

KUDINKULA MWAPA EAZY



STUDY WITH TARGET

BIOLOGY
MSCE QUESTIONS WITH
SOLUTIONS
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Photosynthesis

1)

Figure 1 shows part of a leaf. Use it to answer the questions that follow.

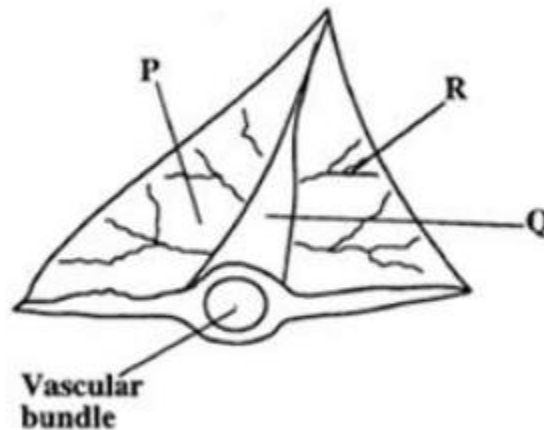


Figure 1

- i. Name the part marked q. (1 mark)

Solution

➤ Midrib

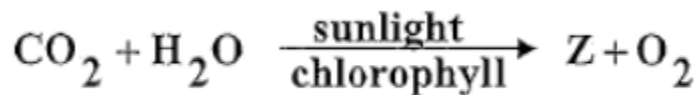
- ii. Explain the functions of p and r in relation to photosynthesis. (4 marks)

Solution

➤ P has large surface area to expose as much of it possible to sunlight and air for photosynthesis.

➤ R is branched to provide good water supply to mesophyll cell for photosynthesis.

- 2) Figure 1 shows part of a chemical equation of a biological process. Use it to answer the questions that follow.



- a) Write down the chemical formula of the substance represented by z. (1 mark)

Solution

➤ $C_6H_{12}O_6$

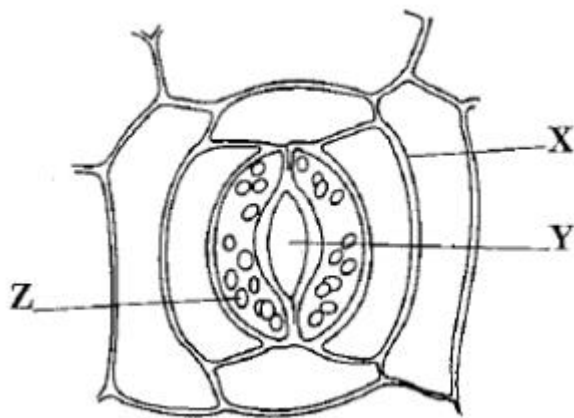
- i. . Explain one use of the substance marked z to a plant. (3 marks)

Solution

- Z is used for respiration to release energy.
 - Z is changed into proteins for growth.
 - Z is changed into lipids for cell wall formation.
- ii. Explain how the process in figure 1 prevents global warming. (2 marks)

Solution

- The process absorbs carbon dioxide from the atmosphere/thereby reducing its concentration in the atmosphere.
- 3) Figure 1 shows some structures of a leaf as seen under An electron microscope. Use it to answer the questions That follow.



- i. Name the parts marked x and y. (2 marks)

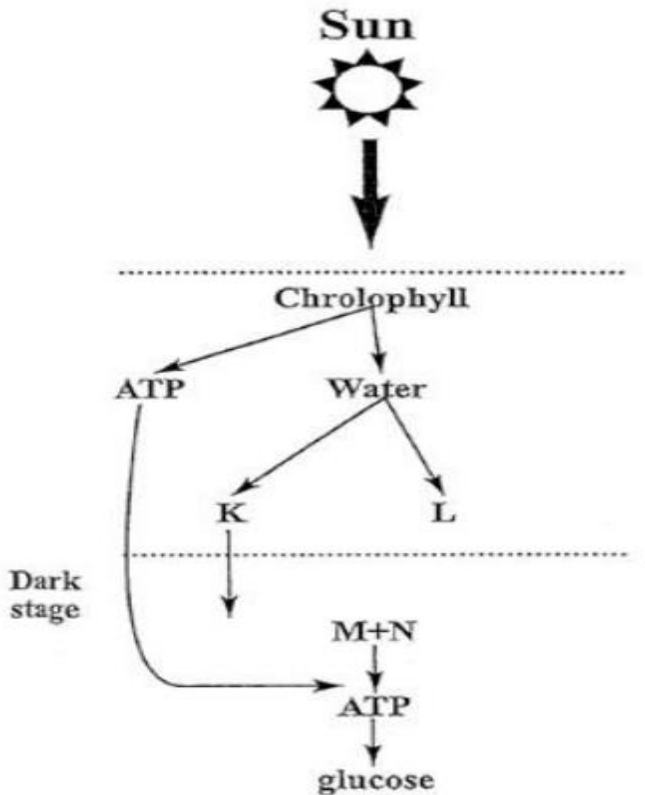
Solution

- **X:** epidermal cell
y: stoma
- ii. Explain how magnesium is important for the function of part marked z. (3 marks)

Solution

- . It is used to form chlorophyll which traps sunlight energy for photosynthesis.

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



- i. Name the process marked k and l.(2 marks)

Solution

- K: oxygen
- L: hydrogen

- ii. Name the process by which substance n gets into the leaf. (1 mark)

Solution

- Diffusion

- iii. Mention one adaptation of a leaf that enables it to get substance n.(1 mark)

Solution

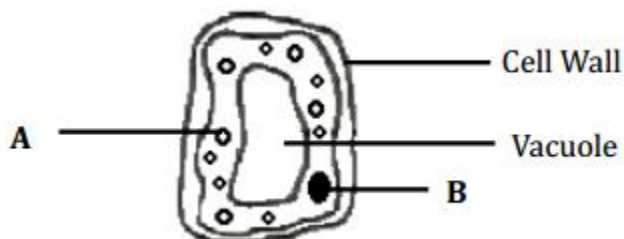
- It has stomata on its surface.

- iv. Name any one chemical reaction that takes place during light stage of photosynthesis.
(1mark)

Solution

- A. Photolysis

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



- 5) (i) give the function of each of the following marked parts

A (1 mark)

Solution

- A: chloroplast, (traps light for photosynthesis).

B (1 mark)

Solution

- B: nucleus



- (ii) what is the name of the cell? (1 mark)

Solution

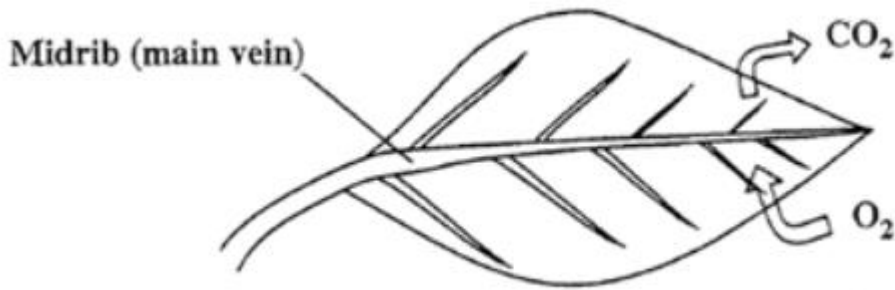
- Plant cell

- iii. State one way in which photosynthesis is important. (1 mark)

Solution

- It provides oxygen to the environment.
- It provides food in form of starch.
- It reduces CO_2 in the atmosphere thereby preventing global warming.

- 6) Figure 1 is a diagram representing gas exchange between a leaf and the atmosphere. Use it to answer the questions that follow.



- i. What process in the leaf leads to this gas exchange shown in figure 1? (1 mark)

Solution

- Respiration

- ii. List two characteristics of a leaf that enable gas exchange shown in figure 1. (2 marks)

Solution

- Has stomata for enter and go out gases.
- Thin lamina to facilitate faster diffusion of gases.

- iii. What is the function of the midrib? (1 mark)

Solution

- Transporting mineral salts as well as water to photosynthesizing leaves.

- 7) What role does the following play in photosynthesis?

- (i) Chlorophyll (1 mark)

Solution

- Chlorophyll absorbs light energy.

- (ii) Xylem (1 mark)

Solution

- Xylem brings water to leaves which is a raw materials for photosynthesis.

- 8) how do plants make proteins? (1 mark)

Solution

- By combining glucose and nitrogen

- 9) Why would a plant fail to carry out photosynthesis if it lacked magnesium? (1 mark)

Solution

- Because magnesium is necessary for production of chlorophyll molecules.

- 10) State one product of the following stages of photosynthesis.

- (i) Light stage (1 mark)

Solution

- oxygen
- (ii) Dark stage (1 mark)

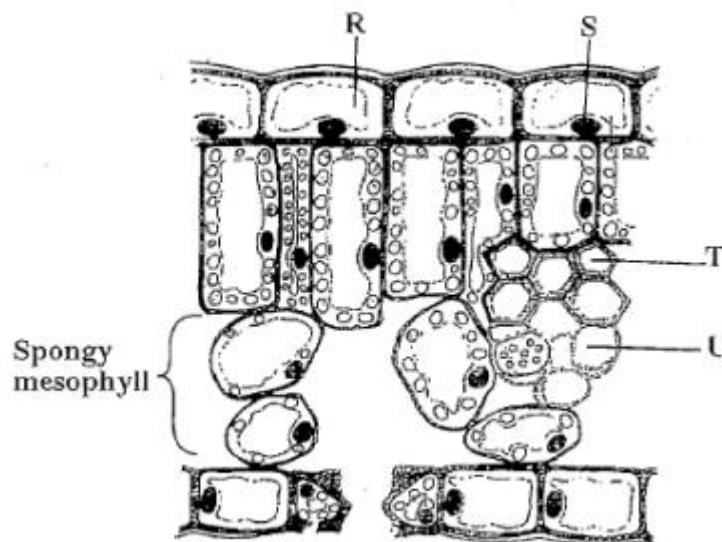
Solution

- Glucose
- 11) how does a green plant reduce carbon dioxide concentration in the atmosphere? (1 mark)

Solution

- By absorbing carbon dioxide which diffuses into leaves of plants to use for photosynthesis.

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



- 13) name the parts marked r and s. (2 marks)

Soution

- R: vacuole
 - S: nucleus
- 14) (i) which tissue is the main site for photosynthesis in the leaf? (1 mark)

Solution

- Palisade mesophyll

- (iii) Give a reason for your answer to (i). (1 mark)

Solution

- having a lot of chloroplasts. Cells are close to upper epidermis

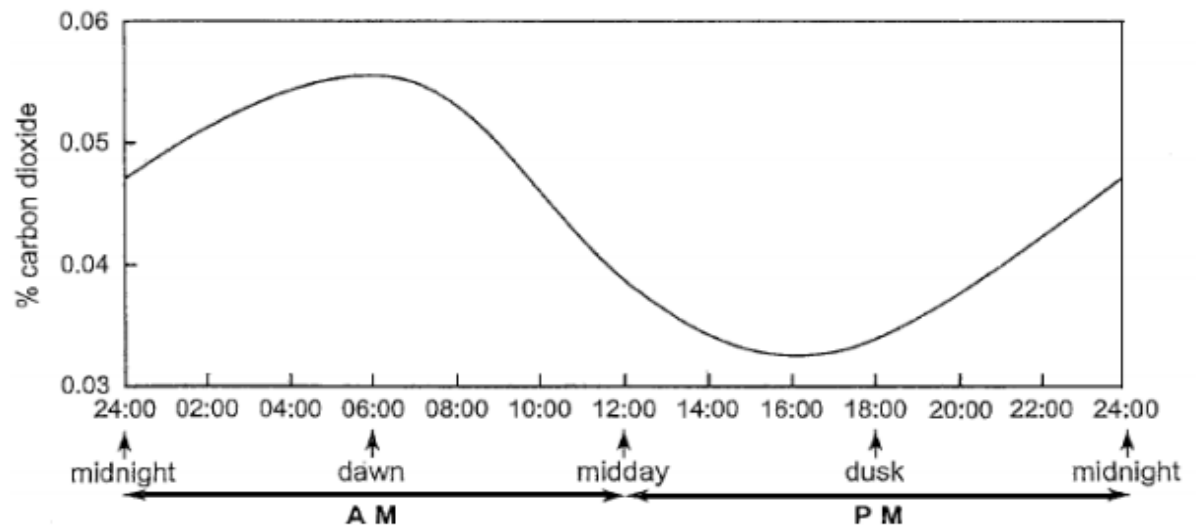
- 15) State two structural differences between the pans marked t and u. (2 marks)

Solution

- T is pentagonal in shape while u is round. T has thick walls while u has thin walls.
- 16) explain how a steady flow of carbon dioxide is maintained between the atmosphere and mesophyll cells in a leaf during day time. (3 marks)

Solution

- Carbon dioxide is used up in the process of photosynthesis in the mesophyll cells so its concentration decreases in the cells hence carbon dioxide diffuses into the leaf to mesophyll cells.
- 17) Figure 3 is a diagram showing the changes in carbon dioxide concentration in air in a forest, over a 24 hour period. Use it to answer the questions that follow.



- 18) describe briefly how the concentration of carbon dioxide changed during the 24 hour period.(3 marks)

Solution

- CO_2 concentration is the highest at dawn. It is decreasing from dawn to dusk. At dusk, the concentration is the lowest. And it is increasing from dusk to dawn.
- 19) Example the carbon dioxide concentration change in . Above. (3 marks)

Solution

- At dawn when sunlight intensity is low, the rate of photosynthesis is low so carbon dioxide which is a raw material for the process does not diffuse much into the leaf. On the other hand, between midday and dusk, the rate of photosynthesis is high since sunlight intensity has increased, so this result in more diffusion of carbon dioxide into the leaf
- 20) Describe an experiment that could be carried out to show that fresh green leaves contain three types of pigments. Your answer should include procedure, results and conclusion in an essay form. (10 marks)

Solution

- Collect fresh green leaves and grind them. Squeeze the ground leaves to obtain an extract. Cut a strip of filter paper. Put a drop of the extract on the strip about 4cm from the edge. Dip the edge of the filter paper with the drop of the extract in alcohol in a beaker about 2cm from the spot of the extract. The alcohol rises up the strips to the spot of the extract dissolve as the alcohol passes through the spot the pigments move up with the alcohol at different rates. This leads to the separation of the pigments into three different coloured spots. The three different coloured spots indicate the leaves have three different types of pigments.

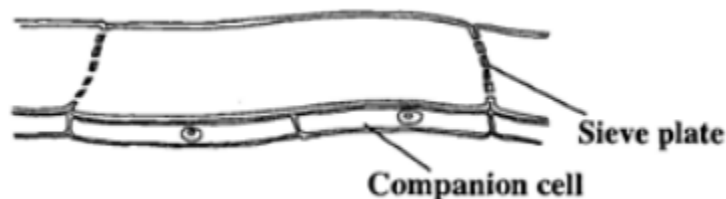
- 21) Explain five ways in which glucose is used by the plant after photosynthesis. (10 marks)

Solution

- 1. Glucose is used by other cells in plant where it can be used for respiration.
- 2. Can be stored for future use in storage organs, e.g. Roots.
- 3. Can be converted into cellulose to make new cell walls.
- 4. Can be converted into fats and oils.
- 5. Can be combined with nitrogen and other minerals to make amino acid and proteins.

Transportation in plants

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



- (i) Identify the tissue. (1 mark)

Solution

- Phloem
- (ii) Give two reasons to support your answer in a.(i). (2 marks)

Solution

- It has sieve plate.
- it has companion cell.
- .

23) explain two adaptations of the tissue to its function. (4 marks)

Solution

- Pores in sieve plate allow sugars to pass from one cell to the other
- . Companion cell carries out some life processes of the phloem

(iii) By what process does a nitrate ion move into a root hair cell when its concentration is higher in the root hair cell than in the soil? (1 mark)

Solution

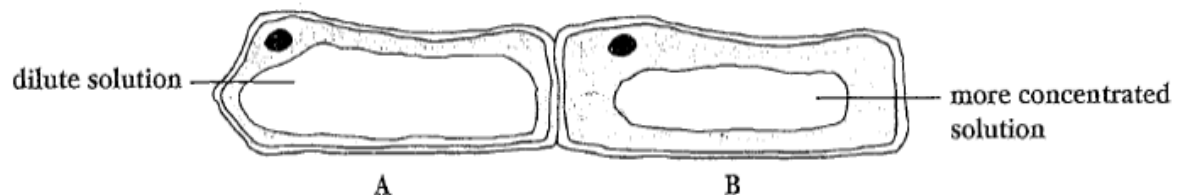
- Osmosis

24) In what way is diffusion similar to osmosis? (1 mark)

Solution

- . Both processes involve movement substance from areas of high concentration to area of low concentration

25) Figure 1 is a diagram of two plant cells in contact. The cells are of different cell sap concentrations. use it to answer questions that follow.



(i) Which one of the cells a or b has a higher osmotic potential? (1 mark)

Solution

- A
-

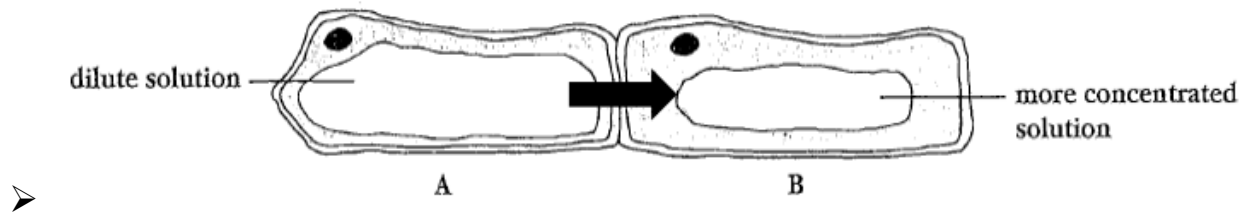
(ii) Give a reason for your answer in a.(i) above. (1 mark)

Solution

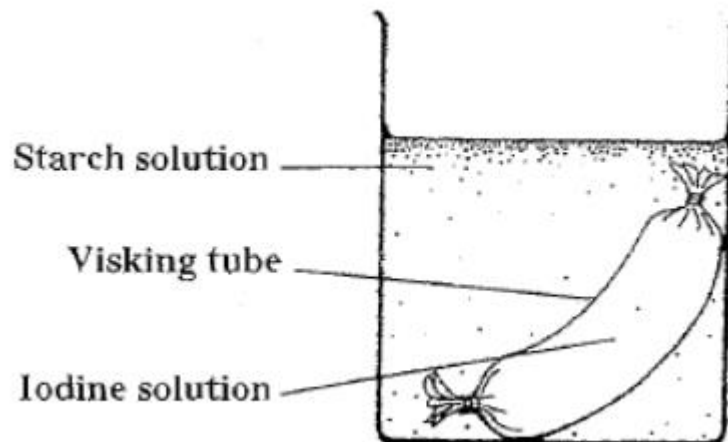
- Because a has more dilute solution, so it has more water molecules than a more concentrated solution that has fewer water molecules.

26) Draw an arrow in the diagram itself to show the direction of water movement between the two cells. (1 mark)

Solution



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



- 28) what type of membrane is the visking tubing? (1 mark)

Solution

- Semi-permeable membrane

- 29) (i) what result would be obtained after some time? (2 marks)

Solution

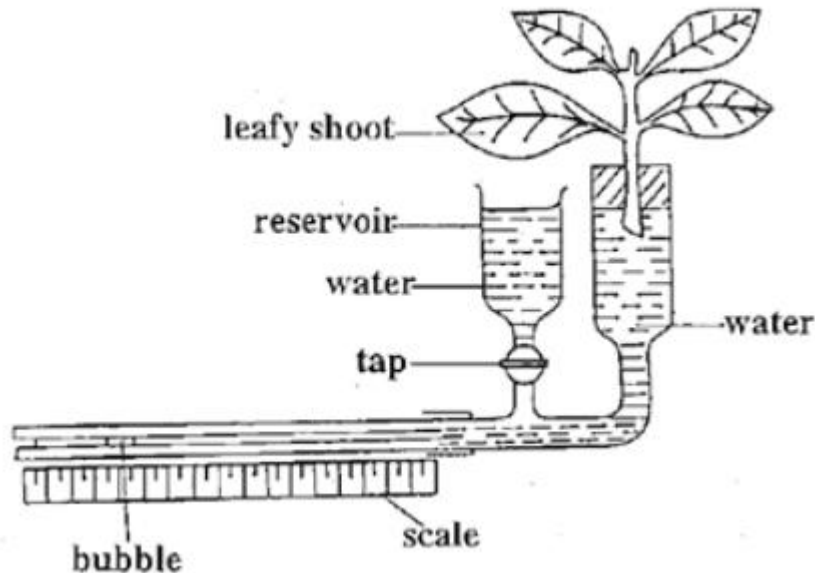
- Blue black colour in starch solution. Brown colour inside the visking tube.

- (ii) explain your answer to .(i). (3 marks)

Solution

- Iodine molecules will diffuse out of the visking tube to starch solution but starch molecule will not enter the tube because their molecules are big

- 30) Figure 10 shows a potometer with a leafy shoot. Use it to answer the questions that follow:



- 31) what effect would each of the following have on the in movement of the bubble?
- (i) Increased temperature of the surrounding air (1 mark)

Solution

- Increased temperature will make the bubble move faster towards the shoot.

- (ii) Increased humidity of the surrounding air (1 mark)

Solution

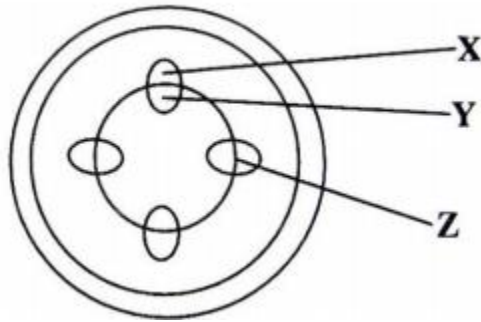
- Increased humidity would make the bubble either move slowly towards the shoot or remain stationary

- 32) Explain how one can measure rate of transpiration in the leafy shoot using the bubble. (3 marks)

Solution

- To measure distance moved by the bubble for a given period of time. Then divide distance moved by time taken.

- 33) Figure 7 shows a cross-section of a stem from a fresh young bean plant that was dipped in coloured water. Use it to answer the questions that follow.



- 34) Name the parts marked x and y.

X (1 mark)

Y (1 mark)

Solution

- X: phloem tube
- Y: xylem vessel

- 35) (i) which tissue could take up the coloured water? (1 mark)

Solution

- Y: xylem vessel

- (iii) Give a reason for your answer to (i). (1 mark)

Solution

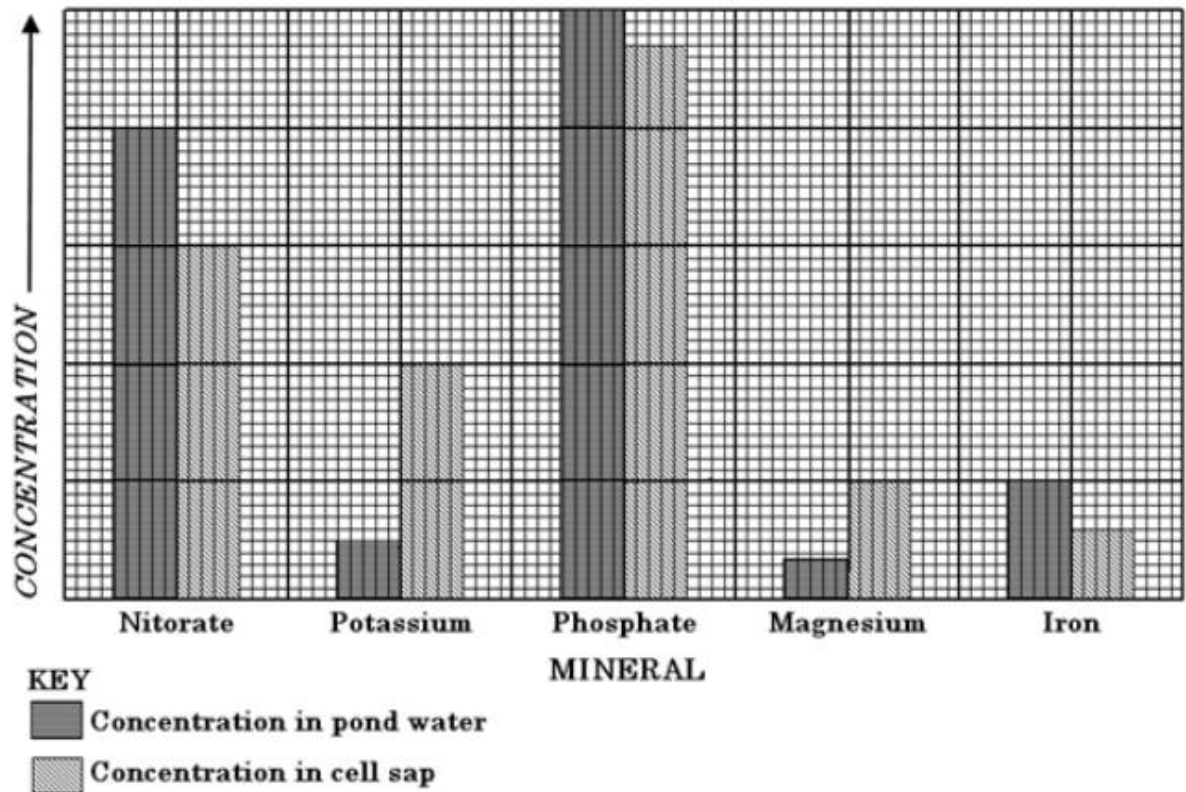
- Xylem vessels carry water up from the roots

- 36) explain the function of z to the stem. (2 marks)

Solution

- Z is called cambium. The cambium is a region of active cell division, where new xylem and phloem are formed.

