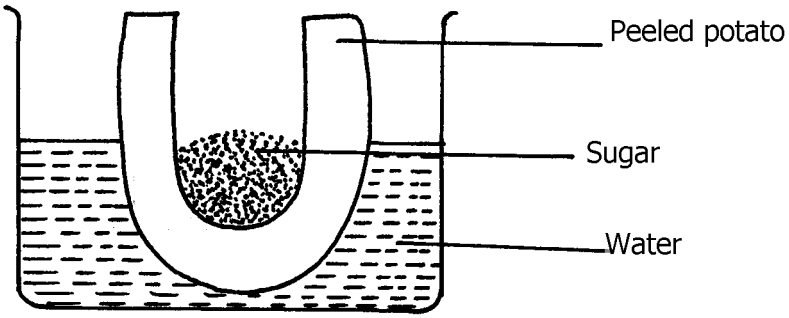
3. Cell Physiology – Osmosis, Diffusion and Active transport

1. Two equal strips **A** and **B** were from a potato whose cell was 30% of sugar. The strip **A** was placed in a solution of 10% sugar concentration while **B** was placed in 50% sugar concentration
   a) What change was expected in strip **A** and **B**

   b) Account for the change in strip **A**

2. An experiment was set-up as shown below and left for one hour



(a) State the expected result at the end of one hour

(b) Explain the observations made in this experiment

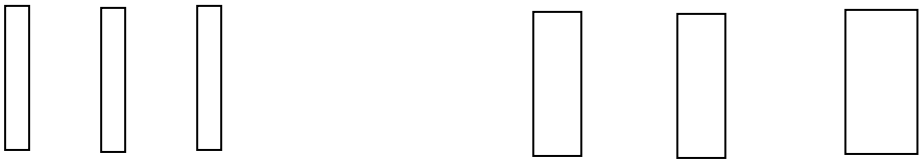
3. State what would happen in each of the following:-

(a) A plant cell placed in: **-** (i) Strong salt solution

(ii) Distilled water

4. State **three** physiological processes that are involved in movement of substances a cross the cell membrane

5. Potato cylinders were weighed and kept in distilled water evernight. They were then reweighed.



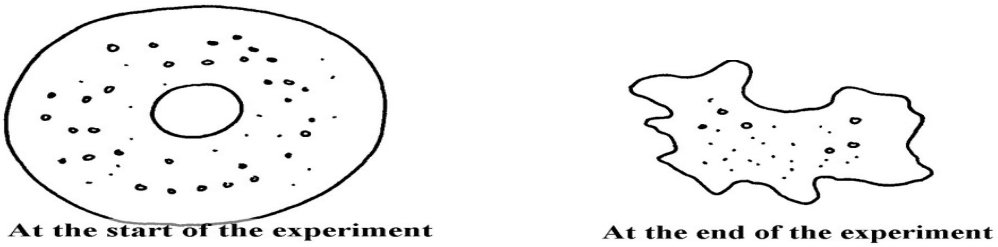
2.5 g 2.4g 2.7g 3.0 g 3.1 g 3.2g

At the beginning of the Experiment. At the end of the experiment

a) Calculate the average mass of a potato cylinders after reweighing. Show your working.

b) Explain why mass of the cylinders hand increased.

6. The diagrams below show a red blood cell that was subjected to a certain treatment.



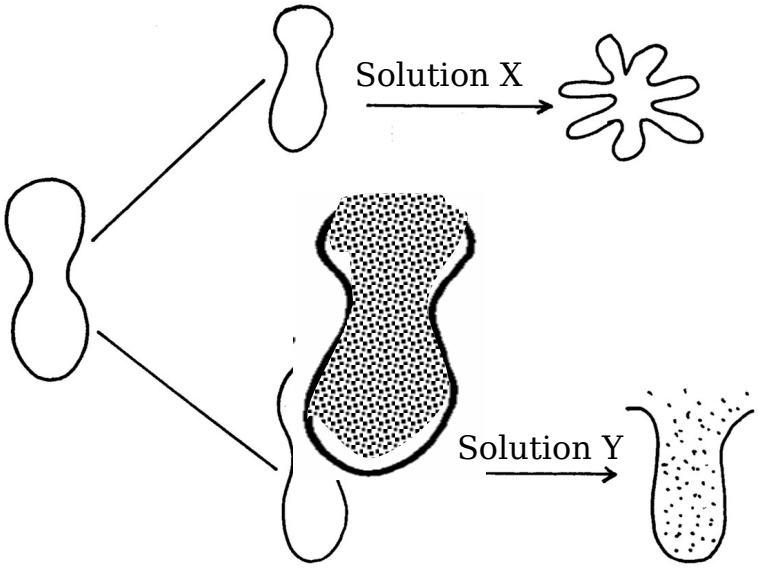
At the start of the experiment

At the end of the experiment

a) Account for the shape of the cell at the end of the experiment.

