CHEMISTRY PROJECT BOOK

SENIOR ONE AND SENIOR TWO

BASED ON LOWER SECONDARY NEW CURRICULUM

BY OKUMU LIVINGSTONE AND MULUMBA ZAKAYO

ABOUT THE BOOK

This book is intended to help learner in the new lower secondary curriculum to identify projects and learn through them. The projects in this book are identified depending on the competency of the different chapters in senior one and two chemistry. Using the projects in the book, a learner can identify another project.

Projects are assignments given to the learner to be done over a certain period of time. Learners are expected to come up with a tangible product.

Projects promote the following

- Innovativeness
- Creativity
- Problem solving
- Collaborative skill
- Time management
- Research skill
- Critical thinking
- Values

After following the projects in this book, a learner is supposed to think and come up with another project by themselves with the guidance of the teacher.

Developing a project involves;

- Identification of the project: tittle (aligned to the chapter); objectives
- Organization: This involves planning, method/way of doing the project, resources to used, carrying out the project using the method identified, summarizing how much i going to be invested in the project.
- Report writing: this involves writing a document about project. It comprises of; title, objective, procedures/methods, result, analyzing, conclusion.
- Project work is going to contribute 10% of the school based assessment. In this book, by the end of every project, there is a table where result of each learner will be entered according to aspect assessed in each project.

- The book also has summarized of what I learnt in each chapter and end of chapter questions that help a learner to follow what is covered in each chapter.

Contents

SENIOR ONE

CHAPTER 1: CHEMISTRY AND SOCIETY

What you have learnt in this chapter

- Chemistry is the study of the materials around us, and their interactions with themselves and the environment.
- We study chemistry to understand the materials around us and know how to use them to serve our needs.
- The study of chemistry supplements on the knowledge of many other fields of study such as environmental science, biology, physics and geology.
- The study of chemistry helps us to explore many other careers in science and technology.
- Chemistry is important to the economy of our nation. The various chemical processes such as manufacture of plastics, soaps, fertilisers and cement benefit our nation economically.

END OF CHAPTER QUESTIONS

1. Explain the meaning of chemistry

……
……
……

2. List some careers related to the study of chemistry

……
……
……
……
……
……
……

3. Explain why chemistry is referred to as a central subject

……

……

……

4. State how the following chemical processes have contributed to our economy

(a) Manufacture of cement

……

……

……

(b) Manufacture of sugar

……

……

……

(c) Sewage treatment

……

……

……

(d) Manufacture of fertilisers

……

……

……

……

5. Which of the following industries essentially require a chemist and state how chemistry is used in them?

Industry	**Industry**
Petroleum	Food and beverages

Mining	Agriculture
Textile	Pharmaceuticals
Cosmetics	Automobile
Fishing	Tourism

PROJECT 1: IDENTIFYING CHEMISTRIES IN THE ENVIRONMENT

By the end of this activity you should be able to

- To identify the applications of chemistry in real life

What you need:

- A note book
- A pen
- Manila papers

What to do:

1. Move around your school.
2. Identify the activities/processes taking place at school.
3. Note down the activities that involve changing matter
4. Identify how matter changes in the identified activities in 3 above
5. Design diagrams on manila papers to show the different chemical processes taking place around the school. Pin it in your class

Results and discussions

1. Processes/activities that involve changing matter

……
……
……
……
……
……
……

2. How do these chemical processes benefit man

……
……
……
……
……
……
……
……
……

3. Identify other chemical processes that are important to man but not in school

……
……
……
……
……
……
……

Write a report.

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		

Product		
Report		
Total		

CHAPTER 2: EXPERIMENTAL CHEMISTRY

What you have learnt

- A laboratory is the special place where chemistry experiments can be carried out.
- Some chemistry activities can be done out the laboratory if they are deemed safe.
- The laboratory hosts apparatus that can be used to conduct different experiments.
- We have special apparatus for measuring weight, temperature, and volume.
- Some apparatus is called heating equipment and issued for heating in the laboratory.
- We have heating equipment in our homes. The choice of the equipment depends on the need and the type of the flame they produce.
- Laboratory rules and guidelines are to ensure safety in the laboratory and must be adhered to.
- Many chemicals in the laboratory have safety signs printed on the bottle. These must be read and interpreted properly before using the chemicals
- Chemistry as a science involves a systematic process of observation, hypothesis development, experimentation, analysis and conclusion.

END OF CHAPTER QUESTIONS

1. (a) Why is it good idea to tie back long hair in the laboratory?

……
……
……

(b) Why is it not good idea to put bags on the laboratory bench?

……
……

……
……

(c) Why is it wise to wear goggles when carrying out experiment?

……
……
……

(e) Why are we advised not to eat in the laboratory?

……
……
……

2. State one use of the following laboratory equipment?

(a) Bunsen burner

……
……

(b) Beam balance

……
……

(c) Mortar and pestle

……
……

(d) Measuring cylinder

……
……

3. Explain the importance of safety signs to chemists.

……
……

……
……
……

4. (a) What is a Bunsen burner?

……
……

(b) Outline the steps taken in lighting and extinguishing a Bunsen burner.

……
……
……
……
……
……

5. (a) What is a flame?

……
……

(b) What is the best flame for heating materials in the laboratory and why?

……
……
……

6. We normally use heating equipment in our homes. Explain the reasons for using particular apparatus for heating in your home

……
……
……
……

7. How important is the scientific method to a scientist?

……

……

……

……

8. (a) Give the differences between a luminous and non-luminous flame.

(b) What could be the importance of the luminous flame in everyday life?

……

……

……

PROJECT 1: MAKING FRUIT JUICES

By the end of this activity you should be able to

- Apply the scientific method in doing experiment

What you need:

- Ripe mango fruits
- Oranges
- Pineapples
- Jack fruits
- Lemons
- Apples
- Clean water
- Blender

- Sugar
- Clean packaging bottles
- Clean beakers, knives

What to do:

1. Identify three different fruits that give you a good taste and flavor.
2. Clean the fruits by washing using clean water
3. Peel the fruits to remove the unwanted parts including seeds.
4. Place the fruits into the blender and blend them to a liquid solid mixture
5. Remove the mixture from the blender and filter off the solid parts of the fruits using a kitchen sieve.
6. Add some water while filtering.
7. Add some sugar to improve on the taste of the juice
8. Package the made juice into clean dry bottles. Give the juice made a name.

Results and discussions

1. Identify the ways how you can improve on the quality and safety measures of the juice in terms of colour, taste and stability.

……
……
……
……
……
……

2. Identify the substances that can be added to make the juice suspension stable.

……
……
……

3. How much do you think can you sell the juice made?

……

……

4. Taste the juice form other groups to find out their quality. Market your product around the school.

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

5.

The project that you did; you followed the scientific method of investigation which involves;

(i) Making observations: Making juice from different fruits

(ii) Asking questions about the observation and gather the information: What fruits can give you the best juice, with a good taste and flavor.

(iii) Formation of hypothesis: A tentative description of what has been observed, making predictions. For example; hypothesis: a mango, pineapple and water melon can give out the best juice.

(iv) Performing the experiment to verify the hypothesis. This involves following the appropriate procedures and obtaining the results/product.

(v) Analyzing the product and make conclusions. This results in rejecting or accepting the hypothesis.

(vi) Repeating the experiment in order to improve.

