

S.2 Work book

New
for
2022

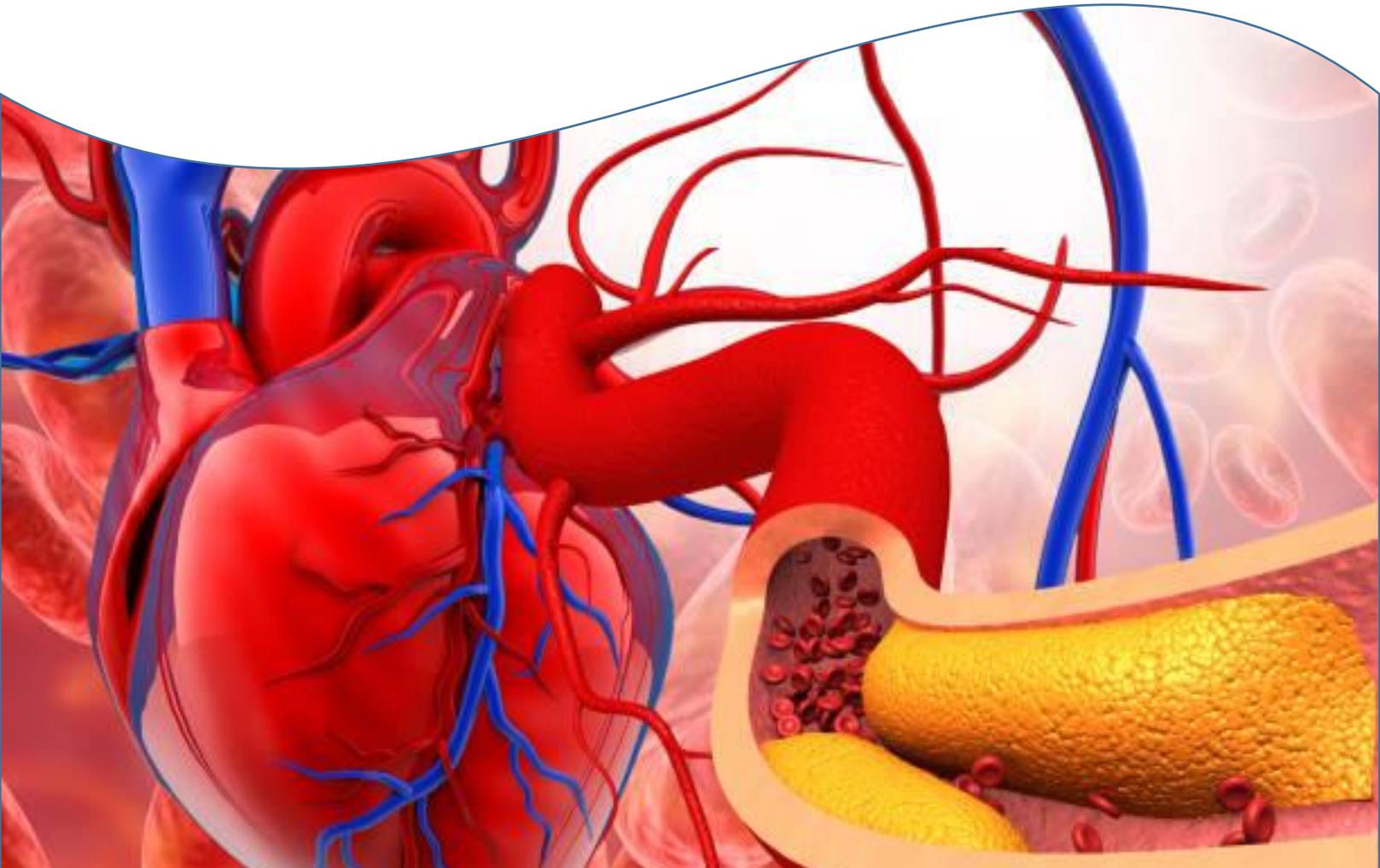
BASED ON THE NEW CURRICULUM

With guide notes, practical, application qns, projects,
Field work, group activities and activities of integration

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Biology

LUMASA RICHARD



New curriculum work book for s.2

Biology

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1

PHYSICAL AND CHEMICAL PROPERTIES OF SOIL

Introduction

Soil is the loose surface material that covers the earth's surface. It consists of organic matter, inorganic matter, water, air and humus. It provides a medium in which plants grow, a habitat for animals, and it stores water. Soil is a vital to life on earth.

.1.1 Types of soil

Soil is divided into three types namely;

Sand soil



clay soil



loam soil



Group activity

a) You are provided with the three types of soil; clay, loam and sand soil. You are required to state the characteristics of each soil type. Touch and feel the texture and size of the soil particles of each type, look at the colour of each soil type. Carry out more research with your group members and state as characteristics of each soil type.

Characteristics of clay soil.

.....

.....

.....

.....

Characteristics of sand soil

.....

.....

.....

.....

Characteristics of loam soil

.....

.....
.....
ii) Why do you think rice is grown in that type of soil?

.....
.....
iii) Briefly describe the features of that type of soil which enable rice growth.

.....
.....
iv) Give one example of an area in Uganda where rice is grown.

.....
The picture below shows growing of red skinned sweet potatoes in a particular type of soil.



i) With reasons, state the type of soil from the picture in which sweet potatoes are being grown

