



2023

HARROAN

S.2

BIOLOGY

Learner's book

Second edition

With 100

Lesson periods

2023

Guide notes

Group activities

Project guidelines

Practical

Questions

And more

Revised from 2022 version and
reviews from those who used it

NEW



HARROAN'S

New curriculum learner's book for



s.2
Biology

This book has been made & revised basing on new curriculum for lower secondary education syllabus

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By the end of the chapter you should:

- Identify the different types of soil
- Describe the constituents of soil.
- Describe the physical properties of soil
- Describe the chemical properties of soil.

NCDC TOPIC PROPOSED TIME FOR THE CHAPTER

Lesson Periods - 22

Weekly biology periods - 3

Coverage time - 7 and a half weeks

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Lesson period 1.1 Investigating characteristics of soil types

1

Introduction

In this period, you are required to investigate and outline the characteristics of soil types

Lesson learning objectives;

- to define soil
- to outline characteristics of each soil type

Guide notes

SOIL

Soil is the loose surface material that covers the earth's surface. It consists of organic matter, water, air, minerals and living organisms

Soil provides a medium in which plants grow, a habitat for animals, and stores water. Soil is vital to life on earth.

Types of soil

Soil is divided into three types namely;

Sand soil, clay soil and loam soil.



Sand soil



Clay soil



Loam soil

Sand soil

Is a type of soil made up of sand particles from weathered rocks. It consists of relatively large particles when compared to other types of soil. It is commonly found in desert landscapes. Sandy soils warm quickly in sunlight and retain less moisture and nutrients than other types. Sandy soils lack many of the nutrients and the conditions necessary for growing certain plants. Though sand soil has a low humus and nutrient content, it can still favour the growth of few plants with a strong root system. Sandy soils can be made fertile by adding organic matter, laying down a layer of mulch and installing a drip irrigation system

Clay soil

Is a type soil made up of very fine mineral particles and not much organic matter. It is quite sticky since there is no much space between the mineral particles. It tends to be more nutrient rich than the other types of soil. This is because the particles that make up clay soil are negatively charged, which means they attract and hold positively charged particles such as calcium, potassium and magnesium. Clay soil is slow to warm and has a tendency to be alkaline in PH. Clay soil is commonly found near fresh water lakes, ponds and rivers. Clay soil can be improved by adding compost. Compost improves drainage and reduces compaction of clay soil.

Note, compost is a mixture of ingredients used to plant fertilizer to improve the soil physical, chemical and biological properties

Loam soil

Is a type of soil made of a healthy balance of sand, silt and clay soils. Loam soil can hold water for some time but still it can drain easily at a rate of about 6 to 12 inches per hour. It is rich in nutrients and minerals. It is loose enough that roots spread out and grow strong. Sand makes 40% of loam soil and also silt makes 40% and clay the remaining 20% of the total soil by volume. Loam describes the ideal soil composition for most garden plants (although some plants require sandy soil and even some require clay soil). Loam holds nutrients and has a texture that retains water long enough for plant roots to access it; yet it drains well- meaning that water eventually seeps away so that plant roots don't sit in water and rot

How sand, silt and clay work together in loam soil

- Sand does not hold water but it lends good aeration and drainage as a component of loamy soil
- Clay contains compact particles, so it's not great for allowing air, water and plant roots through. However, clay soil tends to be higher in nutrients thus lends high mineral content to loamy soil.
- Silt is the medium-size particle with better moisture retention than sand but fewer nutrients than clay
- Silt helps sand clay mix together more readily

Group activity 1

In groups of 3 to 5 students, carry out the following investigations and outline the characteristics of the given soil types

Materials to be used

- 3 soil types labeled A,B and C, Filter funnels, Measuring cylinders, Beakers, Filter papers and Water

Procedure

- Touch and feel the texture and size of the soil particles in each soil type
- Look carefully and observe the colour of the soil type
- For each soil sample, place it in a filter funnel with a filter paper. Place the funnel on the measuring cylinder. Add water to the soil, observe and record the amount of water collected

- a) Outline the characteristics of each soil sample in the table below

Feature	Soil A	Soil B	Soil C
Size of particles			
Drainage			
Rentention			
Texture			
Colour			

- b) From your characteristics, identify the soil types given

A B C

- c) With reasons, state the soil types with

- i) Smallest air spaces

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ii) Largest air spaces

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iii) Medium air spaces

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Lesson period 2 1.2 importance of each soil type

Introduction For this period, you are to describe the importance of each soil type

Lesson learning objectives; • To describe the importance of each soil type

Guide notes

Importance of soil in crop growth

Soil supplies the essential nutrients, water, oxygen and root support that plants needs to grow and flourish. They also serve as a buffer to protect delicate plant roots from drastic fluctuations in temperature

Crops grown in loam soil



Banana growing in loam soil

Loam soil is the best soil type for growing most crops though some crops can grow in clay and even some in sand. Loam favours the growth of most plants because it holds most of the moisture but also drains well so that sufficient air can reach the roots. It also contains humus providing fertility to the soil

Examples of crops grown in loam soil include; sugarcane, cotton, tomatoes, onions, green beans, cucumbers, banana etc.