PROJECT 2: MAKING A COLD SYRUP FROM PLANT EXTRACTS

By the end of this activity you should be able to

- Extract plant component and use them to make a cold syrup following scientific method of investigation

What you need

- Lemon
- Ginger
- Honey
- Clean knife
- Sieve
- Spoon
- Clean mortars and pestles

What to do

1. Wash the gingers and chop them into pieces.
2. Crush 500g of ginger pieces in a mortar using a pestle
3. Add 500cm^3 of hot water. Cover the mixture and leave it to stand for about 30 minutes.
4. Filter off the residue and keep the filtrate
5. Chop the lemon into pieces and blend it to extract the juice.
6. Filter off the residue to obtain the juice using a kitchen sieve.
7. Measure 300cm^3 of ginger extract into a clean beaker.
8. Add 150cm^3 lemon juice
9. Add 50cm^3 of honey. Stir the mixture thoroughly using a spoon for about three minutes.

Results and discussions

1. Why was it good to use extracts not the whole plant

……
……
……

2. Why do you think hot water was used to extract components from ginger?

……
……

3. Identify the project stages and arrange them according to the scientific method.

……
……
……
……
……
……
……
……
……
……
……

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

CHAPTER 3: STATES AND CHANGE OF STATES OF MATTER

What you have learnt

- All substances are made up of matter. Matter can exist in three states: solid, liquid and gas.
- Matter is made up of small particles. These are constantly moving.
- In solids, the particles vibrate but stay in one place.
- In liquids, the particles vibrate but move around but touching each other.

- In gases, the particles can move away from each other.
- Particles of hot substances move around faster than particles of cold substances.
- Solids, liquids and gases expand when heated because the particles move further apart.
- The particles of a gas are far apart. That why they are easily compressed.
- The particles of a liquid and a solid are close to one another. This is why liquids and solids cannot be compressed easily.
- Expansion can both be explained by moving particles

END OF CHAPTER QUESTIONS

1. Define the term matter

……
……

2. Name the three states of matter

……
……
……

3. Write down the names of three solids, three liquids and three gases you can find at school

……
……
……
……
……

4. We learnt that matter is made up of small particles. Give some experimental observations that show this.

……
……
……
……

5. Engineers need to know that substances expand when they are heated. Give three examples where engineers use this information to design things.

……
……
……
……

6. Explain the following observations by using the idea of moving particles

(a) Wet clothes hanging on a line become dry even in cold weather.

……
……
……
……

(b) If you put some sugar in tea, the tea will become sweet even if you don't stir it.

……
……
……
……
……

(c) A car tyre is full of gas, air, but the part of the tyre underneath the wheel does not look flat.

……
……
……

(d) If you place a balloon over the top of a test tube that contains water and you then heat the water, the balloon blows up.

……
……
……

7. If a jam lid does not open, you can often get it to open by heating the lid. Explain how this works.

……
……
……

8. Consider three states of matter i.e solids, liquids and gases. Distinguish between the three states of matter in terms of
   (a) Arrangement of particles
   (b) Motions of particles

9. In a certain school, the toilet is near the S3 class. The foul smell disturbs the students in class and the smell becomes much on a hot day. Explain this phenomenon.

……
……
……
……

10. In terms of kinetic theory, explain why heating causes ice to melt

……
……
……

PROJECT 1: MAKING ICE CUBES

By the end of this activity you should be able to

- Change matter from liquid to solid
- Market the new substance formed to make money

What you need

• Cup/bucket/beaker/saucepan/bowl cover

• Refrigerator

• Water

• Polythene papers

• Ice block cutter

What to do

1. Pour boiled and clean boiled water into a clean cup/bucket/saucepan/ bowl, and cover it.
2. Place the container in a refrigerator/deep freezer.
3. Leave it to stay overnight.
4. Cut ice blocks formed and pack them in polythene papers ready for sale.

Results and discussions

1. Explain the changes in the states of matter during the formation of ice form liquid water

……

……

……

……

……

……

……

……

2. Why was water first boiled?

……

……

3. Suggest any components that can be added to water to improve on the tatse of ice cube in order to attract the buyers.

……

……

……

4. Repeat the project using the component identified above. Package the cubes, market and sell to the school community.

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

PROJECT 2: MAKING LEMON GINGER THROAT CANDY

By the end of this activity you should be able to

- Extract plant components
- Change plant component from one form to another

What you need

- Molds
- Ginger tea
- Honey
- Lemon fruit

What to do:

1. Crush ginger in a clean pestle and put in boiling water to make hot tea.
2. Filter off the ginger pulp to remain with the hot tea.
3. Combine 100cm^3 of hot tea, 150cm^3 honey and 150cm^3 of lemon juice.
4. Boil the mixture while covered and allow to cook for about 40-60 minutes
5. Pour the mixture into molds and allow to harden.

6. Package the product(candies) and brand it for selling

Results and discussions.

1. Explain the importance of each ingrendient in the candy

(a) Honey

……

……

……

……

……

(b) Lemon

……

……

……

……

(c) Ginger

……

……

……

……

2. Explain the changes of the states of matter involved

……

……

……

……

3. Calculate the profit that you can get from each candy. Sell the candies to the community around you.

……

……

……

……

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

CHAPTER 4: USING MATERIALS

What you have learnt

- Common solid materials are woods, glasses, metals, ceramics, plastics and fibres.
- Each type of materials has important properties which determine its usefulness in everyday life.
- Different materials have different properties.
- The properties of materials determine their use.
- Concrete is made by mixing fixed ratios of sand, gravel and cement with water. Once it sets, it forms long crystals which interlock with each other to form a hard material but can be broken when hammered.
- Glass is an amorphous solid with a structure of a liquid. It can be transparent or opaque.
- Glass is easy to shape when it is molten, reasonably resistant to heat when it is set, chemically inert and it can be recycled any number of times but it is also brittle.
- Ceramics are made by mixing clay with water molding and then heating the material to form a hard but brittle structure.
- Polymers are long chain organic materials formed by chemically joining together many small molecules. They can be natural or artificial.
- Plastics are synthetic materials which are molded when hot and shaped to desired articles for everyday use. Plastics are actually artificial polymers formed from a range of different monomers.

- Improper disposal of plastics and other materials can negatively affect our environment.
- Fibres are natural or artificial polymers mainly used in the making of materials with high tensile strength such as ropes, fishing nets and fabrics. Materials such as nylon, polyester, cotton and silk are made of fibres.
- Many materials used in everyday life can be recycled. Recycling materials is one way of disposing them from the environment. At best recycled materials can be converted into other useful articles.
- Heating materials changes their physical and sometimes chemical structure. This affects the use of materials in everyday life. The effect may be negative but in most cases positive.

END OF CHAPTER QUESTIONS

1. State any important properties of the following materials that determine their use:

(a) Ceramics

……

……

(b) Wood

……

……

(c) Plastics

……

……

……

(d) Cement

……

……

……

2. Plastics are used to make many useful materials. Explain the physical properties that make plastics suitable for their uses.

……

……

……

……

……

……

3. (a) Describe how ceramics are made

……

……

……

……

……

……

……

……

b) List three uses of ceramics

……

……

……

……

4. (a) Describe how concrete materials are made

……

……

……

……

b) How can you ensure that the concrete is of high quality?

……

……

……

c) What can you do to ensure that the concrete sets well?

……

……

……

d) State one important property of concrete

……

……

5. For each of the following materials, state the best materials that can be used for its manufacture and give reasons for your choice.

(a) A teapot

……

……

……

(b) Fishing nets

……

……

……

(c) Wine bottles

……

……

……

(d) Electrical wires

……

……

……

(e) A blanket

……

……

……

6. Describe the dangers of using plastics on the environment

……

……

……

……

……

……

……

7. (a) Why should we recycle materials?

……

……

……

……

……

……

.....

b) What are problems involved in recycling plastics?