- 37) Figure 8 is a bar chart showing the relative amounts of different minerals in pond water and cell sap of green alga. Use it to answer the questions that follow.



- 38) (i) name any two minerals that would enter the alga cell sap by active transport. (2 marks)

Solution

- Potassium,
- Magnesium

- (ii) give a reason for your answer to 11.a.(i). (2 marks)

Solution

- Concentration of potassium and magnesium in cell sap is higher than it in pond water, so these minerals enter the cell sap against concentration gradient by active transport

- 39) (i) what would happen to the concentration of minerals in cell sap and pond water if alga were killed? (1 mark)

Solution

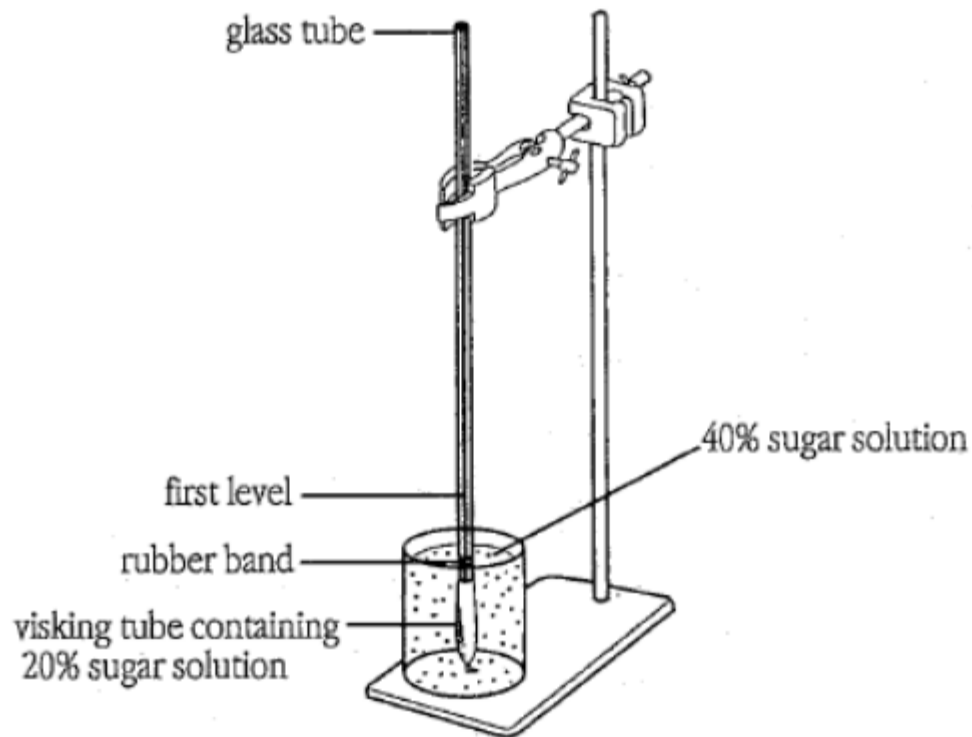
- The concentration of minerals in cell sap and pond water would be equal.

- (iii) Explain your answer in .(i). (2 marks)

Solution

- If alga were killed, alga cannot absorb ions by active transport. As a result, minerals move by diffusion to decrease the concentration gradient.

- 40) Figure 7 is a diagram showing an experiment on osmosis. Use it to answer the questions that follow.



- 41) (i) what change would occur to the level of sugar solution in the glass tubing after some time? (1 mark)

Solution

- It will decrease.
- .

- (iii) Explain your answer to.(i). (2 marks)

Solution

- Because water will move by osmosis from visking tubing to container with 40% sugar solution

- 42) What type of membrane is the visking tubing? (1 mark)

Solution

- Selectively permeable membrane.

- 43) Describe an experiment that could be carried out to show that light intensity affects rate of transpiration in leafy shoots. Your essay should include procedure, expected results and conclusion.(10 marks)

Solution

Procedure

- 1. Fill two similar potometers with equal volume of water.
- 2. Record the level of meniscus.
- 3. Insert one leafy shoot in both potometers.
- 4. Smear vaseline on areas between the shoot and the cork.
- 5. Observe changes in the level of meniscus in both potometers.

Results

- Distance covered by meniscus in the potometer placed in sunlight would be more than in potometer placed in darkness.

Conclusion

- Increase in light intensity increases rate of transpiration.

- 44) Describe an experiment that could be conducted to show that germinating bean seeds contain an enzyme that digests starch. Your answer should include procedure, expected results and conclusions. (10 marks)

Solution

- Prepare soaked bean seeds during about 4 days in water and the agar petri dish which contains starch. Cut the beans in half and put them on the agar petri dish so as that the section of beans faces on the surface of agar. Maintain these sets under 30° during 24 hours. Remove the beans from the agar after 24 hours. Drop the iodine solution on the surface of the agar. Remove the excess iodine solution from the surface of the agar and wash the surface of the agar. Observe colour change on the surface of the agar. If experiment is well done, the parts the beans are put on the surface of the agar does not change, the colour is iodine/brown colour and another parts turn to blue black colour. We can conclude the enzymes are secreted from the beans and it digests starch in the agar.

- 45) Describe an experiment you would do to show that transpiration from leaves affects uptake of water. Your answer should be in an essay form. (10 marks)

Solution

- Prepare a shoot and fix it on a potometer. Fill the potometer with water of known volume. Leave the plant on the ground where air is circulating and where there is enough there light. As water transpires from the aerial surface of the shoot, it draws it from the potometer tube. The potometer will measure the amount of water taken up the plant as result of transpiration. This then shows that transpiration affects water uptake in plant.

Tropism

- 46) What are “auxins”? (1 mark)

Solution

➤ Plant hormone which may affect rates of growing in roots and shoots.

- 47) How does high auxin concentration affect growth of the following parts of the plant?

(i) Shoots (1 mark)

Solution

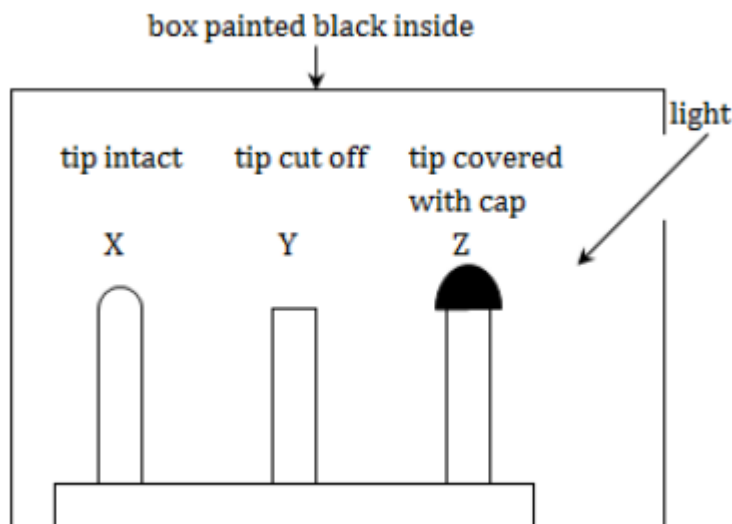
➤ By growing faster.

(ii) roots (1 mark)

Solution

❖ By growing slowly

- 48) Figure 11 shows three seedlings x, y and z placed in a box painted black and with a hole on one side. the seedlings were treated differently. Use it to answer the questions that follow.

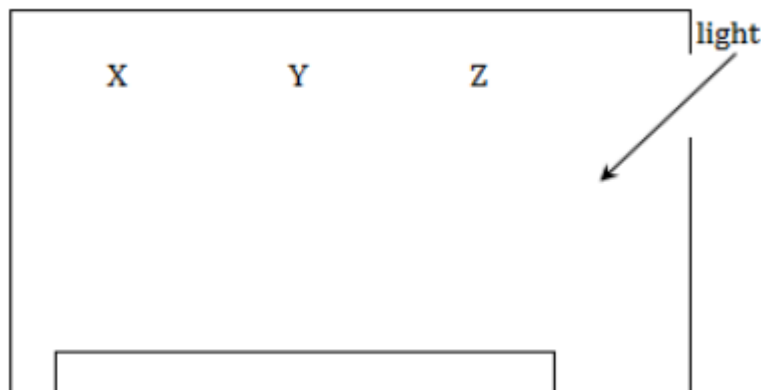


- 49) Why was the box painted black inside? (1 mark)

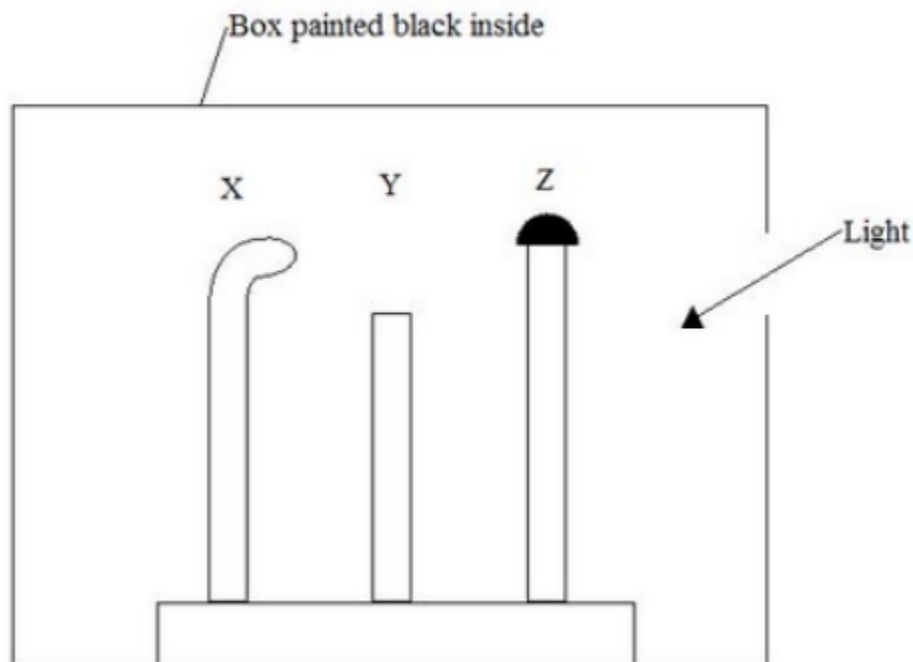
Solution

➤ Because black colour prevents the reflection of light inside the box.

- 50) in the box provided below, draw the seedlings to show the results at the end of the experiment.(3 marks)



Solution

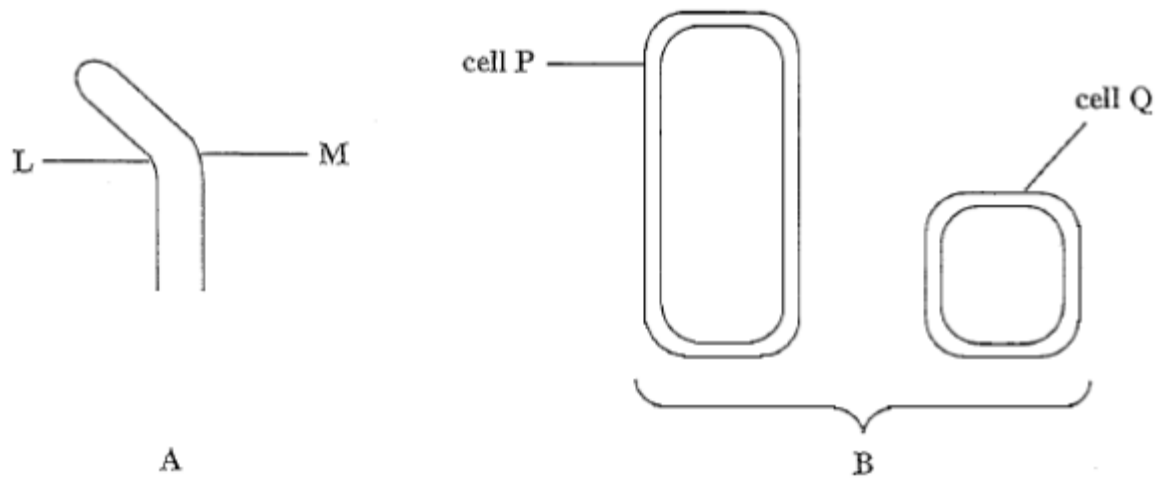


- 51) Explain the results in seedling y. (2 marks)

Solution

- In seedling y the growth does not occur because tip which produces auxins that promote and regulate plant growth was cut off.

- 52) Figure 3 shows diagrams a and b. Diagram a shows the results of what happened when a shoot was illuminated from one side for 48 hours. Diagram b shows cells p and q which were taken from parts of the shoot in diagram a.



which side of the shoot in diagram a was illuminated? (1 mark)

Solution

➤ L

- 53) (i) which cell was taken from the part marked m. (1 mark)

Solution

➤ Cell p

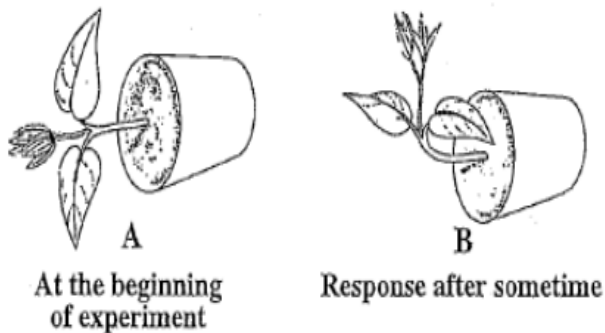
➤

(ii) explain your answer to .(i). (2 marks)

Solution

➤ Because cells in region m are elongated

- 54) Figure 6 shows response in a potted plant which was placed horizontally. Use it to answer the questions that follow.



what was the stimulus in this experiment? (1 mark)

Solution

➤ Gravity.

- 55) (i) describe the response in b. (1 mark)

Solution

- The potted plant shows negative geotropism where it grows away from the pull of the earth gravity

(ii) explain how the response in b.(i) above was brought about. (3 marks) figure 6

Solution

- Owing to gravity, auxin concentrates more on the lower side of the shoot as a result this has a higher concentration of auxin than the upper side. This influences cell elongation on the lower side as compared to the upper side, so the plant bends upwards.

- 56) Design an experiment that you would conduct to find out the region that responds to stimulus of gravity in bean seedlings. Your answer should be in an essay form. (10marks)

Solution

- Prepare pre-germinated bean seedling with straight plumules and radicle, 2 petri dishes, pins, moist cotton. Pin 2-3 bean seedlings on the cotton in each petri-dish. In one petri-dish, the seedlings are in horizontal position. In another one, the seedlings are in vertical position. Make sure there is space between them. Leave the sets on horizontal bench, and observe after 2 days. We will observe that plumules grow upwards, while radicles grow downwards.

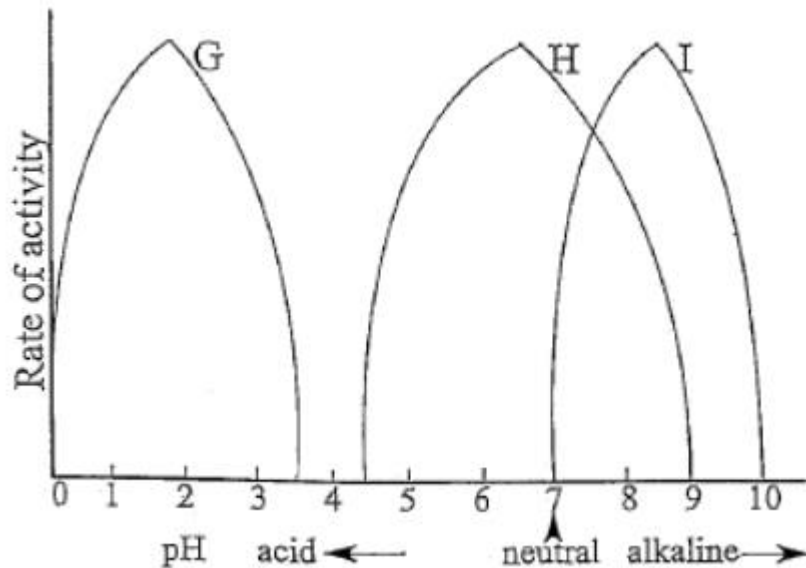
- 57) Describe an experiment that you would use to find out the effect of unequal distribution of light on a growing shoot. In your answer include method, expected results and conclusion. (10 marks)

Solution

- In this as a method, one would need 2 potted plants (seedlings) of similar stages of growth, one of which placed in cardboard box with a window cut in one side allow light to penetrate from one direction. The other should be placed on a clinostat. This exposes the plant to light on both. This is control. After a few days, the two plants should be removed from the boxes and compared. The results would show that the stem of plant with one-sided illumination bends towards the light. The one in the clinostat does not bend. This gives a conclusion that the young shoot has responded to one-sided lighting by growing towards it. This tendency is called phototropism.

DIGESTIVE SYSTEM

- 58) Figure 2 shows the optimum pH for three enzymes g, h and i. Use it to answer the questions that follow.



which enzyme is most likely to be secreted by the stomach? (1 mark)

Solution

- Enzyme g
- .

- 59) What would happen to activity of enzyme h at pH 2? (1 mark)

Solution

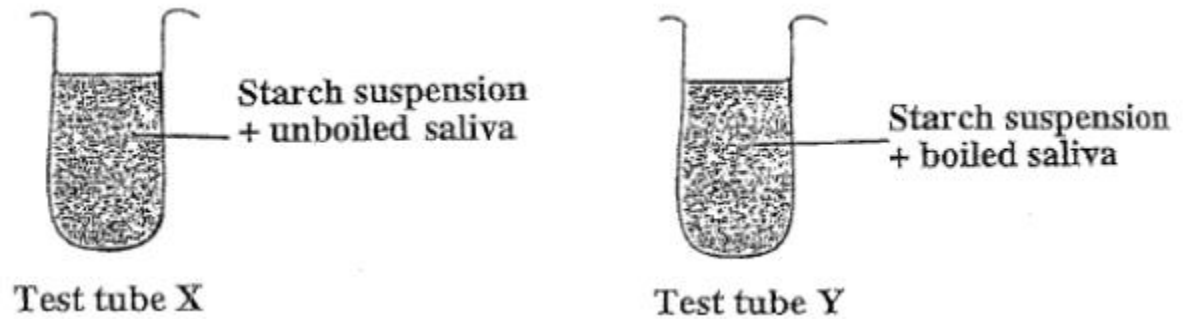
- It would lose its activity. (it would be denatured.)

- 60) What conclusion can be drawn from the results shown by the graphs? (1 mark)

Solution

- Optimum pH of each enzyme is different

- 61) Figure 4 shows a setup of an experiment to investigate properties of enzymes. Use it to answer the questions that follow.



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

Solution

- Enzymes are denatured by heat.
 - .
 - .
- ii. If after 10 minutes the contents of both test tubes were tested for starch, what colour would be seen in the two test tubes?

Solution

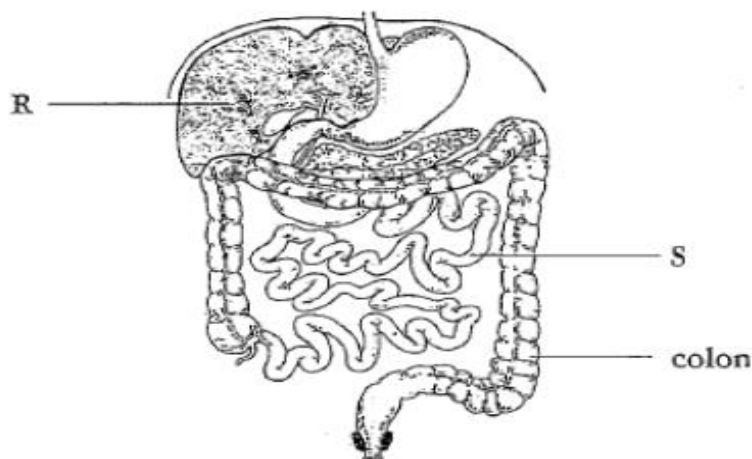
Tube x (1 mark)

- Tube x: brown

Tube y (1 mark)

- Tube y: blue-black

- 62) Figure 1 is a diagram showing part of the human digestive system. Use it to answer the questions the follow.



- i. Name the parts marked r and s. (2 marks)

Solution

- R: liver
- S: small intestines

- ii. Explain how part r ensures a steady supply of glucose to the body. (2 marks)

Solution

- By regulating and recovering excess glucose stored by the liver.

- 63) Give two differences between disaccharides and polysaccharides. (2 marks)

Solution

Disaccharides	Polysaccharides
i. Sweet taste	No sweet taste
ii. White crystalline solids	Not crystalline
iii. Soluble in water	Insoluble in water



- 64) Give one example of a polysaccharide. (1 mark)

Solution

- Starch,
- Glycogen,
- cellulose

- 65) State any two adaptations of a villus for food absorption. (2 marks)

Solution

- Thin epithelium to diffusion of food faster.
- Dense network of blood capillaries to ensure continuous blood flow.

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

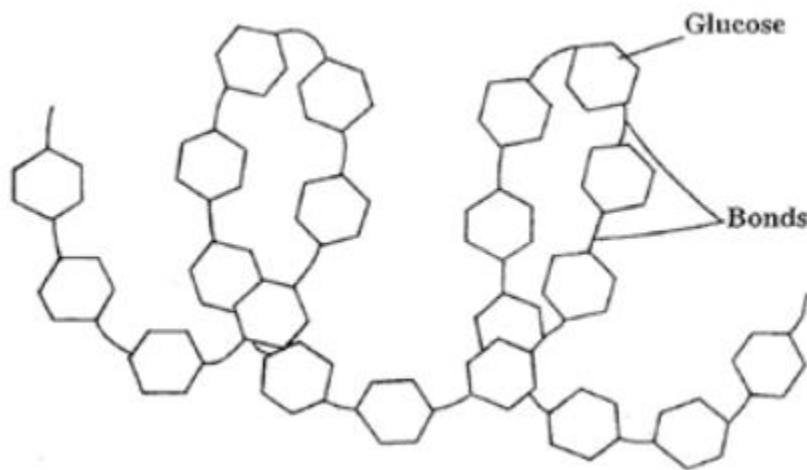
Solution

- Large drops of fats are not broken down.
 - Stomach acid is not neutralized for another enzyme.
- 67) Explain why the level of insulin increases in the blood soon after a meal of carbohydrates. (2 marks)

Solution

- To reduce of glucose level to conversion of glucose to glycogen.

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



- 69) Name the food substance. (1 mark)

Solution

- Starch

- 70) Explain how the food substance is produced. (2 marks)

Solution

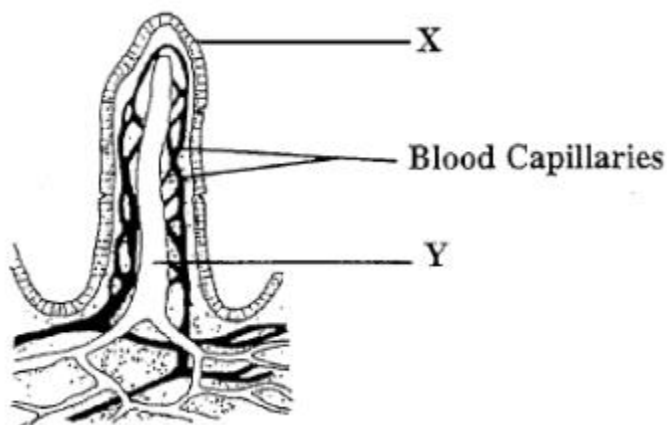
- The food substance is produced by combining several glucose molecules which release water molecules

- 71) Mention two enzymes that could digest the food substance in humans. (2 marks)

Solution

- Salivary amylase. Pancreatic amylase

- 72) Figure 4 is a diagram of a longitudinal section of a villus. Use it to answer the questions that follow.



- 73) Name the parts labelled x and y. (2 marks)

Solution

- X: epithelium
- Y: lacteal

..

- 74) State one end-product of digestion which is transported by the part labelled y. (1 mark)

Solution

- Fatty acids, glycerol

- 75) Explain one adaptation of the villus which enables it to perform its functions efficiently. (2 marks)

Solution

Villus has thin epithelial cells that allow soluble substances to pass easily.