Type of soil

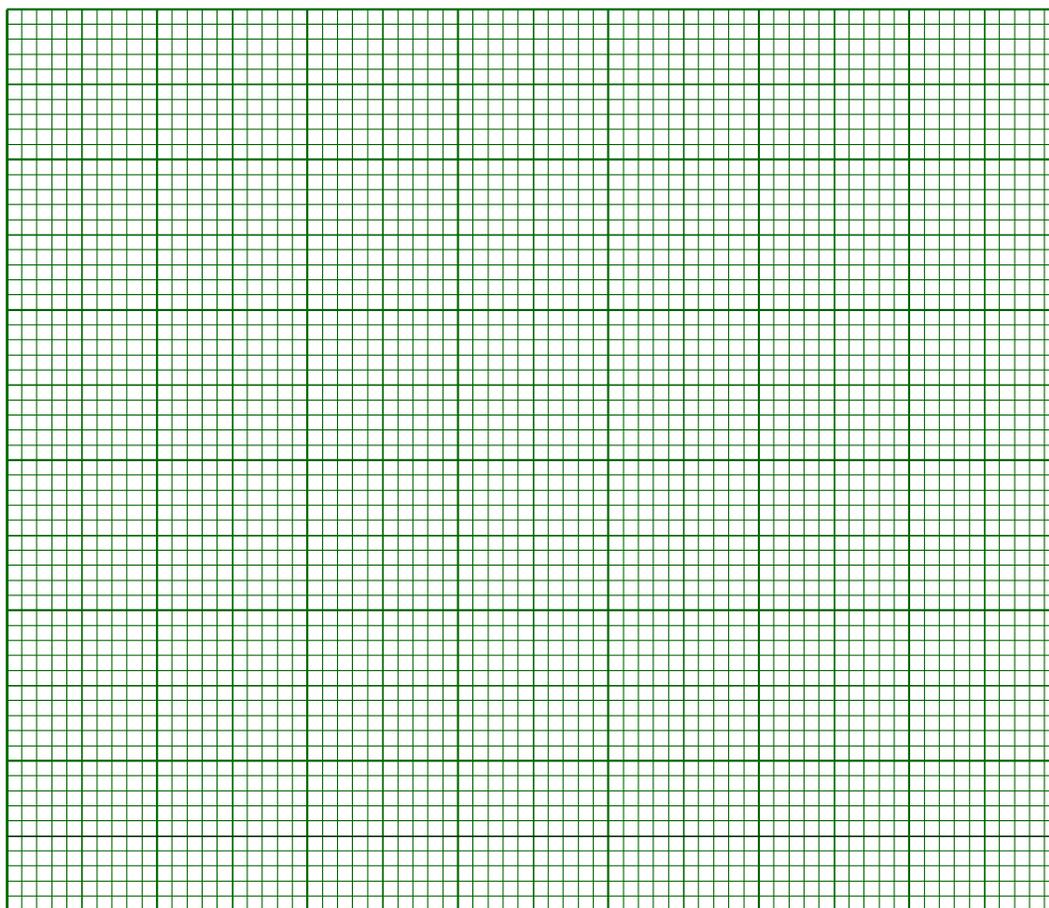
.....
Reasons

.....
.....
ii) Why do you think red sweet potatoes are being grown in that type of soil?

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Time (hours)	Amount of water collected (cm ³)		
	A	B	C
0	0	0	0
1	10	20	30
2	24	40	60
3	36	52	78
4	40	54	82
5	40	56	84

a) Plot a graph.



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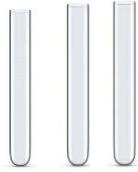
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Group activity; in groups, you are required to carry out an experiment to test for soil PH of soil samples.

Requirements



Petridish



Test tubes



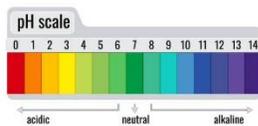
Stop watch or stop clock



Spatula



Distilled water



PH colour chart



Universal indicator



Loam soil



Sand soil



Clay soil

Procedures

- Place 3 spatula end full of a particular soil samples in a Petridish.
- Souk the soil in distilled water and add 3drops of the universal indicator. Leave it to stand for 30minutes.
- Tilt the Petridish so that the indicator solution drains out of the soil into a test tube.
- Compare the indicator colour with the PH colour chart and identify the PH of the soil sample.
- Repeat the procedure with the other two remaining soil sample.
- Note down the observations for each soil sample.

Qn; Write down a report about your investigation and also describe the importance of soil PH.

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Y

c) Which soil component is being investigated in the two experiments?

.....

ii) State the importance of the soil component mentioned in c above. Give 3

.....
.....
.....

2. The picture below show a particular living organism within soil



a i) Name the living organism shown in the soil.

.....

ii) Explain 3 ways the organism maintains the soil in a condition suitable for crop growing.

.....
.....
.....
.....

b i) How does the organism benefit from the soil?

.....
.....

ii) Mention any other two living organisms found in soil

.....

CHAPTER 02

SOIL EROSION AND SOIL CONSERVATION



By the end of this chapter, you should;

- a) Know the features of a fertile soil
- b) Understand the process of soil erosion and factors leading to it.
- c) Understand the causes of reduced soil fertility
- d) Outline the processes involved in the nitrogen cycle

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2.2 The processes of soil erosion

Soil erosion is the process of displacement of the upper layer of soil from one place to another by water wind and animals.

Agents of soil erosion



Running water



Wind



Animals



The **process of soil erosion** occurs in three stages i.e. detachment, transportation, deposition.

At the soil surface, **detachment** of soil particles from the bulk of the soil body occurs due to raindrop impact or blowing wind.

The degree at which detachment occurs depends on the rainfall or wind intensity, vegetation cover on the soil and soil strength.

The detached soil particles are then transported by running water or blowing wind from the parent soil body. This process is known as **transportation**.

Soil particles are then now deposited to another place away from the soil body.

Deposition is initiated by a decrease in the flow velocity of water. Deposition can also be called **sedimentation**.

Group activity; the pictures below shows three different lands.

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b) The picture below shows a particular method used to control soil erosion. Use it to answer the questions that follow.



a) Name the method of controlling soil erosion shown above. (01 mark)

.....

ii) State and describe the pattern followed when practicing the method above
Pattern (01 mark)

.....

Description of the pattern (03 marks)

.....

.....

.....

.....

b) One of the ways of controlling soil erosion is mulching.

Briefly describe the importance of mulching in;

i) Soil water conservation. (03 marks)

.....

.....

.....

.....

.....

.....

ii) Soil conservation (02 marks)

.....

.....

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.....

.....

2.3 Reducing soil fertility

Soil fertility is the ability of soil to supply nutrients in adequate amounts and in available forms for crops to produce high yields.

The pictures below show activities which can cause reduced soil fertility. Use them to answer the questions that follow.



A



B



C



D



E



B

a) Identify the activities

.....

.....

.....

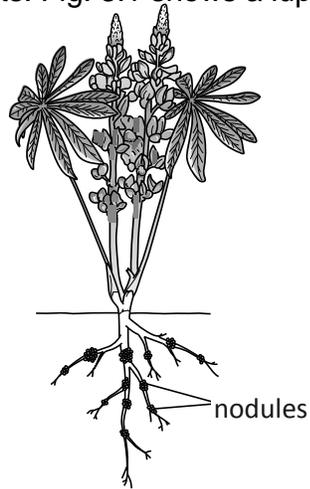
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Chapter 02 application questions.

1. Lupins are leguminous plants. Fig. 3.1 shows a lupin plant with nodules on its roots.



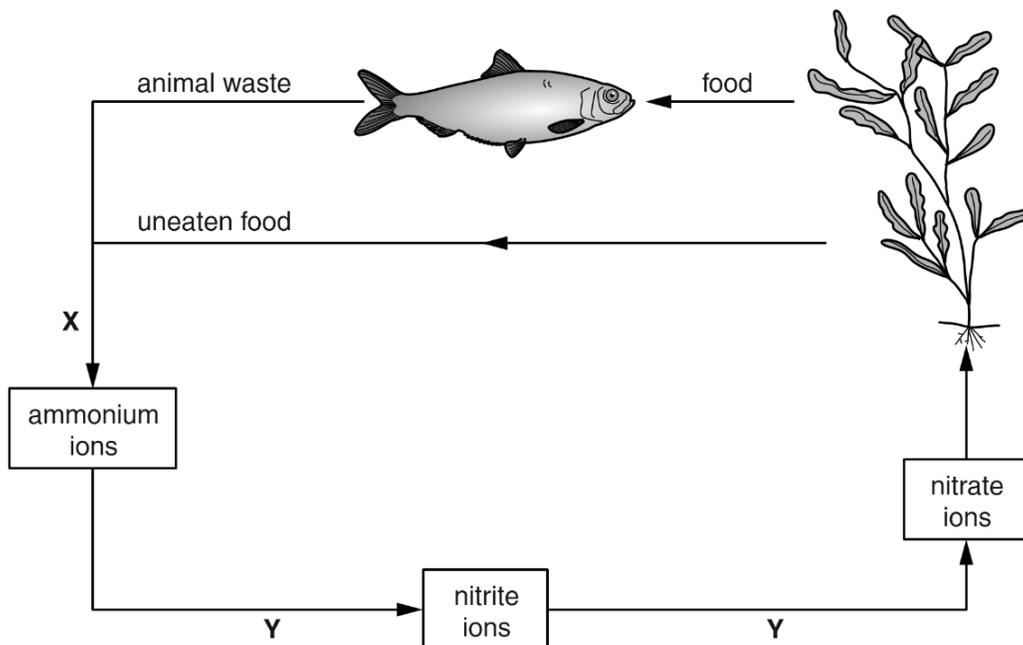
a(i) State the type of microorganism found in the nodules.

