

## ACKNOWLEDGEMENT

I would like to humbly thank Mr. Brown Mkhwayi and M.S.C.E Study Materials Kingdom and Distance Learning for the whole production of this booklet and all teachers of Chichiri Intensive Private Secondary School for the encouragement.

b) Temperature - high temp increases evaporation

wind - increased evaporation

pyrometer measures water uptake by a dry sheet

c) Exchange fluids that harbours HIV is the vaginal fluid

i) Exchange of blood through cuts

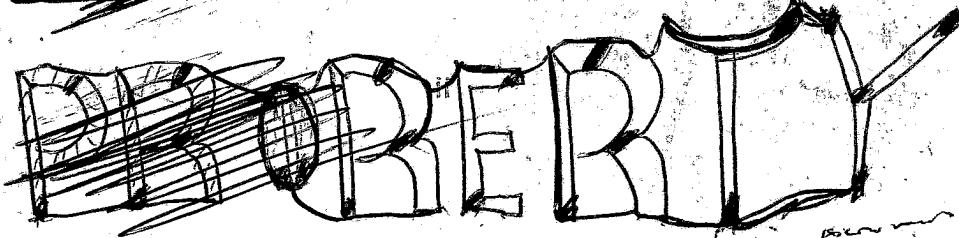
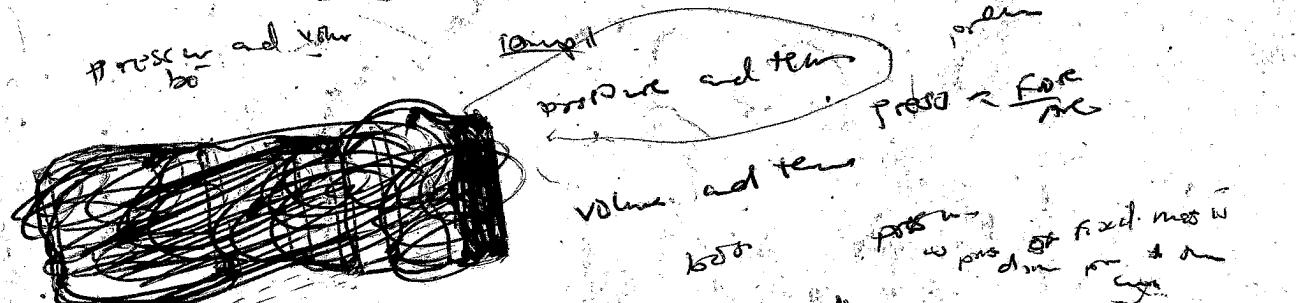
the reproductive organs are most membrane fluid

j) Gastric juice - Pepsin - digest proteins to polypeptides  
Saliva - salivary amylase (ptyalin) digest complex starch to maltose

Pancreatic - pancreatic amylase - digest starch to maltose

Intestinal ptyalin - digest + polypeptides to peptides

Lipase - digest lipids to fatty acids and glycerol



Conclusion - It is known that the most effective way to elicit responses from students is to be extremely effective in ordering the response of the students in accordance to the instructions.

## EXAM TIPS

### MANEB EXAMINATION QUESTIONS FORMAT

The commonly used devices when creating questions are listed below and what a candidate is expected to do.

1. Mention / Give / Name - requires the candidate to give the exact term or name of an object mostly associated with diagrams.
2. State / Outline - requires a simple statement in order to convey the idea.
3. Define - requires giving the meaning of a term, a process etc.
4. Explain - this requires giving reasons for the occurrence of a particular process or system.
5. Describe - requires giving full details of a particular process, activity or system.

## **ESSAY QUESTIONS**

### **GUIDELINE WHEN WRITING AN ESSAY**

- 1) Introduction - must be short and brief. A single sentence to present the main idea.
- 2) One must be direct to the main point. The main points do not have to be necessarily separated by jumping or skipping lines, this saves the space provided.
- 3) No need to raise the main points separately and explain them later. Raise the main point in the topic sentence and immediately explain it.
- 4) Avoid conclusions that involve summing up the main points because these cannot be awarded marks.

*Note:* Essays involving experiments begin with materials (in a single sentence).

Thereafter outline the experimental procedure, followed by observations.

Finally state the result and conclusion (which is the affirmative of the hypothesis investigated in the experiment)

**MAY GOD BLESS YOU.**

2007- BIOLOGY PAPER 1

SECTION A (20 MARKS)

• Answer all the questions in this section.

- 1.a. Name any one chemical reaction that takes place during light stage of photosynthesis.

⇒ Photolysis

- b. Figure 1 is a diagram of a plant cell as seen through a light microscope. Use it to answer the questions that follow.

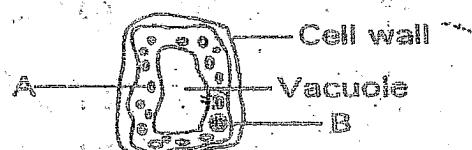


FIGURE 1

- (i) Give the function of each of the following marked parts:

- A. Chloroplast (traps light for photosynthesis)  
B. Nucleus (controls activities of a cell)

(1 mark)  
(1 mark)

- (ii) What is the name of the cell?

⇒ Plant cell

(1 mark)

- c. State one way in which photosynthesis is important. (any of these)

- ⇒ It provides oxygen to the environment  
⇒ Provides food in form of starch  
⇒ Reduce carbon dioxide in the atmosphere, thereby preventing global warming

(1 mark)

2. Figure 2 is a diagram of a sperm cell. Use it to answer the questions that follow.

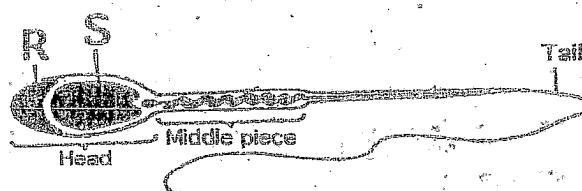


FIGURE 2

- a. (i) What is contained in the part marked S?  
 ⇒ Genetic material (chromosomes) (1 mark)
- (ii) What is the function of enzymes produced by the part marked R?  
 ⇒ Dissolves zona pellucida on the ovum to allow sperm to penetrate it for fertilization. (1 mark)
- b. How does the middle piece assist the sperm cell in movement?  
 ⇒ Contains mitochondria that release energy used in sperm movement. (2 marks)
3. a. Define a "conditioned reflex action".  
 ⇒ Is a reflex action that is acquired through (past) experience. (1 mark)
- b. Mention the three main steps involved in conditioning an organism.  
 Step 1: Presentation of original stimulus and related response made.  
 Step 2: Substitute stimulus is presented together with the original stimulus.  
 Step 3: Substitute stimulus is now presented alone. (3 marks)
- c. What is the difference between "a conditioned reflex" and "a simple reflex action"?  
 ⇒ Conditioned reflex is acquired from past experience with a stimulus that was originally ineffective in producing the observed response while simple reflex action is automatic response to stimulation.
4. Figure 3 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. Use it to answer the questions that follow.

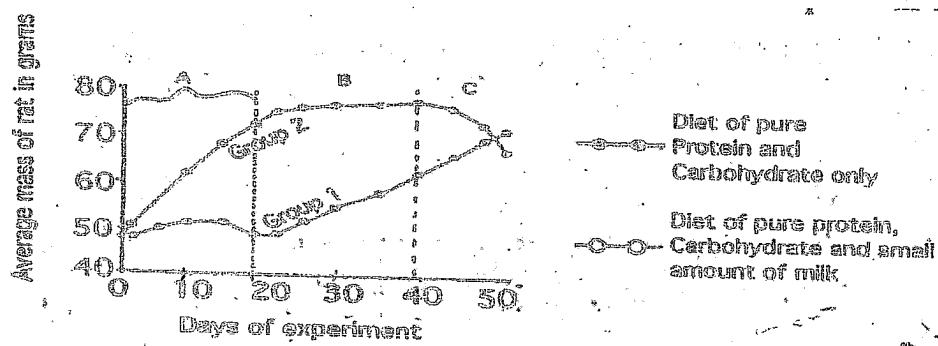


FIGURE 3

Conditioned reflex is a learned response to a stimulus. The stimulus + effect can become a stimulus to produce the effect on its own.

- a. Describe what happened to the mass of group 2 rats in region B and C.  
(i) *Region B*: The rats are not rapidly growing or accumulation of mass. (1 mark)  
Explain your observation: Because the rats lacked a diet with vitamin to make them grow healthy. (1 mark)
- (ii) *Region C*: The rats rapidly start to lose considerable weight. (1 mark)  
Explain your observation: Because the rats could have been attacked by a disease.
- b. Mention any two variables that were kept constant during the experiment.  
(i) Number of rats (1 mark)  
(ii) Quantity of food (1 mark)

## SECTION B (50 MARKS)

⇒ Answer all the questions in this section

5. Students caught 64 grasshoppers in a school garden of area  $32\text{m}^2$  and marked them with nail varnish. They released them into the same garden. After two hours the students captured 60 grasshoppers in the same area of which 12 had marks of nail varnish.

- a. Name the sampling technique used by the students.

⇒ Capture, mark and recapture method (1 mark)

- b. Calculate the total number of grasshoppers for this area.

$$\frac{\text{Number of organisms in first sample} \times \text{number of organisms in second sample}}{\text{Number of marked organisms recapture}}$$

$$64 \times 60$$

$$12$$

$$320 \text{ grasshoppers}$$

(3 marks)

- c. Calculate the population density of the grasshoppers.

$$\begin{aligned} \text{Density} &= \frac{\text{Number of Individuals}}{\text{Area}} \\ &= \frac{320}{32\text{m}^2} \\ &= 10/\text{m}^2 \end{aligned}$$

(2 marks)

6. Figure 4 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. Use it to answer the questions that follow.

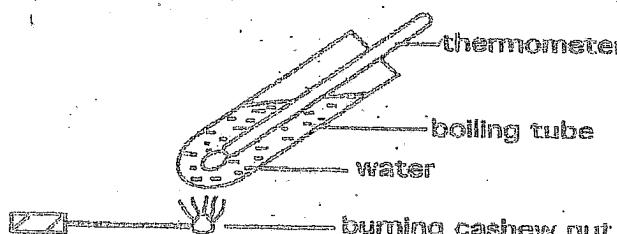


FIGURE 4

- a. If the exact energy value for the cashew nut is 2500 kJ per 1000 g.
- (i) Give two reasons why a lower result was obtained.
    - (i) Some of the energy has been dissipated into air.
    - (ii) Some of the energy has been used to heat the water.
  - (ii) What two things can be done to improve the accuracy of the result?
    - (i) The boiling tube should not be inclined at that angle, it should be upright.
    - (ii) The distance between the cashew nut and the boiling tube should be reduced.
- (2 marks)
- b. 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.
- (i) Size of both the cashew nut and bean seed should be the same.
  - (ii) Amount of water being heated is constant.
  - (iii) Size of the test tube is the same.
- (2 marks)
7. Figure 5 shows volume of air in the lungs of a child at rest to the start of an exercise. Use it to answer the questions that follow.

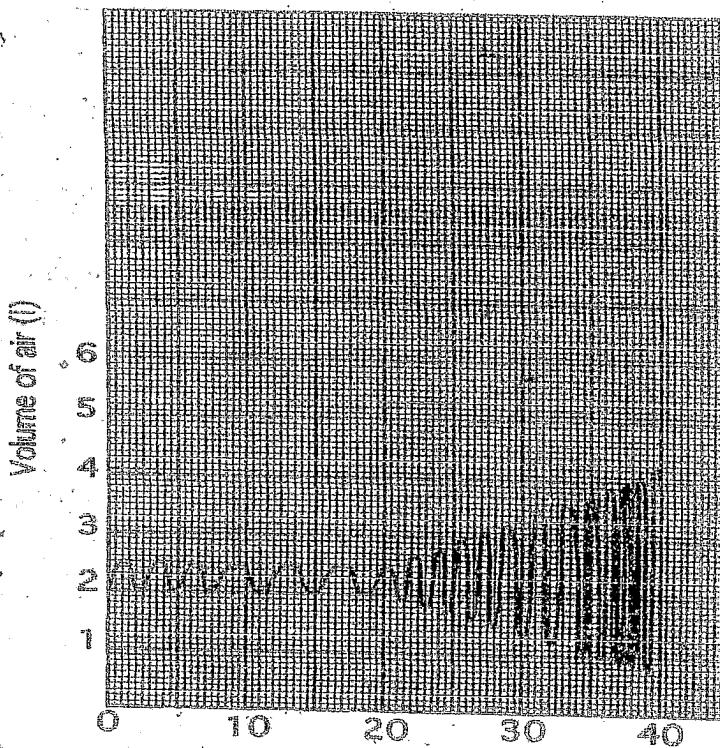


FIGURE 5

- a. At what time does the child start the exercise?  
 ⇒ After 20 seconds (1 mark)
- b. What is the maximum volume of air inspired during the exercise?  
 ⇒ 4.2 litres (1 mark)
- c. Calculate the number of breaths per minute.