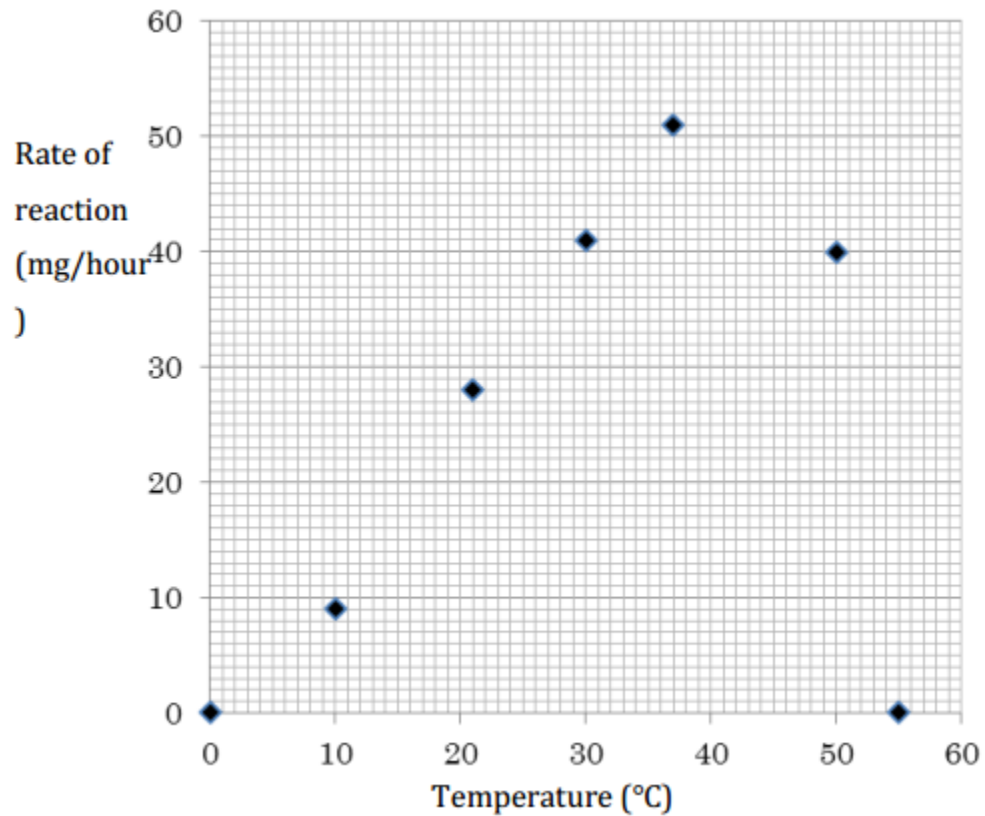
- Epithelial cells on villus have numerous mitochondria that provide energy for the uptake of digested food by active transport. Villi are provide a large surface area for the absorption of the product of digestion

- 76) Table 2 shows results of an experiment on the effect of temperature on enzyme activity. Use it to answer the questions that follow.

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

- i. Plot a graph on rate of reaction against temperature. (3 marks)

Solution



- ii. Describe the effect of temperature on enzyme activity between 20 and 50 . (2 marks)

Solution

- As the temperature increases, the rate of reaction increase too up a point where any more temperature increase does not result in increase in the rate reaction. At that point, enzyme activity is denatured and reaction begins to decrease.

- iii. Briefly explain the cause of the change in the rate of enzyme activity after 37 . (2 marks)

Solution

- Since the enzyme is denatured due to high temperatures, the rate of reaction decrease considerably

- iv. What is the optimum temperature of the enzyme used in this experiment? (1 mark)

Solution

- 37°C

- 77) Describe five problems associated with human digestive system and state how each problem can be controlled. Your answer should be in an essay form. (10 marks)

Solution

- The first problem associated with the human digestive system is constipation. Constipation is a situation where stools become too hard to be expelled from the body. It can be controlled from the body. It can be controlled by drinking enough water after meals and by doing physical exercises. It can also be controlled by using drugs such as laxatives.
- Another problem is heartburn. This is a burning sensation in the oesophagus. It is caused by acidic stomach when the contents surge or increase and move upwards into the oesophagus. It can be controlled by taking anti-acid medications.
- Stomach ulcer is another problem of the human digestive system. It may be caused when a person constantly has too much acid in his or her stomach so that the gastric juice begins to eat into the lining of the stomach, causing ulcers. Ulcers can be avoided by leading a worry-free life and a life not burdened by too much work.
- Indigestion is another problem and is caused by eating food too quickly and not chewing it enough. It can be controlled by ensuring that one eats the food slowly, adequately chewing it before swallowing.
- The fifth problem is appendicitis. This is an inflammation of the appendix. This can be cured by removing the appendix in an operation.

CIRCULATORY SYSTEM

- 78) define “lymph”. (1 mark)

Solution

- Lymph is tissue fluid drained into the lymphatic system.

- 79) State any one difference between lymph and plasma. (1 mark)

Solution

- Lymph does not contain large protein molecules nor red blood cells while plasma contains large protein molecules and red blood cells

- 80) explain how inspirational movement of the chest wall helps in the flow of lymph. (3marks)

Solution

- The volume of chest cavity increases/pressure in the chest cavity decreases/ and this draws the lymph towards the chest cavity.

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

- i. Name the hormone that caused the change in speed. (1 mark)

Solution

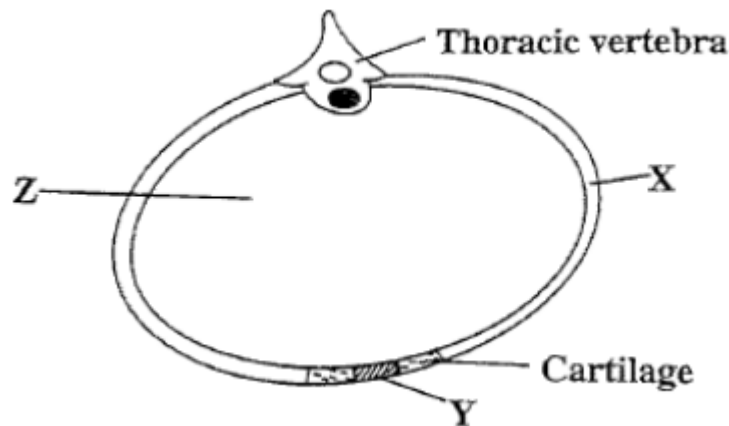
- Adrenaline

- ii. Explain how the hormone led to the change in speed in . (3 marks)

Solution

- It caused more supply of glucose and oxygen to muscles. This increased respiration rate which resulted in more energy released for running.

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



- i. Name the parts marked x and y. (2 marks)

Solution

- A. X: rib
- Y: sternum

- ii. State any one vital organ found in the cavity marked z. (1 mark)

Solution

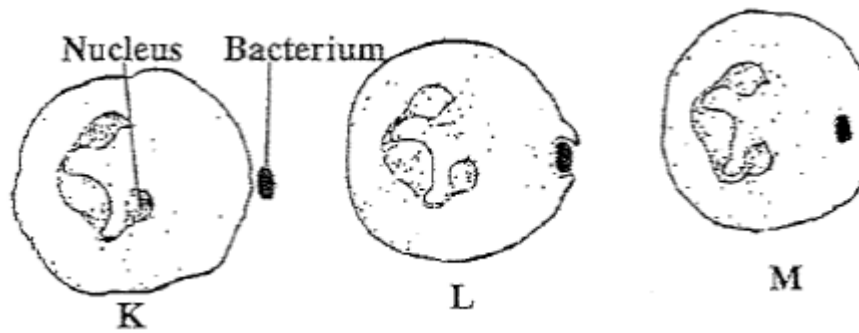
- The heart / the lungs

- iii. Give any one region within the cavity marked z where lymph is found. (1 mark)

Solution

- Pericardial cavity /
- Pleural cavity

- 83) Figure 5 shows stages of a process marked k, l and m carried out by a type of blood cells. Use it to answer the questions that follow:



- i. Name the process. (1 mark)

Solution

- Phagocytosis

- ii. Where does this process take place in the body? (1 mark)

Solution

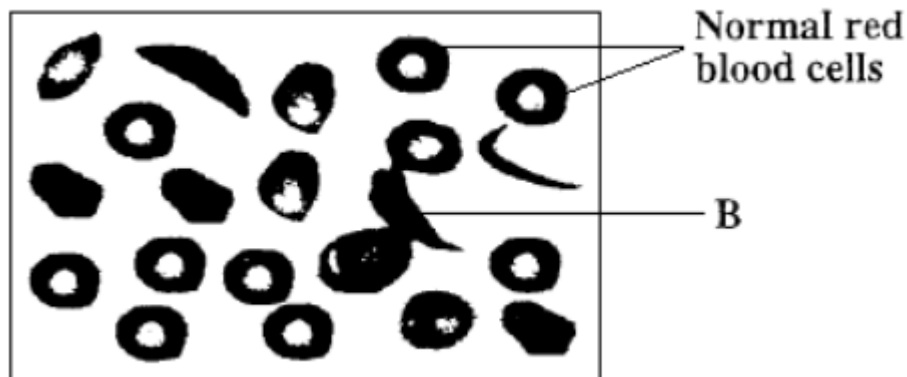
- The site of infection in the blood vessel

- iii. What could happen to the bacterium at stage m of the process? (1 mark)

Solution

- The bacterium is digested

- 84) Figure 2 is a photograph showing blood cells.



- (i) Name the condition of the cell marked b. (1 mark)

Solution

- Sickle-shaped

- (ii) How are red blood cells with this condition affected? (1 mark)

Solution

- They have an abnormal shape like a sickle and contain little haemoglobin

- (iii) What is the cause of the condition of the cell marked b? (1 mark)

Solution

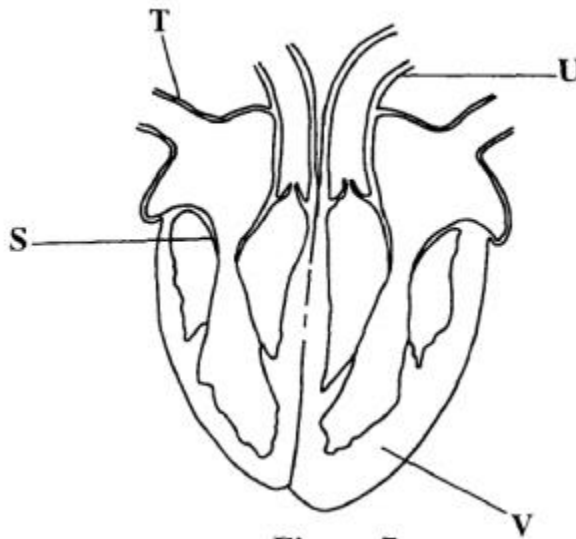
- Genetic/ mutation

- (iv) Name the disease to which a person with the blood sample shown in figure 2 is resistant. (1 mark)

Solution

- Malaria

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



- (i) Name the part marked s. (1 mark)

Solution

- Tricuspid

- (ii) Give two differences between the blood flowing through vessels t and u. (2 marks)

Solution

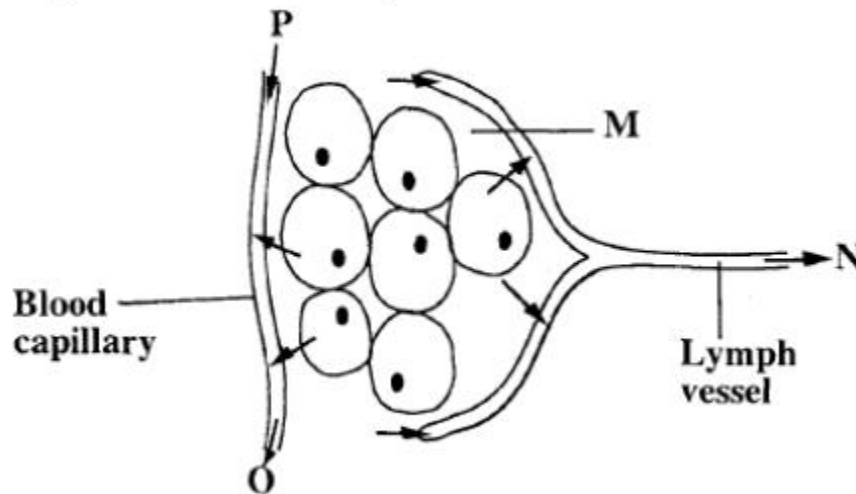
- U has more O_2 than t.
➤ T has more CO_2 than u

- (iii) Explain how part v helps to create systolic pressure. (3 marks)

Solution

- Contract of thick muscles of v to the greater force exerted on blood

- 86) Figure 8 shows capillary bed. Use it to answer questions that follow.



- (i) Name the fluid found in m. (1 mark)

Solution

- tissue fluid
➤ B..

- (ii) Name any two substances found in m that are used by the body. (2 marks)

Solution

- Oxygen,
➤ Water,
➤ glucose, fatty acid,
➤ amino acid

- 87) name two adaptations for each of the following to their functions:

- (i) Blood capillaries (2 marks)

Solution

They are very thin walls which consist of a single layer of flattened cells.

- Having narrow lumens which create high blood pressure to push plasma

- (ii) Lymph vessels (2 marks)

Solution

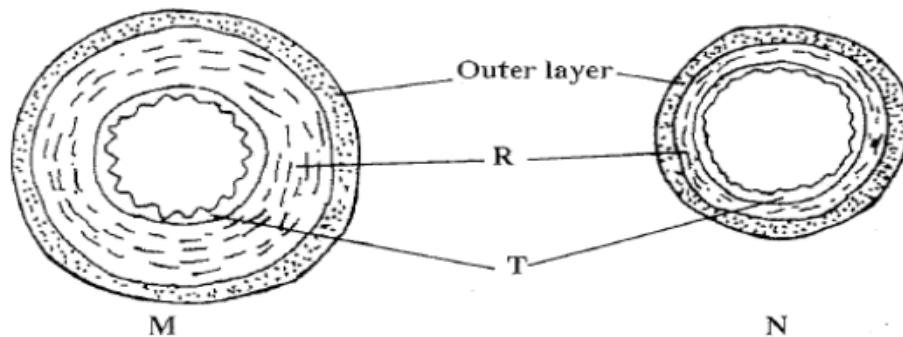
- Having valves to prevent back flow of lymph. The wall of lymph vessel more permeable than capillaries to drain wastes

(iii) Which letter represents the arterial end of the capillary bed? (1 mark)

Solution

- **P**

88) Figure 5 shows cross sections of blood vessels m and n. Use it to answer the questions that follow.



(i) Name the parts marked r and t.

R (1 mark)

T (1 mark)

Solution

- R: elastic muscle fiber (or tunica media)
- T: endothelium (or tunica intima)

(ii) List any two structural differences between vessels m and n. (2 marks)

Solution

M has thick elastic muscle fiber while n has thin elastic muscle fiber.

- M has a narrow lumen while n has wide lumen

(iii) Explain any one way in which blood is transported in vessel n. (3 marks)

Solution

- The contraction of skeletal muscles squeeze vessel n and force blood forward

- 89) Table 1 shows parts of blood for three people f, g and h. Use it to answer the questions that follow.

PART OF BLOOD (mm ³)	F	G	H
Red blood cells	7,500,000	5,500,000	2,000,000
White blood cells	5,000	6,000	5,000
Platelets	250,000	255,000	5,000

- (i) Which person is most likely to suffer from anaemia? (1 mark)

Solution

➤ person h.

- (ii) Give a reason for your answer to .(ii). (1 mark)

Solution

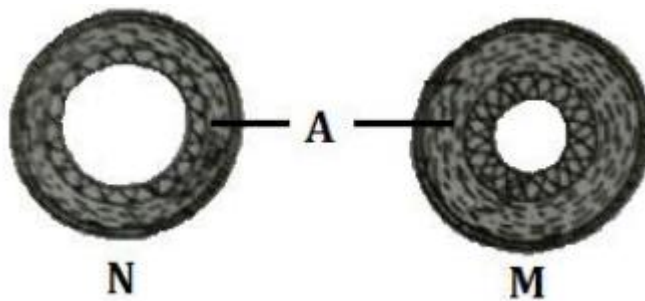
➤ Because has lowest content of red blood cells

- (iii) Calculate the ratio of white blood cells to platelets in the blood of person f. Show your working.(2 marks)

Solution

➤ Ratio of white blood cells to platelet in person f is $5,000 : 250,000 = 1 : 50$

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



- (i) Name the tissue labelled a. (1 mark)

Solution

➤ Tunica media, fiber layer/ fibrous tissue

- 91) (i) which section represents an artery? (1 mark)

Solution.

➤ m

- (ii) Give two reasons for your answer to (i). (2 marks)

Solution

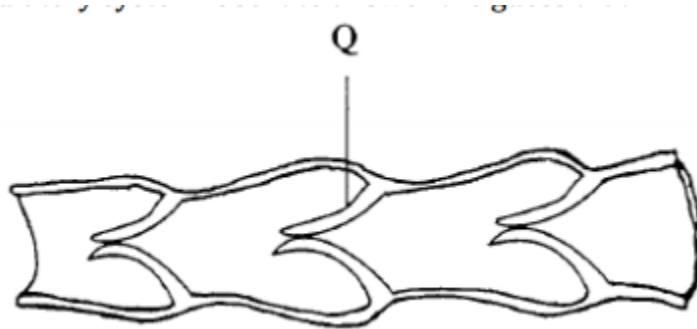
- Arteries have narrow lumen. Fiber layer in arteries is thicker than that in any other blood vessel

(iii) Explain why the rate of heart beat can be measured by pulse rate. (3 marks)

Solution

- Because the pulse rate corresponds to the beating action of the heart as the heart pumps blood through arteries

92) Figure 3 is a diagram showing a vessel of the circulatory system. Use it to answer the guess that follows.



(i) Identify the structure marked q. (1 mark)

Solution

- Valve

(ii) Name two vessels in the human body which have the structure labelled q. (2 marks)

Solution

- Veins and lymph vessel/lacteal

(iii) On the diagram shown in figure 3 put an arrow which indicates the direction of flow. (1 mark)

Solution

- ← arrow shows direction of the flow of blood..

(iv) Describe what is likely to happen if structure q were damaged. (1 mark)

Solution

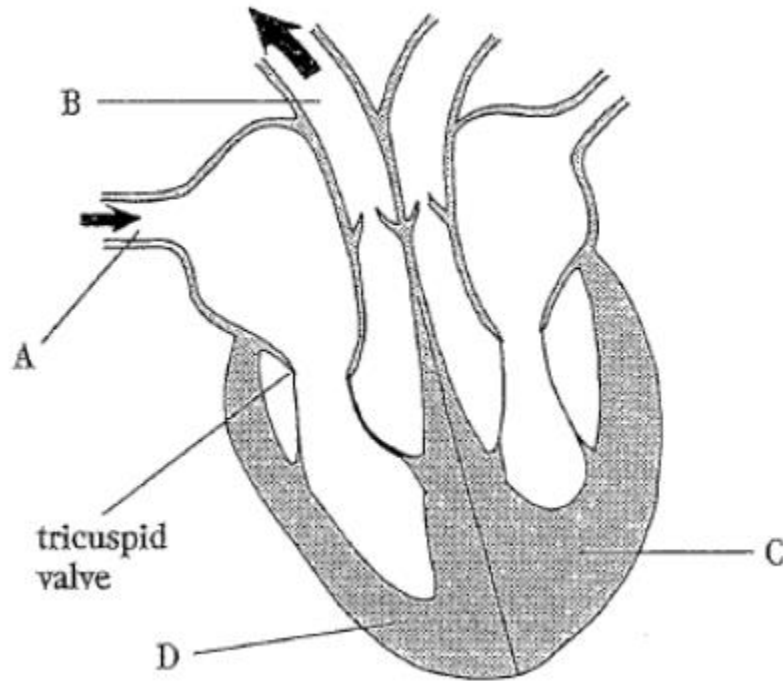
- Blood would flow backwards without reaching the heart

(v) What enables blood to move along this vessel? (1 mark)

Solution

- Muscle contraction

- 93) Figure 5 shows a cross section of the heart and its associated blood vessels.



- (i) Name the parts marked a and b. (2 marks)

Solution

- A: pulmonary artery
- B: vena cave.

- (ii) What is the structural difference between the walls of the parts marked c and d? (1 mark)

Solution

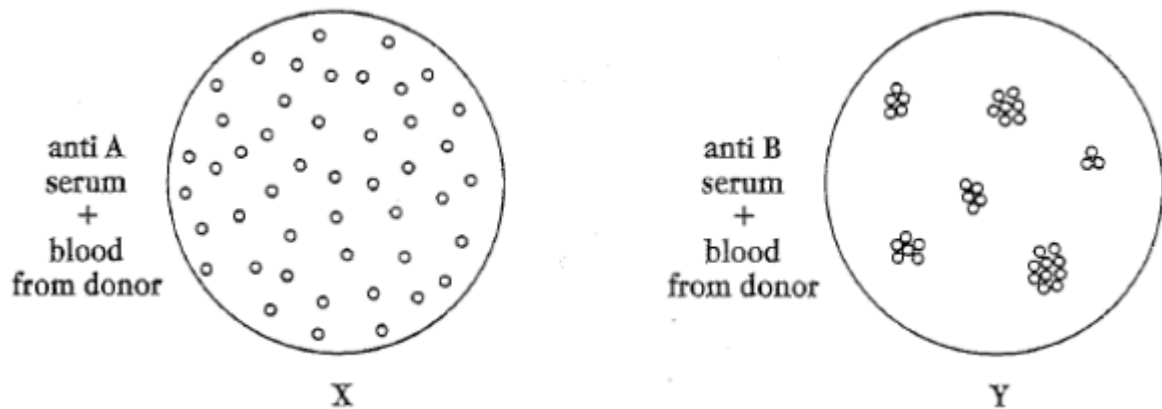
- Walls marked c are thicker than those marked d.

- (iii) Give a reason for the difference stated in .(i). (1 mark)

Solution

- Because they have to pump blood with much force to all parts of the body

- 94) To determine the blood group of a donor, a drop of blood was should to plates containing anti-a serum and anti-b serum respectively. Figure 7 shows results of the test.



- (i) What is “serum”? (1 mark)

Solution

➤ . The liquid part of the blood which fibrinogen has been removed.

- (ii) State the result shown in (1) x (2) y. (1 mark)

Solution

X: compatible blood

➤ Y: agglutination of blood

- (iii) What was the blood group of the donor? (1 mark)

Solution

➤ Group b

- (iv) Give a reason to support your answer in above. (2 marks)

Solution

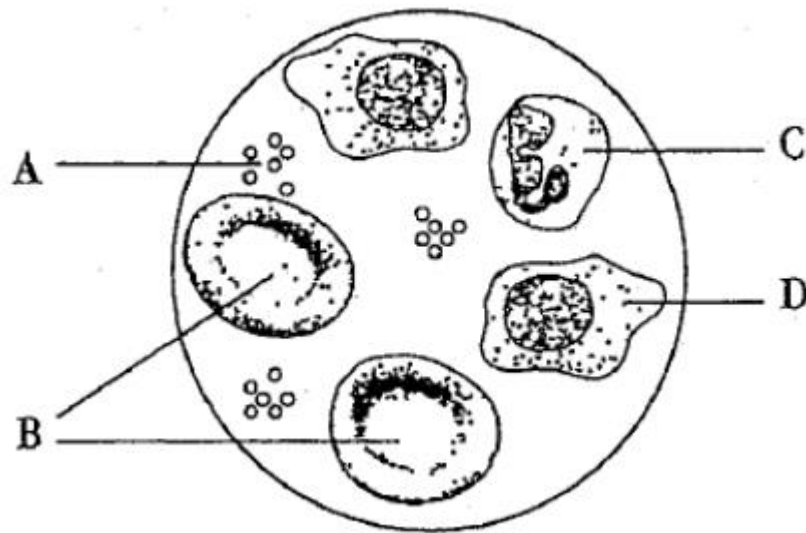
➤ Because anti-b antibodies agglutinate against the b antigens on the red blood cells.

- (v) Why is it necessary to test the blood group of the donor before transfusion? (2 marks)

Solution

➤ Avoid agglutination of blood cells.

- 95) Figure 4 is a diagram representing blood as seen under a microscope. Use it to answer the questions that follow.



- 96) Use the letters to give the parts of blood responsible for the following:

- (i) Transport of oxygen

Solution

➤ **B**

- (ii) Making antibodies

Solution

➤ **D**

- (iii) Blood clotting(3 marks)

Solution

➤ **A**

- 97) explain two ways in which the structures that transport oxygen are adapted for their function.(2 marks)

Solution

- Their shape which is biconcave offers a wide area to collect and release oxygen more efficiently.
- has haemoglobin that has a high affinity for oxygen

- 98) How do c and d differ in the way they function? (2 marks)

Solution

- Cell d produces antibodies to fight against infections which cell c engulfs bacteria and destroys them.

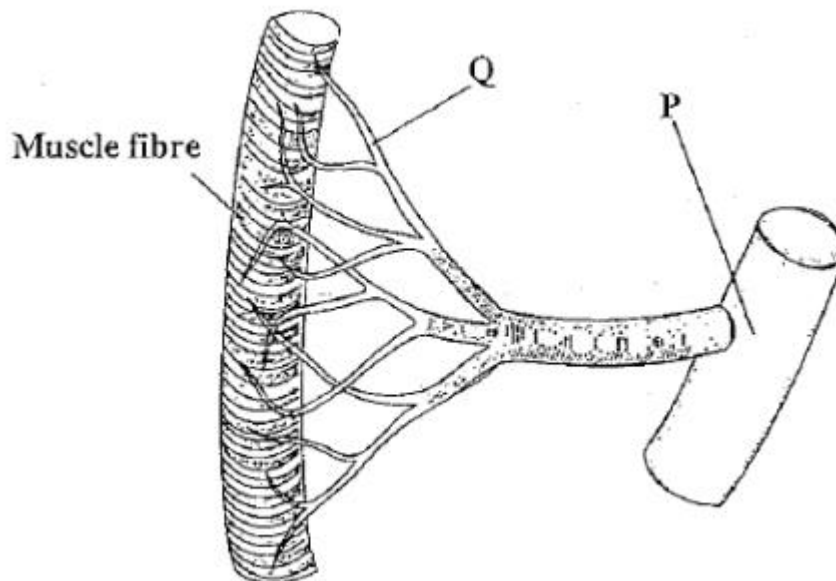
- 99) Write an essay stating five components of human blood and explain their functions. (10marks)

Solution

- Plasma is one of the components of the human blood. Plasma is the liquid part of blood. It contains glucose, amino acid, salts, hormones and blood protein. It also contains antibodies that fight against infections.
- Another component of human blood is white blood cells. There are several types of white blood cells in the body. Phagocytes engulf bacteria and lymphocytes produce antibodies.
- Red blood cells form another component of the human blood. Red blood cells determine blood group of individuals since they have antigens.
- Red blood cells contain hemoglobin which transports oxygen throughout the body to tissues.
- Another component of the human blood comprises the platelets. Platelets prevent entry of germs into the body by forming clots.

