2023

NEW

HARROAN S.1 CHEMISTRY

Work book

Second edition

With 100 Lesson periods

2023

Guide notes
Group activities
Field works
Practical
Questions
And more

Revised from 2022 version and reviews from those who used it

HARROAN'S

New curriculum work book for

2023

s.1

Chemistry

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

Student's information.

This book belongs to:

Name .....

School .....

Class .....

Stream .....

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CHAPTER 01 CHEMISTRY AND THE SOCIETY

By the end of the chapter you should;

- Understand what is chemistry
- Know why chemistry is studied
- Know how chemistry relates with other subjects.
- Understand the importance of chemistry.
- Know the contributions of chemistry to Uganda's economy and how they differ in different organisms.

NCDC TOPIC PROPOSED TIME FOR THE CHAPTER

Lesson Periods – 6

Weekly periods – 3

Coverage time – 2 weeks

Lesson period 1 1.1 Nature of chemistry

Introduction to lesson; In this period, you are required to identify different substances made up of chemicals. Present your letter before the class

Lesson learning objectives;

- To define chemistry
- To identify different substances made up of chemicals

Nature of chemistry.

In primary, you studied science. But have you ever wondered about how the science you studied applies in everyday life. For example, have you ever wondered how tea leaves change the color of hot water when added or why does sugar make the tea sweet. Have you ever wondered why shiny metals develop a brown coating on them?

As you go on with Chemistry you will understand that chemistry is all around us and it's a branch of the science you studied in primary but which specifically deals with studying matters and changes that occur to substances under different conditions.

Hence, chemistry is the study of mater and the changes that occur to substances under different conditions

Chemistry studies the properties of natural and manmade chemicals. This information is used to understand how some chemicals may be modified to make them more useful.

Examples of some products which contain chemicals

1. Soap

When dissolved in water, soap possess the ability to remove dirt from the surfaces such as human skin, textile and other solids. Chemicals with in soap include sodium benzoate, sodium carbonate, sodium hydroxide etc. these chemicals are used to produce lather and bubbles in soap

2. Baking power

Is a leavening agent used to increase volume and lighten the texture of baked products? Baking powder contains chemicals like sodium carbonate, acidic salts and other carbonates

Group activity1a.

. In groups of 3 to 4 students, look at the pictures below of the common things in everyday life. Identify those ones made up of chemicals and those ones which are not.

a) Discuss about each picture in your groups, write in the table below the name of things which have chemicals and those which lack chemicals.

Things made up of chemicals	
Things not made up of chemicals	

ii) Apart from what has been placed in the pictures, Identify other common things around us which are made up of chemicals. Give as many as members in your group can suggest.

……

……

Activity 1b.

Write a letter to your friend about the different substances at your home which contain chemicals and those which don't. Your letter should contain address, greeting remarks, substances in your home which contain chemicals and those which don't

Lesson period 2 1.2 Reasons why we study chemistry

Introduction to lesson; In this period, you are to discuss about the occupations related to chemistry

Lesson learning objectives;

- To identify reasons why we study chemistry
- To outline different occupations in chemistry

Guide notes

Reasons why we study chemistry

1. Chemistry equips us with skills which open up many career options like pharmacists, industrial chemists
2. Chemistry helps us to understand processes in daily life activities. E.g. changing of the colour of hot water when tea leaves or a tea bag is added
3. Chemistry provides us with basic knowledge to read and understand labels on various products
4. Chemistry provides us with knowledge of making new products by mixing the available raw materials to various conditions
5. Chemistry knowledge's us with the impact of environmental pollution and ways we can prevent it

Occupations in chemistry

Pharmacists

Is a healthcare professional who prepares, controls, formulates, preserves and distributes medicines

Chemistry enables pharmacists to understand chemical compositions of various Pharmaceuticals to suit patient's needs. Examples of pharmaceutical products include, Injections, tablets, drops inhalers, capsules, syrups.

Group activity 2.

Below are various chemistry related occupations. Discuss, about each of them more so on what each of them does. Use the internets and text books for research.