b) Draw a diagram to illustrate how a plant cell would appear if subjected to the same treatment

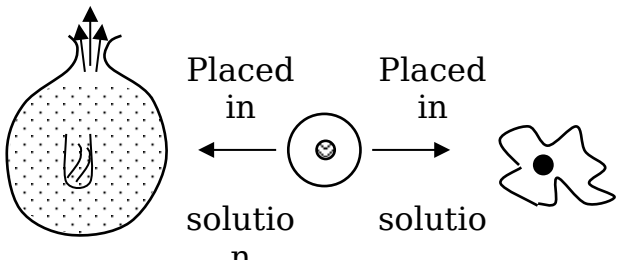
7. The diagram below shows the results obtained when red blood cells are placed in different solution:



(a) What name is given to the process that occurs when the cell is placed in solution **Y**?

(b) Describe the process that would occur in a plant cell when placed in a similar solution as that of solution **X**

8. The figure below shows the results obtained when red blood cells are put in different solutions:-



(a) What is the name given to the process that occurs when the cell is put into solution **B**?

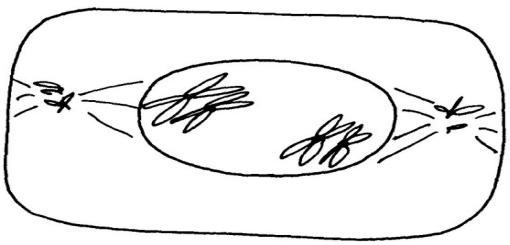
(b) Compare the results obtained when the cell is put in solution **B** to the results that would be obtained if a plant cell was put in the same solution

9. Briefly state **two** adaptation for each of the following cells to their functions

(i) Spermatozoon

(ii) Palisade mesophyll cell

10. The diagram below represents a cell at a certain stage in meiotic cell division



a) Name the stage at which the cell drawn above represents

b) Give a distinguishing reason for your answer in **21(a)** above

c) State any **two** differences between mitosis and meiosis

11. What are **two** differences between tropisms and tactic movement

12. An experiment was carried out to investigate the effect of different concentrations of sodium chloride on human red blood cells. Equal amounts of blood were added to equal volumes of the salt solution but of different concentrations. The results are shown in the table below:

Set -up		**Number of red blood cells**	
	Sodium chloride concentration	**At start of experiment**	**At the end of the experiment**
A	0.9%	Normal	No change in number
B	0.3%	Normal	Fewer in number

(a) Account for the results in the set-up

(b) If the experiment was repeated using 1.4% sodium chloride solution, state the expected results with reference to:

(i) the number of red blood cells

(ii) the appearance of red blood cells if viewed under the microscope

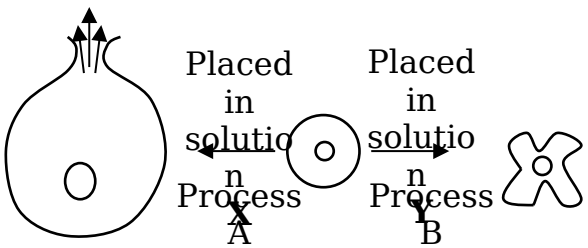
13. Name support tissues in plants characterized by the following

(i) Cells being turgid

(ii) Cells being thickened by cellulose

(iii) Cells being thickened by lignin

14. The diagram below illustrates the behaviour of red blood cells when placed into two different solutions **X** and **Y**.



(a) Suggest the nature of solutions **X** and **Y**.

(b) Name the process **A** and **B**.

(c) What would happen to normal blood cell if it were placed in a solution isotonic.