Crops grown in sand soil

Though sand soil has a good drainage system, it is also warm, light, dry and tends to be acidic with low nutrients. Therefore, it favours crops which require very few nutrients to grow. Organic matter can be added to sand soil to provide plants an additional boost of nutrients by improving the nutrient and water holding capacity of the soil.

In countries of desert region or areas located near the coast, sand soil is used for crop growth but since it does not hold water and nutrients for long, it is mixed up with compost to boast organic matter which increases nutrients obtained by plants and also plants are watered by irrigation regularly



Crops that can grow in sandy soils include; potatoes, carrots, lettuce, corn etc.

The picture on the left shows a man harvesting red skinned sweet potatoes from sand soil.

Organic matter is added to sand soil to provide plants an additional boost of nutrients

Crops grown in clay soil

Clay soils are considered to be one of the heavier soils. They can hold nutrients and water for a long period of time

The good water storage quality makes it hard for air to penetrate into it and its compactness makes it hard for plant roots to easily penetrate and flourish

Poor drainage makes it wet with much water which could make plant roots to rot

However, clay soil can be improved over time;

- By adding a limming agent like calcium which causes clay particles to clump thus improving its drainage (though this works in acidic soils)
- By adding organic matter. This will loosen the bulkness and hardness of clay soil making it easy to work on and easy for penetration of plant roots.

Crops grown in clay soil include; red cabbage, green cabbage, rice, broccoli, pea, potato



Rice growth in clay during dry season



Rice growth in clay during wet season

Group activity 2

In groups of 3 to 5 students, look at the pictures below, discuss about them, answer the questions that follow and present to the class. The pictures below show various uses of soil, for each, identify the use, the soil type and describe how the use is important to our community



A



B



C



D

a) Identify how soil is used in;

A..... B.....

C..... D.....

b) Identify soil type used in;

A..... B.....

C..... D.....

c) Briefly describe the importance of the uses of soil in the pictures to the environment and our society

A.

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B.

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C.

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D.

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d) Describe other uses of soil

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Lesson period

3

Introduction

For this period, you are to write a sensitization message on the use of soil and present to the class



Nsotoka is one of the remote areas in Uganda, most people living in the village are uneducated and they are so poor. You have been chosen to write a sensitization message to people living in the village on how they can use soil to come out of poverty. Present before the class

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By the end of the 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

NCDC TOPIC PROPOSED TIME FOR THE CHAPTER

Lesson Periods - 14

Weekly biology periods - 3

Coverage time - 4 and a half weeks

Lesson period 18 2.1 Features of a fertile soil

Introduction For this period, you are to describe the importance of the features of a fertile soil

Lesson learning objectives: • To outline the features of a fertile soil
• To describe the importance of the features of a fertile soil

Guide notes

Features of a fertile soil

Soil fertility is the ability of soil to sustain plant growth and optimize crop yields

A fertile soil is that one which can provide adequate amounts of nutrients for plants growth resulting in better crop quality and high crop yields

Features of a fertile soil include;

- Adequate concentrations of essential plant nutrients
- Sufficient organic matter
- Sufficient soil air
- Sufficient soil depth
- It has a good soil structure
- It contains a variety of soil micro organisms

Importance of the features of a fertile soil

Sufficient soil water

- All plants need water without water, they cannot grow. However too much water is not good for many crops either. And too little water can cause a plant to wilt and die.
- Soil water contains nutrients that move into plant roots when plants absorb the water, so water is a medium of movement of nutrients into the plants
- Water also plays a role in seed germination, plant growth, plant turgidity and plant structure formation
- When water in the soil is too much, it damages the root hair, causing the rotting of roots which makes the root system unable to absorb water
- Too much water also displaces air from the soil pores since water is denser than air, which makes the soil air deficient
- Therefore soil water in a fertile soil must be little or more but just sufficient



Too much water displaces air from soil & causes plant roots to rot

Group activity 17

Carry out research from internet and text books about other features of a fertile soil. For each, state its importance and describe what happens if it is less or more.
Present to the class

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Lesson period 19

2.2 Soil erosion

Introduction In this period, you are to research about the process of soil erosion

Lesson learning objectives:

- To define soil erosion
- To describe how soil erosion occurs
- To outline agents of soil erosion

Guide notes

Agents of soil erosion

1. Running water

Flowing water moves the soil organic and inorganic particles on soil layers from one place to another. The flowing water can be from rain fall, poor irrigation management, snow melts (glaciations) and run off

2. Wind

Wind is moving air. As air is moving, soil particles are rolled across the soil surface which causes them to collide and dislodge, other soil particles moving them to arrears away from their original positions

3. Animals

Grazing animals such as sheep, cows eat the grass cover on the soil exposing the soil to other agents of soil erosion i.e. wind and flowing water

Animals also dislodge soil particles from the soil surface, hooves and deposit it to other areas.



Running water



Wind



Animals

Group activity 18

The process of soil erosion occurs in three stages i.e. **detachment**, **transportation** and **deposition**. Carry out research and describe the process of soil erosion. Answer in the space below. Present to the rest of the class

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Lesson period 20 2.3 Importance of soil vegetation cover

Introduction In this period, you are to describe the importance of soil vegetation cover in controlling

Lesson learning objectives; • To explain how soil vegetation cover controls soil erosion

Group activity 19

The pictures below shows three different lands.