Industrial chemist

Quality control chemist

Water chemist

Chemical engineer

Laboratory technician

Chemistry teacher

Lesson period 3 1.3 Importance of chemistry in daily life

Introduction to lesson; For this period, you are to identify the nature of chemistry in daily activities and their importance

Lesson learning objectives;

- To outline daily activities involving chemistry
- To explain the nature of chemistry in those activities

Guide notes

Importance of chemistry in daily life.

Many of the things which take place in everyday life are caused by chemical reactions and are examples of chemistry. We use very many chemicals, we eat very many chemicals which makes chemistry an essential part in our daily lives.

Examples of chemistry in everyday life and its nature of action.

1. Digestion; this relies on chemical reactions between food and enzymes to breakdown food into small substances which the body can absorb and use.
2. Cooking; this is a chemical change which changes food to make it tasty, kills all microorganisms on food such that the food is useful to our bodies.
3. Using soaps and detergents; soaps and detergents are chemical substances which dissolve and remove dirt from our bodies, clothes and dishes.
4. Working of drugs; drugs are produced using the knowledge of chemistry. Some like pain killers work by blocking pain receptors.

Group activity 3.

Read carefully below about how members of Sarah's family started their day.

Sarah woke up one day late than usual. She was hearing her mum's loud voice telling her to make tea. When she moved out of the bed, she met her younger brother who was so dirty after playing in mud earlier morning. She removed his dirty clothes and washed them using a detergent. She also bathed her young brother using a bathing soap. As she was moving to the kitchen, her father called her and asked her to clean her shoes. She polished her father's shoes using a new shoe polish they bought from the market. She then went to the kitchen in order to make tea in the kettle. She observed bubbles of boiling water which produced steam in the kettle. She then added tea leaves which changes the entire colour of hot water. She tested the tea but it was so bitter. She then added sugar which made the tea sweet. She poured the tea in the flask and took it in the leaving room where she saw her mother putting fruits and soda in the refrigerator. She started feeling headache. When her mother knew about the headache, she gave her pain killer tablets which made her feel better after a few minutes. She moved out of the house and saw their neighbor painting his old metallic door which had developed a brown coat.

a) Outline activities at Sarah's home showing chemistry. Give all

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b) Explain the nature of chemistry in some of the activities you mentioned in (a)

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Lesson period 5 1.5 relation of chemistry with other subjects

Introduction to lesson; For this period, you are to discuss how chemistry relates with other subjects like biology, physics, math and agriculture

Lesson learning objectives;

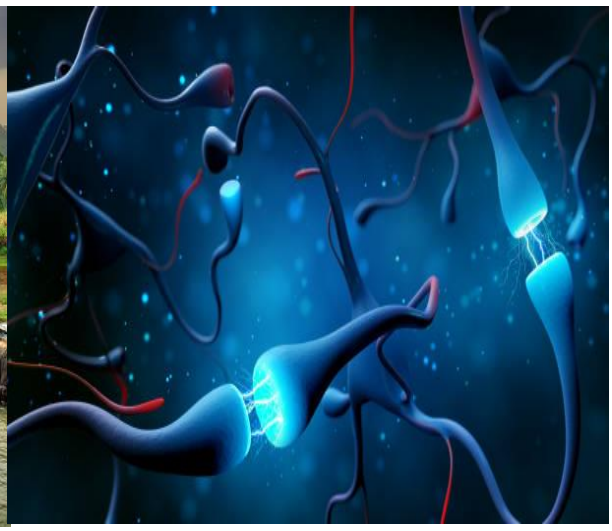
- To state how chemistry relates with other science subjects

Guide notes

How chemistry relates with biology

- Chemistry is a physical science while biology is a life science. Biology is the study of life and all living things but living things contain atoms and molecules studied in chemistry.
- Organs, cells, and tissues student in biology contain neurotransmitters and ions which affect their function and response, but the ions and neurotransmitters are chemistry concepts
- Ecosystems contain organisms in a food web, it might not seem like chemistry but the resources organisms compete for include nutrients which are chemicals

Biology is the study of life and all living things but living things contain atoms and molecules studied in chemistry



Organs, cells, and tissues student in biology contain neurotransmitters and ions which affect their function and response, but the ions and neurotransmitters are chemistry concepts

Here are some examples of the importance of chemistry in biology

- Photosynthesis is the way plants make food. It is a set of chemical reactions (chemistry) that feeds not only, but also animals and fungi
- Processes in plants like leaf changing colour, fruit ripening rely on chemistry
- How bones build calcium why teeth decay if your deity is high in sugar and why proteins don't break down in saliva are all matters of chemistry
- Chemistry explains the action of medications, supplements and toxins

Group activity 5.