.....

(ii) Explain the role of these microorganisms in the nitrogen cycle.

.....
.....
.....

b) Fig. 5.1 shows some of the interactions that take place in an aquatic ecosystem.



3

NUTRITION TYPES AND NUTRIENT COMPOUNDS

3.1 The meaning of nutrition

Nutrition is the process by which organisms obtain food to maintain their life functions.

Why do organisms carry out nutrition?

- To get energy
- To build their bodies
- To be health

Types of nutrition

Nutrition is divided into two types namely;

Autotrophic nutrition

Heterotrophic nutrition

Autotrophic nutrition

Is the mode of nutrition where organisms make their own food.

Organisms that carry out autotrophic nutrition include;

Plants

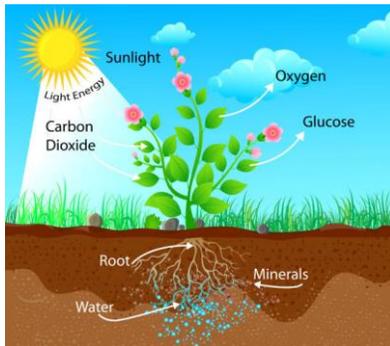
Euglena

Purple sulphur bacteria

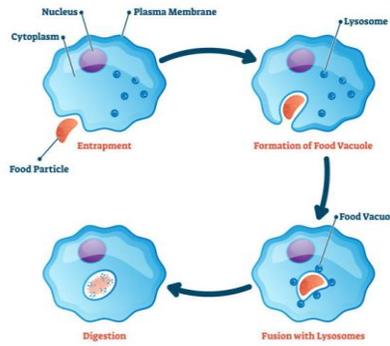
Heterotrophic nutrition

Is a mode of nutrition where organisms feed on already made food?

Group activity; The pictures below show different modes of heterotrophic and autotrophic nutrition. Use them to answer the questions that follow.



A



B



C



D



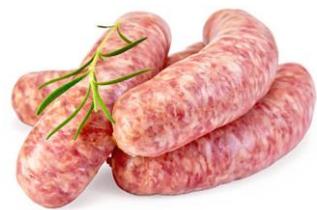
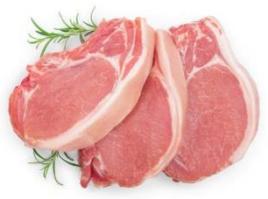
E



F

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Group activity; Identify the name of the source which contain proteins shown in the picture below.



Z

.....
.....
.....

W

.....
.....
.....

3.4. Balanced diet

Is a meal which contains all food values in there right amounts.

A balanced diet is important in maintaining the overall health of an individual.

The amount of nutrients needed in the body varies among various people.

Group activity: in your groups, describe the balanced diet you would give to the people below



A



B



C



D



E



F



Signs of anorexia

- Very restricted patterns of eating
- Intense fear of weight
- Unwillingness to maintain a healthy weight

2. Bulimia:

Is an eating disorder characterized by people eating unusually large amounts of food in a specific period of time. It is characterized by an controlled episodes of over eating forced by purging by self-induced vomiting, misuse of laxative



Signs of bulimia

- ❖ episodes of over eating
- ❖ self-induced vomiting
- ❖ smelling like vomit

3. Binge eating diseases:



Is an eating disorder characterized by recurrent episodes of eating large quantities of food often quickly to the point of being uncomfortable. It is more common in adolescent, people with diabetes. However, old people can be affined to.

Signs and symptoms of eating disorder

- Disappearance of large amounts of food in a short period of time indicating consumption of large amounts of food
- Fear of eating with others

Chapter 03 application questions.

1. The table shows the amounts of four nutrients required by four people for a balanced diet.

person	protein / g	iron / mg	calcium / mg	vitamin C / mg
14 year-old boy	66	11	700	25
14 year-old girl	55	13	700	25
30 year-old woman	53	12	500	30
30 year-old pregnant woman	60	14	1200	60

(i) Explain why there is a difference in the amount of protein required by the 14 year old boy and the 30 year-old woman.

.....

.....

.....

.....

ii) Explain why there is a difference in the amount of iron required by the 14 year-old girl and the 14 year-old boy.

.....

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.....

.....

iii) Explain why there is a difference in the amount of calcium required by the two 30 year-old women.

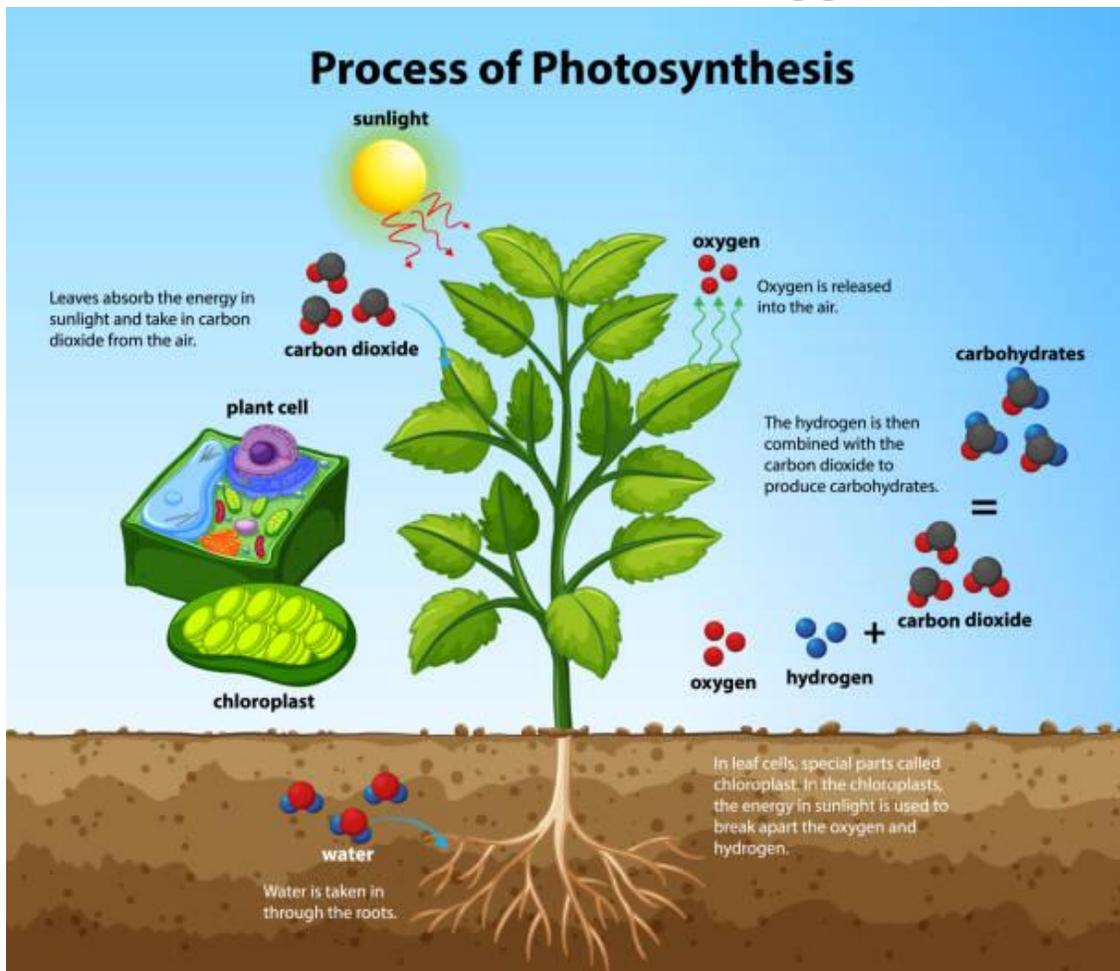
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CHAPTER 04 NUTRITION IN GREEN PLANTS