(i) at rest

5 seconds take 2 breaths  
 60 seconds will take more breaths

$$\frac{60}{5} = 12 \text{ breaths}$$

(ii) after exercise

5 seconds take 2 breaths  
 60 seconds will take more breaths

$$\frac{60}{5} = 12 \text{ breaths}$$

(4 marks)

- d. Explain why there is an increased breathing rate between 20-40 seconds?  
 ⇒ Because the body muscles require more oxygen to release more energy during respiration for exercising. (2 marks)

8. Explain the role of each of the following in body's defence.

- a. *phagocytes*: Engulf and digest foreign particles. e.g bacteria. (3 marks)
- b. *antibodies* (i) By neutralizing poisons (toxins) produced by germs  
 (ii) By dissolving bacteria outer coats.  
 (iii) By adhering to the outer surface of bacteria. (2 marks)

- c. *killer T-cells*: They dissolve and digest bacteria (kill germs directly)

(2 marks)

9. Figure 6 is a section of the kidney. Use it to answer the questions that follow.

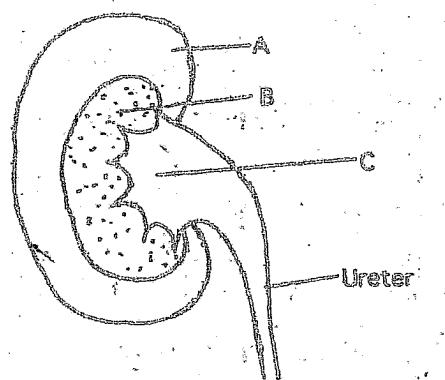


FIGURE 6

- a. Name one structure of the nephron found in each of the following parts of the kidney.
- (i) A Bowman's (1 mark)
  - (ii) B Collecting duct, tubules (1mark)
- b. What is the function of the part labeled C?
- Contains bowman's capsule where ultra-filtration occurs. (1 mark)
- c. (i) What is the effect of an intake of salt solution on urine production?  
⇒ Less urine is produced.
- (ii) Explain how the effect in 9c(i) is brought about.  
⇒ When the blood is concentrated with salt, hypothalamus stimulates the pituitary glands to secrete Anti-diuretic hormone.  
⇒ When this hormone reaches the kidney it causes the tubules to absorb more water from the glomerular filtrate back into the blood and this causes little urine production.

10. Figure 7 shows cross-sections of blood vessels in the human circulatory system. Use it to answer the questions that follow.

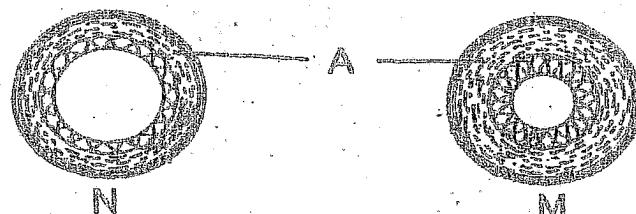


FIGURE 7

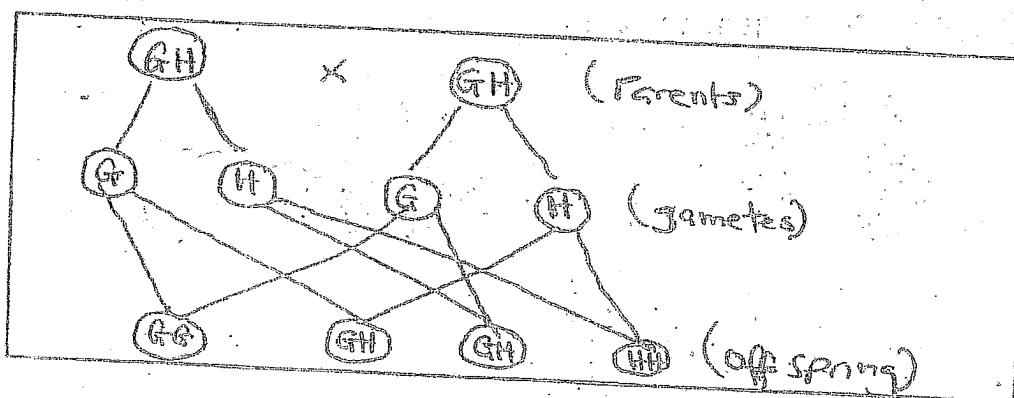
- a. Name the tissue labeled A.  
 ⇒ Tunica media / Fibre layer / Fibrous tissue
- b. (i) Which section represents an artery? (1 mark)  
 ⇒ M (1 mark)
- (ii) Give two reasons for your answer to 10b(i).  
 ⇒ Arteries have narrow lumen.  
 ⇒ Fibre layer in arteries is more present than in any other blood vessel. (2 marks)
- c. Explain why the rate of heart beat can be measured by pulse rate.  
 ⇒ Because the pulse rate corresponds to the beating action of the heart as the heart pumps blood through arteries. (3 marks)

11. 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 offspring 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 plants with variegated leaves. Indicate genotypes of parents and offsprings.



(4 marks)

Genotype: HH

Phenotype: White

(2 marks)

(ii) Explain why these offsprings died.

⇒ Because the offsprings had lethal genes or undesirable traits that are dangerous to the individual organism.

(2 marks)

b. What term is used to describe the behavior of allele G and H in the cross?

⇒ Additive character.

(1 mark)

### SECTION C: (30 MARKS)

#### ESSAY QUESTIONS

⇒ Answer all the questions in this section

12. Describe five problems associated with human digestive system and state how each problem can be controlled. Your answer should be in an essay form.

The first problem associated with the human digestive system is constipation. Constipation is a situation where stools (faeces) become too hard to be expelled from the body. It can be controlled by drinking enough water after meals and by doing physical exercises. It can also be controlled by using drugs such as laxatives.

Another problem is heartburn. This is the burning sensation in the oesophagus. It is caused by acidic stomach when the contents surge or increase and move upwards into the oesophagus. It can be controlled by taking anti-acid medications.

Stomach ulcers is another problem of the human digestive system. It may be caused when a person constantly has too much acid in his or her stomach so that the gastric juice begins to eat into the lining of the stomach. Ulcers can be avoided by leading a worry free life and a life not burdened by too much work. Indigestion is another problem and is caused by eating food too quickly and not chewing enough. It can be controlled by ensuring that one eats food slowly, adequately chewing it before swallowing.

The fifth problem is appendicitis. This is an inflammation of the appendix. This can be controlled by removing the appendix in an operation.

(10 marks)

13. Describe how the population of a plant in an open filed can be estimated. Write your answer in an essay form.

First mark out, using pegs and strings a piece of ground of known area where a particular plant is in abundance.

Use a metre quadrat, collect data from at least a number of quadrats, placed at random in the area you in the area you have marked out. Count number of individual plant in each quadrat.

Calculate the average density of the plant per  $m^2$ .

Finding total population, then multiply the density figure by the number of square metres of the total area calculated at the beginning.

(10 marks)

14. Describe five ways in which a bird is adapted to overcoming gravity and the effect of drag in flight. Your answer should be in an essay form.

If birds were not adapted to overcoming gravity, they would not fly up and not fly at all. Besides, if their bodies were not so adapted the birds would not overcome the effect of drag which are reduced speed and lack of balance. Birds overcome these problems because they have strong but light bones. This makes them lighter. Birds also have large powerful flight or pectoral muscles that provide the power to flap wings in flight.

Their bodies' are also streamlined to reduce air resistance.

They contain air sacs that make them lighter beside the feathers that provide aerofoil needed to generate lift when the wings are raised.

(10 marks)

2008 PAPER 1 \*

1. 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 leopard and her speed immediately rose to 6 meters per second.

(a) Name the hormone that can cause the change in speed  
⇒ Adrenalin

(b) Explain how the hormone led to the change in speed in 1 (a).  
⇒ It stimulates muscles and liver to convert glycogen into sugar which oxidizes to yield energy for athlete to run faster.

2. Figure 1 shows a cross section of the thorax. Use it to answer the questions that follow.

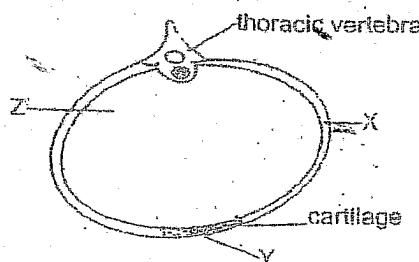


Figure 1

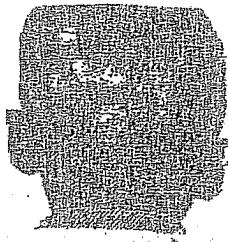


Figure 2

- (a) Name the infection  
⇒ Ring worm
- (b) Mention the causative agent of the infection.  
⇒ *Tinea* (Fungus)
- (c) Give one way of preventing spread of the infection.  
⇒ Voiding skin contact
4. Figure 3 shows an animal cell at an early stage of division. Use it to answer the question that follow.

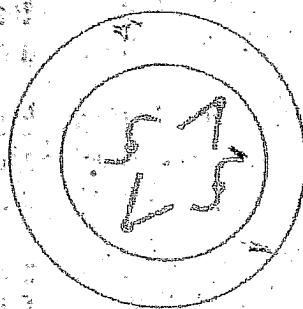


Figure 3

- (a) What term is used to describe the number of chromosome in the cell?  
⇒ Diploid number
- (b) If the cell divided by meiosis:
- i. How many daughter cells would be formed at the end of the first metiotic division?  
⇒ 2 Cells
  - ii. How many chromatids would each daughter cell contain at the end of Telophase ii?  
⇒ 2 chromatids
5. Figure 4 shows a set up of an experiment to investigate properties of enzymes. Use it to answer the questions that follow.

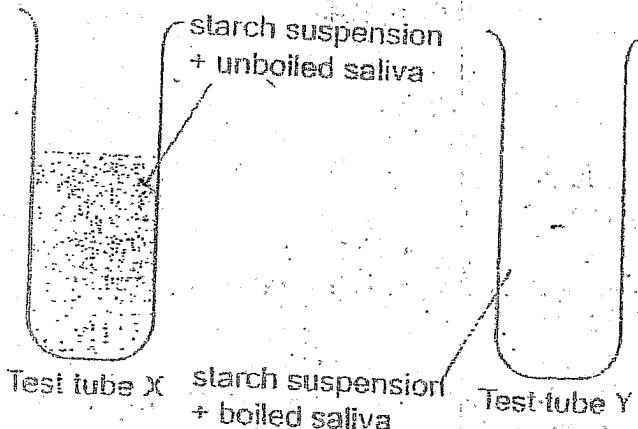


Figure 4

- What property of enzymes is being investigated in the experiment?  
⇒ Denaturing of enzyme at high temperatures.
- 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 - Blue - Black, Tube Y - No color change.

6. 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:

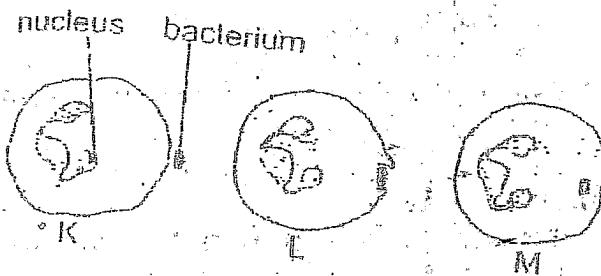


Figure 5

- Name the process.  
⇒ Phagocytosis
- Where does this process take place in the body?  
⇒ Blood plasma
- What could happen to the bacterium at stage M of the process?  
⇒ Will be dissolved and digested

7. Figure 6 shows a closed aquarium which was set up in the sun by a group of students. Use it to answer the questions that follow:

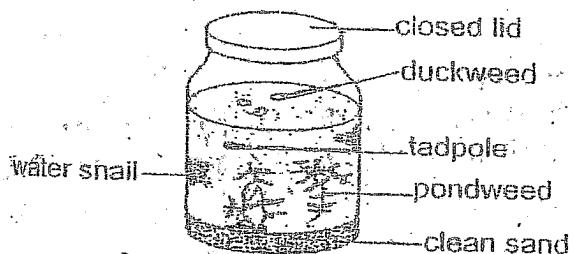


Figure 6

- (a) Besides feeding relationships, explain how the pond weeds and snails depend on each other in the aquarium.

⇒ Pond weeds provide oxygen for respiration of snails while snails provide carbon dioxide to be used by pond weeds in photosynthesis.

- (b) If the following morning students observed that tadpoles and water snails had died, explain the cause of death.

⇒ At night the pond weed would be using much of the oxygen for respiration but producing none since there is no light to provide energy for the process of photosynthesis.

- 8 (a) What is evolution?

⇒ The process in which new species of organisms arise from existing organisms by a series of changes over a long period.

- (b) Explain how each of the following helps to support the theory of evolution:

*(i) Comparative anatomy*

⇒ Studying similar structures in organisms, show inheritance of genes from a series of changes over a long period.

*(ii) Embryology*

⇒ Embryonic development during early stages is similar in many animals; for example, the presence of the gill slits in mammals and birds. This suggests common ancestry.

- (c) How does meiosis cause variation among offspring?

⇒ Due to crossing over genes during the early stages of meiosis where homologous chromosomes pair up.

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

- (a) Which one of the two is a recovery stroke?

⇒ Downward beat

- (b) Explain during downward beat of the wing:

*(i) Spreading of the wing*

⇒ Spreading wings help the bird to glide as air resistance the wing increases.

(ii) Overlapping of the wing feathers

- ⇒ Overlapping helps to increase surface area of the bird wing.  
This increases air resistance below the wing so helps in maintaining height.

10. Figure 7 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.

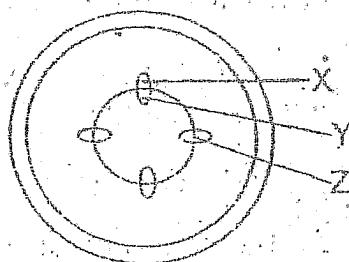


Figure 7

- (a) Name the parts marked X and Y.

⇒ X : Phloem, Y : Xylem

- (b)(i) Which tissue could take up the coloured water?

⇒ Xylem

- (ii) Give a reason for your answer to 10(b) i.

⇒ It transports water and mineral salts throughout the plant.