Carry out research and describe how chemistry relates with other science subjects

Activity of integration

Maseruka is a farmer in one of the villages in Uganda. His garden produces very low crop yields of a small size and they take a long time to grow. His crops have a less resistance to diseases and they are of a poor quality

Using the knowledge you have about agricultural products made using the knowledge of chemistry and how chemistry relates with agriculture, write a letter to Maseruka telling him ways he can solve poor quality crops and low crop yield problems.

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Lesson period 7 2.1 laboratory rules and regulations

Introduction to lesson; In this period, you are required to outline the laboratory rules each with its reason

Lesson learning objectives;

- To outline rules in the laboratory
- To plan designing chart showing some of the rules

Guide notes

Laboratory rules and regulations.

A laboratory is a place where scientific experiments are carried out and where scientific equipments are kept.

Some of the Rules in the laboratory.

1. Carry out only experiments suggested by the teacher.
2. Do not eat or drink in the laboratory.
3. In case of accidents, report to the laboratory technician.
4. Always follow instruction given.
5. Avoid unnecessary movements in the laboratory.
6. Use clean and dry apparatuses when in the laboratory.
7. Handle your apparatus with great care.
8. Don't taste or smell gases.
9. Never use faulty apparatus.

Group activity7; carryout research and state the importance of each of the rule above. Present your findings to the rest of the class.

Planning to design a chart showing the laboratory rules.

For the remaining time make a group plan on how to design a chart showing some of the laboratory rules

Guidelines

Choose which rules will you portray on the chart

Choose which material you want to come up with a poster or chart

Discuss on how it will be unique

Divide what to be done in time intervals

You are to present your chart or poster in lesson period 9

Lesson period 8 2.2 safety in the laboratory

Introduction to lesson; For this period, you are required to understand safety precautions in the laboratory.

Lesson learning objectives;

- To identify most common accidents in the laboratory
- To interprete the different laboratory symbols

Guide notes

Safety in the laboratory.

Safety measures and precautions need to be taken in the laboratory to prevent accidents. The most common accidents are in the laboratory include;

i) Fire out break

ii) Burns

iii) Scalds

iv) Falls

Group activity 8a

The picture below shows a particular laboratory safety equipment. In groups of 3 to 4 students, study the picture below and use it to answer the questions that follow

a) (i) Name the equipment

……..

(ii) Sate the use of the equipment.

……..

b) Outline the procedure of using that equipment

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……

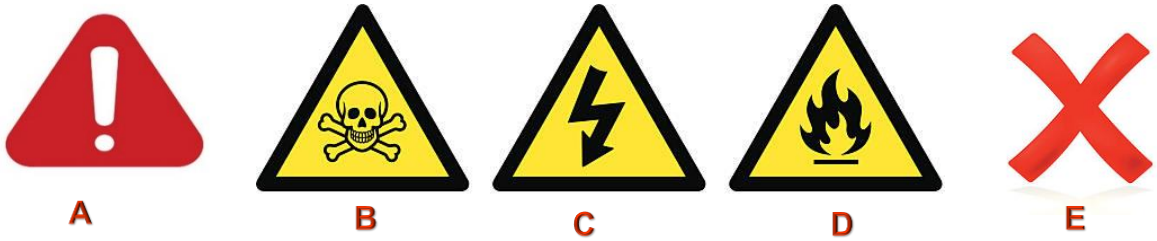
c) Apart from a laboratory, give three other places where we can find that equipment.

……

……

Group activity 8b

Safety symbols are found on labels of containers and on bottles containing dangerous chemicals. Identify the symbols below and give their meaning



Symbol A is Irritant.

It means these substance can irritate your eyes and skin causing itchiness, soreness, redness and blistering.