By the end of this chapter, you should be able to;

- Understand the meaning of autotrophic and heterotrophic nutrition.
- Define and describe the process of photosynthesis
- Perform experiments to investigate the factors that affect the rate of photosynthesis
- Appreciate the structures and adaptations that enable at least to carry out photosynthesis.

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a) How does the woman benefit from the plants in picture B?

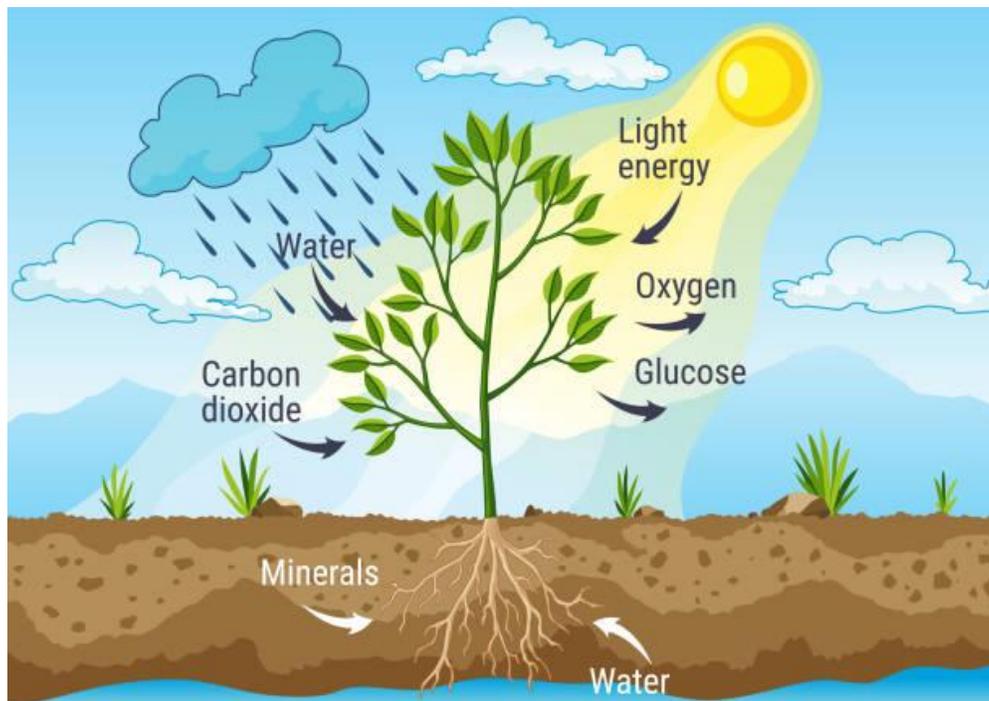
4.2 Photosynthesis

Is the process by which green plants and some other organism use sunlight to synthesize nutrients from carbon dioxide and water.

Photosynthesis involves two raw materials, two conditions and two products.

The two **raw materials** are water and carbon dioxide, the two **conditions** are sunlight and chlorophyll. The two **products** are starch and oxygen.

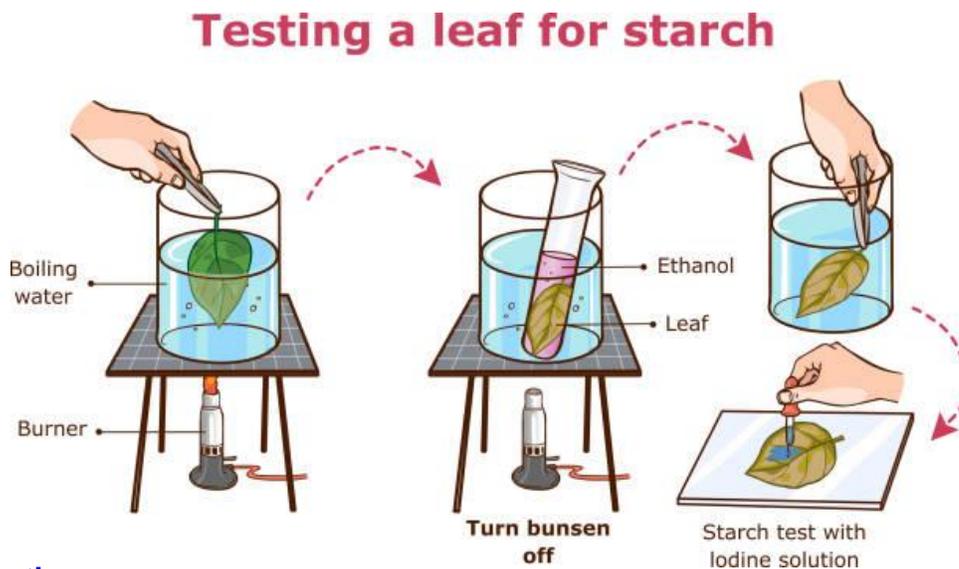
Group activity; the picture below shows the process of photosynthesis. Use it to answer questions that follow.



Procedure

- Get a leaf from a health green plant which has been receiving light.
- Dip the leaf in boiling water for about 5 minutes
- Place the leaf in the test tube containing alcohol and leave the test tube in the water bath until it becomes white
- Dip the leaf in warm water to swollen it.
- Lay the leaf on a white surface and add drops of iodine solution on it.

Setup



Observation

The leaf turns blue – black

Conclusion

The leaf contains starch.

Questions

Explain why the following was done when testing for starch

- i) Placing the leaf in hot water

.....

.....

- ii) Boiling the leaf in alcohol

.....

.....