……

……

……

……

……

……

PROJECT 1: MAKING AND DETERMINING THE STRENGHT OF CONSTRUCTION MATERIALS

By the end of this activity you should be able to

- Make bricks of different strength
- Determine the strength of the bricks

What you need

- mud and/or clay (used for brick-making)
- cement
- sand
- water
- container for mixing cement or mud
- boxes for molding the bricks (for example, long-life milk or juice
- cartons with a flat side cut-out)
- bucket
- piece of wood

Make several different bricks out of different materials. Here are some ideas for some of the bricks.

Try these mixtures for your bricks:

- Two parts of cement added to two parts of sand.
- One part of cement added to three parts of sand.

- Three parts of cement added to one part of sand.

What to do:

Mud suitable for brick-making.

1. Add water to each mixture until it is a firm paste.
2. Mold each mixture into a box and label it carefully.
3. Leave the bricks to dry for a week (not in the sun).

Testing your bricks—bending

Test the strength of each brick by hanging bucket underneath it as shown. Make sure that the testing experiment is exactly the same for each brick.

Write down in the table how much water you put into the bucket before the brick broke.

(Your brick may not break at all. Congratulations! You have made a good strong one.)

Result and discussions

1. Which of the bricks made your group can you recommend for constructing a 3-stoyered building? Give reasons for your answers.

……

……

……

……

……

2. How can you improve on the strength of the bricks made?

……

……

……

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		

Total		

PROJECT 2: CONVERTING USED PLASTICS INTO USEFUL MATERIALS

By the end of this activity you should be able to

- Identify materials that pollute our environment
- Convert the material into useful product

What you need:

- Used plastic drinking straws
- Used polyethene bags
- Used plastic water bottles

What to do:

1. Collect different used plastic materials from around the school
2. Wash them using clean water
3. Craft them into desired articles such as ropes, baskets and plastic hand bags

Results and discussions

1. How can the making of articles above help in the reducing on the amount of plastics in the environment?

……

……

……

2. Apart from the articles made, identify any other articles that can be made from the used plastics from the environment.

……

……

……

……

……

……

……

3. List down how you can convert the used plastics into the desired articles mentioned 2 above.

……

……

……

……

……

……

……

……

……

……

……

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

CHAPTER 5: TEMPORARY AND PERMANENT CHANGES

What you have learnt

- The changes around us can be permanent or temporary.
- Permanent changes are the changes which cannot be reversed while temporary changes can be reversed
- Temporary changes are the changes which occur only for a short period of time. Generally temporary changes are reversible

- Temporary and permanent changes may be periodic in some cases and reversible or irreversible in others.
- A change which can happen forward and backward both, that is, it can be reversed is called a reversible change.
- Chemical changes are the changes that occur in chemical properties of a substance. During physical changes, the physical properties such as shape, size or state othe substance change.
- In physical changes, a substance can return to its original state while after a chemical change, the substance cannot return to its original state.
- In physical change, the chemical properties of the substance do not change while in a chemical change, the chemical properties of the substance change.
- Most physical changes are reversible changes while all the chemical changes are irreversible.

END OF CHARPTER QUESTIONS

1. Classify each of the following as either a physical or chemical change

(a) Hydrochloric acid reacts with potassium hydroxide to produce a salt, water and heat.

……

……

(b) A soft piece of pure sodium metal is sliced in half and placed on water

……

……

(c) Water is heated until it begins to boil and produces steam.

……

……

(d) The compound potassium chlorate decomposes (breaks down) into potassium chloride solid and oxygen gas.

……

……

(e) Iron mental rusts

……

……

(f) A tray of ice cubes is taken out of the freezer and begins to melt.

……

……

(g) The lactose sugar in milk is converted to lactic acid by bacteria

……

……

(h) A birth day party balloon is inflated with helium gas that is less dense than air so it will float

……

……

(i) A plant makes its own food by photosynthesis

……

……

(j) Dry ice, frozen carbon dioxide sublimes directly to carbon dioxide

……

……

(k) Droplets of water condense on the outside of a cold glass of water on a hot summer day

……

……

2. Classify the following statements as true and false:
   (a) Digesting sugar with the amylase in saliva is a chemical change…….
   (b) Electroplating a metal is a physical change……..
   (c) All physical changes are reversible…….
   (d) All chemical changes are reversible……..
   (e) Cooking food is an example of a physical change……..
3. Answer the following questions
   (a) While playing, you accidentally fall into a swimming pool and wet your clothes. Can you reverse this change?

……

……

(b) Give an example of a physical change which cannot be reversed

……

…….....

(c) What can kind of change is observed when copper untensils appear to be greenish in colour?

……

4. Which of the following changes can be reversed

Grain to flour	
Bud to flower	
Ripening of fruits	
Boling tea leaves with water	
Burning of a candle	
Freezing of water into ice	
Boiling water into steam	
Cutting logs of wood	

PROJECT 1: MAKING A CANDLE

By the end of this activity you should be able to

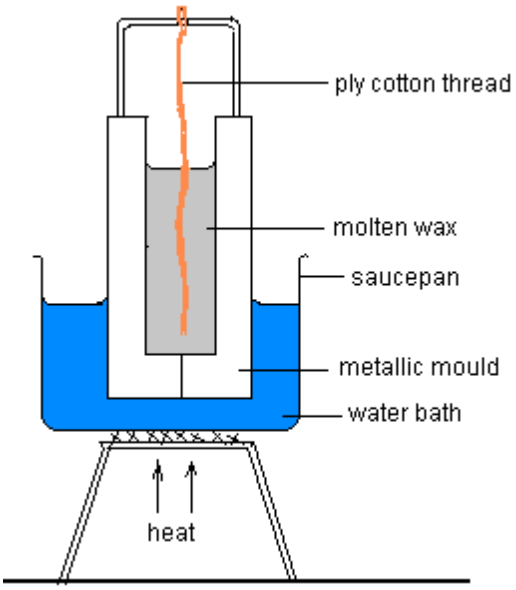
- Identify that material undergo
- Mould candles from wax

What you need

- refined paraffin wax
- stearic acid
- candle mould
- dyes and mosquito repellent
- water bath
- saucepan/beaker
- ply cotton thread

1. Put 1kg of wax in the saucepan and melt it over a water bath
2. Add 40% (40 g in 100 mL of water) of stearic acid into the melted wax and Stir. What is the use of the stearic acid?

3. Once the acid has dissolved, mosquito repellent or dye may be added if one desires. Can you explain how you think the candle would work as a mosquito repellent if you added mosquito repellent to the melted wax?
4. **Caution:** Handle the melted wax and stearic acid with caution. They can be harmful to your skin)
5. Suspend the cotton thread into the centre of the mould and carefully pour the hot wax into the mould as in Figure below
6. **Note:** Don't fill the candle mould with wax to the brim.
7. When the wax has solidified, open the mould and remove the candle. Package the candles and brand them for selling



Results and discussion

1. What is the use of oil/stearic acid

……

……

2. How can a candle you have made work as a mosquito repellent?

……

……

……

3. Depending on the price of wax told by the teacher, calculate how many candles can you obtain from 1kg of wax. How much can you sell them to gain profits?