Lesson period 9

Introduction to lesson;

Lesson learning objectives;

2.3 Laboratory equipments

In this period, you are required to outline the importance of different laboratory apparatuses

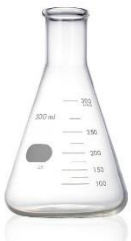
- To outline the examples of laboratory equipments
- To state the use of each laboratory equipment

Group activity 9

Laboratory apparatus and materials.

Observe the pictures of different apparatuses and materials used in the laboratory. Research about each of them more so their uses in the laboratory. In your groups, discuss about each of the apparatuses and write its use then present to the class

Separating funnel



Conical flask

Burette

Beaker

Dropper

Safety goggles

Wash bottle

Flat bottomed flask

Pippete

Measuring cylinder

Bunsen burner

Mask

Evaporating dish

Gas tanks

Volumetric flask

Thermometer

Motor and pestle

Stirring rod

Spatula

Test tube

Weighing scale

Corks

Test tube holder

Funnel

Retort stand

Lesson period 12

2.6 The scientific method of carrying out investigations

Introduction to lesson; For this period, you are to describe the scientific method and its importance

Lesson learning objectives;

- To outline the scientific method of carrying out investigations

Guide notes

Scientific methods used in studying chemistry.

How do chemists work?

Like all scientists, chemists follow the scientific method when carrying out investigations

1. Make an observation

You observe something that makes you ask yourself a question.

2. Come up with a hypothesis

A reasonable statement that you can test.

3. Plan an experiment to test the hypothesis

You might need to do some research in books or on the internet, to help you.

4. Carry out the experiment

Perform an experiment and record the results.

5. Analyze the results.

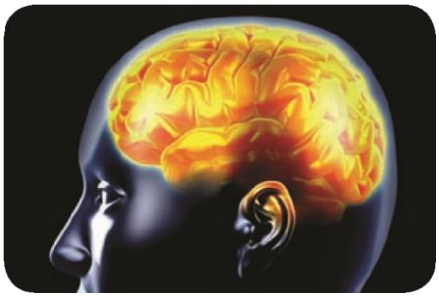
Did the results support your hypothesis?

6. Make a conclusion

Share your conclusions with other people

The skills you use

When you plan to carry out an experiment, you use many different skills.



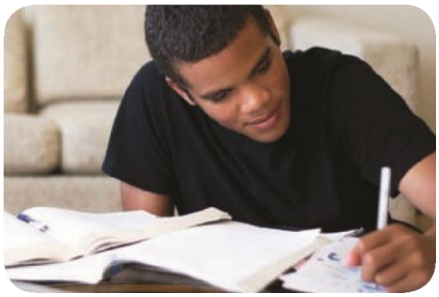
Thinking Use your brain before, during and after the experiment. That is what the brain is used for

Observing This is a very Important skill, chemists have made discoveries by just watching very carefully

Using apparatus and techniques Weigh things, measure the volumes, and measure the temperature do titrations.

Working accurately Sloppy work Will ruin the experiment. Follow the instructions. Measure things carefully. Think carefully. Think about safety too.

Doing some math You often Have to do calculations using your calculations. And drawing a graph can help you see what is going on.



Writing up You may have to write a report on your experiment, and give conclusions. And say how the experiment could be improved.

Group activity 11

Carry out research using the internet and describe the importance of the scientific method of carrying out investigations. Include some examples of inventions which have been made in the field of chemistry and the names of the scientists who made those inventions. Present your findings to the class

Lesson period 13

2.7 Using the scientific method on physical separation

Introduction to lesson; In this period, you are to learn how the scientific method is carried out and how a report is written

Note, in this period, you are to learn how to apply the scientific method and use the knowledge to do activities in the coming lesson periods

Group activity 12

Imagine your teacher left samples of sulphur and iron fillings in the laboratory separately and one of your friends mixes them accidentally. How would you separate them such that the teacher finds separate samples as they were?