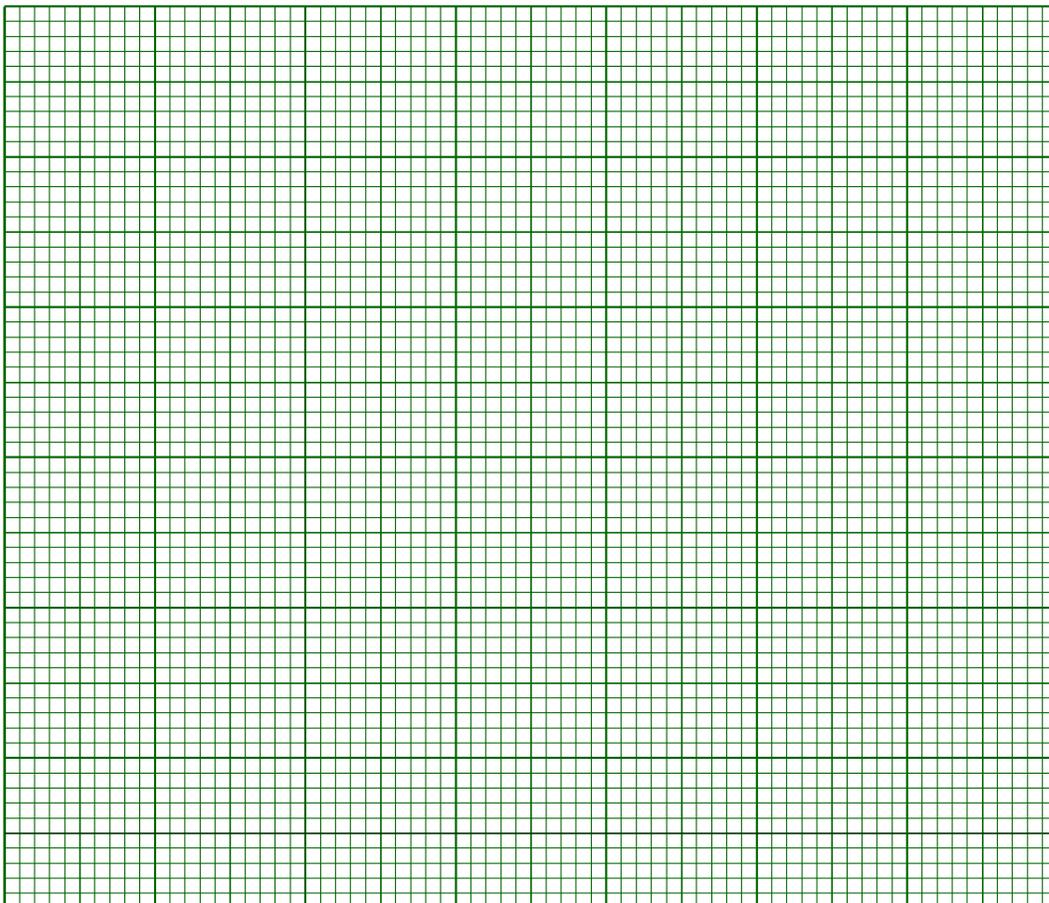
Dipping the leaf in warm water after boiling it in alcohol

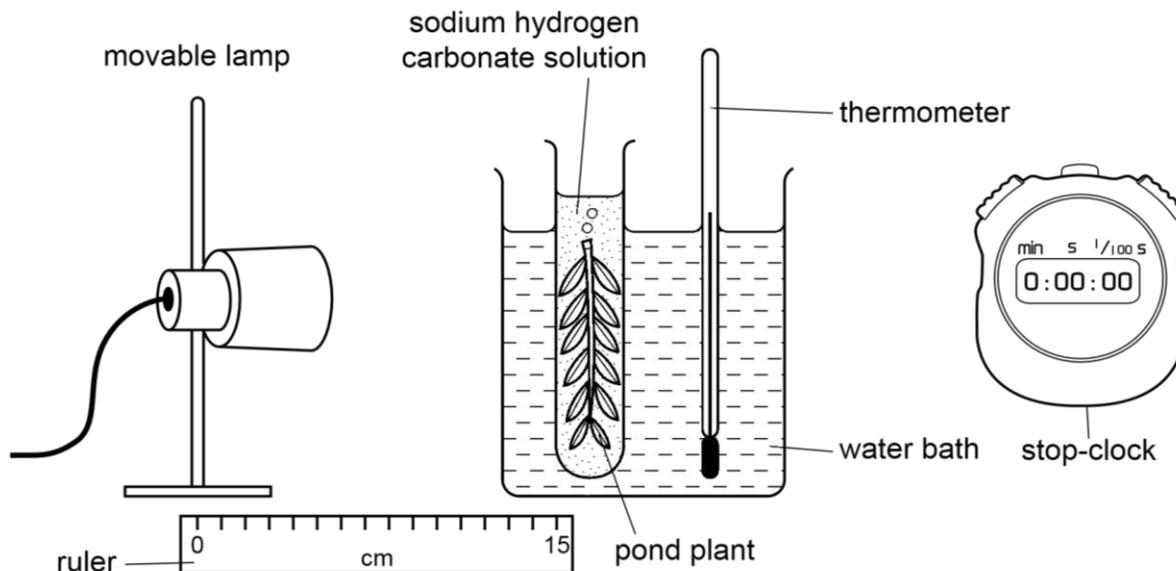
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- Place the boiling tube with pond weed in water in each of the beakers. Add same amount of sodium carbonate in each boiling tube to provide carbon dioxide.
- Leave the boiling tube in water baths in sunlight for one minute and then after observe and record the number of bubbles produced per minute over five minutes at each temperature. **Record your results in a table.**

Time (min)	Number of oxygen bubbles		
	At 10 ⁰ c	At 30 ⁰ c	At 60 ⁰ c
0	0	0	0
1			
2			
3			
4			
5			

Use the data you have obtained, plot a graph of estimated number of bubbles against time.





a) Explain how the student made sure that the results were due to only the changes in carbon dioxide.

.....

.....

.....

b) The student repeated the investigation at each concentration and calculated the rate of photosynthesis. The student's results are shown in table below.

carbon dioxide concentration / %	rate of photosynthesis / number of bubbles per minute			
	1st	2nd	3rd	mean
0	3	2	4	3
0.1	6	4	5	5
0.2	12	7	11	
0.3	14	15	16	15
0.4	18	22	21	20
0.5	19	23	21	21

Calculate the mean rate of photosynthesis when the carbon dioxide concentration was 0.2% and write your answer in the table.

.....

.....

.....

CHAPTER 05



By the end of this chapter you should able to;

- a. Understand how enzymes influence life process.
- b. Explain factors which affect enzymes activity
- c. Identify the type of teeth
- d. Understand how and products of digestion are adsorbed and assimilated.
- e. Understand the importance of oral hygiene

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Group activity; the pictures below show sectors where enzymes are applied in daily life.



A



B



C



D

a) Identify the sectors where enzymes are used.

A B

C D

b) Outline three examples of enzymes involved in sector A, each stating its function

.....
.....
.....

c) For each sector, brief describe how enzymes are used.

.....

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3). Explain your observations for the test tubes at;

5⁰c

.....

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.....

.....

40⁰c

.....

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.....

.....

60⁰c

.....