15. Name **two** plant processes in which diffusion plays an important role

16. Two fresh potato cylinders of equal length were placed one in distilled water and the other in

concentrated sucrose solution:

(a) Account for the change in length of the cylinder in:

(i) Distilled water

(ii) Sucrose solution

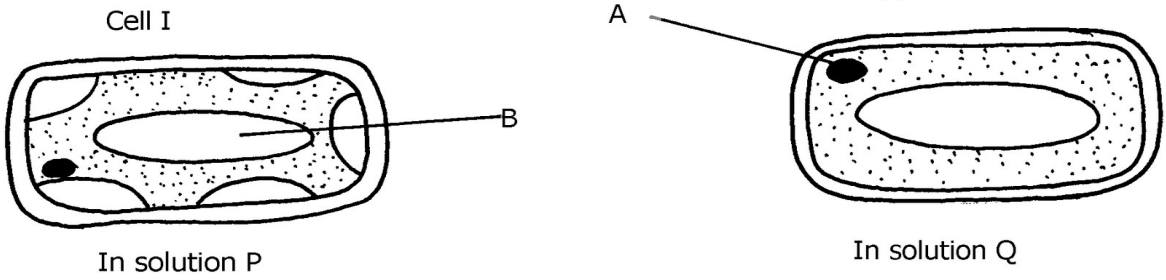
(b) (i) What would be the result in terms of length if a boiled potato was used?

(ii) Explain your answer in **(b)(i)** Above

(c) State **two** uses of the physiological process being demonstrated in the experiment

17. The two cells shown below are obtained from two different potato cylinders which were

immersed in tow different solutions **P** and **Q.**



a) i) Name the structure labelled **A**.

ii) State the function of structure B.

b) If eight of cell I were observed across the diameter of the filed of view of 0.5 mm.

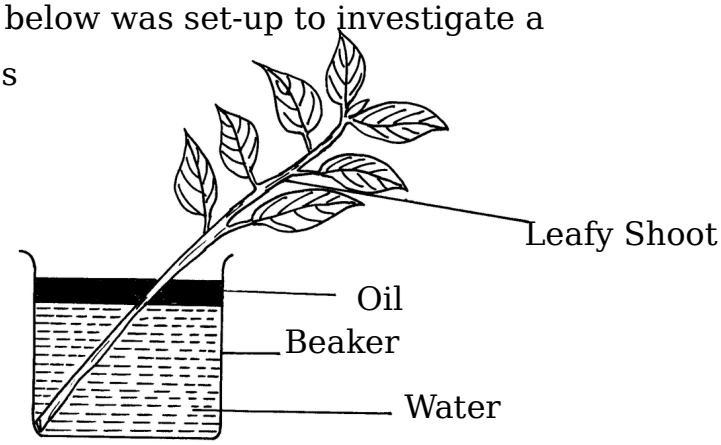
Work out the actual diameters of each cell in micrometers.

c) Suggest the identity of the solution Q.

d) Account for the change in cell I above.

e) State any **one** importance of the physiological process being demonstrated above in animals.

18. An experiment shown below was set-up to investigate a certain physiological process in plants:-



(a) What process was being investigated?

(b) Give the role of the oil layer in this experiment

(c) (i) What observation did the students make after leaving the set-up in bright sunlight for two hours?

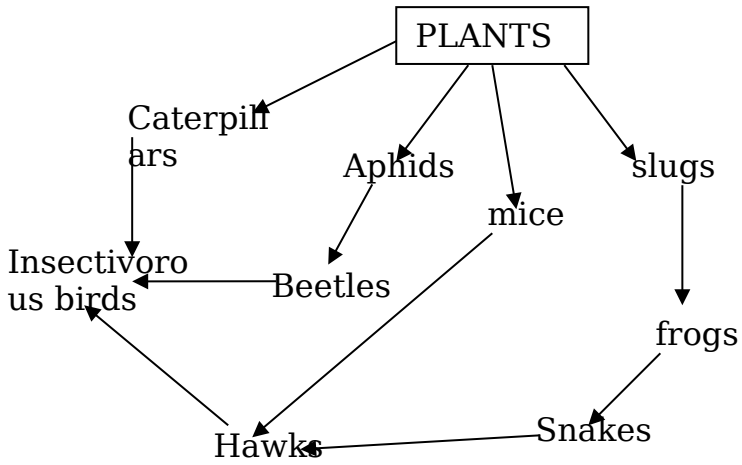
(ii) Explain the observation in **(c)(i)** above

(d) What effect will the following have on the observation made?:-

(i) Fanning the shoot
(ii) Removing all the leaves from the shoot
(iii) Placing the set-up in the dark

(e) Suggest a suitable control for this experiment

19. Study the following food web and answer questions that follow:



(a) (i) Name the organisms that occupy the second trophic level

(ii) What is the other name for the second trophic level

(b) Write down **two** food chains from the food web that:

(i) End with hawks as tertiary consumer

(ii) End with hawks as quaternary consumer

(c) Giving reasons state;

