End of Topic Questions: Transport in Organisms

SECTION A – Multiple Choice Questions

1. By which one of the following processes does carbon dioxide leave the blood capillaries into the alveoli?

A. Osmosis
B. Active transport
C. Diffusion
D. Capillarity

2. A good transport system should have the following except.

A. Transport medium
B. Transport vessels
C. Ventilation system
D. Energy

3. Which one of the following would happen to plasmolysed cells of a plant tissue that has been placed in water for some time?

A. Their cell vacuoles would shrink.
B. They would not experiment any change in size.
C. They would increase in volume.
D. They would become shorter.

4. In a plant tissue, water moved from cell A to cell B. This indicated that

A. Cell A and cell B had the same osmotic potential.
B. Cell A and a higher osmotic potential than cell B.
C. Cell A had a lower osmotic potential than cell B.
D. Cell A was older than cell B.

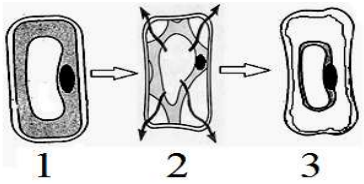
5. The pressure exerted outwards by the vacoule, which pushes and enlarges the cytoplasm against cell wall is called

A. Turgidity
B. Water potential
C. Turgor pressure
D. Osmotic pressure

6. Which one of the following word is used to mean the process which takes place when animals cell is placed in hypertonic solution

A. Plasmolysis
B. Crenation
C. Haemolysis
D. Turgidity

7. Figure below shows diagram of a plant cell illustrating plasmolysis when placed in hypertonic solution



What name is given to the plant when it reaches 2?

A. Turgid
B. Incipient plasmolysis
C. Full plasmolysis
D. Flaccid

8. A solution with high osmotic pressure is referred to as
A. Hypotonic solution
B. Hypertonic solution
C. Isotonic solution
D. Dilute solution

9. Which one of the following combination is true about hypotonic solution
(i). Low osmotic pressure
(ii). Low water potential
(iii). High osmotic pressure
(iv). High water potential
A. (i) and (IV) B. (i) and (iii) C. (ii) only D. (ii) and (iv)

10. Which one of the following is likely to occur if the osmotic pressure of the cell sap of the root hair is lower than that of the surrounding?
A. Plant wilts
B. Cells of root hairs become turgid
C. Rate of transpiration increases
D. More water is absorbed

11. The pressure which builds up to stop the flow of pure water into the solution when water moves across a semi-permeable membrane is called
A. Osmotic pressure
B. Water potential
C. Osmotic potential
D. Turgor pressure

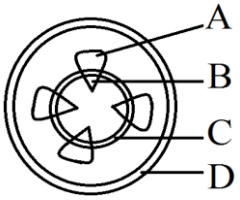
12. The ability of a solution to develop osmotic pressure is
A. Osmotic pressure ability
B. Osmotic potential
C. Water potential
D. Osmotic gradient

13. A prickly pear is a succulent plant with broad flat stems, having leaves in front of spines. Such a plant is likely to be found in a:
A. Water deficient area
B. Water logged area
C. Hilly area
D. Low land

14. An individual was found to experience prolonged bleeding after having an injury which one of the following Vitamins is likely to be lacking in that individual?
A. vitamin D **B.** Vitamin K **C.** Vitamin B_6 **D.** Vitamin B_{12}

15. The greatest increase in the length of a potato cylinder would occur if placed in a petri dish
A. Which is empty
B. Filled with water
C. Filled with dilute sugar solution
D. Filled with concentrated sugar solution.

16. The figure below represents the internal structure of dicotyledonous stem. Which of the parts labeled transports water and dissolved mineral salts?



17. Which one of the following is not a property of a fully turgid plant cell?

A. The vacuole has maximum volume
B. There is no more absorption of water by the cell
C. The cell wall resists further expansion of the vacuole
D. The cytoplasm is only slightly separated from the cell wall

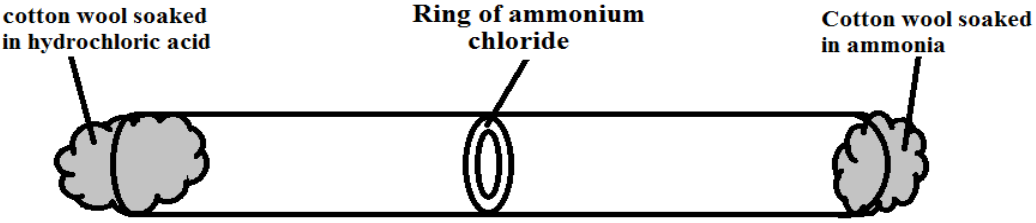
18. The force which mostly help water to move up a tall plant are

A. Osmosis and diffusion
B. Capillarity and transpiration
C. Osmosis only
D. Capillarity and osmosis

19. Which one of the following factors would lead to the fastest rate of transpiration?

A. Windy air and high humidity
B. Low humidity and high temperature
C. High light intensity and low temperature
D. Still air and high light intensity

20. The aim of the experimental set up in figure below is to illustrate….



A. Diffusion in liquids
B. Diffusion of white ring
C. Diffusion in gases
D. That gases are necessary in diffusion

21. The rate of movement of molecules during diffusion is affected by the following factors except

A. Temperature
B. Colour of the molecules
C. Concentration gradient
D. Density of the diffusing molecules

22. Strips **W, X, Y** and **Z** of the same size and shape were cut from a raw pawpaw, whose sap has a sugar concentration of 28%. The strips were then placed in sugar solution of different concentrations as shown in Table below.

Strip	Sugar concentration of solution (%)
W	15
X	25
Y	28.5
Z	48

Which strip would be longest after 4 hours?

A. X B. W C. Y D. Z

23. People living at high altitudes have more red blood cells than those at lower altitudes in order to

A. Breathe more quickly
B. Keep the body warm
C. Pump more blood
D. Absorb enough oxygen

24. The most likely habitat of a plant with many stomata on the upper surface of its leaves is
A. water.
B. salty marsh.
C. high altitude
D. desert.

25. Which one of the following organisms has the largest surface area to volume ratio?
A. Dog B. frog C. Cockroach D. Amoeba

26. Which one of the following occurs when a cylinder of fresh potato tuber is placed in a strong solution of sucrose and left for some time? The cylinder
A. absorbs the solution
B. absorbs water.
C. becomes hard.
D. becomes soft.

27. Removal of a ring of bark from a tree trunk interferes with the movement of
A. Water to the leaves.
B. mineral salts to the leaves.
C. food to the leaves.
D. food to the roots

28. Which one of the following blood vessels contains blood with the highest amount of oxygen?
A. Vena cava.
B. Pulmonary vein
C. Hepatic vein
D. Hepatic portal vein

29. Which one of the following organs is supplied and drained by a vein?
A. Stomach B. Liver C. Kidney D. Pancreas

30. A person with blood group O is a universal donor because
A. lacks antibodies in his serum.
B. Has both the antigens and antibodies in his blood
C. Has only antigen A in his red blood cells.
D. Lacks antigen in his red blood cells.

31. Oxygen is mainly transported in the:
A. plasma
B. platelets
C. white blood cells
D. red blood cells

32. When a donor of blood group A transfused with a recipient of blood group B?
A. Antibody a reacts with antigen B.
B. Antigen B reacts with antibody b.
C. Antibody b reacts with antigen A.
D. Antigen A reacts with antigen B.

33. A person of blood group A can be transfused with blood of
A. group A only.
B. group AB only.
C. groups A and O.
D. groups and AB

34. In the process of blood clotting, thrombin acts as an enzyme to bring about conversion of
A. Fibrinogen to fibrin.
B. Fibrin to fibrinogen
C. Prothrombin to thrombokinase.
D. Thrombokinase to prothrombin.

35. Which one of the following cells could have their functions adversely affected by the AIDS virus?

A. Erythrocytes B. Blood platelets C. Leucocytes D. Nerve cells

36. Which one of the blood groups will not agglutinate with any blood serum when mixed?

A. O B. A C. AB D. B

37. Decrease in the number of mammalian red blood cells could reduce the ability of the blood to

A. Clot.
B. Transport oxygen
C. Destroy harmful bacteria.
D. Distribute heat.

38. Which of the following is the best description of the term double circulation in a mammal?

A. Blood flows into the two lungs and then into the body
B. Blood passes through two chambers of the heart
C. Blood passes through the heart twice in one circulation
D. Blood first through arteries and then through veins

39. A sample of blood from the hepatic portal vein contains

A. fats
B. proteins
C. high concentration of urea.
D. high concentration of products of digestion.

40. Individuals with blood group AB are said to be universal recipients because they have

A. no antigens
B. no antibodies.
C. both antigens and antibodies.
D. antibodies a and b.

41. Which of the following is true about arteries? They

A. carry blood away from the heart.
B. carry deoxygenated blood.
C. carry oxygenated blood.
D. possess valves along their length.

42. When blood passes from the lungs to the kidney it has to go through the

A. pulmonary artery, tricuspid valve and aorta.
B. pulmonary vein, bicuspid valve and aorta.
C. anterior venacava, tricuspid valve and aorta.
D. posterior venacava, biscupid valve and aorta.

43. Which one of the following events does not occur following the contraction of the ventricle in mammalian heat?

A. Blood flows from ventricles into arteries.
B. The blood pressure increases in the aorta.
C. Atrio-ventricular valves open.
D. Arterial valves open.

44. An unknown sample of blood was found to agglutinate with blood of group AB, but not with blood of O. What was the blood group of the unknown sample?

A. O B. AB C. A D. B

45. In the human heart, the mixing of oxygenated and de-oxygenated blood is prevented by the

A. Septum
B. Bicuspid
C. Tricuspid valve.
D. Semi lunar valve

46. Which of the following blood vessels transport blood most rich in nutrients?

A. Pulmonary artery
B. Hepatic portal vein
C. Mesenteric artery
D. Renal vein

47. The blood serum of a universal donor contains

A. Antigens A
B. Antigens B.
C. Neither antigens A nor B
D. Both antigens A and B.

48. Phagocytosis is the process whereby white blood cells

A. Ingest bacteria.
B. cause the bacteria to stick together.
C. dissolve the outer coat of invading bacteria.
D. neutralize bacteria.

