

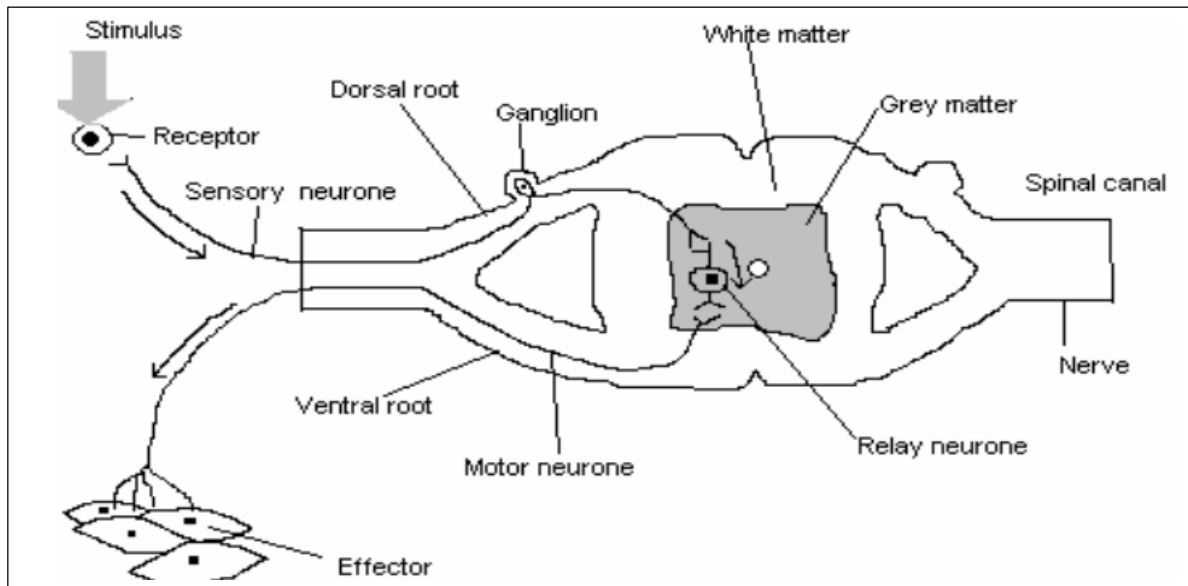
# SUCCESS IN BIOLOGY

## BIOLOGY VOLUME FOUR

*Instant Revision from E.C.Z Question Papers*

**GRADE 10 -12**

**2009 – 2019**



### **THIS BIOLOGY PAPHALENT HELP YOU TO:**

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### **THE ONLY REMEDY FOR EXAMINOPHOBIA**

COMPILED BY MR MUSONDA LAURENT

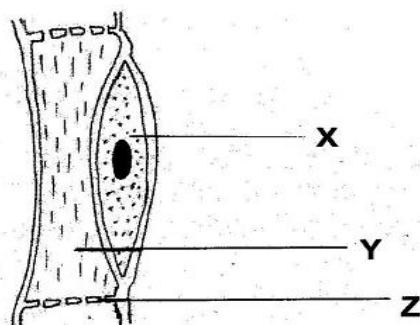
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**SHORT ANSWER QUESTIONS [SECTION A]**

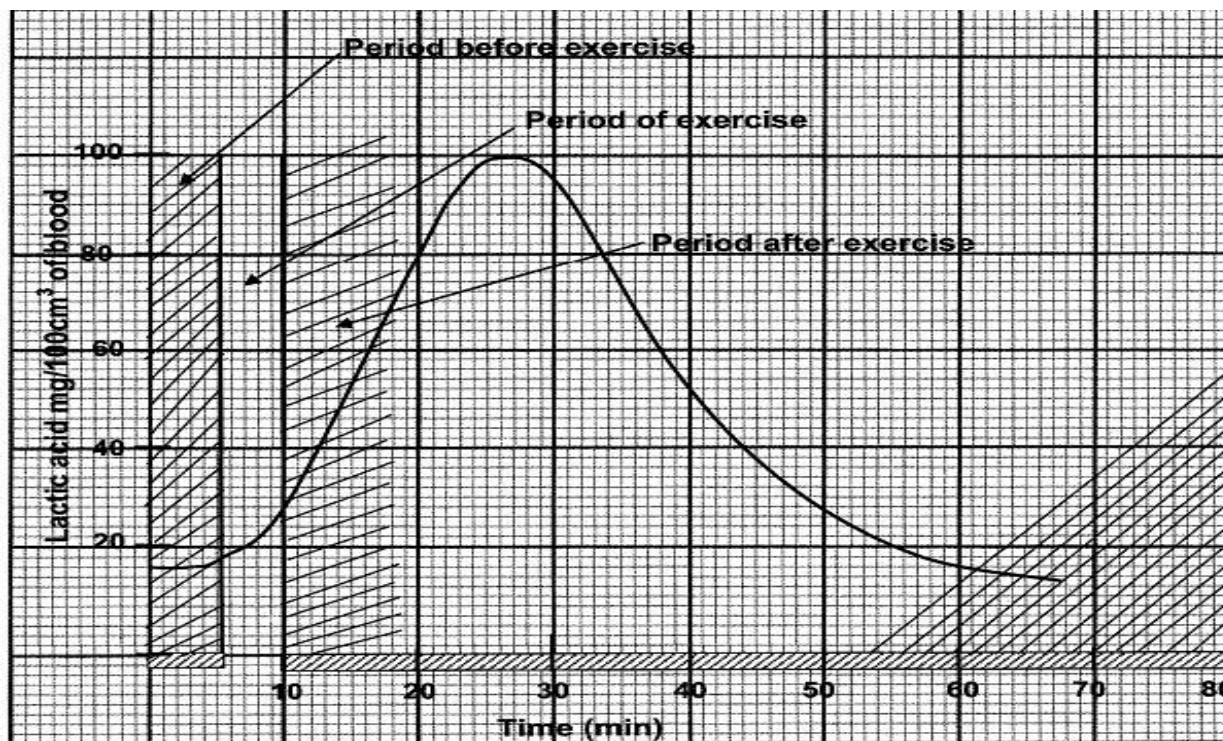
**2009 QUESTION PAPER 2**

1. The diagram below shows some cells taken from a vascular tissue of a plant.



- (a) Identify the cell X and Y and structure labeled Z. [3]
- (b) What are the functions of the cells labeled X and Y? [2]
- (c) What structure, in human being, performs a similar function as structure Y? [1]
- (d) What **two** conditions are necessary for osmosis to take place? [2]

2. **Figure 2.1** shows the amount of lactic acid in the blood before, during and after a heavy exercise.

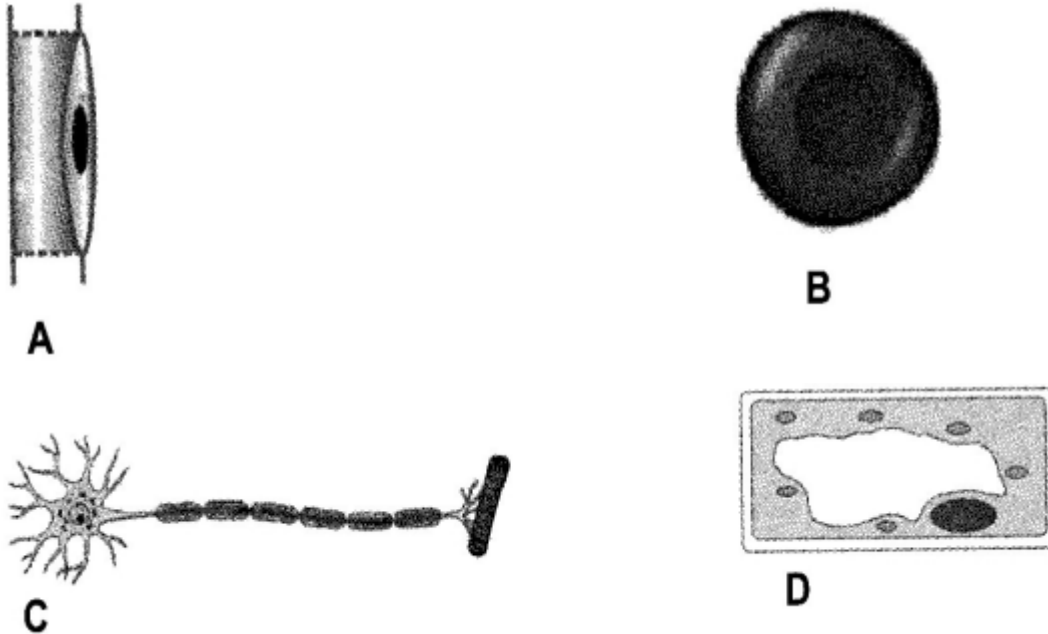


- (a) (i) What was the level of lactic acid in the blood before the exercise? [1]
- (ii) How much lactic acid was produced at 20 minutes after the exercise? [1]
- (i) How long did it take for lactic acid to reach its highest level after the exercise had begun? [1]

- (b) (i) What is the reason for the build-up of lactic acid in the blood? [1]  
 (ii) What are the effects of the build – up of this lactic acid on the person? [2]  
 (iii) Compare the products of the process taking place during the heavy exercise to that which takes place in yeast cells. [2]
- (c) Suggest **two** uses of the process identified in **b (i)** [2]

**2010 QUESTION PAPER 2**

3. **Figure 1.1** shows the structures of four specialised cells.



a) (i) Using the letters of the cells, identify animal cells and name them.

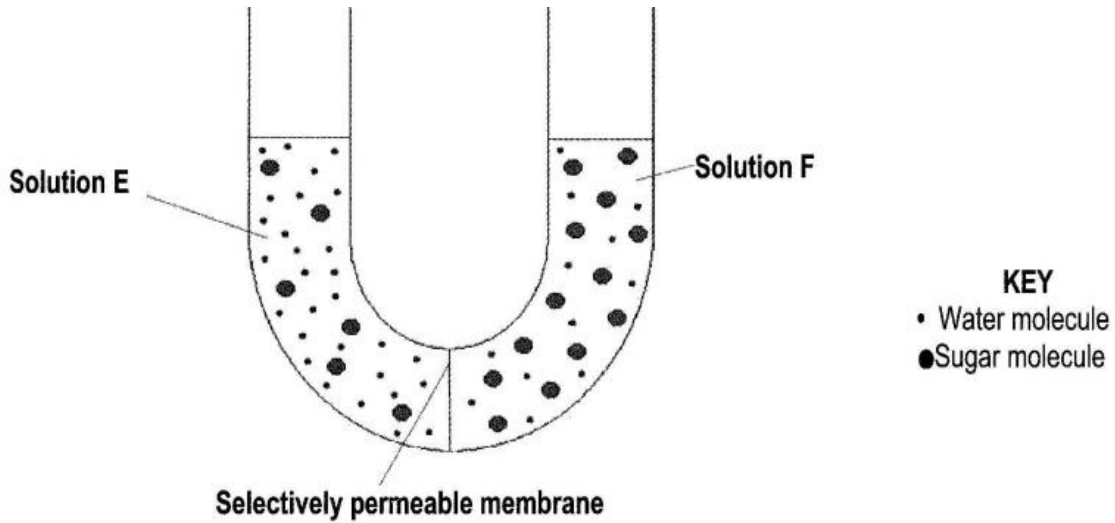
	identity	name
1		
2		

(ii) For each named animal cell in (a) (i), state one of its characteristic features.  
 Feature in Animal cell 1:.....  
 Feature in Animal cell 2: .....[2]

b) For cells A and D in figure 1.1, name the substance found in the cell which enables it to perform its specialised function.

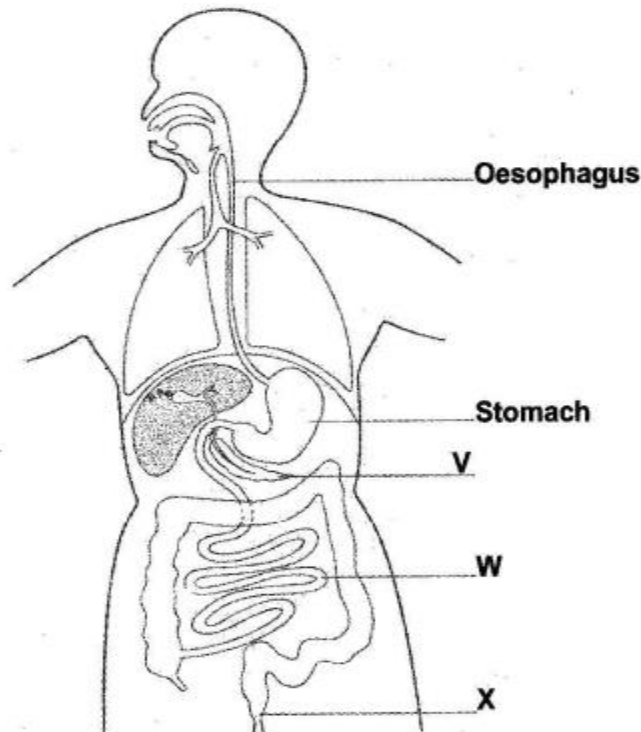
Cell	Substance	Function
A		
D		

c) **Figure 1.2** shows an experiment on osmosis.



- (i) From which solution in figure 1.2 will there be flow of water molecules by osmosis? [1]
- (ii) When will the flow of water molecules across the membrane stop by **Osmosis**? [1]
- (iii) Suggest one reason why only water molecules can move across this membrane. [1]

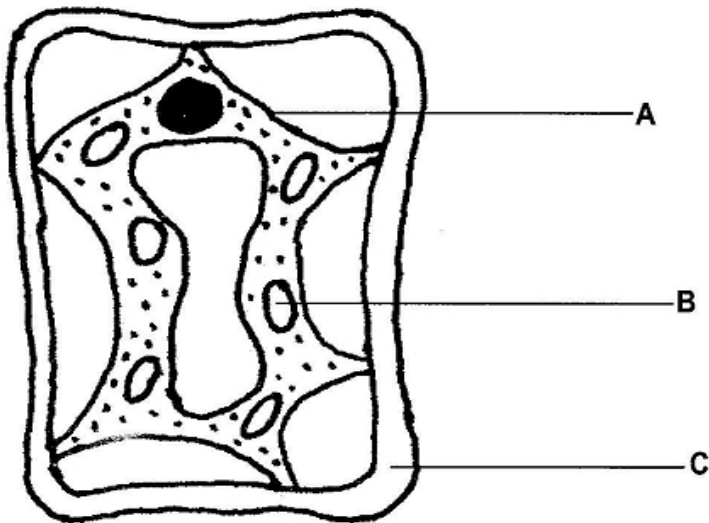
4. **Figure 2.1** shows the human digestive system.



- (a) From **Figure 2.1**, select the letter where
- (i) Egestion occurs .....
  - (ii) pancreatic juice is formed .....
  - (iii) villi are present..... [3]
- (b) The stomach produces hydrochloric acid.  
State **two** functions of this acid in the stomach.
1. ....
  2. .... [2]
- (c) Describe the roles of the liver in
- (i) digestion .....
  - (ii) assimilation..... [4]

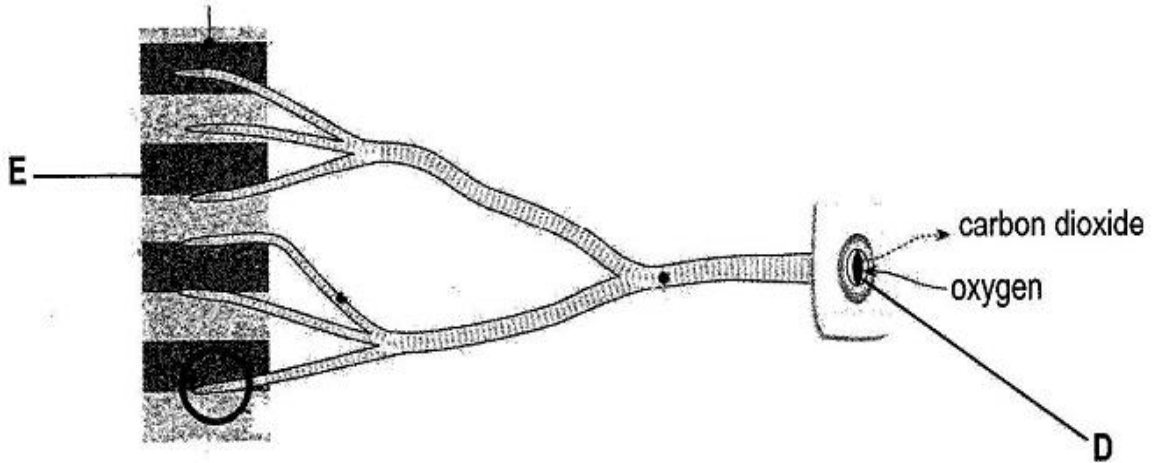
**2011 QUESTION PAPER 2**

5. The diagram below shows a plant cell which has been put in a concentrated salt solution.



- (a) Identify the parts labeled **A** and **B**. [2]
- (b) (i) What happened for the cell to reach this state? [1]
- (ii) State the term given to the cell in this condition. [1]
- (iii) How can this condition be reversed? [1]
- (c) Give one reason the structure labeled **C** remained in its natural state. [1]
- (d) Give two differences between a plant cell and an animal cell. [2]

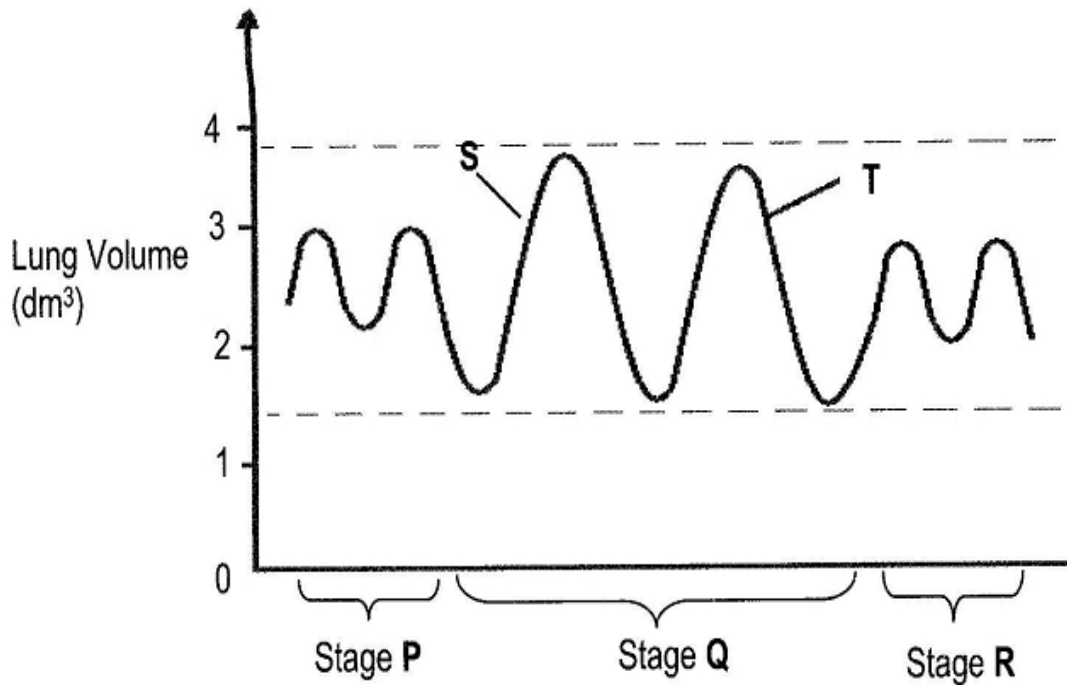
6. The diagram below shows part of the respiratory system of an insect.



- (a) Identify the parts labeled **D** and **E**. [2]
- (b) Explain how oxygen from the atmosphere is able to reach the tissue labeled **E**. [2]
- (c) Explain how the energy released from respiration in an insect is used. [3]
- (d) State two ways in which the respiratory system shown differs from that of a fish. [2]

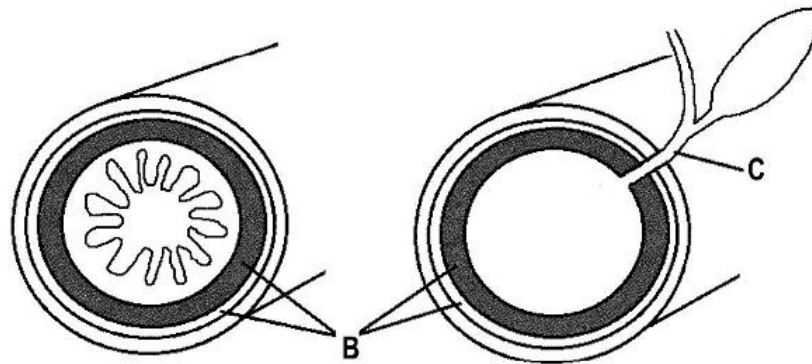
**2012 QUESTION PAPER 2**

7. The diagram below shows a graph showing changes in volume of air during breathing in the lungs of a person.



- (a) (i) Which letter shows the process of inspiration taking place? [1]  
 (ii) Suggest activities taking place at stages **P**, **Q** and **R**. [3]  
 (b) Explain why there is an increase in air volume during stage **Q**. [1]  
 (c) Describe the changes which will take place in the thorax during inspiration in order to facilitate the increase in volume during stage **Q**. [3]

8. **Figure 5.1** and **Figure 5.2** show the cross section through two different portions of the human alimentary canal.



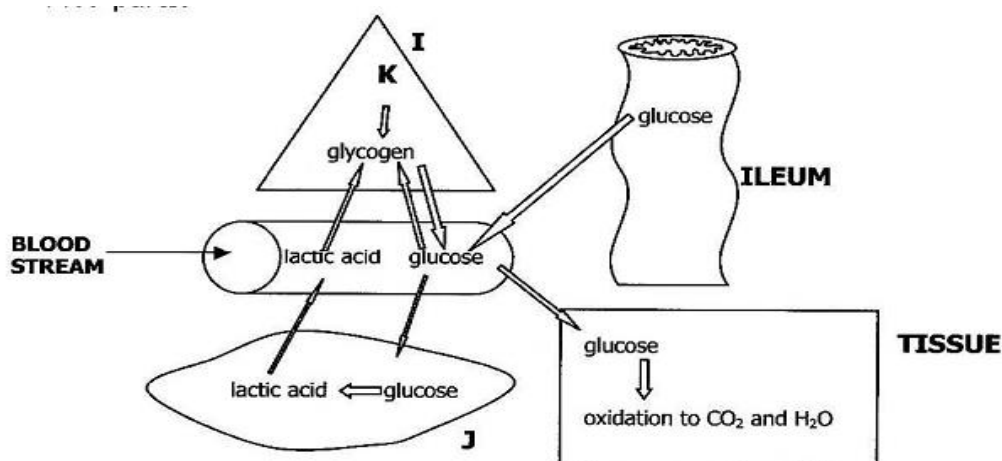
**Figure 5.1**

**Figure 5.2**

- (a) (i) From which part of the alimentary canal were these cross sections taken? [2]  
 (ii) Give reasons for your answers in (a) (i) above. [2]  
 (b) Explain the role played by **B** in the alimentary canal. [3]  
 (c) Name two juices passing through tube **C**. [2]

**2014 QUESTION PAPER 2**

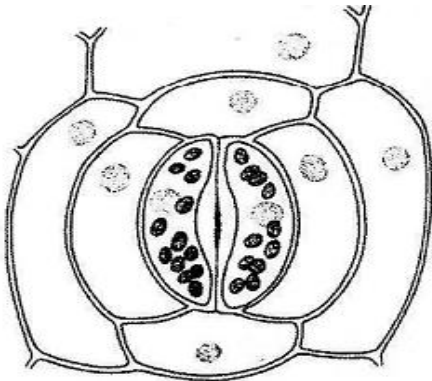
9. The diagram below shows the movement of dissolved substances in the digestive system and some associated parts.



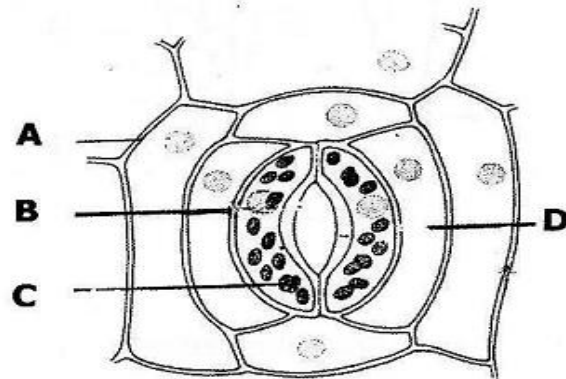
- (a) Name the structures labeled **I** and **J**. [2]
- (b) (i) Name **one** product of digestion in the ileum which is not transported by blood. [1]  
 (ii) Name the enzyme in the ileum whose activity produces glucose. [1]
- (c) Substance **K** when broken down produces a waste substance and glycogen.  
 (i) Identify substance **K**. [1]  
 (ii) Suggest **two** uses of substance **K** in the body. [2]
- (d) State under what conditions the product in structure **J** is produced. [2]

**2015 (i) QUESTION PAPER 2**

10. Figure 1.1 and Figure 1.2 show the structure of specialized cells in plants.



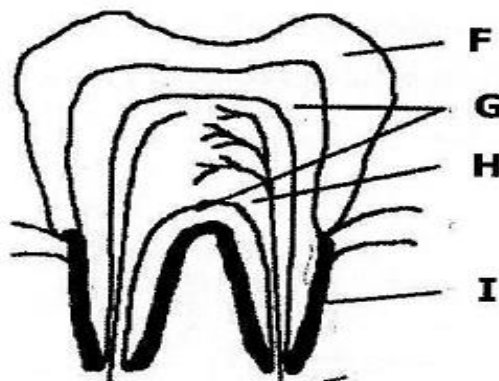
**Figure 1.1**



**Figure 1.2**

- (a) (i) Identify cells labeled **A** and **B** [2]  
 (ii) Identify the parts labeled **C** and **D**. [2]
- (b) (i) Which figure shows a closed stoma? [1]  
 (ii) Explain how the opening of stoma is brought about. [3]

11. Figure 2.1 shows a section through a human tooth.



**Figure 2.1**

- (a) (i) State the names of the parts labeled F and G. [2]  
 (i) Explain the functions of the parts labeled H and I in **Figure 2.1**. [2]  
 (b) (i) Explain how tooth decay brought about. [3]  
 (ii) Suggest **two** ways of preventing tooth decay. [2]

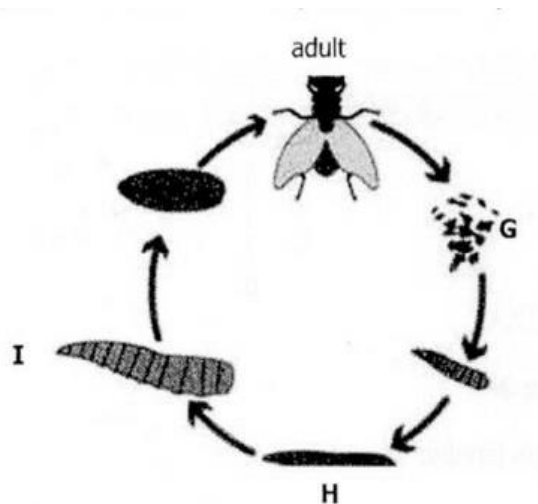
12. **Figure 3.1** shows a cassava plant with root tubers.



- (a) (i) Which common food nutrients is stored in the root tuber? [1]  
 (ii) State where this food in the root tubers was manufactured? [1]  
 (iii) Explain how this food manufactured in (a) (ii) above found itself in storage form in the tubers. [3]  
 (b) (i) State the nutrient in the soil which is necessary for photosynthesis. [1]  
 (ii) Suggest how this nutrient is taken up from the soil to the leaves in the plant in **Figure 3.1**. [3]

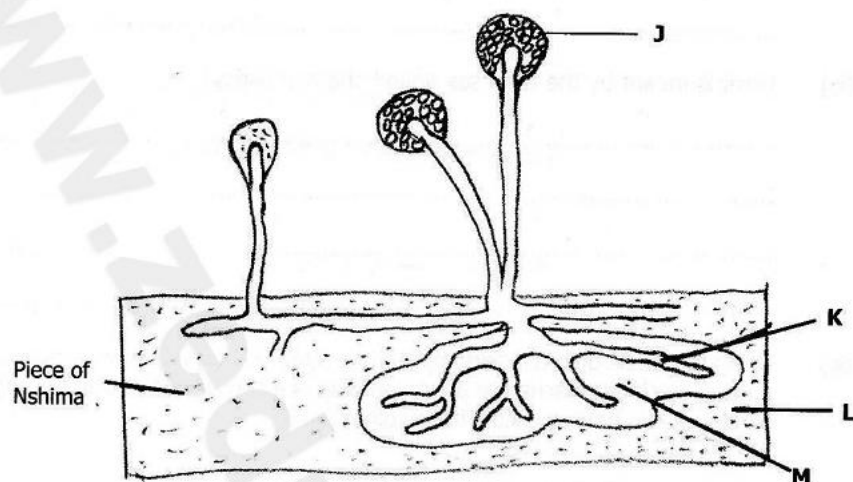
**2015( ii) QUESTION PAPER 2**

13. **Figure 3.1** the life cycle of a housefly.



- (a) (i) Identify the stages labeled **G** and **H**. [2]  
 (ii) Explain the changes taking place during stage **I**. [3]  
 (b) (i) Which stage in **figure 3.1** would be the most effective for eradicating houseflies? [3]  
 (ii) Using a named example, describe the role of a housefly in disease transmission. [1]

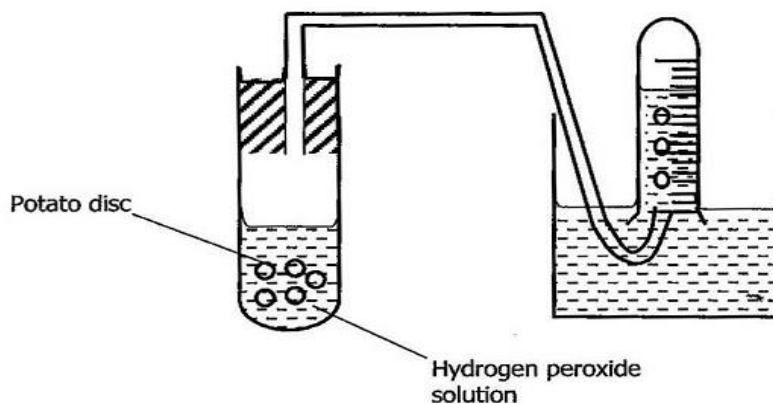
14. Figure 4.1 shows the growth of Mucor on nshima.



- (a) (i) Identify structure J in the diagram above. [1]  
 (ii) Explain how structure K obtains nutrients from nshima. [4]
- (b) The nshima was flooded with iodine solution. State colour changes that would occur at L and at M. [2]
- (c) Give reasons for the colour changes observed in (b) above. [2]

**2016 G.C.E QUESTION PAPER 2**

15. Figure 1.0 shows the set up to an experiment used to investigate the effect of biological catalyst on the decomposition of hydrogen peroxide to produce oxygen.