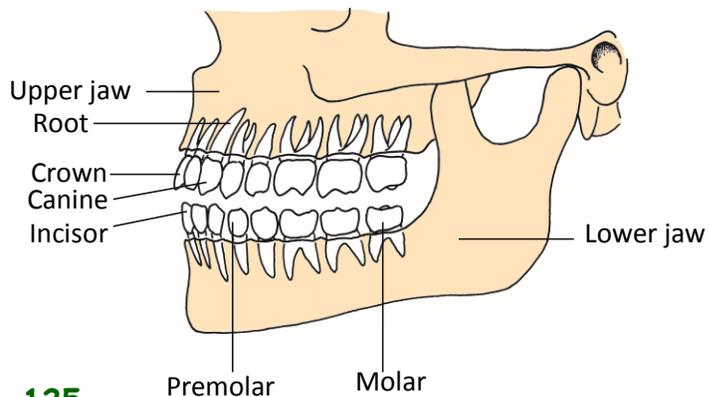
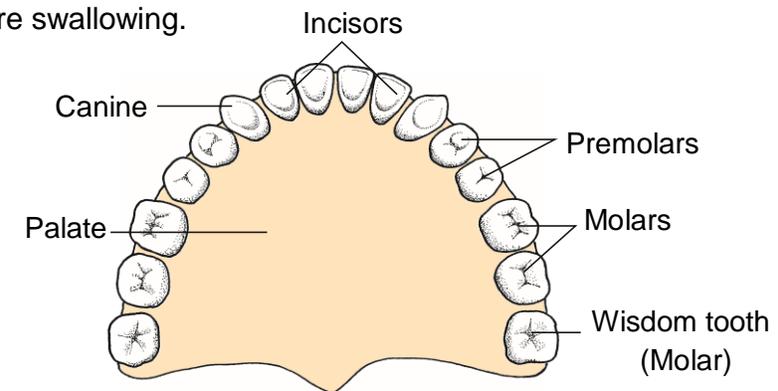
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5.2 The mammalian teeth

Mammals have different type of teeth depending on what they eat. Mammals use teeth to cut, chew, and bite food before swallowing.



b) Study the picture below



i). what do you see in this picture.

.....

ii). Outline the cause of what your see in the picture.

.....
.....
.....

iii). Why do children have more teeth decay.

.....
.....

1.4 Digestive system

Is a body system made up of organ that are important for breakdown of food absorbing the end products.

It consists of the mouth, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and anus

The digestive system breakdown and absorbs nutrients from the food you consume to use for important thing like energy, growth and repairing cell.

Group activity; the picture below a digestive system. Name all the parts labelled

Group activity; food test on enzyme activity,

1. You are provided with solution K which contains common food substance. Carry out the following experiment to verify the food substance present in K. Record your observations and deductions in the table below.

Test	Observation	Deductions
i) To 1 cm ³ of solution K in a test tube add 3 drops of Iodine.		
ii) To 1cm ³ of K in a test tube, add 1 cm ³ of Benedict's solution and boil for a minute		
iii) To 1cm ³ of K add 1cm ³ of dilute hydrochloric acid and boil for. Cool under a running tap and add then add 1cm ³ of sodium hydroxide solution. Add 1cm ³ of Benedict's solution and boil again.		

Identify the food substance reacting in solution K

.....

b) Rinse your mouth with warm water and collect about 5ml of saliva in a test tube. Dilute the saliva with distilled water to make 10ml of solution. Label this solution T.

- ✓ Label three test tubes A, B and C. Add to each of the test tubes the contents indicated in the table below all maintained between 35^oC to 40^oC
- ✓ Keep the test tubes in a test tube rack for 15 minutes.

c). define assimilation and describe how the body uses different food nutrients.

.....

.....

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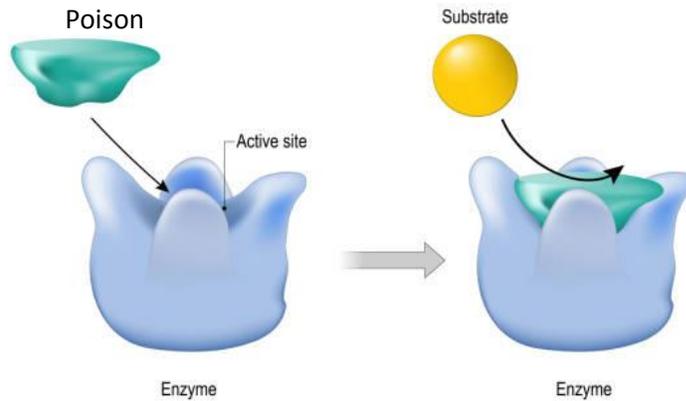
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Activity of integration

Enzymes are important for most of the reactions within the body but they can easily be affected by poisons. You have been chosen to explain to the people in your village the effects of poison on enzymes and on the body and the reasons why they need to keep rat poisons far away from their children

Support material



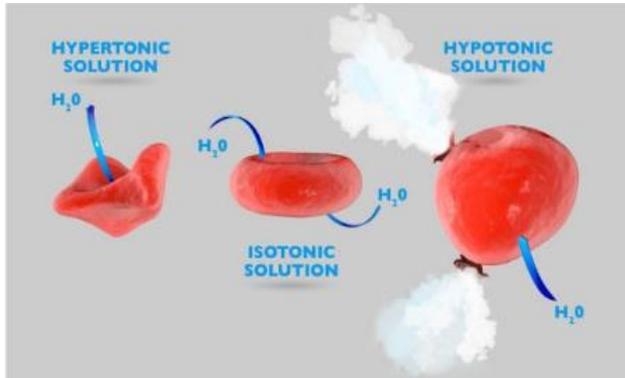
TASK

Write down your sensitization message in the space below.

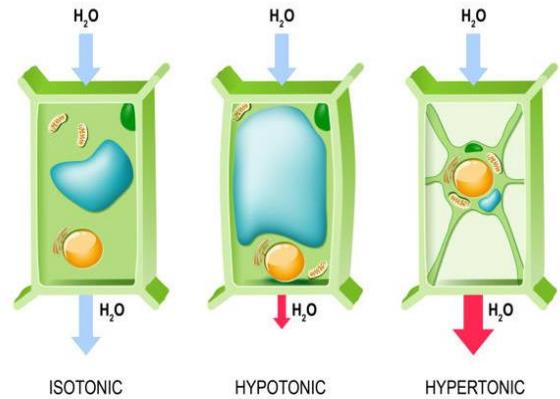
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Group activity. The figures below show animal cell and plant cell placed in different solutions. You are required to explain the effect of the solutions onto the cells.

a) Animal cell



b) plant cell



a)

.....

.....

.....

.....

.....

.....

.....

b)

.....

.....

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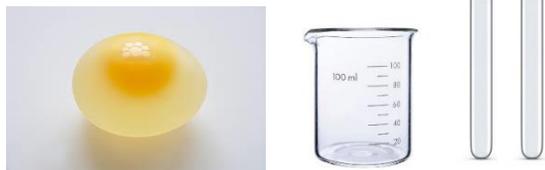
Group activity; You are required to demonstrate osmosis in a non-living tissue

Requirements

Beaker, distilled water, visking tube, 10% glucose solution, heat source, measuring cylinder, benedict's solution and thread.

Group activity; Investigating osmosis on raw unshelled eggs

Requirements



Raw unshelled eggs Beakers Test tubes Sucrose concentrations 0.0M, 0.5M, and 1.0M.

Using the materials you have been provided with, design an experiment to show the effect of sucrose of different concentrations on raw unshelled eggs.