Using the scientific method to separate a mixture of iron and sulphur

Observation; a mixture of yellow and black solids

Qn; which property of the two solids can we use to separate? (Iron is magnetic and sulphur is not)

Hypothesis; A mixture of sulphur and iron could be separated using a magnet

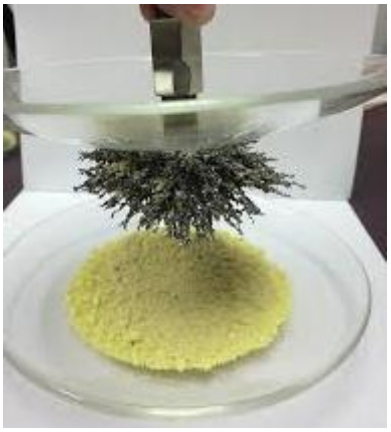
Planning the experiment to test for our hypothesis; we plan to put the mixture on a Petridish then pass a magnet over it such that it attracts the magnetic substance

Carrying out an experiment to test our hypothesis

Procedure

- Place the mixture of sulphur and iron feelings on a Petridish
- Pass the magnet over the mixture in a Petridish
- Leave the magnet over the mixture until all the iron filling are attracted

Results



Iron fillings are attracted by the magnet but the sulphur powder is not

Analyzing the results

One of the substances in the mixture (iron) is attracted by the magnet

Therefore our hypothesis is true.

Note if the results don't support the hypothesis, change the hypothesis and try again.

Conclusion

A mixture of iron and sulphur can be separated using a magnet

A report on an experiment carried out to separate a mixture of sulphur and iron fillings

1st JAN 2023

Purpose: *to separate a mixture of sulphur and iron fillings*

Introduction; *we noticed that yellow powered sulphur and grey iron fillings formed a mixture which couldn't easily separate using our hands*

Our hypothesis; *a mixture of iron and sulphur could be separated using a magnet*

Planning our experiment; *We planned to place the mixture of iron and sulphur on a Petridish then pass a magnet over it and observe whether one of the substances would be attracted*

Procedure

- *Place a clean Petridish on the table*
- *Place the mixture of iron and sulphur in the Petridish*
- *Pass a magnet over the mixture and leave it for some time over the*

Observation

The grey iron filling were attracted to the magnet

Analysis

The iron fillings are magnetic thus were attracted by the magnet. The sulphur powered is not magnetic and it was not attracted by the magnet

Discussion

The experiment went on very well except that some yellow stains of sulphur were still attached on the iron filling on the magnet.

We think we could improve the results seen by using a stronger magnet

Conclusion

A mixture of sulphur powder and iron fillings is separated by a magnet

By;

Bitamazire Jonah

Nakabiti Jennifer

Nabitumbuwa Joan

Batemyetto John Bosco

Lesson period 14 2.8 scientific method on filtration

Introduction to lesson; In this period, you are required to develop a hypothesis on separating a mixture of sand and salt

Lesson learning objectives;

- To separate a mixture of sand and salt using a scientific method

Requirements

- A mixture of sand and salt
- Laboratory apparatus

Guiding statement

Your mother sends you to buy salt at the shop. As you are coming back with it, you accidently fall down pouring the sand on the salt which mixes with the sand on the ground. You try collecting the salt but it has alot of sand mixed in it. Assuming your school laboratory is open and you would like to take salt back to your mom. Suggest a hypothesis you would come up with to separate the mixture. Carry out the experiment using the laboratory apparatus and write down your report in the space below

Lesson period 17

2.11 determining boiling point of liquids

Introduction to lesson; For this period, you are to determine the boiling point of water and ethanol.

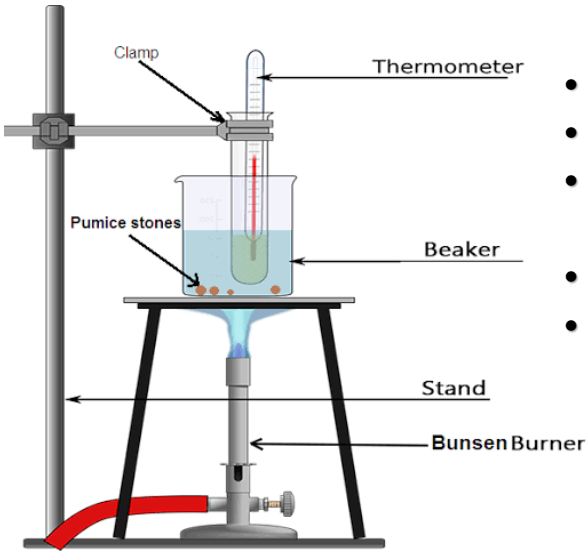
Lesson learning objectives;