49. The following are characteristic of blood vessels.

i) presence of valves.
ii) thick walls.
iii) wide lumen
iv) elastic walls.

Which of the characteristics belong to veins?

A. (ii) and (iv) B. (i) and (iii) C. (ii) and (i) D. (iv) and (i)

50. The blood constituents that help in the formation of blood clot at the site of an injury are

A. platelets and erythrocytes.
B. hormone and plasma.
C. platelets and leucocytes.
D. platelets and fibrinogen.

51. Blood flows in the pulmonary artery at a lower pressure than in aorta because in the pulmonary circulation.

A. blood travels a shorter distance.
B. the right ventricle has thinner walls.
C. the vessel carrying blood is smaller.
D. fewer organs are supplied.

52. Which one of the following blood vessels contains the lowest concentration of urea?

A. Hepatic portal vein.
B. Renal artery.
C. Hepatic vein.
D. Renal vein.

53. Which one of the following is not a function of blood?

A. Regulation of sugar level in the body.
B. Healing of damaged parts of the body.
C. Regulation of body temperature.
D. Transportation of wastes.

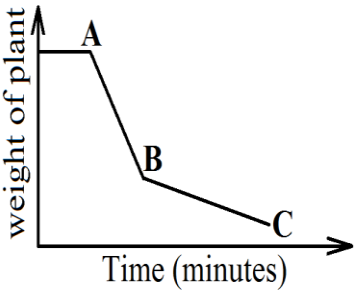
54. Which one of the following is true about a person of blood group O?
A. Receives blood from people of all other blood groups.
B. Donates blood to people of all other blood groups.
C. Receives blood from only people of blood groups AB and O.
D. Donates blood to only people of blood group AB.

55. Lack of a nucleus in a red blood cell is advantageous in that it
A. enables the cell to pass through thin epithelium.
B. helps the cell to fight disease-causing organisms.
C. allows the cell to carry a lot of oxygen.
D. enables the cell to carry much dissolved food.

56. The process by which water enters the root hair cell is called
A. Active transport
B. Diffusion
C. Osmosis
D. phagocytosis

57. Which statement is true of active transport in plants?
A. It depends on the availability of energy
B. It eventually achieves equilibrium.
C. It involves the random movement of molecules.
D. It relies on the kinetic energy of molecules.

58. Figure below shows the results of an experiment to determine the amount of water lost by a potted plant due to transpiration under different environmental conditions.



The most likely conditions under which the experiment was conducted between points A and B were in
A. darkroom and the plant covered with wet polythene bag.
B. an open place, in bright sunlight
C. a cold and humid place
D. a humid and shady place

59. Most water absorption by the root occurs:
A. At root tip
B. Just above zone of elongation
C. Below zone of elongation
D. At zone of elongation

60. Cactus has its leaves modified into thorns and stomata are fewer compared to other plants. How does this help the cactus to survive in desert environment?
A. Increase water loss
B. Increase uptake of carbon dioxide
C. Reduces water loss
D. Reduces uptake of carbon dioxide

61. A piece of plant tissue is removed from a beaker of water into 10% sucrose? What will happen to the plant tissue after one hour?

	Movement of water	***Volume of tissue cells***
A.	Enters the cell	decrease
B.	Enters the cell	increased
C.	Leaves the cell	decreased
D.	Leaves the cell	increased

62. Which of the following pairs of blood constituents play a role in blood clothing?

A. Platelets and hormones
B. Hormones and plasma
C. Platelets and fibrinogen
D. Fibrinogen and leucocytes

63. In a mammalian heart, the left ventricle is more muscular than the right because it

A. Pumps a lot of blood to the lungs
B. Pumps blood to all parts of the body
C. Receives blood from all parts of the body
D. Receives more blood

64. Which blood constituent lacks a nucleus?

A. Lymphocytes B. Phagocytes C. Granulocytes D. Erythrocytes

65. Which structure of the blood vessel puts limit ti its expansion?

A. Lumen B. Elastic fiber C. Thick wall D. Fibrous tissue

66. What initiates and maintains the contraction of the heart muscles

A. Sino-atrial node (SAN)
B. Atrio-ventricular node (AVN)
C. Brain
D. Cardiac muscles

67. Which one of the following is a likely effect of a decrease in the number of platelets in the blood?

A. The blood may not be able to carry enough oxygen.
B. There may be prolonged bleeding in case of an injury.
C. The body may not be able to fight disease.
D. The body may not be able to distribute heat efficiently.

SECTION B – Semi-structured Questions

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

(b). In terms osmosis, give an explanation fro the following circumstances:

i. If too much artificial fertilizer, e.g. Ammonium sulphate, is applied on a pasture, the grass will wither and die. ***(02 mark)***

ii. In an actively photosynthesizing cell, the sugars being formed are quickly converted to starch. ***(02 mark)***

iii. A strips of Irish potato tuber placed in distilled water increased in length *(02 mark)*

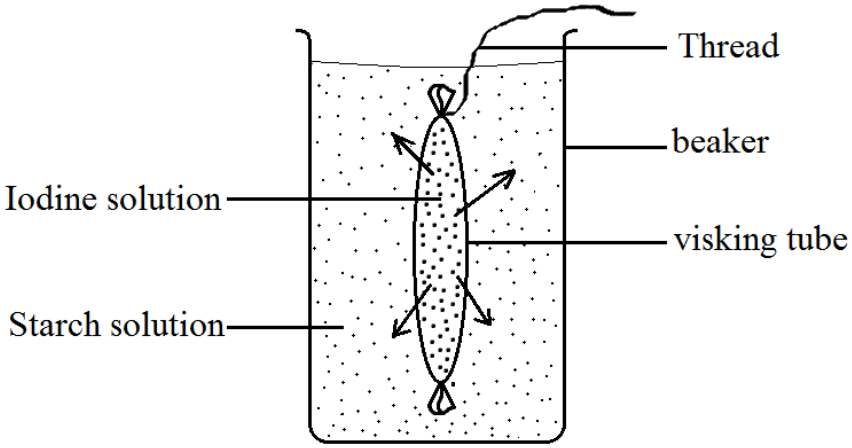
iv. Herbaceous plant maintains its erect position. *(03 mark)*

69. (a). Explain the following scenarios as related to transport in organisms:

(i) Amoeba does not have specialized transport system. *(02 marks)*

(ii) Man has a complex specialized transport system. *(02 marks)*

(b). The figure below shows an experimental set-up left to stand for 20 minutes.



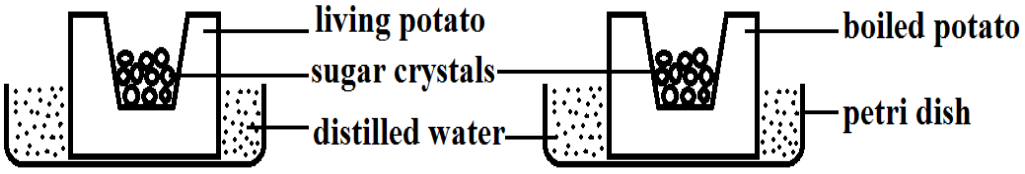
(i) State the aim of the experiment. *(01 mark)*

(ii) State what was observed in the set-up after 20 minutes *(01 mark)*

(iii) Name the physiological process being investigated in the experiment. *(01 mark)*

(iv) State **three** importance of the process to the living organisms *(03 marks)*

70. Figure below shows the set up of an experiment that was carried out by a senior three student to demonstrate a process in a plant tissue. Study it carefully and answer the following questions.



a) State the aim of the experiment. *(01 mark)*

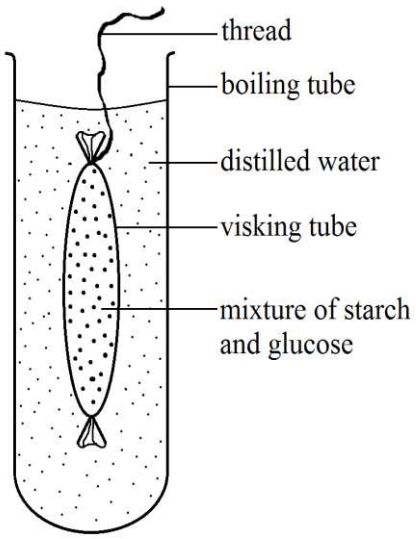
b) Describe what would be observed after 30 minutes. *(02 marks)*

c) Explain the observations made in (b) above. *(03 marks)*

d) Outline the importance of the process demonstrated in this experiment. *(03 marks)*

e) State one application of the process taking place in the experiment *(01 mark)*

71. A solution containing starch and glucose was put in a visking tube in the set-up shown in figure below and left to stand for 30 minutes.



After 30 minutes, samples were drawn from the contents of the tube and boiling tube, then iodine and Benedict's tests carried out on each of them

(a) Describe what was observed with iodine test on
  (i) Visking tube content ***(00½ mark)***
  (ii) Boiling tube content ***(00½ mark)***

(b) Explain your observation in (a) ***(02 marks)***

(c) Describe what was observed with Benedict's test on
  (i) Visking tube content ***(01 mark)***
  (ii) Boiling tube content ***(01 mark)***

(d) Explain your results in (c) ***(03 marks)***

(e) Giving reasons, state the nature of the visking tube ***(02 marks)***

72. Figures **(i)**, **(ii)**, and **(iii)** show variation of the rate of transpiration in different environmental conditions.