Land A



Land B



Land C

- a) Incase high water velocity flow erodes all the different lands with same strength, with reasons, identify the land which will have the; Greatest detachment;

Land.....

Reasons.....

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Moderate detachment

Land.....

Reasons.....

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Least detachment;

Land.....

Reasons.....

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b) Apart from controlling soil erosion, describe the importance of soil vegetation cover.

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Lesson period 21 2.4 Types of soil erosion

Introduction In this period, you are to describe the different types of soil erosion

Lesson learning objectives; • To describe the different types of soil erosion

Guide notes

Types of soil erosion

Soil erosion occurs in various ways and it is divided in the following types;

- Sheet erosion
- Gully erosion
- Rill erosion
- Splash erosion

Gully erosion

Is the massive removal of soil along drainage lines by surface water runoff creating deep channels. It consists of open unstable channels that have been cut more than 30cm deep into the ground.

Causes of gully

Intense rainfall, Land clearing, high run off from steep ground, increased run off caused by low levels of vegetation cover or poor soil infiltration

How gully erosion occurs?



- ❖ Gully erosion occurs when water is channeled across unprotected land and washes away the soils across drainage lines.
 - ❖ The washing away of soils is massive and is done by high velocity run off creating channels.
 - ❖ Excessive land clearing and over grazing often leaves the soil bare and exposed, unable to absorb water.
- ❖ Surface runoff increases and concentrates in drainage lines, allowing gully erosion to develop.

Group activity 20

The pictures below shows the types of soil erosion



A



B



C

For each, identify the type of soil erosion, state its causes and describe how it occurs. Present before the class

Project guidelines

A project Is an individual or group enterprise that is carefully planned to achieve a particular aim.

For the new curriculum learners are expected to come up with at least one project in biology before sitting for their final exams in s.4.

Learners are supposed to come up with their projects basing on what they have studied in relation with environmental problems we face in the society. A project is not given by the teacher though a teacher give learners the guidelines.

Features of a good project

- A project has a fixed set of objectives. Once the objectives have been achieved, it stops to exist.
- A project should have a time period i.e. it has to come to an end
- A project should be unique
- A project can undergo changes throughout its life
- A project should not harm the environment
- A project should be showing innovation and creativity.
- A project should produce a tangible product.

Steps in developing a project.

Step 1. Identifying purpose of a project.

A project's purpose explains the reason why the project exists. The purpose is a direction the project will take and maintain. The purpose also defines the problem and how the project will address it.

Step 2. Create a vision for your project

Your vision should define the end goal and addition criteria that will make the project a success. However, it should not focus on one specific way to achieve this end goal. Instead it should allow multiple paths to the desired result.

Step 3. Brainstorm ideas.

Brainstorming is a way to get your ideas on a paper. Basically, you spend time writing out what you want and connecting ideas.

If ideas look to be bad at the start, it's still ok. Keep trying. Try breaking ideas and building them up

Step 4. Pick a focus.

While it may be tempting to pick a broad topic, it will actually be easier if you narrow that down so that you won't get lost in many details.

Step 5. Decide on how you want to present your project.

For example in making a cell model, there is a possibility of producing a 2D on a paper or a 3D. Choose which one would be unique and possible to u.

Step 6. Research your focus of the project

After picking a focus, carry out research from internet and textbooks. Get the references which you will even include in your report. Explore ways you can develop your project more so following your focus.

Step 7. Plan out your project

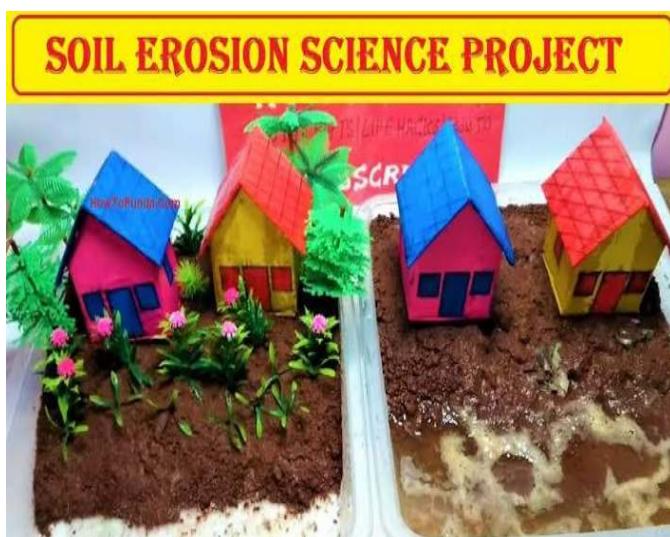
Try sketching it out, make a list of materials you will need before you begin and divide your project into manageable time intervals

Step 8. Create your project

Carry out the project following the manageable time intervals you made.

Step 9. Write a report for your project then present your project product to the teacher with the report.

Examples of students projects on soil



Soil erosion project



Save soil poster project



By the end of the chapter you should:

- Define nutrition
- Identify the food nutrients, their sources and importance to people
- Appreciate the importance of a balanced diet
- Appreciate the causes and effects of nutritional deficiency
- Calculate body mass index (BMI) and explain its implication.