Respiratory system

- 100) Figure 2 shows the respiratory structure of an insect. Use it to answer the questions that follow.



- i. Name the part marked p. (1 mark)

Solution

➤ Trachea

- ii. State one adaptation of the part marked q to its function. (1 mark)

Solution

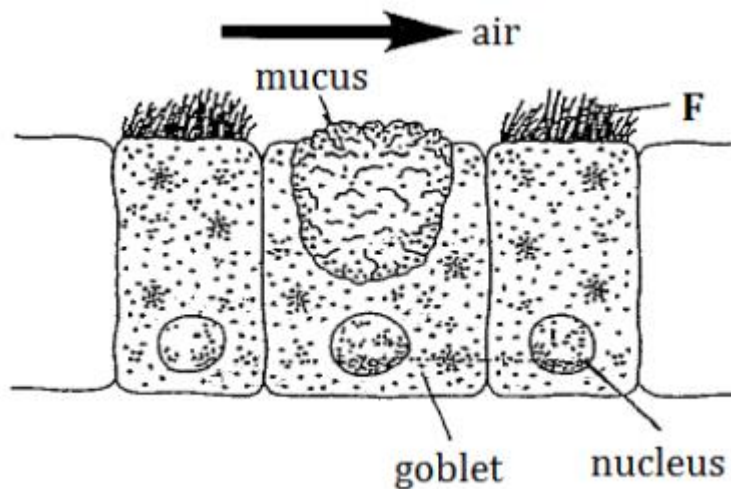
➤ It is thin walled

- iii. Explain how oxygen moves from part marked q to the muscle fiber. (2 marks)

Solution

➤ There is high concentration of oxygen in part marked q than in the muscle fiber hence oxygen diffuses into the muscle fiber

- 101) Figure 1 shows part of the lining of the trachea. Use it to answer the questions that follow.



name the part marked f. (1 mark)

solution

➤ Cilia

- 102) What is the function of each of the following?

- (i) Mucus released by the goblet cell (1 mark)

Solution

➤ It traps dust particles in the air.

➤

- (ii) Pleural fluid (1 mark)

Solution

- It lubricates the surfaces in the regions of contract between the lungs and thorax

103) explain how the trachea is kept open during breathing. (2 marks)

Solution

- The rings of cartilage help to keep trachea open during breathing

104) Mention any two effects of smoking on human health. (2 marks)

Solution

- Causing lung cancer
- Damaging the brain.

105) State any two effects of exercise on breathing. (2 marks)

Solution

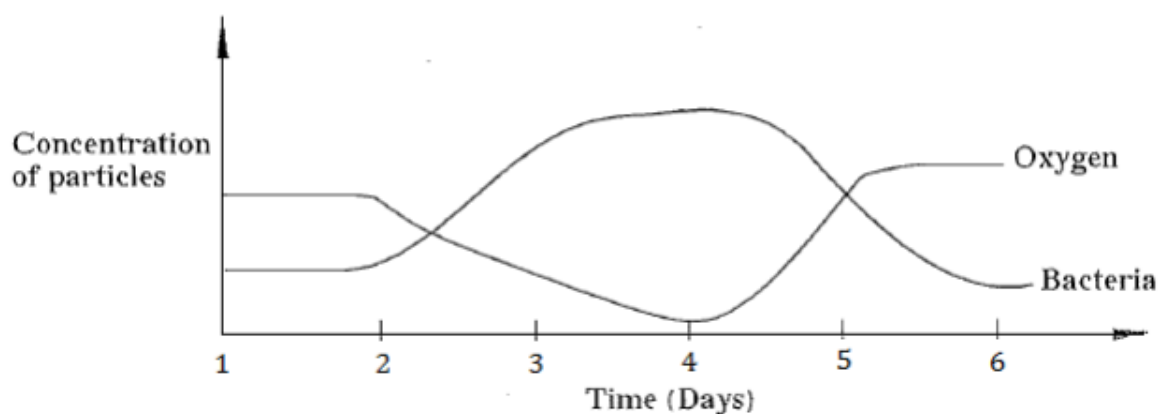
- Increase rate of breathing.
- Increase heart beat
-

106) Mention any two adaptations of alveoli to their function. (2 marks)

Solution

- Very thin wall to diffuse gases effectively
- Surrounded by a network of blood capillaries to exchange gases which in blood easily

107) Figure 10 is a graph showing the population of the bacteria and amount of oxygen in a stream after sewage is discharged into it. Use it to answer the questions that follow.



when was sewage discharged into the stream? (1 mark)

Solution

- Day2

- 108) (i) what happened to the amount of oxygen between day 2 and day 4? (1 mark)

Solution

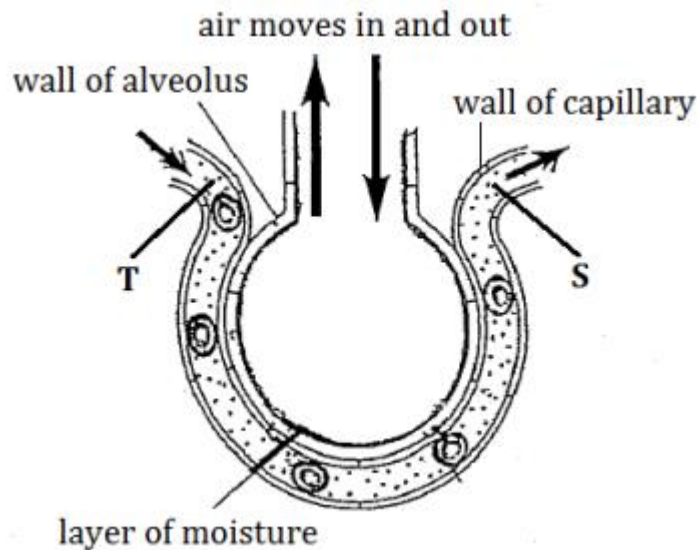
- The amount of oxygen is decreased between day 2 and day 4.

- (ii) Explain your answer given in (i). (2 marks)

Solution

- The population of bacteria is increasing thereby using more oxygen for respiration

- 109) Figure 10 is a diagram of an alveolus surrounded by a blood capillary. Use it to answer the question that follow.



To which chamber of the heart does blood flow from point s? (1 mark)

solution

- Left atrium



- 110) explain why there is a difference in the amounts of oxygen in the blood between points t and s.(2 marks)

Solution

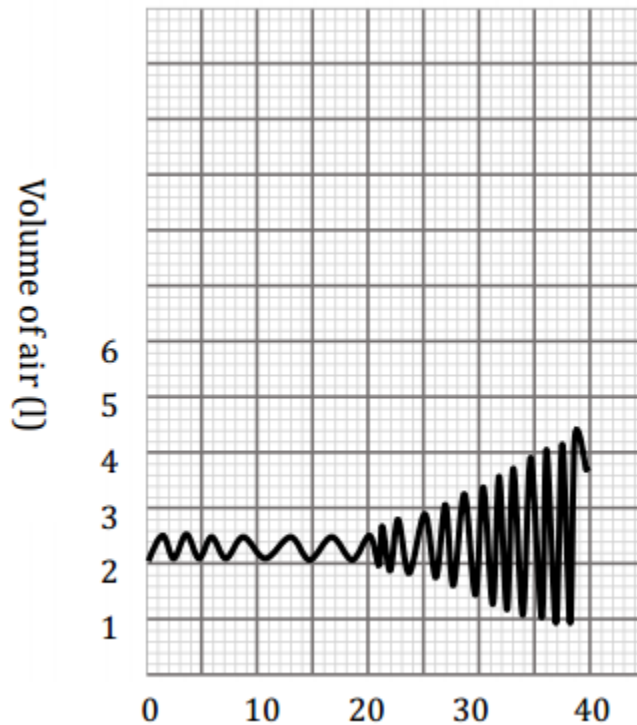
- . Blood flows from point t to s. During this blood flow blood receives oxygen from alveolus.so point s has more oxygen than point t.

- 111) Explain the role of the thin layer of moisture in the alveolus. (2 marks)

Solution

- Oxygen dissolves in this thin layer of moisture for easy diffusion across the wall of the alveolus

- 112) Figure 5 shows volume of air in the lungs of a child at rest to the start of an exercise. Use it to answer the questions that follow.



at what time does the child start the exercise? (1 mark)

Solution

➤ After 20 seconds

- 113) What is the maximum volume of air inspired during the exercise? (1 mark)

Solution

➤ 4.2liters

- 114) Calculate the number of breaths per minute. (4 marks)

(i) At rest

Solution

➤

| 5 seconds take 2 breaths

➤ 60 seconds will take $2 \times \frac{60}{5}$ breaths = 24breaths

(ii) After exercise

Solution

➤ 5 seconds take 4 breaths

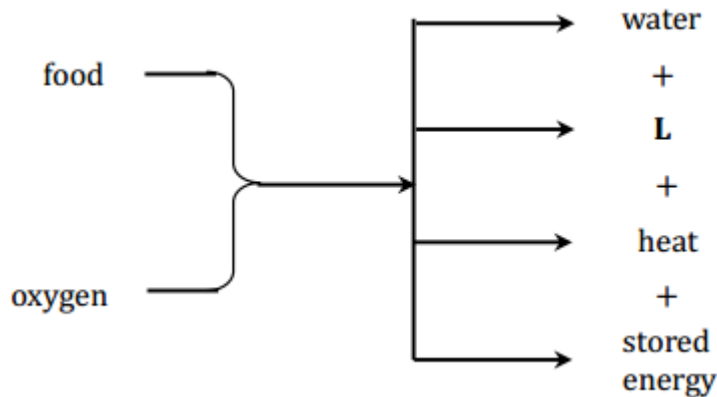
➤ 60seconds will take $4 \times \frac{60}{5}$ breaths = 48breaths

- 115) Explain why there is an increased breathing rate between 20 – 40 seconds? (2 marks)

Solution

- Because the body muscles require more oxygen to release more energy during respiration for exercising.

116) Figure 4 is a diagram showing a summary of the process of respiration. Use it to answer the questions that follow.



name the product represented by the letter L. (1 mark)

Solution

- Carbon dioxide.
- .

117) (i) what type of respiration is shown in figure 4? (1 mark)

Solution

- Aerobic respiration
-

(iii) Give a reason for your answer to (i). (1 mark)

Solution

- Because oxygen is used

118) state any two ways in which the stored energy may be used. (2 marks)

Solution

- For growth.
- For chemical reactions.
- For physical activities

119) During winter, a farmer decided to light a charcoal burner to warm calves in a modern cattle khola. Before the charcoal completely got burnt, it was taken into the khola which had its windows closed. The following morning the calves were found dead. In an essay form, explain the steps that led to the death of the calves. (10 marks)

Solution

- Partially burnt charcoal used up oxygen in the khola and gave off carbon monoxide. The calves breathed in the carbon monoxide which combined

with haemoglobin hence reduction in the amount of oxygen transported. This lowered respiration in cells which resulted in less energy produced. Then brain cells stopped working



- 120) Describe an experiment that could be carried out to investigate the effect of exercise on breathing rate in human beings. Your essay should include procedure, expected results and conclusion. (10 marks)

Solution

- Let a person breath while at rest foe one minute (specified period of time) then record number of breaths made. Let the same person carry out a vigorous activity for some time then immediately after exercise record number of breath made in one minute (specified time). Compare number of breaths made before and after exercise. Number of breaths (or breathing rate) made before exercise is lower than after exercise. Therefore exercise increase rate of breathing.

- 121) Describe the breathing mechanism in human beings. Your answer should be in an essay form.(10 marks)

Solution

- Basically, the breathing mechanism in a human being is viewed from two angles. The first part is inspiration. During inspiration also called inhalation, external intercostal muscles contract. This makes the intercostal muscles relax. The ribs move upwards and outwards and the diaphragm muscles on the edges contract. The diaphragm flattens, making the volume of thorax increase. Air pressure decreases in the thorax and this makes air rush into the lungs.another part is expiration. During expiration or exhalation, the external intercostal muscles relax and the intercostal muscles contract. The diaphragm domes upwards, making the volume of thorax when compared to that of the atmosphere. This forces the air out of the lungs

- 122) Explain the mechanism of breathing in fish. (10 marks)

Solution

- For inhalation, a fish opens its mouth (buccal cavity). This increases the volume of the mouth and decreases the water pressure in the buccal cavity (mouth).water flows into the mouth from outside because internal water pressure is lower than external water pressure. Operculum muscles bulge. This increases volume of the mouth and decreases pressure in the gill region. Water flows over the gills. For exhalation, a fish closes mouth while muscle raises the floor of mouth. This decreases volume of, and

increases the water pressure now exceeds external water pressure. Water is forced out of operculum. As water flows past gill filament oxygen diffuses out of the water into blood, and carbon dioxide diffuse out of the blood into the water.

Locomotion

123) What is the advantage of the following in locomotion?

- (i) Overlapping of scales in fish. (1 mark)

Solution

➤ Provides a slimy surface that reduces friction.

- (ii) Hollow bones in birds. (1 mark)

Solution

➤ It is light and makes buoyancy in air while in flight.

124) Name a locomotory structure in

- (i) Bird (1 mark)

Solution

➤ Feathers

fish (1 mark)

Solution

➤ Fins

➤

125) State two adaptations for locomotion common to both birds and fish. (2 marks)

Solution

- ❖ Both have streamlined body shape.
- ❖ Both have powerful muscles that act on skeleton to produce movement.

126) Figure 9 shows a bird in flight. Use it to answer the questions that follow:



- (i) Identify the stroke shown by the bird. (1 mark)

Solution

- Down stroke

- (ii) Explain how the stroke named in (i) occurs. (2 marks)

Solution

- Depressor muscles contract and elevator muscles relax

- 127) explain how the shape of the wing helps to generate lift in the bird. (2 marks)

Solution

- Has aerofoil shape which creates higher pressure below the wing than on upper part.

- 128) Flight in birds involves an upward beat and a downward beat of the wings.
Which one of the two is a recovery stroke? (1 mark)

Solution

- Upward beat
explain the significance of each of the following during downward beat of the wing:

- (i) Spreading of the wing (3 marks)

Solution

Spreading of the wing provides the large surface area. This creates a large air pressure under the

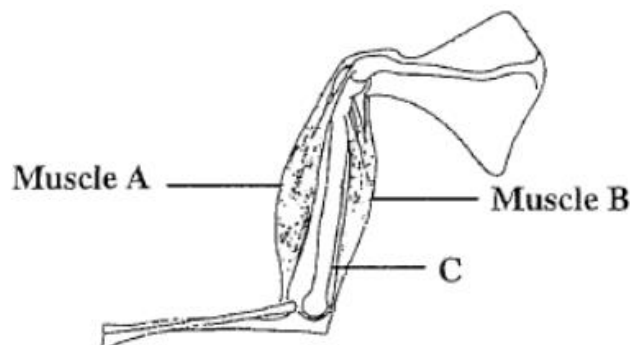
- Surface of the wing.

- (ii) Overlapping of wing feathers (3 marks)

Solution

- Feathers enable birds to trap a lot of air. It raises air resistance below the wings and produces upthrust on the wing

- 129) Figure 10 is a diagram showing antagonistic muscles of the arm.



- (i) What is the name of muscle a? (1 mark)

Solution

- Biceps / flexor muscle

- (ii) Name the part marked c. (1 mark)

Solution

- Humerus
-

- 130) how does contraction of muscle b affect the arm? (1 mark)

Solution

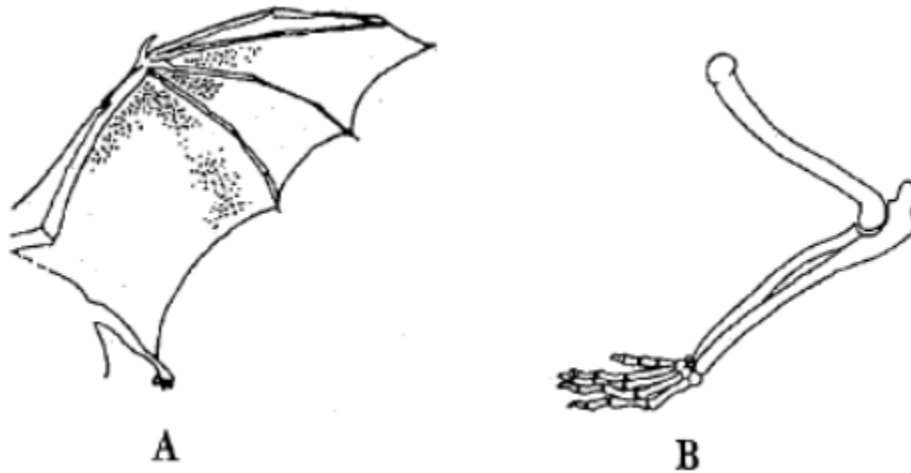
- The arm will stretch.

- 131) State two physical changes that occur in muscle a when contracted. (2 marks)

Solution

- It bulges out. It shortens.

- 132) Figure 4 is a diagram showing the wing of a bat labelled a and the front leg of a rabbit labelled b. Use it to answer the questions that follow.



Give two structural differences between wing a and leg b. (2 marks)

Solution

- Differences in shape of the bones especially humerus.
- Radius and ulna in rabbit are separate while in bat are fused.

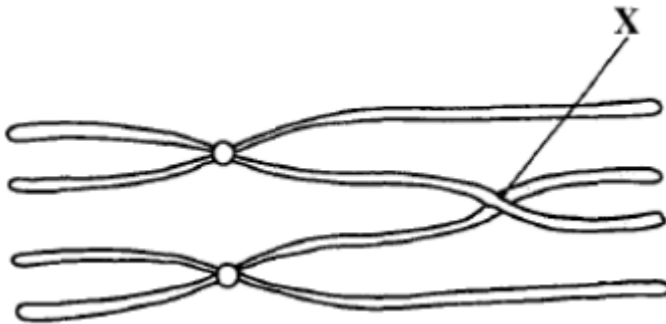
- 133) Describe five ways in which a bird is adapted to overcoming gravity and the effect of drag in flight. Your answer should be in an essay form. (10 marks)

Solution

- If birds were not adapted to overcoming gravity, they would not fly up and not fly at all. Besides, if their bodies were not so adapted the birds would not overcome the effect of drag which are reduced speed and lack of balance.
- birds overcome these problems because they have strong but light bones. This makes them lighter.
- Birds also have large and powerful flight or pectoral muscles that provide the power to flap wings in flight.
- their bodies are also streamlined to reduce air resistance.
- They contain air sacs that make them lighter beside the feathers that provide aerofoil needed to generate lift when the wings.

Reproduction

- 134) Figure 2 shows a stage during meiosis. Use it to answer questions that follow.



- (i) Name the process taking place at part x. (1 mark)

Solution

- Crossing over

- (ii) Name any one organ in the human body in which process x takes place. (1 mark)

Solution

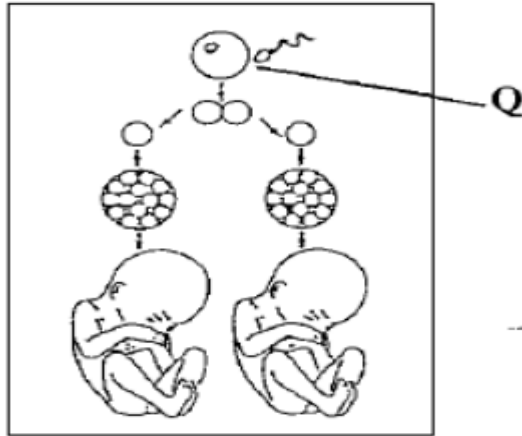
- Ovary or testis

- (iii) Explain the importance of the process taking place at x. (2 marks)

Solution

- Giving variation resulting from exchange of genetic material in strand.

- 135) Figure 5 shows processes in human reproduction. Use it to answer the questions that follow:



name the process represented by letter q. (1 mark)

Solution

➤ Fertilization

- 136) (i) what type of twins are produced in figure 5? (1 mark)

Solution

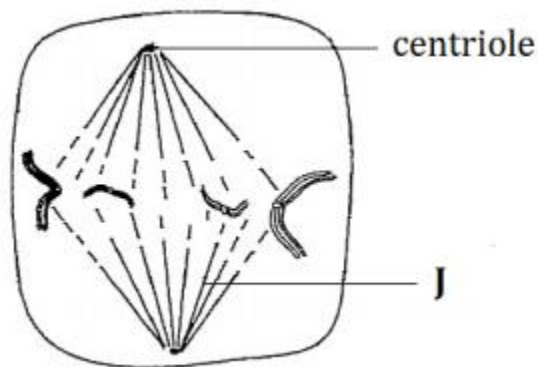
➤ Identical twins

- (ii) Give a reason for your answer in .(i). (1 mark)

Solution

➤ They originated from a single ovum or single zygote

- 137) Figure 3 shows a cell undergoing mitotic division. Use it to answer questions that follow.



- (i) Identify the stage. (1 mark)

Solution

➤ Metaphase

(ii) Give a reason for your answer to (i). (1 mark)

Solution

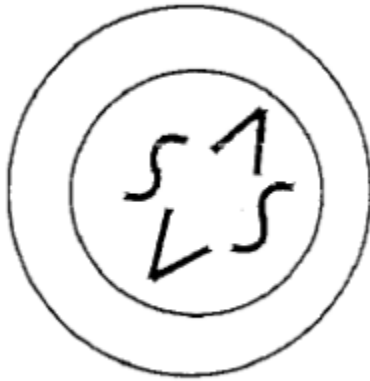
➤ Because the pairs of chromatid line up on equator of cell.

138) . What is the role of j? (1 mark)

Solution

➤ It contracts and pulls chromatids for separating and moving to opposite poles of the cell.

139) Figure 3 shows an animal cell at an early stage of division. Use it to answer the questions that follow.



What term is used to describe the number of chromosomes in the cell? (1 mark)

Solution

➤ Diploid (number)

140) If the cell divided by meiosis:

(i) How many daughter cells would be formed at the end of the first meiotic division? (1 mark)

Solution

➤ 2 daughter cells

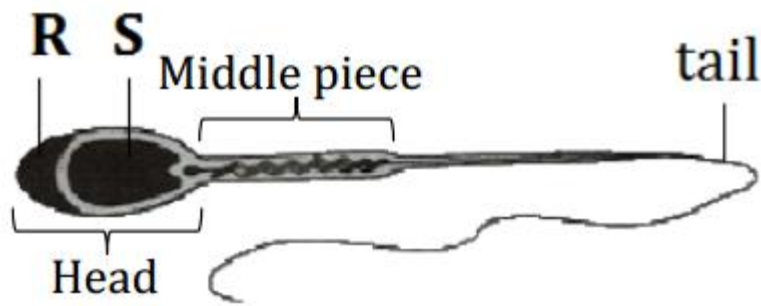
➤

(ii) How many chromatids would each daughter cell contains at the end of telophase ii? (1 mark)

Solution

❖ 2 chromatids

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



- (i) What is contained in the part marked s? (1 mark)

Solution

- Genetic material (nucleus)

- (ii) What is the function of enzymes produced by the part marked r? (1 mark)

Solution

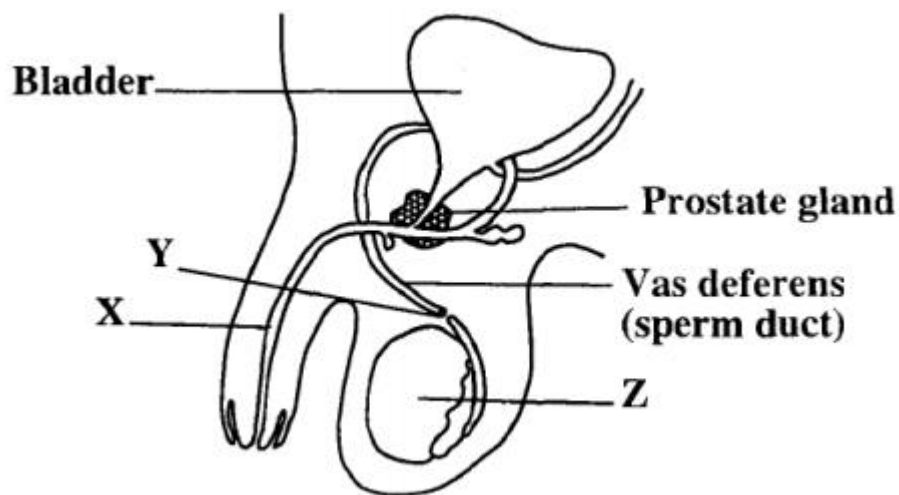
- Dissolves surface on the ovum to allow sperm to penetrate it for fertilization

- 142) How does the middle piece assist the sperm cell in movement? (2 marks)

Solution

- . Contains mitochondria that release energy used in sperm movement

- 143) Figure 6 is a diagram of male reproductive system. Use it to answer questions that follow.