11. Figure 8 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.

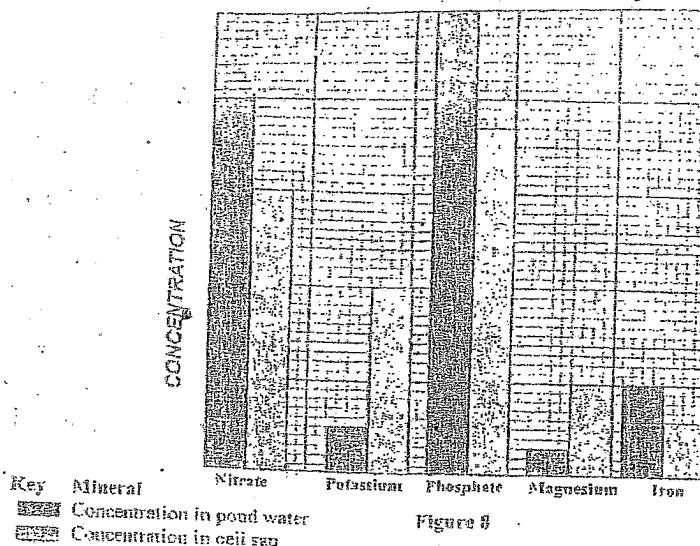


Figure 8

- ⇒ Because their concentration is high in cell sap so they move against concentration gradient.
- (b)(i) What would happen to the concentration of minerals in cell sap and pond water if algae were killed?  
⇒ The concentration will reach equilibrium.
- (ii) Explain your answer in (b) (i).  
⇒ Because movement will be due to diffusion since selectively permeable membrane has been destroyed.
12. Figure 9 shows legs of a person with a skin disease. Use it to answer the questions that follow.

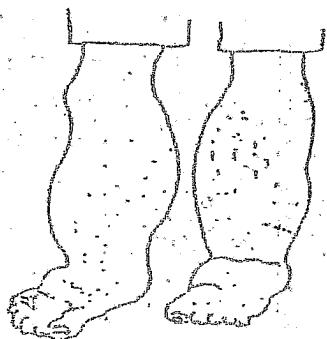


Figure 9

- (a) Name the disease.  
⇒ Elephantiasis
- (b) To which group of organisms does the causative agent of this disease belong?  
⇒ Parasitic worms
- (c) Describe the life cycles of the causative agent of the disease.  
⇒ Adult worms live in lymph nodes of a human being. The female produces living young called microfilaria. These enter bloodstream. At some time during day, might move to skin capillaries where they are sucked by mosquitoes when they bite and continue lifecycle in a mosquito especially the Anopheles or Culex. The mosquito transmits the microfilaria to another body through the skin. They then break the lymph vessels.

- (d) Give any two ways of preventing the disease.
- ⇒ By using mosquito nets to prevent mosquito bites. By controlling the breeding of mosquitoes through destruction of their habitats (stagnant water).
13. Figure 10 shows a family tree in which there is inheritance of recessive that causes haemophilia. Males with a single recessive gene suffer from the disease while females are carriers of the gene. Use it to answer the question that follow.

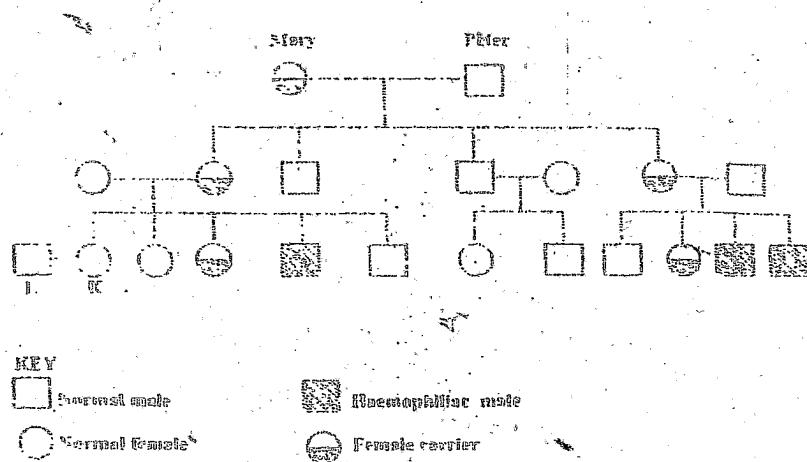


Figure 10

- (a) How many individuals with a single recessive gene are there in the three generations?
- ⇒ 3
- (b) How many of Peters grandsons have haemophilia?
- ⇒ 3
- (c) What type of children with regard to haemophilia would L and K produce?
- ⇒ None will be a carrier nor haemophilic (normal)
- (d) State any two disorders in a haemophiliac person.
- ⇒ Uncontrolled bleeding. Anemia due to loss blood from wound.
- (e) Name the chromosome where the gene for haemophilia is located.
- ⇒ X - Chromosome
- (f) How does the gene for haemophilia arise in a population?
- ⇒ Through mutation

14. Suppose you are a Health Assistant in a community where there is high prevalence of malaria, what advice would you give to the community on prevention of malaria. Explain any five points in an essay form.

I would first of all let them know that the high prevalence of malaria means that there is uncontrolled breeding of mosquito because malaria is caused by plasmodium carried by an Anopheles mosquito.

I would therefore advise them to make sure stagnant waters which are breeding ground for mosquito are either drained or treated. This can be done by, for example, spraying insecticides to water bodies to kill mosquito larvae. The larvae can also be killed by spraying the surface of stagnant water bodies with oil to deprive the larvae of oxygen. One can also introduce a biological control to water bodies. For example, fish can be introduced treated nets to avoid mosquito bite during the night.

I would also advise the people to always sleep under mosquito nets especially insecticide treated nets to avoid mosquito bite during the night.

I would discourage people from walking about at night to avoid mosquito bites.

I would also advise the people to always cover their skins with tough wearing material or with mosquito repellants.

15. Discuss the energy flow in tropical woodland. Your answer should be in essay form.

The major source of energy in an ecosystem is the sun. This energy is trapped by green plants in form of light energy which is converted into chemical energy. The energy is used to build up different compounds in the plant cells and tissues.

When the plant tissues are eaten by animals, the energy is transferred into animals. However, not all the energy absorbed by plants is transferred into animals (herbivores) because the animals do not eat whole plant and not all the parts eaten by the animal is digested. Similarly when the herbivore is eaten by the carnivore, not all the energy stored by it would be transferred.

When all plants and animals die, the energy is transferred into decomposers. If the dead organisms are not decomposed, they may end up forming coal or petroleum whose energy would be released as heat after combustion.

16. Describe an experiment that could be carried out to show that fresh green leaves contain three types of pigments. Your answer should include procedure result and conclusion an essay form.

One would need the following materials to carry out an experiment to show that fresh green leaves contain three types of pigments: fresh leaves, mortar, pestle, two beakers, a dry grass stem, ethanol or acetone, a filter paper and a razor blade.

The procedure or method require one to use a razor blade to cut the fresh leaves into small pieces and put them in a mortar to grind them using a pestle.

Add a small amount of ethanol/acetone and grind the small pieces thoroughly. Then put them in a beaker and squeeze out green extract into a beaker.

Using razor blade, one would then cut the filter paper into a rectangular shape and mark on one side at least away from the end.

After that one would cut the dry grass stem so that the filter paper can be supported by it when placed on the beaker. Then one would insert the filter paper on the side not marked.

Then one would put a drop of the green extract on the marked spot and immediately place it on the beaker, half filled with ethanol. When doing this, ensure that green extract does not come in contact with ethanol in beaker.

After careful observation after some minutes, one would see the ethanol rising the filter paper and separating the pigments. What was initially green would separate into yellow (xanthophylls), orange (carotenes), and green would remain behind and this is chlorophyll.

1. (a) (i) Give any one way of contracting HIV besides sexual intercourse.

(Any of these)

- ⇒ Wet kissing
- ⇒ Usage of unsterilized needles
- ⇒ Mother to child transmission e.g through breast milk
- ⇒ Blood transfusion from unscreened blood.

(ii) What sort of precautions would prevent the spreading of the virus in the method you have given in 1.a. (i)?

(1 mark)

(b) State any two practices that an HIV and AIDS patient can follow to live longer.

- ⇒ Eating well balanced diets
- ⇒ Exercising regularly

(2 marks)

2. Figure 1 shows part of the lining of the trachea. Use

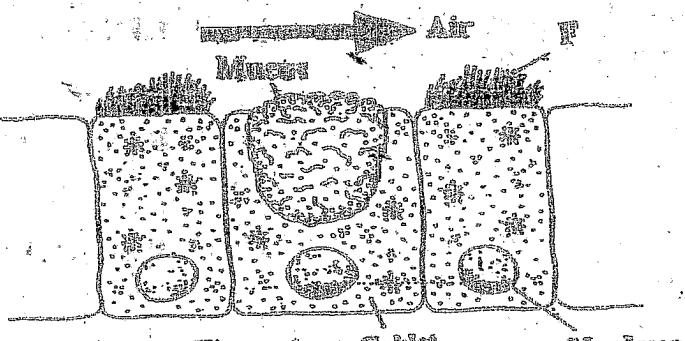


Figure 1 Goblet Nucleus

(a) Name the part marked E.

- ⇒ Cilia

(1 mark)

(b) What is the function of each of the following?

- (i) mucus released by the goblet cell

- ⇒ Traps dust and germs from the air.

(1 mark)

- (ii) pleural fluid

- ⇒ Prevents friction of lungs with the ribs.

(1 mark)

(c) Explain how the trachea is kept open during breathing.

- ⇒ Has cartilage rings that prevent collapsing of trachea.

(2 marks)

Figure 2 shows the optimum pH for three enzymes G, H and I. Use it to answer the questions that follow.

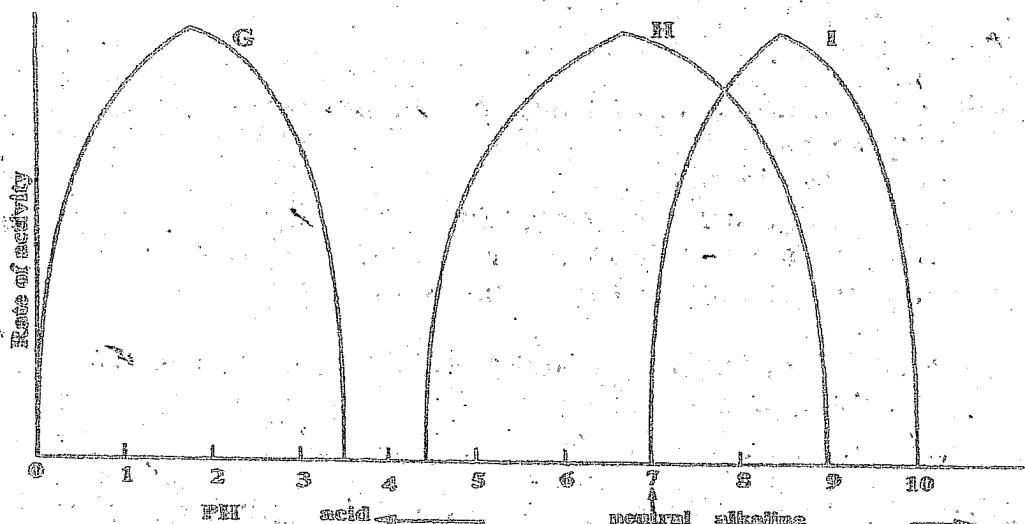


Figure 2

- (a) Which enzyme is most likely to be secreted by the stomach?  
 ⇒ G (1 Mark)
- (b) What would happen to activity of enzyme H at pH 2?  
 ⇒ It would be denatured. (1 mark)
- (c) What conclusion can be drawn from the result shown by the graphs?  
 ⇒ Enzymes work best at specific pH. (1 mark)
4. Figure 3 shows a cell undergoing mitotic division. Use it to answer the questions that follow.

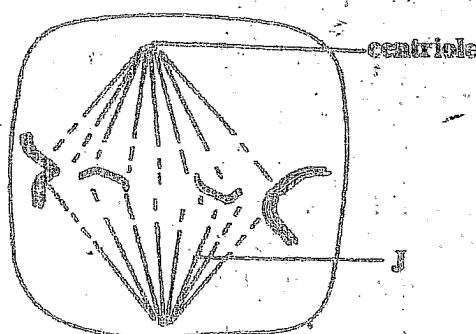


Figure 3

- (a) (i) Identify the stage.  
 ⇒ Metaphase (1 mark)
- (ii) Give a reason for your answer to 4.a (i)  
 Because at this stage the chromatids are aligned at the equatorial plate and begin to separate. (1 mark)

- (b) What is the role of J?  
 ⇒ It is where the chromosomes get attached at the centromeres. (1 mark)
- ④
5. Figure 4 shows a bar graph of human blood groups. Use it to answer the questions that follow.