NCDC TOPIC PROPOSED TIME FOR THE CHAPTER

Lesson Periods - 11

Weekly biology periods - 3

Coverage time - 3 and a half weeks

Lesson period 29 3.1 Meaning of nutrition

Introduction In this period, you are to describe how the different types of nutrition occur and their importance

Lesson learning objectives;

- To describe types of nutrition
- To outline the importance of types of nutrition

Guide notes

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 and to be healthy

Types of nutrition

Nutrition is divided into two types namely;

Autotrophic nutrition

Heterotrophic nutrition

Autotrophic nutrition

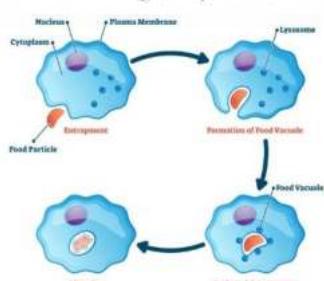
Is the mode of nutrition where organisms make their own food. Organisms that carry out autotrophic nutrition include; Plants, Euglena and Purple sulphur bacteria. Types of autotrophic nutrition include photosynthesis and chemosynthesis

Heterotrophic nutrition

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

Types of heterotrophic nutrition.

1. Phagocytosis



Phagocytosis is the type of heterotrophic nutrition where unicellular organisms engulf solid food particles. E.g. amoeba, white blood cells.

2. Saprophytism



Saprophytism: is a type of heterotrophic nutrition where organisms feed or obtain nutrients from dead decaying matter. E.g. common bread mould, mushrooms.

3. Commensalism



Commensalism is a nutrition association between two organisms of different species where one benefits and the other neither suffers harm nor benefits. E.g. white egret birds and cows.

4. Parasitism



Parasitism is a nutrition association between two organisms of different species the parasite and the host where the parasite obtains food and shelter whereas the host suffers the harm. E.g. a tapeworm in gut of humans, a tick on a cow.

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5. Mutualism

Mutualism is a nutrition association between two organisms of different species where both organisms benefit e.g. rhizobium bacteria and root nodules of leguminous plants, protozoa in the gut of ruminants, fungi and algae (lichen).



Note. All examples of mutualism and commensalism are examples of symbiosis.

Symbiosis; is a nutrition association between two organisms of different species where either both organisms benefit or one benefit but the other neither benefit nor suffers harm. It is divided into mutualism and commensalism.

6. Holozoic nutrition; is a mode of nutrition where organisms take in food which is broken down into simpler substances which are absorbed and utilized by their bodies. It is characterized by 5 processes; ingestion, digestion, absorption, assimilation and egestion.

Ingestion is the taking in of complex food into the body.

Digestion is the breakdown of complex food into simpler soluble food nutrients.

Absorption is the taking up of soluble food nutrients across a membrane.

Assimilation is the utilization of absorbed food nutrients by an organism.

Egestion is the removal of undigested food from the body of an organism.

Examples of organisms feeding by holozoic nutrition include; carnivores, herbivores and omnivores.



A lion feeding on its prey



A cow feeding on grass



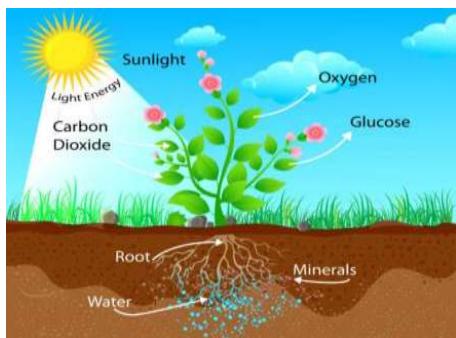
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A venus fly trap feeding on an insect

Group activity 26

In your groups, you are to describe how you have encountered the different types of autotrophic and heterotrophic nutrition occurring around your community and their importance. Guide notes have been provided on photosynthesis

How we encounter photosynthesis and its importance



When you move around your home, school and community, you see plants spreading their leaves towards sunlight during day. They use the sunlight to carry out a type of autotrophic nutrition called photosynthesis.

- Photosynthesis provide oxygen to people and animals. Oxygen produced by photosynthesis is what makes us feel good when we go under plant sheds.
- Photosynthesis enables plants to make their own food which food can also be obtained by animals through feeding on plants.
- Photosynthesis removes carbon dioxide from the atmosphere thus purifying air around us.

Task: describe how you encountered the different types of heterotrophic nutrition in daily life and their importance.

Hint: for each type, describe how you encountered it. Whether when you had gone to zoo, tour, visited your relatives, watched television programs and how is each important in daily life to our communities

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Lesson period 30 3.2 Nutrients in food we eat

Introduction For this period, you are required to outline nutrients in most common food

Lesson learning objectives; • To outline nutrients in most common food

Guide notes

Nutrients in food we eat.

Nutrients are substances that provide nourishment essential for the maintenance of life and growth.

Organisms use nutrients to survive, grow and reproduce. Nutrients are divided into two main types include;

- Macro nutrients
- Micro nutrients

Macro nutrients

Are nutrients required in large amounts by the bodies of organisms e.g. carbohydrates, fats and proteins.

Micro nutrients

Are nutrients which organisms need in small quantity in their diet e.g. vitamins and mineral salts.