- (i) Name the parts marked x and z. (2 marks)

Solution

- X: urethra
- Z: testis

- (ii) Mention the contraceptive method shown at y. (1 mark)

Solution

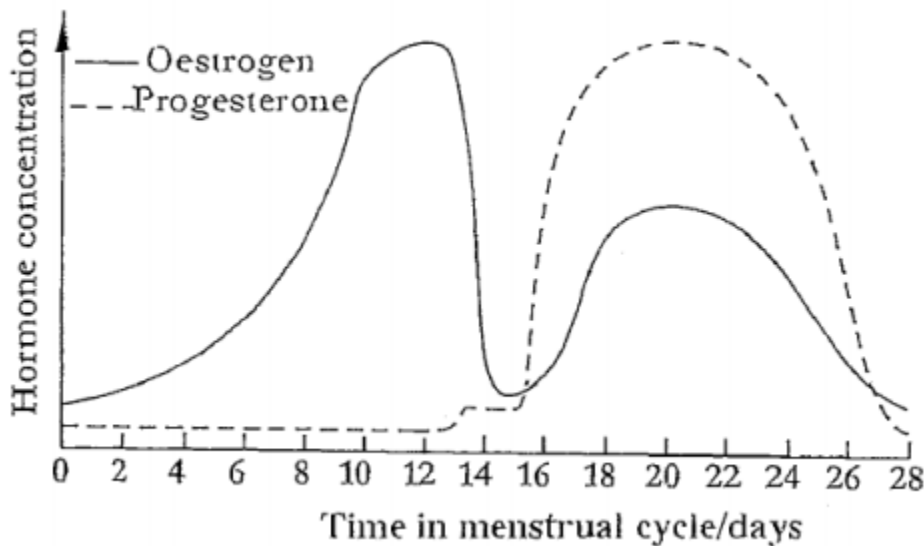
➤ Vasectomy

- (iii) Mention any two advantages of using this contraceptive method. (2 marks)

Solution

- Passing sperm is stopped completely.
- permanent.
- No side effect.

- 144) Figure 6 shows levels of some hormones during the menstrual cycle. Use it to answer the questions that follow.



- (i) During which period is fertilization more likely to occur? (1 mark)

Solution

➤ Day 12 to 16

- (ii) Give a reason for your answer to .(i). (1 mark)

Solution

➤ Ovulation has occurred or the egg is in the fallopian tube

- 145) . Stale any two things they may happen to the wall of the uterus between days 5 and 10. (2 marks)

Solution

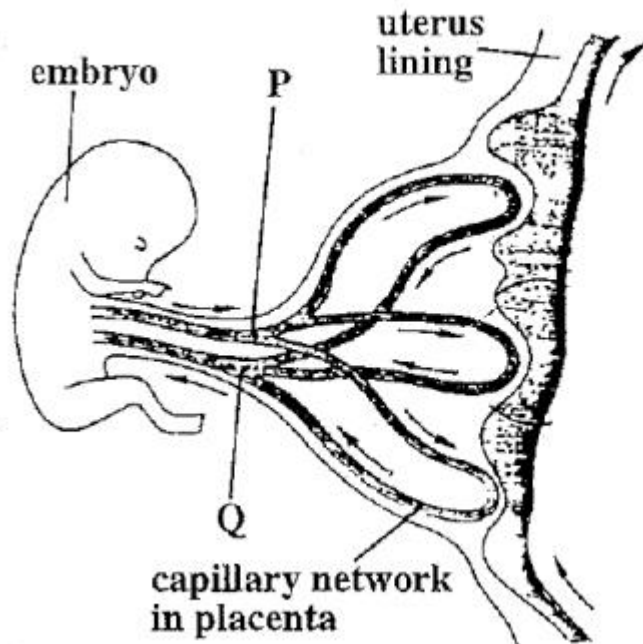
- .thickening of the uterine wall.
- vascularization of uterine wall.

- 146) explain why the level of progesterone increases from day 16 to 20. (3 marks)

Solution

- . Corpus luteum produces progesterone which maintains the thickness of the uterine wall in
- Preparation for implantation

- 147) Figure 7 is a diagram showing blood supply between an embryo and the placenta. Use it to answer the questions that follow.



- (i) Name the blood vessels marked p and q. (2 marks)

Solution

- . P: umbilical artery
- Q: umbilical vein

- (ii) Mention any two substances transported by blood vessel marked p. (2 marks)

Solution

- carbon dioxide
- Urea

- (iii) Name one organ that starts to function immediately a child is born. (1 mark)

Solution

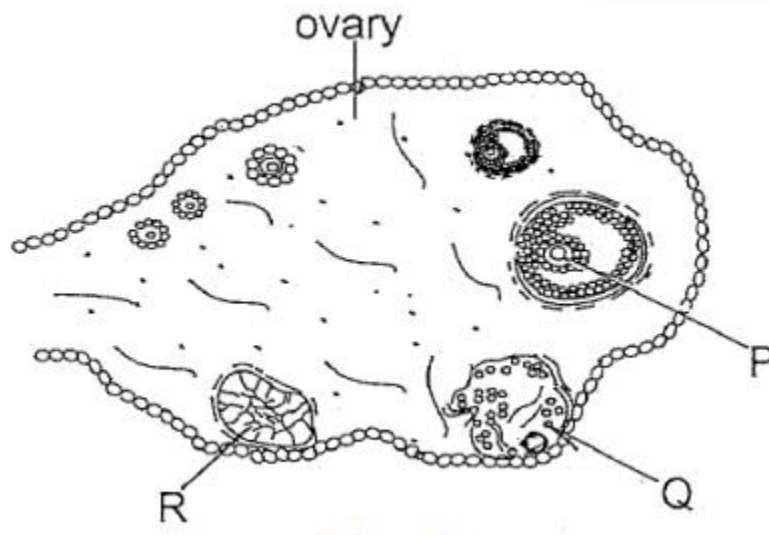
- Lungs

- (iv) Explain one adaptation of the placenta to its function. (2 marks)

Solution

- Has dense network of blood vessels for efficient transport of substance.

- 148) Figure 7 shows the development of an ovum in the ovary of a woman. Use it to answer the questions that follow.



- (i) Name the parts marked p and r. (2 marks)

Solution

- P: ovum
- R: corpus luteum

- (ii) Name the process taking place at q. (1 mark)

Solution

- Ovulation

- 149) (i) what hormone is produced by the part marked r? (1 mark)

Solution

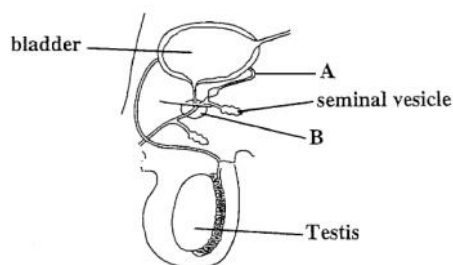
- Progesterone

- (iii) Explain the role of the hormone in (i) above in women. (2 marks)

Solution

- It keeps the uterus lining thick and with a dense network of blood vessels

- 150) Figure 6 is a diagram showing part of the male reproductive system. Use it to answer the question that follow.



- (i) Name the parts labelled a and b. (2 marks)

Solution

- A: vas deferens or sperm duct
- B: prostate gland

- (ii) Name the hormone produced by the testis.(1 mark)

Solution

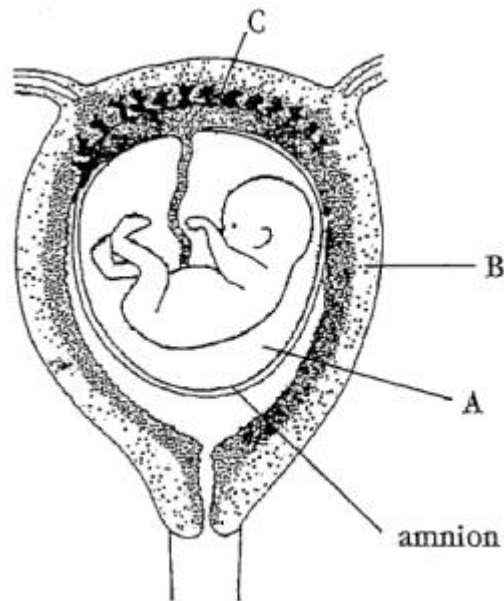
- Testosterone
-

- 151) Explain why a contraceptive method which involves cutting of part labelled a is more effective. (2 marks)

Solution

- Because of cutting the sperm duct, sperm cannot reach the penis.

- 152) Figure 6 shows a developing human foetus inside the womb.



- (i) Name the parts marked b and c. (2 marks)

Solution

- B: uterus
- C: placenta

- (ii) State two roles played by the part marked a during the development of the foetus. (2 marks)

Solution

- It acts as a shock absorber, protecting the developing foetus against mechanical injury.
- It supports the foetus and allows it to move freely during growth.

- 153) Data below are the birth masses of 12 babies in kg. Use it to answer the questions that follow.

3.1	3.4	3.0
2.5	2.5	3.5
3.0	2.6	2.0
3.5	3.4	3.5

- (i) Calculate the average birth mass. (3 marks)

Solution

$$= 3 = (3.1+2.5+3.0+3.5+3.4+2.5+2.6+3.4+3.0+3.5+2.0+3.5/12)$$

- (ii) Using the above information, complete the table below. (1 mark)

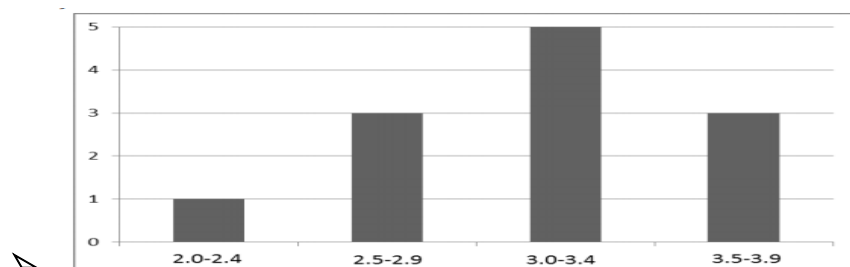
Birth mass (kg)	2.0-2.4	2.5-2.9	3.0-3.4	3.5-3.9
Number of Babies				

Solution

Birth mass(kg)	2.0-2.4	2.5-2.9	3.0-3.4	3.5-3.9
No. of babies	1	3	5	3

- (iii) Using the table in 2 above draw a histogram to compare the mass and number of babies of each range. (4 marks)

Solution



- 154) What is the model birth mass range? (1 mark)

Solution

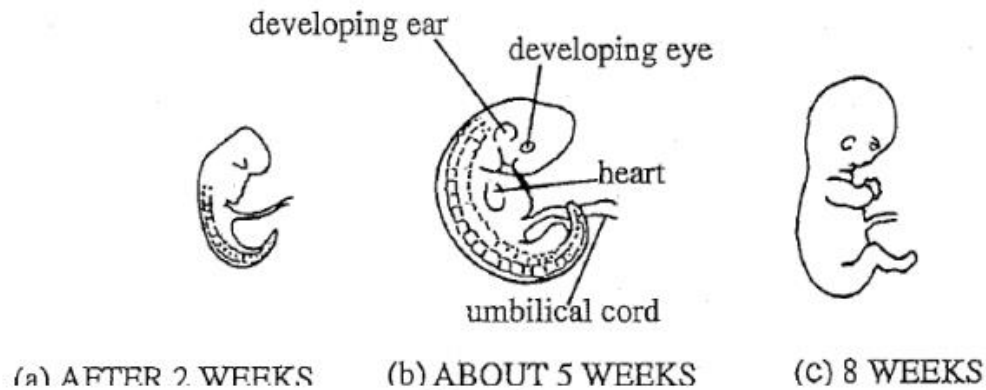
➤ 3.0-3.4

- 155) what type of variation is birth mass? (1 mark)

Solution

➤ . Continuous variation

- 156) Figure 8 is a diagram showing a human embryo at different stages of development. Use it to answer the questions that follow.



how old is the embryo by the time a circulatory system develops? (1 mark)

Solution

➤ About 5 weeks

- 157) (i) apart from the head and tail, name the structure which is present in all the three stages shown in figure(1 mark)

Solution

➤ Umbilical cord

- 158) (ii) explain two ways in which the structure named in above(i) is important to the embryo. (2 marks)

Solution

- It allows antibodies diffuse from the mother's blood into the embryonic blood capillaries.
- It allows metabolic waste, e.g. Urea to diffuse from the embryonic blood capillaries into the mother's bloodstream.
- It allows dissolved food substances such as glucose to diffuse from the mother's blood into that of embryo.

- 159) What type of cell division contributes to the increase in size of the embryo? (1 mark)

Solution

- Mitosis

160) Explain any five ways in which breast feeding is important. (10 marks)

Solution

- First milk of breast feeding called colostrum which is rich in proteins, vitamins and antibodies which help the baby fight early infections before its own immunity system develops.
- Breast milk is cheap and is available the instant it is needed.
- Breast milk is digested more quickly and more easily than bottled milk. If unhygienically handled, bottled milk may cause frequent constipation in babies.
- Breast milk is at the right temperature, i.e. The normal body temperature for the baby.
- Breast feeding provides emotional and psychological benefits to both mother and baby.

161) State any five contraceptive methods and explain how each one works. Your answer should be in an essay form. (10 marks)

Solution

- There are several contraceptive methods. Typical contraceptive methods are following ways;
- 1. The rhythm method: the rhythm method prevents pregnancy by avoiding sexual intercourse during the period when ovulation is most likely to occur.
- 2. Use of the condom: the condom is used to cover the penis and collect the semen in order to prevent pregnancy.
- 3. Taking contraceptive pills: contraceptive pills contain female sex hormones that prevent ovulation.
- 4. Use of the intra-uterine device (iud): the iud is inserted into the uterus. It prevents the implantation of an egg in the uterus.
- 5. The vasectomy: the sperm ducts are tied and cut by the surgical operation. This prevents sperm from reaching the penis, so no sperm are discharged.
- *another contraceptive methods:
- The tubal ligation is the sterilization operation for women. Both the oviducts are cut and tied back. This prevents the sperm in the uterus from reaching the egg.
- The diaphragm is inserted into the top of the vagina and placed over the cervix. It prevents sperm from getting into the uterus.
- The spermicides are placed high into the vagina before intercourse and chemicals that can be used to kill the sperm.

- 162) A married couple wants to choose a contraceptive method in order not to bear children for a period of four years. Suppose you are a health worker, state five contraceptive methods that the couple can use, explaining how each method work in preventing conception. (10 marks)

Solution

- I would advise the couple to choose from a number of contraceptive methods.
- the first would be use of contraceptive pills. These are pills that contain estrogen and progesterone-like hormones. The hormones prevent ovulation.
- Another method would be the use of a diaphragm. A diaphragm is a dome-shaped rudder cap with an elastic rim increased onto the top of the vagina and placed over the cervix, preventing sperms from entry into uterus.
- The couple would also benefit if i presented to them the use of a condom as a contraceptive method.a condom is a thin rubber tube which is used to cover the erect penis before intercourse.sperms are collected at the end of the sheath so are prevented from entering the uterus.
- i would also present to them the rhythm method. This is also known as safe-period method. This method is based on the fact that in every menstrual cycle, there is a fertile period when ovulation is likely, so avoiding sexual intercourse during this period prevents pregnancy.
- The fifth method i would present to them would be withdrawing the penis from the vagina before the organism so as to prevent depending the sperms into the uterus. I would however emphasise that this is a very risky method because it can be too late to withdraw the penis.

EXCRETION

- 163) Define “deamination” (1 mark)

Solution

- The process that removes amino groups from the amino acid.

- 164) state one substance that is excreted in each of the following excretory organs.

- (i) Lungs (1 mark)

Solution

- Carbon dioxide

(ii) kidneys (1 mark)

solution

➤ Nitrogenous compounds e.g. Urea

165) (i) name the main nitrogenous waste excreted by kidneys. (1 mark)

Solution

➤ Urea

(ii) Describe how the nitrogenous waste mentioned in 166 .(i) is formed. (3 marks)

Solution

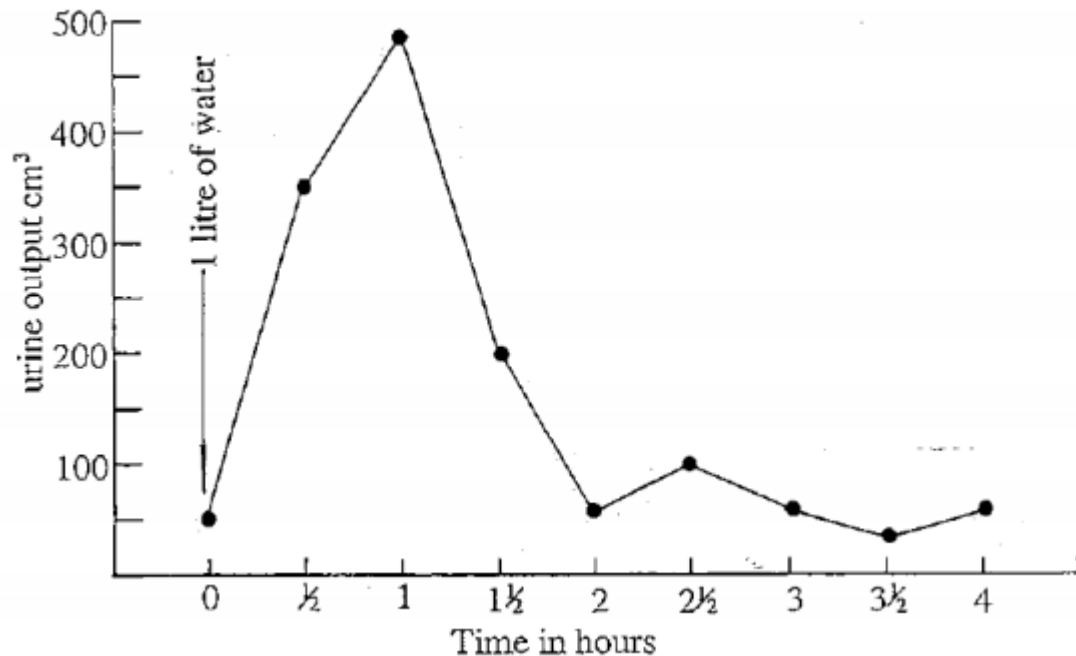
➤ Excess amino acids are deaminated by the liver. Deamination is the removal of amino groups from amino acid molecules by the liver. The amino group is changed to urea and sent to the kidneys.

166) Name two substances found in blood plasma that are not found in the urine of a healthy person.(2 marks)

Solution

➤ Glucose,
➤ protein

167) Figure 6 is a graph showing urine output in a person after drinking 1 litre of water. Use it to answer the questions that follow:



- (i) What was the maximum amount of urine produced? (1 mark)

Solution

➤ 485cm^3

- (ii) What effect did drinking of the water have on urine output during the first hour of the investigation? (1 mark)

Solution

➤ Urine output increased

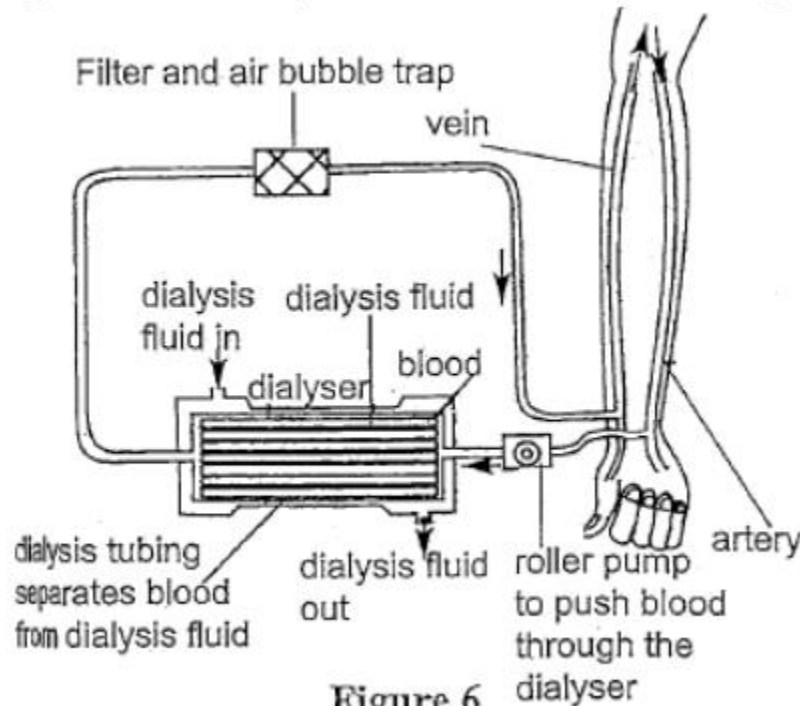
➤

- 168) Explain how anti-diuretic hormone (adh) affected results of urine output between 1 hour and 2 hours. (3 marks)

Solution

➤ Adh made kidney to reabsorb more water hence reducing urine output

- 169) Figure 6 shows a dialysis machine. Use it to answer the questions that follow.



- (i) Explain why patient's blood and the dialysis fluid move to opposite directions in the dialyser. (2 marks)

Solution

➤ . Because they produce concentration gradient in the dialyser for efficient diffusion of waste matters.

- (ii) Why are there many smaller channels in the dialyser rather than one large one? (2 marks)

Solution

➤ Because they provide a large surface area to increase the rate of diffusion.

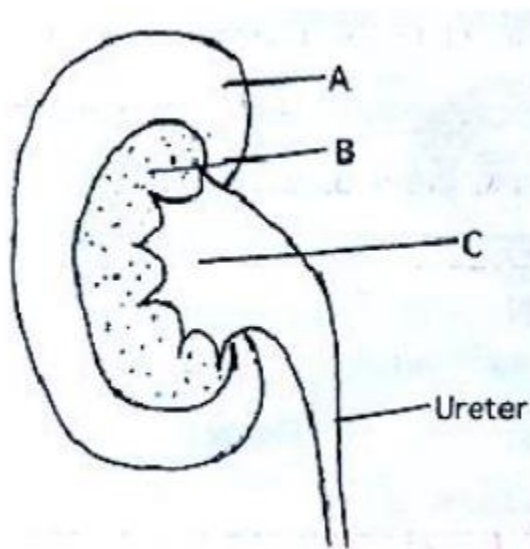
- (iii) Explain why it is dangerous for an air bubble to get into the patient's blood while on the dialysis machine. (2 marks)

Solution

❖ Because if an air bubble enters the patient's blood vessels, it blocks and prevents the blood flow. as a result, it leads the death of the patient.

➤

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



name one structure of the nephron found in each of the following parts of the kidney.

- (i) A (1 mark)

Solution

➤ A: medulla

- (ii) B (1 mark)

Solution

- (iii) B: collecting duct, t

➤

- 171) what is the function of the part labelled c? (1 mark)

Solution

- Contains the bowman's capsule where ultra-filtration occurs.

172) (i) what is the effect of an intake of salt solution on urine production? (1 mark)

Solution

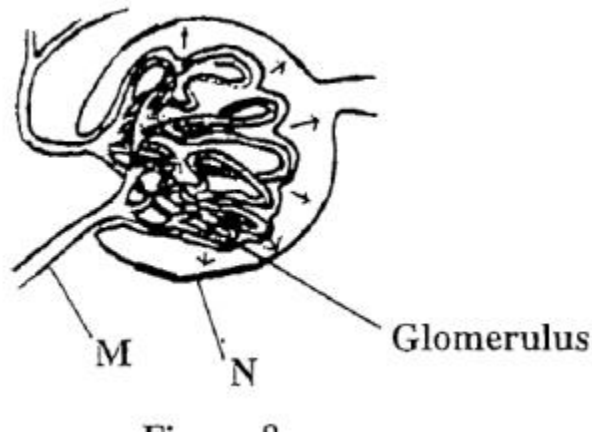
- Less urine is produced

(iii) Explain how the effect in (i) is brought about. (3 marks)

Solution

- When blood is concentrated with salt, hypothalamus stimulates pituitary glands so secrete into blood anti-diuretic hormone. When this hormone reaches the kidney, it causes tubules to absorb more water from the glomerular filtrate back into the blood and this causes kittle urineproduction

173) Figure 8 is a diagram showing part of a nephron. Use it to answer the questions that follow.



Name the parts marked m and n. (2 marks)

Solution

- M: renal artery n: bowman's capsule

174) (i) mention the process represented by the arrows. (1 mark)

Solution

- Ultra-filtration
-

(iii) Describe one adaptation of the figure to the process mentioned in (i). (2 marks)

Solution

- Blood capillaries in the bowman's capsule have very small diameter, so the high blood pressure forces substances out or semipermeable hence allows some substances to pass and not others

- 175) Give one example of active transport which occurs in the nephron. (1 mark)

Solution

- Reabsorption of glucose from the tubule into the bloodstream

- 176) Table 1 shows the composition of human blood and urine. Use it to answer the questions that follow.