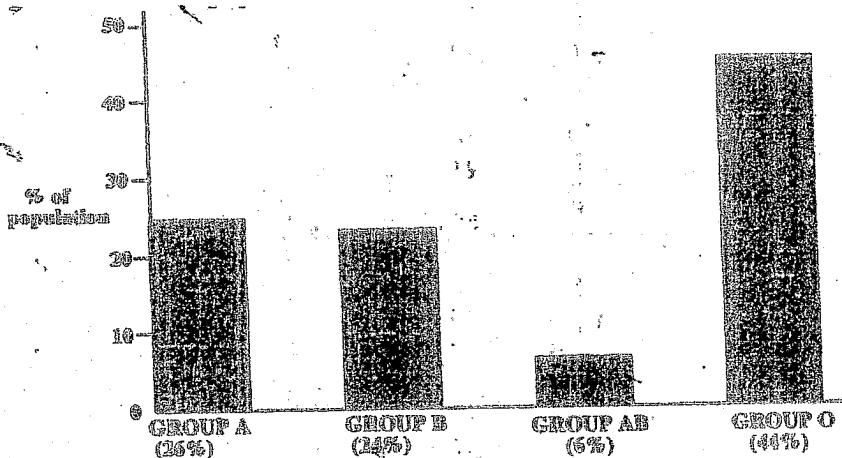


Figure 4

- (a) (i) What type of variation is shown by blood groups in the bar graph?  
 ⇒ Discontinuous variation (1 mark)
- (ii) Give a reason for your answer to 5.a.(i).  
 ⇒ Because the characteristic has no intermediate forms. (1 mark)
- (b) In a population of 200 people, what would be the number of people with blood group O? Show your working.

$$\begin{aligned} \text{Blood group O} &= \frac{44 \times 200}{100} \\ &= 88 \text{ people} \end{aligned}$$

(3 marks)

**SECTION B. (50 MARKS)**  
Answer all the questions

6. Figure 5 represents a process taking place in a plant. Use it to answer the questions that follow.

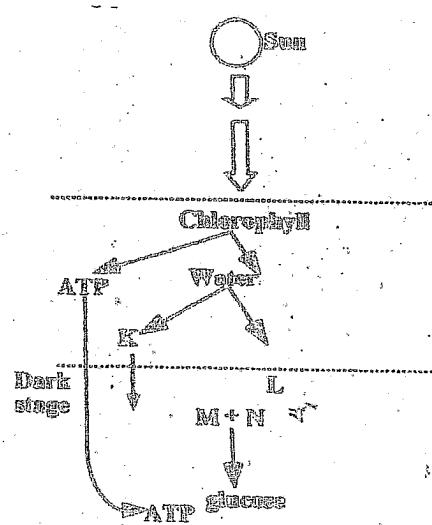


Figure 5

- (a) Name the products marked K and L.  
⇒ K: Hydrogen      L: Oxygen (2 marks)
- (b) Name the process by which substance N gets into the leaf.  
⇒ Diffusion (1 mark)
- (c) Mention one adaptation of a leaf that enables it to get substance N.  
⇒ Possession of a thin Lamina that facilitates diffusion  
⇒ Presence of stomates on the leaf. (1 mark)

7. Figure 6 shows a dialysis machine. Use it to answer the questions that follow.

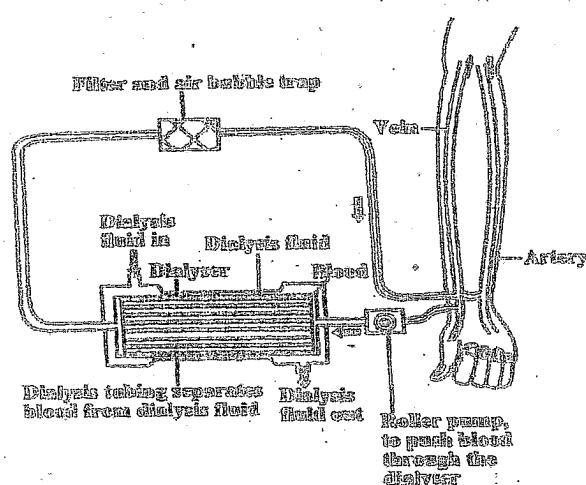


Figure 6



Type 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?

$$\Rightarrow 500 - 475 = 25$$

(3 marks)

- (b) Calculate the percentage of white beetles that survived.

$$\frac{123 \times 100\%}{500} = 24.6\%$$

(3 marks)

10. Figure 8 is a graph showing the response of antibodies in the human body at different times. Use it to answer the questions that follow.

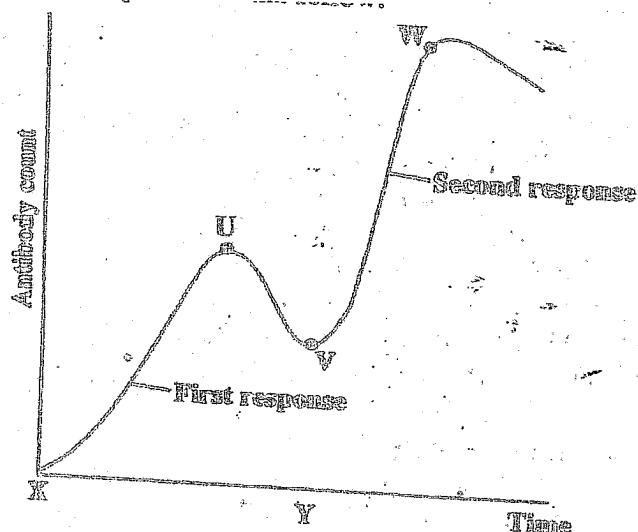


Figure 8

- (a) Why does the level of antibodies decrease between points U and V?

→ Because there was an infection.

(1 mark)

- (b) State what happens in the human body at points X and Y.

→ The parasites that infect a person start fighting with the antibodies. So some of them are destroyed by the parasites.

(1 mark)

- (c) Why is there a rapid change in response between points V and W?  
⇒ It is because the presence of parasites induces the body to produce antibodies and these fight the parasites. (2 marks)

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



Figure 9

- (a) What is the phenotypic ratio of the offspring?  
⇒ 1 : 1 (1 mark)
- (b) If the allele B for black fur, is dominant over the allele b for white fur, what would be the possible genotype of parents?  
(i) Black parent: Bb  
(ii) White parent: bb (2 marks)
- (c) If these animals feed at night, explain how natural selection would operate on the recessive allele in an environment where wild cats are predators.  
⇒ The allele of the white fur in the population will be wiped out because the animals will be preyed upon by the wild cats since will be seen at night. (3 marks)

12. Figure 10 is a diagram of an alveolus surrounded by a blood capillary. Use it to answer the questions that follow.

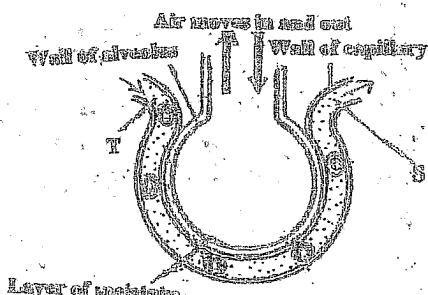


Figure 10

- (a) To which chamber of the heart does blood flow from point S?  
 ⇒ Left Atrium (Auricle) (1 mark)
- (b) Explain why there is a difference in the amounts of oxygen in the blood between points T and S.  
 ⇒ Because blood flowing in the pulmonary artery is deoxygenated and as it moves through the capillary surrounding the lungs, there is gaseous exchange where carbon dioxide diffuses from the blood into the lungs and oxygen diffuses from lungs into the blood stream. (2 marks)
- (c) Explain the role of the thin layer of moisture in the alveolus.  
 ⇒ Thin layer of moisture facilitates diffusing of gasses. It filters the air. (2 marks)

13. Table 2 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. Use it to answer the questions that follow.

Table 2

Analysis	Concentration of pesticide
Stream water	2
Water plants	500
Fish type A	27000
Fish type B	115000
Fish eagles	160000

- (a) Write down a food chain that includes all the organisms shown in the table.

Water plant → Fish type A → Fish type B → Fish Eagles

(3 marks)

- (b) Why is the insecticide concentration in the fish eagles higher than in the water plants?

⇒ Because the fish eagle's source of food are the two types of fish. So there is accumulative effect of pesticides in the body muscles of the eagles, as there was no breakdown of the pesticide.

(2 marks)

14. Figure 11 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. Use it to answer the questions that follow.

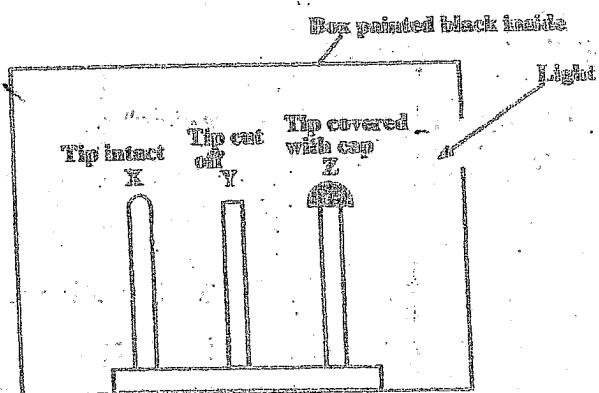
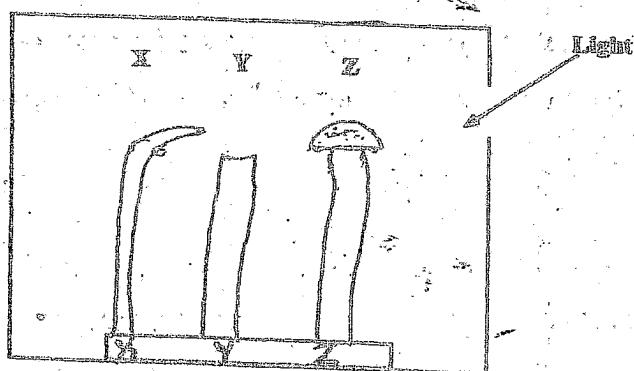


Figure 11

- (a) Why was the box painted black inside?  
→ To prevent reflection of light. (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.  
→ The seedling tip produces a growth hormone, Auxin, so when it is cut, Auxin production ceases. The result is that there is no growth. (2 marks)

### SECTION C (30 MARKS)

#### Essay Questions

⇒ Answer all questions in this section

15. State any five contraceptive methods and explain how each one works. Your answer should be in an essay form.

The first contraceptive method is the contraceptive pill. Contraceptive pills contain oestrogen and progesterone like hormones. These hormones prevent ovulation.

Another contraceptive method is vasectomy. This is an operation that is carried out on a man where the sperm ducts (vas deferential) are tied and cut. This prevents sperms from reaching the penis, so no sperms are discharged.

The third type of contraceptive method is the use of the diaphragm.

This is a dome-shaped rubber cap with an elastic rim inserted onto the top of the vagina, and placed over the cervix. In this way the diaphragm prevents sperms from entry into the uterus.

Another contraceptive method is the use of the condom. A condom is a thin rubber tube which is used to cover the erect penis before intercourse. Sperms are collected at the end of the sheath so are prevented from entering the uterus.

Rhythm method is another contraceptive method. It is also known as safe-period method. This method is based on the fact that in every menstrual cycle, there is a fertile period when ovulation is likely, so avoiding sexual intercourse during this period prevents pregnancy.

(10 MARKS)

16. Suppose you are an environmental officer in an area where people are not aware of the causes of environmental degradation. Explain any five causes and effects of environmental degradation you would include in your advice to people in the area. Your answer should be in an essay form.

There are a number of causes and effects of environmental degradation.

Overgrazing is an environmental degradation that results from feeding large herd of animals on a small piece of land continuously. It causes depletion of plant species or may lead to desertification or siltation of rivers. Siltation can cause floods.

Deforestation results from wanton cutting down of trees. It leaves the soil bare. When there is heavy wind or rain, top soil is lost through soil erosion. Loss of top soil can lead to siltation in rivers and also disturb weather pattern, leading to drought or climatic change or desertification. In some cases it may lead to loss of habitat for some animal species.

Another environmental degradation arises from pollution. This is when humans or industries dump waste toxic materials in the environment. Pollution can cause death of organisms or loss of habitat or eutrophication or acid rains.

Introduction of alien species to a habitat or community may lead to the new species feeding on indigenous species or competing for food and light with indigenous species. This may lead to extinction of indigenous species.

Bush fires are an environmental degradation which destroys the ecosystem. They may also reduce total number of species in the environment or cause soil erosion or siltation of rivers or air pollution. These may lead to global warming or loss of habitat.

(10 marks)

17. Describe an experiment that could be conducted to show that germinating bean seeds contain an enzyme that digests starch. Your answer should include procedure, expected results and conclusions.

In the procedure for this experiment, crush germinating bean seeds in a mortar. Then add water to obtain (enzyme) extract.

After that put starch solution in test tubes A and B. In test tube A add extract, but leave test tube B intact. Leave both test tubes to stand for some time.

Later, add drops iodine solution in both test tubes and observe colour changes. You will observe that test tube A there will be brown colour. This shows that there is no starch present. In test tube B, you will observe blue-black colour. This change indicates presence of starch.

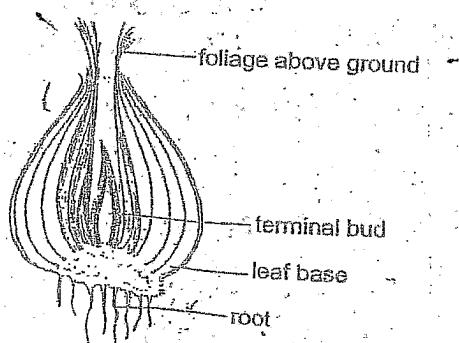
These results lead to a conclusion: Germinating bean seeds contain an enzyme that digests starch.

(10 marks)

**END OF QUESTION PAPER**

2010 PAPER II

- You are provided with an onion bulb and a razor blade or scalpel or knife.
  - Make a longitudinal section of the onion bulb, draw and label any three parts.



(4 marks)

- Describe how you would test the specimen for the presence of reducing sugars.  
 ⇒ By peeling it first to remove the outer part. Then crush it. Using the pulp add few drops of Hydrochloric Acid then Benedict's solution. Heat the mixture gently.  
 ⇒ The mixture turns brick red in colour indicates presence of reducing sugar.