……

……

……

……

……

……

……

……

……

4. How can you improve on the quality of your candles

……

……

……

5. Describe the changes that took place during the candle making

……

……

……

……

……

6. Make another mould and another size of candles around your community

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

CHAPTER 6: MIXTURES, ELEMENTS AND COMPOUNDS

What you have learnt:

- Matter can be classified as pure or impure substances. Pure substances are made of only one kind of particle.
- Inpure substances are made up of more than one pure substances not chemically combined.
- Impure substances are also called mixtures.
- A mixture contains more than one substance(element and/or compound) mixed in any proportion.
- Mixtures can be separated into pure pure substances using appropriate separation techniques.
- A solution is homogeneous of two or more substances.
- The major component of a solution is called the solvent and the minor, the solute.
- The concentration of a solution is the amount present per unit volume or per unit mass of the solution/solvent.
- Materials that are insoluble in a solvent and have particles that are visible to naked eyes form a suspension. A suspension is a heterogeneous mixture.
- Pure substances can be elements or compounds.
- An element is a form of matter that cannot be broken down by chemical reactions into simpler substances.
- A compound is composed of two or more different types of elements, chemically combined in a fixed proportion.
- Properties of a compound are different from its constituent elements, whereas a mixture shows the properties of its constituting elements or compounds.

END OF CHARPTER QUESTIONS

1. Classify each of the following as element, compound and mixture: ice, sea water, milk, common salt, ink, blood, copper, carbon dioxide, diamond.

……
……
……
……
……

……

……

2. Describe an activity you can carry out to test for the purity of water.

……

……

……

……

……

……

……

……

……

3. Oil was discovered in Uganda in the western region at lake Albert. However, scientists say we cannot use the oil without processing it. Write a brief note about processing oil to obtain petrol.

……

……

……

……

……

……

……

……

……

……

……

……

4. Describe an activity that can be used to obtain salt that has been accidentally mixed with sugar.

……

……

……

……

……

……

……

……

……

……

5. Discuss the method of separation you will use for seaparation of iron from sand.

……

……

……

……

……

……

6. Name the solid that can be purified by sublimation.

……

……

7. When solid iodine was heated, it directly changed into a violet vapour without melting.

(a) What name is given to this process?

……

(b) Name another two substances that can undergo a similar process like iodine.

……

……

8. (a) Describe an activity that can be used to separate paraffin from water.

……

……

……

……

……

……

……

(b) Suggest a reason why the above method is used to separate the mixture of water and paraffin.

……

…….....

PROJECT 1: PREPARING DYES FROM COLOURED FLOWERS

By the end of this activity, you should be able to:

1. Prepare dyes of different colours.
2. Package and market the dyes.

What you need

- Pestle and mortar
- Glass rod/ wooden rod
- Bottles
- Test tubes
- Ethanol (98%) or propanone or crude waragi
- Coloured flower petals (red cabbages, bougainvillea, hibiscus etc)

What to do

1. Pick coloured flowers and pluck off the petals.
2. Crush the petals in a mortar with a pestle.
3. Add either ethanol or propanone or crude waragi to the mortar and stir with the glass rod or wood rod or pestle.
4. Filter the mixture to obtain a clear coloured mixture which is the dye prepared.
5. Pour the dye in a clean bottle.
6. Different flower extracts can also be mixed to get varying dyes.

Results and discussions:

1. Name the plants that have petals that have the best coloured dye.

……

……

……

……

2. State the properties of the dye made.

……

……

……

……

……

3. Which method can be used to the separate the components of the dye made?

……

4. Which principle does the method depend on when separating the components of the dye.

……

……

5. Use different flowers to make a variety of dyes and try to market the dyes. State the physical properties of the dyes made.

……

……

……

……

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

PROJECT 2: PREPARING COUGH MIXTURE

By the end of this activity, you should be able to:

1. Prepare a homemade cough mixture.
2. Use, package and market the product.

What you need

- saucepan
- glass rod/wooden rod
- burner/stove

- packing bottles
- knife
- lemon fruits
- ginger
- honey
- mango tree bark and leaves
- water

What to do

1. Cut fresh/green 3 lemon fruits and 200g of ginger into small pieces.
2. 2 Place the cut parts in a saucepan.
3. Add the crushed pieces of mango bark or mango leaves (100g) to the saucepan.
4. Measure distilled/ rain/ tap clean water to the saucepan.
5. Heat on the burner/ stove to boiling, till most water has evaporated.
6. Allow to cool then add honey. Stir and cover with a net/ cover.
7. Leave the mixture to cool further.
8. Filter the mixture and measure the required volumes and package in bottles.
9. You have made a cough mixture. Now calculate the unit cost and selling price. Try to market the products.

Report

Follow-up activity
Get other substances that are locally used to prepare such cough mixture.

Project 3: Making toothpaste (mouth cleanser)

By the end of this activity, you should be able to:

1. Make a mouth cleanser.
2. Use and promote the use of mouth cleansers by members of the community.

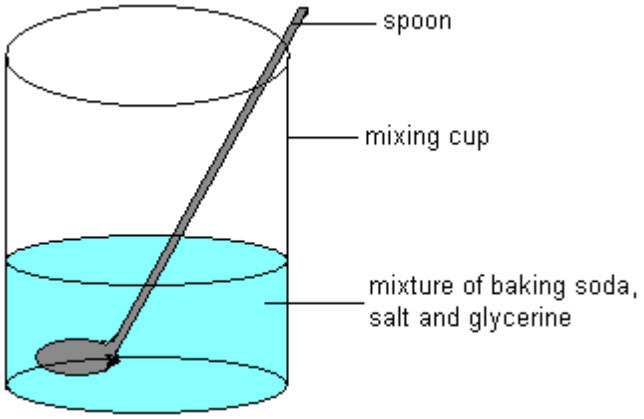
What you need

- *Measuring* cups of the following sizes; 1 cup, ½ cup, ¼ cup (the 1 cup size has a capacity of 250 ml)
- Measuring cylinder
- Spoon of capacity 5 ml
- Small buckets (2l)
- a table spoon

- Cold boiled water
- Glycerin
- Peppermint oil
- Baking soda (sodium bicarbonate)
- Containers with lid(50ml)
- Table salt

What to do

1. Place 1 cup of baking soda in the bucket followed by $\frac{1}{3}$ cup of a mixture table salt and glycerin. Mix these thoroughly well using the table spoon.
2. Measure out ¼ cup of dry mixture into another bucket containing ¼ cup of cold boiled water to the dry mixture. Add more water to make a thick paste. What is the role of the glycerin in the mixture?
3. To the thick paste, add a spoonful of peppermint oil. What is the function of peppermint oil? What is the colour of the paste you have made?
4. Pack the toothpaste in the container with a lid.



Results and discussions.

1. What is the "active ingredient" in toothpaste?

……

2. What is the role of the "active ingredient" in toothpaste?

……

……

Follow-up activity

1. Brush your teeth using your toothpaste and make a comparison between your "homemade" toothpaste and the commercially manufactured tooth paste.
2. Carry out health education in communities on why it is important to practice good oral hygiene.

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

CHARPTER 7: AIR

What you have learnt:

- The main gases in the atmosphere are nitrogen and oxygen with small amounts of other gases such as argon and carbon dioxide.
- Oxygen is chemically very reactive and combines with other elements to form oxides of the elements. This process is called oxidation.
- Nitrogen does not easily take part in chemical reactions because a lot of energy is needed to break the strong bond between the two nitrogen atoms.
- Oxygen and nitrogen are obtained from liquid air by frational distillation. The pure oxygen is used in hospitals, oxyacetylene welding and in steal making.
- The main use of nitrogen is the manufacture of nitrate fertilisers.
- Many human activities cause air pollution. Solid particles (smoke and dust) or gases can pollute air.
- Gaseous pollutants include carbon monoxide, sulphur dioxide and nitrogen oxides.
- The main sources of these pollutants are factories and power stations, motor vehicles and residential area.