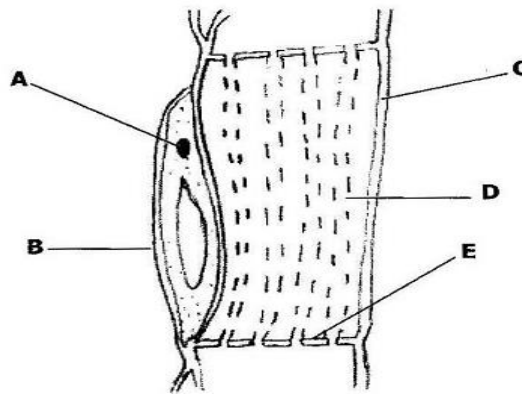


Three experiments were carried out under different conditions as shown in the table below.

Experiment number	Volume of hydrogen peroxide	Number of potato discs used	Nature of potato discs used	Volume of oxygen
1	5cm <sup>3</sup>	0	-	1.5cm <sup>3</sup>
2	5cm <sup>3</sup>	5	Boiled	1.5cm <sup>3</sup>
3	5cm <sup>3</sup>	5	Raw	10.0cm <sup>3</sup>

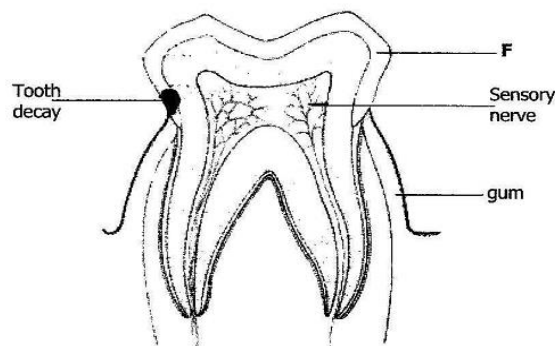
- (a) (i) What is the general name given to a biological catalyst? [1]  
 (ii) Give a reason for boiling the potato discs in experiment 2. [1]  
 (iii) Explain the difference in results obtained between experiments 1 and 3. [3]
- (b) Predict what would be the result of:  
 (i) Increase the number of potato discs in 5cm<sup>3</sup> of hydrogen peroxide. [1]  
 (ii) Heating the mixture of 5cm<sup>3</sup> of hydrogen peroxide with potato discs. [1]
- (c) Suggest two other characteristics of a biological catalyst not demonstrated in (a) and (b) of this question.

16. **Figure 2.0** shows cells taken from a vascular tissue in a plant.



- (a) (i) Identify the specialized cell in **figure 2.0**. [1]  
 (ii) Name one feature in **figure 2.0** which enable you to identify the specialized cell in (a) (i) above. [1]  
 (iii) Which letters on **figure 2.0** correspond to the following structures?  
     1 Nucleus.....[1]  
     2 Cytoplasm ..... [1]
- (b) Give **two** functions of the cell labelled **B**. [2]
- (c) With reference to the specialized cell in **figure 2.0**.  
 i. Name the process by which substances are transported in specialized cell. [1]  
 ii. Suggest two substances transported by the specialized cell. [2]

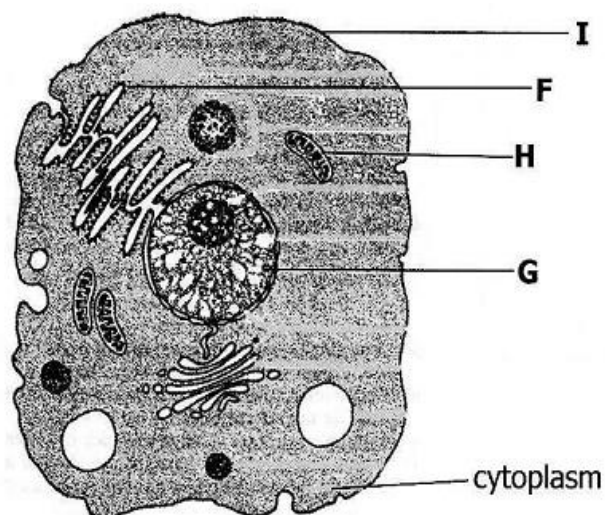
17. **Figure 3.0** shows a diagram of a tooth.



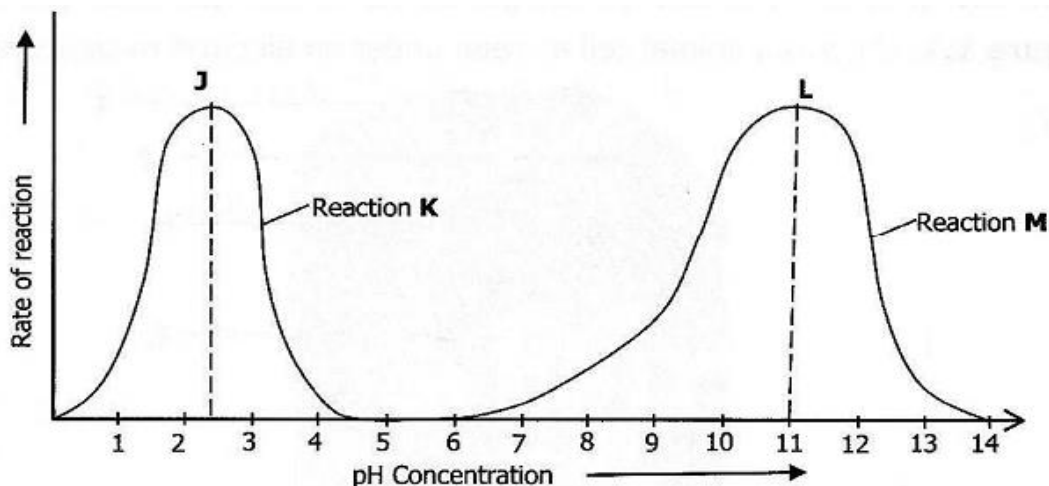
- (a) (i) Identify the type of tooth shown in **figure 3.0** above and state its function. [1]
- (ii) Label on the diagram the following parts of a tooth.
- |          |                          |     |
|----------|--------------------------|-----|
| <b>1</b> | <b>blood capillaries</b> | [1] |
| <b>2</b> | <b>Dentine</b>           | [1] |
- (b) (i) Mention **two** elements or ions which enable part **F** to perform its functions more efficiently. [2]
- (ii) Suggest how tooth decay can be brought about. [2]
- (iii) Give **one** way in which tooth decay can be prevented. [1]

**2016 QUESTION PAPER 2**

**18.** **Figure 1.1** shows an animal cell as seen under an electron microscope.



- (a) Identify the labelled parts **F** and **G**. [2]
- (b) Explain the functions of the parts labelled **H** and **I**. [4]
- (c) Suggest **two** cell parts which would be present in **figure 1.1** if it was a plant cell. [2]
- 19.** **Figure 2.1** shown the effect of pH on the rate of enzyme catalysed reactions of **K** and **M**.



- (a) What term is given to pH at **J** and **L**? [1]
- (b) Explain why the rate of reactions **K** and **M** goes down after point **J** and **L** respectively. [2]
- (c) Name the regions of the alimentary canal where reactions **K** and **M** take place. [2]
- (d) (i) Suggest one enzyme which can catalyse reaction **M**. [1]
- (ii) State **one** food nutrient which can be catalysed in reaction **K**. [1]
- (e) State **two** factors other than pH which affect enzyme activity. [2]

**2017 G.C.E QUESTION PAPER 2**

20. (a) Complete the table below shows parts of a microscope and their functions.

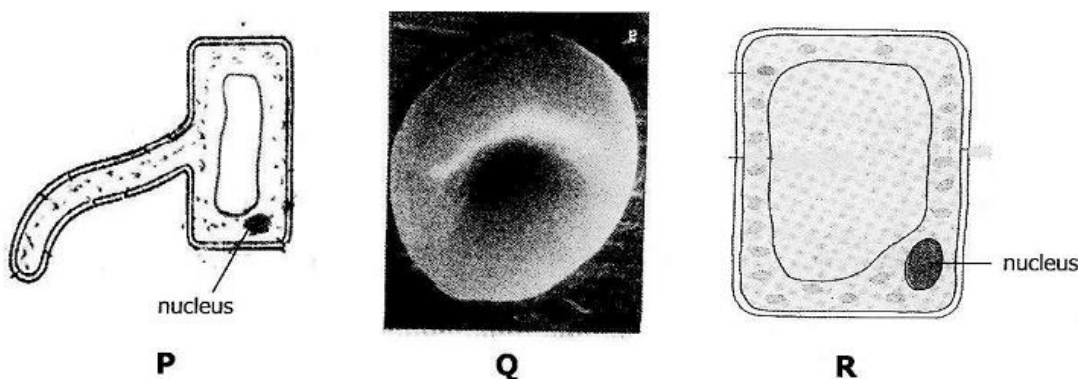
PART	FUNCTION
(i)	Collect and reflect light onto specimen on the stage
Diaphragm	(ii)
(iii)	Magnifies the image further
Stage	(iv)
(v)	Brings the image into sharp focus especially when the specimen is being viewed at high magnification.

[5]

- (b) State three parts of a plant cell which can be easily seen under a light microscope. [3]

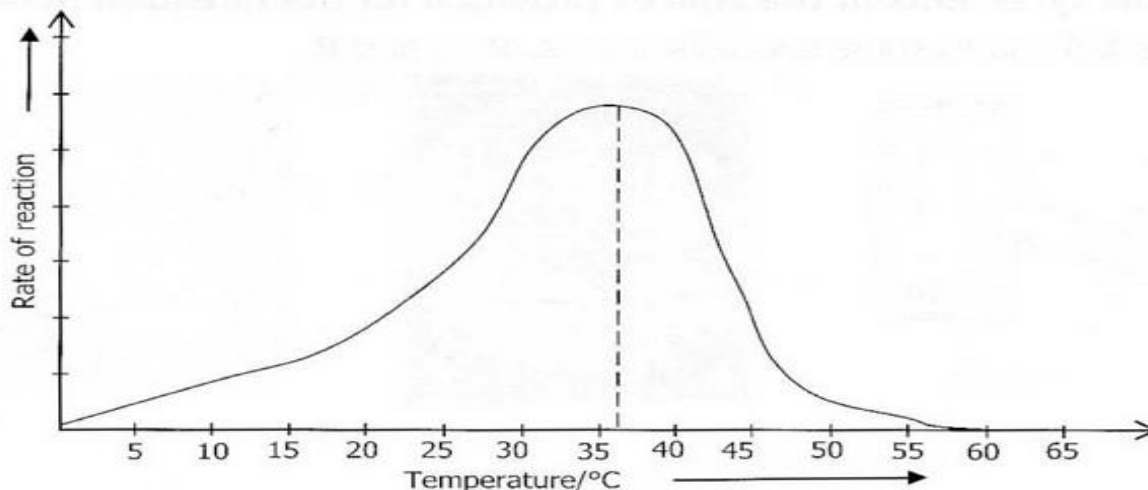
**2017 QUESTION PAPER 2**

21. Figure 1.0 shows some specialized cells, **P**, **Q** and **R**.



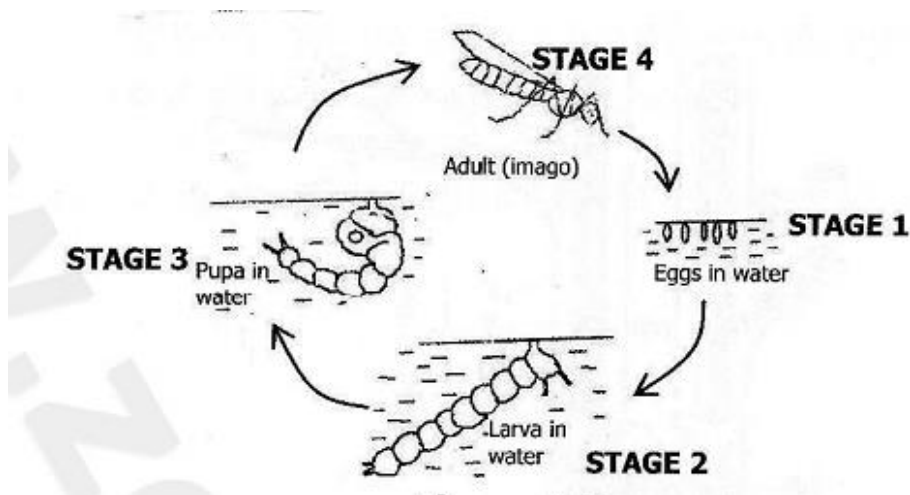
- (a) Name each of the cells above **P**, **Q** and **R**. [3]
- (b) (i) State the functions of cells **P** and **Q**. [2]
- (ii) Explain the adaptation for cells **P** and **Q** to their function. [2]
- (c) Where in the leaf is cell **R** located? [1]

22. Figure 2.0 shows a graph showing the effect of temperature on an enzyme catalysed reaction.



- (a) (i) What is an enzyme? [1]  
 (ii) What is the optimum temperature of the enzyme reaction shown in the graph in **figure 2.0**? [1]  
 (b) (i) At what temperature in **figure 2.0** is the enzyme completely denatured? [1]  
 (ii) Give a reason for your answer in (b) (i) above. [1]  
 (c) (i) Explain why it is important to measure the body temperature when a person is sick. [2]  
 (ii) Propose two ways the body temperature of a sick person can be brought down to normal. [2]

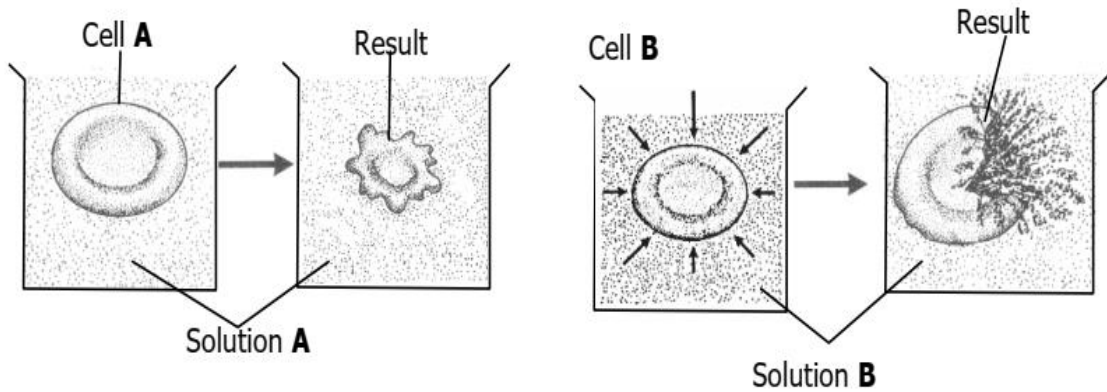
23. **Figure 3.0** shows the life cycle of a mosquito.



- (a) (i) Identify two stages in figure 3.0 which are most suitable for eradicating malaria. [2]  
 (ii) For each stage identified in (a) (i) above, state how malaria may be eradicated. [2]  
 (iii) Suggest **two** ways in which malaria can be controlled in the community. [2]  
 (b) What term is given to the mosquito based on its role in the transmission of malaria pathogen? [1]  
 (c) (i) Define pathogen [1]  
 (ii) Name the malaria causing pathogen. [1]

**2019 G.C.E QUESTION PAPER 2**

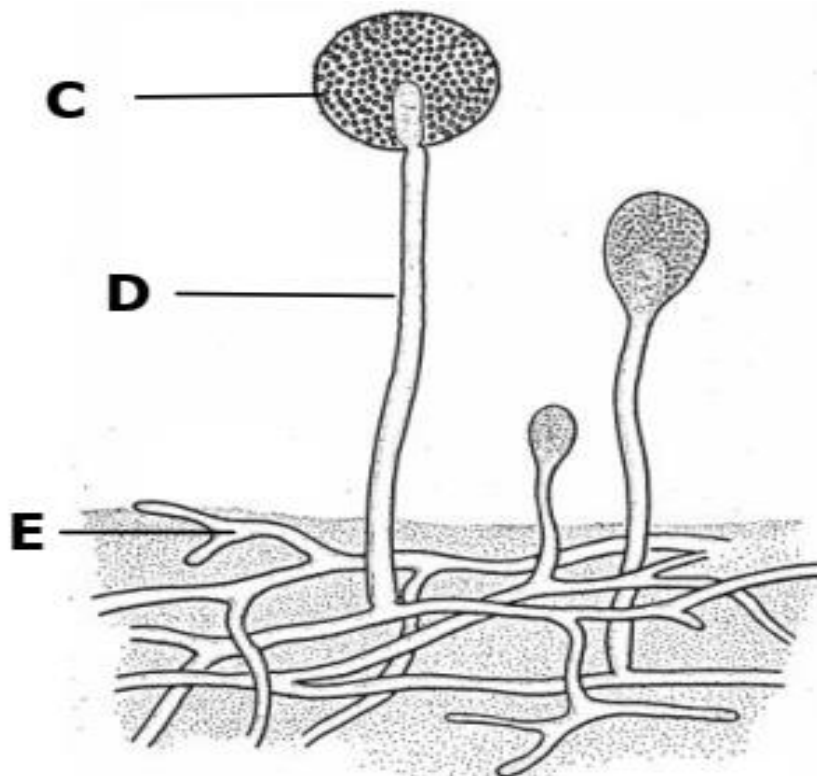
24. Figure 1.1 shows red blood cells placed in different solutions.



(a) State the type of the solution in which each cell was placed. [2]

(b) Give an explanation for your answer in (a) above. [6]

25. Figure 2.1 shows parts of a Rhizopus.



(a) (i) Identify the parts labelled C and D. [2]

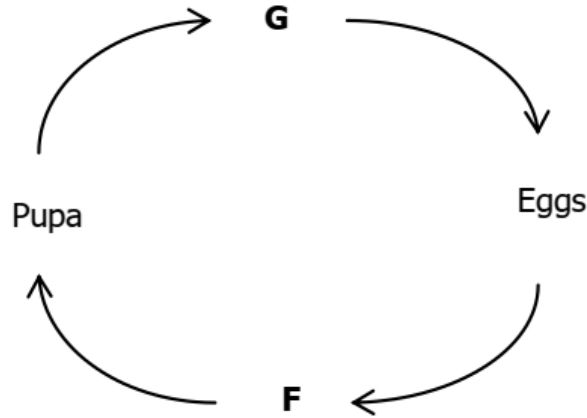
(ii) State the function of the part labelled E. [1]

(b) Briefly explain how the organism obtains its food. [3]

(c) Rhizopus also produce zygosporangia. Give one difference between a spore and a zygosporangium. [1]

(d) Name two important roles played by fungi in nature. [2]

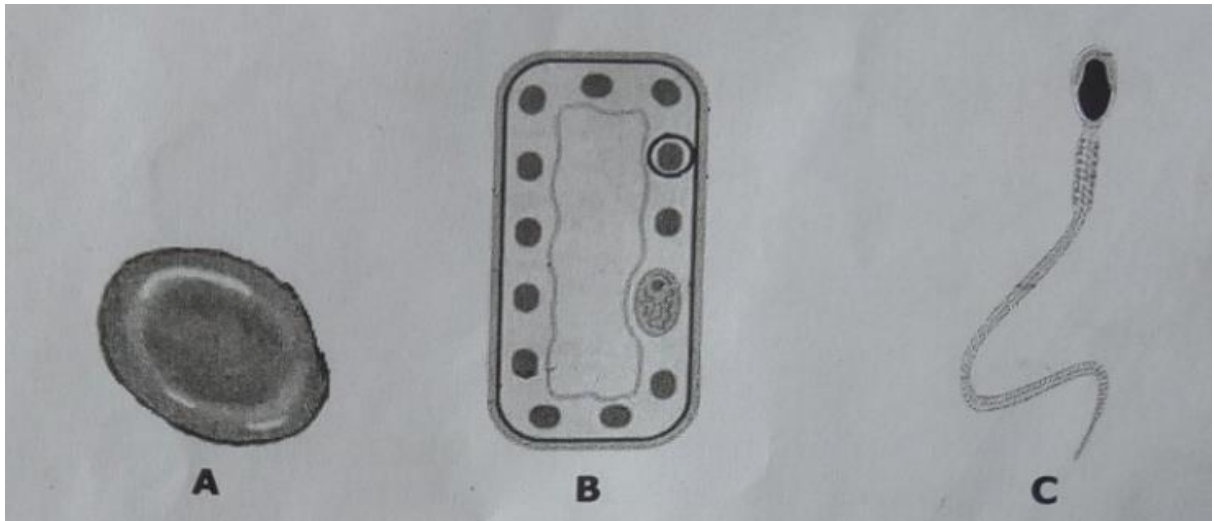
26. Figure 3.1. shows an incomplete life cycle of a vector.



- (a) Name two organisms which have a life cycle shown in figure 3.1 above. [2]
- (b) Identify the stages labelled F and G. [2]
- (c) Suggest the best habitat where eggs are laid by the named organisms in (a) above. [2]
- (d) Which of the two vectors is host to the following pathogens
  - (i) Plasmodium .....
  - (ii) Vibrio cholera .....[2]
- (e) Explain why it is so important to eradicate these two vectors of disease. [1]

**2019 QUESTION PAPER 2**

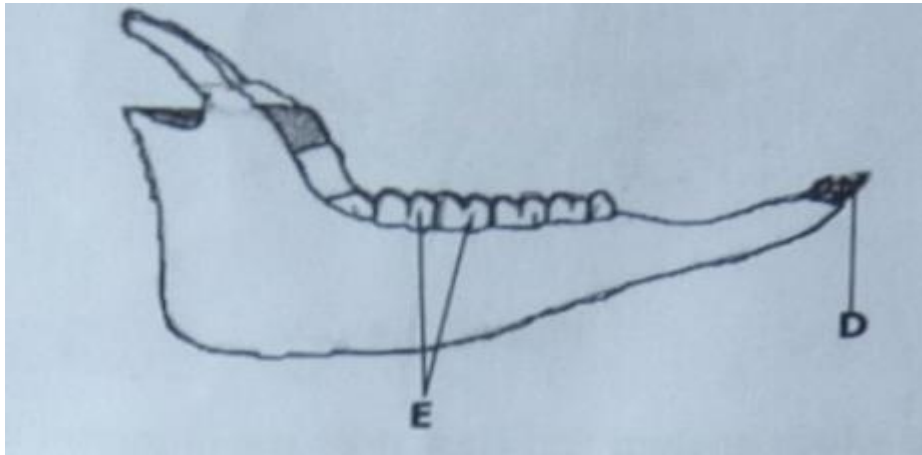
27. 1 Figure 1.1 shows different types of specialised cells.



**Figure 1.1**

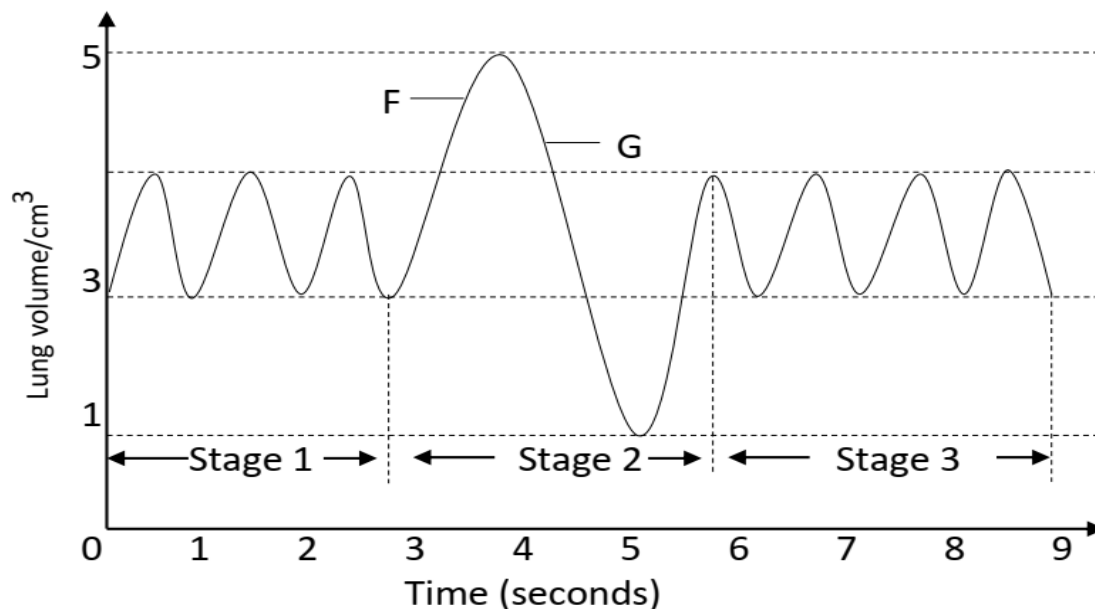
- (a) (i) Identify the cells A, B and C. [3]
- (ii) State the part of the living organism in which each cell is normally found. [3]
- (b) Explain how cells B and C are adapted to their functions. [3]

28. Figure 2.1 shows the lower jaw of a mammal.



- (a) (i) Name the types of teeth labelled D and E. [2]  
 (ii) Relate the structure of the teeth D and E to their function. [4]  
 (b) State and describe the mode of nutrition of the mammal with the type of dentition shown above. [3]

29. Figure 4.1 is a graph showing changes in volume of air during inspiration and expiration in the respiratory organs of a person.



- (a) (i) Which letter shows the process of inspiration taking place? [1]  
 (ii) Name the activities taking place during stages 1, 2 and 3. [3]  
 (b) Explain why there is an increase in air volume during stage 2. [1]  
 (c) Describe four changes which will take place in the thorax during inspiration in order to facilitate the increase in the volume during stage 2. [4]

**SECTION B ESSAY QUESTIONS**

**2009 QUESTION PAPER 2**

30. (a) Explain how leaves are adapted to carry out photosynthesis [4]  
(b) How does a plant get and use the following elements:  
(i) Nitrogen [2]  
(ii) Magnesium [2]  
(d) Explain how enzyme activity is affected by the pH and concentration of substrate. [4]

**2010 QUESTION PAPER 2**

31. (a) Compare and contrast gaseous exchange in a fish and an insect. [4]  
(b) Describe the composition and functions of lymph. [8]
32. (a) (i) Explain the factors which reduce immunity to pathogens. [3]  
(ii) Explain why immunisation against diseases such as measles and tuberculosis (TB) is most important in children under the age of five. [3]  
(b) Describe the methods of transmission of schistosomiasis (bilharzia). How can it be prevented and controlled? [6]

**2011 QUESTION PAPER 2**

33. (a) Explain the term immunity to disease. [2]  
(b) Distinguish between active immunity and passive immunity, giving one example in each case. [5]  
(c) Discuss how immunity to disease is reduced. [5]

**2012 QUESTION PAPER**

34. (a) Compare and contrast nutrition in a guava plant and Rhizopus fungus. [4]  
(b) Discuss the importance of saprophytic nutrition to the environment. [4]  
(c) Describe the digestion of food in the mouth. [4]

**2014 QUESTION PAPER**

35. (a) Explain what is meant by the term aerobic respiration. [2]  
(b) Describe the adverse effects of named air pollutants on the health of human beings. [6]  
(c) Explain how some parts of the respiratory system are adapted to minimize the entry of air pollutants into the lungs. [4]
36. (a) Describe the life cycle of a mosquito. [4]  
(b) With reference to the disease bilharzias, discuss its ..... [4]  
(i) Signs and symptoms. [4]  
(ii) Method of transmission. [4]

**2015(i) QUESTION PAPER**

37. (a) Describe anaerobic respiration in yeast. [4]  
(b) Explain the use of yeast in brewing and baking. [5]  
(c) Compare and contrast anaerobic respiration in man and yeast. [3]

**2015(ii) QUESTION PAPER**

38. (a) Explain the term respiration. [2]  
(b) Distinguish gaseous exchange in fish and insects. [4]  
(c) Explain how the alveolus is adaptation for gaseous exchange. [6]

**2016 G.C.E QUESTION PAPER**

39. (a) What are characteristics of the alveolus as a respiratory surface? [5]  
(b) Describe the mechanism involved in inspiration in human beings. [7]

**2016 QUESTION PAPER**

40. (a) Explain gaseous exchange in green plants during:  
(i) day time [2]  
(ii) night time [2]  
(b) Using **named** organisms, explain the industrial application of respiration. [4]  
(c) Describe how gum disease is brought about. [4]
41. (a) Explain how HIV can be transmitted from one person to another. [6]  
(b) (i) Explain the causes of stigma to people living with HIV and AIDS. [4]  
(ii) Describe ways of reducing stigma. [2]

**2017 G.C.E QUESTION PAPER**

42. Explain how the internal parts of a leaf are adapted for photosynthesis. [12]
43. (a) Describe the production of adenosine triphosphate (ATP) during respiration. [3]  
(b) Suggest ways in which respiration is important to living things. [3]  
(c) Compare and contrast the respiratory surface of humans and fish. [6]

**2019 G.C.E QUESTION PAPER 2**

44. (a) Give examples in each case, define the following types of drugs;  
(i) Therapeutic drugs,  
(ii) Narcotic drugs,  
(iii) Recreation drugs [6]  
(b) Suggest the dangers which may result from abusing the drugs to change body image. [6]

**ANSWERS FOR SECTION A**

**ANSWERS FOR 2009 QUESTION PAPER 2 SECTION A**

1. (a) X = companion cell                      Y = phloem cell                      Z = sieve plate
- (b) (i) X: companion cells are living and supply energy to sieve tubes.  
 (ii) Y: Phloem transport food to different parts of the plant.  
 (iii) Sieve plate, this is where cells communicate with one another and dissolved food is passed through the holes during its transport through the stem.
- (c) Two conditions are:  
 - There must be two regions separated by a selectively permeable membrane.  
 - There must be a difference in concentration of solution the two sides.
2. (a) (i) 18 mg/100 cm<sup>3</sup> of blood.                      (ii) 80 mg/100 cm<sup>3</sup> of blood.                      (iii) 26 minutes
- (b) (i) because of insufficient oxygen in the body and the cells started respire anaerobically.  
 (ii) 1 - Muscle clamp.                      2 – Fatigue (tiredness).  
 (iii) - The process in heavy exercise produces lactic acid while that in yeast cells produces alcohol.  
 - The process in heavy exercise does not produce any gas while that in yeast cells produces carbon dioxide gas.
- (c) 1 – It is used in industry to make daily food product like cheese, yoghurt, etc  
 2 – It is in pharmaceutical industry to make medicine.

**ANSWERS FOR 2010 QUESTION PAPER 2 SECTION A**

3. (a)(i)

	<b>identity</b>	<b>name</b>
<b>1</b>	<b>B</b>	<b>Red blood cell</b>
<b>2</b>	<b>C</b>	<b>Motor neurone cell</b>

- (ii) - Animal cell 1: has a concave shape i.e thin at the centre and thick on its circumference.  
 - Animal cell 2: It is long structured; its length is covered with myelin sheath; one end has a nucleus and a number of dendrons.