(i) the organism with largest biomass

(ii) the organism with least biomass

3. Cell Physiology – Osmosis, Diffusion and Active transport

1. a) A- The strip increased in length/ size; B - Decreased in length/ size;
b)The sugar solution was hypotonic to the cell sap strip A; it gained water by osmosis
hence increasing in length;

2. (a) The potato cup will be filled with solution;
(b) The solution in the potato cells is hypertonic to the water; hence water moves into the cell by
osmosis; this makes the solution in the neighbouring cells to be hypertonic to the outer cells;
hence water moves from cell to cell until it eventually enters the potato cup;

3. (a) (i) Will lose water by osmosis and become plasmolysed;

4. Diffusion;

Osmosis ;
Active transport ;

5 a) 3.0 + 3.1 + 3.2 = 9.3 g;

$$\text{Average} = \frac{9.3}{3} = 3.1\text{g};$$

b) The cell sap had a higher concentration of solutes than distilled water, water therefore
moves from the environment to the cell by osmosis ;

6. (a) red blood cells placed in a hypertonic solution and as a result lost water to the surrounding
thorough osmosis hence shrunk/crenated ;

(b) Appearance of that cell if subjected to the same condition

7. a) Haemolysis

b) Plant cell will lose water the cell sap to the outside solution by osmosis; the cell
becomes plamolysed/ flaccid; but it will retain its shape due to rigid cell wall;

8. a) Haemolysis ;

b) The plant cell will draw in water molecules by osmosis; it will swell and become turgid; but it
will not burst because of the presence of cellulose cell wall;

9. i) Spermatozoon

- Tail – For swimming in vagina tract
- Numerous mitochondria – for provision of energy for swimming
- Streamlined – to reduce friction during movement
- Haploid nucleus – for fertilization of haploid ovum

Palisade mesophyll cell

- Numerous chloroplasts for photosynthesis
- Narrow and cylindrical – packed in small space
- Large sap vacuole for storage of manufactured food;

10. a) Prophase I Reject prophase alone

b) Homologous Chromosomes side by side or Bivalency

c)

Mitosis	Meiosis
One phase	Two phases
Diploid daughter cells	Haploid daughter
No chiasmata formation	Chiasmata formation; Any two correct

Trophism	Tactic response
Growth is involved or brought about cell division	Locomotary
Slow	Fast

Set -up		Number of red blood cells	
	Sodium chloride concentration	At start of experiment	At the end of the experiment
A	0.9%	Normal	No change in number
B	0.3%	Normal	Fewer in number

11. A-no change in; number because 0.9% sodium chlorine solution is isotonic to RBC/blood;

B-fewer in number because 0.3% sodium chloride solution is hypotonic to RBC/blood
therefore some water was drawn in to RDC by osmosis ;leading to haemolysis/boosting of RBCs

b)i)number will not change;
ii)RBC will appear small in size/wrinkled/crenated/shriveled/shrink; 1mk
Rej. Flaccid/flabby/plasmolysed

12. (i) Paranchyma;
(ii) Collenchyma;
(iii) Xylem: and sclerenchyma

13. (a) X – hypotonic solution;

Y – hypertonic solution;

(b) A – haemolysis;

B – crenation /laking;

(c) The cell will maintain/retain its normal shape.

14. Absorption of mineral salts by root hairs from the soil; Translocation of food from leaves to other parts of the plant; movement of salts from one cell to the next;

15. (a) (i) Increased in length, absorbed water through osmosis, (since cylinder cells were hypertonic/ at higher concentration) and become turgid.

(ii) Reduced in length, cylinder host water to the hypertonic sucrose solution/become flaccid.

(b) (i) No change in length

(ii) Cells are dead and cannot carry out osmosis.

(c) - opening and closing of stomata
- Support in plants
- Movement of water from cell to cell
- Feeding in insectivorous plants
- Absorption of water by root hairs
- Absorption of water in the intestines
- Reabsorption of water in kidney nephron.

16. (a) (i) Nucleus

(ii) Maintain the shape of he cell providing support to herbaceous plants; stores sugar and salts; (mark first one)

(b) $\frac{0.5 \times 100}{8}$; 62.5µm;

(c) Hypotonic solution;
Accept -highly concentrated salt/sugar solution

(d) The potato cell sap were lowly concentrated than the surrounding solution; hence lost water molecules by osmosis through the semi permeable membrane to become plasmolysed;

(e) Re-absorption of water from the kidney tubules/ hence important in osmoregulation;

17. a) transpiration

b) prevent evaporation of water from the surface
c) the level of water dropper
d) i) faster drop in water level ii) no change in water level;
iii) slower/very slow drop in water level;
e) another set up using a leafless twig;