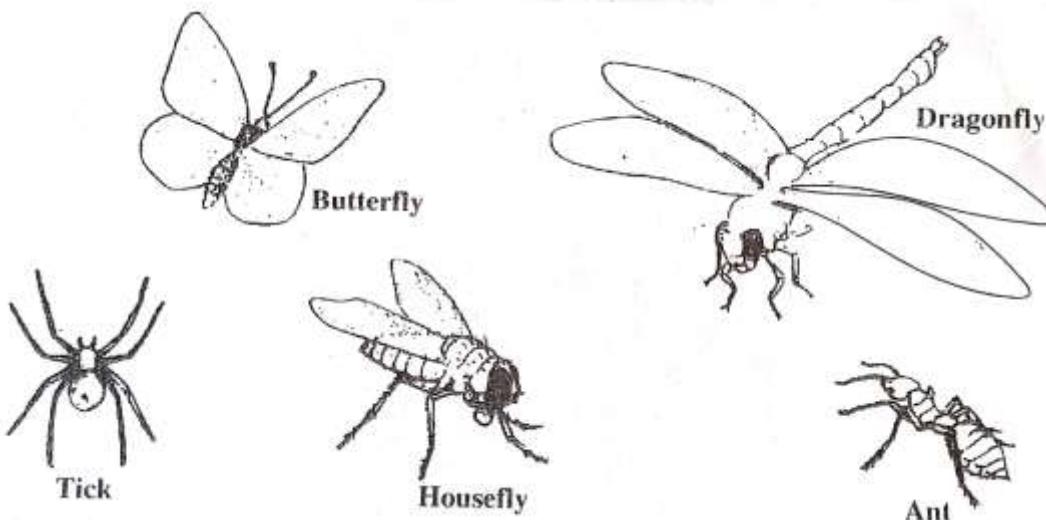


- Name any **two** structural differences between T and S. (2 marks)
- (i) Which plant is more likely to die in dry conditions? (1 mark)
(ii) Explain your answer to b. (i). (2 marks)

- c. (i) To which group of plants does S belong? (1 mark)
(ii) Give a reason for your answer to c. (i). (1 mark)
d. Why would goats find it difficult to feed on T? (1 mark)
e. Explain how plant marked T obtains its food. (2 marks)

(2010, II Practical)

56. Figure 24 shows diagrams of five different animals. Use it to answer the questions that follows:



Construct a dichotomous key that can be used to identify the organisms. (8 marks)

(2010, II Practical)

57. Students at Target Private Secondary School estimated the population of tridax in their garden using a quadrat. Table 6 shows data that was collected during the investigation. Use it to answer the questions that follow.

Table 6

| Quadrat Throws | Number of Tridax |
|----------------|------------------|
| 1 | 3 |
| 2 | 2 |
| 3 | 4 |
| 4 | 3 |
| 5 | 2 |
| 6 | 2 |
| 7 | 5 |

- a. Calculate the average number of tridax per quadrat. Show your working. (3 marks)
b. If the area of the school garden was 100 m^2 and the quadrat measured 50 cm by 50 cm, calculate the total population of tridax in the garden. (4 marks)
c. Explain why several quadrats were thrown in the investigation. (3 marks)

(2011, II Practical)

58. **Figure 25** shows diagrams of different animals. Use it to answer the questions that follow



Snail



Bird



Housefly



Chameleon



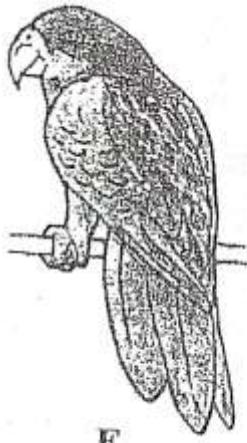
Frog

Construct a biological key that can be used to identify the animals.

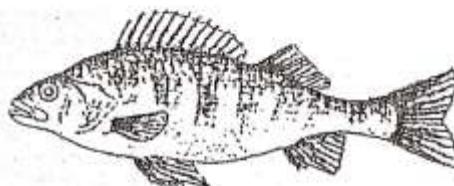
(8 marks)

(2013, II Practical)

- 59.** a. (i) What ecological method could be used to find the population of *Bidens pilosa* (chisoso) in savanna woodland ecosystem? **(1 mark)**
(ii) How are the errors minimized when using the method mentioned in a.(i)? **(1 mark)**
(iii) Explain how pollution of soil could affect a savanna woodland ecosystem. **(3 marks)**
- b. **Figure 26** shows some animals in an environment. Use it to answer the questions that follow.



F



G

- (i) What is the feeding behavior of organism F? **(1 mark)**
(ii) Give a reason for your answer to b.(i). **(1 mark)**
- c. Give two observable adaptations of organism G to life in water. **(2 marks)**

(2012, II Practical)

- 60.** You are provided with fresh leaves **P** (Gmelina leaf), **Q** (Pine leaf), **R** (Cassava leaf), **S** (Jacaranda/Moringa (Cham'mwamba) leaf or any other bipinnate leaf) and **T** (Cassia leaf). Use it the specimen to answer the questions that follows.

Construct a biological key that could be used to identify the leaves.

(8 marks)

(2015, II Practical)