END OF CHARPTER QUESTIONS

1. Name two major components of air

……

……

2. Describe how the components of air can be obtained from the atmospheric air.

……

……

……

……

……

……

……

……

3. Write the uses of the following gases
   (a) Oxygen
   (b) Nitrogen
   (c) Argon
   (d) Carbon dioxide

……

……

……

……

……

……

……

4. Why does eythyne burn better in oxygen than in ordinary air?

……

……

……

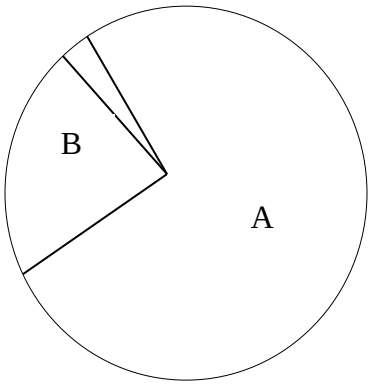
5. Explain why carbon dioxide which is essential to life can also be dangerous.

……

……

……

6. The pie chart shows the percentage composition of main gases in dry air.



(a) State which gases are represented by segments A and B.

……
……

(b) State which gas will combine with other elements when they are bunt in it?

……

(c) State which of noble gases is present in the greatest amount of air

……

(d) Explain why we can say that air is dilute "oxygen". What would happen if air was pure oxygen?

……
……
……

(e) Oxygen dissolves in water. Explain why this is important to us.

……
……
……

7. Describe the experiment to show that air contains:
   (a) Carbon dioxide
   (b) Water vapour

……
……
……
……

……
……
……
……
……
……
……

8. The table below shows the content of the exhaust fumes from a car

Gas	**Percentage (%)**
Water vapour	44
Carbon dioxide	38
Carbon monoxide	10
Unburnt hydrocarbons	5
Nitrogen oxides	2
Other gases	1

(a) State the most common gas present in a car exhaust fumes. Would you describe this gas as a pollutant?. Give reasons for your answers?

……
……
……
……

(b) Draw a bar chart showing the four main substances in car exhaust fumes.

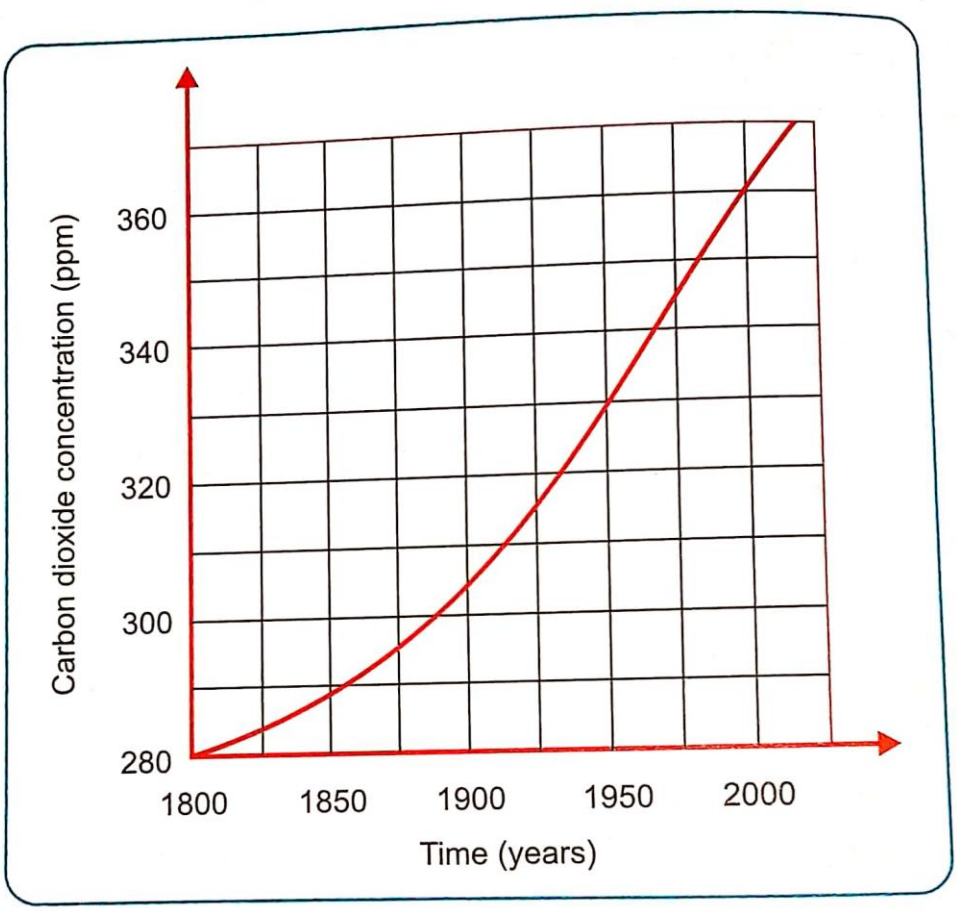
(c) Explain why carbon monoxide is present in these fumes

……
……
……

(d) One of the other gases is sulphur dioxide. Explain the effect of this gas on the environment.

……
……
……

9. The graph below shows the carbon dioxide concentration in the earth's atmosphere over the past two hundred years



(a) Calculate how much carbon dioxide concentration increased from the year 1800 to the year 1950.

……
……
……

(b) State two factors that could have contributed to the increased amounts of carbon dioxide in air between 1950 to 2000

……
……

(c) Explain the effect of an increased carbon dioxide concentration in the air can have on the environment over a long period of time.

……
……

(d) Name two ways by which air pollution caused by carbon dioxide can be reduced.

……
……

(e) State the importance of carbon dioxide in the air.

……
……
.....
.....

10. Describe any experiment by which the percentage of oxygen in air can be determined.

……
……
……
……
……
……
……
……
……

11. A student left a knife outside the house for about a week. On observing the knife, it was found that the knife turned dark brown on the surface.

(a) What is the chemical name of the dark brown coating

……

(b) What conditions lead to the formation of the brown coating?

……
……

(c) How can you show that iron underwent a chemical change?

……
……
……
……
……....

(d) Explain the ways by which the formation of the brown coating can be prevented.

……
……
……
……

……
……

12. Explain the effects of rusting on domestic and farm equipment made up of iron.

……
……
……
……
……
……
……

13. How can you show that rusting cannot take place I the presence of water alone (without air)?

……
……
……
……
……
……

PROJECT 1: ESSAY COMPETITION ON METHODS OF PREVENTING RUSTING

What to do

1. In this activity, you will be given a topic for essay competition such as, "Discuss the methods of preventing rusting of iron".
2. Do an extensive research from the library about the topic.
3. Go to the nearby community and list the materials on which different methods of preventing rusting have been applied.

REPORT

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		

Total		

PROJECT 2: **MAKING RUST-RESISTANT DUSTBINS**

By the end of this activity, you will be expected to:

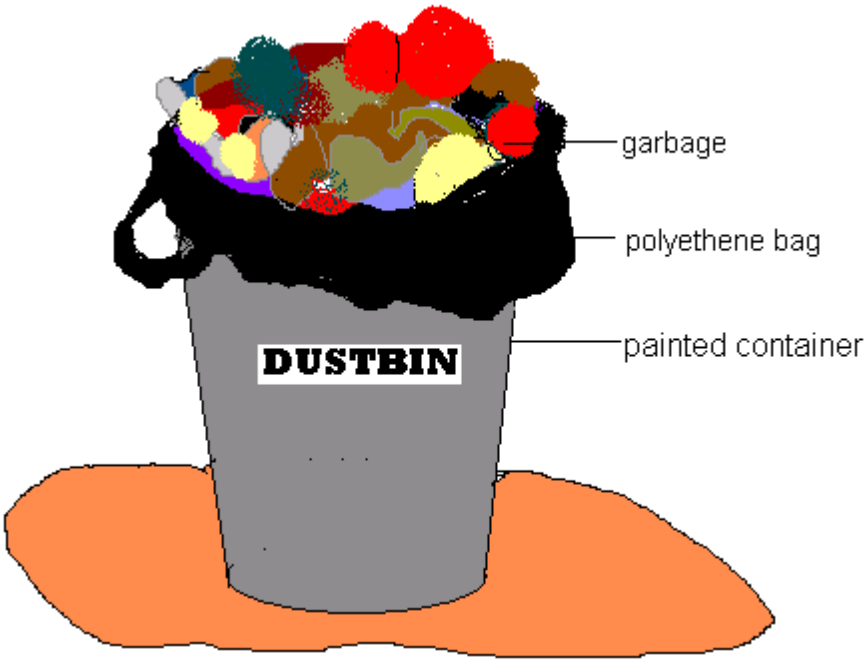
1. Provide services to the school or to your community by applying the methods of preventing rusting.
2. Make rust-resistant dustbins for sale to the community.