The basic nutrients needed by all animals are;

Proteins	Carbohydrates	Fats	Oils	Vitamins
Mineral salts	Water			Nucleic acids

Group activity 27

You are provided with pictures of food sources below for each, identify the name of the food source and the nutrients



A



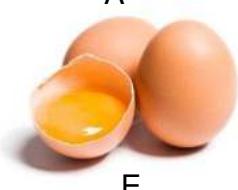
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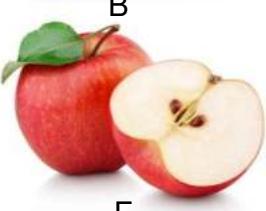
C



D



E



F



G



H



I



J



K



L



M



N



O



P



Q



R



S



T

Food	Name of the source	nutrients
A	Avocado	Vitamins C, E, K, fats.
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
L		
M		
N		
O		

Lesson period 33 3.5 lipids

Introduction In this period, you are to name sources of lipids and describe their importance

Lesson learning objectives; • To outline properties of lipids
• To describe importance of lipids

Lipids Guide notes

These are organic food compounds which contain high proportional carbon and hydrogen but very little oxygen. They include; wax, fat and oils.

They are insoluble in water. Fats are solid at room temperature and oils are liquids at room temperature. Fats and oils are collectively called **triglycerides**.

Types of fats

Fats are divided into two parts namely;

- Saturated fats
- Unsaturated fats

Saturated fats: are solids at room temperature and are found in animal products.

Unsaturated fats: are liquids at room temperature. They are found mainly in plant extracts

Unsaturated fats can be converted to saturated fats by adding hydrogen atoms.

Properties of Lipids

- They are inert substances
- They solidify when subjected to very high temperatures
- They also form emulsions with dilute alkalis
- They are greasy organic substances
- They are lighter than water and insoluble in it.
- They are soluble in organic solvents such as alcohol.
- They are bad conductors of heat.

Group activity 30

The pictures below show various sources of lipids. Identify the name of the source



A



B



C



D



E



F



G



H



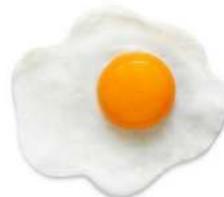
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a) Name the lipid sources named.

A

B

C

D

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Describe the importance of lipids.

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Lesson period 34 3.6 Vitamins

Introduction In this period, you are to describe the importance of vitamins

Lesson learning objectives; • To outline sources of vitamins

Guide notes • To describe the importance of vitamins

Vitamins

A vitamin is an organic molecule that is essential in small quantities for the proper functioning of an organism's metabolism.

Properties of vitamins

- They are not digested
- They have no energy value in the body
- They are needed in small quantities
- They have a low molecule weight

Types of vitamins

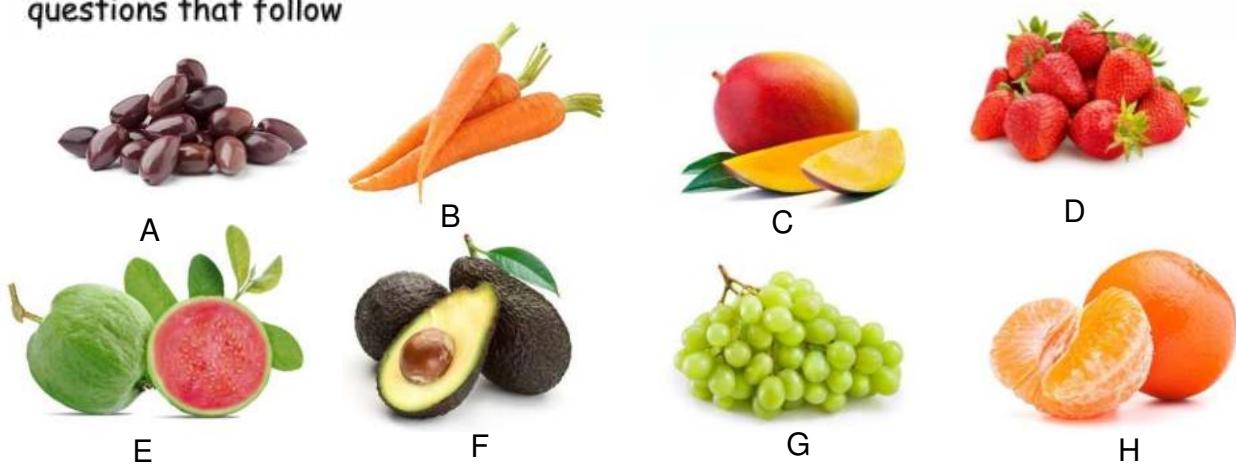
Vitamins are divided into water soluble and fat soluble vitamins.

Water soluble vitamin. These are vitamins which dissolve in water. They are not stored in the body, so they must be eaten through diet every day. **Examples include;** Vitamins B and C

Fat soluble vitamins. These are vitamins which are insoluble in water but soluble in fats. They can be stored in the body so they may not be eaten every day. **Examples include;** A, D, E and K

Group activity 31

The pictures below show different sources of vitamins. Use them to answer questions that follow





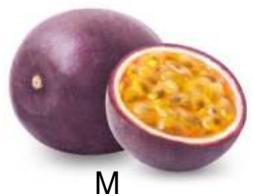
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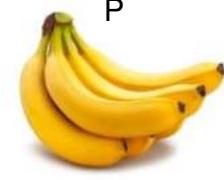
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X

- a) Identify the name of the source of the vitamin and the kind of vitamins within the source.