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

- (i) Give one substance which is present in blood but is completely absent in urine. (1 mark)

Solution

- Glucose,
➤ Protein

- (ii) Apart from urea and water, mention two substances which are more concentrated in urine than in blood. (1 mark)

Solution

- Uric acid, creatinine, chloride, sodium, potassium

- 177) Which hormone regulates water concentration in the blood? (1mark)

Solution

- Anti-diuretic hormone

- 178) Why is urea excreted in large quantities? (3 marks)

Solution

- Because it contains ammonia which is not needed and harmful to the body

- 179) A dialysis machine is an artificial kidney which is used when a person has kidney failure.

how is the loss of glucose and other important substances from the blood prevented when a patient is on the dialysis machine? (2 marks)

Solution

- Dialysis fluid and blood plasma are similar in composition so important substances do not diffuse out of the blood.

- 180) State one similarity between the dialysis tube and the tubule of the nephron. (2 marks)

Solution

- Each has a selectively permeable membrane that allows only smaller particles to pass through.
-

- 181) Name two substances which diffuse out of the dialysis tube when it is in operation. (2 marks)

Solution

- Urea
- Water

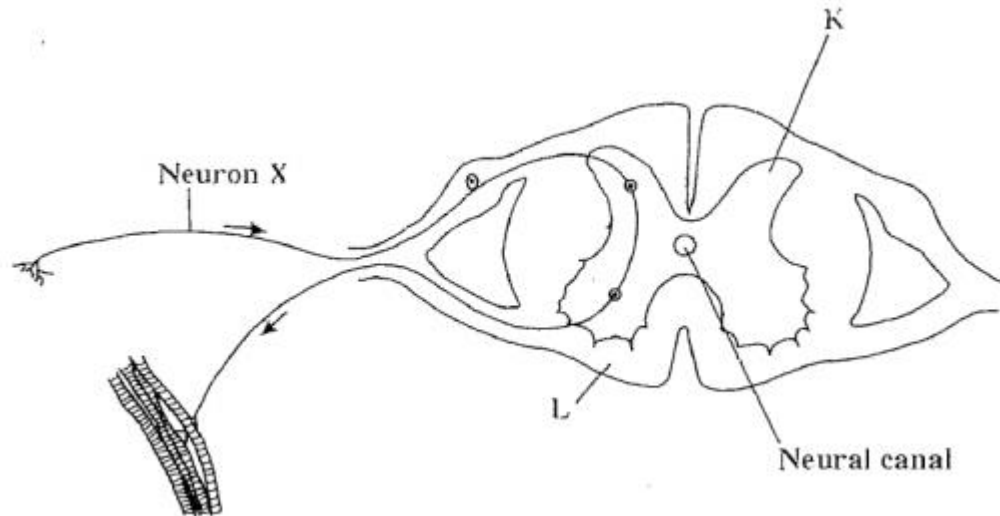
- 182) Describe how urine is formed in the kidneys of the human body. Write your answer in an essay form.(10 marks)

Solution

- There is filtration in the glomerulus due to high pressure which results in smaller substances leaking out into the bowman's capsule or renal tubules.then selective re-absorption of useful substances occurs from the renal tubules into the blood capillaries either by active transport or diffusion or osmosis(for water) leaving behind substances in the renal tubules called urine.

COORDINATION

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



- (i) Name the part marked k. (1 mark)

Solution

- Grey matter

- (ii) Mention one disease that attacks neurone x. (1 mark)

Solution

- Leprosy

- (iii) Give one function of the fluid found in the neural canal. (1 mark)

Solution

- To protect spinal cord from the external force
-

- 184) Define a “conditioned reflex action”. (1 mark)

Solution

- It is a reflex action that is acquired through experience.

. Mention the three main steps involved in conditioning organism. (3 marks)

Solution



Step 1: presentation of original stimulus and related response made.

Step2: substitute stimulus is presented together with the original stimulus.

Step3 substitute response is now presented alone.

- 185) What is the difference between “a conditioned reflex” and “a single reflex action”? (1 mark)

Solution

- Conditioned reflex is acquired from experience with a stimulus that was originally ineffective in producing the observed response while simple reflex action is an automatic response to stimulation.

- 186) Table 1 shows results of an experiment where a person was blindfolded and asked to locate the direction of sound produced by a clock placed at different distances.

DIRECTION OF SOUND	DISTANCE FROM EARS (cm)			
	60	80	100	120
Up	✓	✓	X	✓
Down	✓	X	✓	X
Left	✓	✓	X	X
Right	✓	✓	✓	X

Key: ✓ = correctly located sound direction
 X = incorrectly located sound direction

- (i) What two variables were kept constant in this experiment? (2 marks)

Solution

- Time taken for the person to hear the sound.
- Intensity of the sound from the clock.

- (ii) What was the aim of the experiment? (1 mark)

Solution

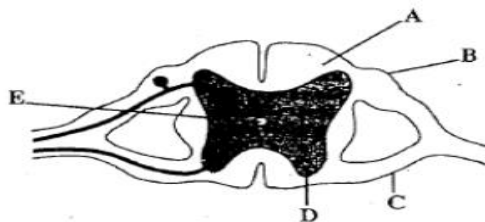
- To find out the out the distance of sound from the cars increases, It became difficult to locate the source of the sound location is effective by using two cars.

- (iii) What conclusion can be drawn from the results shown in table 1? (1 mark)

Solution

- In general, as the distance of sound from the ears increases, it becomes difficult to locate the source of the sound, and sound location is effective by using two ears.

- 187) Figure 1 is a diagram showing a transverse section of the spinal cord. Use it to answer the questions that follow.



- (i) Name the parts labelled b and c. (2 marks)

Solution

- A-white matter
- B-ganglion

- (ii) State the structural difference between parts labelled a and d. (1 mark)

Solution

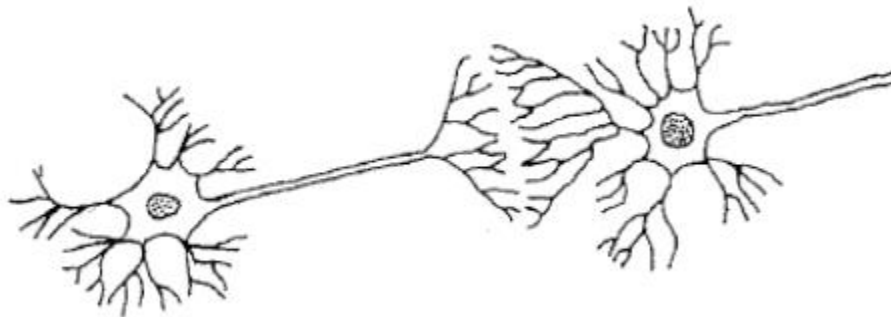
- A consists of nerve fibers while d consists of cell bodies.
- .

- (iii) What is the function of the substance found in the part labelled e? (1 mark)

Solution

- Over-exposure to radiations. Smoking, viral infection

- 188) Figure 7 is a diagram showing a synapse between two nerve cells. Use it to answer the questions that follow.



- (i) Use an arrow to indicate the direction of the nerve impulse in the diagram. (1mark)

Solution



- (ii) State any one function of the synapse to the work of neurons. (1mark)

Solution

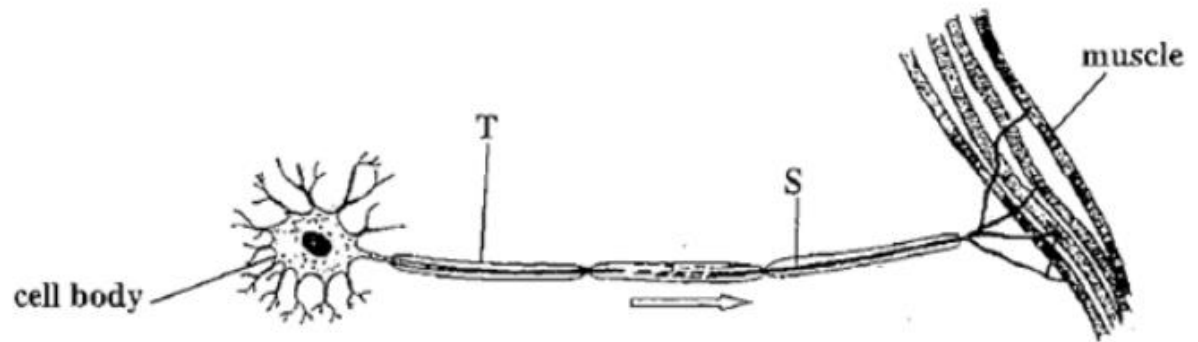
- To ensure that impulses travel one direction or to help filter weak or unwanted stimuli.

- (iii) Explain one effect of smoking indian hemp to the nervous system. (2 marks)

Solution

- It affects the cerebrum thereby affecting decision making of an individual.

189) Figure 8 is a diagram of a nerve cell. Use it to answer the questions that follow:



- (i) Name the parts marked t and s. (2 marks)

Solution

- T: myelin sheath s: axon

- (ii) Name the type of nerve cell shown in figure (1 mark)

Solution

- Motor neurone
-

- (iii) Explain what could happen if the cell body was damaged. (2 marks)

Solution

- Impulses would not be transmitted to effectors or muscle hence no response

- (iv) Explain any one adaptation that enables the nerve cell to conduct impulses at high speed. (2 marks)

Solution

- . Has myelin sheath which insulates the neurone

Human disease

- 190) . State any two ways in which vectors transmit diseases. (2 marks)

Solution

- Carrying germs which introduce human body through bite.
- Burrowing under the skin of human and lay eggs. E.g. Flea cause the jigger.

- 191) Mention any two signs of athletes foot. (2 marks)

Solution

- Itching in between toes. Splitting skin between toes

192) At a certain school students developed rash on the skin and high fever. A doctor diagnosed them positive for a diarrhoeal disease.

- (i) Name the disease. (1 mark)

Solution

➤ Typhoid

- (ii) What is the causative agent of the disease? (1 mark)

Solution

➤ Salmonellosis (bacteria)

- (iii) Mention any two ways in which the disease could have been transmitted. (2 marks)

Solution

➤ Drinking contaminated water.

➤ Eating contaminated food

193) Explain what happens during incubation period of a disease. (2 marks)

Solution

➤ Germs multiply in the body but there are no symptoms in the host.

194) Figure 4 shows a mode of transmission of some diseases. Use it to answer the questions that follow.



- (i) Identify the mode of transmission. (1 mark)

Solution

➤ Droplet infection

- (ii) Name any two diseases that can be transmitted by the mode shown in figure 4. (2 marks)

Solution

➤ Tuberculosis, common cold

- (iii) Explain one way of preventing transmission of diseases through the mode shown in the figure (2 marks)

Solution

- Covering the mouth or nose when coughing or sneezing to prevent germs(drops) getting into the air or to others.

- 195) (i) give any one way of contracting hiv besides sexual intercourse. (1 mark)

Solution

- Sharing injection needles with an infected person.
- Receiving infected blood during a blood transfusion
- Mother-to-child transmission.

- (iii) What sort of precautions would prevent the spreading of the virus in the method you have given in (i) above (1 mark)

Solution

- Avoiding to share injection needles

- 196) State any two practices that an hiv and aids patient can follow to live longer. (2 marks)

Solution

- They have to take the drug arv that can slow down the illness.
- They have to keep the healthy daily life

- 197) Figure 2 shows the head of a child with a skin infection. Use it to answer the questions that follow.



- (i) Name the infection. (1 mark)

Solution

- Ringworm

- (ii) Mention the causative agent of the infection. (1 mark)

Solution

- Fungu

- (iii) Give one way of preventing spread of the infection. (1 mark)

Solution

- To ensure personal cleanliness. /
- To avoid contact with infected person or personal objects.
- To dry the skin to remove moisture./to wash the skin with soap, etc.(write any one.)

- 198) Cancerous cells carry out many cellular functions as normal cells. What characteristics distinguish them from normal cells? (1 mark)

Solution

- They carry out cell division uncontrollably.

- 199) Why is cancer not contagious? (1 mark)

Solution

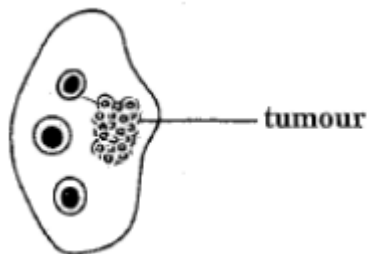
- Because it is genetic.

- 200) Explain two ways of reducing the risk of developing cancer. (2 marks)

Solution

- Avoiding exposure to ultraviolet rays (radiation).
- Avoid smoking as this induces mutation of chromosomes.
- Avoid drinking alcohol.
- Protect yourself from strong sunlight.
- Reduce stress

- 201) Figure 2 is showing a lymph node which has a tumour beginning to develop. Use it to answer the questions that follow:



- (i) Name the type of disease shown in figure (1 mark)

Solution

- Cancer

- (ii) State two ways in which the cells of the tumour might affect cells surrounding it. (2 marks)

Solution

- The cell of the tumour takes nutrition from surrounding cells.
- the cell of the tumour cause other cells to malfunction

- (iii) Suggest any two factors that would increase the risk of developing the disease named in 1 above (2marks)

Solution

- Smoking
- Drinking excess alcohol

- 202) In an experiment, five petri dishes with nutrient agar were sterilized and then exposed to air in the laboratory for 30 minutes, after which they were placed in areas of different temperatures. Table 1 shows the result of the experiment after 2 days.

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

- (i) What was the aim of the experiment? (1 mark)

Solution

- To find out the effect of temperature on bacterial growth.

- (ii) At what temperature did the bacteria grow most rapidly? (1 mark)

Solution

- 37°C

- 203) . What causes sleeping sickness? (1 mark)

Solution

- Trypanosome

- 204) Explain any two ways of preventing transmission of sleeping sickness. (4 marks)

Solution

- Using insecticides to kill the tsetseflies.

- Applying repellants to the skin to avoid being bitten by tsetseflies.
- 205) define “passive immunity”. (1 mark)

Solution

- It is body defense against infection through already made antibodies or through introduction of
- Antibodies.
- .
- .

- 206) Explain how each of the following helps the body to defend itself against infection.

- 207) (i) platelets (2 marks)

Solution

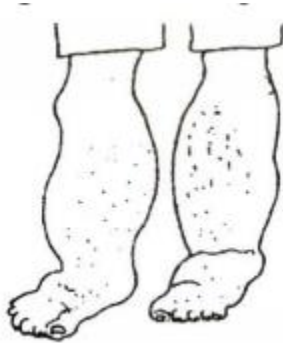
- Platelets form blood clots or scab which prevent entry of germs

- (ii) stomach (2 marks)

Solution

- Stomach produces hydrochloric acid which kills germs

- 208) Figure 9 shows legs of a person with a skin disease. Use it to answer the questions that follow.



- (i) Name the disease. (1 mark)

Solution

- Elephantiasis

- (ii) To which group of organisms does the causative agent of this disease belong? (1 mark)

Solution

- Filarial worms



- (iii) Describe the life cycle of the causative agent of the disease. (4 marks)

Solution

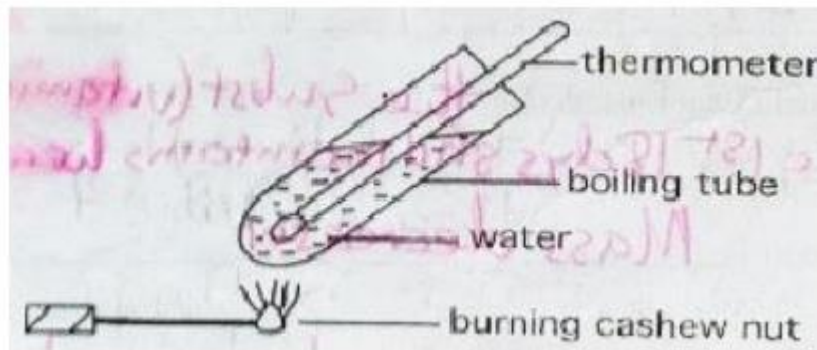
- The tiny larvae of this worm are transmitted by mosquitoes.
- The mosquito bites a person and the filarial worms are injected into the victim's blood stream. After that, these worms grow in the lymph vessels and lay eggs. If another mosquito bites an infected person, it sucks this worm.

(iv) Give any two ways of preventing the disease. (2 marks)

Solution

- Always wear long trousers and long sleeved shirts at dusk and dawn
- And sleep under mosquito nets to prevent you from mosquito bites.

209) Figure 4 is a diagram of an experiment that was used to find the energy value of cashew nuts. The result obtained was 1800kJ per 100g of cashew nuts. Use it to answer the questions that follow.



210) if the exact energy value for the cashew nut is 2500kJ per 100g,

(i) give two reasons why a lower result was obtained. (2 marks)

Solution

- . Because some of the energy has been dissipated into the air.
- Also some of the energy has been used to heat the water.

(iii) What two things can be done to improve the accuracy of the result? (2 marks)

Solution

- The boiling tube should not be inclined at that angle, it should be upright.
- The distance between burning cashew nut and the boiling tube should be reduced

- 211) If this method was used to find out energy value of beans, state two experimental conditions that must be kept constant in order to make a fair comparison of energy values of cashew nuts and beans. (2 marks)

Solution

- Size of both cashew nut and bean seed should be the same.
- Time taken to burn the seeds should be kept constant.
- Amount of water being heated is constant size of test tube is the same.

- 212) how does each of the following methods work in preventing malaria?

- 213) (i) spraying a layer of oil on stagnant water (2 marks)

Solution

- Oil prevents oxygen from reaching the mosquito larvae. So, they will be died.

- (iii) Breeding fish in slow running water (2 marks)

Solution

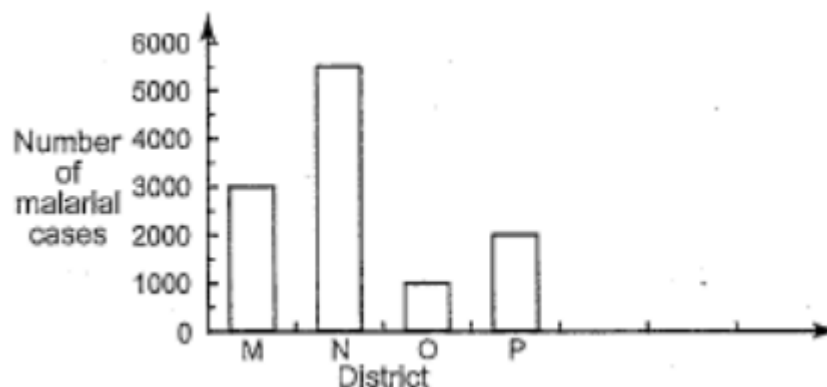
- Fish eats mosquito larvae and eggs

- 214) why does a malarial patient become anaemic? (2 marks)

Solution

- Because malaria parasites destroy red blood cells.

- 215) The ministry of health conducted a research to study malaria causes in four randomly selected districts m, n, o and p in malawi. The study was done in some health centers for three months and the results were presented in a bar graph as in figure 5.



- (i) Which district had the highest number of cases of malarial infection? (1 mark)

Solution

- N

- (ii) How many cases were registered during the whole research period? Show your working. (2 marks)

Solution

$$M=3000$$

$$N=5500$$

$$O=1000$$

$$P=2000$$

➤ $\text{Total } 11500$

- (iii) Suggest two reasons why it is not correct to conclude that these were the only malarial patients in the studied districts. (2 marks)

Solution

- Others might have got the infection but did not show malarial signs so were not included in the survey.
- The number of malarial cases represented only the sample of the whole district.

- (iv) Mention any two signs of malaria. (2 marks)

Solution

- High fever, shivering and chills followed by sweating.
- Aches and pain, anaemia, enlargement of liver and spleen.

- 216) Suppose you are a medical doctor and you have a patient who requires blood transfusion. Explain any five factors that you would consider before carrying out a blood transfusion. Your answer should be in an essay form. (10 marks)

Solution

- This was also an essay question and the expected five points should have included the following:
 - • checking the blood groups of donor and recipient to avoid agglutination
 - • consider the rhesus factor to avoid any reactions or still birth or miscarriages in subsequent pregnancies.
 - • testing blood for hiv to avoid infecting the recipient
 - • checking haemoglobin content of the donor to avoid death of donor due insufficient oxygen supply.
 - • check for syphilis in donor to avoid infecting recipient.
 - • consider blood pressure of donor to avoid death of donor due to low blood pressure.
 - • check for hepatitis in donor to avoid infecting the recipient.
 - • consider age of the donor, i.e. Should not be too old or too young to avoid death of donor as replacement of blood may be too slow.
 - • check for malarial parasites to avoid infecting the recipient

- 217) Suppose you are a health assistant in a community where there is high prevalence of malaria, what advice would you give to the community on prevention of malaria. Explain any five points in an essay form. (10 marks)

Solution

- First point is killing the adult mosquitoes directly to spray rooms and houses with insecticides.
- ▪ second point is killing the mosquitoes at the larvae, eggs and pupa stages to drain all stagnant water. All empty receptacles such as tins, bottles and broken pots should be removed or turned upside down.
- ▪ third point is taking the breeding places from mosquitoes to cut down all the tall grasses around
- Homes to prevent mosquitoes from finding breeding places.
- ▪ fourth point is decrease in number of mosquitoes. Where mosquitoes breed in a slow running
- Stream, the use of fish or ducks to eat the mosquito larvae and pupa is applied.
- ▪ fifth point is protecting yourself from mosquitoes. Always wear long trousers and long sleeved shirts at dusk and dawn when mosquitoes are likely to bite. And always sleep under mosquito net.

- 218) Suppose there is an outbreak of diarrhoea on a boarding school. Describe how you would establish the cause of the outbreak. Your answer should be in an essay form. (10 marks)

Solution

- To establish the cause of diarrheal disease, the following can be done:
I would find out about personal hygiene items of students because unhygienic condition result in breeding of various type of germs.i would also find out about source of water used be the students whether it is from a hygienic source. If it is from boreholes, then i would advise that the boreholes should be re-located away from pit latrines. Knowing whether the students had been vaccinated against diseases like cholera before would also be necessary. Beside all theses, i would find out the methods of waste disposal used at the school. Waste management is crucial since waste disposal areas re breeding groups for microbes that cause diarrheal diseases.

Immunity

- 219) Name the agglutinating proteins in plasma of a person with blood group o. (2 marks)

Solution

- Antibodies a and b

- 220) Explain why a person with blood group o is a universal donor. (2 marks)

Solution

- Because in blood plasma of a person with blood group o, there are no antigens so which trigger agglutination

- 221) What is the function of helper t-cells in the body? (1 mark)

Solution

- It produce chemicals which coordinate the activity of all cells in the immune system.

- 222) Explain the effect of hiv on helper t-cells in the body. (2 marks)

Solution

- Hiv destroys the helper t-cell by inhibiting the producing of antibodies by the t-cell.

- 223) Table 2 shows the number of children that were infected by tuberculosis after being exposed to two different treatments. Use it to answer the questions that follow.

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

- (i) Calculate the percentage of vaccinated children that were not infected. Show your Working. (3 marks)

Solution

- Number of uninfected children= $500-20=480$ children
- % of uninfected children = $480 \div 500 \times 100\% = 96\%$

- (ii) Explain how the vaccine protected some children from tuberculosis. (2 marks)

Solution

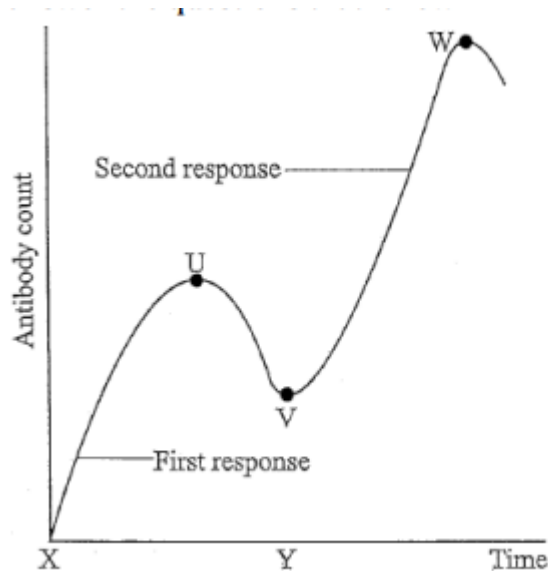
- It stimulate the production of antibodies which fought against bacteria

- (iii) How does the “human immunodeficiency virus” (hiv) weaken immunity of the human body? (2 marks)

Solution

- It destroys or kills white blood cells which defend the body against diseases.

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



- (i) Why does the level of antibodies decrease between points u and v? (1 mark)

Solution

- Because antibodies killed some antigen and then the level of antigens decreased.

➤ .

- (ii) State what happens in the human body at points x and y. (1 mark)

Solution

- The body is memorizing information about the antigens

- (iii) Why is there a rapid change in response between points v and w? (2 marks)

Solution

Because antibodies are produced in large amounts very quickly by the memory cells after reinfection by some antigen

- 225) Explain the role of each of the following in body's defence.

- (i) . Phagocytes (3 marks)

Solution

- Engulf and digest foreign particles, e.g. Bacteria.

(ii) Antibodies (2 marks)

Solution

- By neutralising the (poisonous) toxins produced by bacteria.
- By dissolving bacteria outer coats.
- By agglutinating bacteria so that they cannot invade.
- By adhering to the outer surface of bacteria and so making it easier phagocytes to ingest them.

(iii) Killer t-cells (2 marks)

Solution

- By dissolving digesting bacteria.

226) state two factors which must be considered before a blood transfusion is done. (2 marks)

Solution

- Hemoglobin level in blood.
- Presence of hiv and aids.
- Blood group
- Rhesus factor
- Hepatitis
- Syphilis

227) describe how an individual could acquire natural active immunity. (3 marks)

Solution

- An individual makes its own antibodies as a result of contact with the antigen from the disease. Once it recovers, it can make some antibodies very quickly.