(b) From cells A and D, name the substance found in the cells which enables it to perform its specialised function.

<b>Cell</b>	<b>Substance</b>	<b>Functions</b>
<b>A</b>	Sieve plates	Allow food to pass through these sieves from cell to the other
<b>B</b>	Cellulose	Cell wall is made up of cellulose. Cellulose makes the cell wall strong and tough to protect the inner tissues and substances of the cell.

(c) (i) Solution E.

(ii) Water molecules will stop when the solution on either side has have equal concentration (when the two solutions reach equilibrium).

(iii) Because water molecules are small molecules which can be allowed to pass through selectively permeable but large molecules are not allowed.

4. (a) (i) X                      (ii) V                      (iii) W

(b) 1- Hydrochloric acid activates enzymes (pepsin and rennin) into active enzymes and sets an acidic pH which is optimum.

2- Hydrochloric acid it kills some bacteria and hydrolyses sucrose to glucose and fructose.

(c) (i) Liver produces bile which contain bile salt that emulsify fats thereby increasing the surface area for the action of lipase.

(ii) The liver converts excess glucose in the blood to glycogen which is assimilated by the liver cells for storage.

**ANSWERS FOR 2011 QUESTION PAPER 2 SECTION A**

5. (a) A = Cytoplasm                      B = Chloroplast

(b) (i) The cell was put in a concentrated solution hence it lost its water by the process of osmosis.

(ii) Plasmolysis.

(iii) Put the cell in dilute solution (pure water).

(c) Because it is made up of cellulose which is tough i.e cell wall.

(d) (i) Animal cell has no cell wall while plant cell has a cell wall.

(ii) Most plant cells have chloroplast while and animal cell has no chloroplast.

6. (a) D = Spiracle                      E = Muscle cells

(b) Oxygen enters through the spiracles which connect to the trachea. Trachea branches into many tubes called tracheole, which eventually reaches the tissues. Movement of abdomen and wings help air to go in and out.

(c) -Movement of abdomen and wings during the process of respiration

-Flying and ground movement.

-Eating

(d) Air enters insect through spiracles while in fish it enters through gills.

In insects Gaseous exchange occurs across the walls of the tracheoles while in fish Gaseous exchange occurs across the surfaces of the gills.

**ANSWERS FOR 2012 QUESTION PAPER 2 SECTION A**

7. (a) (i) Letter **S**  
(ii) Stage **P** = Resting/sitting  
Stage **Q** = Strenuous exercise e,g running  
Stage **R** = Resting
- (b) Because the body needed more oxygen for the production of energy which is used for strenuous exercises.
- (c) - The diaphragm contracts and moves downwards (flattens)  
- External intercostal muscles contract and internal intercostal muscles relax.  
- The ribcage move upwards and outwards.  
- Volume of the lungs increases while pressure in the lungs decreases then air is drawn in.
8. (a) (i) **Figure 5.1** is small intestine (ileum) **Figure 5.2** is Duodenum  
(ii) **Figure 5.1** because it has projection in the inner lining called villi (villus).  
**Figure 5.2** Because it has a duct which opens into it.
- (b) It contains longitudinal and circular muscles that contract and relax during peristalsis and keep the food moving on its way through the digestive system.
- (c) 1- Pancreatic juice            2- Bile

**ANSWERS FOR 2014 QUESTION PAPER 2 SECTION A**

9. (a) **I** - Liver            **J** – muscle tissue
- (b)(i) Fatty acid and glycerol.            (ii) Maltase and lactase.
- (c) (i) **K** - Amino acid.  
(ii) - it is used in growth and repair of body tissues  
-It is used for making body chemicals such as hormones, enzymes, antibodies, etc.
- (d) It is produced when there is not enough oxygen in the body due to strenuous exercises like running.

**ANSWERS FOR 2015 (i) QUESTION PAPER 2 SECTION A**

10. (a) (i) **A** – Epidermal cell    **B** – Guard cell  
(ii) **C** – Chloroplast            **D** – Cytoplasm
- (b) (i) **Figure 1.1**  
(ii) During the day potassium concentration in vacuole of guard cell increases this lower the water contents in the cell sap which lead to the flow of water from epidermal cells to the guard cells. This inflow of water raises the turgor pressure inside the guard cells. The turgor pressure causes the guard cells to curve in such a way that the stoma between open.

11. (a) (i) F = Enamel                      G = Dentine
- (ii) **H** - This is a space within the dentine which is made of tooth-producing cells, nerves and blood vessels. The nerves make the tooth sensitive to stimuli such as temperature, pH and pressure. The blood vessels supply the tooth with food and oxygen
- I** - This is a bone-like tissue with fibres that anchor the tooth to the jawbone.
- (b) (i) tooth decay is brought about when sweet food particles stick in between the teeth for so long and form a plaque. A bacteria start to feed on the plaque and respire anaerobically producing an organic acid. This acid dissolves (corrodes) the enamel of teeth forming a cavity in the teeth. When cavity reaches the dentine, the tooth starts getting painful. The pain increases further when the cavity reaches the pulp cavity. This is called tooth decay.
- (ii) **1**- Brushing teeth with fluoride toothpaste after every meal  
**2** - Avoiding intake of sugary foods.
12. (a) (i) Starch /carbohydrates/glucose .
- (ii) In the leaves
- (iii) When glucose is manufactured in the leaves it is combined (converted) to sucrose which is transport from the leaves to the tuber via phloem tube by the process of translocation. In the tube sucrose combined forming starch and stored in that form.
- (b)(i) Water
- (ii) Water in the soil is absorbed by the root hair by the process of osmosis. It is taken up through the xylem vessel with the help of transpiration pull, root pressure and guttation till it reaches the leaves.

**ANSWERS FOR 2015 (ii) QUESTION PAPER 2 SECTION A**

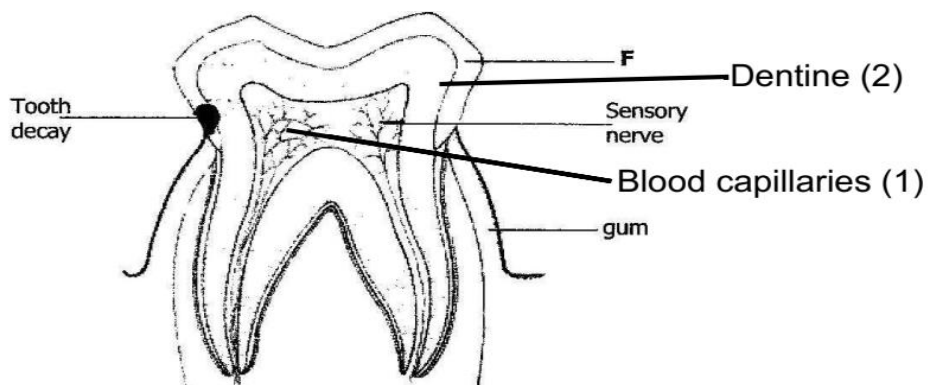
13. (a) (i) G – Eggs                      H – Second instar stage (second larva stage).
- (ii) It is increasing greatly in size. It is reducing in production of predatory maggots that feed on other maggots. It is reducing in feeding on rotting material by sucking the nutrients and moving using pads on the lower side of their bodies.
- (b)(i) Pupae Stage because its inactive and not moving just stationary hence it is every easy to kill by spraying with insecticides. At this stage it is also not being able to reproduce.
- (ii) Houseflies are vectors for pathogens that cause cholera, dysentery and typhoid.
14. (a) (i) sporangium
- (ii) The Mucor releases enzymes from its hyphae into nshima. These enzymes hydrolyze the nshima into glucose as the end product and the structure k (stolon) absorbs this end products.

- (b) (i) At **L** colour changes to blue – black and at **M** no colour changes it remained yellowish brown.  
 (c) At **L** it is because of the presence of starch and at **M** it is because of absence of starch because starch has being converted to glucose by the enzymes secreted by the Mucor.

**ANSWERS FOR 2016 G.C.E QUESTION PAPER 2 SECTION A**

15. (a) (i) Enzyme  
 (ii) to denature (kill) enzymes (catalase) in it.  
 (iii) In **experiment 2** the volume of oxygen produced is very small, this is because almost all the enzymes in the potato discs are denatured hence very minute enzyme to covert hydrogen peroxide to oxygen and water. In **experiment 3** the volume of oxygen produced is very much, this is because all the enzymes in the potato discs are converting hydrogen peroxide producing oxygen and water.
- (b) (i) More oxygen gas will be produced within very short time, this is because enzyme concentration has being increased.  
 (ii) As the temperature increases also the production of oxygen gas increases, this is because reactivity of enzyme work well at optimum temperature.
- (c) 1 – enzymes are specific in nature i.e. they have a specific substrate to catalyse.  
 2 - Their activity is affected by pH, mean some enzymes work well in acidic medium while others they don't work well in acidic medium.

16. (a) (i) Phloem cell.                      (ii) Letter B      (iii) 1 – Nucleus: Letter A      2 – Cytoplasm: Letter D  
 (b) 1- Companion cell provides energy to cell.      2 - Companion cell supply with enzymes to the cell.  
 (c) (i) Translocation.                      (ii) 1 – Sucrose.                      2 - Amino acids.
17. (a) (i) Premolar / Molar                      (ii)



- (b)(i) 1 – Calcium ion.                      2 – Phosphate ion.

- (ii) Tooth decay is brought about when sweet food particles stick in between the teeth for so long and form a plaque. A bacteria start to feed on the plaque and respire anaerobically producing an organic acid. This acid dissolves (corrodes) the enamel of teeth forming a cavity in the teeth. When cavity reaches the dentine, the tooth starts getting painful. The pain increases further when the cavity reaches the pulp cavity. This is called tooth decay.
- (iii) Using dental floss to remove food particles from teeth.

**ANSWERS FOR 2016 QUESTION PAPER 2 SECTION A**

18. (a) F – Rough endoplasmic reticulum      G – Nuclear membrane  
(b) H – this is the site where respiration takes place.  
I – It is selective permeable membrane i.e. it allow some substance to pass through it.  
(c) 1 – cell wall      2 – large vacuole
19. (a) Optimum pH.  
(b) Enzymes in **reaction K** have their optimum pH of 2.5 and when the pH of the medium raises enzymes started denaturing hence the reaction started reducing. Enzymes in **reaction M** have their optimum pH of 11 and when the pH of the medium raises enzymes started denaturing hence the reaction started reducing.  
(c) Reaction K – Stomach      Reaction M – Mouth / Duodenum  
(d) (i) Pepsin / Rennin      (ii) Protein  
(e) 1 – Temperature      2 - Inhibitors

**ANSWERS FOR 2017 QUESTION PAPER 2 SECTION A**

20. (a) (i) Mirror  
(ii) It control the amount and brightness of the light falling onto the specimen.  
(iii) Eyepiece  
(iv) This is where microscope slides with the specimen are placed.  
(v) Fine adjustment knob  
(b) 1 – Nucleus      2- Vacuole      3 – Cell wall

**ANSWERS FOR 2016 QUESTION PAPER 2 SECTION A**

21. (a) **P** – Root hair cell    **Q** – Red blood cell    **R** – Palisade cell  
(b) (i) **P** – It absorbs water by osmosis and mineral salts by active transport from the soil.

**Q** – It transport oxygen from the lungs to the site of reaction and small amount of carbon dioxide from the site of reaction to the lungs.

(ii) **P** – it has elongated outgrowth that increase the large surface area for absorption.

**Q** – It has a red pigment called haemoglobin which has a high affinity (attraction) for oxygen.

(c) In the leaves.

22. (a)(i) An enzyme is a biological catalyst i.e. it speed up metabolic reaction without itself used up.

(ii) Optimum temperature: **37 °C**.

(b)(i) At 55 OC

(ii) Because after that there is no reaction (no products formed)

(c) (i) body temperature is measured because some diseases are characterized by body temperature change.

Body temperature is measured to enable the doctor to analyze the effectiveness of treatment.

(ii) 1- By being put on the drip. 2 - By drinking a lot of water

23. (a)(i) stage 1 and stage 3

(ii) At stage 1 – by draining stagnate water. At stage 3 - by spraying all the stagnate water with insecticides.

(iii) By encouraging the community to be sleeping under a treated mosquito net.

By encouraging the community to clear (cutting/slashing) tall grass.

(b) Biological vector

(c) (i) Pathogens are disease-causing organisms, mainly microorganisms.

(ii) Plasmodium.

**ANSWERS FOR 2019 G.C.E QUESTION PAPER 2 SECTION A**

24. (a) Cell A – Hypertonic solution (Concentrated solution)                      Cell B – Hypotonic solution ( pure water)

(b) Cell A – when it was placed in hypertonic solution, the cell started losing water by osmosis. As it continue losing water the cell started to reduce in size and to shrink until it fully shrunk and this process is called cell crenation.

Cell B – when it was placed in hypotonic solution, the cell started gaining water by osmosis. As it continue gaining water the cell started to expanding in size and stretches until it burst and this process is called lysis.

25. (a)(i) C – Sporangium                      D - Sporangiphore

(ii) It grows over and into the food, digesting and absorbing nutrients.

(b) The Mucor releases enzymes from its hyphae into food. These enzymes hydrolyze the food forming the products and mycelium absorbs these products.

(c) A spore is a single cell while a zygospore is made up of two similar cells.

(d) They decompose dead organic matter, thereby preventing accumulation of dead bodies  
Some saprophytes such as yeast are important in brewing and baking

26. (a) 1 – Housefly                      2 – Mosquito

(b) F – Larva                      G – Adult insect

(c) Housefly – Eggs in rotting material (food)                      Mosquito – Eggs in stagnate water

(d) (i) Mosquito                      (ii) Housefly

(e) In order to minimize the spreading of diseases like malaria, cholera, etc.

**ANSWERS FOR 2019 QUESTION PAPER 2 SECTION A**

27. (a)(i) A – Red blood cell                      B – Palisade cell                      C – Sperm cell

(ii) Cell A – in blood vessel in blood

Cell B – Leaves

Cell C - Testis

(b) Cell B – It has a lot of chloroplast that trap light energy for photosynthesis.

Cell C – It has a tail which help in movement.

28. (a)(i) D - incisors                      E – Premolars

(ii) **D** - These are chisel-shaped used for cutting and biting.

**E** - These are broad and ridged teeth used for grinding or crushing food.

(b) Holozoic Nutrition is a type of nutrition in which an organism takes food present in the bodies of other organisms. It occurs in animals in a specialized tube called the alimentary canal and involves five stages namely ingestion, digestion, absorption, assimilation and egestion.

29. (a) (i) Letter F

(ii) Stage 1 = Resting/sitting

Stage 2 = Strenuous exercise e.g running

Stage 3 = Resting

(b) Because the body needed more oxygen for the production of energy which is used for strenuous exercises.

(c) – The diaphragm contracts and moves downwards (flattens)

- External intercostal muscles contract and internal intercostal muscles relax.

- The ribcage move upwards and outwards.

- Volume of the lungs increases while pressure in the lungs decreases then air is drawn in.

ANSWERS FOR 2009 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

30. (a) The leaves are adapted to carry out photosynthesis because they have thin lamina for easy penetration of light. They have large surface area to capture as much light as possible. They have presence of veins/vascular bundles to supply the leaf with water (the xylem) and to transport end products of photosynthesis (the phloem). In the leaves there is the presence of stomata for entry of carbon dioxide and exit of oxygen. Presence of chloroplasts to absorb light energy for photosynthesis. The highest Concentration of chloroplasts is found in the palisade cells, followed by the spongy cells and finally the guard cells.

(b)(i) Plant get nitrogen in the soil in form of nitrate ion or ammonium ions. Nitrate ion or ammonium ions is absorbed by the root hair by the process of active transport. Once the nitrate ion or ammonium ions is in the plant, the plant use nitrogen in nitrogen for synthesis of proteins and amino acids.

(ii) Plant get magnesium in the soil in form of magnesium ion. Magnesium ion is absorbed by the root hair by the process of active transport. Once the magnesium ion is in the plant, the plant uses magnesium ion for synthesis of proteins and amino acids.

(c) pH values lower or higher than the optimum pH lower enzyme activity. This is because it causes the bonds in the enzymes to be broken and the enzyme denatured. The substrate cannot fit into the active site of an enzyme to form enzyme – substrate complex.

Concentration of substrate is direct proportion on the rate of enzyme – catalysed reaction until all the active sites of the enzymes are filled up. At this point increasing the substrate concentration has no effect on the rate of enzyme – catalysed reaction.

ANSWERS FOR 2010 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

31. (a) Gaseous exchange in Insects is called tracheal system. Oxygen enters through the spiracles which connect to the trachea. Trachea branches into many tubes called tracheole and gaseous exchange occurs across the walls of the tracheoles. This is achieved by pushing their abdomens in and out.

While gaseous exchange in fish occurs across the surfaces of the gills on the gill filament structures known as gill lamellae. This happens as water enters the gill chamber of a fish through the mouth and comes out through the operculum.

**(b)** The lymphatic system is made up of lymphatic capillaries that join to form larger lymphatic vessels. The vessels finally drain into the blood system at the vena cava just before it enters the heart. The lymph move along the vessels by contraction of muscles surrounding them. The vessels have valves at intervals to prevent back flow of lymph.

Lymphocytes produced in the lymph nodes defend the body against diseases by producing antibodies and antitoxins. Lymph nodes have a network of fibres that trap bacteria which are then destroyed by the lymphocytes.

32. **(a)(i)** Factors that reduce immunity include poor diet, development of resistant strains of pathogens, repeated invasions by pathogens, intake of immuno-depressant drugs and infection by HIV that destroys the lymphocytes.

**(ii)** Immunization is important in that protects children against harmful infections before they come into contact with them in the community. Immunization uses the body's natural defense mechanism the immune response to build resistance to specific infections. Disease are being prevented by routine childhood immunization. After immunization, your child is far less likely to catch the disease if there are cases in the community, the benefit of protection against the disease far outweighs the very small risks of immunizations.

**(b)** Bilharzia (schistosemiasis) is caused by Flat worm (schistosoma mansoni). This Flat worm is transmitted by Exposure to cercaria larvae in water .Schistosoma eggs pass from patient into water and hatch into larvae .larvae bore into snail and produce other larvae .These bore into the skin of humans and become adults. Bilharzia (schistosemiasis) can be prevented and controlled by avoiding contact with infected water, destroying snail habitat, draining all stagnant water, drinking boiled water and avoiding urinating in or near water bodies.

*ANSWERS FOR 2011 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

33. **(a)** Immunity is the resistance of the body to infection due to the presence of antibodies in the blood. This is achieved by either active Immunity where the body is involved in the production of antibodies to fight infections or passive immunity where the body receives ready-made antibodies from an external source to fight infections.

**(b)** Active Immunity is a type of immunity where the body gets naturally infected and gets stimulated to produce antibodies against the infection or Introducing dead, weakened germs/ antigens into the blood stream of a person so as to stimulate production of antibodies by the body e.g. person becomes permanently immune to measles after suffered from it and BCG vaccination against tuberculosis; polio vaccine; cowpox vaccine etc.

Whereas passive immunity is a type of immunity where ready-made antibodies are introduced into the blood stream of a person through natural means such as breast feeding or across the placenta from a mother to an unborn baby to give immediate but temporal protection against particular antigens or Immune serum containing ready-made antibodies is injected into the blood stream of a person to give immediate but temporal protection against a particular antigen e.g. Anti-venom or anti-tetanus injections.

(c) Immunity reduce by having poor diet. Diet that lacks vitamins and minerals reduce the immunity.

Development of resistant strains of pathogens also reduce the immunity, repeated invasions by pathogens, intake of immuno-depressant drugs and infection by HIV that destroys the lymphocytes all these they reduce immunity of a person.

*ANSWERS FOR 2012 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

34. (a) Nutrition in a guava plant is called autotrophic nutrition meaning the guava plant makes its own food through the process of photosynthesis. This is the process by which green plants manufacture glucose from carbon dioxide and water in the presence of light energy absorbed by chlorophyll. Oxygen is produced as a by-product. This process takes place in leaves.

Nutrition in a Rhizopus fungus is called saprophytic nutrition. This is type of nutrition where an organism called the saprophyte feeds on dead and decaying organic matter known as the substrate. The saprophyte feeds by secreting extracellular digestive enzymes from its hyphae which hydrolyze the substrate and the saprophyte absorbs the end products.

(b) Saprophytic nutrition is important to the environment because ways it decompose dead organic matter, thereby preventing accumulation of dead bodies. It play a role in the recycling of nutrients such as carbon and nitrogen.

(c) Digestion in the Mouth occurs after food has been ingested into the mouth and broken down to small pieces by the process of mastication. Saliva will be secreted by the salivary glands. The Saliva cools food that is too hot and warming up food that is too cold so that its temperature is favorable for enzyme action and softens food for easy masticating. It will also lubricates food for easier swallowing and make alkaline pH is favorable or optimum for the activity of salivary amylase then the Salivary amylase starts the digestion of cooked starch to produce maltose.

ANSWERS FOR 2014 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

35. (a) Aerobic respiration is the release of a relatively high amount of energy from food substances in living cells in the presence of oxygen and producing the by-products (carbon dioxide and water).
- (b) The air pollutants that effects the health of human beings are Carbon monoxide. This gas when inhaled, it gets into the blood and combines irreversibly with haemoglobin to form carboxyhaemoglobin. This reduces the capacity of the blood to transport oxygen. This may cause breathlessness, headache and suffocation to death in humans. Babies born from mothers that have been frequently exposed to this gas have a low birth weight. The other air pollutant is Sulphur dioxide. When this gas is breathed in, it irritates the nose, throat and airways which in return causes coughing, wheezing, shortness of breath, or tight feeling around the chest.
- (c) The respiratory system has tiny muscular hair-like projections called cilia on the cells that line the airway. The cilia propel a liquid layer of mucus that covers the airways. The mucus layer traps pathogens and dust particles preventing from reaching the lungs. The alveoli has alveolar macrophages (white blood cell) on its surface. Theses white blood cells seek out deposited particles, bind to them, ingest them, kill any that are living, and digest them.
36. (a) Life cycle of a Mosquito is a complete metamorphosis. It has four stages which are are egg, larva, pupa and adult (imago). Eggs are laid in water by female mosquitoes after mating and they hatch into larvae. Larvae can swim and they feed on phytoplankton and zooplankton. They eventually develop into pupae which are a less active stage that continually undergoing internal changes. After some time, the adult insect emerges out of the pupa case.
- (b) (i) Bilharzia signs and symptoms are blood in urine, pain in lower abdomen, coughing, fever, enlargement of spleen and liver and skin itching.
- (ii) Bilharzia (schistosemiasis) is caused by Flat worm (schistosoma mansoni). This Flat worm is transmitted by Exposure to cercaria larvae in water .Schistosoma eggs pass from patient into water and hatch into larvae .larvae bore into snail and produce other larvae .These bore into the skin of humans and become adults.

ANSWERS FOR 2015 (i) QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

37. (a) Anaerobic respiration in yeast is called alcoholic Fermentation. This is the release of energy from food substances in living cells in the absence of oxygen, producing alcohol (ethanol) and carbon dioxide as by products. This process releases a relatively low amount of energy. The reaction is catalysed by an enzyme called zymase which is naturally found in yeast.

Zymase

Glucose -----> Carbon dioxide + Alcohol + Energy

(b) Yeast is important in brewing and baking in that it is the organism that is used to carry out the alcoholic fermentation. In brewing yeast is added to a paste containing sugar maltose. Yeast contains an enzyme called zymase which converts glucose to carbon dioxide and alcohol, releasing energy in the process. The alcohol is then removed from the mixture by simple distillation. In baking, flour is mixed with water, salt, sugar and yeast to form a paste called dough. When there is insufficient oxygen, zymase from yeasts acts on sugars to form carbon dioxide and alcohol. The carbon dioxide begins to form bubbles in the dough causing it to rise.

(c) Anaerobic respiration in man lactic acid is produced while that in yeast alcohol is produced. Anaerobic respiration in man no gas is produced while that in yeast carbon dioxide gas is produced. Anaerobic respiration in man an enzyme is involved to achieve the process while that in yeast an enzyme zymase is involved to achieve the process.

*ANSWERS FOR 2015 (ii) QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

38. (a) Respiration is defined as the release of energy from food substances in living cells. There is internal respiration in which energy is released inside the living cell e.g. aerobic and anaerobic respiration. The other one is external respiration in which energy is used and it occurs outside living cells e.g. breathing and gaseous exchange.

(b) Gaseous exchange in Insects is called tracheal system. Oxygen enters through the spiracles which connect to the trachea. Trachea branches into many tubes called tracheole and gaseous exchange occurs across the walls of the tracheoles. This is achieved by pushing their abdomens in and out.

While gaseous exchange in fish occurs across the surfaces of the gills on the gill filament structures known as gill lamellae. This happens as water enters the gill chamber of a fish through the mouth and comes out through the operculum.

(c) The alveolus has the following features which are large surface area to maximize the exchange of gases, moist surface because gases need to dissolve before they can diffuse across a surface, thin surface to minimize the distance of diffusion so that there is faster diffusion, close association with a transport system to transport the gases to and from the gaseous exchange surface, thereby maintaining a constant diffusion gradient for the gases and well-ventilated to maintain a constant diffusion gradient.

ANSWERS FOR 2016 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

39. (a) the alveolus has the following features which are large surface area to maximize the exchange of gases, moist surface because gases need to dissolve before they can diffuse across a surface, thin surface to minimize the distance of diffusion so that there is faster diffusion, close association with a transport system to transport the gases to and from the gaseous exchange surface, thereby maintaining a constant diffusion gradient for the gases and well-ventilated to maintain a constant diffusion gradient.

(b) In inspiration, external intercostal muscles contract, internal intercostal muscles relax, the ribs are pulled upwards and outwards, the diaphragm muscles contract, pulling the diaphragm down thus causing it to flatten. The volume of the chest cavity increases and pressure reduces. Air is then forced in to the lungs from the outside. Exchange of gases takes place along a diffusion gradient i.e. oxygen diffuses into the blood and carbon dioxide out of the blood capillaries into the alveolus.

ANSWERS FOR 2016 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

40. (a) (i) During the day gaseous exchange in plants occurs in the spongy layer of the leaf because photosynthesis is actively taking place and a plant leaf takes in carbon dioxide and releases oxygen.

(ii) At night the plant leaf takes in oxygen and releases carbon dioxide. This is because respiration is the only process taking place at night.

(b) Yeast is used in brewing and baking in that it is the organism that is used to carry out the alcoholic fermentation. Yeast contains an enzyme called zymase which converts glucose to carbon dioxide and alcohol, releasing energy in the process. The alcohol is then removed from the mixture by simple distillation. In baking, flour is mixed with water, salt, sugar and yeast to form a paste called dough. When there is insufficient oxygen, zymase from yeasts acts on sugars to form carbon dioxide and alcohol. The carbon dioxide begins to form bubbles in the dough causing it to rise.

Bacteria are used in the production of fermented milk products like yoghurt, cheese and butter. Also production of sour milk is through fermentation of fresh milk under anaerobic respiration. Bacteria are used in sewage treatment during the secondary stage of treatment, sewage is treated by aerobic and anaerobic micro-organisms. This removes organic wastes and harmful substances.

(c) The layer of saliva and mucus over the teeth contains bacteria which live on the food residues in the mouth and build up a coat called plaque. If the plaque is not removed, mineral salts of calcium and magnesium are deposited in it, forming a hard layer of tartar. If this is not removed, then the bacteria plaque will spread down the tooth into the narrow gap between the gum and enamel. Here it will cause inflammation which leads to redness and bleeding of the gums and to bad breath. It also causes the gums to recede and expose the

cement. If this is not treated it progresses to gum disease and the fibres holding the tooth in the jaw are destroyed, so the tooth becomes loose and falls out.

41. (a) HIV can be transmitted from one person to another through sexual intercourse in semen or vaginal secretions, sharing needles during intravenous drug use, in hospitals when carrying out blood transfusion, in some cases the blood is infected with the virus or blood products that contained HIV, though this is much reduced now because of knowledge of transmission. The HIV virus can be transmitted from the blood of an infected female to foetus during pregnancy or delivery (mother to child transmission). The HIV can also be transmitted through organ transplants from an infected donor and sharing toothbrushes, shaving blades or nail cutters with infected person.

(b) (i) The lack of information and awareness combined with outdated beliefs lead to people to fear getting HIV. Many people think of HIV as a disease that only a certain groups get which leads to negative judgment about people living with HIV. There is Lack of support groups. The groups that support HIV programs for health worker to provide information to people living with HIV are not supporting. Another cause of stigma is lack of information on the available services.

(ii) Providing them with ARVs which help to slow down the advancement of the condition. Loving them and responding to their needs. Counselling them to stop behavior that could worsen their conditions. Not discriminating them. Avoid branding them as walking corpses, denying them education and health services, chasing them away from home, hiding them from public and refusing to share rooms or utensils with them.

ANSWERS FOR 2017 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

42. The leaf has thin lamina for easy penetration of light energy for photosynthesis. It has large surface area to capture as much light as possible. Presence of veins/vascular bundles to supply the leaf with water (the xylem) and to transport end products of photosynthesis (the phloem). Presence of stomata for entry of carbon dioxide and exit of oxygen. Presence of chloroplasts to absorb light energy for photosynthesis. The highest concentration of chloroplasts is found in the palisade cells, followed by the spongy cells and finally the guard cells.

43. (a) Adenosine triphosphate (ATP) is produced by using energy from respiration to synthesize it. This is done by combining adenosine diphosphate (ADP) and inorganic phosphate as shown below;

Adenosine diphosphate + inorganic phosphate → Adenosine triphosphate

(b) Respiration is important for Muscle contraction, e.g, laughing, walking, eating, blinking and playing. Active transport of substances across the plasma membranes. Transmission of nerve impulses, e.g, hearing, seeing and feeling. Cell division, e.g, new cells used for growth and repair of worn out tissues.

(c) The respiratory surface of humans is an alveolus which has the following features which are large surface area to maximize the exchange of gases, moist surface because gases need to dissolve before they can diffuse across a surface, thin surface to minimize the distance of diffusion so that there is faster diffusion.

The respiratory surface of fish are the gills. The gills consists of a long curved bone called the gill bar and a double row of filaments attached to the bar. Each filament has numerous vertical plates called lamellae which contains a network of capillaries. The gills also have structures called gill rakers. Gill rakers trap solid particles and prevent them from reaching the delicate gill filaments. The gill is also protected by a bony plate called operculum which also controls movement of water in and out.