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By the end of the chapter you should:

- 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.

NCDC TOPIC PROPOSED TIME FOR THE CHAPTER

Lesson Periods - 10

Weekly biology periods - 3

Coverage time - 3 and a half weeks

Lesson period

47

4.5 investigating the effect of temperature on the rate of photosynthesis

Introduction

For this period, you are to investigate how temperature affects the rate of photosynthesis

Lesson learning objectives; • To investigate the effect of temperature on photosynthesis

Guide notes

The rate of photosynthesis

The rate of photosynthesis in the laboratory can be determined by measuring:

- The rate of oxygen output
- The rate of carbon dioxide uptake
- The rate of carbohydrate production

The main factors affecting the rate of photosynthesis are:

Light intensity

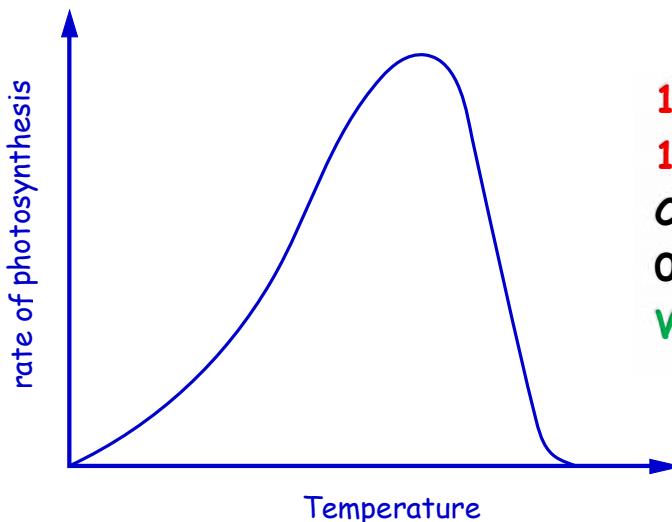
Carbon dioxide concentration

Temperature

Temperature

Increase in temperature to the optimum increases the rate of photosynthesis. This is because enzymes are activated by increasing temperature below the optimum.

Very low temperatures lower the rate of photosynthesis because enzymes are inactivated at low temperatures. Very high temperatures above the optimum lower the rate of photosynthesis because enzymes are denatured at high temperatures.



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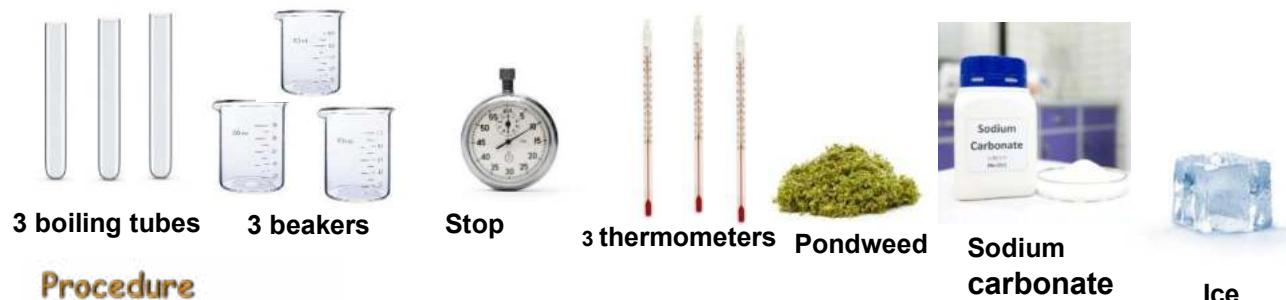
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Group activity 43

In groups, you are required to determine the effect of temperature on the rate of photosynthesis.