What you need

- metallic tin
- piece of cloth
- large polythene bag
- oil paint

What to do

1. Get a metallic cylindrical container from your teacher.
2. Clean it in and out with a clean cloth or papers.
3. Make small holes at the bottom of the tin.
4. Mix oil paint and paint the inside and outside of the container.
5. Place the large, polythene bag in the painted container.
6. Place it outside the classroom for use as dustbin.



Follow-up activity

1. Educate the community on how to protect materials containing iron from rusting.

……
……
……
……
……
……
……
……

2. Describe the different methods that can be used to prevent rusting.

……
……
……
……
……

3. Explain why iron sheets used for roofing in industrial areas rust much faster than those in far away from the industrial areas.

……
……
……
……

4. Does rusting have any advantages? Explain your answer.

……
……
……
……
……

Report

Phase	**Indicators**	**Score**
Identification,		

planning, deign		
Project implementation		
Product		
Report		
Total		

CHARPTER 8: WATER

What you have learnt:

- Water is found almost everywhere in nature like springs, lakes, rivers seas and oceans. It can also be obtained as rain and as underground water in borehole.
- Many living materials contain water and it is vital for their life.
- Water is a colourless, odourless, and tasteless liquid and is the compound formed between hydrogen and oxygen.
- Unlike other similar compounds of hydrogen, it is a liquid at normal temperatures found on earth.
- Ice, which is solid water, is unusual because it is less dense than liquid water and floats on top of it. Both these unusual properties are essential to life on earth.
- Pure water has a boiling point of 100^0c and a freezing point of 0^0c at sea level. It has a density of $1g/cm^3$.
- The chemical test for water is that it turns white anhydrous copper (II) sulphate blue.
- We need water for drinking, cooking, washing, agriculture and industry.
- Water is a very good solvent. It normally carries with it dissolved minerals when it passes through rocks.
- Water can be purified for public use in water treatment plants.
- Sewage consists of materials from household sources. It must be treated to prevent infections and diseases from decaying materials.

END OF CHARPTER QUESTIONS

1. (a) Name five sources of natural water

……

……

……

……

……

(b) How do you normally make water from those sources safe for drinking?

……

……

……

……

……

……

……

……

2. Describe an experiment that be conducted to show that living materials contain water.

……

……

……

……

……

……

……

……

……

3. Describe one method you can use to purify water at home

……

……

……

……

4. Describe the process of recycling water naturally

……

……

……

……

……

5. How does water get polluted?

……

……

……

……

……

……

6. Describe the stages of sewage treatment. Why is sewage treated?

……

……

……

……

……

……

……

……

……

……

……

……

PROJECT 1: MODELLING A WATER CYCLE

By the end of this activity, you should be able to advise the community on the importance of wetland conservation.

What you need

a) a clear plastic jar

b) cling film or sheets of clear plastic

c) rubber band

d) soil

e) seed

f) measuring cup

g) water

What to do

1. Ensure that the plastic jar is clean and dry.
2. Add a layer of soil to the bottom of the jar. The layer should be about 2 cm deep.
3. Sprinkle about half a teaspoon of chickenfeed over the soil.
4. Cover the seeds with another layer of soil that is also about 2 cm deep.
5. Measure 60 ml of water using the measuring cup. Slowly pour this over the soil. Make sure the water is poured evenly over the soil surface.
6. Cover the top of the jar with cling film or plastic and secure it with a rubber band.
7. Place the jars on a window sill or other place where they can remain in direct sunlight. Over the next few days, the learners
8. Record your observation

Observations

……

……

……

……

……

……

……

……

Results and discussions

Results

1. How did the appearance of the jar and plastic cover change?

……

……

……

2. Did droplets appear on the inside or outside of the jar?

……

3. Where do you think the droplets came from?

……

……

4. What happened to the seed?

……

……

5. What role did sunlight play in the change from liquid water to water vapour?

……

……

Report

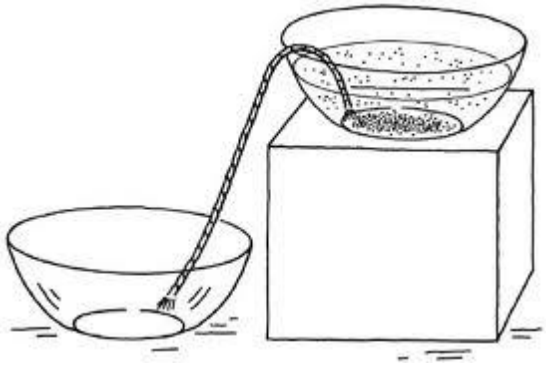
Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

RPOJECT 2: HOMEMADE WATER PURIFIER

By the end of this activity, you should be able to make a homemade water purifier to see how suspended matter can be filtered from water.

What you need

- eight-inch-tall cardboard box
- two bowls
- water
- dirt
- wool yarn



What to do

1. Set an eight-inch-tall cardboard box on a table. Set a bowl of clean water on top of the box.
2. Gently drop a small handful of dirt into the water. Much of the dirt will remain suspended in the water, and the water in the bowl will be discolored.
3. Set an empty bowl on the table right next to the cardboard box.
4. Twist together several one-foot strands of wool yarn to make a rope.
5. Put one end of this rope, or wick, into the bottom of the bowl of dirty water. Place the other end of the wick in the empty bowl. After a while, drops of clear water will drip off of the free end of the wick into the empty bowl.

Results and discussions

1. Explain the observations

……

……

……

……

……

……

……

……

……

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		

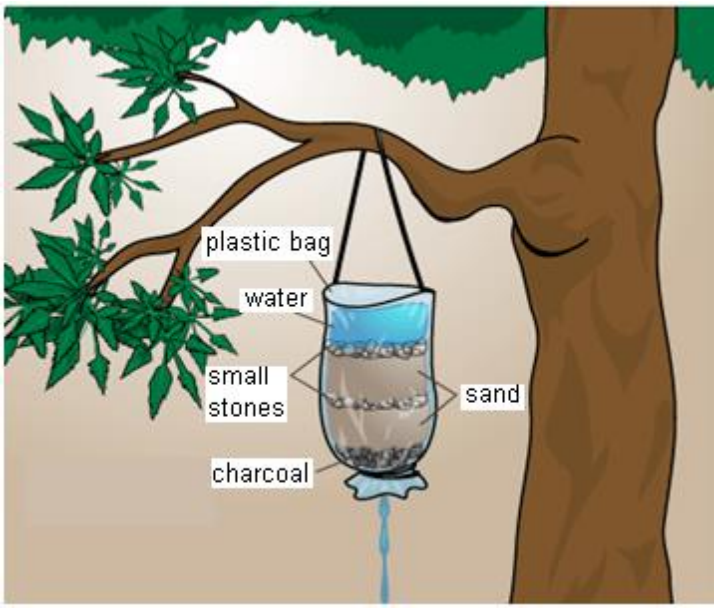
Total		

PROJECT 3: **HOMEMADE CHARCOAL WATER FILTER**

By the end of this activity, you should be able to make a homemade water filter easily and inexpensively that will help to serve the immediate clean water needs.