ANSWERS FOR 2019 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

44. (a) (i) *Therapeutic drugs* are drugs that are used to treat diseases because they interact with receptors or enzymes in the cells to promote healthy functioning and reduce or cure illness e.g. gentamicin, lithium citrate, digoxin
- (ii) *Narcotic drugs* are drugs that are used to treat moderate pain by binding on opioid receptors in the central nervous system and are addictive affecting the mood or behavior e.g. opium, heroin, etc.
- (iii) *Recreation drugs* are chemical substances taken for enjoyment or leisure purposes rather than for medical reactions e.g. alcohol, tobacco and caffeine.
- (b) Drug abuse increase the risk of cardiovascular diseases such as hypertension and coronary heart disease. They have severe withdrawal symptoms e.g. vomiting, diarrhea and dizziness. Uncontrolled shaking (delirium tremens) and hallucinations in some cases. Slowing down the transmission of nerve impulses, thereby slowing down reactions to stimuli. Drug abuse brings social problems such as crime and prostitution committed by addicts who need money for the drugs.

THE END OF GRADE 10 WORK IS THE  
BEGNNING OF GRADE 11 WORK

## SECTION A SHORT ANSWER QUESTIONS

### 2009 QUESTION PAPER 2

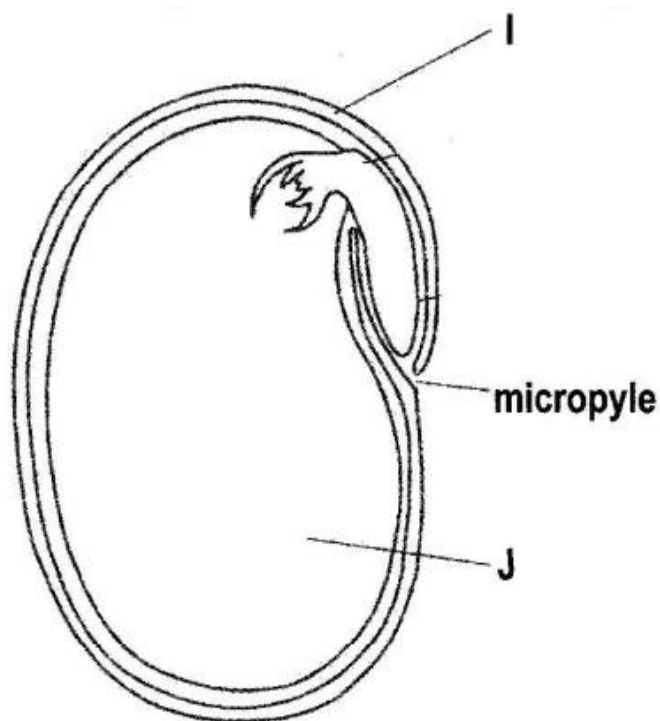
1. (a) Complete the **Table 3.1**, by filling in the blank spaces. [4]

	HORMONE	SOURCE	ACTION
<b>(i)</b>		Ovary	Begins rebuilding the lining of the uterus
<b>(ii)</b>	Thyroxin	Thyroid gland	
<b>(iv)</b>		Adrenal gland	

- (b) What happens to the hormones after completing their action in target organs? [1]
- (c) State **two** ways in which hormones and nerve impulses differ in controlling body processes? [2]

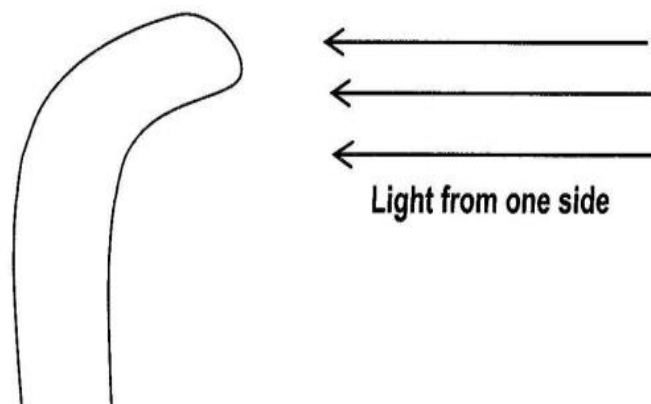
### 2010 QUESTION PAPER 2

2. Figure 3.1 shows a longitudinal section through a bean seed.



- (a) Identify the parts labelled **I** and **J**. [2]
- (b) Describe the role of the micropyle and structure **J**. [2]

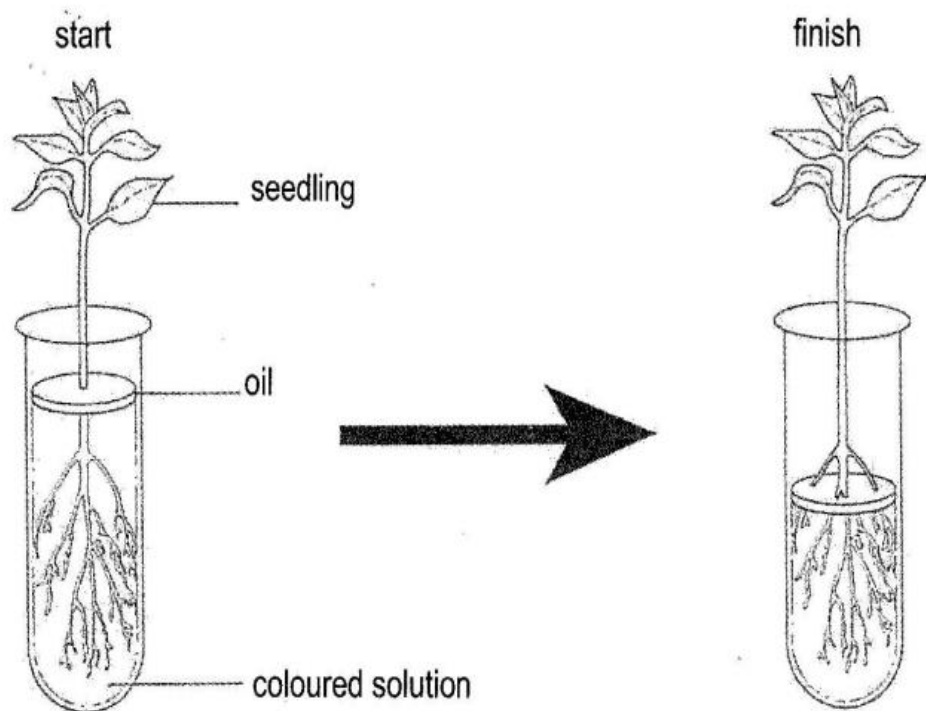
(c) Figure 3.2 shows the position of the plumule after exposure of a seedling to one sided light for five days.



- (i) Explain the effects of one sided light on the tip of the Plumule. [2]
- (ii) What is the benefit of this effect to the seedling? [2]

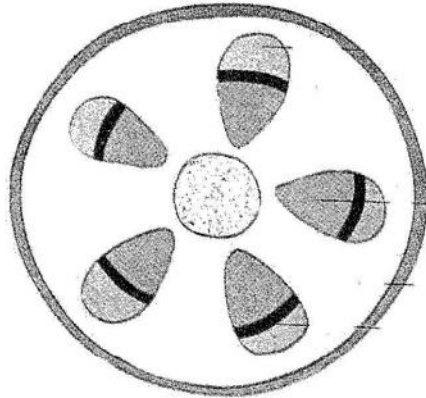
**2011 QUESTION PAPER 2**

3. **Figure 2.1** shows an experiment to investigate the movement of coloured solution in a slant.



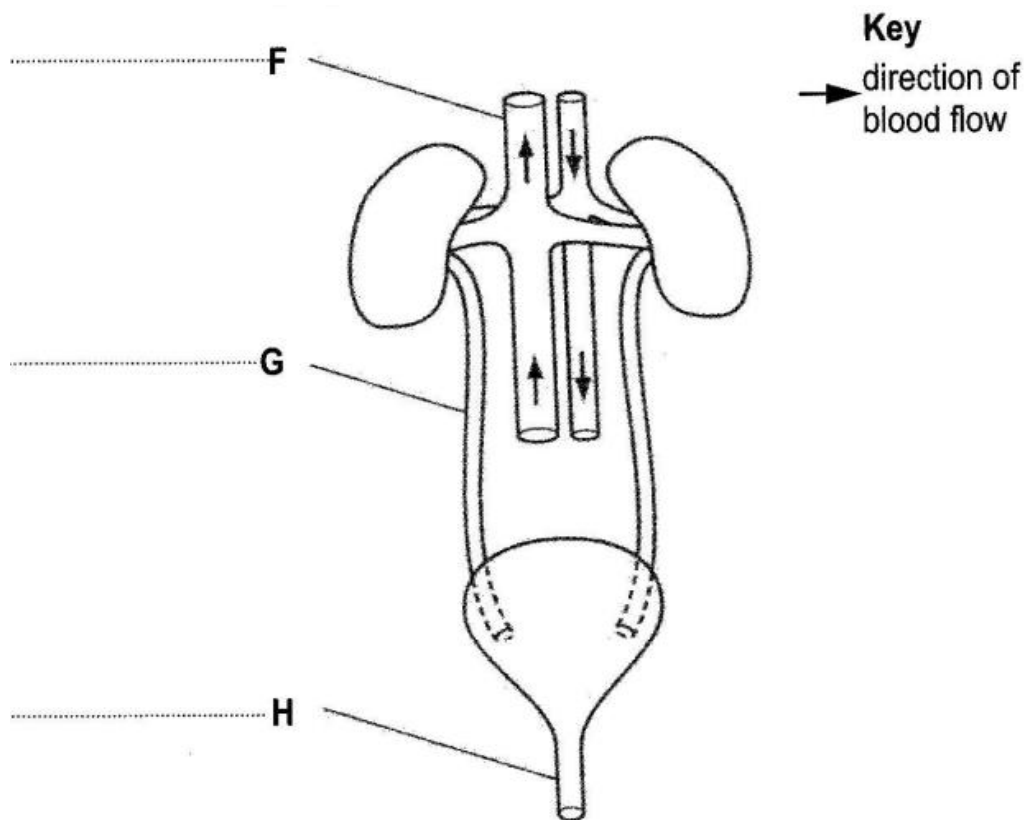
- (a) Name the process by which [1]
  - (i) Water in the solution was absorbed by the plant. [1]
  - (ii) Coloured solute in the solution was absorbed by the plant. [2]
- (b) Why was oil put on top of the coloured solution? [1]

(c) *Figure 2.2* shows the cross section of the stem obtained from *Figure 2.1* at the end of the experiment.



- (i) Using the letter **X**, label the part on the figure which was stained by the dye. [1]
- (ii) Identify the part you have labelled **X** on the *Figure 2.2*. [1]
- (iii) Name **two** substances transported by part **X** and give **one** function for each. [2]

4. *Figure 4.1* shows the urinary system and its blood supply.



- (a) *On Figure 4.1* label structures **F**, **G** and **H**. [3]
- (b) State **two** processes that are involved in urine formation. [2]

(c) **Table 4.1** shows the relative quantities of several substances in the blood in the renal artery and renal vein.

Substance	Relative quantities in blood in renal artery (arbitrary units)	Relative quantities in blood in renal vein (arbitrary units)
Glucose	10.0	9.5
Oxygen	100.0	40.0
Sodium salts	32.0	27.0
Urea	6.0	2.5
Water	180.0	175.0

Explain what happens in the kidney to bring about the changes in the relative quantities of

- Glucose.....
- Oxygen.....
- Sodium salts.....
- Urea.....[4]

**2012 QUESTION PAPER 2**

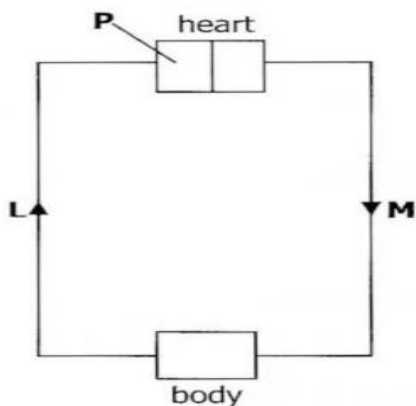
5. (a) The table below shows the blood groups in human beings.

A	B	AB	O
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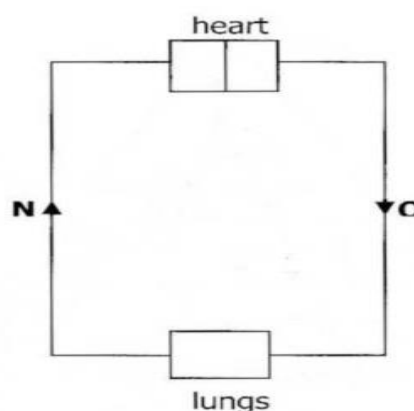
- (i) Which **two** blood groups exist in two different forms? [2]
- (ii) Which blood group can be donated to any person? [1]
- (iii) Which blood group can receive any other group of blood? [1]
- (b) Outline the five steps involved in blood clotting. [5]

**2014 QUESTION PAPER 2**

6. **Figures 3.1** and **3.2** show part of the circulatory system in humans.

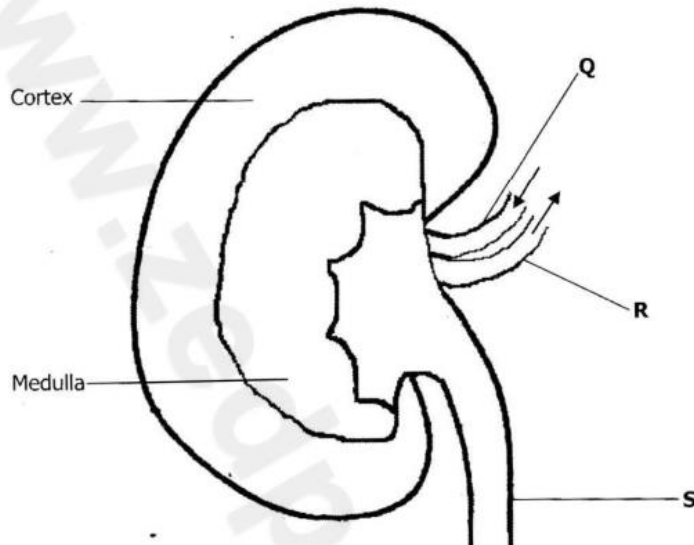


**Figure 3.1**



**Figure 3.2**

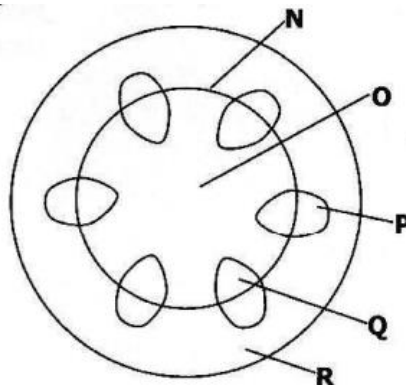
- (a) Identify the **two** types of circulation illustrated in *Figures 3.1* and *3.2*. Figure. [2]
- (b) (i) Suggest the names of blood vessels labelled **M** and **O** in **figure 3.1** and **3.2**. [2]
- (ii) State **two** differences between blood vessels **M** and **O**. [2]
- (c) State the name of the heart chamber labelled **P** in *Figure 3.1*. [1]
- (d) State **two** blood disorders found in humans. [2]
7. *Figure 4.0* shows the longitudinal section through a human kidney.



- (a) (i) Identify the blood vessels labelled **Q** and **R**. [2]
- (ii) State two waste substances that are likely to be present in the liquid which pass through the structure labelled **S**. [2]
- (b) State **two** processes that occur in the kidney during urine formation. [2]
- (c) (i) Suggest **two** methods of how a person with kidney failure may live a normal life. [2]
- (ii) State the hormone that affects osmoregulation in the kidney. [1]

**2016 QUESTION PAPER 2**

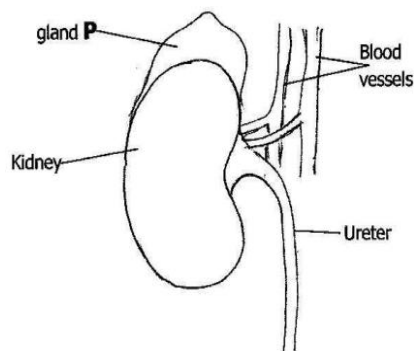
8. **Figure 3.1**. Shows a cross-section through a stem of a plant which had been previously dipped in a red dye for 6 hours.



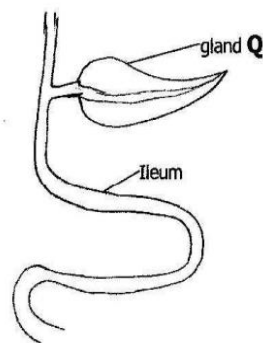
- (a)(i) Identify the parts labelled **N**, **P** and **Q**. [3]  
 (ii) Which labelled part in **Figure 3.1** would be stained red? [1]  
 (iii) Give a reason for your answer in (a)(ii) above. [1]  
 (b) (i) Suggest **three** factors that would increase the rate of movement of the dye in the stem when it is dipped in the red dye. [3]  
 (ii) Name the process that will cause the movement of the red dye in the stem. [1]

**2017 G.C.E QUESTION PAPER 2**

9. **Figure 2.1** and **2.2** show two endocrine glands labelled **P** and **Q** respectively.

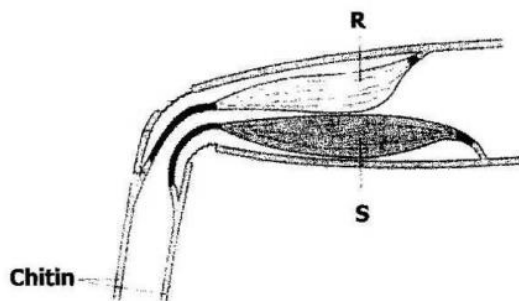


**Figure 2.1**



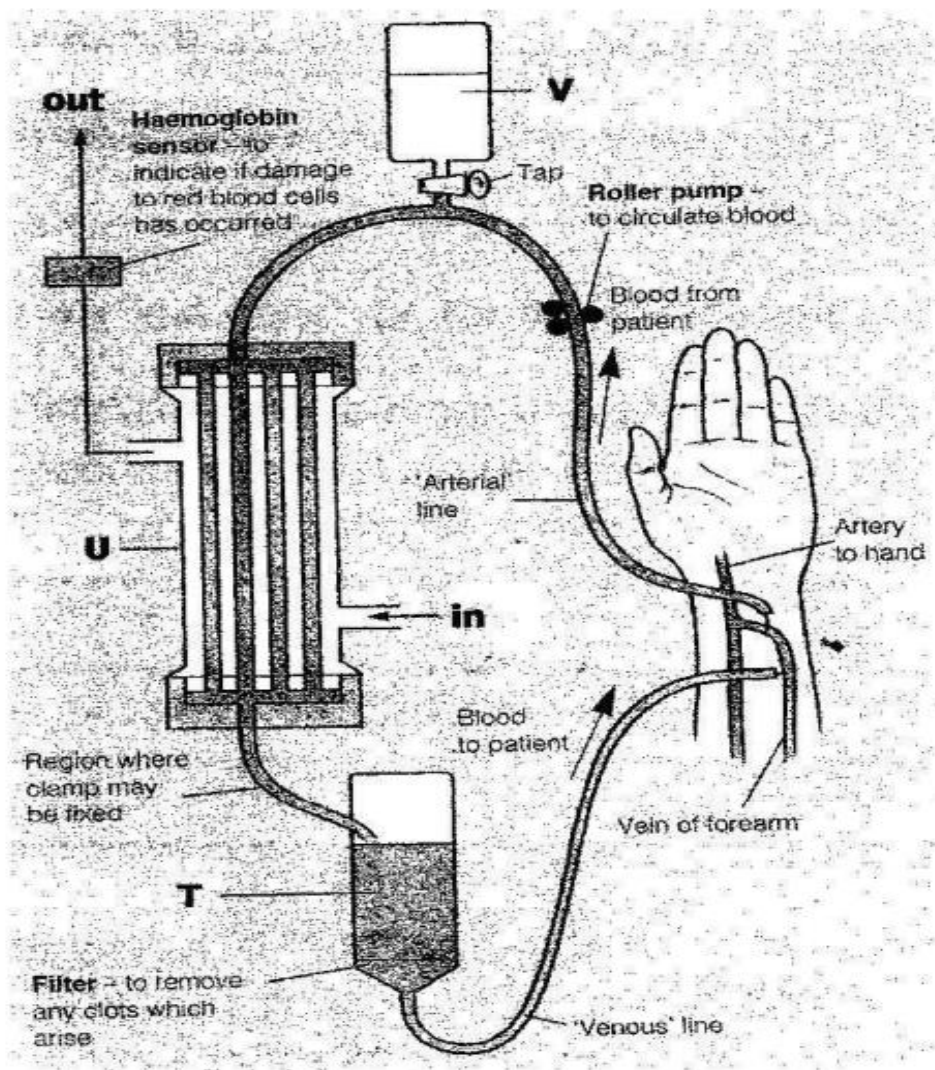
**Figure 2.2**

- (a) (i) Identify the endocrine glands **P** and **Q**. [2]  
 (ii) State **one** hormone produced by each gland. [2]  
 (iii) Explain how the hormone produced by gland **P** stated in (a) (ii) above plays a role in coordination. [3]  
 (b) Explain the other role played by gland **Q** apart from producing hormones. [2]  
 10. **Figure 3.0** shows the muscles in a bent limb in a grasshopper.



- (a) Identify muscles **R** and **S**. [2]  
 (b) In order to straighten the limb what happens to muscle **R** and **S**? [2]  
 (c) State the term used to refer to the action of muscle **R** and **S**. [1]  
 (d) Identify the type of skeleton shown in **figure 3.0**. [1]  
 (e) State **three** functions of the skeleton in **figure 3.0**. [3]

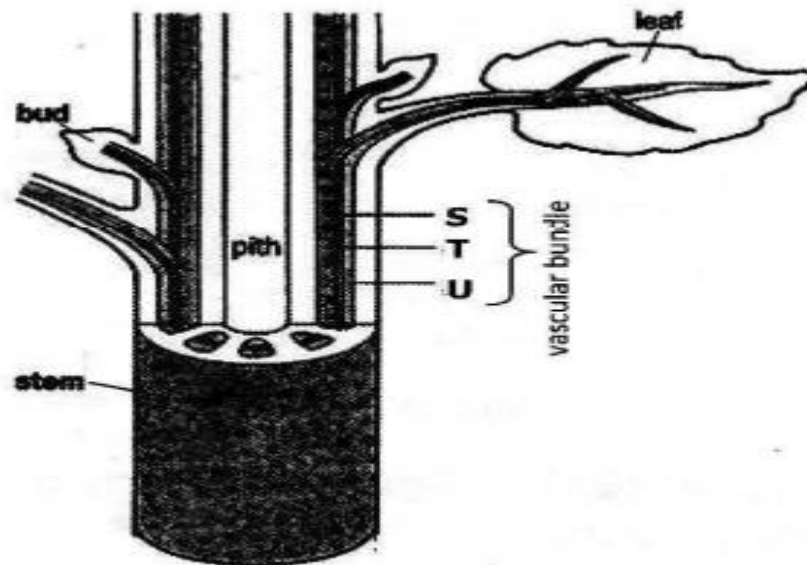
11. **Figure 4.0** shows the process involved in using a dialysis machine by a patient suffering from kidney failure.



- (a) (i) Which of the labelled parts **V**, **U** and **T** is the dialysis machine? [1]
- (ii) Which labelled parts, **V**, **U** and **T** removes gas bubbles to prevent air lock? [1]
- (b) Suggest **two** reasons why both tubes, to and from the dialysis machine are connected to the vein and not the artery. [2]
- (c) Explain how important nutrients like glucose, amino acids and salts are prevented from leaving blood in the dialysis machine. [2]
- (d) State **two** disadvantages of using a dialysis machine by patients with kidney failure, [2]
- (e) Suggest **one** other method of treatment of kidney failure in a patient. [1]

**2017 QUESTION PAPER 2**

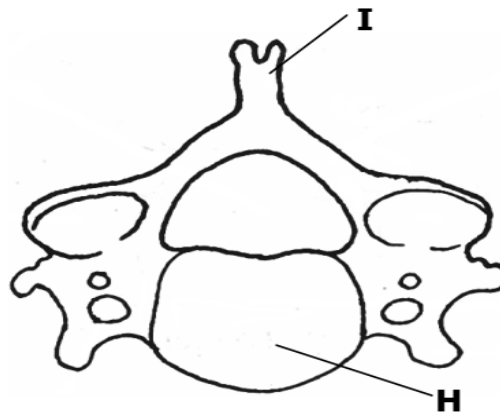
12. **Figure 4.0** shows the longitudinal section of a stem.



- (a) (i) Which letters in **figure 4.0** correspond to cambium, xylem and phloem? [3]  
 (ii) Explain the functions of S and T in the plant. [4]
- (b) (i) Which letter corresponds to the structure which needs companion cells to function properly?  
 (ii) Which letter in **figure 4.0** corresponds to a structure in which substances can either move up or down? [1]

**2019 G.C.E QUESTION PAPER 2**

13. Figure 4.1 shows a vertebra of mammal



- (a) Identify the parts labelled H and I. [2]
- (b) (i) In which region of the vertebral column is this vertebra found? [1]  
 (ii) Give a reason for your answer in (b) (i) above. [1]
- (c) State the total number of vertebrae in the region of the vertebral column identified in (b)(i) above. [1]
- (d) State **two** other types of vertebrae found in the vertebral column and their location. [2]

## SECTION B ESSAY QUESTIONS

### 2009 QUESTION PAPER 2

14. (a) (i) Explain the role of the kidney in excretion. [3]  
 (ii) Explain the role of the kidneys in homeostasis. [3]  
 (b) Describe the disadvantages of a kidney transplant. [3]  
 (c) Explain why there is limited excretion of nitrogenous wastes and salts in plants. [3]
15. (a) What is the importance of the following in relation to blood?  
 (i) Leukemia [1]  
 (ii) Sickle cell anaemia [1]  
 (b) Explain the role of house flies in disease transmission. [2]  
 (c) Discuss the cause, signs, symptoms and prevention of malaria. [8]
16. (a) (i) Explain the importance of transpiration. [3]  
 (ii) Explain how **two** named environmental factors affect the rate of transpiration. [4]  
 (b) Describe the role of blood in transporting materials in the body. [5]

### 2010 QUESTION PAPER 2

17. (a) Explain the meaning of the following terms:  
 (i) positive geotropism  
 (ii) phototropism [4]  
 (b) Distinguish between a tropic response and a tactic response. [4]  
 (c) Outline the path taken by an impulse through a spinal reflex arc. [4]
18. (a) Explain the following terms  
 (i) Transpiration pull  
 (ii) Translocation  
 (iii) Guttation [6]  
 (b) Describe how a simple potometer can be set up and used to show transpiration. [6]

### 2011 QUESTION PAPER 2

19. (a) What is meant by the term hormone? [2]  
 (b) Describe the function of auxins in plants. [4]  
 (c) Relate the effects of auxins in geotropism. [6]

20. (a) Describe the structure of a synovial joint and explain the functions of its parts. [6]  
(b) Differentiate the following:  
(i) Tendon and ligament.  
(ii) Ball-and-socket joint and hinge joint. [6]

**2012 QUESTION PAPER 2**

21. (a) Explain the process of transpiration. [4]  
(b) Describe **three** environmental factors which affect transpiration. [6]  
(c) Relate the significance of transpiration to plants and the environment. [2]
22. (a) Using the auxin theory, explain the effects of light coming from one direction on the growth of shoots. [6]  
(b) Describe the term taxic responses with named examples. [6]

**2014 QUESTION PAPER 2**

23. (a) Explain what is meant by the term positive phototropism. [2]  
(b) Explain the effects of gravity on the plumule and radical in a germinating seed. [4]  
(c) Compare and contrast the hormones adrenalin and glucagon. [6]
24. (a) Distinguish between a ball-and-socket joint and a hinge joint. [2]  
(b) Describe the action of antagonistic muscles in the straightening and bending of the arm. [4]  
(c) Differentiate between the thoracic and lumbar vertebrae in human beings. [6]

**2015 (i) QUESTION PAPER 2**

25. (a) Explain the functions of the following parts in the human ear.  
(i) Eustachian tube  
(ii) Cochlea [5]  
(b) Distinguish between the sensory neurone and the motor neurone. [3]  
(c) Describe the pupil reflex action in humans. [4]
26. (a) What is meant by excretion? [2]  
(b) Explain how the following substances are excreted from the body.  
(i) Carbon dioxide  
(ii) Urea [10]

**2015 (ii) QUESTION PAPER 2**

27. (a) Explain the term homeostasis [2]  
(b) Discuss the role of the liver in homeostasis. [10]
28. (a) Describe the process of seed germination. [9]  
(b) Explain how auxins affect the growth of shoots. [3]
29. (a) Explain what is meant by double circulation in humans? [2]  
(b) Distinguish between the two parts of the double circulation. [3]  
(c) Discuss the transport functions of blood. [7]

**2016 G.C.E QUESTION PAPER 2**

- 30 (a) (i) Explain the causes of coronary heart disease. [8]  
(ii) Discuss how coronary heart disease can be prevented. [2]  
(b) Describe the functions of lymph nodes in disease prevention. [2]

31. The following are parts associated with the skeletal system.

- 1 Vertebrae column
- 2 Skull
- 3 Skeletal muscle

Describe

- (a) their characteristics. [6]  
(b) their functions. [6]
32. (a) What is meant by tropic response? [2]  
(b) Discuss the role of auxins in a  
(i) shoot receiving light from one side. [5]  
(ii) radicle growing horizontally. [5]
- 33 (a) Explain how flowering plants get rid of excess and unwanted substances from their bodies [4]  
(b) Discuss the importance of homeostasis in mammals. [8]

**2016 QUESTION PAPER 2**

34. (a) (i) Describe the structure and functions of endocrine glands. [3]  
(ii) Explain the difference between the adrenal gland and the salivary gland. [3]  
(b) Explain the function of the following hormones in the body:  
(i) Insulin [3]  
(ii) Antidiuretic hormone (ADH) [3]

35. (a) State the parts of a synovial joint and explain their functions. [6]  
(b) Explain why a bone is considered a living tissue. [3]  
(c) Explain the action of antagonistic muscles of the eye when one moves from a dark room into bright light. [3]

**2017 G.C.E QUESTION PAPER 2**

36. (a) Explain why  
(i) Persons with blood group **AB** are referred to as universal recipients. [4]  
(ii) A person with blood group **A** cannot donate blood to a person with blood group **B**. [4]  
(b) Explain the importance of taking **named** precautions before blood transfusion can be done. [4]

**2019 G.C.E QUESTION PAPER 2**

37. (a) Define homeostasis. [2]  
(b) Briefly explain the role of the following organs in homeostasis;  
(i) Kidney  
(ii) Liver [4]  
(c) Describe when and how the skin reduces loss of heat from the body. [6]
38. (a) Distinguish between open and closed blood circulatory systems. [3]  
(b) Giving named examples, explain the terms single and double circulation. [4]  
(c) Compare and contrast the structure and functions of arteries and veins. [5]

**2019 QUESTION PAPER 2**

39. (a) Explain the process of transpiration. [2]  
(b) Describe **three** environmental factors which affect transpiration. [6]  
(c) Relate the significance of transpiration to plants and the environment. [4]
40. (a) Describe the functions of the main components of blood. [8]  
(b) Explain sickle cell anaemia and haemophilia as blood disorders in a human being. [4]

## ANSWERS FOR SECTION A

### ANSWERS FOR 2009 QUESTION PAPER 2 SECTION A

1. (a)

	HORMONE	SOURCE	ACTION
(i)	<i>Progesterone</i>	Ovary	Begins rebuilding the lining of the uterus
(ii)	Thyroxin	Thyroid gland	<i>Regulate the rate of metabolic reaction.</i> <i>Increase effect of GH to ensure normal growth and mental development</i>
(iv)	<i>Adrenaline</i>	Adrenal gland	<i>Readiness in fight or flight by helping the body increases metabolic activities.</i>

(b) They are taken to the liver and deaminated/destroyed.