228) Define a “vaccine”. (2 marks)

Solution

- A preparation of killed disease bacteria or viruses or forms of these treated in such a way as to prevent their reproduction and when injected into bloodstream the organism undergoes a mild form of the disease and its cells manufacture an excess of antibodies.

229) Children under five years of age are vaccinated against diseases like tetanus and tuberculosis.

(i) Explain how vaccination protects children against infection. (3 marks)

Solution

- Vaccination helps the body produce antibodies that fight against infections. Vaccines which induce the production of antibodies and these

antibodies remain in the body for a short time but the ability to produce them in future becomes greatly increased due to the vaccines greatly increased due to the vaccines, so any future invading viruses or bacteria are stopped at once

- (ii) Why can a vaccine for tetanus not be used against tuberculosis? (1 mark).

Solution

- Because vaccines are specific for the type of infections.

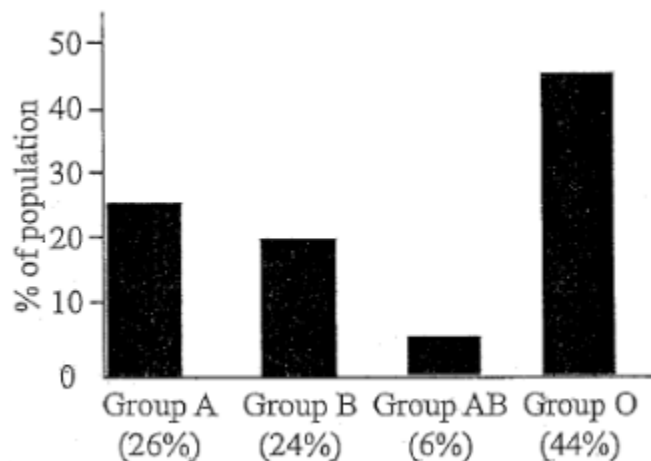
- 230) Describe five barriers which the body used to prevent entry of disease causing organisms into it. explain how each barrier works. (10 marks)

Solution

- The first barrier is the skin. This is a physical barrier which prevents entry of pathogens into the body. It does this by acting as a plastic hindrance or coverage so that pathogens cannot enter the bloodstream.
- In case the skin is cut, the mechanism of blood clotting acts as another barrier. Blood clotting prevents the entry of germs into the bloodstream through cuts in the skin, apart from preventing further loss of blood.
- Tears also act as a barrier. Tears are produced by tear glands. The tears contain enzymes which kill germs which may try to enter the bloodstream through the eyes.

Genetics

- 231) Figure 4 shows a bar graph of human blood groups. Use it to answer the questions that follow.



- (i) What type of variation is shown by blood groups in the bar graph? (1 mark)

Solution

- Discontinuous variation

- (ii) Give a reason for your answer to (i). (1 mark)

Solution

- Because the graph does not give a general shape

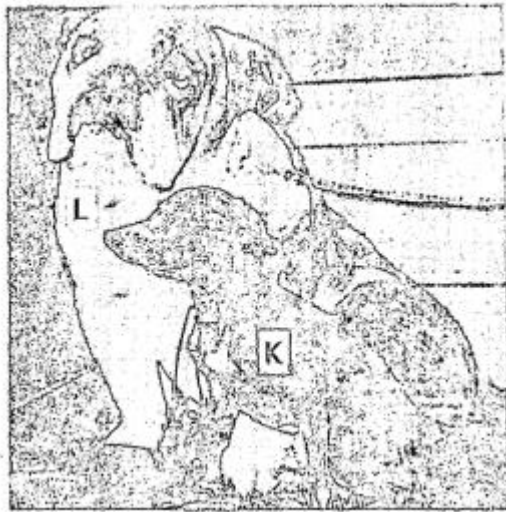
232) In a population of 200 people, what would be the number of people with blood group o?

Show your working. (3 marks)

Solution

- 88%

233) Figure 2 is a diagram, of two adult dogs labeled l and k of the same age and produced from a common ancestor by artificial selection.



(i) Write down two variations that you can see between dogs l and k. (2 marks)

Solution

- . Size, colour

(ii) Suggest the cause of the variations between the two dogs. (1 mark)

Solution

- Genetics(heredity), environment

234) A man with blood group a was married to a woman with blood group b. Their first born son was of blood group 0 while their second born son was of blood group ab.

(i) Give the genotypes of the two parents. (2 marks)

Solution

- Man is ao. Woman is bo

- (ii) Explain how the genotype of the second born son came about. (3 marks)

Solution

The son inherited allele a from father and allele b from mother have a new combination ab.

- These are co-dominant alleles

- 235) When a grey cock was mated with a grey hen, grey and white chicks were produced.

- (i) Using g for grey colour and g for white colour draw a generic diagram to determine the genotype of the offspring. (3 marks)

Solution

- Grey cock: gg grey hen: gg

	G	g
G	GG	Gg
G	Gg	gg

The genotype of offspring are gg, gg and gg.

- (ii) Give the genotypic ratio of the chicks. (2 marks)

Solution

- GG: Gg: gg=1:2:1

- (iii) If the parents produced 12 chicks, how many were white? Show your working. (2 marks)

Solution

- $12 \times \frac{1}{4} = 3$ 3 white chicks

- 236) Figure 8 shows occurrence of light and dark varieties of peppered moth in an industrial area before and after industrial revolution in England. Use it to answer the questions that follow.

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

Parents		red RR		} offsprings
white rr	Gametes	R	R	
	r	Rr	Rr	
	r	Rr	Rr	

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

Solution

➤ Rr.

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

Solution

Heterozygous

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

Solution

➤ Roan/red roan or patched red and white

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



- (i) what is the phenotypic ratio of the offspring? (1 mark)

Solution

➤ The phenotype of offspring is white and black furs and their ratio is 1 to 1.

- 238) If the allele b for black fur, is dominant over the allele b for white fur, what would be the possible genotypes of parents? (2 marks)

- (i) Black parent

Solution

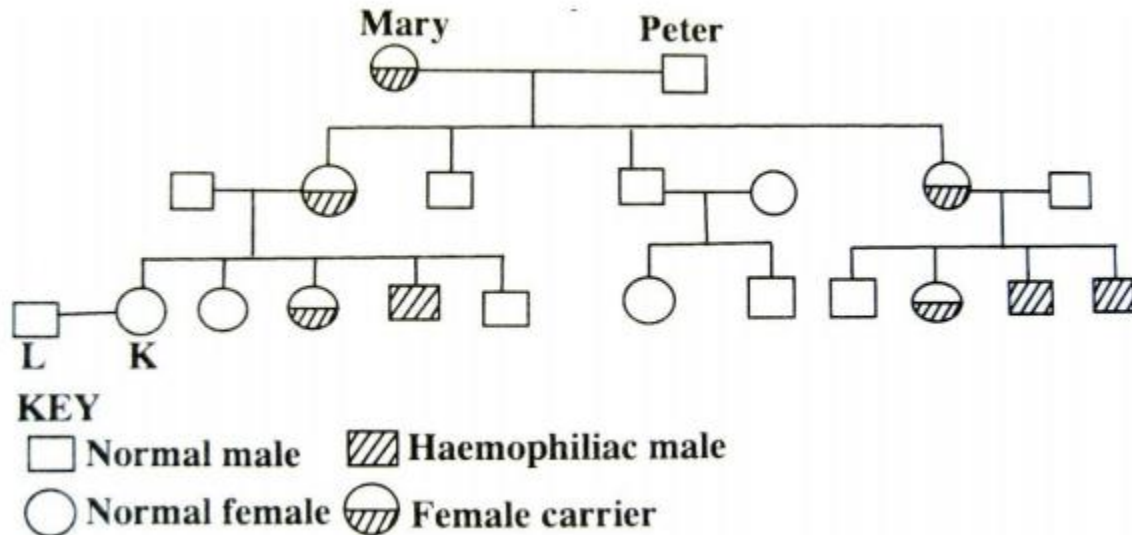
➤ Black parent: bb

- (ii) white parent

Solution

➤ White parent: bb

- 239) Figure 10 shows a family tree in which there is inheritance of a recessive gene that causes Haemophilia. Males with a single recessive gene suffer from the disease while females are carriers of the gene. Use it to answer the questions that follow



- (i) How many individuals with a single recessive gene are there in three generations? (1 mark)

Solution

➤ eight

- (ii) How many of peter's grandsons have haemophilia? (1 mark)

Solution

➤ three

➤

- (iii) What type of children with regard to haemophilia would l and k produce? (1 mark)

Solution

➤ . normal male,

➤ normal female

- (iv) State any two disorders in a haemophiliac person. (2 marks)

Solution

➤ Blood fails to clot properly./ blood lacks platelets./ blood lacks plasma proteins, and so on.

(v) Name the chromosome where the gene for haemophilia is located. (1 mark)

Solution

➤ X-chromosome

(vi) How does the gene for haemophilia arise in a population? (2 marks)

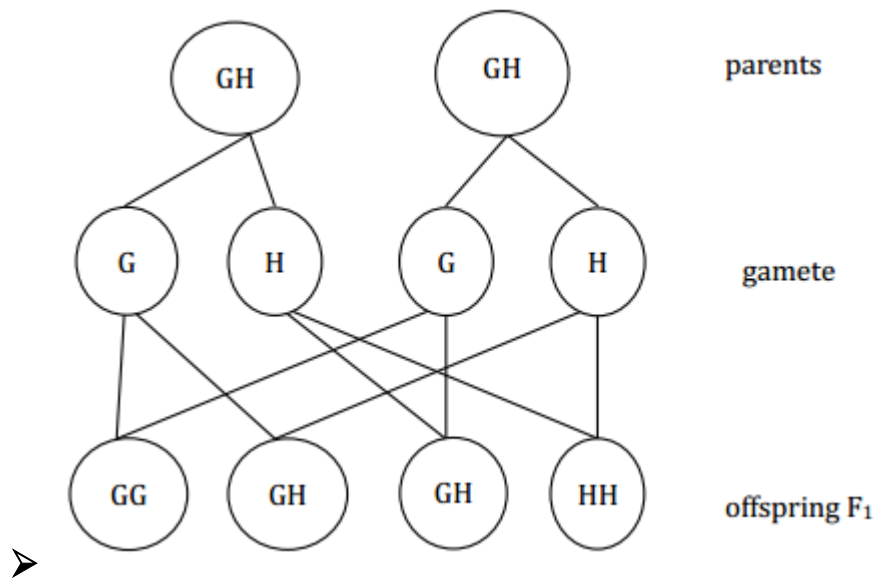
Solution

➤ Haemophilia arises by a gene mutation in the gene which controls the formation of the blood clotting mechanism

240) In a certain plant species, the leaves may be pure green, pure white or variegated (white and green patches). When two plants with variegated leaves were crossed, a total of 84 offsprings were produced of which 21 were green, 42 were variegated and the remaining 21 died soon after germination.

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

Solution



(ii) State the genotype and phenotype of offsprings that died soon after germination. (2 marks)

Solution

➤ Genotype: HH

➤ Phenotype: white

- (iii) A. Explain why these offsprings died. (2 marks)

Solution

- Because the offspring had lethal genes or undesirable traits that are dangerous to the individual organisms

- 241) What term is used to describe the behaviour of allele g and h in the cross? (1 mark)

Solution.

- Additive character

- (i) Give two examples of sex-linked characteristics. (2 marks)

Solution

- Haemophilia,
- Duchenne's muscular dystrophy.,
- Hairy ears,
- Red-green colour blindness,
- Baldness.

- (ii) Complete table 2 by indicating the categories of the given genotypes. (2 marks)

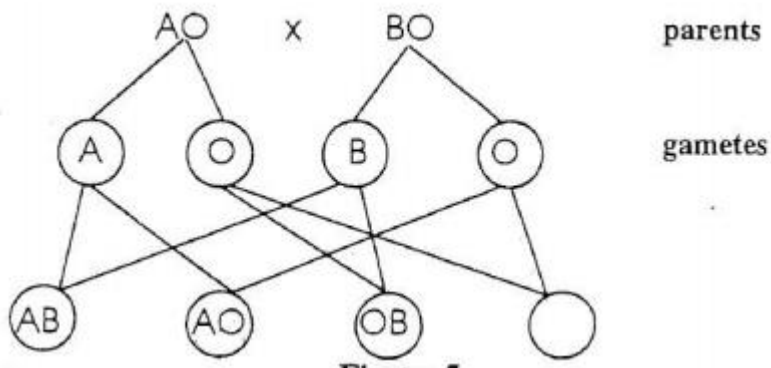
GENOTYPE	CATEGORY
Gg	
GG	Homozygous dominant
gg	

Solution

Genotype	Category
Gg	Heterozygous dominant
GG	Homozygous dominant
Gg	Homozygous recessive



Figure 5 shows a cross diagram between a woman of blood group a married to a man of blood group b.



- 242) (i) complete the cross-diagram by filling in the genotype of the remaining offspring. (1 mark)

Solution

➤ OO

➤

- (ii) what is the total number of blood groups of the offspring? (1 mark)

Solution

➤ 4 (A, AB, B, O)

- 243) In mice a gene for coat colour has two alleles. There is dominant allele, g, for grey colour and a recessive allele, g, for white colour.

complete the table below using the information provided. (3 marks)

Colour of mice	Genotype of mouse
Grey (homozygous)	
Grey (Heterozygous)	
White (Homozygous)	

Solution

Colour of mice	Genotype of mouse
Grey(Homozygous)	GG
Grey (Heterozygous)	Gg
White(Homozygous)	gg



- 244) (i) using a genetic diagram show the results of a cross between a grey heterozygous and a white homozygous mouse. (3 marks)

Solution

Parent	→ Gg	
↓	Gamete	G G
gg	g	Gg Gg
	g	Gg Gg



- (iii) State the phenotypes in f1 generation. (2 marks)

Solution

- Grey and white

- (iv) If the mice produced 24 off springs, how many mice would be white? Show your working. (2 marks)

Solution

- Phenotype ratio=1:1

$$24 \times \frac{1}{2} = 12$$

12 mice white

- 245) A scientist crossed a red flowered plant with a white flowered plant, all the f1 generation had pink flower.

- (i) . Explain how the f1 plant had produced pink flowers. (1 mark)

Solution

- Because the inheritance of genes was an intermediate process.

246) using r to represent gene for red colour and r to represent gene for white colour, write down genotype of

- (i) Red flowered plants (1 mark)

Solution

➤ RR

- (ii) F_1 plants (1 mark)

Solution

➤ Rr

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

Solution

➤ It facilitates production of hybrids with desirable characteristics

➤

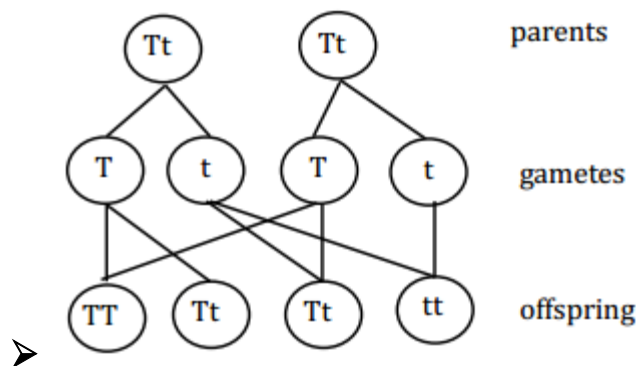
247) Dwarfism is a human characteristic in which a person is abnormally short. Gene t for tallness is dominant over gene t for shortness.

If a man and a woman who are both heterozygous for this trait marry (3 marks)

- (i) draw a cross diagram to show how this family would produce a dwarf.

- (ii) Indicate genotype of parents, gametes and offspring.

Solution



248) write down the ratio of the genotype and the phenotype of the offspring. As shown by the cross diagram.

- (i) Genotypic ratio (1 mark)

Solution

➤ 1:2:1

- (ii) Phenotypic ration (1 mark)

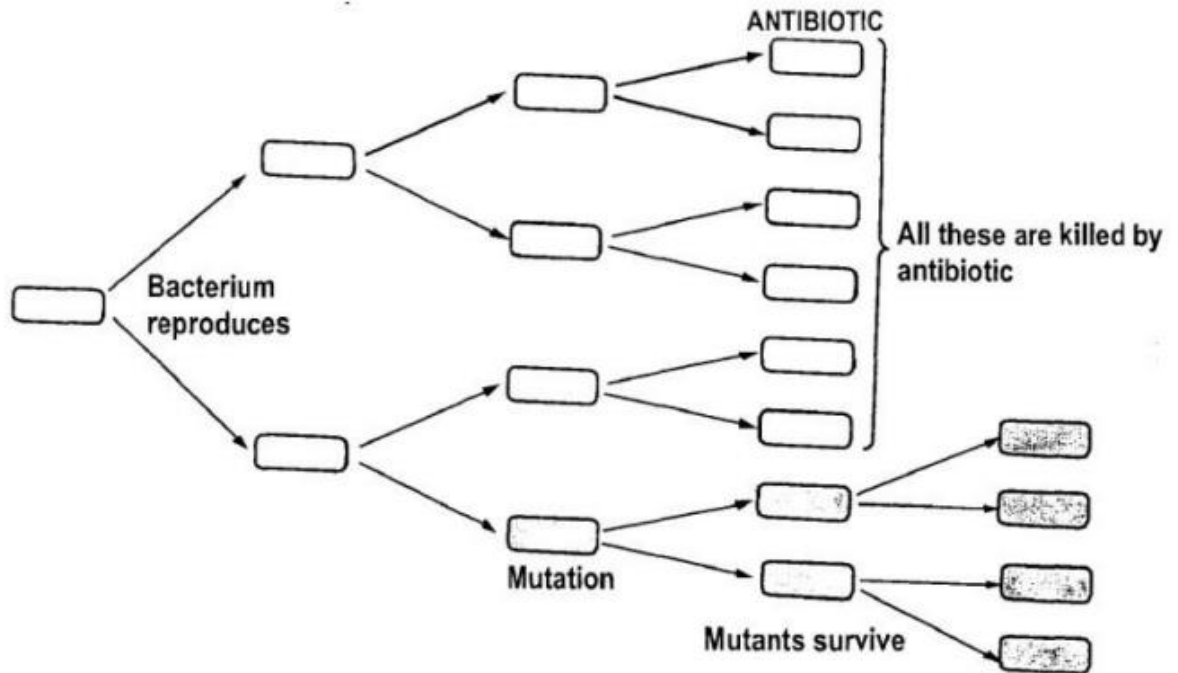
Solution

➤ 3:1

➤

Evolution

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



- (i) Name the example of natural selection shown. (1 mark)

Solution

- Drug resistance in germ

- (ii) Describe what led to the survival of some of the bacteria while the others got killed. (2 marks)

Solution

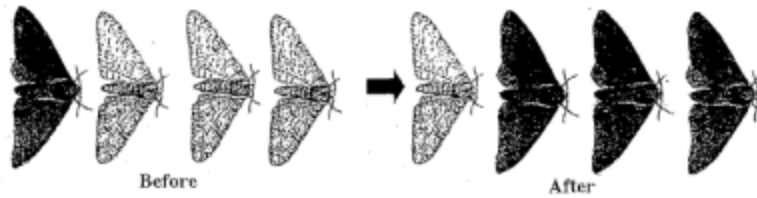
- The bacteria has resistance gene by mutation.

- 250) What will happen to the antibiotic after sometime? (1 mark)

Solution

- Population of the resistance bacteria become higher than before

- 251) Figure 8 shows occurrence of light and dark varieties of peppered moth in an industrial area before and after industrial revolution in England. Use it to answer the questions that follow.



- (i) In the table provided, state two differences in the population of moths before and after industrial revolution. (2 marks)

Before	After

Solution

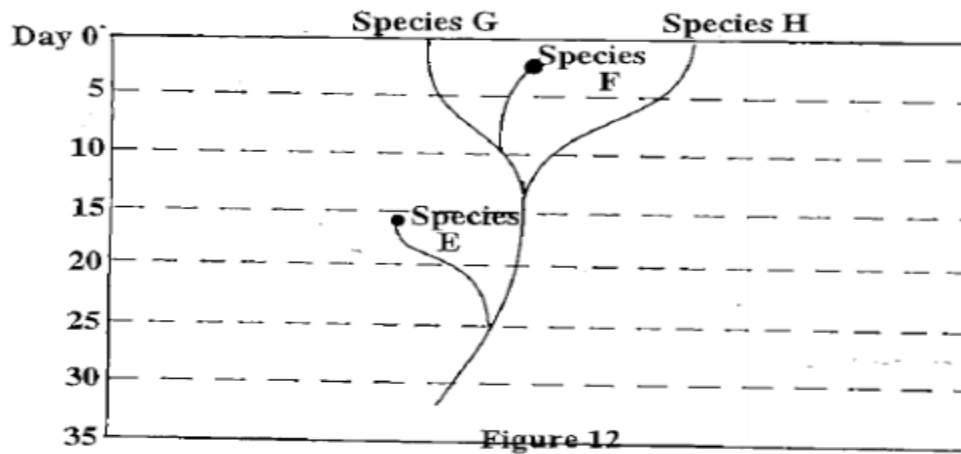
Before	After
More light peppered moth	Less light peppered moth
Less dark peppered moth	More dark peppered moth

- (ii) explain how the population of dark peppered moth could have arisen before industrial Revolution. (3 marks)

Solution

- Through mutation which gave dark peppered moth an advantage over the light peppered moth because they were better camouflaged.

- 252) Figure 12 is an evolutionary tree of an organism. Use it to answer the questions that follow:



- (i) Name two species that have become extinct. (2 marks)

Solution

➤ Species E and F

- (ii) At what time did species e evolve? (1 mark)

Solution

➤ day25

- (iii) Explain how fossil records can be used to show that the species in the diagram have a common ancestor. (3 marks)

Solution

➤ Structures of fossils for organisms that existed in the past should be compared with the current ones resemblances show relationships

- 253) Table 1 shows results of an investigation on mechanism where equal numbers of red and white ground beetles were put on red clay in a mesh cage. Insect-eating birds were then introduced in the cage. Use it to answer questions that follow.

Types of beetles	Number of beetles before experiment	Number of beetles after experiment
Red ground beetles	500	475
White ground beetles	500	123

- (i) How many red ground beetles were eaten by the birds? (3 marks)

Solution

➤ . 25 beetles

- (ii) Calculate the percentage of white beetles that survived. (3 marks)

Solution

➤ 24.6%

➤

- (iii). Explain the results of this investigation. (2 marks)

Solution

➤ Red beetles were eaten less than white beetles because their red colour was useful for them to be difficult to be found by birds on red clay

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



If these animals fed at night, explain how natural selection would operate on the recessive allele in an environment where wild cats are predators. (3 marks)

Solution

➤ The natural selection would decrease the recessive allele

- 255) What is “evolution”? (1 mark)

Solution

➤ A gradual change or formation of new organisms from already existing species.

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

- (i) Comparative anatomy (2 marks)

Solution

By anatomy some parts of animals have same basic structure. This means these animals evolved from common ancestor

- (ii) Embryology (2 marks)

Solution

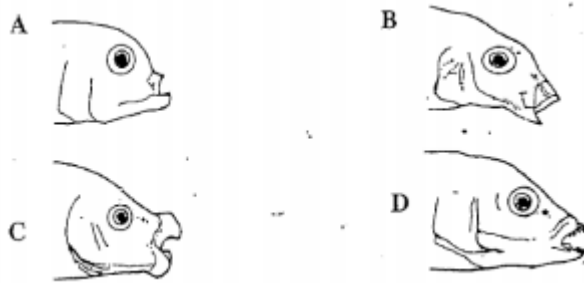
- Embryology proves that the early stage of embryological development are similar in animals have a close relationship.

- 257) how does meiosis cause variation among offsprings? (2 marks)

Solution

- During that early stage of meiosis when homologous chromosomes pair up, these chromosomes exchange portions. This leads to variability in the gene combinations in the gametes. Fertilization of these gametes produces variation among offspring.

- 258) Figure 7 is a diagram showing some of the varieties of cichlid fish (mbuna) found in lake malawi. Use it to answer the questions that follow.



- (i) Which cichlid fish is adapted for carnivorous feeding habits? (1 mark)

Solution

- **D**

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

Solution

- Because it has a pointed mouth and teeth.

- (iii) Explain briefly how the four varieties of the cichlid fish may have arisen from a common ancestor. (3 marks)

Solution

- They have one pair of nostril and the different adaptation of the mouth to feeding behavior. These are enough to suggest that they arise from a common ancestor or since they share a common ancestor. It means they used to depend on the same type of food. Owing to a rise in population, the

competition for food and space was high. Some fish sought alternative forms of food, others migrated to new environments where their body morphological adap

- 259) Figure 4 is a diagram showing the wing of a bat labelled and the front leg of a rabbit labelled b. Use it to answer the questions that follow.



- (i) What type of evidence of evolution is shown in figure ? (1 mark)

Solution

➤ Homologous structure

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

Solution

➤ Because these structure have same design

- 260) in malawi, during the 1980s, ddt was a common pesticide that was used to kill weevils. This pesticide began to appear. In the 1990s, a new pesticide had to be introduced because the majority of weevils could not be killed by ddt.

- (i) How could weevils become resistant to DDT? (1 mark)

Solution

➤ Through adaptation where the weevils have acquired characteristics that help them survive DDT.