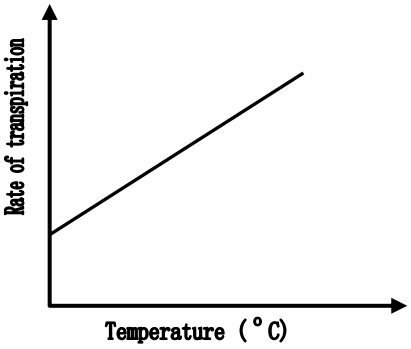


Fig. (i)

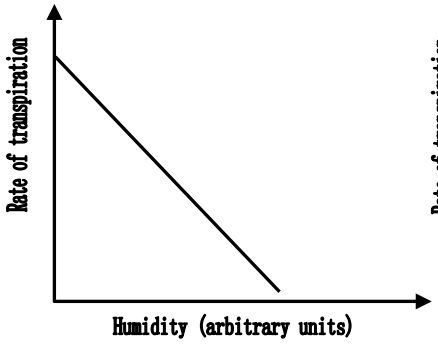


Fig. (ii)

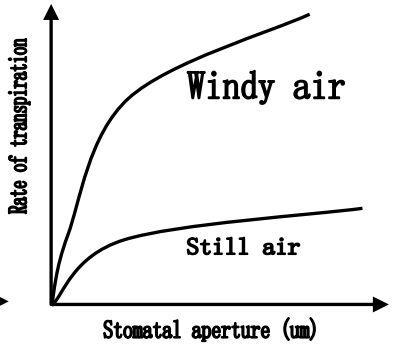


Fig. (iii)

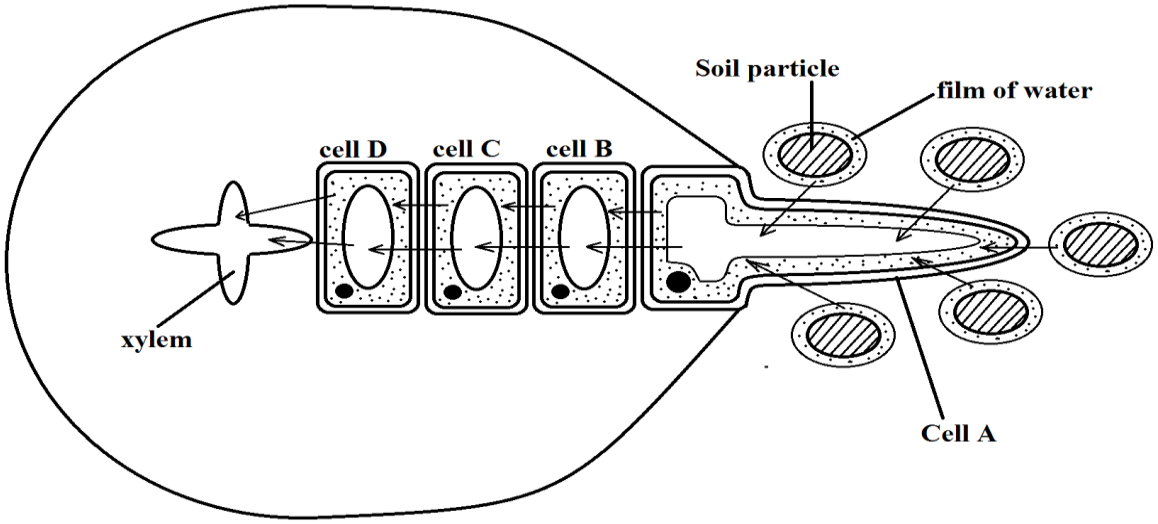
a) What **four** conclusions can you draw from the graphs in figure **(i)**, **(ii)**, and **(iii)** above? ***(04 marks)***

b) Explain the conclusions you have drawn for:
  (i) Graph in figure **(i)** ***(03 marks)***
  (ii) Graph in figure **(ii)** ***(03 marks)***

c) Describe and explain the shape of the curves in figure **(iii)** for:
  (iii) Windy air ***(04 marks)***
  (iv) Still air ***(04 marks)***

d) State the three environmental conditions affecting the rate of transpiration in the above figure ***(02 marks)***

73. The figure below shows a section through a plant root. Study it carefully and answer the questions that follow.

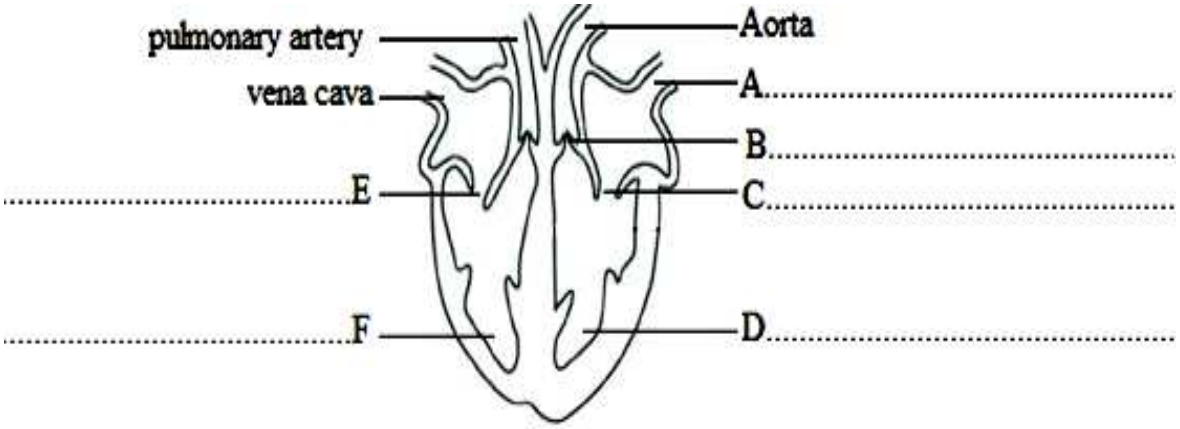


(a) (i). Name the cell labelled **A** *(01 mark)*

(ii). Describe how cell **A** is adapted to its functions *(04 marks)*

(b) Describe how water around the soil particles is absorbed by cell A until it reaches the xylem *(05 marks)*

74. The figure below shows a section of the human heart. Study it carefully and answer the questions that follow.



(a) Name the parts labelled **A** to **F** in the figure above. *(03 marks)*

(b) State the general function of the parts labelled **B**, **C** and **E** *(01 mark)*

(c) **(i).** What is **double blood circulation**? *(01 mark)*

(ii). Describe how double blood circulation occurs in the human heart above. *(03 marks)*

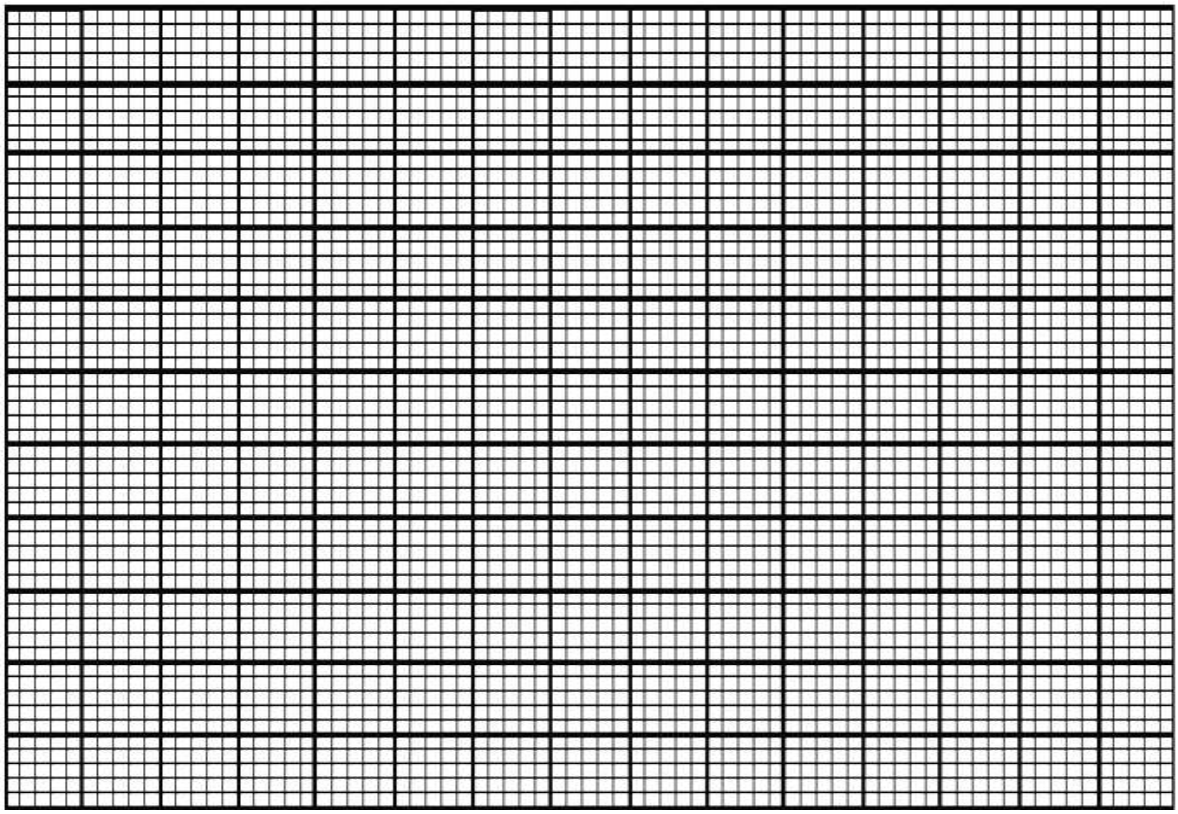
(d) **(i).** State one structural difference between part **D** and part **F.** *(01 mark)*

(ii). State the significance of the difference stated in (d) (i) above. *(01 mark)*

75. The following data in figure below represents the results obtained during a study on the rate of transpiration under two conditions using a potometer.