(c) **1-** Nerve impulses responses are localized while hormones responses are widespread and affect more than one target organ.

**2-** Nerve impulses responses are often quick while hormones responses are either quick (e.g. for adrenaline or slow (e.g. for sex hormones).

### ANSWERS FOR 2010 QUESTION PAPER 2 SECTION A

2. (a) I – Testa (seed coat). J – Cotyledon.

(b) *Role of Micropyle:* It admits water when the seed start germinating.

*Role of structure J:* It is a seed leaf which contain food reserves.

(c)(i) The light shining one sided it makes the auxins to accumulate on dark opposite side. This makes cells on this side to grow faster than cells on right side hence the shoot will start to bend to side towards light.

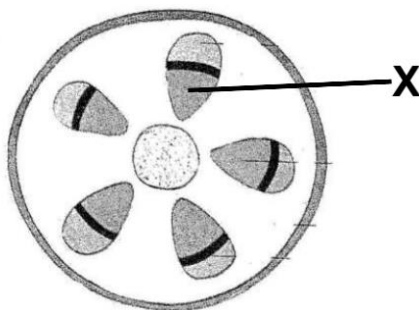
(ii) Makes the auxins accumulated on the underside of the shoot which increases cells elongation and causes the shoot to grow upward. On the other hand auxins accumulation on the underside of radicle which reduces cell elongation and causes downward growth.

ANSWERS FOR 2011 QUESTION PAPER 2 SECTION A

3. (a)(i) Osmosis (ii) Active transport

(b) To prevent the loss of water by evaporation.

(c) (i)



(ii) Xylem vessel (iii) 1 – water 2 – Mineral salts

4. (a) F – Vena cava G – Ureter H – Urethra

(b) 1 – Ultrafiltration / Pressure filtration. 2 - Selective reabsorption.

(c) *Glucose* – 80% of it is reabsorbed back into the blood by the process of selective reabsorption in the proximal and distal convoluted tubules.

*Oxygen* – it used for the production of energy by the process of respiration.

*Sodium salts* – excess are filtered and the rest are reabsorbed.

*Urea* - 90% of it is filtered and never reabsorbed back in the blood.

ANSWERS FOR 2012 QUESTION PAPER 2 SECTION A

5. (a) (i) Blood group A and Blood group B (ii) Blood group O (iii) Blood group AB

(b) 1 - Platelets are exposed to damaged/injured body.

2 - Platelets release an enzyme called thromboplastin.

2 - Thromboplastin converts inactive prothrombin to an active form called thrombin.

3 - Thrombin converts a plasma protein called fibrinogen into an insoluble form called fibrin.

4 – Fibrin forms a mesh (net) over the wound and form a clot over the wound.

ANSWERS FOR 2014 QUESTION PAPER 2 SECTION A

6. (a) *Figures 3.1* – Systematic circulation. *Figures 3.2* – Pulmonary circulation

(b)(i) *Blood vessel M* - Aorta *Blood vessel O* – Pulmonary artery

(ii) *Blood vessel M* is thicker than *Blood vessel O*.

*Blood vessel M* takes the blood from left ventricle to the body while *Blood vessel O* carries blood from right ventricle to the lungs.

- (c) Heart chamber P – Right atrium  
(d) 1 – Leukaemia                      2 - Haemophilia
7. (a) (i) Q – Rena artery                      R – Renal vein  
(ii) 1 – Urea                      2 – Excess mineral salts
- (b) 1 - Pressure filtration / Ultrafiltration    2 – Selective reabsorption
- (c)(i) 1 – Through kidney transplant                      2 – by using a dialysis machine  
(ii) Antidiuretic hormone (ADH)

*ANSWERS FOR 2016 QUESTION PAPER 2 SECTION A*

8. (a) (i) N – Cambium layer                      P – Phloem vessel                      Q – Xylem vessel.  
(ii) Part labelled Q.  
(iii) Because Part labelled Q transport water and mineral salts of which red dye is made of.
- (b)(i) 1 – High temperature                      2 – Low humidity                      3 – high speedy wind  
(ii) Transpiration

*ANSWERS FOR 2017 G.C.E QUESTION PAPER 2 SECTION A*

9. (a) (i) P – Adrenal gland                      Q – Pancreas  
(ii) P – Produces adrenaline hormone. Q – Produces glucagon hormone / insulin hormone.  
(iii) Hormone produced by gland labelled P diverts blood from the changing of glycogen to glucose, thereby increasing glucose levels in the blood to be used for gut to the muscles by constricting the blood vessels of the gut and dilating the blood vessels of the muscles. It dilates the pupils in the eyes for increased alertness. It increases the sensitivity of the nervous system for faster response to stimuli.
- (b) The gland Q plays a role in digestion by secreting pancreatic juice which contains an enzyme pancreatic amylase that breaks down starch to maltose.
10. (a) Muscle R – Flexor muscle                      Muscle S – Extensor muscle.  
(b) Muscle R relax while muscle S contract.  
(c) Antagonistic action.  
(d) Exoskeleton  
(e) 1 - The skeleton gives an insect the structure and the shape of its body.  
2 – The skeleton supports the body of an insect by holding it upright.  
3 – The skeleton provides places of attachment of muscles and when they contract and relax an insect move from one place to another.

11. (a) (i) The belled part U (ii) labelled part T
- (b) 1 – Because veins are often more superficial and close to the surface than arteries.  
2 – Connecting it to an artery blood can pool back the needle because blood in the artery moves at high pressure.
- (c) As the filtrate is passing through the proximal and distal tubule important nutrients are reabsorbed back in the blood by the process of selective reabsorption.
- (d) 1 - Dialysis machine may require a lengthy session in hospital, three times a week, leaving the patient very tired after each session.  
2 - Dialysis machines are expensive to buy and maintain.
- (e) Kidney transplant

ANSWERS FOR 2017 QUESTION PAPER 2 SECTION A

12. (a)(i) cambium – letter T, xylem – Letter S, phloem – Letter U  
(ii) Letter S – It transport water and mineral salts and support the plant mechanically  
Letter T – It carries out cell division to produce new cells, including xylem and phloem cells.
- (b)(i) Letter U (ii) Letter U

ANSWERS FOR 2019 G.C.E QUESTION PAPER 2 SECTION A

13. (a) I – Neural spine H – Centrum
- (b)(i) Neck region  
(ii) Because of absent of transverse process and small neural spine in atlas.
- (c) Seven (7) vertebrae
- (d) Name of vertebrae location
- |                              |                                 |
|------------------------------|---------------------------------|
| 1- <u>Thoracic vertebrae</u> | <u>Chest region</u>             |
| 2 - <u>Lumbar vertebrae</u>  | <u>Abdominal region or loin</u> |
| 3 - <u>Sacral vertebrae</u>  | <u>Hip region</u>               |

ANSWERS FOR 2009 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

14. (a)(i) The kidney filter out small molecules from the blood like water, mineral salts, glucose and urea from the glomerulus into the Bowman’s capsule as glomerular filtrate by the process of ultrafiltration. The kidney reabsorbs useful substances like some water, mineral salts and all glucose from the glomerular filtrate in the renal tubule into the blood stream by the process of selective reabsorption. The kidney also regulate water levels in body fluids by Osmoregulation.

(ii) The kidney regulate water levels in body fluids and this takes place in the loop of Henle. If the body has little water in it, a hormone called antidiuretic hormone (ADH) also called vasopressin is secreted by the pituitary gland in the brain. It causes water to be absorbed from the glomerular filtrate into the surrounding cells. This results in the production of small volumes of concentrated urine. But if the body has enough water, ADH is not secreted and huge volumes of dilute urine are produced.

(b) Transplants require a suitable donor with a good tissue match. The donor may be from a dead person, or from a close living relative who is prepared to donate a healthy kidney. The operation is very expensive. There is a risk of rejection of the donated kidney – immunosuppressive drugs have to be used. Transplants are not accepted by some religions.

(c) Plant excrete limited nitrogenous wastes and salts because large quantity is used by the plant for growth. Plants also they do not have a well-developed excretory system to remove nitrogenous waste and salts. Plants they do undergo metabolic reactions that can produce nitrogenous waste hence they have limited nitrogenous substance.

**15. (a) (i)** Leukaemia is a type of cancer found in blood and bone marrow and is caused by rapid production of abnormal white blood cells that do not fight infections.

(ii) Sickle cell anaemia is inherited condition in which the haemoglobin of the red blood cells changes to half-moon or sickle shaped.

(b) Houseflies are mechanical vectors that carries pathogens that cause cholera, dysentery and typhoid on the external surface of its body.

(c) Malaria is caused by a protozoon called Plasmodium which is transmitted to human through a bite from female Anopheles mosquito.

Malaria's signs and symptoms are Headache; fever; anaemia (tiredness); pain in muscles and joints; shivering and sweating.

Malaria can be prevented by controlling or killing of mosquitoes; preventing mosquito bites. Draining and spraying all stagnant pools of water to eliminate eggs, larvae and pupae of mosquito. Use of insecticide – treated mosquito nets to trap and kill adult mosquitoes. Clearance of bushes and tall grass where adults normally live before entering houses. Physical killing of adult mosquitoes.

**16. (a) (i)** Transpiration it helps to cool the leaves, especially in hot conditions. It ensures that there is a continuous flow of water to the leaves for photosynthesis and to keep the cells of the leaves moist. Transpiration provides a pathway for transporting mineral salts through the plant. Transpiration releases water vapour into the air to continue the water cycle.

(ii) Humidity: this is the amount of water vapour in the atmosphere. The higher the humidity, the lower the transpiration rate because high humidity lowers the concentration gradient between the leaf and the atmosphere.

Wind: wind is moving air. The higher the wind speed, the greater the rate of transpiration. When the air is still, a layer of water vapour forms over the leaf and reduces the transpiration rate. But when there is wind, this layer of vapour is blown away thereby increasing the diffusion rate.

(b) Blood transport oxygen in the form of oxyhaemoglobin from the lungs to the body cells. It transport nutrients dissolved in the plasma from the digestive system to all the cells. Blood transport metabolic wastes and carbon dioxide for removal from the body via the lungs and kidneys. Blood transport hormones to target cells from the glands.

*ANSWERS FOR 2010 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

17. (a)(i) *Positive geotropism* is the response of a plant part by growing towards the gravity.

(ii) *Phototropism* is the response of a plant part to light by growing either towards or away from the light.

(b) Tactic response its response is locomotory response while trophic response its response is growth response. Tactic response its response is temporary response while trophic response its response is permanent response. Tactic response its response is fast while trophic response its response is slow. Tactic response its response is not influenced by hormones while trophic response its response is influenced by hormones.

(c) A receptor detects a change in a condition (stimulus).A message is carried in form of an electrical impulse from the receptor to the central nervous system by a sensory neuron. A relay neuron will then carry the electrical impulse from the sensory neuron to the motor neuron which will in turn carry the impulse to the effector.

18. (a)(i) *Transpiration pull* is the movement of water up the plant through xylem vessels in a continuous stream due to transpiration, capillarity, root pressure and guttation.

(ii) *Translocation* is the movement of manufactured food (sucrose and amino acids dissolved in water) from the source / manufacture to the sink sites (the sites of usage or storage) through phloem.

(iii) *Guttation*: the loss of water drops from the tips and margins of leaves through openings called hydathodes.

**(b)** The apparatus used to set up a simple potometer are water reservoir, water-filled tubing and a woody plant stem tightly connected. Hold the plant stem under water and cut the end. Push the plant stem into the tubing of the potometer, making sure that it is a very tight fit. Place the capillary tubing into a water filled beaker. Take the apparatus out of the water and secure the plant and potometer on clamp stands. Use the potometer by removing the capillary tube from the beaker. Blot the end of capillary tube, which will leave an air bubble. Place the capillary tube back in the beaker of water. The air bubble will move up the capillary tube when the plant loses water by transpiration. The time taken for the bubble to move a set distance is measured.

*ANSWERS FOR 2011 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

- 19. (a)** A hormone is a chemical secreted by a ductless gland, transported by blood and has effects on one or more target organs before being destroyed by the liver.
- (b)** Auxins promote cell elongation in the region behind the shoot and root tip. It promote apical dominance and inhibit lateral bud development. It control the direction of plant growth (tropism). It promote fruit development since they delay abscission of fruit and auxins inhibit leaf abscission.
- (c)** Gravity pulls the auxins to the lower side of the radicle and plumule hence the concentration of auxins is higher on the lower sides than the upper sides. This will make the plumule to grow faster on the lower side than the upper side, causing it to grow upwards (away from gravity) and the radicle will grow faster on the upper side than the lower side, causing it to grow downwards (towards gravity).
- 20. (a)** The synovial joint has the following parts; Ligament which joins bone to bone and keeps the joint stable by preventing dislocation. Tendons which joins muscle to bone; translate muscle contraction into movement of bone. Joint Capsule that encloses the joint membrane. Synovial fluid which supplies nutrients and acts as a lubricant that reduces friction. Synovial membrane they secretes synovial fluid and Cartilage it reduces friction at ends of bones, absorbs mechanical shocks and spreads forces.
- (b) (i)** Tendons joins muscle to bone while Ligament joins bone to bone. Ligament is Elastic fibrous tissue made of an elastic protein while Tendons is tough and inelastic fibrous protein largely made of a collagen. Ligament keeps the joint stable by preventing dislocation while tendon translate muscle contraction into movement of bone.

(ii) Ball-and-socket joint consist of one bone with a ball – shaped surface that fit into another bone with a cut-like socket while hinge joint bones are joined like a hinge on the door. Ball-and-socket joint enable bones to move in all directions while hinge joint enable bones to move in one direction. Ball-and-socket joint are located on hips and shoulder while hinge joint elbow, knee, knuckle and phalanges.

*ANSWERS FOR 2011 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**21. (a)** Transpiration is the diffusion of water vapour from leaves to the atmosphere through stomata. In leaves of plants, there are more stomata on the under-side than on the upper-side. The water moves from the xylem vessels to the mesophyll cells by osmosis then it evaporates from the surfaces of the mesophyll cells into the air spaces and finally diffuses out of the air spaces to the atmosphere through the stomata.

**(b)** Temperature: this is the degree of hotness or coldness of a substance. The higher the temperature, the higher the transpiration rate. This is because high temperatures increase the kinetic energy of the water molecules making them diffuse faster out of the leaf.

Humidity: this is the amount of water vapour in the atmosphere. The higher the humidity, the lower the transpiration rate because high humidity lowers the concentration gradient between the leaf and the atmosphere.

Light Intensity: This is the brightness or dimness of light. The higher the light intensity, the higher the transpiration rate because high light intensity causes opening of the stomata.

**(c)** Transpiration it helps to cool the leaves, especially in hot conditions. It ensures that there is a continuous flow of water to the leaves for photosynthesis and to keep the cells of the leaves moist. Transpiration provides a pathway for transporting mineral salts through the plant. Transpiration releases water vapour into the air to continue the water cycle.

**22. (a)** Auxins are plant hormones which are very sensitive to light. When they are exposed to light they move to the side of the stem that has no light. There, auxins will cause the plant cells on the shaded side of the stem to elongate. This redistribution of auxins causes the stem to bend towards the light.

**(b)** A taxic response is a response of an animal to a stimulus by moving either towards or away from the stimulus. Movement towards the stimulus is called positive taxism while movement away from the stimulus is called negative taxism. Examples of taxic responses in animals are: Woodlice are moving water is positive hydrotaxic and they move away from light hence they are negatively phototaxic. Earthworms are moving to water therefore, they are positively hydrotaxic and they also move to the soil so they are positively geotaxic. Cockroaches are negatively phototaxic by moving away from light.

*ANSWERS FOR 2014 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**23. (a)** Positive Phototropism is the response of a plant part to light by growing towards the light.

**(b)** The gravity will pull the auxins in plumule downward. This accumulation of auxins on the underside of the plumule, increases cell elongation and causes the plumule to grow upward.

The gravity will pull the auxins in radical downward. This accumulation of auxins on the underside of the radical reduces cell elongation and causes the radical to grow downward.

**(c)** Glucagon is secreted by a gland called pancreas. It when the pancreas detects that glucose levels are too low in blood. It causes the cells of the liver and muscles to convert glycogen to glucose. It also causes fat to be changed into glucose and may cause proteins to be modified so that they are utilized for energy production.

Adrenaline is secreted by a gland called adrenal gland. It secreted when an individual is angry, scared, emotionally excited or under stress. It prepare the body to fight or flight hence it is called “fight or flight hormone”. It prepares the body for action in various ways such as, boosting the respiration, increasing the breathing rate so that more oxygen is taken in to be used for energy production, increasing the heart rate so that more blood containing glucose and oxygen can be carried to the muscles.

**24. (a)** Ball-and-socket joint consist of one bone with a ball – shaped surface that fit into another bone with a cut-like socket while hinge joint bones are joined like a hinge on the door. Ball-and-socket joint enable bones to move in all directions while hinge joint enable bones to move in one direction.

**(b)** During straightening of the arm the triceps contract and shortens at the same time the biceps relaxes.

During bending of the arm the biceps contract and shortens pulling the radius at the same time the triceps relaxes and returns to its normal length.

**(c)** Thoracic vertebrae its spinous process is long and fairly thick while lumbar vertebrae its spinous process is short and bunt. Thoracic vertebrae its transverse process is fairly large while lumbar vertebrae its transverse process is large and bunt. Thoracic vertebrae its spinal canal is large while lumbar vertebrae its spinal canal is comparatively small. Thoracic vertebrae provide attachment sites for ribs while lumbar vertebrae help in maintaining the vertical posture above the pelvis. Thoracic vertebrae contain articular facets for ribs while lumbar vertebrae do not contain articular facets for ribs. Thoracic vertebrae its intervertebral disk is thin while lumbar vertebrae its intervertebral disk is massive.

ANSWERS FOR 2015 (i) QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

- 25. (a)(i)** Eustachian Tube is a tube that connects the middle ear to the back of the pharynx. It opens during swallowing and yawning in order to equalize pressure between the middle ear and the atmosphere. This prevents the ear drum from bursting when atmospheric pressure changes drastically e.g. during an aeroplane flight or deep-sea diving.
- (ii)** Cochlea is a coiled structure that detects sound intensity and frequency and transduces sounds to generate nerve impulses. Nerve impulses from the ear are carried to the brain by the auditory nerve.
- (b)** Sensory Neurons are neurons that carry impulses from sense organs (receptors) to the central nervous system while Motor Neurons are neurons that carry impulses from the central nervous system to effectors. Sensory neurons they have long dendrons and short axons while motor neurons they have long axons and short dendrites. Sensory neurons their cell bodies are not terminally located but are axillary while motor neurons their cell bodies are terminally located (located at the end).
- (c)** The pupil reflex it is an automatic reaction of the pupil to change in size. This is caused by exposure of the eye to different light intensities. When bright light falls on the eye, the iris responds by making the diameter of the pupil smaller. This restricts the amount of light reaching the retina, which contains the light-sensitive cells. If dim light falls on the eye, the iris responds by making the diameter of the pupil larger, so that as much light as is available can reach the retina to stimulate the light-sensitive cells.
- 26. (a)** Excretion is the removal of toxic metabolic waste products from the bodies of living organisms. The waste products are removed from the body by the excretory organs.
- (b)(i)** Carbon dioxide is excrete by the Lungs. Carbon dioxide is excreted during the process of gaseous exchange in the alveoli. Carbon dioxide diffuses from the blood into the alveoli across the alveolar walls.
- (ii)** Urea is excreted in the kidney nephron. It occurs in two stages, namely, ultrafiltration (pressure filtration) and selective reabsorption.
- During ultrafiltration as blood is passing through the nephron, small molecules such as water, mineral salts, glucose and urea are filtered out from blood in the glomerulus into the Bowman's capsule of a nephron. The liquid that collects in the Bowman's capsule is called the glomerular filtrate. The glomerular filtrate is drained from the Bowman's capsule by the renal tubule.
- As the glomerular filtrate is passing in the renal tubule useful substances like some water, mineral salts and glucose are reabsorbed back into the blood stream and this is called reabsorption. It occurs mainly in the folded regions (convolutions) of the tubule where the tubule is entangled with blood vessels to facilitate reabsorption. The first (proximal) convolution reabsorbs all glucose, some water and some salts. The

second convolution reabsorbs salts and water. Water is reabsorbed by osmosis; glucose by diffusion and mineral salts by active transport.

Then urea will be removed mixed with excess water and salts as urine from the kidney through the collecting duct and ureter. The urine is passed on to the urinary bladder where it is temporarily stored before being passed out.

*ANSWERS FOR 2015 (ii) QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**27. (a)** Homeostasis is defined as the maintenance of a constant internal environment. It involves the regulation of body temperature (thermoregulation), regulation of the amount of water in body fluids (osmoregulation), regulation of blood sugar and removal of toxic metabolic wastes (excretion).

**(b)** When the glucose level is above normal in the blood, the pancreas is stimulated to produce insulin which stimulates cells of the liver convert excess glucose to glycogen which is stored in the liver. It also stimulates liver cells to oxidize glucose to release energy. Therefore, the level of glucose will be lowered.

When glucose levels are too low in the blood, the pancreas secretes glucagon which causes the cells of the liver to convert glycogen to glucose and causes fats (glycerol) and amino acids to be changed into glucose. The liver produces and distributes heat because of many metabolic reactions that take place in it and the network of blood vessels.

**28. (a)** The seed absorbs water from the soil and provides moisture to the embryo. The plant cells start duplicating, enzymes get activate, and the embryo starts getting nourishment. Then the tiny root will come out of the seed. With more and more nourishment, the embryo starts growing. Eventually, the growing plant bursts open through the seed coat in search of sunlight to start its own process of photosynthesis. Once the seed coat falls off, the root starts growing downwards to anchor the seed and to search for more food and nutrients from the soil. Meanwhile, the shoot also starts growing upwards towards the light.

**(b)** Auxins are plant hormones which are very sensitive to light. When they are exposed to light they move to the side of the stem that is not in light. Therefore, auxins will cause the plant cells on the shaded side of the stem to elongate. This redistribution of auxins causes the stem to bend towards the light.

**29. (a)** *Double Circulation* is a type of circulation where blood passes through the heart twice during one circulation around the body. It involves two types of circulation, namely the pulmonary circulation and systemic circulation.

**(b)** In double circulation there is pulmonary circulation and systemic circulation. In pulmonary circulation blood is pumped at low pressure from the heart while in systemic circulation blood is pumped at high pressure. In pulmonary circulation carries deoxygenated blood from the heart from the heart while in systemic circulation carries oxygenated blood from the heart. Pulmonary circulation carries blood from the heart to one part of the body called the lungs while in systemic circulation carries blood from the heart to all parts of the body.

**(c)** Blood transport oxygen in the form of oxyhaemoglobin from the lungs to the body cells. It transport nutrients dissolved in the plasma from the digestive system to all the cells. Blood transport metabolic wastes and carbon dioxide for removal from the body via the lungs and kidneys. Blood transport hormones to target cells from the glands. Blood regulate body temperature by spreading heat around the body; occurs as the amount of blood flowing through the skin varies. Blood protect the body from infection by viruses and bacteria by transporting leucocytes to areas where they are needed. Blood protect the body from losing too much blood when platelets form clots and prevent foreign materials from entering the body.

*ANSWERS FOR 2016 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

- 30. (a) (i)** Causes of Coronary Heart Disease are Excessive intake of fatty foods. Fatty foods are easily converted to cholesterol which in turn blocks the coronary arteries. Smoking, Cigarette smoke contains a stimulant called nicotine which tends to promote the accumulation of cholesterol in the blood. Emotional stress. The body secretes high levels of adrenaline during emotional stress. This also tends to promote accumulation of cholesterol in the blood stream. Lack of exercise increases the risk of coronary heart disease. Inhalation of harmful gaseous compounds, for example carbon monoxide when the environment is polluted increases the chances of suffering from a coronary disease.
- (ii)** Coronary heart diseases can be prevented by avoiding excessive intake of fatty foods. Regular exercise improves blood circulation and reduces chances of accumulation of cholesterol in arteries. Avoid smoking and emotional stress.
- (b)** They produce and store lymphocytes which are added to the lymph as it passes through on its way to the subclavian vein. They filter foreign bodies, bacteria and dead tissue from the lymph before it joins the blood. They become very active when the body is invaded by foreign bodies, becoming swollen and tender in the process.

**31. (a)** The characteristic of vertebrae column has a projection on top of the neural arch and a curved bony structure arising from the centrum and has an opening in the centre called the neural canal. It has projections on the sides of the centrum.

The characteristic of skull is that it consists of eight bony plates joined together forming cranium. It has a facial bones including nasal bones, cheek bones and eye sockets.

The characteristic of skeletal muscle is that it consists of long and slender muscle cells which are grouped together forming bundle. They are in pairs and have many blood vessel and nerve fibre.

**(b)** The functions of vertebrae column is that it protects the spinal cord from mechanical damage. It Provides attachment for ribs and girdles. It supports the body trunk and imparting flexibility to the body trunk due presence of cartilaginous joints.

The functions of skull is that it protects the brain from mechanical injuries. It provide sockets for eyes.

The functions of skeletal muscle is that they enable locomotion via antagonistic. They produce voluntary movements, such as in dancing, running or bending the arms.

**32. (a)** A tropic response is the response of a plant part to a stimulus by either growing towards or away from the stimulus. When a plant part grows towards a stimulus, the response is called a positive tropic response, but when a plant part grows away from a stimulus, the response is called a negative tropic response.

**(b)(i)** Plant has hormones called auxins which are very sensitive to light. When they are exposed to light they move to the side of the stem that has no light. There, auxins will cause the plant cells on the shaded side of the stem to elongate. This redistribution of auxins causes the stem to bend towards the light.

**(ii)** The gravity will pull the auxins in plumule downward. This accumulation of auxins on the underside of the plumule, increases cell elongation and causes the plumule to grow upward. The gravity will pull the auxins in radical downward. This accumulation of auxins on the underside of the radical reduces cell elongation and causes the radical to grow downward.

**33. (a)** Excess water from plants is excreted by the process of transpiration through the stomata. Carbon dioxide and oxygen are removed from the plant through diffusion through the stomata. Other wastes are deposited in the leaves which are removed upon drooping or wilting. Resins and gums are removed through the exudates.

**(b)** Homeostasis is the regulation of body temperature by producing heat or releasing excess heat. It maintains glucose level in the blood stream through the pancreas releases a hormones called *insulin* and Glucose in the bloodstream. Homeostasis protect the body from infections by getting infections before they make the person ill. It maintain blood pressure by slowing down the heart pumping or increasing the pressure in arteries to keep the balance. Homeostasis is also important to regulate fluid (i.e. water) as well

as the concentration of ions in the body. Maintains of breathing patterns through an involuntary action and the nervous system helps to keep the homeostasis by ensuring the body gets its most essential oxygen by proper breathing patterns. Removes wastes and toxins by getting rid of toxins such as urine, feces, CO<sub>2</sub>, bile, sweat and worn out cells from the body. The way Homeostasis is maintained by the eyes is by contracting the pupil when excess light enters; on contrast, the pupil expands when exposed to darkness to get a sense of the visual.

*ANSWERS FOR 2016 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**34. (a)(i)** A gland is ductless gland that secretes hormones. There are many glands some of them are pancreas which secretes hormones insulin and glucagon. Adrenal gland which is found on top of the kidneys and it secretes hormones called adrenaline. The other gland is thyroid gland, it is found on the neck and it secretes a hormone called thyroxine.

**(ii)** Adrenal gland secretes hormones that help the body to fight or flight while salivary gland secretes hormone that help in digestion. Adrenal gland secretes hormones to the blood stream while salivary gland secretes hormone to saliva. Adrenal gland is stimulated when the body is anxiety or fear while salivary gland is stimulated when the body smell delicious food or food is in the mouth.

**(b) (i)** Insulin is secreted when the sugar levels are high in the blood and causes the cells of the liver and muscles to convert excess glucose to glycogen which is stored in the liver and muscles. It causes the cells of the adipose tissue to convert excess glucose to fats. The fats are stored under the skin and around delicate body organs such as the heart, liver, kidneys, intestines and brain. Insulin enables body cells to absorb glucose from the blood and use it, promotes convection of carbohydrates to fats and Slows down the conversion of protein to carbohydrates.

**(ii)** Adrenaline prepares the body for action in various ways such as, boosting the respiration, increasing the breathing rate so that more oxygen is taken in to be used for energy production, increasing the heart rate so that more blood containing glucose and oxygen can be carried to the muscles. Adrenaline diverts blood from the changing of glycogen to glucose, thereby increasing glucose levels in the blood to be used for gut to the muscles by constricting the blood vessels of the gut and dilating the blood vessels of the muscles. It dilates the pupils in the eyes for increased alertness It dilates the bronchi and increases the volume of the thorax so that more air containing oxygen may be taken in .It increases the sensitivity of the nervous system for faster response to stimuli .It raises hair in furry animals and causes the appearance of 'goose bumps' as well as shivering.

- 35. (a) (a)** The synovial joint has the following parts; Ligament which joins bone to bone and keeps the joint stable by preventing dislocation. Tendons which joins muscle to bone; translate muscle contraction into movement of bone. Joint Capsule that encloses the joint membrane. Synovial fluid which supplies nutrients and acts as a lubricant that reduces friction. Synovial membrane they secretes synovial fluid and Cartilage it reduces friction at ends of bones, absorbs mechanical shocks and spreads forces.
- (b)** A bone is considered a living tissue because it consists of living cells and fibres and penetrated by blood vessels which keep the cells alive and allows growth and repair. The spongy bone is filled with red bone marrow that forms red blood cells. The central cavity is filled with yellow bone marrow which makes white blood cells.
- (c)** The pupil constricts by circular and radial muscles of the iris in response to changes in light intensity. Due to excess light that may damage the retina by bleaching it □ Circular muscles contract at the same time the radial muscles relax. This in returns makes the pupil to constricts (becomes smaller) to prevent bleaching of the retina by excess light.