- To determine the boiling point of water

Materials Caution; Ethanol is flammable keep a distance while heating

Heat source, retort stand, thermometer, glass beaker, wire gauze, water, ethanol,

Procedure



- Attach a boiling tube on a retort stand using clamps.
- Place about 10 cm^3 of water in the boiling tube
- Insert the thermometer in the boiling tube
- Place the boiling tube containing water into a beaker of water on heat source (water bath)
- Read off the temperature at which water boils.
- Repeat the same procedures using ethanol instead of water. Add some anti-bumping stones in the boiling tube as you determining the boiling point of ethanol.

a) State the boiling points of water and ethanol you recorded.

i) Boiling point of water ……

ii) Boiling point of ethanol……

b) Explain the reasons for;

i) Heating using a water bath ……

……

……

ii) using anti-bumping (pumice) stones……

……

……

CHAPTER 04 USING MATERIALS

By the end of the chapter you should;

- Know the materials used in everyday life
- Know how common materials pollute the environment
- Understand properties of different materials
- Understand polymers and their use in daily lives

NCDC TOPIC PROPOSED TIME FOR THE CHAPTER

Lesson Periods – 09

Weekly periods – 3

Coverage time – 3 weeks

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Lesson period 28 4.1 classifying materials as natural and synthetic

Introduction to lesson; For this period, you are to classify materials as natural or synthetic

Lesson learning objectives;

- To define natural and synthetic materials
- To give examples of natural and synthetic materials
- To describe how a material being natural or synthetic

Guide notes

Materials

A material is any substance that an object is made from. E.g. glass, plastic, clay etc. All materials are made up of matter. Around as, all items are made up of a particular material.

Materials can be classified a natural or synthetic materials basing on where they are obtained.

Natural materials

Are materials that come up from nature without human intervention

Synthetic materials

Are materials made by human through various chemical reactions

Group activity 25

The pictures below show natural and synthetic materials. Write the name of the material besides it then describe it as natural or synthetic.

i) Write the name of the material besides it.

ii) Group the items above as natural and synthetic

Write their names in the table below

Type of the material	Name of item
Natural materials	
Synthetic materials	

Describe the use of each of the material above in daily life

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Lesson period 29 4.2 properties of different materials

Introduction to lesson; For this period, you are to describe the properties of a concrete

Lesson learning objectives;

- To describe the properties of concrete

Guide notes

BRITTLE MATERIALS

Brittle materials are materials that can easily break.

Examples of brittle materials include concrete, glass and ceramics.

a) Concrete

Sand

Gravel

Cement

Cement has crystals which start forming when water is added to it and they become stronger if the concrete is allowed to dry out slowly. This is why it is a good idea to wet concrete with water for several days after it has been made to make the strongest structure. Because concrete is made out of crystals, it is quite easily broken with a hammer. Crystalline substances are easily broken.

Concrete can easily be broken with a hammer

Limestone is used in the manufacture of cement.

Group activity 26

The pictures below shows concrete being made. Use it to answer the questions that follow. Carry out research using textbooks and the internet.

a) Briefly describe how concrete is made. (Research from internet)

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b) Suggest any three properties of concrete

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c) Outline four uses of concrete

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Lesson period 30 4.3 Glasses

Introduction to lesson; In this period, you are to describe the properties of glasses and their uses in daily life

Lesson learning objectives;

- To outline properties of glasses
- To describe the uses of glasses

Guide notes

c) Glass

A glass is a hard non-crystalline solid whose molecules are not arranged in any particular pattern.

Properties of glasses

- It is hard
- It is transparent
- It is brittle
- It is non-crystalline

The structure of glass is like that of a liquid but its molecules are too large to move around, hence glasses are liquids that behave like solids. The most common type of glass is made by heating limestone (calcium carbonate) with sodium carbonate and sand (silicondioxide) in a furnace. The three substances melt together and run out from the furnace as a clear liquid which is then allowed to cool as a flat sheet of glass. This can be moulded into any shape before it cools down and turns into a solid. Other substances like metal oxides can be added to make different kinds of glass.