Note down your observation, make conclusions and explanations in the space below

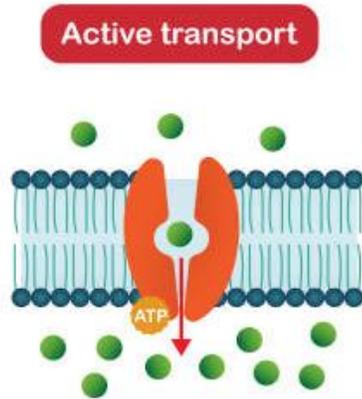
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Active transport

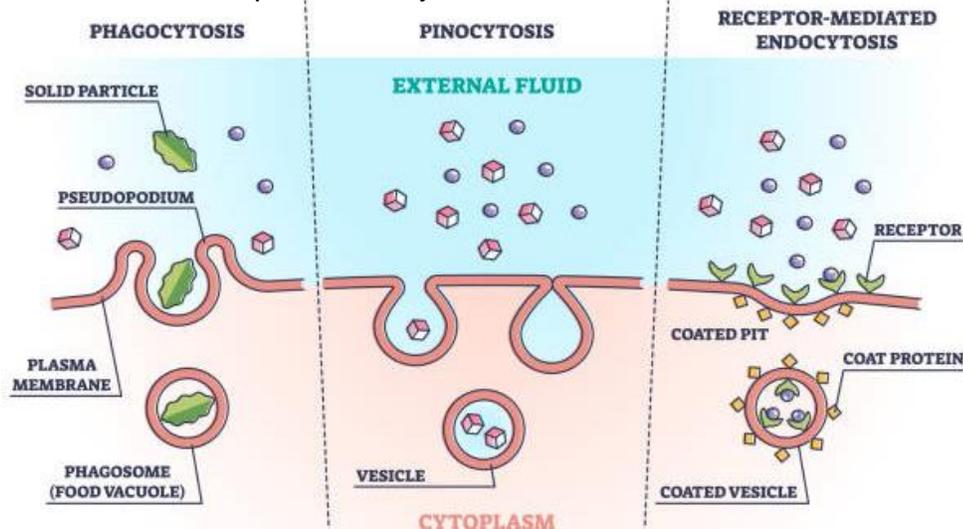
Is the movement of molecules from a region of low concentration to a region of high concentration using energy. Molecules move against concentration gradient using energy got from respiration.

Examples of active transport

- Absorption of ions from soil to plant roots.
- Movement of calcium ions between cells
- Minerals travelling through a stem
- Exchange of sodium and potassium ions a/ PHAGOCTOSIS



The pictures below show other processes by which substances move into cells.



Describe how the following occur;

i) Phagocytosis. (also give examples where it occurs)

.....

.....

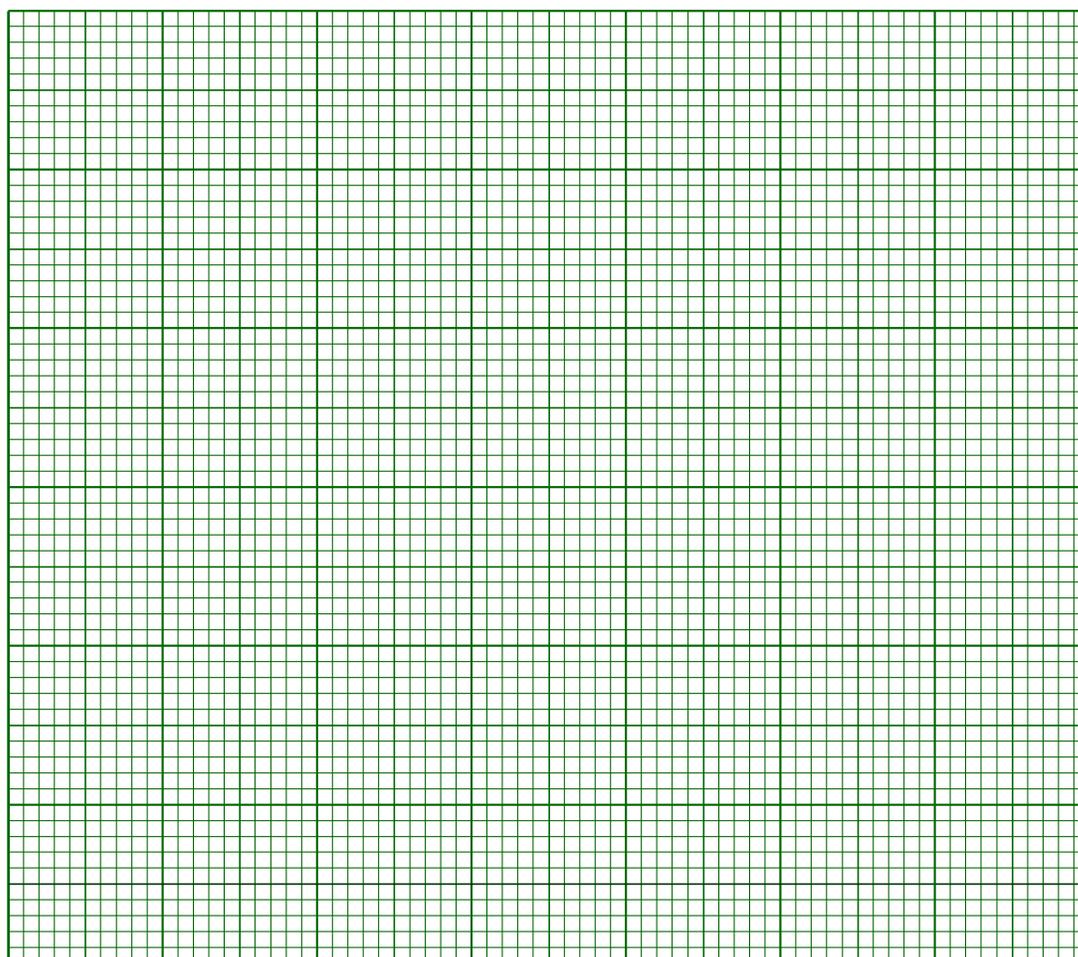
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Group activity; Table 4.1 shows the loss of water vapour by two similarly-sized potted plants, **F** and **G**, grown in the same environment over a period of 12 hours.

Table 4.1

time of day /hours	water vapour loss /arbitrary units	
	plant F	plant G
08.00	1.0	5.2
10.00	2.0	13.8
12.00	5.8	14.8
14.00	4.8	9.2
16.00	3.6	6.8
18.00	3.0	4.4
20.00	2.0	1.0

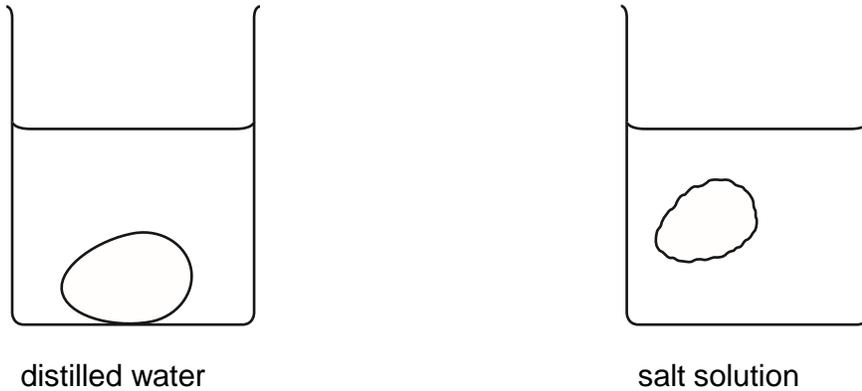
a) Plot a suitable graph for the data above



Chapter 06 application questions.