*ANSWERS FOR 2017 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

- 36. (a)(i)** Blood group AB can receive blood from all other blood groups because it has no antibodies in the blood plasma to attack the antigens in the donor's blood. For this reason, it is called the universal recipient. An antigen reacts with a corresponding antibody making the blood cells to clump together. Antigen-A and antibody-A can cause agglutination. Antigen B and antibody-B can also cause agglutination.
- (ii)** Blood group A has antigen A on its red blood cell surface and anti-B antibody in the blood plasma. Blood group B has antigen B on its red blood cell surface and anti-A antibody in the blood plasma. When a person with blood group A donate blood to a person with blood group B, the anti – A antibody in the blood plasma of blood group B will reacts/destroy the antigen A in blood group A making the blood to agglutinate. Therefore, the blood donation is not compatible.
- (b)** The following precautions must be noted when carrying out a blood transfusion: Blood group O can be given to any blood group. □ Blood group AB can receive blood from all other blood groups □ □ A person can receive blood from another person of the same blood group without complications arising. Before a donor's blood is given to a recipient, it has to be screened to determine the following: the blood group, the rhesus status and to check for infections such as hepatitis and HIV. To ensure blood is safe and no disease causing micro- organisms are present that could cause disease in the recipient.

ANSWERS FOR 2019 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

**37. (a)** Homeostasis is defined as the maintenance of a constant internal environment. It involves the regulation of body temperature (thermoregulation), regulation of the amount of water in body fluids (osmoregulation), regulation of blood sugar and removal of toxic metabolic wastes (excretion).

**(b)(i)** Kidney regulate the amount of mineral salts and water by urinary system. Mineral salts are regulated during when glomerular filtrate is passing in the proximal convoluted tubule some salts reabsorbs back into blood stream. Water regulated by releasing a hormone called antidiuretic hormone which causes water to be absorbed from the glomerular filtrate into the surrounding cells. The hormone is not released if water level is below.

**(ii)** Liver convert excess glucose to glycogen to reduce the level of glucose in the blood. Liver also convert glycogen to glucose when glucose level is low in the blood. The liver produces and distributes heat because of many metabolic reactions that take place in it and the network of blood vessels.

**(c)** The skin reduces loss of heat from the body by contracting the erector muscles thereby pulling the hairs upright. The erect hair traps a layer of air which insulates the skin against heat loss. The contraction of hair erector muscles leads to development of goose bumps on the skin in cold weather. Vasoconstriction (narrowing of skin arterioles) occurs to reduce the amount of blood passing through the skin. This reduces heat lost. Shunt vessels open, reducing the amount of blood passing through superficial vessels near the skin surface. This reduces heat loss. Sweat glands become less active or inactive to minimize loss of heat which might occur through sweating.

**38. (a)** In open blood circulatory systems blood moves freely around the tissue while closed blood circulatory systems blood moves inside the blood vessels. In open blood circulatory systems blood moves at low pressure around the tissue while closed blood circulatory systems blood moves at high pressure inside the blood vessels. In open blood circulatory systems blood is pumped by a sac-like heart through a short vessel while closed blood circulatory systems blood is pumped at high pressure inside a long blood vessels.

**(b)** Single circulation is a type of circulation in which blood goes through the heart once for each complete circulation of blood. E.g. the fish blood passes through capillaries in the gills then to the heart from the heart to the body again back to the heart.

Double circulation is a type of circulation in which blood passes through the heart twice for each complete circulation of blood. E.g. in the man, blood goes to the heart through vena cava from the heart it goes to the lungs via pulmonary artery for oxidation. From the lungs it goes back to the heart via pulmonary vein then it will pumped at high pressure from the heart to all parts of the body through the aorta.

**(c) (i)** Arteries carry blood away from the heart and at high pressure. They have thick walls and narrow lumens. The thick walls help them withstand the pressure from the heart. They have no valves since the pressure from the heart is enough to keep blood moving in one direction. They all carry oxygenated blood except the pulmonary artery. They appear round in cross-section. They are located deeper under the skin than the veins.

While veins carry blood towards the heart and at low pressure. They have thin walls and wide lumens. They have valves to keep blood moving in one direction by preventing back flow. They all carry deoxygenated blood except the pulmonary vein. They appear irregular in cross-section. They are located nearer to the skin surface than the arteries.

*ANSWERS FOR 2019 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**39. (a)** Transpiration is the diffusion of water vapour from leaves to the atmosphere through stomata. In leaves of plants, there are more stomata on the under-side than on the upper-side. The water moves from the xylem vessels to the mesophyll cells by osmosis then it evaporates from the surfaces of the mesophyll cells into the air spaces and finally diffuses out of the air spaces to the atmosphere through the stomata.

**(b)** Temperature: this is the degree of hotness or coldness of a substance. The higher the temperature, the higher the transpiration rate. This is because high temperatures increase the kinetic energy of the water molecules making them diffuse faster out of the leaf.

Humidity: this is the amount of water vapour in the atmosphere. The higher the humidity, the lower the transpiration rate because high humidity lowers the concentration gradient between the leaf and the atmosphere.

Light Intensity: This is the brightness or dimness of light. The higher the light intensity, the higher the transpiration rate because high light intensity causes opening of the stomata.

**(c)** Transpiration it helps to cool the leaves, especially in hot conditions. It ensures that there is a continuous flow of water to the leaves for photosynthesis and to keep the cells of the leaves moist. Transpiration provides a pathway for transporting mineral salts through the plant. Transpiration releases water vapour into the air to continue the water cycle.

**40. (a)** Blood transport oxygen in the form of oxyhaemoglobin from the lungs to the body cells. It transport nutrients dissolved in the plasma from the digestive system to all the cells. Blood transport metabolic wastes and carbon dioxide for removal from the body via the lungs and kidneys. Blood transport hormones to target cells from the glands. Blood regulate body temperature by spreading heat around the body; occurs as the amount of blood flowing through the skin varies. Blood protect the body from infection by viruses

and bacteria by transporting leucocytes to areas where they are needed. Blood protect the body from losing too much blood when platelets form clots and prevent foreign materials from entering the body.

(b) Sickle Cell Anaemia is an inherited disease where a person has abnormal haemoglobin. As a result, the red blood cells become sickle-shaped, especially when oxygen levels are low in the body. The disease reduces the capacity of the body to transport oxygen.

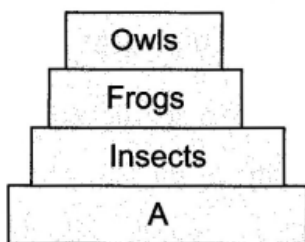
Haemophilia is an inherited disease where a person bleeds for longer periods than normal due to poor clotting of blood. It is caused by absence of blood clotting factors.

## THE END OF GRADE 11 WORK IS THE BEGINNING OF GRADE 12 WORK

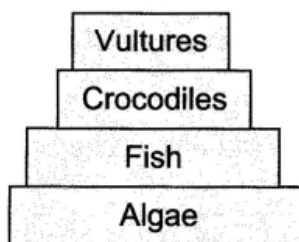
### **SHORT ANSWER QUESTIONS [SECTION A]**

#### **2009 QUESTION PAPER 2**

1. Figure. 4.1 and Figure 4.2 show pyramids of food relationship among organisms in a forest and a lake.



**Figure 4.1 Forest**



**Figure 4.2 Lake**

- (a) (i) Identify the organism found in trophic level labelled A in Figure 4.1. [1]  
(ii) What would happen if the population of insects in Figure 4.1 reduced? [2]
- (b) (i) What is the ultimate source of energy for both pyramids? [1]  
(ii) Explain the differences in energy between trophic levels as you go up the pyramids [2]
- (c) Traces of DDT applied on a nearby farm were washed by rain into the lake and were taken up by algae in Figure 4.2.  
Why was there more DDT in organisms in the fourth trophic level of Figure 4.2 than in those in the first trophic level? [2]

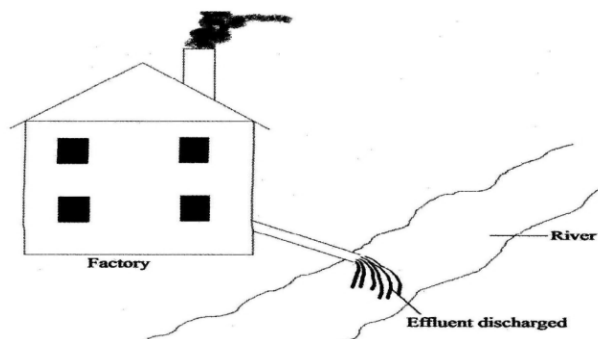
2. (a) Haemophilia is an example of a sex-linked inherited disease arising from a blood disorder.
- (i) What is a sex-linked characteristic? [1]
- (ii) Explain why males are more likely to suffer from sex-linked diseases than female? [2]
- (b) Colour blindness is another sex-linked disease. Using a genetic diagram, show the chances of having a colour blind child from a couple made up of a normal male parent and a carrier female parent. (Use the symbols  $X^R$  and  $X^r$ ). [7]

## 2010 QUESTION PAPER 2

3. Figure 4.1 shows some components found in an ecosystem.

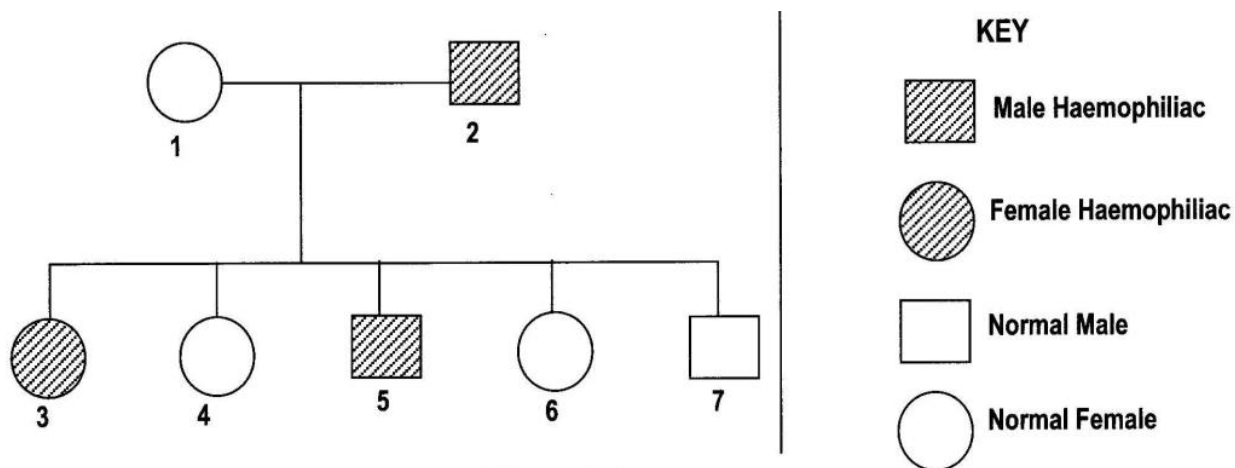
Component A	Component B	Component C
1 river 70 trees 250 hectares of grass 17 rocks 50 hares 100 impalas 200 zebra 4 lions	100 impalas	50 hares 100 impalas 200 zebra 4 lions

- (a) Which of the above component corresponds to
- (i) a population?
- (ii) a community?
- (b) (i) which of the above components contains abiotic factors?
- (ii) From the component named in b(i), give one example of an abiotic factor.
- (iii) Construct a food chain using organisms in component A in figure 4.1.
- (c) Figure 4.2 shows untreated industrial effluent being discharged into a river.



- (i) What type of pollution is shown in figure 4.2?
- (ii) Suggest a pollutant which can be found in the industrial effluent.
- (iii) What measures can be taken to reduce this type of pollution? [2]

4. Figure 5.1 shows the inheritance of haemophilia in a family.



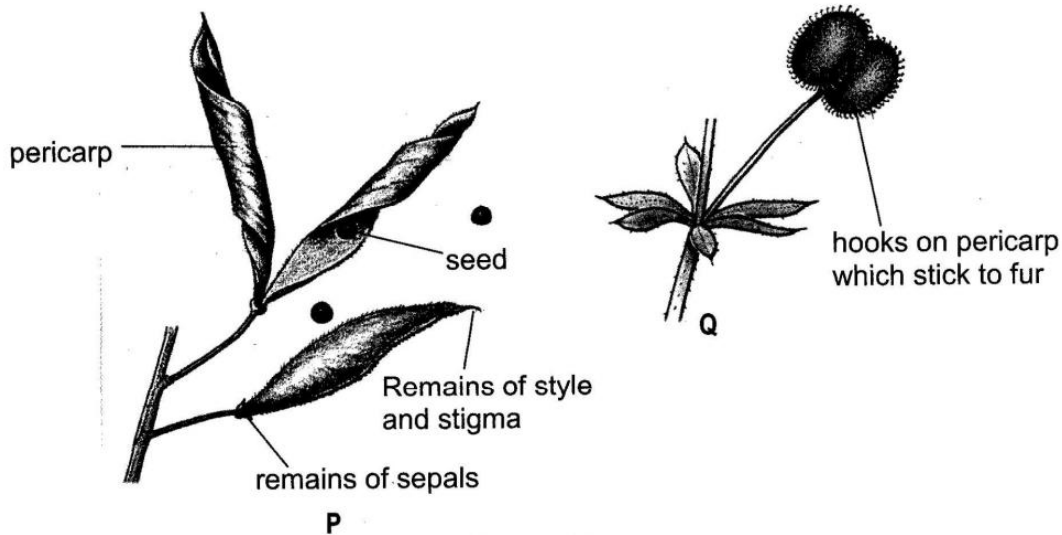
- (a) Taking the allele for haemophilia to be  $X^h$ , what is the genotype of offspring 3 and 7? [2]
- (b) Offspring 4 married a person with similar genotype to offspring 7.
  - (i) Draw a genetic diagram to show the genotypes and the phenotypes of the offspring. [5]
  - (ii) What is the probability of them having a normal child? [1]
  - (iii) What is the probability of them having a child who is a carrier? [1]

## 2011 QUESTION PAPER 2

- 5. In an experiment to demonstrate the inheritance of coat colour in cattle, a roan bull was repeatedly crossed with a roan cow and produced roan, white and red calves.
  - (a) Which coat colour is as a result of co-dominance? [1]
  - (b) Determine the genotypes of the three coat colours, given that  $C^R$  is gene for red colour and  $C^W$  is gene for white colour. [3]
  - (c) Show using a genetic diagram the possible offspring which could be produced when a red bull was crossed with a roan cow.

**2012 QUESTION PAPER 2**

6. Figure 3.0 shows some fruits from dicot plants.



(a) (i) State the type of dispersal each fruit undergoes.

Fruit P.....

Fruit Q..... [2]

(ii) Give a reason for your answer in (a) (i) above for each fruit.

Fruit P.....

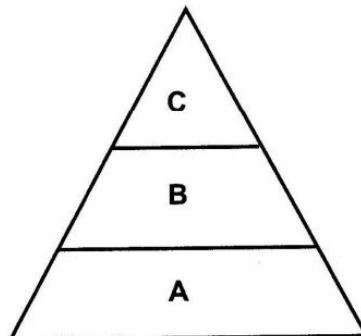
Fruit Q.....[2]

(b) (i) Which fruit disperses seeds over a short distance? [1]

(ii) Which dispersal will involve seeds and not the fruit? [1]

(c) Give three differences between Fruit Q and a tomato. [3]

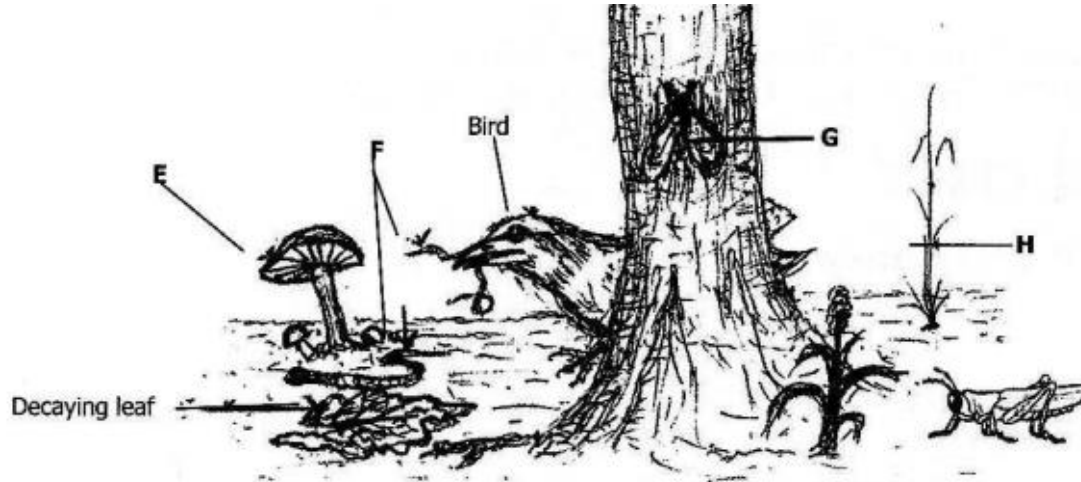
7. The figure below shows a pyramid of biomass.



- (a) (i) Identify trophic levels B and C. [2]  
 (ii) State the names given to organisms that feed at trophic levels B and C. [2]  
 (iii) Explain why level C is much smaller than the other levels. [2]
- (b) Describe the flow of energy in the pyramid. [3]

**2014 QUESTION PAPER 2**

8. *Figure .1.0* shows organisms in an ecosystem.



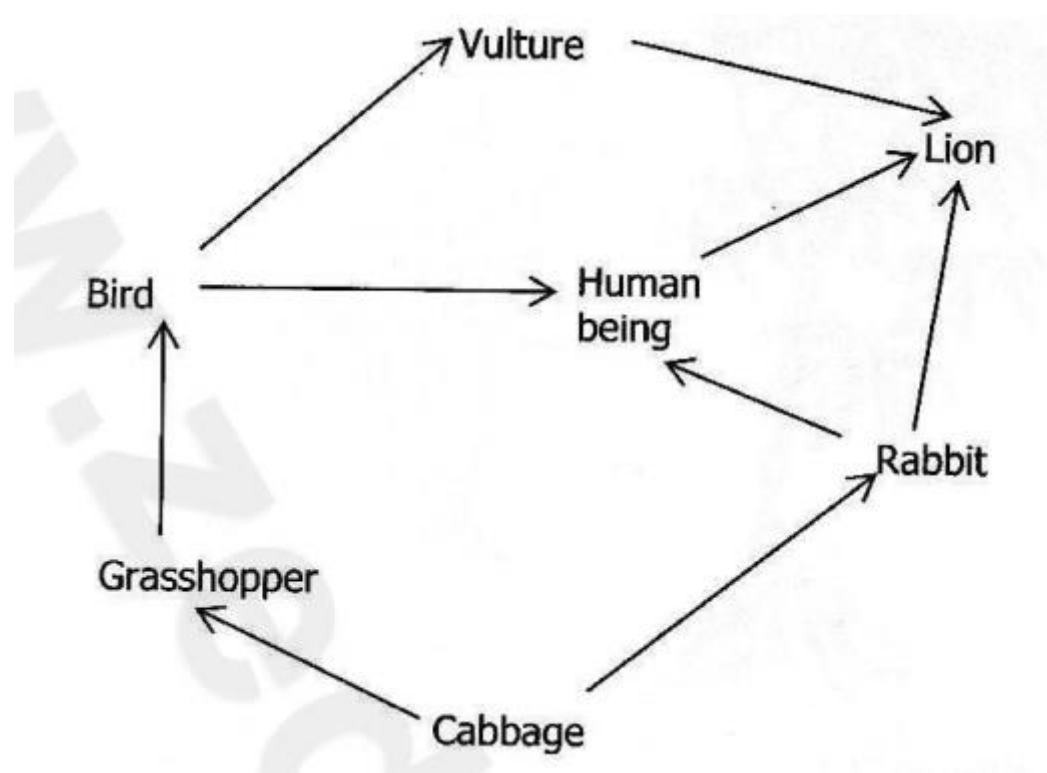
(a) Using letters classify the following organisms in *Figure 1.0*

Group	Letters
Angiosperm	
Reptile	
Fungi	

- (b) What type of nutrition is carried out by organisms E and H?
- (c) State two differences between the cells found in organisms G and H.
- (d) Construct a food chain using organisms found in *Figure 1.0*.
9. (a) Explain what is meant by the term sex-linked characteristic. [2]  
 (b) The allele for haemophilia (h) is a recessive allele carried on the non-homologous pair of the X chromosome.  
 (i) A couple is both normal to this trait. They have three sons, two of whom are haemophilic. Use a genetic diagram to explain how this may occur. [5]  
 (ii) What is the probability of their next son being haemophilic? [1]

**2015 (i) QUESTION PAPER 2**

10. Figure 4.1 shows a food web in a given ecosystem.



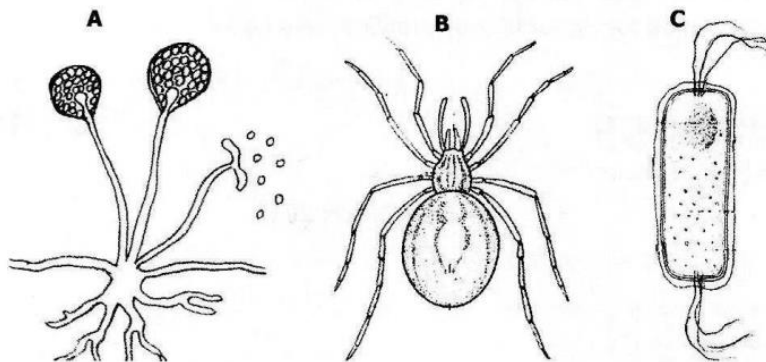
- (a) (i) Identify any primary consumer. [1]
- (ii) Construct a food chain using three organisms from Figure 4.1. [1]
- (iii) Using the food chain in (a) (ii) construct a pyramid of energy. [3]
- (b) Distinguish between a food chain and a food web. [2]
- (c) Explain why organisms at the end of a food chain have the least amount of energy. [2]

11. Pure breeding dwarf garden pea plants were crossed with pure-breeding tall garden pea plants. The resulting offsprings were all tall.

- (a) (i) What is meant by pure breeding? [1]
- (ii) Using your own symbols, state the genotypes of the parents.  
 Pure breeding dwarf garden pea plant =.....  
 Pure breeding tall garden pea plant =..... [2]
- (b) Using a genetic diagram, show the cross between a dwarf parent and one of the offspring. [5]
- (c) Differentiate between homozygous and heterozygous. [1]

**2015 (ii) QUESTION PAPER 2**

12. Figure 1.1 shows three different types of organisms labelled A, B and C.



(a) (i) Identify the three organisms shown in Figure 1.1 above.

A is.....

B is.....

C is..... [2]

(ii) Classify the organisms identified in (a) (i) above according to their kingdoms.

A is.....

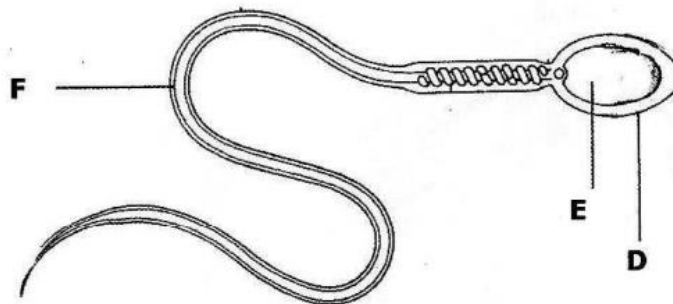
B is.....

C is..... [3]

(b) (i) State two organisms which might bring about decay of organic matter. [2]

(ii) Name one disease caused by organism A. [1]

13. Figure 2.1 shows the structure of a mammalian sperm



(a) (i) Identify the parts labelled D and E. [2]

(ii) Explain the function of the part labelled F. [1]

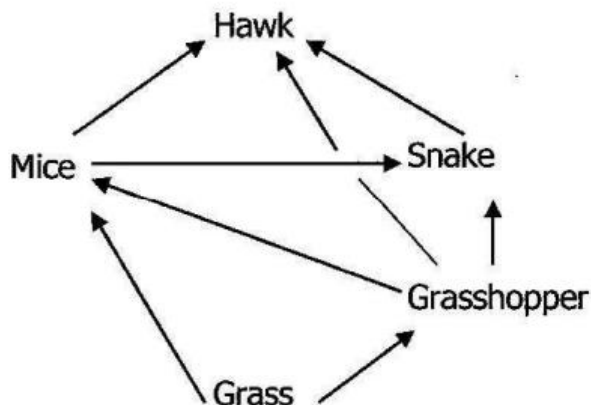
(b) What substance produced by the cervix enable the sperm to swim in the female reproductive tract? [1]

(c) (i) Explain why only one sperm fertilises the ovum. [2]

(ii) Distinguish between a sperm and an ovum. [2]

**2016 G.C.E QUESTION PAPER 2**

14. Figure 4.0 shows feeding relationship of organisms in an ecosystem.



- (a) Which of the named organisms represents?
- (i) a producer
  - (ii) a primary consumer [2]
- (b) What is the primary source of energy in figure 4.0 above? [1]
- (c) (i) State the form in which energy flows from one trophic level to another. [1]
- (ii) Explain what happens to the energy named in (c) (i) as it passes from one trophic level to the next. [2]
- (d) (i) Identify two organisms in figure 4.0 which are both secondary consumers and tertiary consumers. [2]
- (ii) Using named organisms in figure 4.0 construct the longest food chain. [1]

15. Table 5.0 below shows a cross between a brown male pig labelled pig B, with two female pigs' brown (pig A) and white, pig C.

Pig	Phenotype	Offspring	
		White	Brown
<b>B</b>	Brown male	Nil	Nil
<b>A</b>	Brown female	4	12
<b>C</b>	White female	8	8

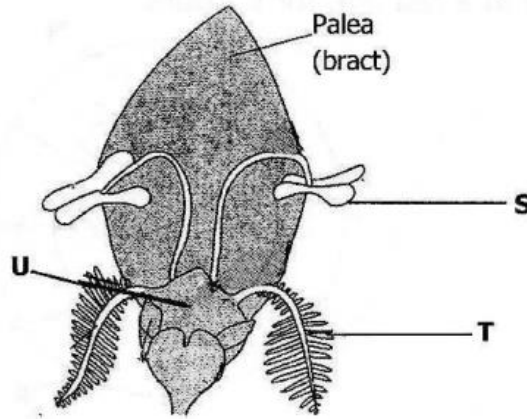
- (a) Explain why pig B had no offspring. [1]
- (b) From the results in table 5.0 and using the symbol B for dominant allele and b for recessive allele,
- (i) Identify the recessive phenotype of the skin colour of the pigs. [1]

(ii) Suggest the genotypes of pigs A and C. [2]

(c) Using a genetic diagram, show the results of crossing pig B with pig C. [5]

**2016 QUESTION PAPER 2**

16. Figure 4.1. Shows a certain type of flower.



(a) Identify the parts labelled S, T and U.

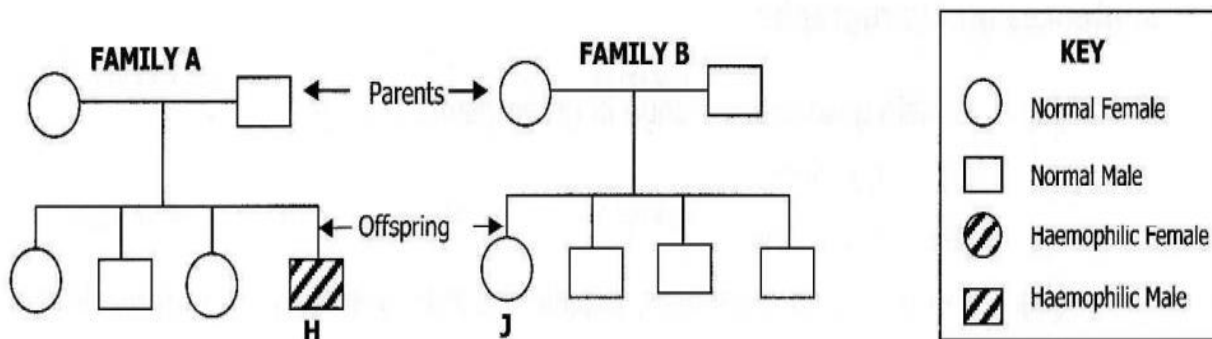
(b) (i) Identify the type of pollination that occurs in the flower in Figure 4.1. [1]

(ii) Give two features from Figure 4.1 which support your answer in (b)(i) above. [2]

(c) (i) State one other type of pollination other than the one mentioned in (b)(i) above. [1]

(ii) Give two characteristics of the flower where the type of pollination mentioned in (c)(i) above occurs. [2]

17. Figure 5.1. Below shows pedigree diagrams for two families A and B, outlining inheritance of a sex-linked disease called haemophilia.



(a)(i) From Figure 5.1, which family has a parent who is a carrier for haemophilia? [1]

(ii) Give a reason for your answer in (a)(i) above. [1]

(b)(i) Using the symbols  $X^H$  and  $X^h$ , state the genotypes for offspring H and J, if J is a carrier for haemophilia. [2]

- (ii) Using a genetic diagram, show whether the offspring would be haemophilic or normal when H and J are crossed.