(6 marks)

- Figure 1 shows diagrams of two plants. Use it to answer the questions that follow:

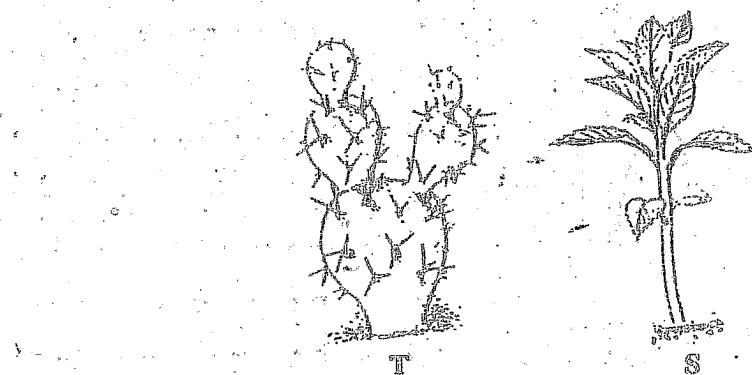


Figure 1

- Name any two structural differences between T and S.

Plant T	Plant S
Thorny leaves	Smooth leaves
Un proper stem	Proper stem

(2 marks)

*↓ gives  
more water  
loss*

(b) (i) Which plant is more likely to die in dry conditions?

⇒ S

(1 mark)

(ii) Explain your answer to 2b(i).

⇒ Because more water would be evaporated from the leaves during dry condition unlike plant T that has modified leaves.

(2 marks)

(c) (i) To which group of plants does S belong?

⇒ Hibiscus plant

(1 mark)

(ii) Give a reason for your answer to 2.c(i).

⇒ It has simple leaves

(1 mark)

(d) Why would goats find it difficult to feed on T?

⇒ The leaves of T have thorns.

(1 mark)

(e) Explain how plant marked T obtains its food.

⇒ Through photosynthesis that take place in the stems and leave of the plant

(2 marks)

3. The table below shows blood alcohol level (BAL) in a person over sometime during an experiment. Use it to answer the questions that follow.

Time (hours)	BAL mg/100cm <sup>3</sup>
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

(a) Plot a graph of blood alcohol level (BAL) against time on the graph paper provided.

(6 marks)

(b) What was the blood alcohol level at 2.5 hours?

⇒ \_\_\_\_\_ (1 mark)

(c) Explain why there was a decrease in the blood alcohol level from 1.5 hours to 5.0 hours.

⇒ \_\_\_\_\_

(d) Explain how a person who is driving a car under the influence of alcohol is likely to be involved in a road accident.

⇒ Alcohol depresses the central nervous system and affects thought, emotion, and judgment. It also affects muscle coordination which may cause an individual to be involved in a road accident. (3 marks)

4. Figure 2 shows diagrams of five different animals. Use it to answer the question that follows:

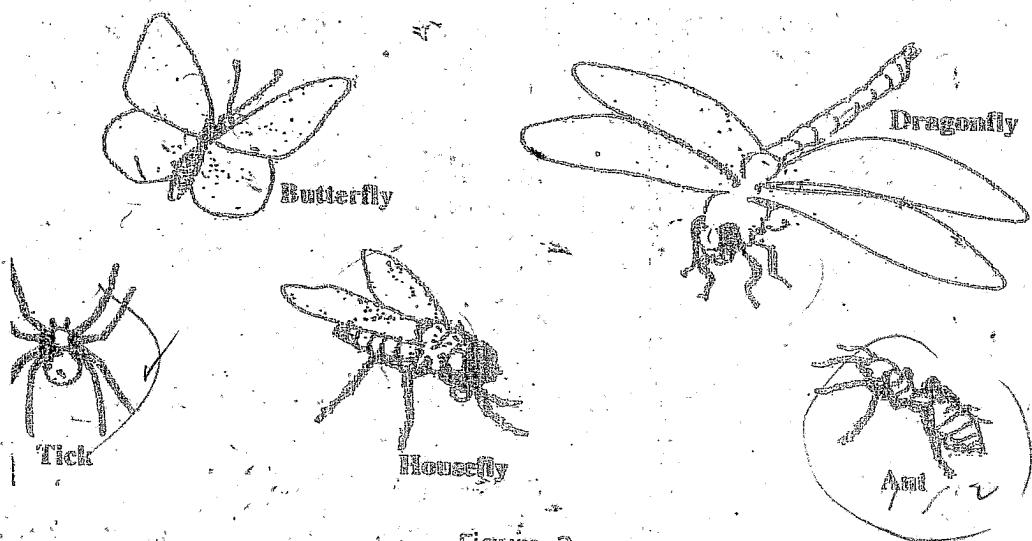


Figure 2

Construct a dichotomous key that can be used to identify the organisms.

1. Wings present ..... see 2  
Wings absent ..... see 3

2. A pair of wings ..... house fly  
2 pairs of wings ..... see 4

3. Segmented body present ..... Ant  
Segmented body absent ..... Tick

4. Antennae present ..... Butterfly  
Antennae absent ..... Dragon fly

(8marks)

END

**2011 PAPER 1**

- 1.a. Define "lymph".  
⇒ Lymph is blood without proteins and red cells drained out of blood vessels. (1 mark)
  - b. State any one difference between lymph and plasma.
    1. Lymph has no red blood cells while plasma has red blood cells.
    2. Lymph has no fibrinogen while plasma has fibrinogen. (1 mark)
  - c. Explain how inspirational movement of the chest wall helps in the flow of lymph.  
⇒ The inspirational movement of the chest presses on the lymph in the thoracic ducts which enter the main veins called subclavian veins in the neck region. (3 marks)
2. Figure 1 shows part of a chemical equation of a biological process. Use it to answer the questions that follow.



Figure 1

- a. Write down the chemical formula of the substance represented by Z.  
 $\text{C}_6\text{H}_{12}\text{O}_6$  (1 mark)
- b. Explain one use of the substance marked Z to a plant.  
⇒ Glucose is used in the synthesis of other substances in a plant. Cellulose for cell wall, fatty substances for plant membrane, proteins and pigments for flower petals are some of the substances built up from sugar molecules produced in photosynthesis. (3 marks)
- c. Explain how the process in Figure 1 prevents global warming.  
⇒ Photosynthesis takes off carbon dioxide from the atmosphere and convert it into organic food. This reduces the concentration of carbon dioxide which absorb heat that cause global warming. (2 marks)

3. At a certain school students developed rash on the skin and high fever. A doctor diagnosed them positive for a diarrhoeal disease.
- (i) Name the disease.  
⇒ Typhoid (1 mark)
  - (ii) What is the causative agent of the disease?  
⇒ Bacterium called salmonella typhi (1 mark)
  - (iii) Mention any two ways in which the disease could have been transmitted.  
⇒ Eating or drinking contaminated food or water.  
⇒ Vectors such as house flies which spread the bacteria from faeces or vomits. (2 marks)
- b. Explain what happens during incubation period of a disease.  
⇒ The infected individual may experience mild fever, nausea etc. (2 marks)

4. Figure 2 shows a cross section of the spinal cord. Use it to answer the questions that follow.

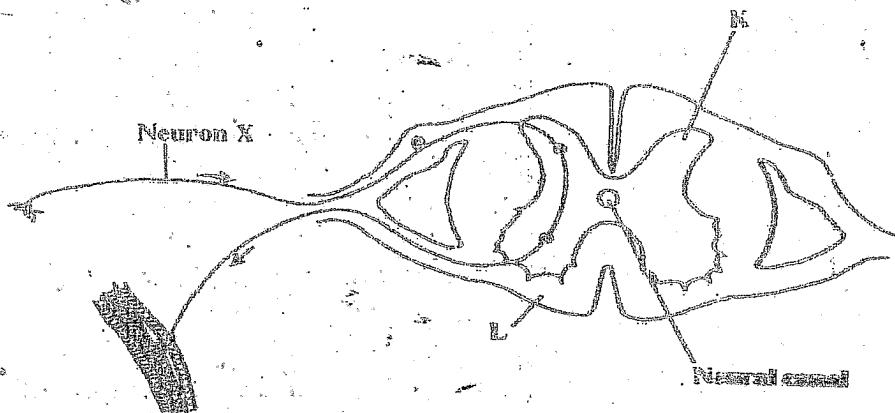


Figure 2

- Name the part marked K.  
⇒ Grey matter (1 mark)
- Mention one disease that neurone X affects.  
⇒ Poliomyelitis (1 mark)
- Give one function of the fluid found in the neural canal.  
(i) Cerebral spinal fluid act as shock absorber  
(ii) Cerebral spinal fluid supplies nutrients to the nerve cells in the spinal cord. (1 mark)

## Section B

5. Figure 3 is a diagram representing a cross section of a leaf. Use it to answer the questions that follow.

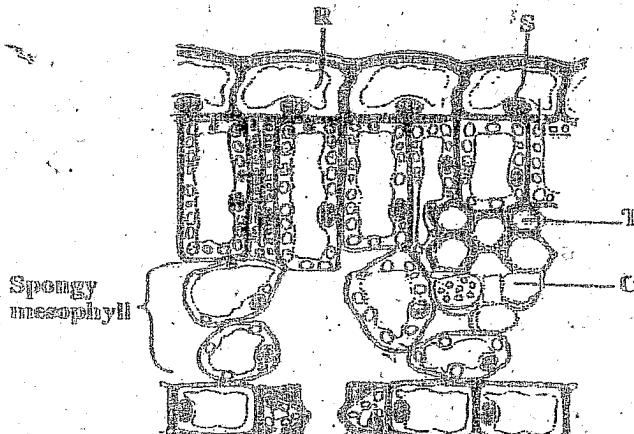


Figure 3

- a. Name the parts marked R and S.

R Vacuole

S Nucleus

(2 marks)

- b. (i) Which tissue is the main site for photosynthesis in the leaf?

⇒ Palisade mesophyll

(1 mark)

- (ii) Give a reason for your answer to 5 b (i).

⇒ Has numerous chloroplast that synthesize chlorophyll used to trap light energy for photosynthesis.

(1 mark)

- c. State two structural differences between the parts marked T and U.

⇒ T (phloem) consists of living cells while U (xylem) consists of dead cells.

⇒ T (phloem) transports sugar and amino acids while U (xylem) transports water and mineral salts.

(2 marks)

- d. Explain how a steady flow of carbon dioxide is maintained between the atmosphere and mesophyll cells in a leaf during day time.

⇒ During day time there is higher rate of photosynthesis in the mesophyll cells which increases the concentration gradient of carbon dioxide which maintain a steady flow of carbon dioxide between the atmosphere and the mesophyll cells.

6. Figure 4 shows structure of a food substance. Use it to answer the questions that follow.

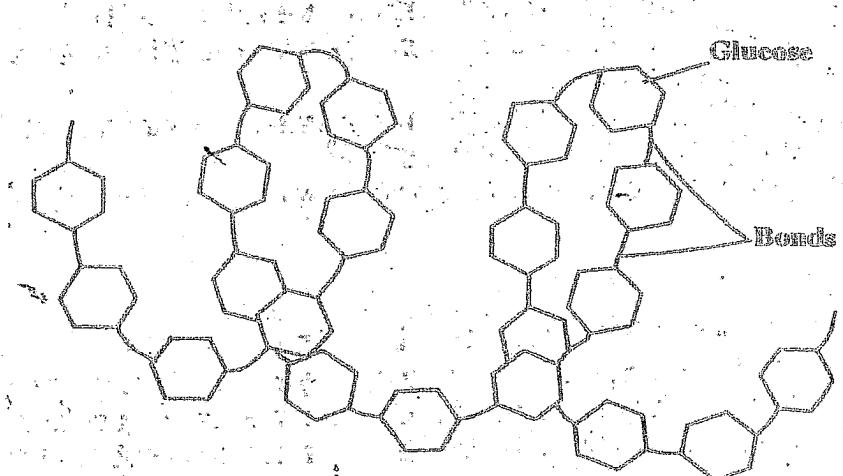


Figure 4

- a. Name the food substance.  
⇒ Starch (carbohydrate) (1 mark)
- b. Explain how the food substance is produced.  
⇒ When more than two monosaccharides combine in a process called condensation. (2 marks)
- c. Mention two enzymes that could digest the food substance in humans.  
1. Salivary Amylase (ptyalin)  
2. Maltase (2 marks)

7. Figure 5 shows cross sections of blood vessels M and N. Use it to answer the questions that follow.

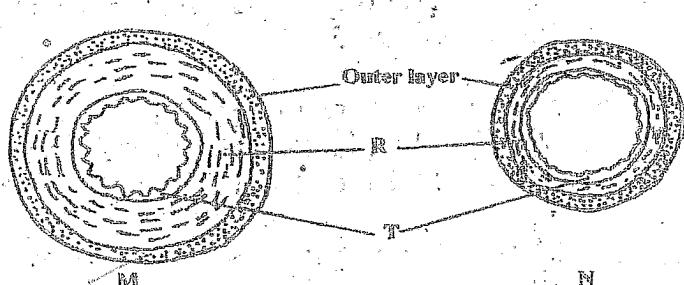


Figure 5

- a. Name the parts marked R and T.  
R Tunica adventitia / Tunica media / Fibrous tissue (1 mark)  
T Tunica intima (1 mark)

- b. List any two structural differences between vessels M and N.
- M (Artery) has thick elastic walls (tunica adventitia) while N (vein) has thin inelastic wall.
  - M (artery) has no valves at intervals while N (vein) has valves at intervals to control the direction of blood flow.
  - M (artery) has narrow lumen while N (vein) has wide lumen.

(2 marks)

- c. Explain any one way in which blood is transported in vessel N.
- As blood pressure is low in veins they are often surrounded by lots of muscle and when these muscles contract, they squeeze the veins further, which help to push blood in the right direction back to the heart.