What you need

- 2 litre pop bottle
- straw
- sand - fine and large grain
- gravel- fine and large grain
- Charcoal granules
- cotton batting
- coffee filter
- cup



1. Cut the bottom off of the two litre bottle. Cut a hole in the lid and insert the straw into the hole so the filtered water will flow out of the straw.
2. Insert the cotton batting at the bottom of the bottle. If you have charcoal granules, layer those next. The next layer is fine grain sand followed by larger grain sand. After the sand layers, add the gravel layers. Start with the fine grain gravel followed by the larger grain

gravel. Alternate these layers until you reach the top of the bottle. Top the layers off with the coffee filter.

3. Once you have everything in place, pour the water through the coffee filter.
4. The water will work through the different layers to remove the impurities.
5. The cotton batting at the bottom works as the final layer to catch particles from the sediment. The water will flow out of the straw and into the cup.

Results and discussions

1. What is the use of charcoal in purifier?

……

……

2. What is the role of coffee filter in the purifier?

……

……

3. In your groups, discuss how this water purifier can be improved

……

……

……

……

……

4. How can you ensure that the purifier remains functional?

……

……

……

Follow-up activities

- Visit water treatment plants to see how water is treated.
- Find out from nearby shops the different chemicals used for purifying water.
- Find out whether there are any plant materials that can be used for water purification.

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project		

implementation		
Product		
Report		
Total		

CHARPTER 9: ROCKS AND MINERALS

What you have learnt:

- There are three classes of rocks namely; igneous rocks, metamorphic rocks and sedimentary rocks
- Igneous rocks are formed as a result of the cooling of molten rock from the crust and upper mantle.
- Sedimentary rocks are formed by weathering of existing rocks at the earth's surface.

END OF CHARPTER QUESTIONS

1. (a) What do you understand by the term "rocks"?

……

……

(b) Name the three major classes of rocks

……

……

……

2. (a) What is an igneous rock?

……

……

(b) Describe how igneous rocks are formed and give their characteristics.

……

……

……

……

……

3. (a) What is a sedimentary rock?

……

……

(b) Describe the mode of formation of sedimentary rocks

……

……

……

……

4. (a) Explain what is meant by the term rock cycle?

……

……

……

(b) Describe the relationship between the process in rock cycle of the major types of rocks?

……

……

……

……

……

5. (a) Define the term mineral and name the major classes of minerals with their physical characteristics.

……

……

(b) Describe the nature and mode of origin of thechief types of rock at the earth's crust. How will you distuinguish them?

……

……

……

……

……

……

……

6. (a) What are metamorphic rocks?

……

……

(b) Describe the types of metamorphic rock and how are they formed?

……

……

……

……

……

……

……

7. (a) What is weathering?

……

……

(b) Distinguish between physical and chemical weathering.

……

……

……

……

……

……

8. Soil, rocks and minerals are examples of natural resources. Explain the usefulness of these resources.

……

……

……

……

……

……

……

PROJECT 1: MAKING PAINT FROM ROCKS

By the end of this activity you will be able to make

- Make handmade water colours and use it to make handmade paint from rocks.

What you need

- Gum
- Water
- Honey
- Cooking oil
- Rocks
- Motor and pestle
- Clean containers
- Hammer
- Glass beaker
- A sieve
- A muller

Procedure A

1. Fill a glass beaker with 200g of gum up to the first mark.
2. Add 150cm^3 of boiled water to the second mark. Let the mixture stand for a night to dissolve. Turn the beaker once a while to help it get wet.
3. The next day evening, add more water to meet the second mark. Leave it to stand for a day.
4. Add 50cm^3 of cooking oil
5. Filter the un dissolved solid through a same sized sieve.
6. Store the media in a very cool place for future use

Procedure B

1. Crush the bigger rocks using a hammer when placing the rocks on a large stone.
2. Grind the rocks collected into fine powder using a motor and a pestle. For larger rocks, first break them into smaller pieces using a hammer. Do this step outside the laboratory and on a hard surface.
3. Sieve the powder got to remove the larger pieces.
4. Take 200g your finely rock powder into a dry clean glass beaker.
5. Add 50cm^3 of water colour media made above to the fine powder at the center. Let it soak into the surrounding pile before mixing using a rod.
6. Use a muller to get the powder suspended and stable in the media.
7. Put the paint in pans and label it

Results and discussions

1. How can you improve on the appearance of the paint?

……

2. What is the purpose of honey in the paint?

……

……

3. What is the purpose of gum in the paint

……

……

Follow up activity

- Visit a nearby quarry center and obtain the different rocks you can use to make different paints
- Maker larger amounts of paint from the rocks obtained

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

Record of work

Competency	**C1**		**C2**		**C3**		**C4**		**C5**		**C6**		**C7**		**C8**		**C 9**	
Activity of integration																		
Project																		

SENIOR TWO

CHARPTER 1: ALKALIS AND ACIDS

What you have learnt:

- Many locally available substances are either acids or alkalis.
- Acids are sour in taste
- Alkalis are bitter in taste and soapy on touch
- Acids turn blue litmus blue
- Substances which are neither acidic nor alkaline(basic) are called neutral
- Solutions of substances that show different colours in acidic, alkaline and neutral solutions are called indicators.
- An acid and base (an alkali) neutralize each other and form a salt. The salt formed may be acidic, alkaline or neutral in nature.

END OF CHARPTER QUESTIONS

1. (a) What do you understand by the term indicator?

……

……

(b) What would be observed when

(i) Litmus is dropped into hydrochloric acid?

……

……..

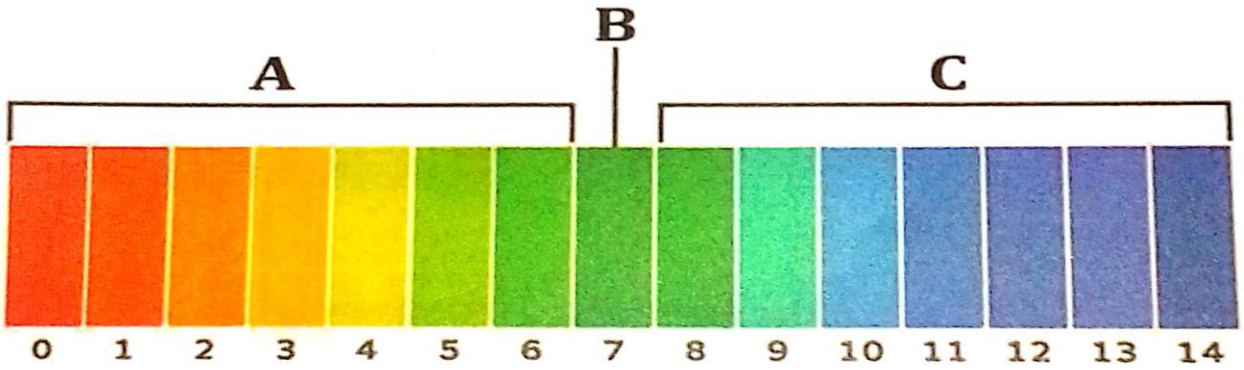
(ii) Phenolphthalein is added to sodium hydroxide solution?