Stomatal aperture (µm)	**0**	**4**	**9**	**13**	**17**	**19**
Rate of transpiration in still air (mm^3/min.)	0	35	42	45	46	46
Rate of transpiration in windy air (mm^3/min.)	0	80	145	180	191	200

(a) Plot a graph showing the variation in the rate of transpiration with stomatal aperture for the two conditions on the same axes. *(07 marks)*



(b) What is the stomatal aperture when the rate of transpiration in the still air is 25 mm^3/min? ***(00 1/2 mark)***

(c) Describe the shape of the graph in the two conditions. ***(03 marks)***

(d) Explain the shapes of the graphs obtained ***(04 marks)***

(e) Outline three other factors that affect the rate of transpiration. ***(01 1/2 marks)***

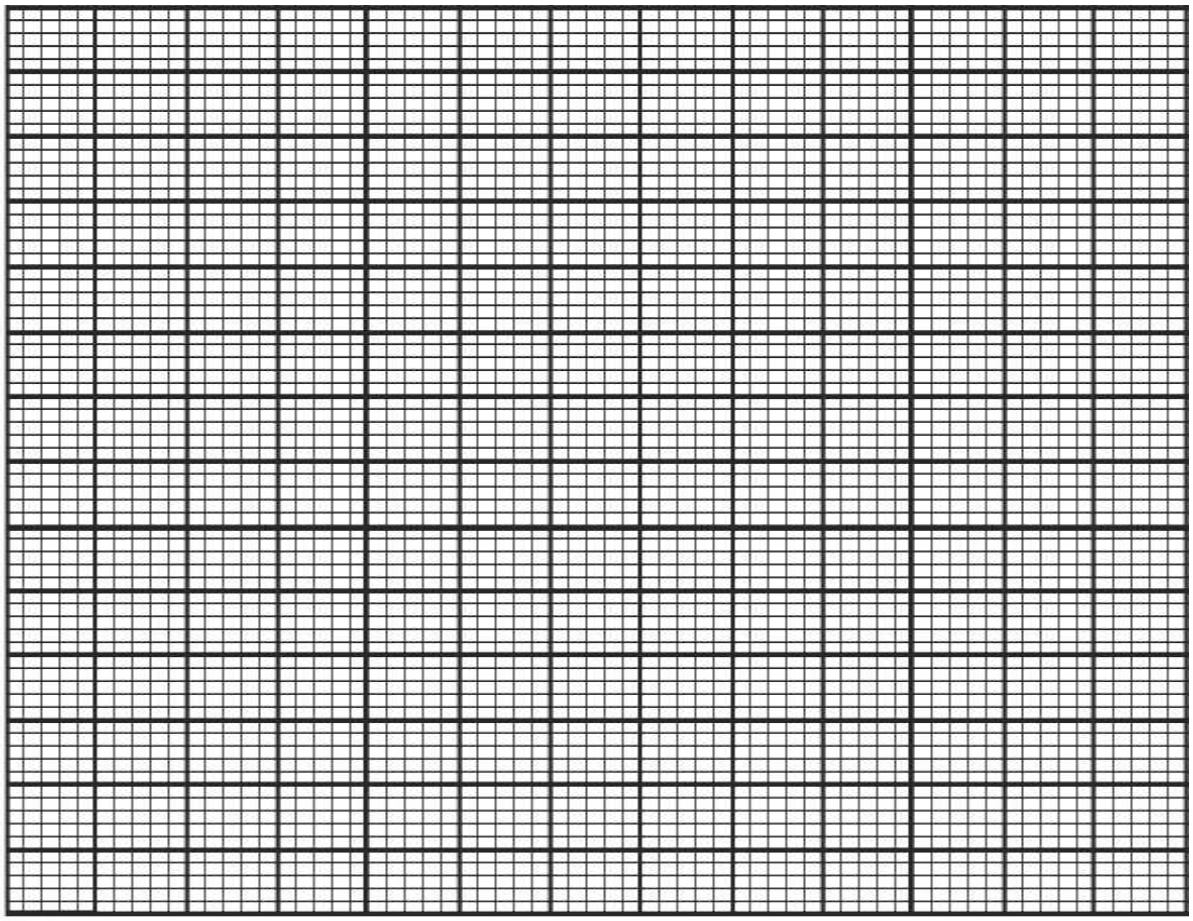
(f) Explain how water moves from the soil through root cells to the xylem. ***(04 marks)***

76. In an experiment to investigate osmosis in plants, four potato cylinders of equal length were used. Each potato cylinder was immersed in a test tube containing sucrose solution of different concentrations. After 1 hour the potato cylinders were removed from solutions and re-measured and the following results, in the table below, were obtained.

Sucrose solution (moles/litre)	*Initial length of potato cylinder (mm)*	*Final length of potato cylinder (mm)*	*Change in length (mm)*	*Percentage change in length (%)*
0.0	**20.0**	**25.0**	**+5.0**	
0.25	**20.0**	**22.0**	**+2.0**	
0.50	**20.0**	**18.5**	**−1.5**	
0.75	**20.0**	**16.0**	**−4.0**	

(a) Complete the table above by calculating the percentage change in length. ***(02 marks)***

(b) Plot a graph of percentage change in length against sucrose solution. ***(04½ marks)***



(c) From your graph, determine the sucrose solution with the same concentration as that of the cell sap of potato cylinders. ***(00½ marks)***

(d) Explain the effect of sucrose solutions to the length of the plant cylinders in the following cases:

(i) A difference in the length of less than 0.0 mm ***(01½ marks)***

(ii) A difference in length of more than 0.0 mm ***(01½ marks)***

77. (a). Complete the table below *(03 marks)*

Blood group	Can donate blood to	Can receive blood from
A		
B		
AB		

(b) The table below shows the composition of blood of three adult individuals. One lives at a high altitude, another is anaemic and the other has an infection. It also shows the average number of each blood component in an adult human. Study the information in the table and answer the questions that follow:

Components of blood	**Person A**	**Person B**	**Person C**	**Average number in man**
Red blood cells per mm^3	7,500,000	5,000,000	2,000,000	5,000,000
white blood cells per mm^3	6,000	8,000	12,000	5,000 – 10,000
Blood platelets per mm^3	250,000	255,000	100,000	250,000

Giving a reason, suggest the person,

(i) Who lives at high altitudes? *(02 marks)*

(ii) Who is aneamic? *(02 marks)*

(iii) Who has an infection? *(02 marks)*

(c) Suggest a likely effect of the observed number of blood platelets in person C in the table in (b) above *(01 marks)*

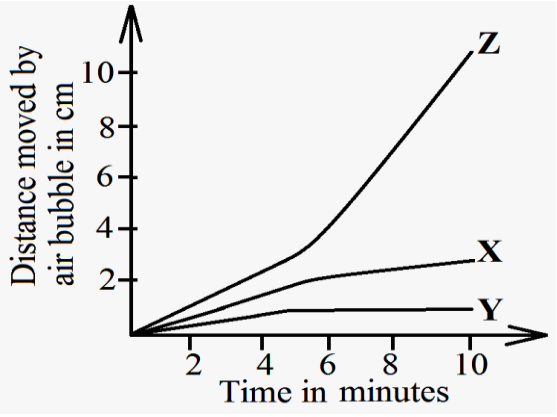
78. Three equal sized shoots **X**, **Y** and **Z** bearing the same number of leaves from similar herbaceous plants were treated as follows:

X – Had the upper epidermis of all its leaves covered with petroleum jelly.

Y – Had the lower epidermis of all its leaves covered with petroleum jelly.

Z – All its leaves were left uncovered.

The three shoots were cut under water and each placed in one of the three identical potometer. All the photometers were then left under a shade. After 5 minutes, the potometer bearing shoot Z was transferred to a sunny place. The movement of the air bubble in each potometer was recorded every minute for 10 minutes. The results are shown in the figure below. Use the information to answer the questions that follow.



(a) Describe the pattern of movement of the air bubble in each of the three potometers during the time of the experiment. *(06 marks)*

(i) X (ii) Y (iii) Z

(b) Explain the pattern of movement of the air bubble in each potometer. *(10 marks)*

(i) X (ii) Y (iii) Z

(c) Why were similar shoots and potometer used and placed under a shade? *(02 marks)*

(d) The movement of the air bubble in the potometer is a measure of water uptake rather than loss. Why is this so? *(02 marks)*

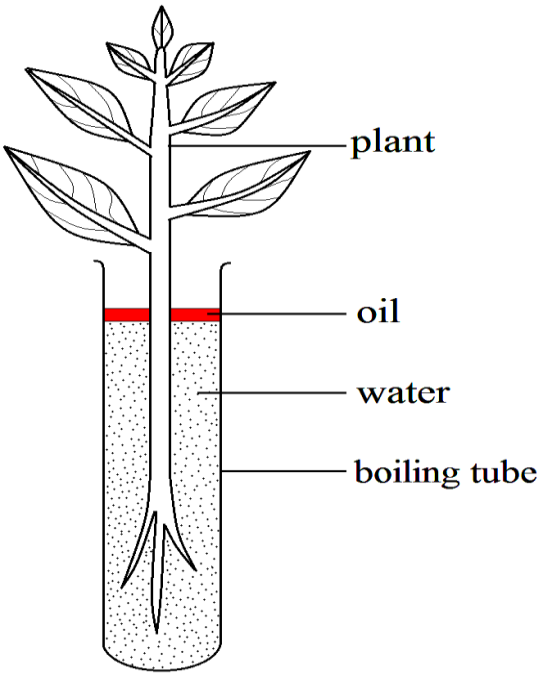
79. (a) What is an **artery**? ***(01 marks)***

(b) State **three** structural differences between an artery and a vein. ***(03 marks)***

(c) State how arteries and vein are suited for their respective functions. ***(06 marks)***

i) Arteries ii) Veins

80. The figure below shows a setup in an investigation on water loss and uptake, in a green plant.



The setup was left in the open and the mass of the plant together with the boiling tube were recorded every 2 hours for 14 hours. The results are shown in the table below. Use the information to answer the questions that follow.