(3 marks)

8. Figure 6 shows levels of some hormones during the menstrual cycles. Use it to answer questions that follow.

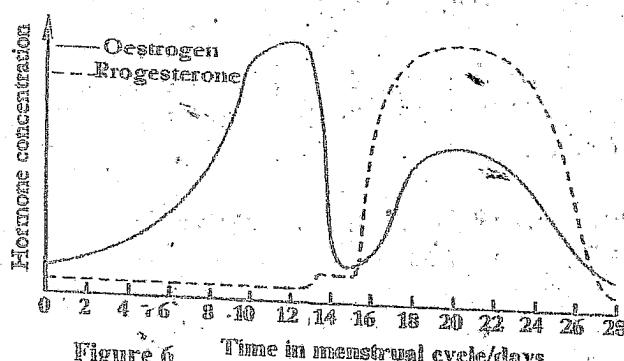


Figure 6 Time in menstrual cycle/days

- a. (i) During which period is fertilization more likely to occur?  
→ Between day 14 to 16. (1 mark)
- (ii) Give a reason for your answer to 8'a (i)  
→ The level of oestrogen decreases in blood resulting into rapid increase of progesterone which indicates ovulation.
- b. State any two things that may happen to the wall of the uterus between days 5 and 10.  
(i) Thickening of uterine wall initiated by the hormone called oestrogen.  
(ii) Development of blood capillaries in the uterine wall. (2 marks)
- c. Explain why the level of progesterone increases from day 16 to 20.  
→ Progesterone maintains the lining of the uterus during the second half of the menstrual cycle in readiness for implantation and pregnancy. (3 marks)

- a. (i) In the table provided, state two differences in the population of months before and after industrial revolution.

Before	After
Many light variety of peppered moths.	Few light variety peppered moths.
Few dark variety of peppered moths	Many dark variety of peppered moths.
	(2 months)

- (ii) Explain how the population of dark peppered moth could have arisen before industrial revolution.

→ The dark peppered moths possessed a gene for the brown pigment that caused colour change and hence they survived. This is called speciation.  
(3 marks)

- b. Table 1 shows a cross between a pure breeding red cow and a pure breeding white bull. Use it to answer the questions that follow.

Parents	red RR		
	Gametes	R	R
White rr	r	Rr	Rr
	r	Rr	Rr

P  
offspring

Table 1

- (i) Complete the table by filling the genotype of the offspring marked P.  
Rr  
(1 mark)

- (ii) What term is used to describe the genotype of the offspring?  
→ Heterozygous dominant  
(1 mark)

- (iii) If R and r are codominant, determine the phenotype of the offspring.  
→ Pink  
(1 mark)

12. Figure 9 shows an experimental set up in a laboratory. Use it to answer the questions that follow.

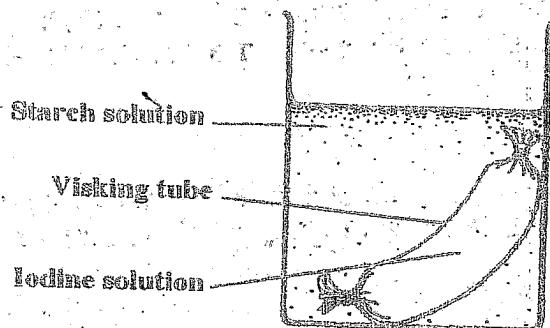


Figure 9

- a. What type of membrane is the visking tubing?  
⇒ Semi - permeable membrane (1 mark)
- b. (i) What results would be obtained after sometime?  
⇒ Starch solution in the beaker would turn blue – black colour.  
(ii) Explain your answer to 12b (i).  
⇒ The visking tubing which is semi-permeable allowed iodine molecule to diffuse across it into the starch solution. However starch molecules were so large to diffuse across the visking tubing. (2 mark)
13. Figure 10 is a graph showing the population of bacteria and amount of oxygen in a stream after sewage is discharged into it. Use it to answer the questions that follow.

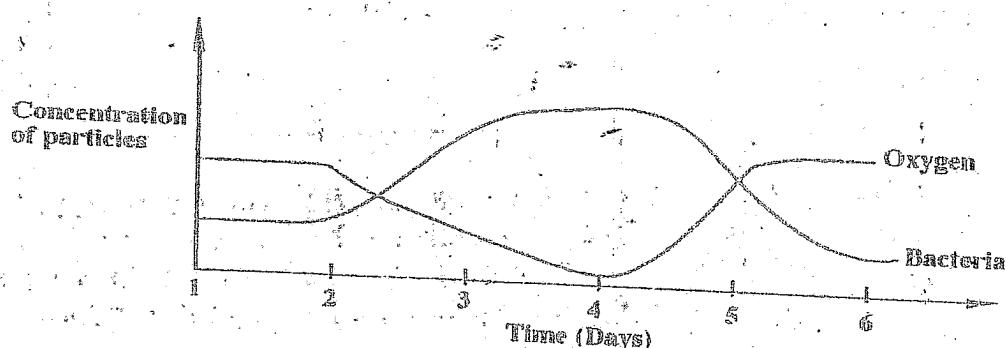


Figure 10

- a. When was sewage discharged into the stream?  
⇒ Day 2 (1 mark)
- b. (i) What happened to the amount of oxygen between day 2 and day 4?  
⇒ The amount of oxygen decreased tremendously. (1 mark)

(ii) Explain your answer given in 13b (i).

- ⇒ Because from day 2 and 4, the concentration of sewage becomes greater than the concentration of water containing oxygen as such the bacteria In the sewage used up the oxygen available hence decreasing its concentration.

(2 marks)

14. Table 2 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.

Treatment	Number of children	Number of Infected children
Vaccinated	500	20
Unvaccinated	500	250

Table 2

- a. Calculate the percentage of vaccinated children that were not infected. Show your working.

$$\frac{\text{Number of children not infected}}{\text{Total number of children}} \times 100\%$$

$$\frac{480}{500} \times 100$$

$$96\%$$

(3 marks)

- b. Explain how the vaccine protected some children from tuberculosis.

- ⇒ The vaccine containing attenuated bacteria triggered the body's immune response to produce antibodies, and when the children were exposed to real pathogens of tuberculosis, the memory cells produced the antibodies.

## Section C

### Essay Question

Answer all questions in this section

15. During winter, a farmer decided to light a charcoal burner to warm calves in a modern cattle khola. Before the charcoal completely got burnt, it was taken into the khola which had its windows closed. The following morning the calves were found dead. In an essay form, explain the steps that led to the death of the calves.

The calves were found dead due to carbon monoxide poisoning. Carbon monoxide (CO) is an odourless, colourless and non irritant gas produced by the incomplete combustion of carbon containing fuels such as charcoal. Like oxygen, carbon monoxide can also bind to haemoglobin when inhaled into the lungs forming a compound called carboxy haemoglobin. If both carbon monoxide and oxygen are inhaled, carbon monoxide will preferentially bind to haemoglobin. This reduces the amount of haemoglobin available to transport oxygen, so the body tissues becomes starved of oxygen.

Carboxy haemoglobin taken from the lungs has direct effect on the blood vessels by causing them to become leaky especially in the brain, causing the brain to swell. This leads to unconscious and death due to brain damage as in the case of the calves that were found dead.

16. Describe an experiment that could be carried out to show that light intensity affects rate of transpiration in leafy shoots. Your essay should include procedure, expected results and conclusion.

Cut a leafy shoot from a plant and set it on a potometer. Allow the bubble time to round the corner and start at the beginning of mm scale. Place the potometer in two different conditions for the same duration of time.

First place the potometer in a bright light for a period of 2 hours and record the water uptake. Next place the potometer in dim light for a period of 2 hours and record the water uptake.

Compare the rates of water uptake by the leafy shoot in a bright light and dim light.

You will notice that the water uptake by the leafy shoot in a bright light is higher than that in dim light.

This indicates that light intensity affects rate of transpiration.

(10marks)

END OF QUESTION PAPER

1. a. State any two ways in which vectors transmit diseases.  
 1. Spread germs that cause diseases by contaminating food and water.  
 2. Inducing the disease pathogen into the body of a person e.g mosquito bite.
- (2 marks)
- b. Mention any two signs of athletes foot  
 1. Blisters or splitting of skin between toes.  
 2. Itching between toes.
- (2 marks)
2. Figure 1 shows part of a leaf. Use it to answer the questions that follow.

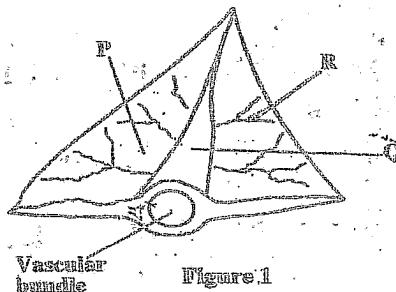


Figure 1

- a. Name the part marked Q.  
 ⇒ Mid rib of vascular bundle.
- (1 mark)
- b. Explain the functions of P and R in relation to photosynthesis  
 ⇒ P provides a short distance for carbon dioxide to diffuse in and oxygen to diffuse out easily.  
 ⇒ R contains the xylem and phloem tubes that bring water and salt to the leaf and transports the dissolved food away from the leaf.
- (4 marks)

3. Figure 2 shows a stage during meiosis. Use it to answer questions that follow.

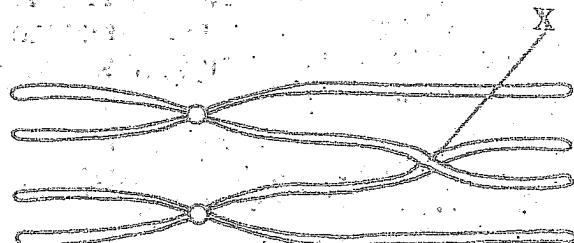


Figure 2

- a. Name the process taking place at part X  
⇒ Crossing over (1 mark)
- b. Name any one organ in the human body in which process X takes place.  
⇒ Testis / ovaries (1 mark)
- c. Explain the importance of the process taking place at X  
⇒ Crossing over provides a mechanism for producing variations in the chromosomes because each of the four cells from meiosis differs from the other three. (2 marks)

4. Figure 3 shows a plant tissue obtained from a stem. Use it to answer the questions that follow.

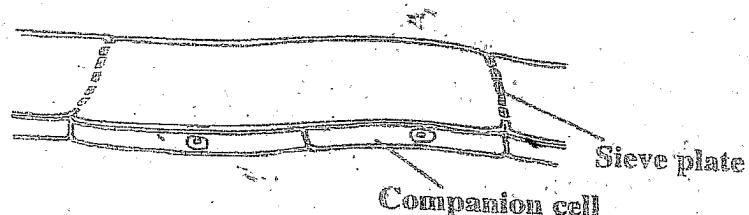


Figure 3

- a. (i) Identify the tissue  
⇒ Phloem (1 mark)
- (ii) Give two reasons to support your answer in a(i).  
⇒ Presence of sieve plate  
⇒ Presence of companion cells. (2 marks)
- b. Explain two adaptations of the tissue to its function.  
(i) Companion cells have numerous mitochondria where energy is produced through respiration needed to load sugars from mesophyll cells into sieve tubes.  
(ii) Sieve plates have holes which allow rapid flow of manufactured food substances through sieve tubes. (4 marks)

## Section B

Answer all the questions in this section.

5. A man with blood group A was married to a woman with blood group B. Their first born son was of blood O while their second born son was of blood group AB.

- a. Give the genotypes of the two parents.

⇒ AO

⇒ BO

(2 marks)

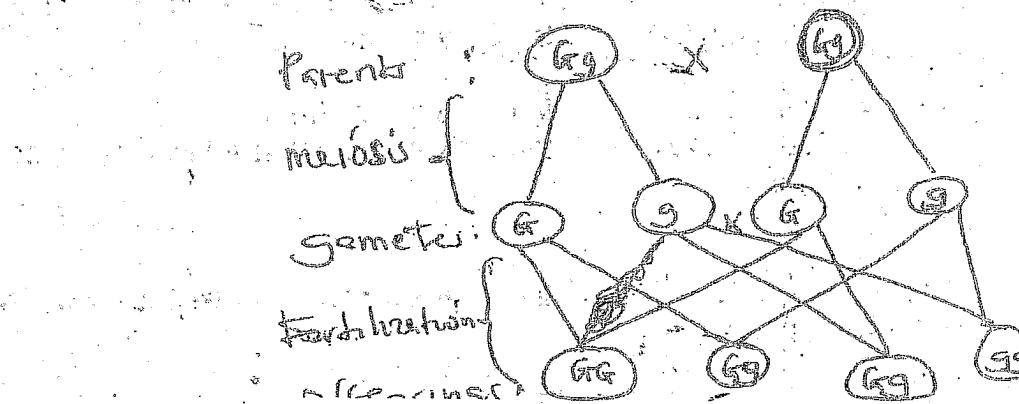
- b. Explain how the genotype of the second born son came about.

⇒ The second born son inherited gene A from the father and gene B from the mother that are co-dominant

(3 marks)

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

- a. Using G for grey colour and g for white colour draw a generic diagram to determine the genotype of the offspring.



(3 marks)

- b. Give the genotype ratio of the chicks.

⇒ 3 : 1

(2 marks)

- c. If the parents produced 12 chicks, how many were white? Show your working.

Ratio 3 : 1

Total ratio : 4

White chick  $\frac{1}{4} \times 12$

$$= 3 \text{ chicks}$$

(2 marks)

7. Figure 4 shows one of the examples of natural selection in action. Use it to answer questions that follow.

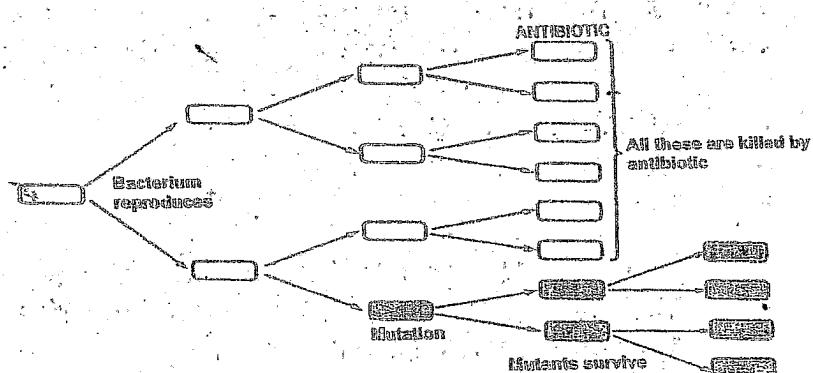


Figure 4

- a. (i) Name the example of natural selection shown.  
 ⇒ Speciation (1 mark)
- (ii) Describe what led to the survival of some of the bacteria while the others got killed.  
 ⇒ Bacteria which survived had changed gene due to mutation that made them to be resistant to the antibiotic. (2 marks)
- b. What will happen to the antibiotic after sometime?  
 ⇒ Will be phased out because it would no longer kill this type of bacteria. (1 mark)
8. Figure 5 shows one of the nutrient cycles in nature. Use it to answer the questions that follow.