### **2017 G.C.E QUESTION PAPER 2**

18. A pure breeding black bull was crossed with a pure breeding red cow, all the resulting offspring were black.
- (a) Using letter B or b for alleles;
- (i) Which allele was dominant for skin colour? [1]
- (ii) What was the genotype for the parent black bull? [1]
- (b) Using a genetic diagram, show the resulting offspring if the offspring black bull was crossed with the parent red cow. [5]
- (c) Suggest what could happen to the pure breeding black bull or red cow to cause them to produce a black and white offspring. [2]

### **2017 QUESTION PAPER 2**

19. Mrs Mumba delivered a baby girl in a certain hospital. Mrs Mumba has blood group O and the father to the girl has blood group AB. Mrs Mumba sues the hospital for giving her a wrong baby whose blood group was O.
- (a) Explain using a genetic diagram why Mrs Mumba would win or lose the case. [8]
- (b) What could have been the correct genotype of the actual father? [1]

### **2019 G.C.E QUESTION PAPER 2**

20. Two adolescent learners were not sure how the sex of a foetus is determined and wanted to try by engaging in sexual relationships.
- (a)(i) Explain the sex determinants of the foetus. [2]
- (ii) Use the genetic diagram to illustrate your answer. [5]
- (b) Explain two best methods of avoiding pregnancies as adolescents. [2]

### **2019 QUESTION PAPER 2**

21. A young girl had multiple sexual partners consisting of the following: a young boy, a businessman and public worker.
- (a)(i) Briefly explain two risks the girl may have had from the multiple sexual relations. [2]
- (ii) Identify one sexual behaviour that can help the young girl achieve her set goals in education. [1]

- (b) Suggest one best contraceptive method the girl could have been using to protect herself. [1]
- (c) If the sexual partners had the following blood groups
- Young girl – blood group O
  - Young boy – blood group B
  - Businessman – blood group AB
  - Public worker – blood group B
- (i) Suggest the sexual partner who would have been responsible for the pregnancy if the young girl had a child with blood group A. [1]
- (ii) Use a genetic diagram to explain your answer in (c)(i) above. [4]

## **SECTION B ESSAY QUESTIONS**

### **2009 QUESTION PAPER 2**

22. (a) What are the advantages of sexual reproduction over asexual reproduction in flowering plants? [5]
- (b) Explain how asexual reproduction in a fungi, such as a Rhizopus, takes place. [3]
- (c) Describe the sequence of events which take place in a flower from pollination to fertilization. [4]

### **2010 QUESTION PAPER 2**

23. (a) Explain the effects of the following human activities on other organisms.
- (i) Fishing [3]
  - (ii) Charcoal burning [3]
- (b) Describe the undesirable effects of the following types of pollution.
- (i) Raw sewage in water. [3]
  - (ii) Sulphur dioxide in air [3]

### **2011 QUESTION PAPER 2**

24. (a) Describe how nitrogen is cycled within the ecosystem. [6]
- (b) Describe the importance of each of the physical components of soil. [6]

### **2012 QUESTION PAPER 2**

25. (a) Describe the special dietary needs of a pregnant woman. [6]
- (b) Discuss artificial methods of birth control. [6]
26. (a) With the aid of a labelled diagram, describe the carbon cycle. [6]
- (b) Discuss the effects of deforestation on the carbon cycle. [6]

**2014 QUESTION PAPER 2**

27. (a) Using named examples explain how fruits and seeds are adapted to fruit/seed dispersal. [6]  
(b) Explain the advantages and disadvantages of vegetative propagation. [6]

**2015 (i) QUESTION PAPER 2**

28. (a) Describe the following methods of artificial vegetative propagation.  
(i) Grafting  
(ii) Budding [6]  
(b) Describe the artificial methods of birth control in humans. [6]

29. (a) Explain the following terms:

- (i) Pollination  
(ii) Fertilisation [3]

- (b) Discuss fruit and seed dispersal. [9]

**2015 (ii) QUESTION PAPER 2**

30. (a) Explain the following terms: [2]  
(i) Community  
(ii) Habitat  
(iii) Niche [6]

- (b) Describe the role of producers, consumers and decomposers within an ecosystem. [6]

**2016 G.C.E QUESTION PAPER 2**

31. (a) Explain how flowering plants get rid of excess and unwanted substances from their bodies.[4]  
(b) Discuss the importance of homeostasis in mammals. [8]

**2016 QUESTION PAPER 2**

32. (a) Describe factors that make soil fertile. [4]  
(b) Explain the causes of loss of soil fertility. [4]  
(c) Explain methods of improving and retaining soil fertility. [4]

**2017 G.C.E QUESTION PAPER 2**

33. (a) Explain the advantages and disadvantages of vegetative propagation. [5]  
(b) Describe the process of fertilization in flowering plants. [7]

34. (a) Using a pond as an example, describe the features of an ecosystem. [6]  
(b) Explain the effect of agriculture on an ecosystem. [6]

**2017 QUESTION PAPER 2**

35. (a) Identify causes of infertility in human beings. [6]  
(b) Describe how a healthy pregnancy could be maintained. [4]  
(c) Describe safe child birth. [2]
36. (a) Explain the functions of the following nerve cells.  
(i) Sensory neurone  
(ii) Motor neurone  
(iii) Relay neurone [6]
- (b) Describe, giving examples in each case,  
(i) Spinal reflex action,  
(ii) conditioned reflex action. [6]

37. (a) Describe the antagonistic action of muscles in the iris. [4]  
(b) Compare and contrast exoskeleton and endoskeleton. [6]  
(c) Describe one joint disorder. [2]

38. (a) Define the term biodiversity. [2]  
(b) State the importance of biodiversity of organisms in an area. [4]  
(c) Describe the economic reasons for maintaining biodiversity. [6]

39. (a) Explain the term population. [4]  
(b) Discuss factors that cause changes in population size. [8]

**2019 G.C.E QUESTION PAPER 2**

40. (a) Define sexual feelings. [2]  
(b) Explain the causes of sexual feelings. [4]  
(c) State the consequences of acting on sexual feelings without proper planning. [6]
41. (a) Describe the effects of the following on the ecosystem;  
(i) Agriculture  
(ii) Deforestation [8]
- (b) Suggest how the effects described in (a) above could be minimised. [4]

**2019 G.C.E QUESTION PAPER 2**

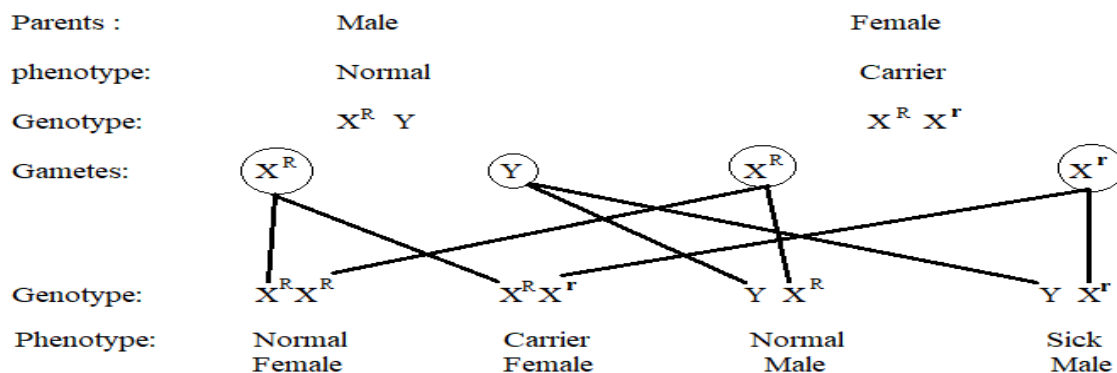
42. (a) Describe the different methods of natural propagation in plants. [7]  
 (b) Explain the advantages and disadvantages of vegetative propagation of plants. [5]
43. (a) Define the term puberty. [2]  
 (b) Describe changes that occur at puberty to both boys and girls. [8]  
 (c) Describe two determinants of puberty. [2]
44. (a) Describe the importance of the factors that make the soil fertile. [8]  
 (b) Explain how soil fertility can be maintained. [4]

**ANSWERS FOR SECTION A**

**ANSWERS FOR 2009 QUESTION PAPER 2 SECTION A**

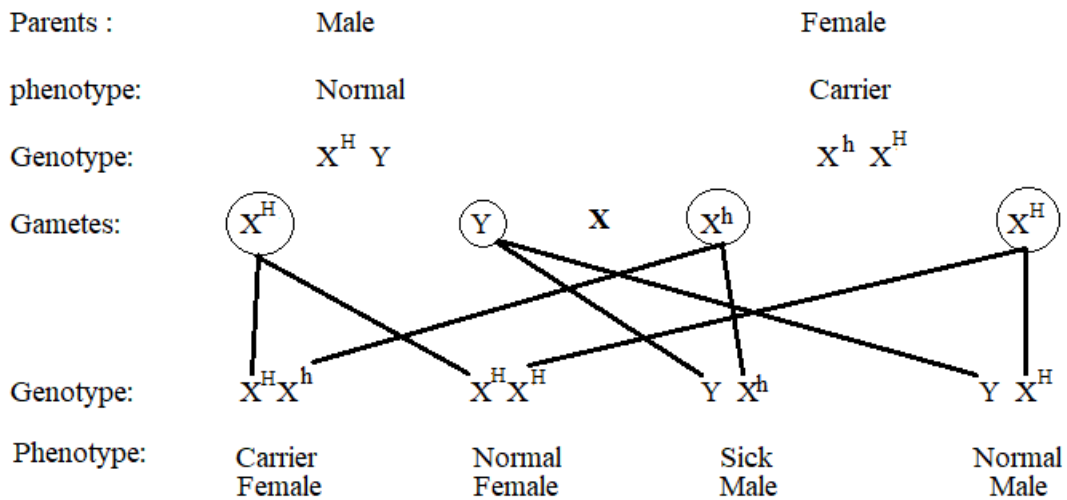
1. (a) (i) Glass  
 (ii) The organisms in trophic level labelled A could increase in population abundantly while frogs and owls could decrease in population.
- (b)(i) The Sun  
 (ii) At each trophic level 90% of its total of energy is lost through respiration, egestion and excretion and only 10% of the energy present is passed on from one trophic level to the next.
- (c) The DDT concentration of insecticide often increases (accumulate) as it passes along a food chain.
2. (a) (i) A *sex-linked characteristic* is a trait that is expressed by a gene/allele found on the sex chromosome.  
 (ii) Because the genes/alleles cause's sex-linked diseases are found on the extra (non-homologous) portion of the X chromosome and male have only one X chromosome and once it is present on the very one meaning one is sick. Male they lack another X chromosome that can have a dominant allele to suppress a recessive allele causing sex-linked diseases.

(b)



**ANSWERS FOR 2010 QUESTION PAPER 2 SECTION A**

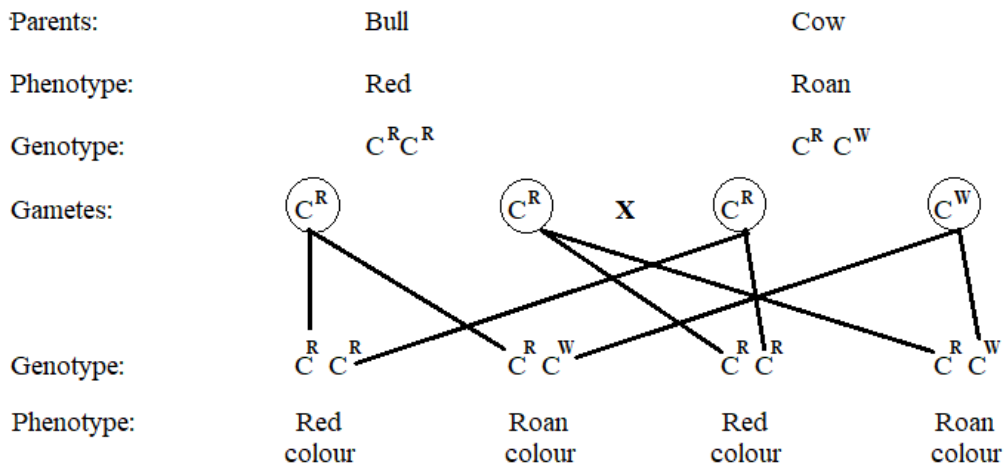
3. (a)(i) Component B                      (ii) Component C  
 (b)(i) Component A                      (ii) Rive and Rocks  
 (iii) Grass → Impala                      → Lion      OR      Grass → Zebra → Lion  
 (c)(i) Water pollution                      (ii) Nitrates and phosphates  
 (iii) Treat effluent before discharge them into the river.
4. (a) Genotype of 3:  $X^h X^h$       and      Genotype of 7:  $X^H Y$   
 (b)(i)



- (ii) Probability of having a normal child =  $\frac{1}{2}$                       (iii) Probability of having a normal child =  $\frac{1}{4}$

**ANSWERS FOR 2011 QUESTION PAPER 2 SECTION A**

5. (a) Roan colour.  
 (b) Roan colour:  $C^R C^W$ ,                      White colour:  $C^W C^W$                       Red colour:  $C^R C^R$   
 (c)



**ANSWERS FOR 2012 QUESTION PAPER 2 SECTION A**

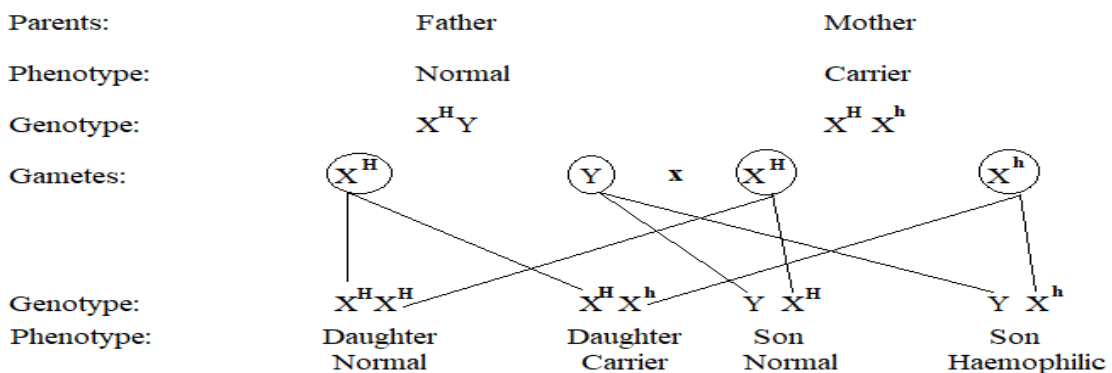
6. (a)(i) Fruit P: Self dispersal                  Fruit Q: Animal dispersal  
 (ii) Fruit P: Presence of dehiscent pericarp, and remains of style, stigma and sepals.  
 Fruit Q: Presence of hooks on pericarp which stick to fur of animals.
- (b)(i) Fruit P                  (ii) Wind dispersal
- (c) 1 – Tomato has many small seeds while fruit Q has two big seeds  
 2 – Tomato has no hooks on its pericarp while fruit Q has hooks on its pericarp  
 3 – Tomato has Succulent (juicy) mesocarps while fruit Q is not succulent.
7. (a)(i) B – Primary consumer    C- Secondary consumer  
 (ii) B - Herbivores                  C – Carnivores  
 (iii) Because the number of organisms are reducing as the trophic levels are increasing due to limited supply of food from the previous trophic level.
- (c) At each trophic level 90% of its total of energy is lost through respiration, egestion and excretion and only 10% of the energy present is passed on from one trophic level to the next.

**ANSWERS FOR 2014 QUESTION PAPER 2 SECTION A**

8. (a)

Group	Letters
Angiosperm	H
Reptile	F
Fungi	E

- (a) E - Saprophytic nutrition                  H - Autotrophic nutrition
- (b) 1 - Cells in organism H have vacuole while cells in organism G have no vacuole.  
 2 - Cells in organism H have chloroplasts while cells in organism G have no chloroplasts.
- (c) Organism H → Organism G → Organism F → Bird
9. (a) A *sex-linked characteristic* is a trait that is expressed by a gene/allele found on the sex chromosome.  
 (b) (i)



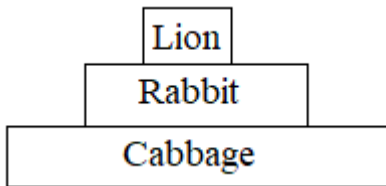
(ii) Probability of having a normal child =  $\frac{1}{4}$

**ANSWERS FOR 2015 (i) QUESTION PAPER 2 SECTION A**

10. (a)(i) Grasshopper or Rabbit.

(ii) Cabbage → Rabbit → Lion

(iii)



(b) 1 - In food chain each organism occupies only one trophic level while in food web each organism may occupy more than one trophic level except the producer.

2- Food chain usually involves fewer organisms while food web usually involves more organisms.

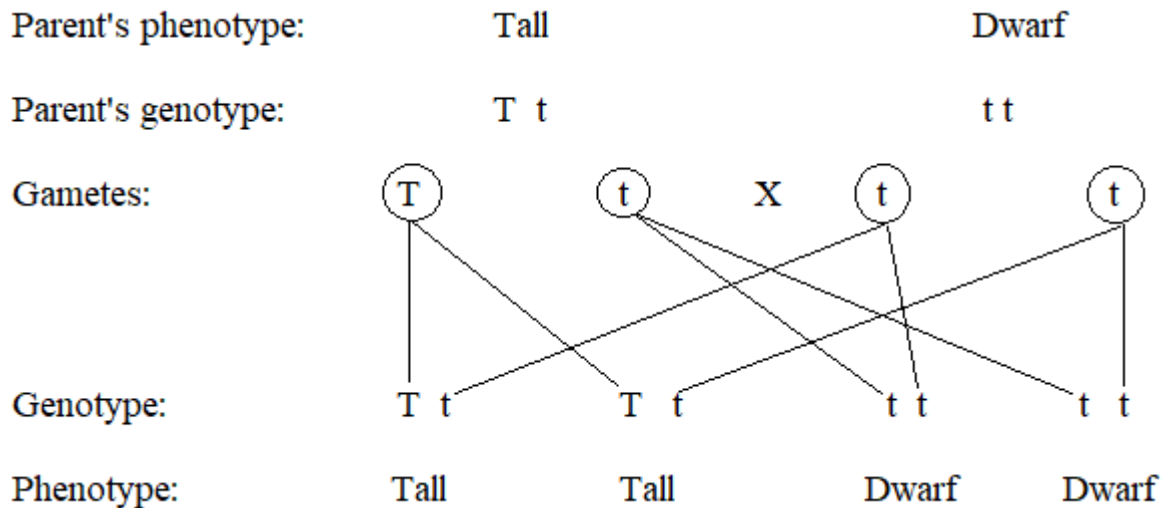
(c) At each trophic level 90% of its total of energy is lost through respiration, egestion and excretion and only 10% of the energy present is passed on from one trophic level to the next.

11. (a) (i) *Pure breeding* is an organism with a genotype whose both alleles are the same either dominant or recessive.

(ii) Pure breeding dwarf garden pea plant =  $t t$

Pure breeding tall garden pea plant =  $T T$

(b)



(c) *Homozygous* a type of genotype where both alleles are the same either dominant or recessive while *heterozygous* is a type of genotype where the two alleles are different, such as one allele is dominant while the other is recessive.

**ANSWERS FOR 2015 (ii) QUESTION PAPER 2 SECTION A**

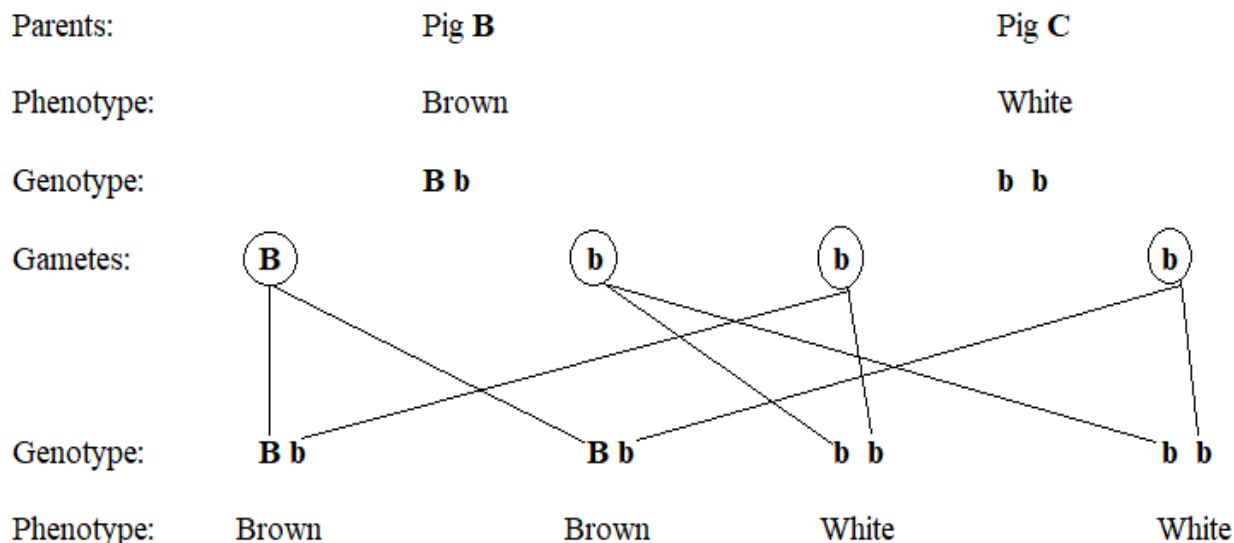
12. (a)(i) A is Rhizopus                      B is Spider                      C is Bacterium  
 (ii) A is Fungi kingdom                      B is Animalia kingdom                      C is Prokaryota kingdom  
 (b) (i) 1 – Bacteria      2 – Fungi (Rhizopus)                      (ii) Fungal disease.
13. (a)(i) E – Nucleus      D – Head  
 (ii) F - Is used for swimming (moving) in the uterus.                      (b) Mucus
- (c) (i) The sperms gather around the ovum and compete for it by secreting enzymes which can digest the wall of an ovum. Once one of them succeeds in penetrating the wall of the ovum, it gets in leaving its tail out. At the same time, the ovum produces an impermeable wall around it called fertilization membrane which prevents any more sperms entering the ovum.  
 (ii) 1 - Ovum is big in size while a sperm is small in comparison.  
 2 – An ovum is unable to move by itself while a sperm is able to move on itself.

**ANSWERS FOR 2016 G.C.E QUESTION PAPER 2 SECTION A**

14. (a)(i) Grass      (ii) Grasshopper or Mice      (b) The SUN                      (c)(i) Chemical energy  
 (ii) At each trophic level 90% of its total of energy is lost through respiration, egestion and excretion and only 10% of the energy present is passed on from one trophic level to the next.  
 (d) (i) 1 – The Snake      2 – The Hawk  
 (ii) Grass → Grasshopper → Mice → Snake → Hawk
15. (a) Because it doesn't have a birth canal (vagina), it's a male.

(b) (i) White colour                      (ii) Genotype of Pig A: B b                      Genotype of Pig C: b b

(c)



**ANSWERS FOR 2016 QUESTION PAPER 2 SECTION A**

16. (a) S - Anther                      T - Stigma                      U - Ovary

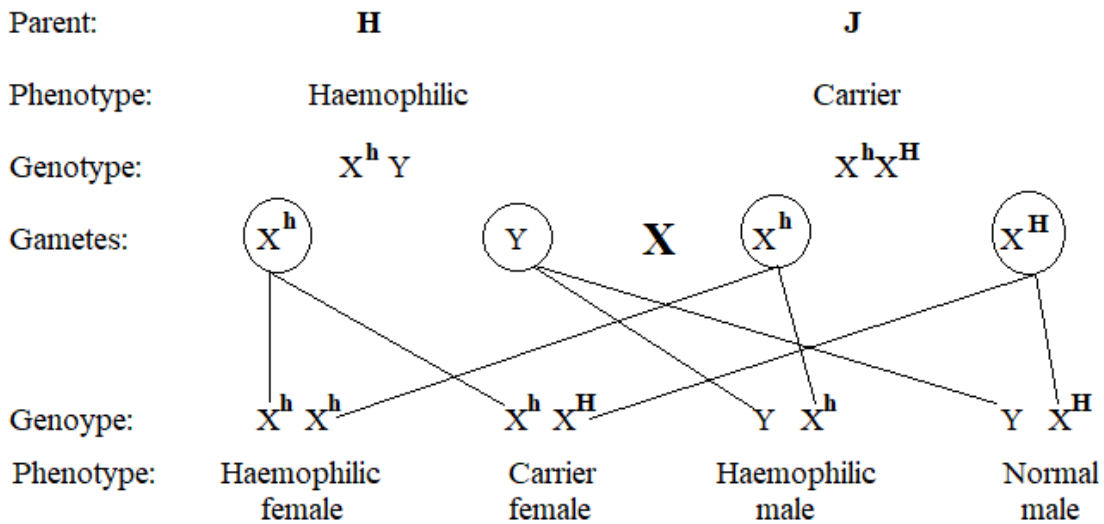
(b) (i) Wind pollination .

(ii) 1 – its anther and stigma are hangs out.                      2 – its stigma are hairy.

17. (a)(i) Family A                      (ii) Because it has produced one child who is hemophilic.

(b) (i) Genotype of offspring H:  $X^h Y$                       Genotype of offspring J:  $X^H X^h$

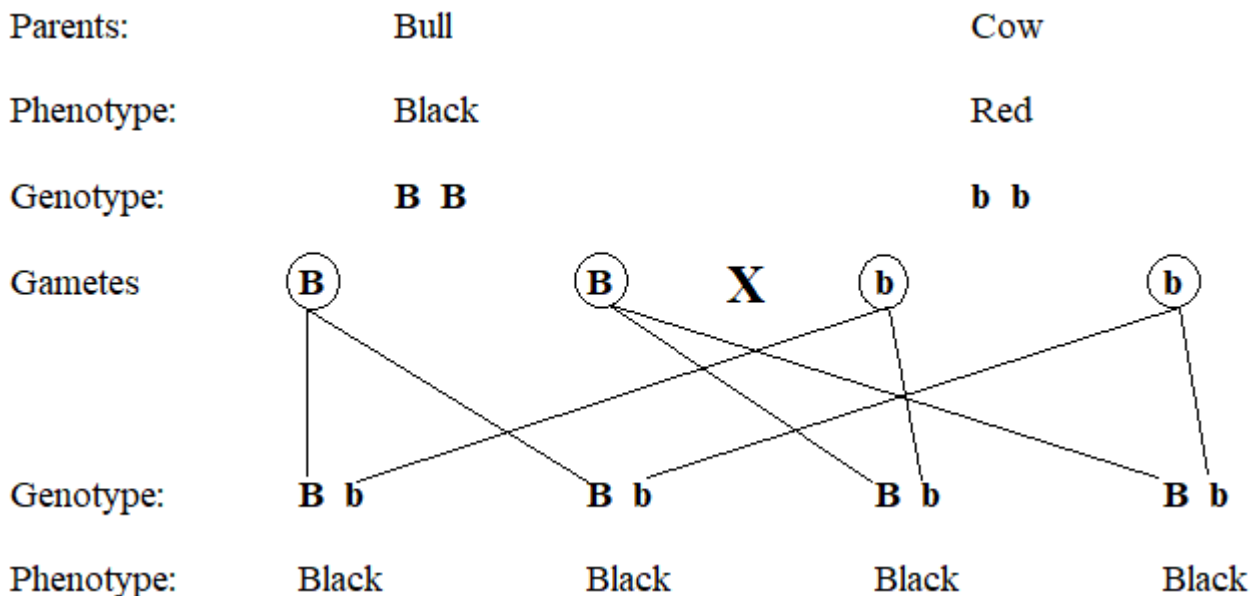
(ii)



**ANSWERS FOR 2017 G.C.E QUESTION PAPER 2 SECTION A**

18. (a)(i) allele for black colour (B)                      (ii) Genotype of black bull: B B

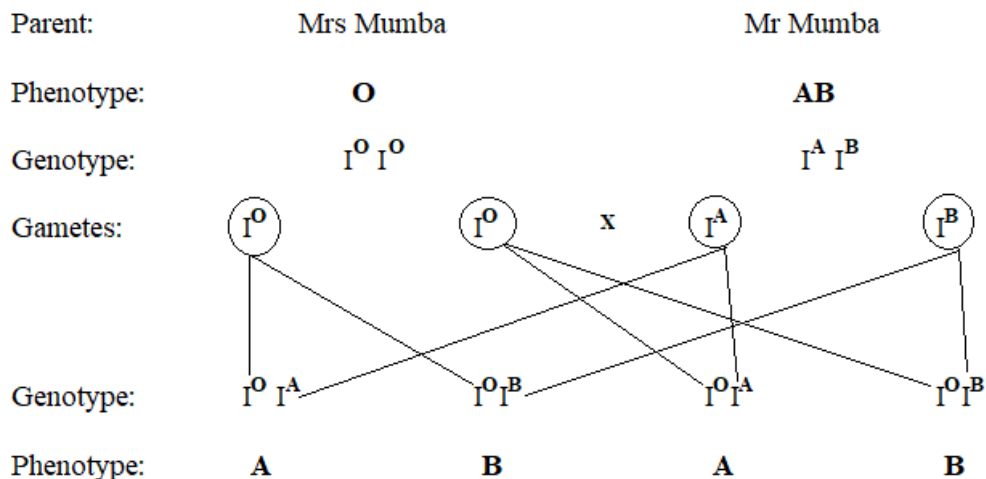
(b)



(c) Do Charolais dilution to the pure breeding black bull or red cow which will mutate the gene. This dilutes red pigment to pale-red and black pigment to gray while two copies produce the typical white phenotype of Charolais breed.

**ANSWERS FOR 2017 QUESTION PAPER 2 SECTION A**

19. (a)

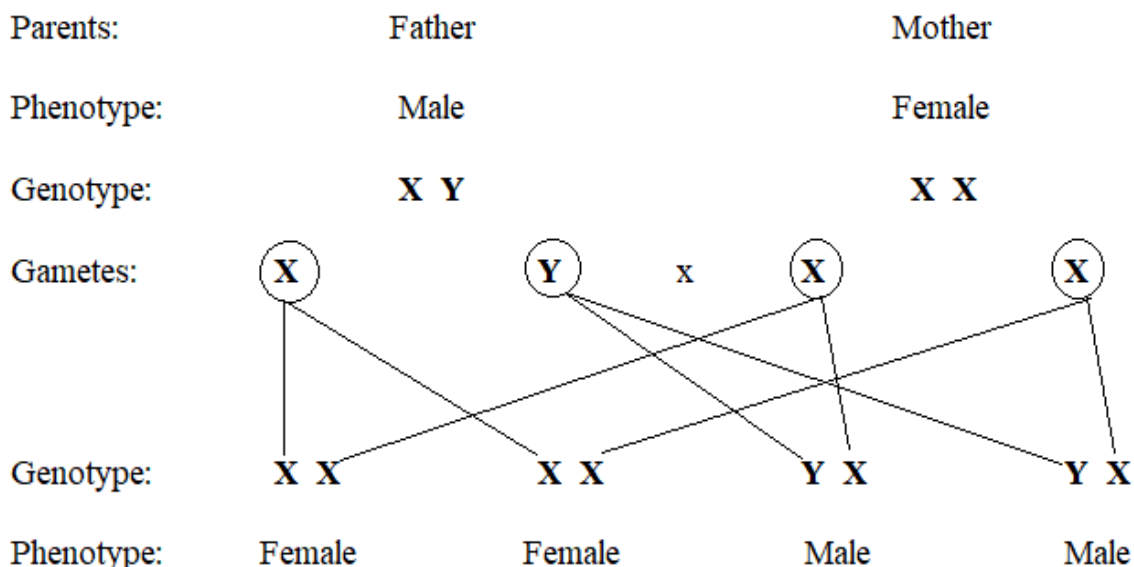


(b) Genotype of the actual father:  $I^O I^O / I^A I^O / I^B I^O$

**ANSWERS FOR 2019 G.C.E QUESTION PAPER 2 SECTION A**

20. (a) (i) The sex of the foetus is determined by sex chromosomes which are X – Chromosome and Y – chromosomes. Maleness is determined by the presence of Y chromosomes and its genotype is X Y. Femaleness is determined by the absence of Y chromosome and its genotype is X X.

(ii)



(b) 1 – Abstinence i.e. practice of restraining oneself from indulging in sex.

2 – By using condom always when one is having sex.

**ANSWERS FOR 2019 QUESTION PAPER 2 SECTION A**

21. (a)(i) 1 - She is risking of contracting STIs' including HIV.