Materials

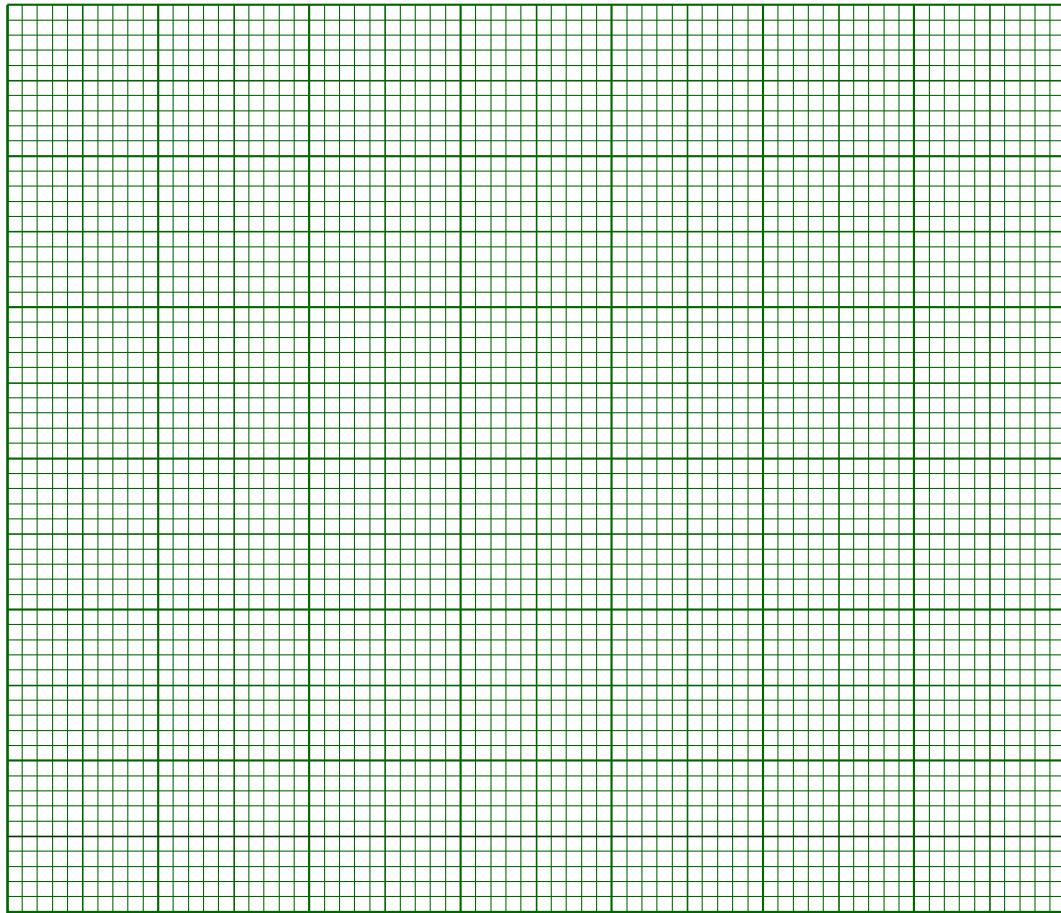


Procedure

- Setup three beakers with water each maintained at different temperatures i.e. at 10°C , 30°C and 60°C using a thermometer.
- 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°C	At 30°C	At 60°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) What conclusions can you give about your graphs

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b) Explain your conclusions above.

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Lesson period 48 4.5 investigating the effect of carbon dioxide concentration on the rate of photosynthesis

Introduction For this period, you're to investigate the effect of carbon dioxide concentration on the rate of photosynthesis

d) Suggest the result that the student would get if carbon dioxide concentration of 0.6% was used and explain your answer.

Result..... bubbles per minute

Explanation

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e) The students used tap water as 0% carbon dioxide concentration. Explain why the student recorded some bubbles being produced.

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Lesson period 4.7 investigating the effect of light intensity 50 on the rate of photosynthesis

Introduction For this period, you're to investigate the effect of carbon dioxide light intensity on the rate of photosynthesis

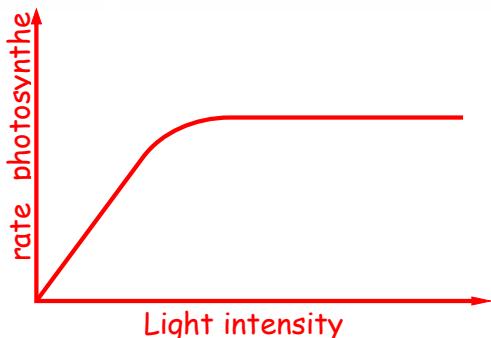
Lesson learning objectives; • To investigate the effect of carbon light intensity on photosynthesis

Guide notes

Light intensity

Without enough light, a plant cannot photosynthesize very quickly even if there is plenty of water and carbon dioxide and suitable temperature.

Increasing light intensity increases the rate of photosynthesis because light produces energy for splitting up water molecules (photolysis) providing many hydrogen ions which reduce carbon dioxide to carbohydrates.



Increase in light intensity increases the rate of photosynthesis until some other factor- a limiting factor becomes in short supply.

At very high light intensities, photosynthesis is slowed and then inhibited but these light intensities do not occur in nature.

Group activity 46

In your groups, you are required to determine the effect of light intensity on the rate of photosynthesis