Time (hours)	Mass of plant and boiling tube (g)
08:00	365
10:00	363
12:00	358
14:00	353
16:00	347
18:00	344
20:00	342
22:00	341

(a) Why was oil used in the experiment? ***(01 marks)***

(b) Plot a graph in the space below to represent the information in the table above. ***(07 marks)***

(c) From the graph, determine the mass of the plant and the boiling tube at 13:00 ***(01 marks)***

(d) Calculate the volume of the water lost by the plant during the period of the experiment. ***(02 marks)***

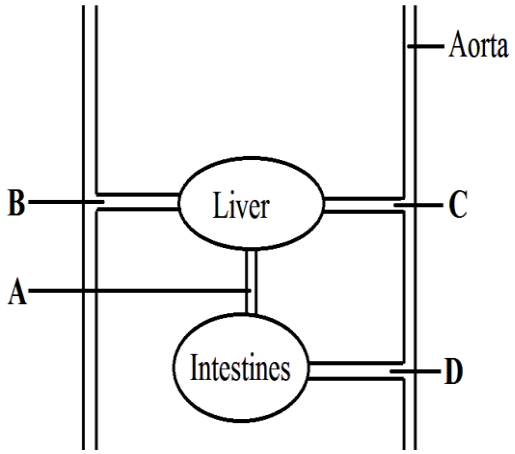
(e) (i) Using your graph, state the time with the highest rate of transpiration. Give a reason for your answer. ***(02 marks)***

(ii) Give two reasons why the time in (e) (i) had the highest rate of transpiration. ***(02 marks)***

(f) Suggest two ways that this plant could benefit from the transpiration. ***(02 marks)***

(g) Suggest three ways that this plant may reduce water loss. ***(03 marks)***

81. The figure below shows part of the mammalian circulatory system.



a) Name the blood vessels labeled **A**, **B**, **C** and **D**. ***(02 marks)***

b) Using arrows, show on the diagram the direction of blood flow in the blood vessels labeled A and B. ***(01 marks)***

c) State **three** differences in composition of blood flowing in **A** and **B** ***(03 marks)***

d) Explain the changes in the composition of glucose in **A** and **B**. ***(02 marks)***

e) How is blood vessel **A** structurally adapted to perform its function? ***(02 marks)***

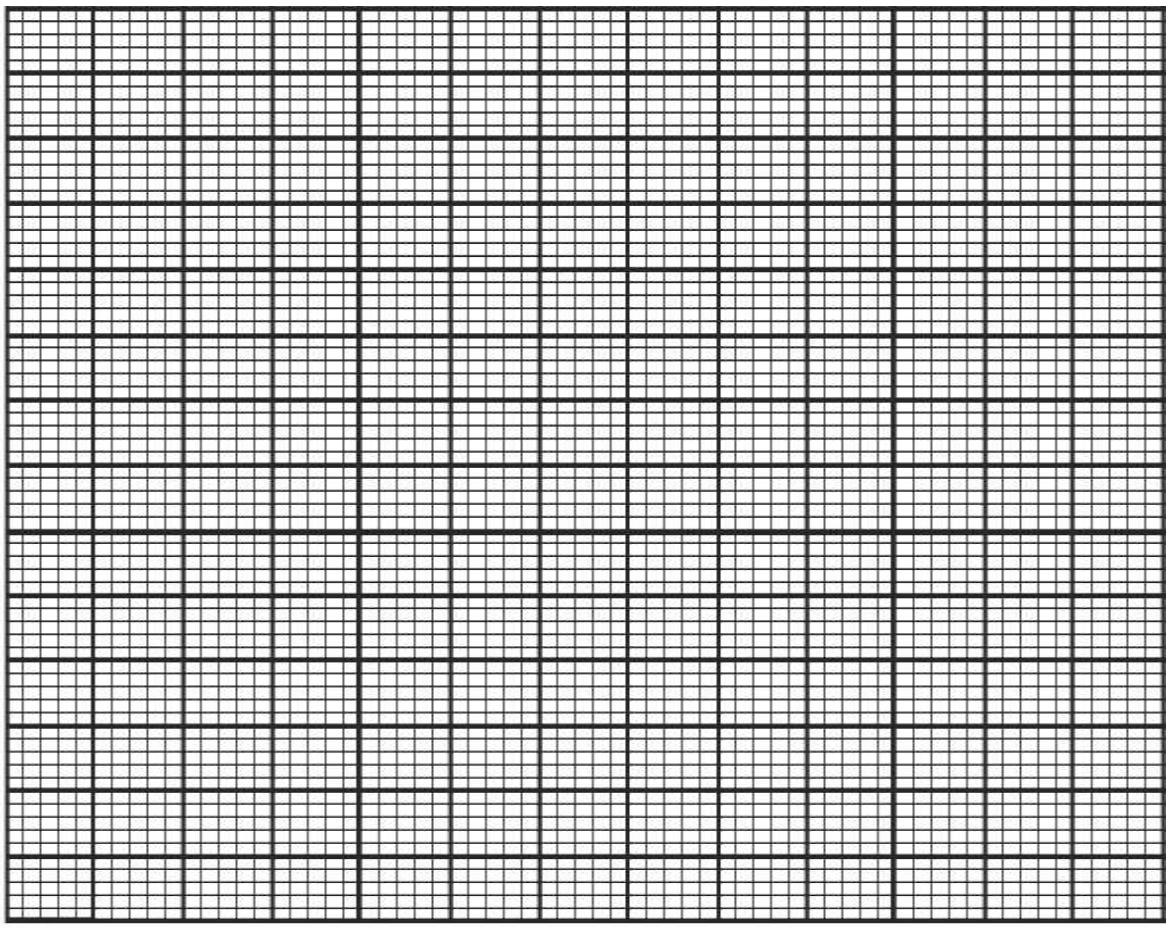
82. The table below shows results of an experiment to determine the percentage of onion epidermal cells plasmolysed in different concentrations of sucrose solution. In each case, the total number cells observed in one filed view of the microscope were 80.

Concentration of sucrose solution (mol./dm^3)	Number of cells plasmolysed	Percentage of plasmolyis
0.10	0	
0.20	0	
0.30	2	
0.40	3	
0.45	10	
0.50	60	
0.55	80	
0.60	80	

(a) Complete the table by working out the percentage of cells which are plasmolysed. ***(04 marks)***

(b) What is plasmolysis? ***(02 marks)***

(c) Plot a graph to show the relationship between percentage of plasmolysed cells and sucrose concentration. ***(06 marks)***



(d) (i) State the relationship between percentage of plasmolysis and sucrose concentration. ***(01 marks)***

(ii) Explain the relationship stated above. ***(03 marks)***

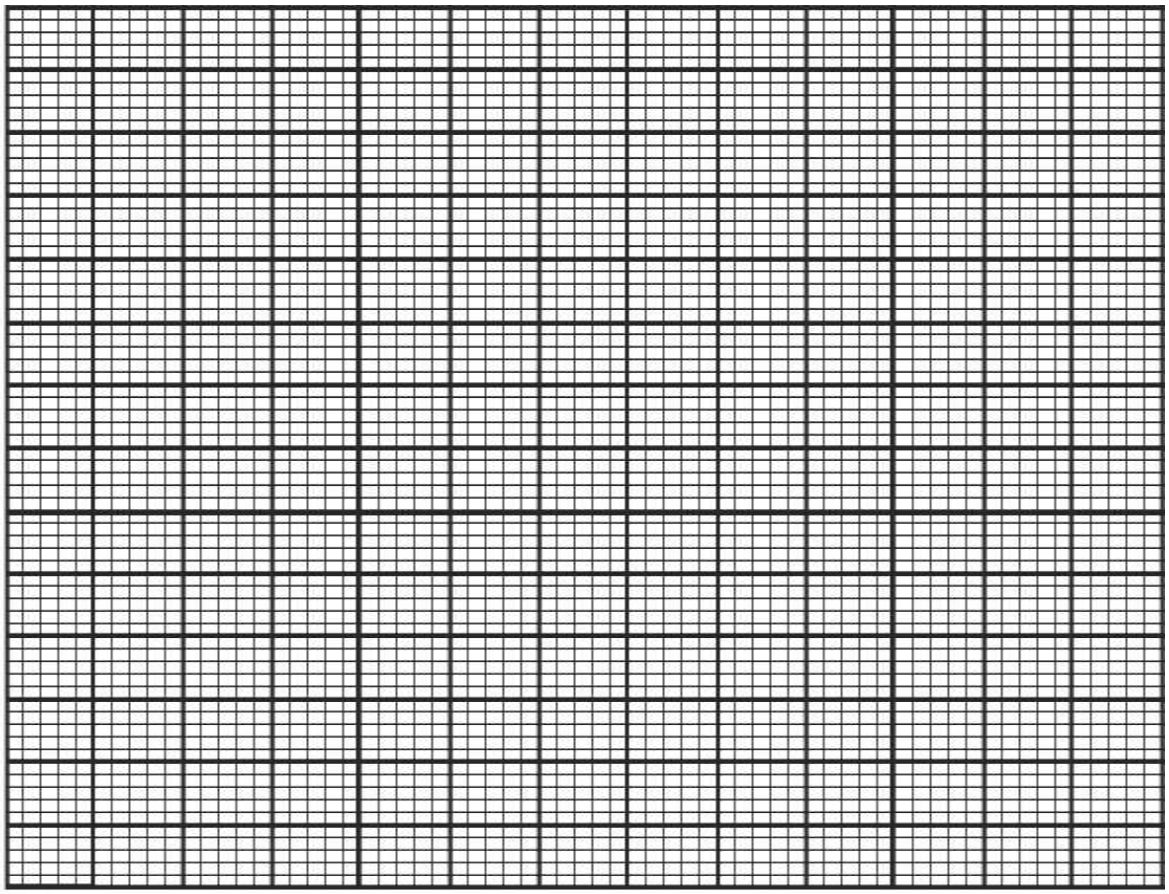
(e) (i). From your graph state the sucrose solution(s) were there was no net gain or net loss of water from the cells. ***(01 marks)***

(ii). Why? ***(03 marks)***

83. An experiment was carried out to investigate the effect of sodium chloride solution on red blood cells. The red blood cells were placed in sodium chloride of different concentrations and some red blood cells in the solution burst (haemolysed). The percentage of cells, which burst in each solution, was determined and the results were recorded in the table below.