Group activity 27

The pictures below uses of the glasses in our community

A

B

C

i) Identify the uses of the glasses in the picture below

A.....

B.....

C.....

ii) Identify and describe the property of glass which favours the role stated in ai).

A.....

.....

B.....

.....

C.....

.....

b) The picture below shows a president's car with windows made of glasses which bullets cannot break

i) Which kind of glasses are in the president's car?

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ii) Why are those cars made with such glasses?

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iii) State why cars in Uganda don't have such glasses.

.....

iv). Outline the various importance of glasses in the community.

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d) Which property is exhibited by the glass in the presidents car

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Lesson period 31 4.4 ceramics

Introduction to lesson; In this period, you are to describe the properties ceramics and their uses in daily life

Lesson learning objectives;

- To outline properties of ceramics
- To describe the uses of ceramics

Guide notes

Ceramics

Ceramics are materials made out of soft clay and then hardened by heat. Clay contains a mixture of compounds mainly aluminium oxide and silicon dioxide.

Properties of ceramic materials.

- It can easily be moulded. (it is because molecules in the clay attract water molecules . these water molecules allow the clay molecules to slip easily around each other)
- It becomes hard when it dries.
- It becomes permanently hard when heated with fire.

Lesson period 77 8.1 sources of water

Introduction to lesson; In this period, you are to discuss the various sources and categories of water then present it before the class

Lesson learning objectives;

- To describe the sources of water

Guide notes

OCCUURRENCE OF WATER

Water occurs naturally in liquid form at room temperature. All living things need water to remain alive. The earth is known as the blue planet because 71% of the earth's surface is covered with water. Water is the commonest compound on this planet. It is vital to our existence and survival because it is one of the main constituents in all living organisms. For example, your bones contain 72% water, your kidneys are about 82% water and your blood is about 90% water. There are several sources of water which are categorized as rain, underground and surface water.

SOURCES OF WATER

Water sources refers to the bodies of water that provide water to various living organisms

Water source can be used to mean both origin of water and a place where people get their water

Types of water sources

There are three main types of water sources i.e.

- Rain water
- Groundwater
- Surface water

Rain water

It is a form of liquid water that occurs when clouds condense.

When the temperature in the clouds drops below zero degrees Celsius, the water droplets increase in size and weight there comes a time when droplets become so heavy that they can no longer float and fall as a rain.

Features of rain water

It is pure as long as it is not produced by acid rain water.

It is slightly alkaline.

Ground water

Is the water that is found underground with in rocks. Its presence depends on the type of rocks. Permeable rocks have tiny spaces between the solid rock particles that allow water to pass through and to be held within the rock structure. The layers of the rock that holds ground water are called aquifers.

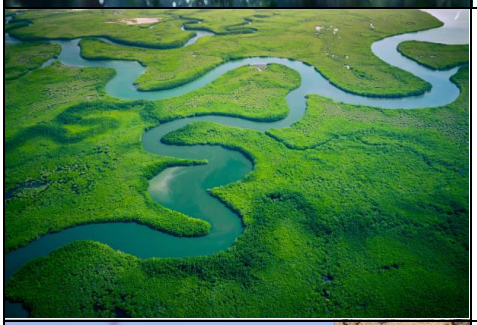
Surface water

Is the water located on top of land. It is produced by precipitation
Sources of surface water include streams, rivers, lakes etc.

Group activity 69

The pictures below show different sources of water. Identify each source.

picture	Name of source of water	Category or type of source

b) Describe the advantages and disadvantages for each type of water

BOOK OVERVIEW

Harroan s1 chemistry learner's book is a work book made and revised to simplify learner's understanding of chemistry based on the new curriculum.

The book is a development of the 2022 version and has been improved basing on the reviews of those who used the 2022 version

Number of pages – 200

Number of lesson periods – 100

Support structure; Harroan will provide a support to teachers on the expected answers in this work book. For more information read the full book overview pdf document

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