- (ii) Explain how natural selection would help the population of weevils to become resistant to DDT. (4 marks)

Solution

➤ Weevils that have developed an adaptation for surviving in a DDT accumulated environment are going to survive compared to those that are not well adapted, so these weevils will become resistant to DDT and able to reproduce more of resistant weevils

Population

- 261) Explain how one can estimate the population of fish in a pond. Your answer should be in an essay form. (10 marks)

Solution

➤ To estimate the population of fish in a pond, one would need the following materials: nets, nail varnish or indelible ink and paintbrush. One would then use the following methods; First use nets to capture the fish from a pond. Then mark each fish caught with a spot of nail varnish or indelible ink. Small paintbrush should be used to apply dye or ink. Next, count the number of fish marked. Then release the fish into a pond. This should take at least some time before another capturing exercise. At this point, repeat the capturing exercise in which one should collect both marked and unmarked fish. One should then count them and use this formula: $\text{Population size} = \frac{\text{Number of fish in first catch} \times \text{Number of fish in second catch}}{\text{Number of fish recaptured}}$. In the end or in the conclusion, one would find that the calculations give an estimate of the population of the fish in a pond.

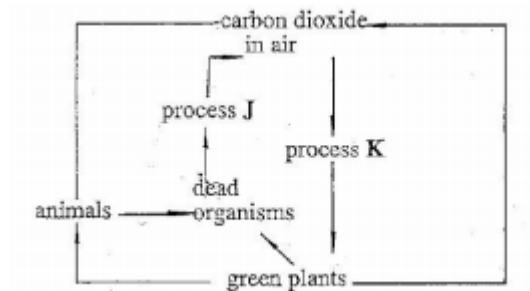
- 262) Describe five problems which result from rapid growth of human population and how they could be controlled. Your answer should be in an essay form. (10 marks)

Solution

➤ The first problem from rapid growth of human population is deforestation. This is the clearing of large areas of natural woodland and forests either for settlement or agriculture. Deforestation disturbs rainfall pattern, which eventually leads to desertification. Another problem is overgrazing. When people have occupied almost all lands including where animals would be feeding, the animals are forced to graze on a small piece of land for a long time. This leads to soil erosion and therefore loss of fertility. Scarcity of land forces people and companies to dump waste material some of which can be toxic into the environment. This pollution can lead to contamination and therefore diseases. Overpopulation can lead to overcrowded and this can encourage spread of diseases such as tuberculosis. Diseases like HIV and AIDS easily spread in highly populated areas due to the high rate of interaction between individuals. Rapid growth of human population causes pressure on social services like health service, education and welfare services.

Ecosystem

263) Figure 3 shows the carbon cycle. Use it to answer the questions that follow:



(i) Name the processes j and k. (2 marks)

Solution

➤ J: Decomposition K: Photosynthesis

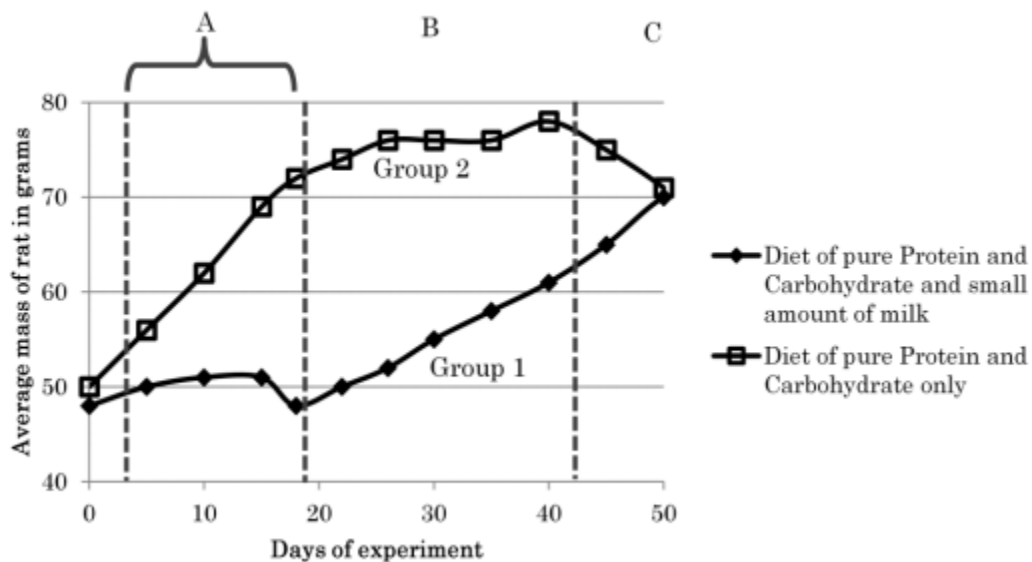
(ii) Mention one environmental problem that is caused by increased amounts of carbon dioxide in the atmosphere. (1 mark)

Solution

➤ Global warming

➤

264) Figure 3 is a graph showing results of an experiment on the diet of two groups of rats. The graph is divided into three regions a, b and c. Use it to answer the questions that follow.



describe what happened to the mass of group 2 rats in regions b and c.

(i) region b (1 mark)

Solution

- In region B, the rats are not rapidly growing or accumulating mass.

Explain your observation: (1 mark)

Solution

- Because the rats lacked a diet with vitamins to make them grow healthy.

(iii)Region c (1 mark)

Solution

- In region C, the rats rapidly start to lose considerable weight.
- .

Explain your observation: (1 mark)

Solution

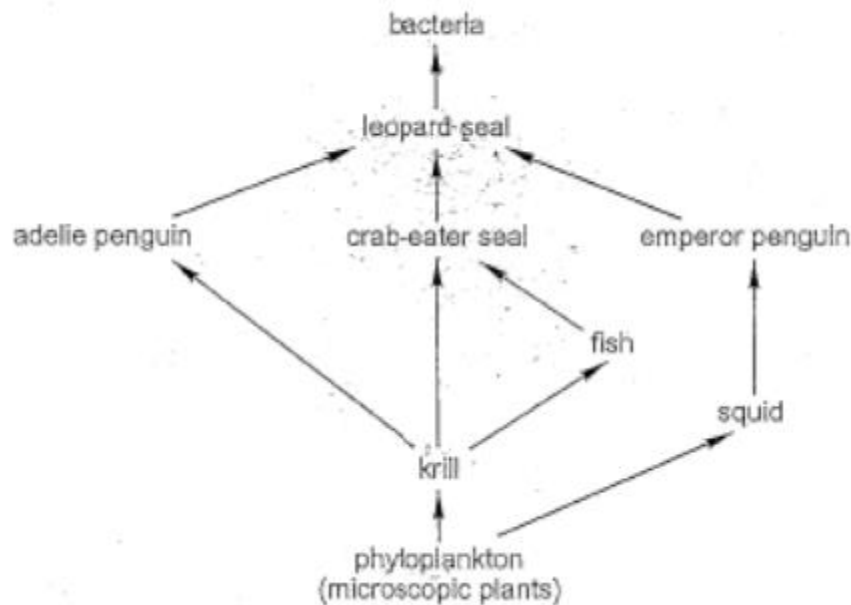
- Because the rats could have been attacked by diseases

265) Mention any two variables that were kept constant during the experiment. (2 mark)

Solution

- Number of rats ,
- Quantity of food given

266) Figure 2 is a diagram showing a food web in an aquatic ecosystem. Use it to answer the questions that follow.



Name one organism which represents a:

- (i) Herbivore (1 mark)

Solution

➤ Squid or krill

- (ii) Decomposer (1 mark)

Solution

➤ Bacteria

➤

- 267) from the food web draw one food chain of six organisms. (2 marks)

Solution

➤ . Phytoplankton → Krill Fish → Crab-eater seal → Leopard seal → Bacteria

- 268) Why would bacteria not belong to a specific feeding level? (1 mark)

Solution

➤ Because they are organisms the break down dead organisms at any other tropic level.

- 269) define the following terms:

- (i) “ecosystem” (1 mark)

Solution

- Refers to the natural unit that is composed of both living and non-living components of the environment.

(ii) “community” (1 mark)

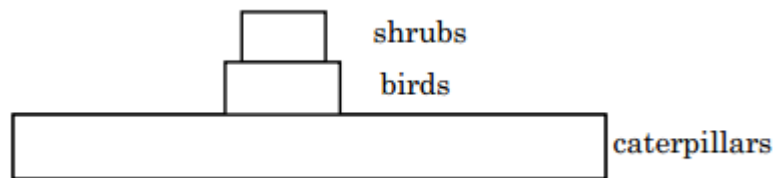
Solution

Refers to an association of plants and animals that live together in the same habitat and affect each other

270) suppose a particular ecosystem has 2 shrubs, 100 caterpillars and 3 birds, construct a pyramid of:

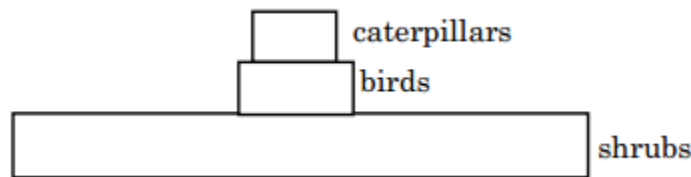
(i) Number (1 mark)

Solution



(ii) biomass (1 mark)

Solution



271) Mention one abiotic factor that affects plant growth. (1 mark)

Solution

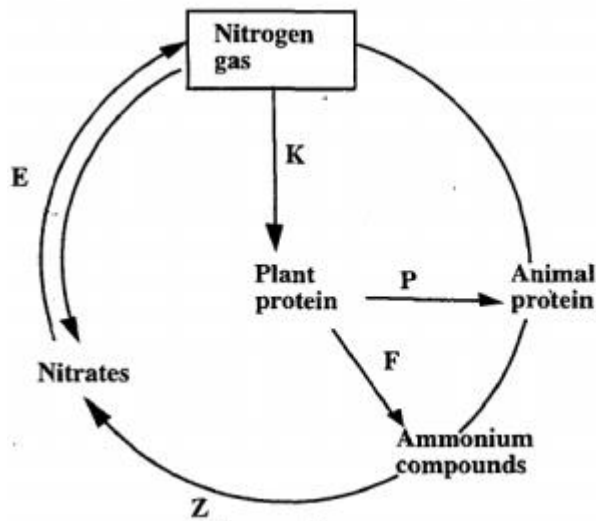
- . Light, temperature, water, humidity, wind speed, topography, oxygen

272) Give two way in which the activities of man can affect an aquatic ecosystem. (2 marks)

Solution

- 1. Water pollution through washing away of chemicals, e.g. fertilizer from cultivated fields
- 2. Industrial accidents, for example, for example, spills in oceans cause pollution on the surface water. Oils spills besides cutting off oxygen supply, can also stick to feathers of water-living birds.

- 273) Figure 5 shows one of the nutrient cycles in nature. Use it to answer the questions that follow.



- (i) Name the processes taking place at f, z and p. (3 marks)

Solution

- F: Decomposition P: Feeding Z: Nitrification

- (ii) Explain how the process at k takes place. (3 marks)

Solution

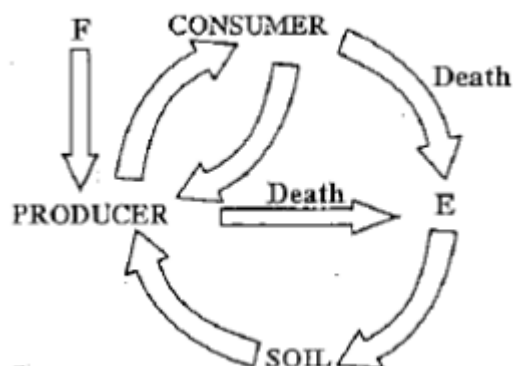
- Nitrogen gas is changed to ammonium compound while nitrogen fixation by bacteria in soil. Then nitrifying bacteria change ammonium compound to nitrate while nitrification. absorbed by plant.

- (iii) Under what conditions does the process at e take place? (1 mark)

Solution

- Denitrification takes place in the conditions which are groundwater, wetlands and poorly ventilated corners of the ocean. Denitrification takes place under special conditions in both terrestrial and marine ecosystems.
- In general, it occurs where oxygen, a more energetically favourable electron acceptor, is depleted, and bacteria respire nitrate as a substitute terminal electron acceptor. Due to the high concentration of oxygen in our atmosphere, denitrification only takes place in environments where oxygen consumption exceeds the rate of oxygen supply, such as in some soils and groundwater, wetlands, poorly ventilated corners of the ocean, and in seafloor sediments.

- 274) Figure 11 is a diagram showing recycling of materials in an ecosystem. Use it to answer the questions that follow.



- (i) What does f represent? (1 mark)

Solution

- Sunlight
- .

- (ii) Explain how the producer benefits from the activities of organisms represented by letter e. (3marks)

Solution

- ❖ Decomposes organic matter and releases mineral salts which are used by producer for growth or for protein formation or lipid formation or synthesis of vitamin

- 275) Table 2 shows results of an analysis of water in a stream and the organisms present in it. The stream was sprayed annually with an insecticide to kill larvae of mosquitoes. Use it to answer the questions that follow.

Analysis	Concentration of pesticide
Stream water	2
Water plants	500
Fish type A	27,000
Fish type B	115,000
Fish eagles	160,000

- (i) Write down a food chain that includes all the organisms shown in the table. (3 marks)

Solution

➤ water plants → fish type A → fish type B → fish eagles

- (ii) Why is the insecticide concentration in the fish eagles higher than in the water plants? (2 marks)

Solution

➤ Because in high trophic level's animals the insecticide is accumulated and then concentrated by eating another animals which contain insecticide in their body

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



- (i) Besides feeding relationship, explain how the pond weeds and snails depend on each other in the aquarium. (4 marks)

Solution

➤ Pondweeds produce oxygen by photosynthesis. Water snails use this oxygen for respiration. Water snails produce carbon dioxide by respiration. Pondweeds use this carbon dioxide for photosynthesis.

- (ii) If the following morning students observed that tadpoles and water snails had died explain the cause of death. (3 marks)

Solution

➤ Because there was no oxygen to breath in the aquarium. During the night, pondweeds and duckweeds couldn't carry out photosynthesis and produce oxygen because of a lack of light.

- 277) Student caught 64 grasshoppers in a school garden of area 32 and marked them with nail varnish. They released them into the same garden. After two hours the students captures 60 grasshoppers in the same area of which 12 had marks of nail varnish.

- (i) Name the sampling technique used by the students. (1 mark)

Solution

- Capture, mark and recapture method



- (ii) Calculate the total number of grasshoppers for this area. (3 marks)

Solution

$$P = \frac{(\text{No. of organism in first sample} \times \text{No. of organisms second sample})}{\div \text{No. of marked organism recaptured}}$$

Where P = is total no. of grasshoppers in the area

$$P = 64 \times 60 \div 12$$

- $P = 320$

- (iii) Calculate the population density of the grasshoppers. (2 marks)

Solution

$$\text{Density} = \frac{\text{No. of individuals}}{\div \text{Area}}$$

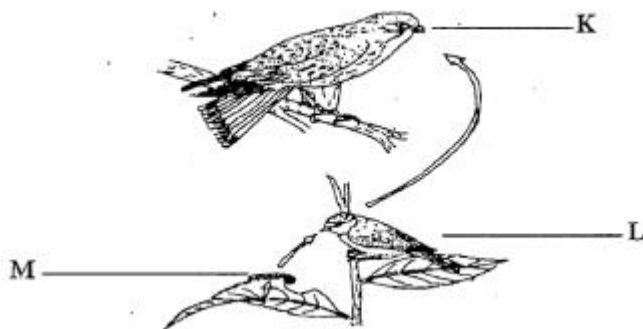
$$= \frac{320}{32\text{m}^2}$$

$$= 10/\text{m}^2$$



First mark out, using pegs and strings a piece of ground of known area where a particular plant is in abundance. Use a metre quadrat, collect data from at least a number of quadrats placed at random in the area you have marked out. Count number of individual plants in each quadrat. Calculate the average density of the plant per m^2 . Finding total population, then multiply the density figure by the number of square metre of the total area calculated at the beginning

- 278) Figure 9 is a diagram showing one of the relationships that exists among organisms in any ecosystem. Use it to answer the questions that follow.



- (i) Name the type of relationship shown in figure (1mark)

Solution

- Feeding relationship

- (ii) State two adaptations of organism k to survive in this relationship. (2 marks)

Solution

- Sharp eye sight.
- Sharp beak

- (iii) Explain briefly how organism k would be affected if the population of organism m was red. (2marks)

solution

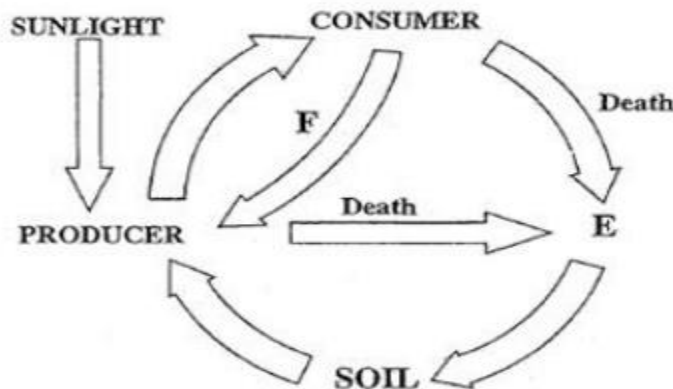
- Population of K will also decrease. Because population reduction of M will bring lack of food for L. So population of L will decrease. It means K will be not able to get food. As a result, population of K will decrease.

- (iv) Apart from pesticide application, mention one way of reducing population of organism m. (1 mark)

solution

- By introducing more of organism L in the environment.

- 279) Figure 3 is a diagram showing recycling of materials in an ecosystem; use it to answer the questions that follow.



- (i) What do the letters e and f represent? (2 marks)

Solution

- E-Decomposers
- F-Carbon dioxide

- (ii) Explain how the consumer be affected if e was absent in the cycle. (3 marks)

Solution

- Absence of decomposers result in shortage of mineral salts in the soil, making the soil infertile for growth of producers; the result of which is that the consumer has little food.

(iii) How would a worm using the soil as a habitat benefit the producer? (3 marks)

solution

- Worms make holes in soil and these holes help aerate the soil as a result enough oxygen is available to producers for respiration. Worms provide nutrients to the soil from their excreta.

280) Figure 5 is a photograph of plant known as cactus. Use it to answer the questions that follow.



(i) Suggest a possible environment where the plant in figure would grow. (1 mark)

Solution

- Desert

(ii) State one adaptation shown in the photograph which would assist the plant to survive in its habitat. (1 mark)

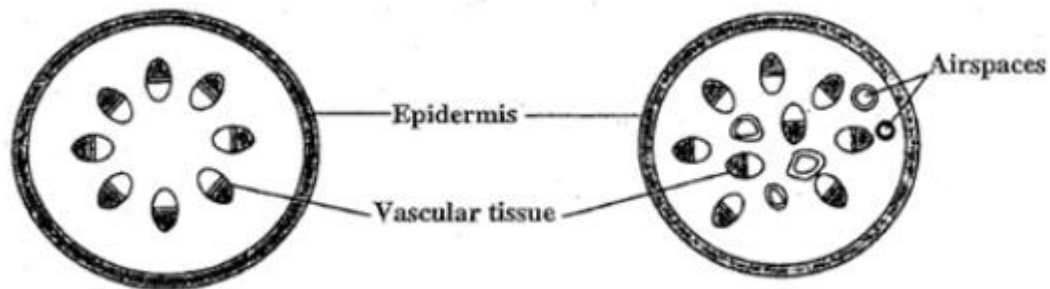
Solution Spine

(iii) explain how the adaptation in .(ii) would help the plant to survive in its habitat. (1 mark)

Solution

- Modified leaves that are in form of spine. Because less water will be evaporated from the leaves since reduced surface area

- 281) Figure 6 shows cross-sections through stems 6a and 6b of two plant species. Use it to answer the questions that follow.



state two structural between figure 6a and 6b. (2 marks)

Solution

- 6B has air spaces but not 6A.
- 6A has spirally arranged vascular tissue but 6B has not.

282)

- (i) Which cross-section belongs to an aquatic plant? (1 mark)

Solution

- 6B

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

Solution

- Because has air spaces to contain oxygen while in water

- 283) Figure 7 is a graph showing the effect of untreated sewage on concentration of oxygen in a stream. Use it to answer the question that follow.



- (i) Describe the effect of untreated sewage on oxygen concentration from the point of sewage discharge as distance increases down stream. (2 marks)

Solution

- Untreated sewage causes failure of oxygen to dissolve into the water surface at point of discharge as a result oxygen concentration is low at that point. But as distance increases, from the point of sewage discharge, the concentration of the sewage becomes low, due to the fact that it becomes spread, so oxygen will dissolve into the water surface and combines with water molecules more, so oxygen concentration starts to increase.

- (ii) Explain why there is a change in oxygen concentration from the point where sewage is discharged into the stream. (2 marks)

Solution

- Because at the point of sewage discharge, the concentration of sewage becomes greater than the concentration of water containing oxygen, so oxygen does not dissolve into the water surface from the atmosphere.

- (iii) Suppose there were fish in the stream, what effect would untreated sewage have on the population of fish?

Explain your answer.

Effect (1 mark)

Explanation (1 mark)

Solution

- Effect: It would be decreased.
- Explanation: Fish can not get enough oxygen,

- 284) Suppose you are an environmental officer in an area where people are not aware of the causes of environmental degradation. Explain any five causes and effects of environmental degradation you would include in your advice to people in the area. Your answer should be in an essay form. (10marks)

Solution

- Environmental degradation can be caused by next five causes.

1, Soil erosion.

When it rains, the rain washes soil off hilly slopes. Soil erosion results in the loss of topsoil. This is the most fertile soil as it contains the nutrients that plant need. When people cultivate the land, it also cause soil erosion. So we need to take measures against it such as reforestation.

2, Deforestation.

Deforestation is caused by the cutting down of trees for making the gardens, firewood and building the house. Deforestation can cause soil

erosion, reduction of rainfall and changes in weather patterns.

In order to prevent the deforestation, we need to change the source of energy and materials from trees to new ones.

3, **Air pollution.**

Air pollution is caused by an increase in harmful gases and fumes from fires, industry and vehicle exhausts. It is responsible for the greenhouse effect and for global warming. It may cause respiratory diseases. In order to prevent air pollution, we need to do the proper disposal of trashes and control the amounts of exhaust from vehicles and industries.

4, **Water pollution.**

Water pollution is caused when sewage or domestic and industrial wastes are released into streams and rivers. The release of untreated sewage into rivers can spread waterborne diseases such as cholera, dysentery and typhoid. We have some ways for preventing the water pollution. One of them is to dispose the urine and faeces properly.

5, **Over-fishing.**

The number of fish is declined by the over fishing in the lake. Over-fishing is partly due to changes in fishing patterns. Now fishermen catch too many fish including small and immature fish. This means that fish are caught faster than they can replace themselves through breeding. We have the closing season and return small and immature fish into the lake for keeping the number of fish.

- 285) Discuss the energy flow in a tropical woodland. Your answer should be in essay form. (10 marks)

Solution

- The energy flow is started up by light energy from the sun. This light energy is absorbed by chlorophyll in green plants. In the chlorophyll light energy is converted into chemical energy. In tropical woodland, there are so many green plants. They absorb much light energy and it is converted into chemical energy. Next energy flow is from plants to first consumers along food chains as plants are eaten by first consumers. In this step, energy moves to first consumers from plants. And then the first consumers are eaten by second consumers. So energy moves to second consumers from first consumers. But much of this chemical energy is lost at each step. So, a little energy is transferred to the next level. Some energy is lost as heat energy, as plants and animals respire. Some is unused when parts of plants and animals are left uneaten. Substances such as carbon and nitrogen are cycled in ecosystem. But the energy flow is one-way flow. The energy flow is started up by light energy. And then energy

flows from one link to the next along food chains. And some energy is lost as respiration by living things

- 286) Describe how the population of a plant in an open field can be estimated. Write your answer in an essay form. (10 marks)

Solution

- First mark out, using pegs and strings a piece of ground of known area where a particular plant is in abundance. Use a metre quadrat, collect data from at least a number of quadrats placed at random in the area you have marked out. Count number of individual plants in each quadrat. Calculate the average density of the plant per m^2 . Finding total population, then multiply the density figure by the number of square metre of the total area calculated at the beginning.

- 287) Design an experiment that would be used to estimate the density of grasshoppers in a school garden.(10 marks)

Solution

- To estimate the density of grasshoppers in the garden, one would need the following materials: nets, nail varnish or indelible ink and paintbrush. One would then use the following methods; First use nets to capture the grasshoppers from the garden. Then mark each grasshopper caught with a spot of nail varnish or indelible ink. Small paintbrush should be used to apply dye or ink. Next, count the number of grasshoppers marked. Then release the animals into the garden. This should take at least some time before another capturing exercise. At this point, repeat the capturing exercise in which one should collect both marked and unmarked grasshoppers. One should then count them and use this formula:
$$\text{Population size} = \frac{\text{Number of grasshoppers in first catch} \times \text{Number of grasshoppers in second catch}}{\text{Number of grasshoppers recaptured}}$$

In the end or in the conclusion, one would find that the calculations give an estimate of the population of the grasshoppers in the garden.

LIST OF REFERENCE

- *MSCE MANEB Questions with their solutions*
- *Japan Overseas Cooperation Volunteers*
- *Thokozani Chakhala*
- *Senior Biology*
- *DG Mackean*