Sodium chloride concentration (g/100 cm^3)	0.33	0.36	0.38	0.39	0.42	0.44	0.48
Percentage of red blood cells which burst (%)	100	91	82	69	30	15	0

(a) Plot a graph of percentage of red blood cells which burst against the sodium chloride concentration. ***(06 marks)***



(b) Explain why red blood cells burst when placed in some solution of sodium chloride. ***(03 marks)***

(c) (i). From your graph, determine the concentration of sodium chloride in which the burst cells were equal to the intact cells. ***(01 marks)***

(ii). Why? ***(02 marks)***

(d) Explain the results obtained at the following concentration of the sodium chloride solution:

(i). 0.33 g/100 cm^3 ***(03 marks)***

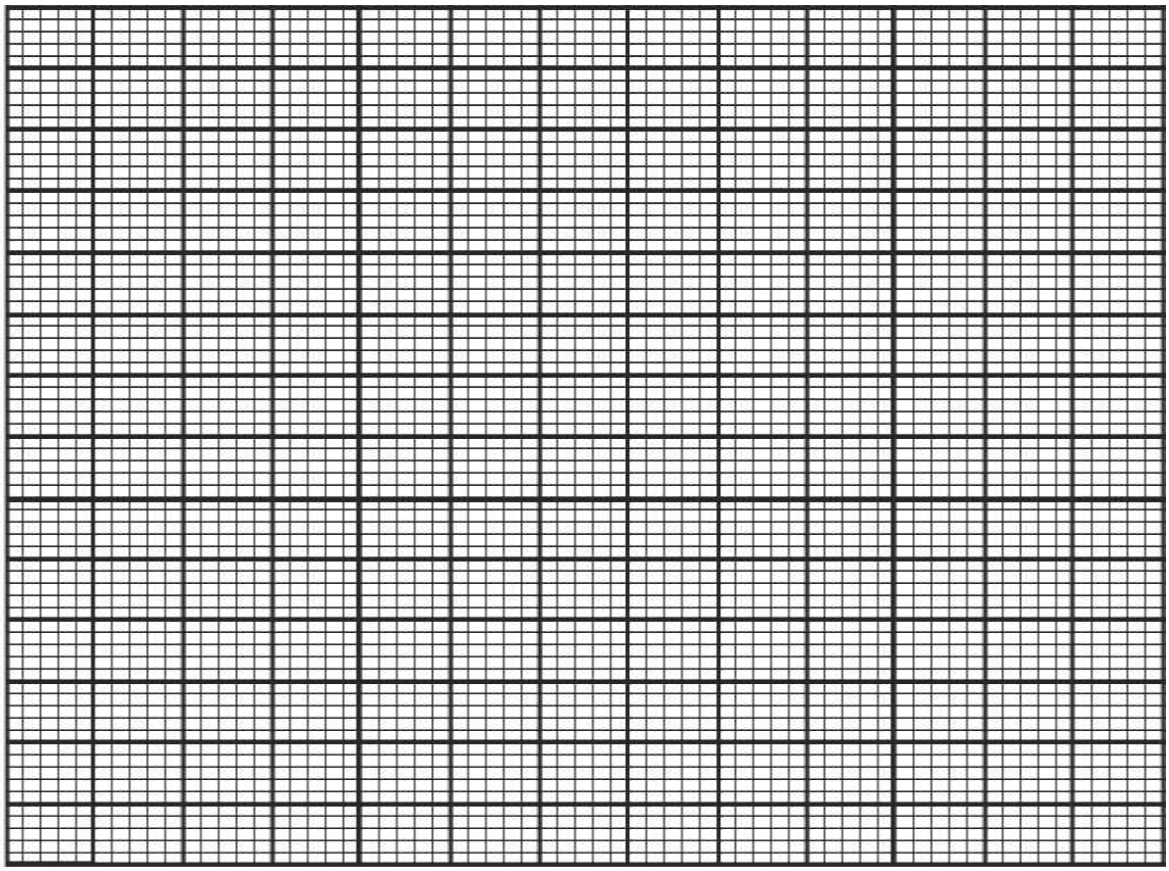
(ii). 0.48 g/100 cm^3 ***(03 marks)***

(e) Explain what would happen to the red blood cells if they were placed in a sodium chloride solution of 0.5 g/100 cm^3. ***(02 marks)***

84. An investigation was done on the effect of temperature and relative humidity on the rate of transpiration on a bright sunny day and the following obtained.

Temperature in ℃	10	20	30	40	50	60	70
Relative humidity (mm/Hg)	69	62	48	41	30	19	8
Rate of transpiration (cm^3/second	22	30	41	49	61	73	84

(a) Plot a graph to show the relationship between relative humidity, temperature and rate of transpiration using the same axes. ***(08 marks)***



(b) Describe how the changes in temperature and relative humidity influence the rate of transpiration. ***(02 marks)***

(c) Explain the effects of:

(i). rise in temperature on the rate of transpiration ***(03 marks)***

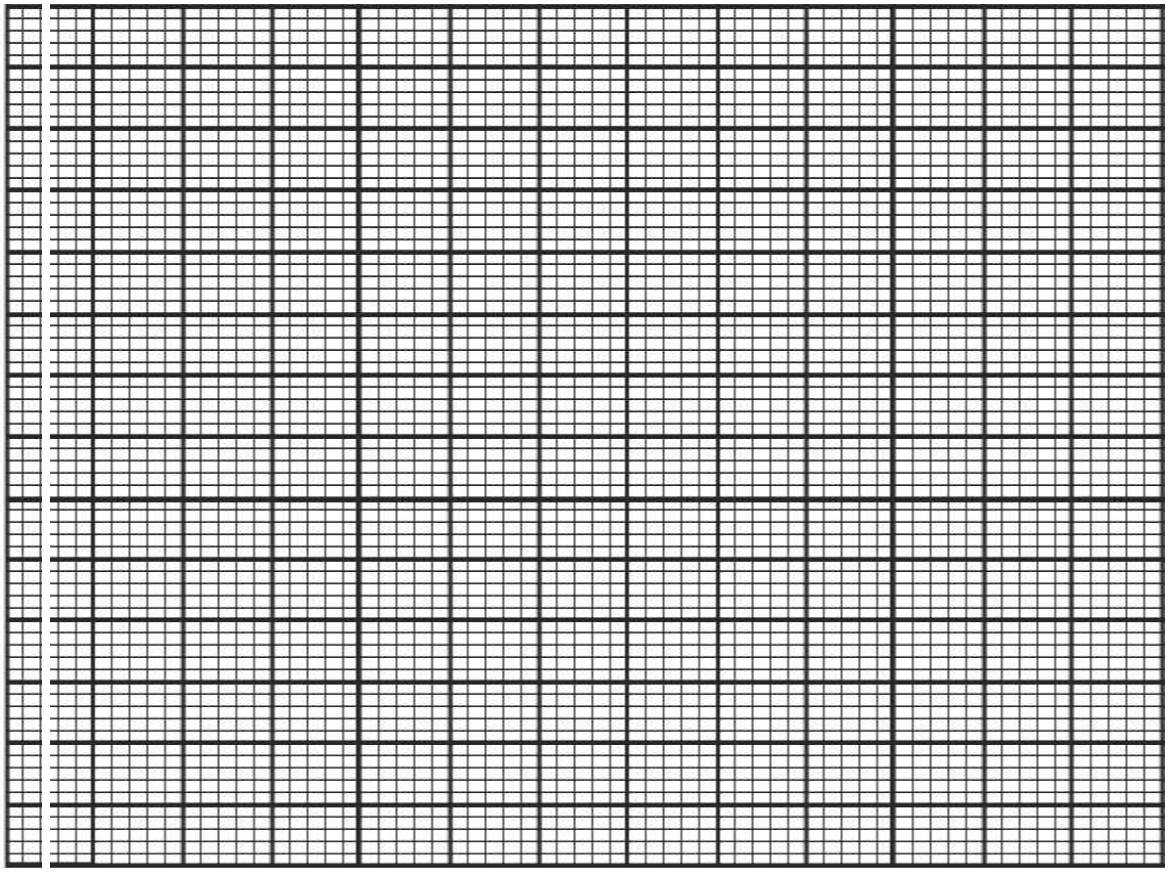
(ii). rise in temperature on the rate of transpiration ***(02 marks)***

(d) Describe five structural adaptations of plants that reduce transpiration ***(05 marks)***

85. An investigation was carried out into the relationship between the rate of water absorption and the rate of transpiration in sunflower plants at various times of the day. The results are shown in the table below.

Time in hours	Rate of transpiration	Rate of water absorption
08:00	10	08
10:00	32	15
12:00	42	27
14:00	51	3
16:00	42	39
18:00	32	40
20:00	03	16
24:00	05	07
02:00	07	07
04:00	06	07
06:00	07	07

(a) On the same axes, plot a graph to represent the data in the table above. ***(07 marks)***



(b) State the relationship between:

(i). Time of the day and rate of water absorption ***(01 marks)***

(ii). Rate of transpiration and rate of water absorption ***(01 marks)***

(c) Explain the relationship between:

(i). Time of the day and rate of water absorption ***(04 marks)***

(ii). Rate of transpiration and rate of water absorption ***(03 marks)***

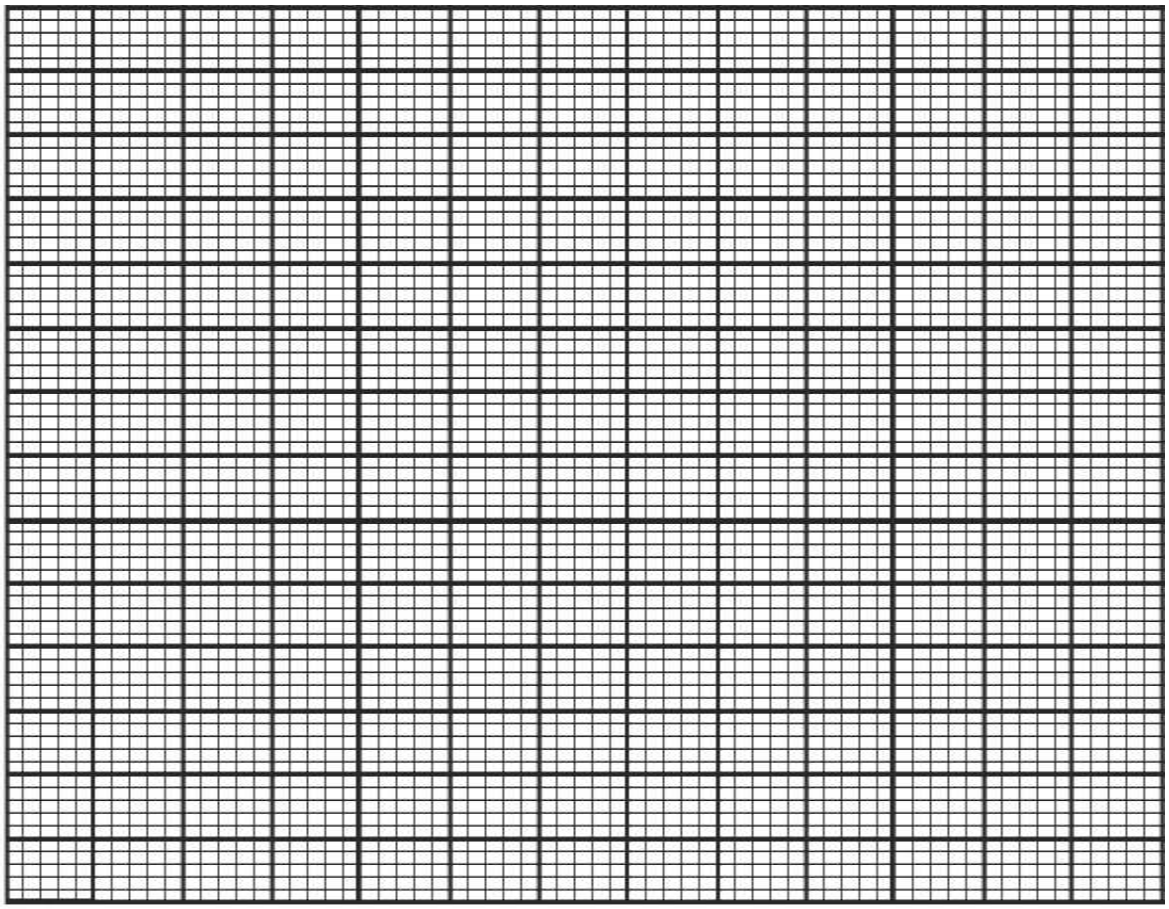
(d) Describe the change in the rate of water absorption from 08:00 to 20:00 hours ***(02 marks)***

(e) What are the differences in the changes in the rate of water absorption and the rate of transpiration from 08:00 to 20:00 hours ***(02 marks)***

86. In an experiment to determine the effect of ringing on the translocation of sugars in phloem, a ring of the bark from a tree was removed. The amount of sugar in grams per 10 cm^3 piece of the bark above the ring was measured at 3-hour intervals. Sugar was also measured in the bark of the stem at the same height of a similar tree, which was not ringed. The results are shown in the table below.

Time of the day in hours		07:00	10:00	13:00	16:00	19:00	22:00	01:00
Amount of sugar in g/ 10 cm^3 piece of bark	Normal stem	0.48	0.57	0.7	0.65	0.56	0.47	0.40
	Ringed stem	0.48	0.66	0.90	1.01	0.90	0.75	0.56

(a) Using the same axes, plot a graph of the amount of sugar against time ***(07 marks)***



(b) From your graph, state the amount of sugar at 14:30 in each stem ***(02 marks)***

(c) How much sugar would be in the normal stem if the experiment was continued for another 3 hours? ***(01 marks)***

(d) Give reasons why there was sugar in the sugar in the stems of both trees at 07:00 hours ***(02 marks)***

(e) Explain the shape of the graph for:

(i). Ringed stem between 07:00 hours and 06:00 hours ***(02 marks)***

(ii). Ringed stem between 19:00 hours and 01:00 hours ***(02 marks)***

(ii). Normal stem between 07:00 hours and 06:00 hours ***(02 marks)***

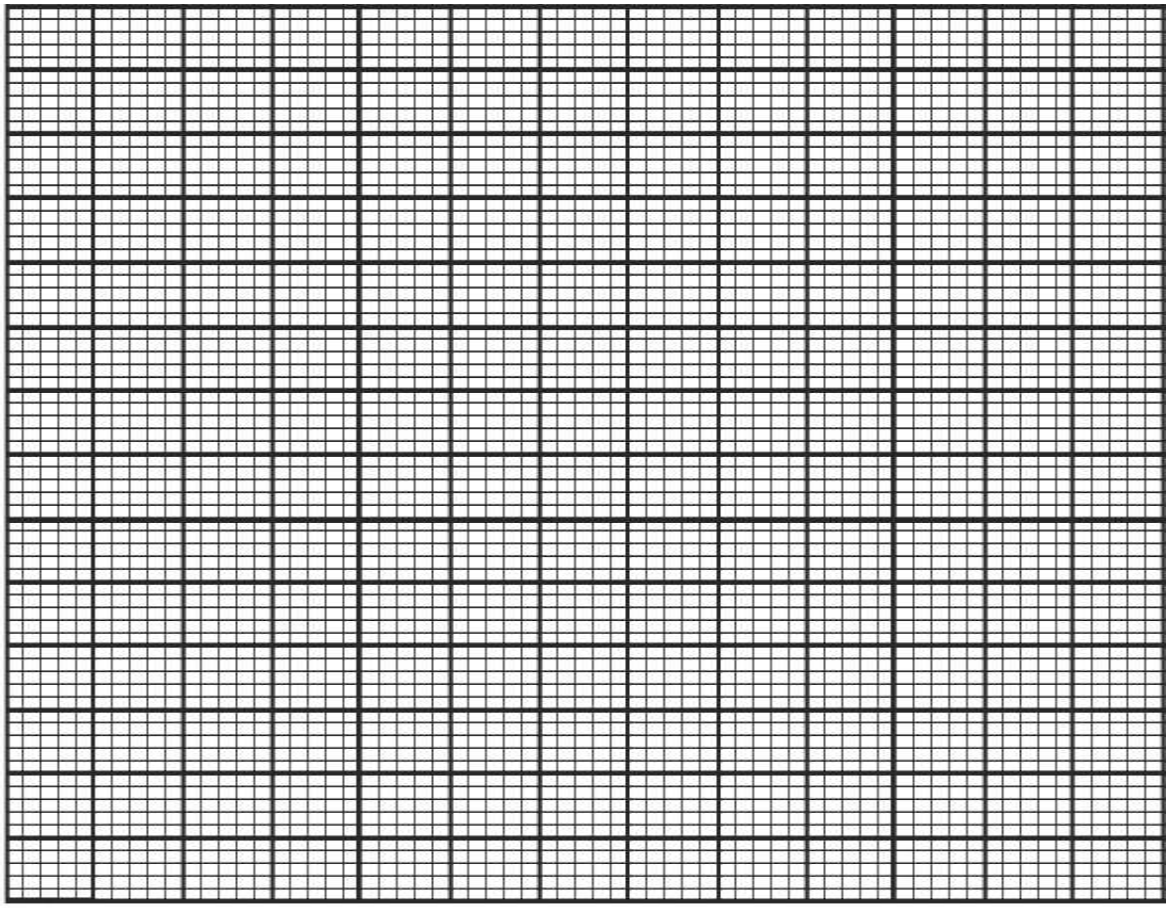
(f) Name the cells in phloem that responsible for the translocation of manufactured food in plants. ***(02 marks)***

87. An experiment was carried out to investigate the effect of oxygen concentration on the uptake of phosphate ions from a salt solution by a plant. Plant roots were dipped in a solution containing the phosphate ions. A metabolic poison was introduced into the solution when the oxygen concentration was 10 ppm (parts per million). The table below shows the results obtained.

concentration of oxygen (ppm)	0	2	4	6	8	10	12	14
Total phosphate uptake (mg)	3	5	20	30	41	49	23	0

(a) Name the processes by which plant roots absorb phosphate ions ***(02 marks)***

(b) Plot a suitable graph to represent the data in the table above. ***(06 marks)***



(c) Explain the graph:

(i). At 0 ppm of oxygen concentration ***(02 marks)***

(ii). Between 2 ppm and 12 ppm of oxygen concentration ***(02 marks)***

(iii). At 14 ppm of oxygen concentration ***(02 marks)***

(d) Describe and explain the effect of adding metabolic poison in the solution ***(02 marks)***