1 Two uncooked hen's eggs of similar size were submerged in acid to dissolve the shell. The contents of the eggs are left intact, enclosed by the egg membrane. Use One de-shelled egg has been placed in distilled water for 2 days. The other egg has been placed in salt solution for 2 days.

Fig. 1.1 shows the two eggs after two days.



(a) (i) Complete the table to compare the two eggs.

	egg in water	egg in salt solution
b) size of the egg		
position in the liquid		
external appearance of the egg		

Suggest an explanation for these differences.

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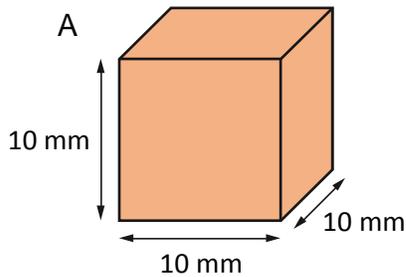
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7.1 surface area to volume ratio

It's the amount of surface area per unit volume of an object. It is used to explain diffusion of small molecules, water loss by animals, organism's thermoregulation etc.

Examples of calculations involving surface area to volume ratio

1. Calculate the surface area to volume ratio of the cubes below.

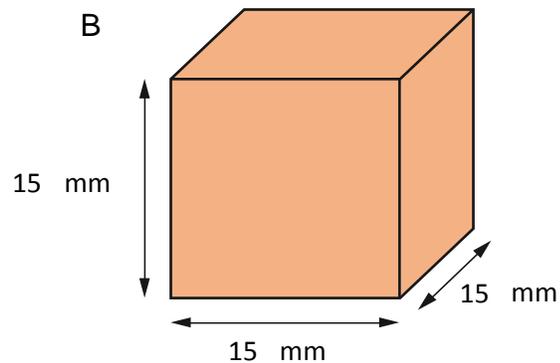


For cube A,

$$\begin{aligned} \text{Surface area} &= 6S^2 \\ &= 6(10 \times 10) \\ &= 600 \text{ mm}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume} &= S^3 \\ &= (10 \times 10 \times 10) \\ &= 1000 \text{ mm}^3 \end{aligned}$$

$$\begin{aligned} \text{Surface area : volume} &= \frac{\text{surface area}}{\text{Volume}} \\ &= \frac{600 \text{ mm}^2}{1000 \text{ mm}^3} \\ &= 0.6 \text{ mm}^{-1} \end{aligned}$$



For cube B

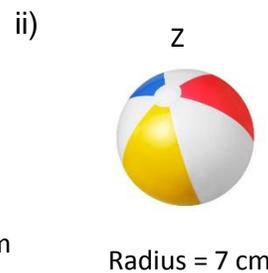
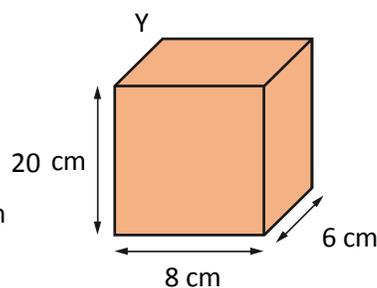
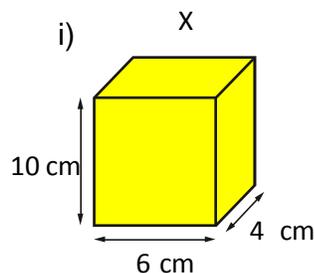
$$\begin{aligned} \text{Surface area} &= 6S^2 \\ &= 6(15 \times 15) \\ &= 1350 \text{ mm}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume} &= S^3 \\ &= (15 \times 15 \times 15) \\ &= 3375 \text{ mm}^3 \end{aligned}$$

$$\begin{aligned} \text{Surface area : volume} &= \frac{\text{surface area}}{\text{Volume}} \\ &= \frac{1350 \text{ mm}^2}{3375 \text{ mm}^3} \\ &= 0.4 \text{ mm}^{-1} \end{aligned}$$

Note; from the examples we can see the smaller the object, the larger the surface area to volume ratio.

Group activity; a) Calculate the surface area to volume ratio for the objects below



Closed circulatory system

Is a type of a circulatory system where blood is contained in blood vessels, circulating unidirectionally from the heart to tissues then returns to the heart again.

Examples of animals with a closed circulatory system

Mammals, fish, earthworm

Characteristics of closed circulatory system

- Blood is kept in vessels.
- Pressure can be maintained
- Flow can be maintained
- Flow can be directed from certain tissues or organs.

Advantages of a closed circulatory system

- It is efficient in delivering oxygen throughout an organism.
- It provides more pressure for blood to reach to higher levels of distribution
- Blood transfer is faster thus nutrients and wastes are transported faster.

Dis advantages of a closed circulatory system

- It requires more energy for blood distribution.
- Pressure changes can impact an organism negatively.
- There is a high resistance for movement of blood in vessels.

Types of closed circulatory system

- Single circulatory system
- Double circulatory system.

Single circulatory system

Is the type of closed circulatory system where blood passes only once through the heart in each complete circuit of the body. It occurs in fishes.

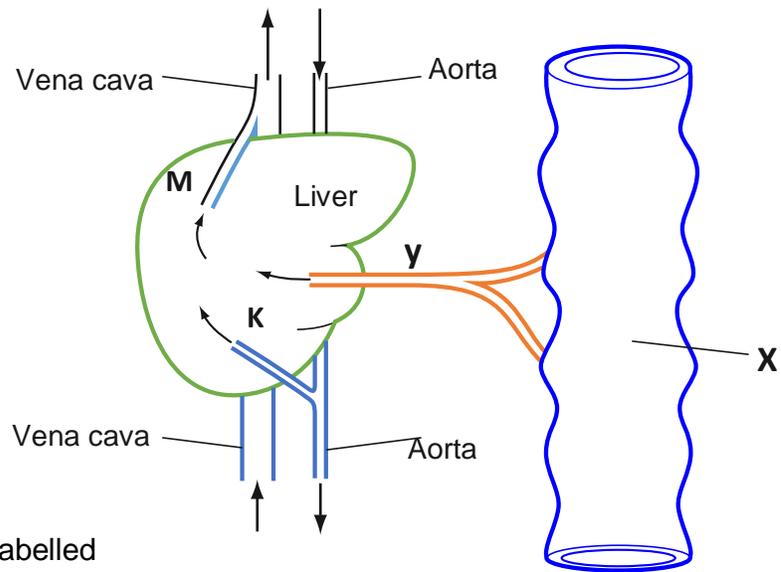
Double circulatory system.

Is the type of closed circulatory system where blood passes twice through the heart making one complete round through the body. It occurs in humans.

It consists of pulmonary circulation where blood flows from the lungs to the heart and systemic circulation where blood flows from the heart to all body parts.

Gut

Group activity; the figure shows the blood supply for the liver of a mammal.



i) Name the parts labelled

X Y
 M K

ii) Compare blood vessels Y and M

Blood vessel Y	Blood vessel M

Similarities

.....

iii) Compare blood vessels K and M

Blood vessel K	Blood vessel M

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7.10 Lymph

Lymph is a collection of extra fluid that drains from cells and tissues and that is not reabsorbed back into the capillaries.

Lymph is colourless, and circulates through the lymphatic system. The picture below shows the formation of lymph.