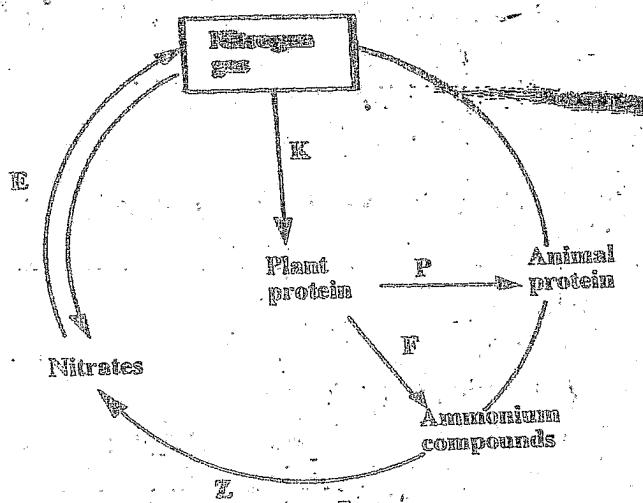


Figure 5

- a. Name the processes taking place at F, Z and P.  
F: Decomposition  
P: Feeding  
Z: Nitrification

b. Explain how the process at K takes place.  
The process is called nitrogen fixation which takes place when certain species of bacteria turn nitrogen gas into nitrates or Ammonia e.g. Rhizobium and Azotobacter bacteria.

c. Under what conditions does the process at E take place?  
When the soil is water-logged (during this condition denitrifying bacteria are active and convert soil nitrates into atmospheric nitrogen).

9. Figure 6 is a diagram of male reproductive system. Use it to answer the questions that follow.

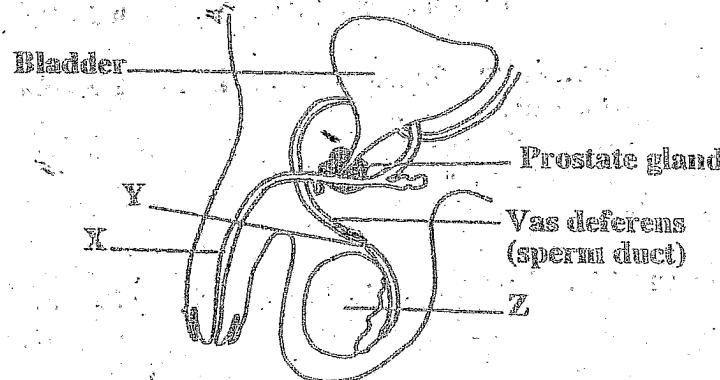


Figure 6

- b. State any two effects of exercise on breathing.  
The rate and depth of breathing increases to increase the rate of gaseous exchange.
2. The heart rate increases in order to increase the rate of blood flow to the muscles. (2 marks)
- c. Mention any two adaptations of alveoli to their function.  
The walls of alveoli are very thin (one cell thick) for easy diffusion of gases. They have a large surface area (over thousands) for gaseous exchange. (2 marks)
11. a. (i) Name the main nitrogenous waste excreted by kidneys.  
Urea (1 mark)
- (ii) Describe how the nitrogenous waste mentioned in 11a(i) is formed.  
The liver breakdown excess amino acid in process called Deamination. The amino group removed is converted to urea. (3 marks)
- b. Name two substances found in blood plasma that are not found in the urine of a healthy person.  
1. Glucose  
2. Amino acids (2 marks)

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

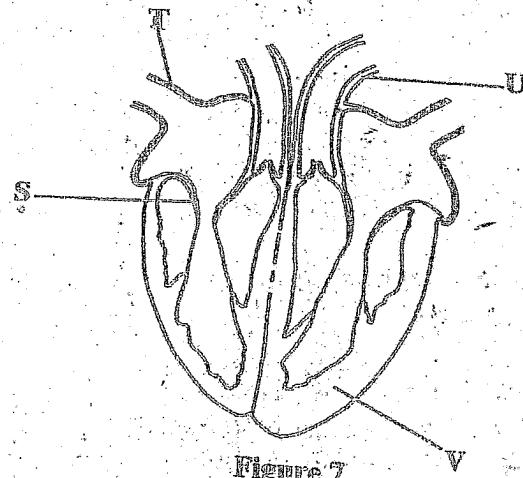
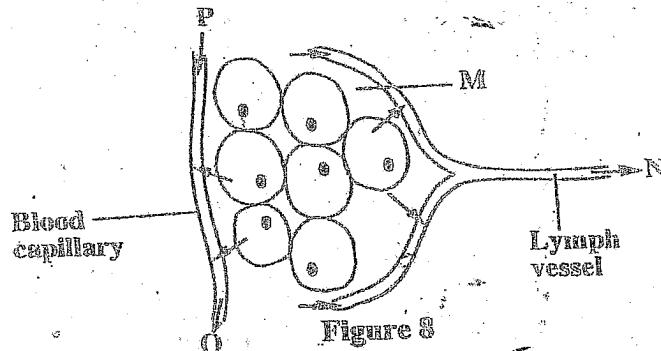


Figure 7

- a. Name the part marked S.  
Tricuspid valve (1 mark)
- Give two differences between the blood flowing through vessels T and U.  
(i) Vessel T transport deoxygenated blood while vessel U transport oxygenated blood.  
(ii) Vessel T carries blood with low pressure while vessel U carries blood with high blood.

- C Explain how part V helps to create systolic pressure.  
 ⇒ Part V (left ventricle) contracts powerfully to push blood out of the heart into the arteries. This creates systolic pressure. (3 marks)
13. a. State any two adaptations of a villus for food absorption.  
 1. Villi have thin walls (epithelium) which reduces barrier to diffusion.  
 2. Villi are richly supplied with blood capillaries and lymphatic capillaries (lacteal) which transport food. (2 marks)
- b. If the liver failed to produce bile, what two effects could this have on digestion?  
 1. Lipids would not digest because emulsification is halted.  
 2. Hydrochloric Acid would not be neutralized and this would denature all the enzymes. (2 marks)
- c. Explain why the level of insulin increases in the blood soon after a meal of carbohydrates.  
 ⇒ The concentration of sugar in the blood increases as such the level of insulin increases to trigger the liver to convert the sugar to glycogen. (2 marks)

14. Figure 8 shows capillary bed. Use it to answer questions that follow.



- a. (i) Name the fluid found in M.  
 ⇒ Tissue fluid (1 mark)
- (ii) Name any two substances found in M that are used by the body  
 ⇒ Glucose  
 ⇒ Oxygen (2 marks)

b. Name two adaptations for each of the following to their functions:

(i) *Blood capillaries*

- ⇒ Has epithelial wall (one cell thick) for easy diffusion.
- ⇒ Very thin to provide a short distance for exchange of substances.
- ⇒ Narrowest lumen - low blood flow in capillaries to give more time for diffusion of materials.

(ii) *Lymph vessels*

- ⇒ Have very thin walls for easy diffusion of substance.
- ⇒ Have lymph nodes that filter / purify dirt in the lymph.

(2 marks)

c. Which letter represents the arterial end of the capillary bed?

- ⇒ P

(1 mark)

## Section C

### ESSAY QUESTIONS

Answer all questions in this section.

15. Explain any five ways in which breast feeding is important.

Firstly breast milk contains colostrums during the early days after birth.

This colostrums contains antibodies to protect the baby against diseases.

The other importance is that mother's milk is clean because it does not contain harmful bacteria hence protect child from diseases.

In addition, the digestive system of the baby finds it easier to digest mother's milk than bottled milk.

Lastly but not least, the baby is well emotionally developed since the baby is very close to the mother while feeding.

Finally, bottled milk may be allergic to babies (bringing undesired effects like soles) while mothers milk is not.

(10 marks)

16. Explain how one can estimate the population of fish in a pond. Your answer should be in an essay form.

The population size of fish in a pond can be estimated using mark-recapture method as follows:

First use nets to capture fish from the pond. Then mark each fish caught with a spot of nail vanish or indelible ink using small paint brush.

Next count the number of fish marked and record and then release the fish into the pond. This should take sometime before another capturing exercise.

At this point, repeat the capturing exercise in which one should collect both marked and unmarked fish. One should then count them and record the number of marked and unmarked fish.

The population of fish is then estimated using the formula

$$\text{Population size} = \frac{\text{No of fish caught first} \times \text{No. of fish caught second}}{\text{No. of marked fish recaptured}}$$

The calculations give an estimate of the population of fish in a pond.

(10 marks)

END OF QUESTION PAPER

1. 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.  
 ⇒ Measles (1 mark)
- (ii) How is the disease transmitted?  
 ⇒ Through droplets - air borne as well as through contaminated eating utensils and clothes. (1 mark)
- (b) Explain one way of preventing the disease in 1a(i).  
 ⇒ Vaccination made of attenuated virus. This triggers the body to produce antibodies. (2 marks)

2. Figure 1 shows an experiment that was set up to investigate the movement of water in plant tissues. Use it to answer the questions that follow.

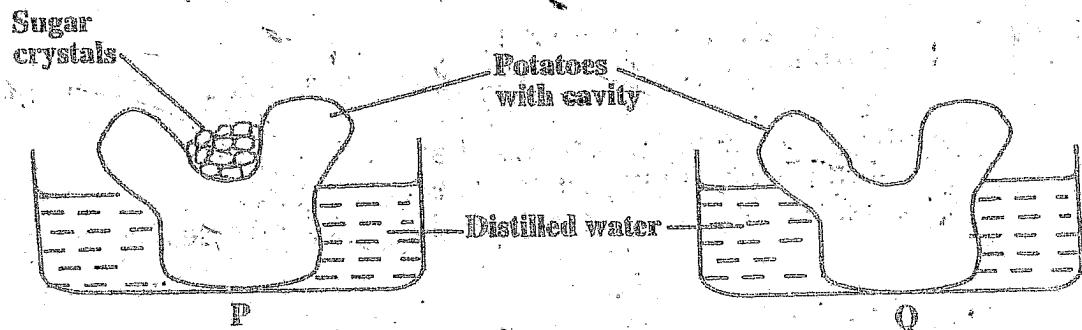


Figure 1

- (a) (i) What would be observed in P after 1 hour?  
 ⇒ The sugar crystal on potato cavity P, will be dissolved by water.
- (ii) Give a reason for your answer in 2a (i)  
 ⇒ The sugar crystal on potato cavity marked P causes water to move from the beaker through the potato into the cavity by osmosis. (2 marks)
- (b) Which set up is a control?  
 ⇒ Set Q (1 mark)

- (c) Name any one variable that was kept constant in the investigation.  
⇒ Volume of water in the beakers. (1 mark)

3. Figure 2 is diagram of a fish gill. Use it to answer questions that follow.

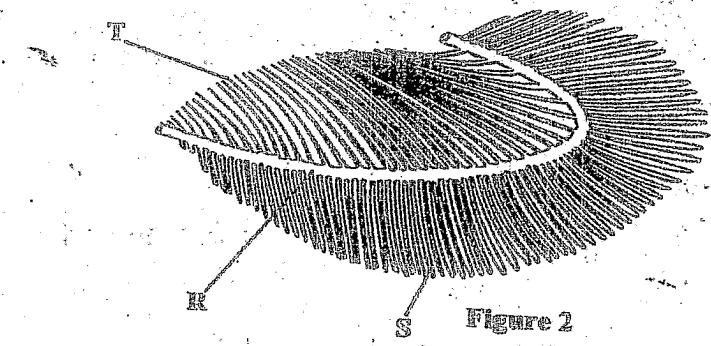


Figure 2

- (a) Name the part marked T.  
⇒ Gill raker. (1 mark)
- (b) What is the function of part marked R?  
⇒ To hold the gill filaments and gill rakers in position. (1 mark)
- (c) Give any two adaptations of part marked S to its function.  
(i) Contain numerous capillaries to transport oxygen.  
(ii) Has plate-like structures called lamellae which increase the surface area. (2 marks)

4. Figure 3 shows the structure of a bone. Use it to answer the question that follow.

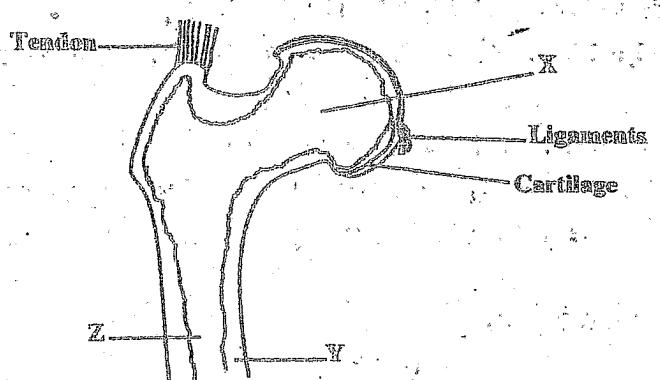


Figure 3

- (a) Name the parts marker X and Y.  
X: Spongy bone  
Y: Compact bone (1 mark)  
(1 mark)

- (b) State the function of part marked Z  
⇒ Production of red blood cells.