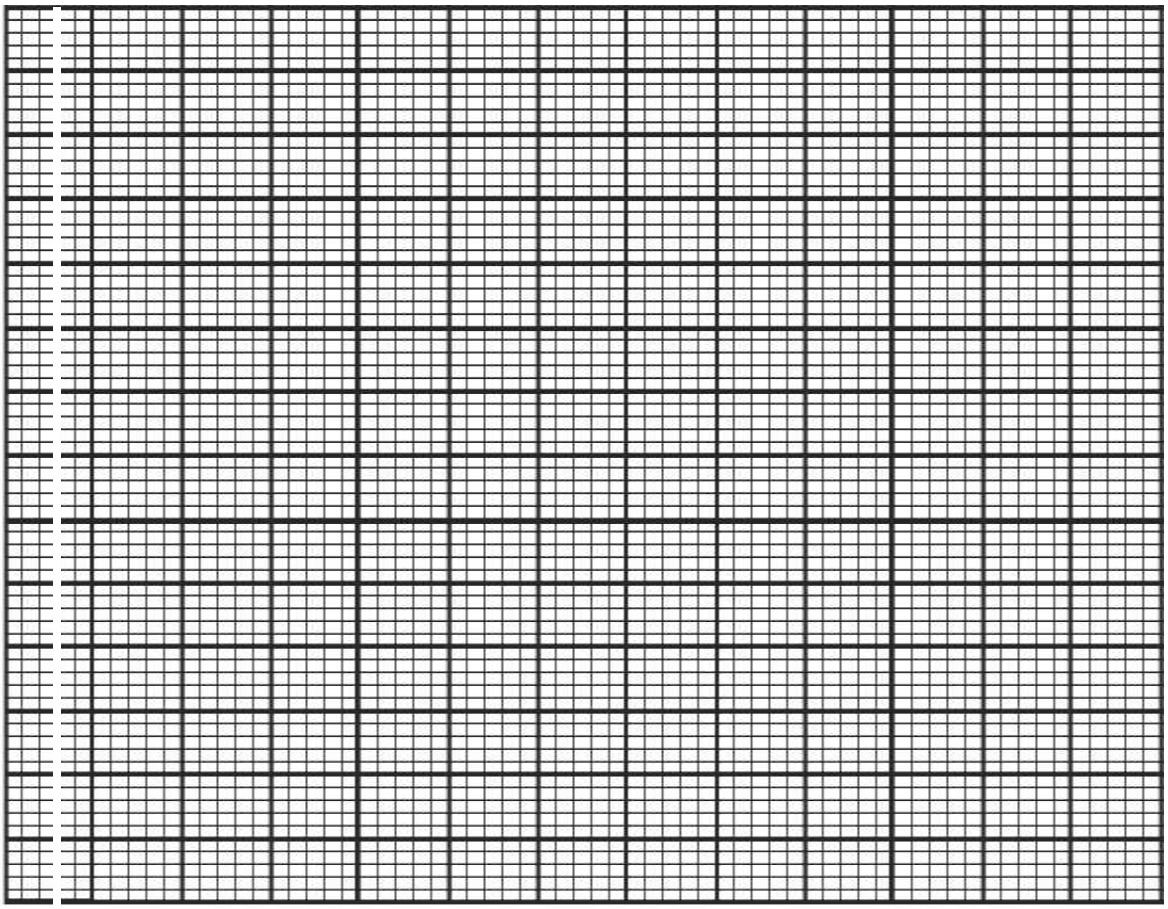
(e) State two conclusions you can draw from the graph. ***(02 marks)***

(f) State two other factors that affect the rate of ion uptake by the root. ***(02 marks)***

88. The table shows the results of blood cell count taken on people living at different altitudes. The counts were expressed in blood cells per mm^3 of blood.

Altitude in meters	1000	2000	3000	4000	5000
White blood cell count ($100/mm^3$ of blood)	0.2	0.2	0.2	0.2	0.2
Red blood cell count ($100/mm^3$ of blood)	5.0	5.6	6.2	7.0	7.8

(a) On the same axes, represent the information in table above on a graph. ***(06 marks)***



(b) State the relationship between:
  (i). altitude and red blood count *(01 marks)*
  (ii). altitude and white blood count *(01 marks)*

(c) Explain the relationship between:
  (i). altitude and red blood count *(03 marks)*
  (ii). altitude and white blood count *(01 marks)*

(d) Other than blood count, state **three** physiological changes that would occur in individuals living at altitude of 5000 meters above sea level. In each case, state the significance of each physiological change. *(06 marks)*

Section C – essay questions

89. (a). State **three** differences between diffusion and osmosis *(03 marks)*
(b). Describe an experiment to demonstrate osmosis, using a named plant material. *(08 marks)*
(c). State the role of diffusion in organisms. *(04 marks)*

90. (a). What is meant by the term diffusion? *(01 mark)*
(b). Explain briefly the factors which affect the rate of diffusion in an organism. *(09 marks)*
(c). Describe an experiment to demonstrate diffusion in gases. *(05 marks)*

91. (a) Define the term translocation. ***(01 marks)***
(b) Name the major components of the medium of transport in mammals. ***(03 marks)***
(c) Distinguish between double circulation and single circulation systems. ***(01 marks)***
(d) Precisely describe the functioning of the heart. ***(07 marks)***
(e) Give three adaptations of erythrocytes to their function. ***(03 marks)***

92. In humans, the blood circulatory and lymphatic systems transport body fluids.
(a) Outline the functions of the **lymphatic system.** ***(03 marks)***
(b) Explain the changes that occur in the composition of blood as it passes through the capillaries of the following parts of the body
(i) Lungs (ii) Liver (iii) kidney

93. (a) Describe the benefits of transpiration to a plant ***(04 marks)***
(b) Explain how each of the following forces contribute to the movement of water and mineral salt up the xylem vessels of a plant ***(11 marks)***
(i). Transpiration pull (ii). Adhesion (iii). Capillarity

94. (a) Describe two ways in which the white blood cells defend the body ***(02 marks)***
(b) Explain how red blood cells are adapted to their functions ***(01 marks)***
(c) Describe the changes that occur in an individual blood if the person moves from a lowland and goes to live on a highland. Explain your answers. ***(03 marks)***

95. (a) Explain how a plant benefits from transpiration ***(04 marks)***
(b) Describe how plants in arid areas control excessive loss of water ***(11 marks)***

96. a) What is transpiration? ***(01 marks)***
b) State 5 environmental factors that affect the rate of transpiration ***(05 marks)***
c) Describe an experiment to show that a plant transpires. ***(09 marks)***

97. Describe the processes and forces involved in the movement of water from the soil up to the leaves, until it is lost to the surrounding atmosphere of a tall tree. ***(15 marks)***

98. (a) What is the advantage to an animal of having capillaries which are:
i. Very narrow ***(01 marks)***
ii. Repeatedly branched ***(01 marks)***
iii. Very thin-walled ***(02 marks)***
(b) Explain why single-celled organisms like amoeba do not need a circulatory System. ***(03 marks)***
(c) Explain why a transport system is necessary in higher animals. ***(03 marks)***

99. (a) "Transpiration is a necessary evil". Discuss. **(*04 marks*)**
(b). Explain how the following factors affect the rate of transpiration:
(i). Humidity. (ii). Light intensity. **(*04 marks*)**
(c). How do the following plants control the rate of transpiration:
(i). Xerophytes. (ii). Halophytes **(*07 marks*)**

100. (a) Describe how the structure of each of the following is related to its function.
- (i) Mammalian heart **(*03 marks*)**
- (ii) Blood capillary **(*03 marks*)**

(b) Explain the difference between:
- (i) Serum and blood plasma **(*02 marks*)**
- (ii) Blood and lymph **(*04 marks*)**
- (iii) Tissue fluid and blood plasma **(*03 marks*)**

101. (a) Outline the adaptations of the following structures of a plant leaf to their functions
- (i) Cuticle **(*04 marks*)**
- (ii) Palisade mesophyll layer **(*04 marks*)**
- (iv) Spongy mesophyll layer **(*04 marks*)**

(b) Describe the modifications of leaves on plants growing in hot areas. ***(03 marks)***

102. (a) Distinguish between
- (i) Diastole and systole **(*01 marks*)**
- (ii) Single and double circulation **(*01 marks*)**
- (iii) Open and closed circulatory system **(*01 marks*)**
- (iv) Systemic circulation and pulmonary circulation **(*01 marks*)**

(b) Why do people living in high altitudes have more red blood cells than those living in low altitude areas. ***(02 marks)***

(c) Explain how blood clotting occurs in humans **(*09 marks*)**

103. (a) Define the term immunity ***(01 marks)***

(b). With specific examples distinguish between the following immunological terms ***(03 marks)***

(i) Innate immunity and acquired immunity

(ii) Natural active acquired immunity and Natural passive acquired immunity

(iii) Artificial active acquired immunity and artificial passive acquired immunity

(c). Outline the different causes of diseases. ***(03 marks)***

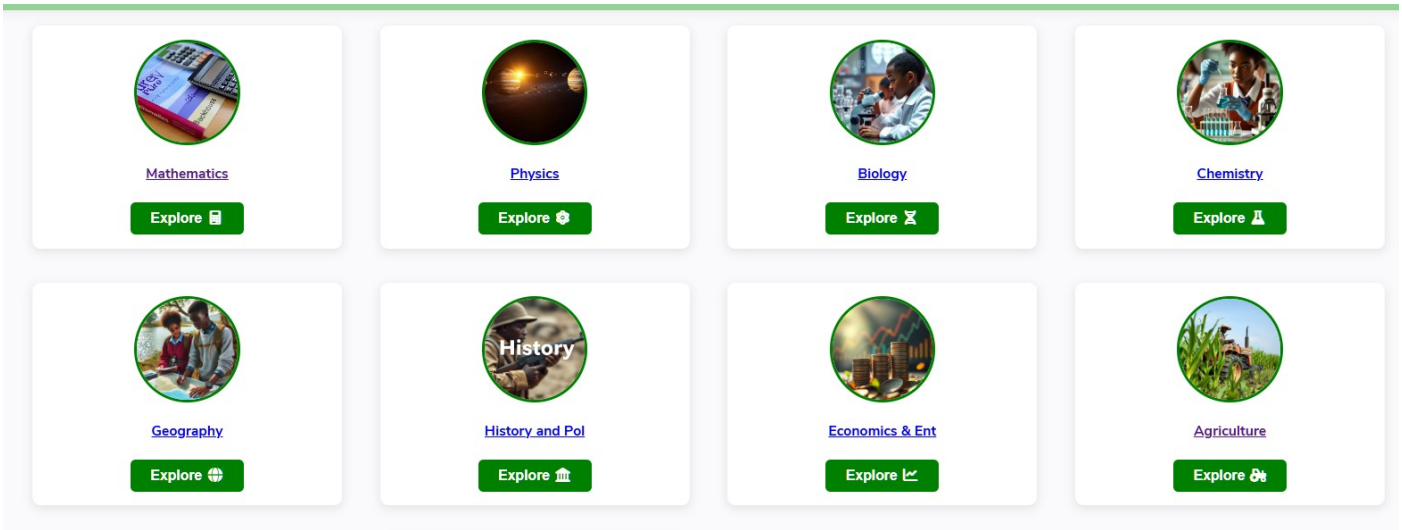
(d). Describe how the human body defends itself against pathogens ***(08 marks)***

104. On a hot sunny day, the leaves of bean seedlings were seen wilted. However, at night, they recovered and regained their normal shape and size.

(a). Explain the process which lead to the:
- (i) Wilting ***(08 marks)***
- (ii) Recovery and regaining of the shape and size ***(05 marks)***

(b). Explain the ecological advantage of wilting to a plant. ***(03 marks)***

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