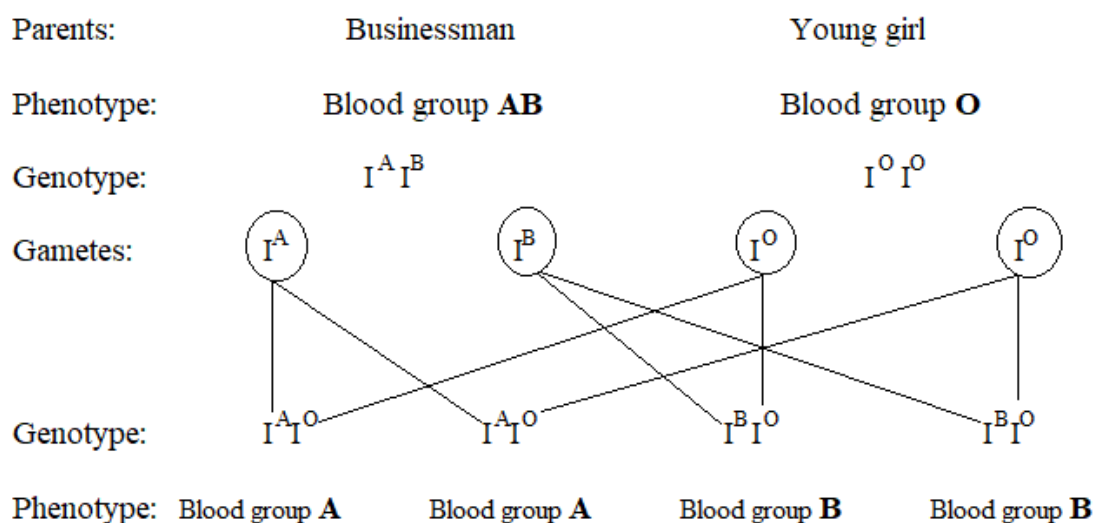
2 - She is risking of having unintended pregnancy and disintegration of families.

(ii) Abstinence i.e. practice of restraining oneself from indulging in sex.

(b) By using a Condoms: A condom keep semen from being deposited directly into the vagina.

(c) (i) Businessman.

(ii)



**ANSWERS FOR 2009 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS**

22. (a) Sexual of reproduction is better than the asexual reproduction in that Sexual reproduction provides diversity in the genetic makeup of the offspring. Since both the parents are involved, the newly formed individuals have the attributes of both. Variations are more successful in sexual mode than in asexual one. The species produced by sexual reproduction survive more than those produced by asexual reproduction. This is because genetic variations help them to adapt to different environments.

(b) At the top of the reproductive hyphae there is a sporangium that contains spores. Spores are reproductive structures that can grow into another fungus. At some time the sporangium will burst open dispersing the spores into the air. If a spore falls on an area of favorable conditions (food – water– air) it will germinate and grow into a new identical fungus.

(c) A pollen grain lands on a stigma and then secretes sugary solution. This stimulates the development of pollen tube which grows down the style & ovary. The pollen tube nucleus secretes an enzyme to digest a pathway through style. The male gamete is liberated in ovary and fuse with ovum cell forming an embryo. The first male nucleus fuses with the egg cell to form a diploid zygote which later develops into the embryo. The second male nucleus fuses with two polar nuclei to form a triploid cell which later develops into the endosperm.

### *ANSWERS FOR 2010 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**23. (a)(i)** Fishing can lead to reduction of fish population and endangers it (puts it at risk of extinction). This is due to overfishing. Fishing endanger habitat destruction and habitat degradation. Fishing causes water pollution. During fishing oil from machine boat pollute the water.

**(ii)** Charcoal burning produces carbon monoxide which pollute the air. This causes breathlessness, headache and suffocation to death in humans. It interferes with the carbon cycle because there is reduced photosynthesis, leading to accumulation of carbon dioxide in the atmosphere. This in turn contributes to the greenhouse effect. Charcoal burning promotes soil erosion by wind and rain water because trees are cut and the land is left bare.

**(b) (i)** Some microorganisms present in sewage are pathogenic and may cause diseases such as cholera, dysentery and typhoid. Decomposition of the organic components of sewage leads to high levels of phosphates and nitrates and leads to algal blooms and multiplication of water weeds. This lowers the amount of oxygen in water and may result in death of fish. Suspended particles present in the sewage reduce penetration of light, slowing down photosynthesis in aquatic plants.

**(ii)** Sulphur dioxide dissolves in rain water forming acid rain. The acid rain breaks down the waxy cuticle on plant leaves, leading to excessive transpiration and leaching of nutrients. This may lead to death of trees and destruction of forests. It destroys the root hairs of plants, leading to reduced uptake of nutrients and water.

### *ANSWERS FOR 2011 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**24. (a)** Nitrogen gas in the atmosphere is taken in the soil by nitrogen fixation and lightening: This is done by the action of nitrogen fixing bacteria such as Rhizobium found in the root nodules of leguminous plants. These bacteria contain an enzyme which catalyses nitrogen gas and hydrogen to form ammonia. Another

bacteria Nitrosomonas oxidized ammonia to nitrite and nitrite to nitrate by nitrobacter and this is called nitrification. Nitrate then is absorbed by the plants hence they have gotten nitrogen and animals got it by eating plants. When plants die, they will be decomposed by fungi and bacteria converting it into ammonia by ammonification, then to nitrite and nitrate by nitrification. Finally nitrate will be converted in nitrogen gas and deposited into atmosphere by the process of denitrification.

(b) The physical components of soil are mineral particles, dead organic matter, water and air. Mineral particles provides the texture of the soil. Dead organic matter it improves soil fertility and help control weeds, and enhances soil aggregation and intact large pores in turn allowing water infiltration and reducing runoff erosion. Water is important in the germination of seeds. The water is imbibed (absorbed) by the seed and softens the testa so that it can split to release the plumule and radicle, activates enzymes and provides an aqueous medium for metabolic reactions to take place and water is involved in hydrolysis of complex nutrients in a seed e.g. hydrolysis of starch to maltose. Air has a gas called oxygen which is necessary for germination of seeds. It is required for respiration which provides energy for germination.

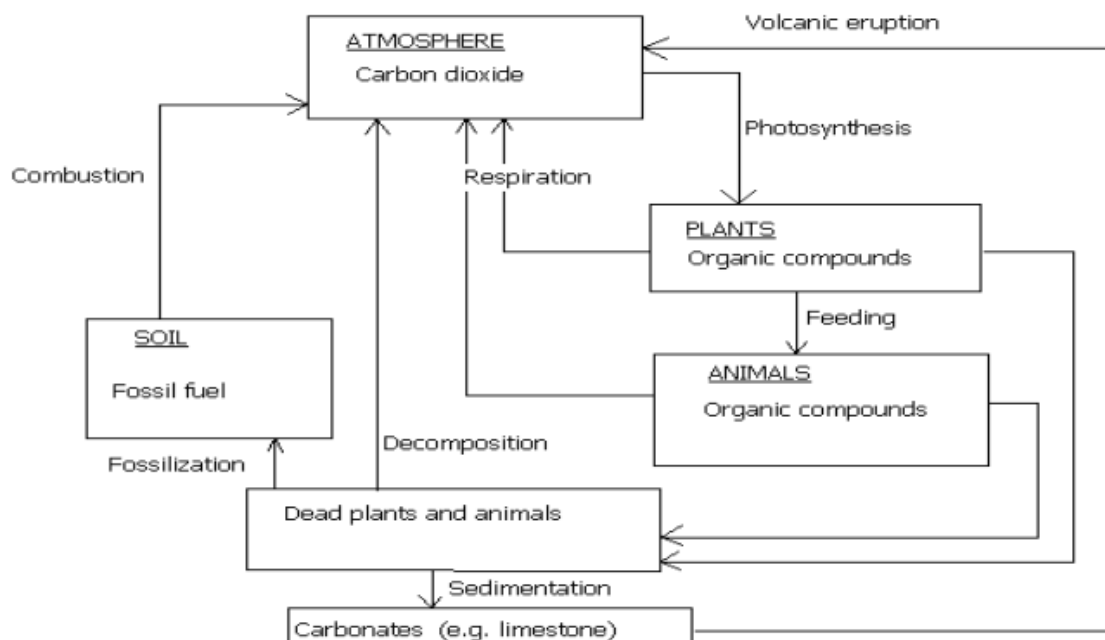
### ANSWERS FOR 2012 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS

25. (a) A pregnant woman needs diet rich in proteins because new cells for growth are made and Vitamin C to prevent infections. She needs Mineral ions like calcium and phosphorus for strong and proper formation of bones and teeth, if she takes less calcium, her teeth would ache. Iron for the formation of red blood cells, if little is taken, much of it is used by the foetus alone and the mother becomes anemic. A lot of fluids because many chemical reactions take place in fluid medium and the water is also required for buoyancy in the amniotic cavity. A pregnant woman needs also lot of carbohydrates in order to be energetic.

(b) Condoms: A condom is fitted around an erect penis or inserted into the vagina before intercourse so as to keep semen from being deposited directly into the vagina. Diaphragm (cap): This is a thin latex cap fitted over the cervix before intercourse so as to block spermatozoa from entering the uterus. Intra-uterine Device (IUD): This is a device made of plastic and copper wire that is inserted into the uterus to prevent implantation by irritating the lining of the uterus. Spermicides: These are chemical substances that are applied inside the vagina before sexual intercourse in order to kill spermatozoa. Vasectomy: This is the cutting and tying of sperm ducts to block passage of spermatozoa from the testicles. Tubal Ligation (Laparotomy): Oviducts are cut and tied to prevent passage of eggs from the ovaries to the uterus.

26. (a)

**CARBON CYCLE**



(b) Deforestation has an effect on the Carbon Cycle also known as the Greenhouse gas effect and global warming. Trees and forest balance the amount of Carbon in the atmosphere through the process of photosynthesis in which plants make their own food with carbon dioxide. When there is an excess amount of carbon dioxide in the atmosphere a ‘blanket’ of carbon dioxide is created and this ‘blanket’ traps heat and prevents it from leaving the earth surface in the atmosphere. This excess heat warms the earth. If there is too much of it and this causes Global Warming and the heating of the earth. Deforestation has an effect to the Landscape because there will not be as many plants and trees to take in the earth’s carbon dioxide and produce oxygen. Thus causing air pollution and greenhouse gas problems. Deforestation has the effect to People because the lack of trees and plants means the lack of oxygen which humans need to breathe and live.

**ANSWERS FOR 2014 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS**

27. (a) (i) Animal-dispersed seeds have the following characteristics: Presence of hooks to cling to the fur of animals e.g. black jack. Succulent (juicy) mesocarps to attract and reward animals e.g. mangoes. Brightly coloured epicarps to attract animals to fruits, especially when ripe e.g. oranges. Seeds have hard testa that are resistant to digestive enzymes found in the guts of animals e.g. guavas. Scented fruits to attract animals e.g. oranges. Wind-dispersed seeds have the following characteristics: Parachute’ of hairs (pappus) formed from sepals after fertilization causes the fruit to float thereby delaying landing and encouraging dispersal. An example of a seed that has a pappus is the dandelion seed. Wing-like Structures that cause the fruit to float thereby delaying landing and encouraging dispersal. An example of a seed that has wing-like structures

is the sycamore seed as illustrated in the following diagram. Water-dispersed fruits have fibrous pericarps that enable them to float in water e.g. coconut fruits.

(b) The advantages of vegetative propagation is a mate is not required for offspring to be produced. Large numbers of offspring can be produced in a short time. Desirable features of parents are passed on to the offspring unchanged. It makes it possible to grow new plants of certain species even when seeds fail. The disadvantages of vegetative propagation is undesirable features of parents are passed on to the offspring unchanged. Lack of genetic variation makes it difficult to adapt to a variety of habitats. It often leads to overcrowding and competition for resources

*ANSWERS FOR 2015 (i) QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**28. (a) (i)** Grafting involves bringing together a stock and a scion coming from two closely related plants i.e. plants of the same species or genus. The stock is the part whose aerial (upper) parts have been cut off and it provides an already established root system that is responsible for absorbing water and mineral salts. The scion is the aerial part that bears buds which later form the shoot. This is the part that has the desired stem, leaves, flowers or fruits. The stock and scion are cut with complementary shapes that fit into each other before being tied together.

(ii) Budding: This a type of vegetative propagation where a bud is used as scion and the bark of an entire plant used as a stock. The bud is cut in such a way that it has some cambium. A T-shaped cut is made in the scion reaching up to the cambium. Then the bud (scion) is inserted into the T-shaped part of the stock in such a way that the cambium from the two parts is in contact. The two parts are tied together and sealed with wax, leaving the bud exposed. The wax prevents excessive transpiration.

(b) Condoms: A condom is fitted around an erect penis or inserted into the vagina before intercourse so as to keep semen from being deposited directly into the vagina. Diaphragm (cap): This is a thin latex cap fitted over the cervix before intercourse so as to block spermatozoa from entering the uterus. Intra-uterine Device (IUD): This is a device made of plastic and copper wire that is inserted into the uterus to prevent implantation by irritating the lining of the uterus. Spermicides: These are chemical substances that are applied inside the vagina before sexual intercourse in order to kill spermatozoa. Vasectomy: This is the cutting and tying of sperm ducts to block passage of spermatozoa from the testicles. Tubal Ligation (Laparotomy): Oviducts are cut and tied to prevent passage of eggs from the ovaries to the uterus.

- 29. (a)(i)** Pollination is the transfer of pollen grains from the anther to the stigma on the same plant or different plants of the same species.
- (ii)** Fertilization is the fusing of male gamete with a female gamete forming an embryo. In flowering plants the male gamete is liberated in ovary and fuse with ovum cell forming an embryo. The first male nucleus fuses with the egg cell to form a diploid zygote which later develops into the embryo. The second male nucleus fuses with two polar nuclei to form a triploid cell which later develops into the endosperm.
- (b)** Animal-dispersed seeds have the following characteristics: Presence of hooks to cling to the fur of animals e.g. black jack. Succulent (juicy) mesocarps to attract and reward animals e.g. mangoes. Brightly coloured epicarps to attract animals to fruits, especially when ripe e.g. oranges. Seeds have hard testa that are resistant to digestive enzymes found in the guts of animals e.g. guavas. Scented fruits to attract animals e.g. oranges. Wind-dispersed seeds have the following characteristics: Parachute' of hairs (pappus) formed from sepals after fertilization causes the fruit to float thereby delaying landing and encouraging dispersal. An example of a seed that has a pappus is the dandelion seed. Wing-like Structures that cause the fruit to float thereby delaying landing and encouraging dispersal. An example of a seed that has wing-like structures is the sycamore seed as illustrated in the following diagram. Water-dispersed fruits have fibrous pericarps that enable them to float in water e.g. coconut fruits.

*ANSWERS FOR 2015 (ii) QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

- 30. (a) (i)** *Community* is a group of populations found in the same area and interact with each other.
- (ii)** *Habitat* is a place where an organism lives. Examples of habitats are aquatic habitats (found in water), terrestrial habitats (found on land)
- (iii)** *Niche* is the specific role a given organism plays in an ecosystem e.g. some organisms such as algae and green plants are producers; other such as animals are consumers; and other such as bacteria and fungi are decomposers.
- (b)** Producers they capture solar energy during the process of photosynthesis and converted to chemical energy (food) which living organisms are able to use (eat) hence they provide food for other living organisms in an ecosystem. Consumers they obtain energy by feeding on other organisms and sometimes transfer energy to other organisms (consumers). Decomposers they remove the dead remains of plants and animals, which would otherwise collect on the Earth's surface. They also break these remains down into substances that can

be used by other organisms. Some bacteria, for example, break down the protein of dead plants and animals and release nitrates, which are taken up by plant roots and are built into new amino acids and proteins.

*ANSWERS FOR 2016 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**31. (a)** Factors that make soil fertile are air, it makes the soil aeration because plants cannot use nutrients if roots have no air. Micro-organisms are responsible for most of the nutrient release from organic matter. They decompose organic matter and releases ammonia which turned again to nitrate which plants uses for growth. Organic matter it enhances soil aggregation and intact large pores in turn allowing water infiltration. Water (moisture) is imbibed (absorbed) by the seed and softens the testa so that it can split to release the plumule and radicle. Mineral elements like nitrogen, phosphorous and potassium make the soil fertile. The pH of the soil must be between 6 and 7.

**(b)** Causes of soil loss fertility is deforestation removes legume trees that replaces nutrients in the soil and it makes soil erosion by wind and rain water. Poor farming methods like the consisting the use of some chemicals like herbicides, pesticides and fertilizers they kill micro-organism in the soil. Overgrazing removes the ground cover exposing the soil to wind and water which lead to soil erosion. Leaching removes vital nutrients and micronutrients such as water-solute boron from the soil causing potential deficiencies in crops.

**(c)** Methods of improving and retaining soil fertility is crop rotation which minimize the risk of depleting the soil of particular nutrients or water at a particular soil depth because each crop has its own specific requirement. Tillage suppresses the growth of weeds and promotes a good crumbly and porous with a stable granular structure. Liming increase the pH, neutralizing the acidic soil and promoting clumping of soil particles thus improving soil structure. Addition of organic which promotes humus formation and improves soil structure.

*ANSWERS FOR 2016 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**32. (a)** The advantages of vegetative propagation is a mate is not required for offspring to be produced. Large numbers of offspring can be produced in a short time. Desirable features of parents are passed on to the offspring unchanged. It makes it possible to grow new plants of certain species even when seeds fail. The disadvantages of vegetative propagation is undesirable features of parents are passed on to the offspring unchanged. Lack of genetic variation makes it difficult to adapt to a variety of habitats. It often leads to overcrowding and competition for resources.

(b) After pollination, the pollen grain absorbs water from the stigma and becomes swollen. Then the pollen tube nucleus germinates to form a pollen tube which grows through the stigma, style and ovary until it reaches the embryo sac inside the ovule. To form the pollen tube, the pollen tube nucleus secretes enzymes that break down part of the stigma, style and ovary. After reaching the micropyle the tube nucleus disintegrates. The generative nucleus follows the tube nucleus behind and divides into two haploid cells called male nuclei. The first male nucleus fuses with the egg cell to form a diploid zygote which later develops into the embryo. The second male nucleus fuses with two polar nuclei to form a triploid cell which later develops into the endosperm. This type of fertilization where one male nucleus fuses with the egg cell to form a diploid zygote and the other male nucleus fuses with two polar nuclei to form a triploid cell is called double fertilization.

**33. (a)** Ecosystem is a definable area made of communities of living things that interact with each other and their non-living environment e.g. a pond. It has air dissolved in water which contain oxygen which animals use for respiration. Air also contain carbon dioxide gas which algae use for photosynthesis. The ecosystem has water which is used by plants for photosynthesis and animal (fish) for hydration. It has light (sun), this is used by plant for photosynthesis and animal it provides favorable temperature. Producers e.g. algae are features of ecosystem and they capture solar energy during the process of photosynthesis and converted to chemical energy (food) which living organisms are able to use (eat) hence they provide food for other living organisms in an ecosystem. Ecosystem has Consumers (snail, fish, moorhen) they obtain energy by feeding on other organisms and sometimes transfer energy to other organisms (consumers). Ecosystem has decomposers they remove the dead remains of plants and animals.

(b) Agriculture contributes to deforestation as forests are cleared to make room for growth of crops or rearing of livestock in return destroying habitat of animals. Fertilizers and pesticides disturb the ecosystems by killing innocent organisms and increasing soil acidity. This leads to water, soil and air pollution. The clearance of forest for agriculture leads to reduction in biodiversity.

*ANSWERS FOR 2017 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**34. (a)** Infertility in Women is caused by ovulation disorders. If a woman has an ovulation disorder, she may ovulate infrequently or not all. Tubal factor fertility is when there are problems in the fallopian tube(s), which prevents the sperm from fertilizing the egg also causes infertility. Endometrial polyps are growths found in the uterine cavity. Large polyps or multiple polyps can impact fertility by interfering with the ability of

embryo to implant and should be removed. Fibroids are noncancerous growths in the uterus. Fibroids that distort the uterine cavity have an impact on the ability of an embryo to implant and should be removed surgically. The most common causes of infertility in men is varicocele, this is a swelling of the veins that drain the testicle, which can impact sperm quality. The other is ejaculation disorders include premature ejaculation, anejaculation (the failure to ejaculate), and retrograde ejaculation, which is when semen enters the bladder during orgasm instead of coming out the tip of the penis. Presence of Anti-sperm antibodies are immune system cells that mistakenly identify sperm as harmful invaders and attempt to eliminate them. Problems with sexual intercourse, these can include trouble keeping or maintaining an erection sufficient for sex (erectile dysfunction), premature ejaculation, painful intercourse, anatomical abnormalities such as having a urethral opening beneath the penis (hypospadias), or psychological or relationship problems that interfere with sex.

**(b)** During pregnancy eating a balanced diet will also reduce the risks of anemia, as well as other unpleasant pregnancy symptoms such as fatigue and morning sickness. A well-balanced pregnancy diet includes protein, vitamin C, calcium, fruits and vegetables, whole grains, iron-rich foods, adequate fat and folic acid. In order to protect mom and baby from bacteria or parasitic infection, make sure that all milk, cheese, and juice are pasteurized. Don't eat meat from the deli counter or hot dogs unless they are thoroughly heated. Also avoid refrigerated, smoked seafood and undercooked meat, poultry, and seafood. Taking a prenatal vitamin, Folic acid (folate) supplements which provide the extra nutrition that the developing fetus needs. Doing moderate exercise about 30 minutes a day which help circulation, strengthen muscles, and decrease stress. Prenatal service for checking the growth and healthy of the baby.

**(c)** Childbirth, also known as labour and delivery, is the ending of pregnancy where one or more babies leaves the uterus by passing through the vagina or by Caesarean section. Safe child birth is to insure that the baby is ready to be born and the mother's body is ready to birth her baby. Let labor begin on its own and the delivery happen in the hospital or clinic.

- 35. (a)(i)** Sensory Neurons they carry impulses from sense organs (receptors) to the central nervous system.
- (ii)** Motor Neurons they carry impulses from the central nervous system to effectors.
  - (iii)** Relay Neurons they form a link between sensory neurons and motor neurons.
- (b) (i)** A spinal reflex action is an automatic and stereotyped response through which impulses pass through the spinal cord. Examples of spinal reflex are withdrawing a hand from a hot object, jumping up after sitting on a pin, etc.

(ii) A conditioned reflex action is a response that results from learning or training and a response given is not related to the stimulus but the animal associates it with a related stimulus after being trained to do so. Example is walking, responding to a name, cycling and driving, etc.

**36. (a)** The iris contains two sets of muscles, the circular and radial muscles. Circular muscles run around the iris and radial muscles run from the centre to the outside. When circular muscles contract they make the pupil smaller. When the radial muscles contract they stretch the pupil outwards making it wider. In bright light, too much light is entering the eye, the circular muscles contract at the same time the radial muscles relax limiting the amount of light entering the eye. In a dark room, the radial muscles contract at the same time the circular muscles relax widening the pupil to let more light in.

(b) Exoskeleton is a type of skeleton located outside the muscles of the body and occurs in all arthropods (crustaceans, insects, myriapods and arachnids). Exoskeleton is a hard, tough layer made of substance called chitin. Exoskeleton is a non-living and does not grow as animal grow. Whereas an endoskeleton is located inside the body and is made of bones and cartilage which are living tissues. This type of skeleton is found in all vertebrates i.e. fish, amphibians, reptiles, birds and mammals.

(c) *Gout* is a condition characterized by formation of uric acid crystals at the joints. It leads to swelling and pain of joints. *Arthritis* is inflammation of joints characterized by painful and swollen joints. The inflammation initially affects the synovial membranes but eventually causes damage to cartilage and bone, making movement difficult. *Dislocation* is a condition where one or more bones move out of place at a joint.

**37. (a)** Biodiversity is the variety of living organisms in an ecosystem. It is the variety of ecosystems, habitats, species and genotypes that exists in an area.

(b) Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. Biodiversity enable species to depend on each other. Each species depends on the services provided by other species to ensure survival. It is a type of cooperation based on mutual survival. Biodiversity ensures natural sustainability for all life form and it enable ecosystems to be better, withstand and recover from a variety of disasters.

(c) Biodiversity should be maintained to preserve different plants in which some are used make drugs hence bring income by supplying the drugs Tourism provides people with the means to explore the natural world and provides income for the country. Medicinal plants provide herbs used to treat diseases like malaria. Animals are hunted for food and skins. Biodiversity should be maintained to preserve many more plant species in rainforests, which could potentially provide life-saving medicines. Biodiversity should be maintained to preserve because in some countries, people derive income from tourists who visit the country to see wildlife. Biodiversity should be maintained to make stability of ecosystems because if there is a loss of one of more species within a community may have negative effects on others, so that eventually an entire ecosystem becomes seriously depleted.

**38. (a)** A population is a group of organisms of the same species living in the same area at the same time. Population size is the number of organisms in a population and population density is the number organisms of the same species per unit area. Population growth rate is the increase in the size of a population per unit time.

(b) The factors that cause changes in population size birth rate which is the number of births per unit number of adults in a population. When there is high availability of food, water, oxygen and light, less predators and parasites and minimal disease and no pollutants and competition, and the climate change favorable then the birth rate and the immigration will be high. Hence the population will increase. Immigration is the movement of more organisms into a population. People move to an area where there is high availability of food, water, oxygen and light, less predators and parasites and minimal disease and no pollutants and competition, and the climate change favorable. This will increase the population. Death rate is the number of deaths per unit number of adults in a population. If there is more death then the population will reduce but with low death rate can maintain or increase the population. Emigration: the movement of organisms out of a population. Animals move in search food, peace (no predators, parasites, disease or competition).

*ANSWERS FOR 2019 G.C.E QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

**39. (a)** Sexual feeling is a motivational state and an interest in “sexual objects or activities, or as a wish, or drive to seek out sexual objects or to engage in sexual activities. Sexual feelings are *libido*, *sexual attraction* or *lust* that one person has for another person.

(b) The causes of sexual feelings are having interest in any type of sexual activity, including masturbation. Often having sexual fantasies or thoughts. Being concerned with sexual activity or fantasies. Recalling instances when felt sexy or having sexual intercourse.

(c) The consequences of acting on sexual feelings without proper planning is risking of contracting STI'S such as HIV. One is risking of having disintegration of families due to the death of parents. A person can have unplanned pregnancies

40. (a) (i) Agriculture contributes to deforestation as forests are cleared to make room for growth of crops or rearing of livestock in return destroying habitat of animals. Fertilizers and pesticides disturb the ecosystems by killing innocent organisms and increasing soil acidity. This leads to water, soil and air pollution. The clearance of forest for agriculture leads to reduction in biodiversity.

(ii) Deforestation effect the Carbon Cycle also known as the Greenhouse gas effect and global warming. Deforestation has an effect to the Landscape because there will not be as many plants and trees to take in the earth's carbon dioxide and produce oxygen. Thus causing air pollution and greenhouse gas problems. Deforestation has the effect to People because the lack of trees and plants means the lack of oxygen which humans need to breathe and live. Deforestation also destroys the habitats of animals hence they migrate to new area leaving an ecosystem distorted. It brings reduction in biodiversity.

(b) To minimise the effects of Agriculture and Deforestation on ecosystem the following must be done which are crop rotation, this minimize the risk of depleting the soil of particular nutrients or water at a particular soil depth because each crop has its own specific requirement. Tillage the land which suppresses the growth of weeds and promotes a good crumbly and porous with a stable granular structure. Liming increase the pH, neutralizing the acidic soil and promoting clumping of soil particles thus improving soil structure. Addition of organic which promotes humus formation and improves soil structure.

### *ANSWERS FOR 2019 QUESTION PAPER 2 SECTION B ESSAY QUESTIONS*

41. (a) The natural propagation in plants are : Root tuber: This is a root that has become swollen because of stored food and is able to grow into a new plant e.g. sweet potatoes and carrots. Stem tuber: This is an underground stem that has become swollen because of stored food and contains eye buds that are able to grow into new plants e.g. Irish potatoes. Corm: This is swollen underground and vertical short stem with apical and axillary buds that can grow into new shoots e.g. Crocus sp. Bulb: A bulb is made of underground fleshy leaves growing from a short stem e.g. garlic and onion (*Allium* sp). The fleshy leaves contain food in

them. Rhizome: This is a swollen underground horizontal stem e.g. ginger. A rhizome has adventitious roots and buds that can develop into new shoots at the nodes. Suckers: These are underground lateral branches of stems having terminal buds and adventitious roots e.g. bananas and plantains. Runners, stolons and vines: These are horizontal stems growing above the ground and have adventitious roots and buds at the nodes e.g. lawn grass, sweet potato vines. Leaves: Certain plants such as Bryophyllum have leaves that are swollen with stored food and have buds and adventitious roots that can develop into new plants.

(b) The advantages of vegetative propagation is a mate is not required for offspring to be produced. Large numbers of offspring can be produced in a short time. Desirable features of parents are passed on to the offspring unchanged. It makes it possible to grow new plants of certain species even when seeds fail. The disadvantages of vegetative propagation is undesirable features of parents are passed on to the offspring unchanged. Lack of genetic variation makes it difficult to adapt to a variety of habitats. It often leads to overcrowding and competition for resources

**42. (a)** Puberty is the stage in the development when one reaches sexual maturity and becomes capable of reproducing. It is when reproductive organs become matured.

(b) The changes that occur at puberty to both boys and girls are, development of pubic hair on the vulva. The hair in the armpits will also start appearing at puberty. The whole body grows rapidly. At puberty once will start secreting sex hormones. Sexual reproductive organs start in enlarging.

(c) The determinant of puberty in humans are the hormones and age. Hormones they make the body more adapted to carry out reproduction. In males, their development is influenced by the hormone called testosterone which is secreted by the testicles. In females, their development is influenced by the hormone called oestrogen which is secreted by the ovaries. In boys the average age to starts puberty is 11 to 12 years old and in girls its 10 to 11 years old.

**43. (a)** Factors that make soil fertile are air, it makes the soil aeration because plants cannot use nutrients if roots have no air. Micro-organisms are responsible for most of the nutrient release from organic matter. They decompose organic matter and releases ammonia which turned again to nitrate which plants uses for growth. Organic matter it enhances soil aggregation and intact large pores in turn allowing water infiltration. Water (moisture) is imbibed (absorbed) by the seed and softens the testa so that it can split to release the plumule and radicle. Mineral elements like nitrogen, phosphorous and potassium make the soil fertile. The pH of the soil must be between 6 and 7.

(b) Methods of improving and retaining soil fertility is crop rotation which minimize the risk of depleting the soil of particular nutrients or water at a particular soil depth because each crop has its own specific requirement. Tillage suppresses the growth of weeds and promotes a good crumbly and porous with a stable granular structure. Liming increase the pH, neutralizing the acidic soil and promoting clumping of soil particles thus improving soil structure. Addition of organic which promotes humus formation and improves soil structure.