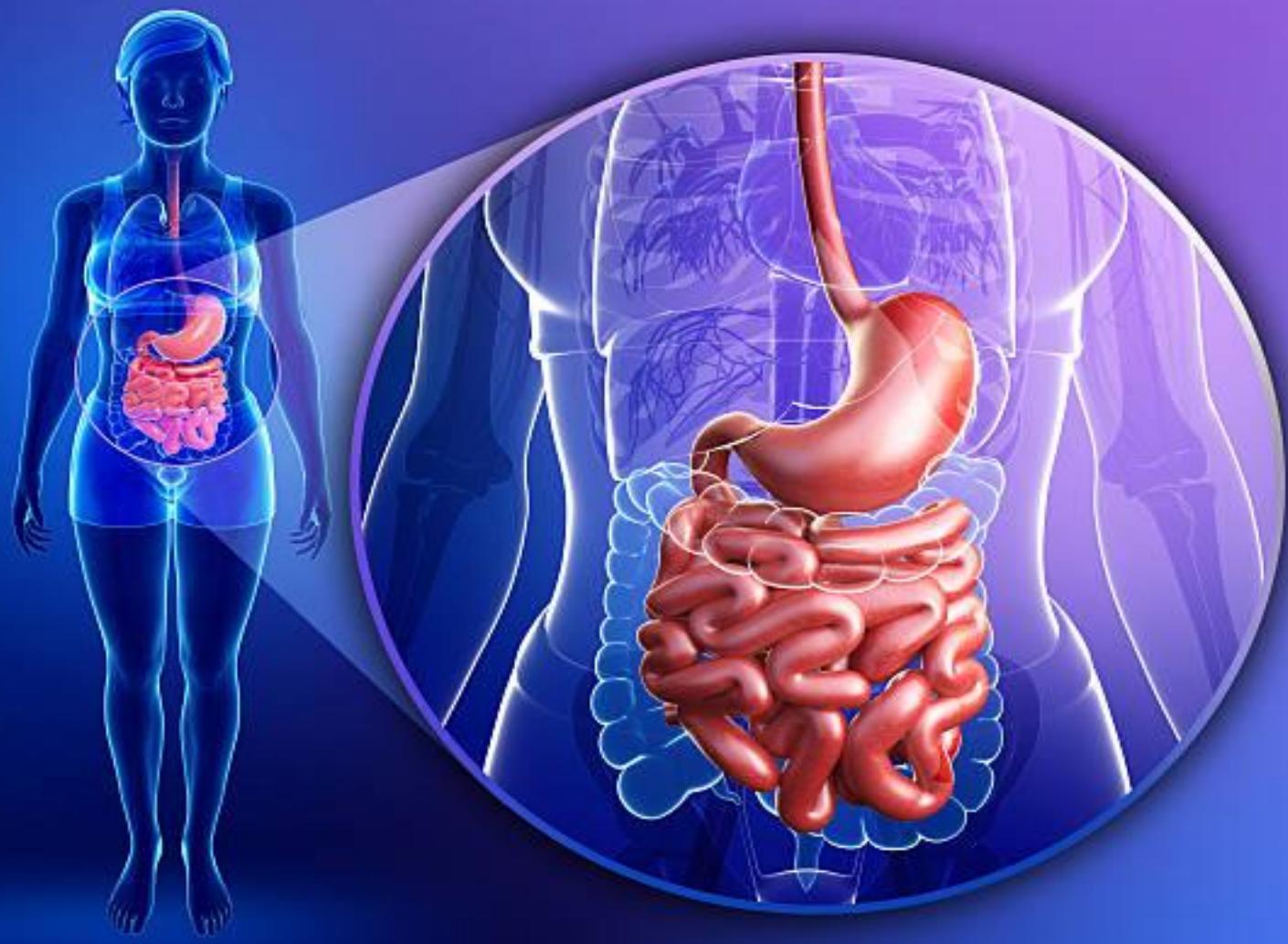
Materials: Pondweed, 0.3% sodium hydrogen carbonate solution, Meter rule, Source of light, Thermometer, Beaker, Heat source and One boiling tube

Procedure

- Set up a beaker with water maintained at 25°C in a dark room with no light. Place a boiling tube with a pondweed in water containing 0.3% sodium hydrogen carbonate in a beaker.
- Place a light source e.g a bulb at a distance of 100cm from the set up. Leave it to stand for some time until bubbles are seen from the water plant.
- Observe and record the bubbles produced in one minute.
- Repeat the experiment with the light source placed at distances of 80cm, 60cm, 40cm, 20cm and 10cm. Record your results in the table below.

Distance of light from the set up in cm	Number of bubbles
10	
20	
40	
60	
80	
100	

- a) Plot a graph to the results above.



By the end of the chapter you should;

- 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

NCDC TOPIC PROPOSED TIME FOR THE CHAPTER

Lesson Periods - 15

Weekly biology periods - 3

Coverage time - 5 weeks

Lesson period 53 5.1 Enzymes

Introduction In this period, you are to describe how enzymes are applied in daily life

Lesson learning objectives; • To define enzyme

- To outline properties of enzymes

Guide notes

Enzymes

Enzymes are biological substance protein in nature that speed up the rate of chemical reaction. The molecules upon which enzymes may act are called substrates and the enzymes converts the substrates into different molecules known as products.

Properties of enzymes

- They speed the rate of chemical reactions.
- They are effective in small quantities.
- They are specific in action.
- They are unchanged at the end of the reaction.
- They are denatured by very high temperatures.
- They work best at a specific PH.
- They are inactivated by chemical e.g. poisons.

Importance of enzymes in the body

They speed up metabolic reaction. In absence of enzymes, reaction in cells proceed so slowly.

Group activity 49

Using internet and textbook, research and list down some examples of enzymes in the human digestive system. For each enzymes, state where it is located on the digestive system and the function it does

Enzyme	Its location	Function it does
Salivary amylase	mouth	Breaks down starch to maltose

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

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

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d) Outline any other sectors apart from the ones in the pictures where enzymes are involved. For each sector, state how enzymes are applied.

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BOOK OVERVIEW

Harroan s2 biology learner's book is a work book made and revised to simplify learner's understanding of biology based on the new curriculum.

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