(1 mark)

5. Figure 4 shows a biological process taking place in the body of a person. Use it to answer the questions that follow.

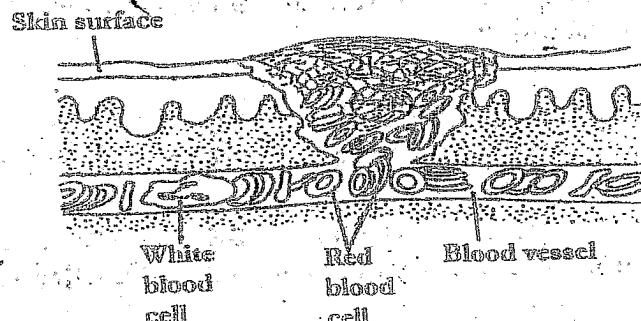


Figure 4

- (a) Name the process.  
⇒ Blood clotting. (1 mark)
- (b) State any one enzyme which is involved in the process.  
⇒ Thrombin (1 mark)
- (c) Give two ways in which the process is important to the human body.  
(i) Minimises excessive loss of blood through bleeding. (1 mark)  
(ii) Prevents entry of germs into the body. (1 mark)

**Section B (60 Marks)**

6. (a) Define "transpiration stream".  
⇒ Continuous flow of water from the roots to the leaves through the stems due to transpiration.

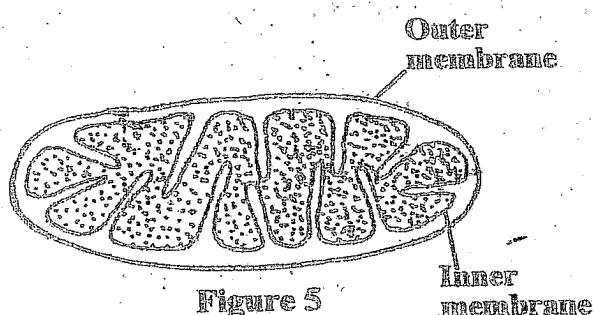
- (b) (i) State any two ways in which transpiration is important to plants.  
1. Transportation of salts from the soil into the plants as water enters the plant  
2. Uptake of water. As water evaporates, cohesion results into continuous flow through the plant hence absorption of water from the soil.

(2marks)

- ⇒ (ii) Describe how the transpirational stream is caused.  
Transpiration results into a fall of the cells turgidity and a rise in the concentration of their cell sap which decrease their osmotic potential. In this condition cells start absorbing water from neighbouring cells and eventually from the xylem vessels of the leaf.

(3 marks)

7. Figure 5 shows a structure found in a plant cell. Use it to answer the questions that follow.



- (a) Name the structure.  
⇒ Mitochondrion

(1 mark)

- (b) State any one substance produced by the structure.  
⇒ Carbon dioxide  
⇒ Water

(1 mark)

- (c) Explain any two adaptations of the structures to its function.  
1. The inner membrane is highly folded to increase the surface area to allow more reactions.  
2. Has a smooth outer membrane which enhances diffusion of substances used for Chemical reactions.

(4 marks)

8. Figure 6 shows a summarized reaction which occurs in the human body. Use it to answer the questions that follow.



Figure 6

- (a) (i) Name the compound represented by Z. (1 mark)  
⇒ Oxyhaemoglobin
- (ii) In which organ does the reaction take place? (1 mark)  
⇒ Lung
- (b) State any two food nutrients that are required for the formation of haemoglobin.  
1. Protein (Globin means protein)  
2. Iron (haem means iron) (2 marks)
- (c) Describe the behavior of chromosomes during mitosis and meiosis at the stated stages.

Stage	Chromosome behavior during mitosis	Chromosome behavior during meiosis
Prophase	Chromosomes shorten and thicken to become visible.	Chromosomes shorten and thicken. Homologous chromosome pair up
Metaphase	Lined up at the equator	Line up at the equator

(4marks)

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

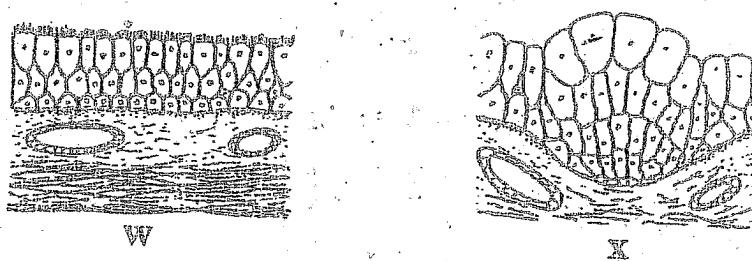


Figure 7

- (a) Name the disease that causes the condition in X. (1 mark)  
⇒ Lung Cancer

- (b) Explain how the disease is caused.  
 → Uncontrollable cell division (multiplication of cells). This results into accumulation of new cells to form a ball of cells called tumour.
- (c) State any two ways of preventing the disease.  
 1. Never to smoke or to stop smoking in order to avoid tar that comes from cigarettes.  
 2. Avoid over exposure to radiation. (2 marks)

10. Figure 8 is a graph of number of maize cobs against their length. Use it to answer the questions that follow.

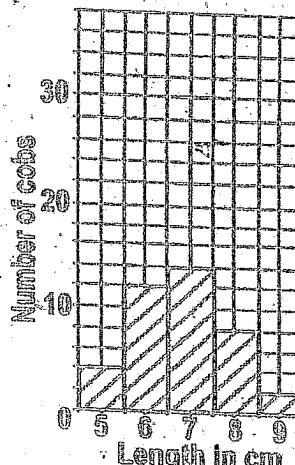


Figure 8

- (a) What is the range of the lengths of the maize cobs?

$$\Rightarrow 9 \text{ cm} - 5 \text{ cm} = 4 \text{ cm} \quad (1 \text{ mark})$$

- (b) Calculate the median length of the cobs. Show your working.

Number of terms	=	5
Position of middle term	=	$\frac{5 - 1 + 1}{2}$
	=	$\frac{4 + 1}{2}$
	=	2 + 1
	=	3
	=	7 cm

∴ the median length

(4 marks)

- (c) Mention the type of variation shown by maize cob length.  
⇒ Continuous variation (1 mark)

11. Figure 9 is a diagram of the human brain. Use it to answer the questions that follow.

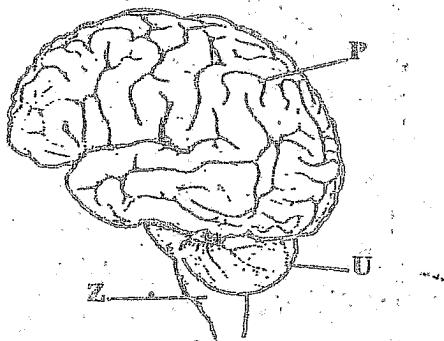


Figure 9

- (a) State any one function of part marked P.  
⇒ The cerebrum is the centre of thinking, memory, reasoning, imagination, learning and voluntary actions. (1 mark)
- (b) Why is part marked P highly folded?  
⇒ The cerebrum is highly folded to increase the surface area for co-ordination. (2 marks)
- (c) State any two differences in structure between parts Z and U.  
1. Part Z (medulla oblongata) is not folded while U (cerebellum) is highly folded.  
2. Part Z (medulla oblongata) forms the brain stem while part U (Cerebellum) has two layers (Grey matter and white matter). (2 marks)
- (d) Explain why injury to part Z may cause death.  
⇒ Damage of medulla oblongata may lead to death because it controls processes which are vital to life e.g. breathing, blood circulation, peristalsis etc. (2 marks)

12. Figure 10 shows part of a nephron. Use it to answer the questions that follow.

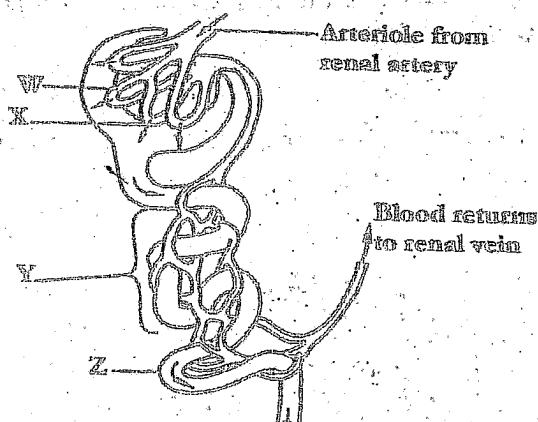


Figure 10

- (a) Name the parts marked W and Z.  
 W: Glomerulus  
 Z: Distal convoluted tubule (1 mark)  
 (1 mark)
- (b) Name the process that occurs in region Y.  
 ⇒ Selective reabsorption. (1 mark)
- (c) State any two substances that become part of the fluid shown by arrow X.  
 (i) Amino acids, Glucose (nutrients)  
 (ii) Water (1 mark)  
 (1 mark)
- (d) Name the conditions associated with presence of glucose in urine.  
 ⇒ Diabetes (1 mark)
13. Table 1 shows average quantities of food substances taken by three students in their meals per day. Use it to answer the questions that follow.

Table 1

Food Substance	Student A	STUDENT B	STUDENT C
Carbohydrates	690	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

$$\begin{aligned}
 \text{Energy from carbohydrates} &= 710 \times 17 \text{ KJ} = 12,070 \\
 \text{Energy from fats} &= 47 \times 39 \text{ KJ} = 1,833 \\
 \text{Total Energy gained} &= 12,070 + 1,833 \\
 &= 13,903 \text{ KJ}
 \end{aligned}$$

(6marks)

14. Figure 1 is a diagram of a vector. Use it to answer the questions that follow.

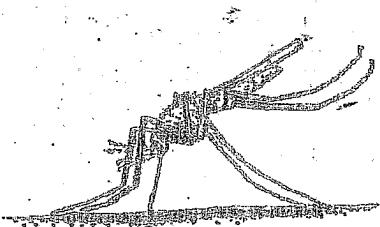


Figure 11

- (a) Name the disease that is transmitted by this vector.  
⇒ Malaria. (1 mark)

(b) (i) How does the vector transmit the disease?  
⇒ The vector feeds on people's blood and during feeding infected mosquitoes pass on the malaria parasite from their salivary glands. (2 marks)

- (ii) Explain any one way in which the disease in 14b(i) can be controlled.  
⇒ Any of these:

- (1) *Use of insecticides* - adult mosquitoes are active at night and rest in places such as houses during the day. Insecticides can be used to spray in the resting places.
- (2) *Draining stagnant water*. This will kill the larvae before they develop into adults. (2 marks)
- (3) Spraying oil into open water to make a film on the surface preventing the larvae from coming to the surface to get air.
- (4) Biological control-putting fish into ponds where mosquitoes breed to eat the larvae.
- (5) Sleeping under a mosquito net so that people are not beaten by female mosquitoes which transmit malaria.

Ques 1  
i) Haemolysis is breakdown of red blood cells  
caused by one solute which is taken may cause haemolysis & Hyper tonic solution is the one causes Haemolysis.

Ans: Temperature high temp - Increases evaporation  
wind

Section I C (20 marks)

15. Describe any five characteristics that enable fresh water plants to survive in their habitat. Your answer should be in an essay form.

Plants living in water are called hydrophytes. Hydrophytes may be rooted in the soil or free floating and as such they have special characteristics that enable them to survive in their habitat.

The first characteristic is presence of flexible stems which can sway with current. The stems may be expanded into leaf-like fronds to form a floating plant such as duck weed.

The second characteristic is that hydrophytes have air cell tissue or aerenchyma which store and give buoyancy to stem and leaves. They also store oxygen from photosynthesis.

The other characteristic is that the leaves have long petioles hence making them afloat and receive more light.

The fourth characteristic is that the flower is raised above the water to prevent pollen from becoming wet.

Finally, submerged plants either have small and numerous leaves. This increases the surface area for absorption of gases and light for photosynthesis.

(10 marks)

16. State any five vitamins and their respective functions. Your answer should be in an essay form.

Vitamins are complex compounds usually just referred by a letter. Like mineral salts, they are needed in small amounts.

The body needs vitamin A in order to produce the pigment on red cells so that an individual can see clearly at night.

Vitamin B helps in the production of energy in body cells.

Vitamin C is necessary to keep the skin and gums healthy. It also enhances wounds to heal and the absorption of Iron.

Vitamin D helps in the absorption of calcium which may be used in bones and teeth.

Finally vitamin K is required in the process of blood clotting. This vitamin reacts with platelets debris and calcium to produce Thromboplastin.

(10 marks)

END OF QUESTION PAPER

# HODGE'S DIALYSIS MACHINE

(cont.)

Blood from the artery of the patient's arm is pumped into the dialysis machine through a tube. Doctors add heparin to

blood in the tube to prevent blood clotting.

In the machine the tube is divided into several tubes in order to increase

the surface area for diffusion of substances from the blood. These dialysis tubes have

a half permeable wall that separate blood from dialyzed fluid. Dialysis fluid

has the same composition as blood plasma  
but it lies outside this wall when

it is diffuse from the blood into dialysis

Treatment where it carried out, blood &

dialysis fluid move in opposite direction.

Urea for fast & efficient diffusion

In the dialysis machine food nutrient &

does not diffuse from blood because the concentration

is food nutrient in a dialysis fluid is

lower than blood. Blood bags cells and blood proteins

not pass through the wall of dialysis tube

because they are large as such they cannot

move from blood into dialysis fluid. After

passing purified blood is returned into the

arm of the patient arm through a tube. This

tube has roller that removes air bubbles

from the blood. Blood vessel & adjustable

flow of the blood in the body