……

……

2. A universal indicator is a very useful way of finding out not only if a liquid is an acid or an alkali, but also how strong the acid or alkali actually is. The indicator changes colour and this colour can be matched against a number on a chart like the one shown below.

a) Complete the labels A, B and C on the chart



……

……

……

b) Which pH value would be the strongest acid?

……

c) Which pH value would be the weakest acid?

……

d) Which pH value would be the strongest alkali?

……

e) Which pH value would the weakest alkali?

……

f) Which pH value would neutral?

……

g) Which pH value best describes the pH of stomach acid?

……

h) Which pH best describes the pH of distilled water?

……

3. A group of learners were given a range of liquids by their chemistry teacher and were asked to find out, using litmus solution, if they were acidic, alkaline or neutral. Complete the following table to show their expected results

Test liquid	**Colour blue litmus solution**	**Colour in red litmus solution**	**Acid, alkali or neutral?**
Vinegar	Red	Red	

Distilled water	Blue	Red	
Washing soda	Blue		Alkali
Lemon juice	Red		Acid
Alcohol	Blue	Red	
Ammonia		Blue	Alkali

4. California is stung by wasp and her aunt pours some vinegear on the sting.

(a) Why does she do this?

……

(b) Suggest what California's aunt would put on a bee sting

……

……

PROJECT 1: PREPARATION OF INDICATORS FROM RED CABBAGE

By the end of this activity, you should be able to:

1. Prepare an indicator from red cabbage.
2. Test its colour in acid and base.

What you need

- 250 ml beakers
- hot plates
- beaker tongs
- 2l distilled water
- large screw – top storage bottle
- dropper bottles of 1M HCl
- dropper bottle of 1M NaOH
- red cabbage
- watch glasses
- goggles

What to do

1. Pull a few leaves of red cabbage into very small chunks with your fingers.
2. Fill a 250 ml beaker halfway with torn cabbage leaves and add water until the beaker is about two-thirds full. Place the beaker on a hot-plate at a medium temperature.
3. You should notice that the water turns purple as the cabbage boils. When the water is very purple, remove the beaker from the heat with beaker tongs and let cool. The purple juice you made is acid-base indicator.
4. To find the colour of your indicator in acid, add one drop of indicator to one drop of 1M Hydrochloric acid in a watch glass. Record the colour of the indicator in acid.

5. To find the colour of your indicator in acid, add one drop of indicator to one drop of 1M sodium hydroxide in a watch glass. Record the colour of the indicator in a base.

……

……

……

……

Follow-up activity

1. Prepare different indicators including universal indicators from plant materials of different colours. Test the nature of the various solutions using the different plant material extracts including that of a mixture of red, orange, yellow, green, blue, indigo and violet.
2. Study indicator properties of other dyes. Boil other vegetables and determine whether the resulting juices can be used as acid-base indicators.

3. Package the various juices in plastic bottles, cost the products and try to market to other schools.

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

PROJECT 2: PREPARATION OF INDICATORS FROM PLANT MATERIALS

By the end of this activity, you should be able to make an indicator from plant materials.

What you need

- glass beakers (50cm3)
- filter funnel
- filter papers
- stand and clamp
- glass rod
- mortar and pestle
- test tubes
- measuring cylinder (5 cm3)
- red or blue flower petals
- water
- ethanol or local waragi
- lemon or orange juices
- dilute sulphuric acid
- soap solution
- dilute sodium hydroxide
- solution of ashes (from plants)
- small bottles

What to do

1. Collect blue flowers from the compound and then follow the steps as given in 2 – 8 below.
2. Place the blue flower petals in a mortar.
3. Grind the petals using a pestle.
4. Add a portion of a solvent made by mixing ethanol (Waragi) with water and continue grinding until the extract is as deep in colour as possible.
5. Decant the extract into a test tube until you have about 10cm3 of it.
6. Repeat procedure 1 – 4 with red flower petals.
7. Use the flower extracts to test the solutions: lemon or orange juices dilute sulphuric acid, soap solution, dilute sodium hydroxide, solution of ashes (from plants) and soap solution.
8. Record your observations in a suitable table and discuss them with your fellow students. Classify the solutions as acids and bases.

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

OBSERVATIONS

……
……
……
……
……
……
……
……

CHARPTER 2: SALTS

What you have learnt

- Salts are all around us
- Acids and alkalis (bases) react to form salt and water
- When an acid reacts with an alkali, we call the reaction neutralization.
- The amount of an acid that neutralizes an alkali can be determined by titration.
- The salts are compounds derived from acids when their hydrogens are replaced.
- The method used to prepare a given salt sample depends on whether the salt is soluble or insoluble.
- Soluble salts are recovered from a solution formed from neutralization reaction by careful evaporation to dryness of the solution.
- A saturated solution contains more of the salt than water.

- The insoluble salts are prepared by precipitation method where two soluble salts are mixed to form an insoluble salt.
- The main groups of salts are sulphates derived from sulphuric acid. Chlorides derived from hydrochloric acid, nitrates derived from nitiric acid and carbonates derived from carbonic acid.
- The solubility of slats in water varies depending on several factors like the type of salt, amount of salt, temperature and amount of solvent used.
- All sulphates are soluble except barium sulphate, calcium sulphate and lead (II) sulphate.
- All chlorides are soluble except silver chloride and lead (II) chloride.
- Lead (II) chloride dissolves in hot water and reforms on cooling.
- All nitrates are soluble
- All carbonates are insoluble except sodium, potassium and ammonium carbonates
- All sodium, potassium and ammonium slats are soluble.
- The slats are widely used in homes and in industries for consumption, cleaning, and for making fertilisers and drugs.

END OF CHARPTER QUESTIONS.

1. Explain the following with aid of examples

(a) Neutralization

……

……

……

(b) Titration

……

……

……

(c) Soluble salt.

……

……

……

(d) Insoluble salt.

……

……

……

2. What is meant by the following terms

(a) Salt

……

……

(b) Crystallization.

……

……

(c) Precipitation.

……

……

(d) Solubility

……

……

3. Differentiate between acid salt and normal salt. In each case, give an example.

……

……

……

……

……

4. Name the salts formed from the following reactions:

(a) Zinc oxide and dilute hydrochloric acid

……....

(b) Silver nitrate solution and sodium chloride solution

……

(c) Ammonium hydroxide solution and dilute sulphuric acid.

……....

5. Potassium hydrogen sulphate is described as an acid salt

(a) Name the acid and alkali that can be used to prepare potassium hydrogen sulphate

……

(b) Why do you think potassium hydrogen sulphate is described

(i) As a salt

……

……

……

(ii) As an acid?

……

……

……

6. Explain why both hydrochloric acid and nitric acid cannot form salts.

……

……

7. Sodium hydroxide reacts with nitric acid to form the salt sodium nitrate.

(a) Write a word equation for this reaction

……

……

(b) What type of reaction is this?

……

8. The following are chemical names of some salts; sodium hydrogen sulphate, silver chloride, ammonium sulphate, aluminium sulphate, silver chloride, ammonium carbonate, potassium phosphate and copper (II) carbonate.

(a) Identify the salts are

(i) Soluble in water

……

……

……

(ii) Insoluble

……

……

……

……

(iii) Can be prepared by titration

……

……

……

(iv) Can be prepared by precipitation method

……

……

……

(v) Described as an acid salt

……

(vi) Described as neutral salt

……

……

(b) Name two substances which when reacted together can form:

(i) Copper (II) carbonate

……

……

(ii) Aluminium nitrate

……

……

9. Sulphuric acid solution can be neutralized using an alkali such as sodium hydroxide or adding a solid oxide such as copper (II) oxide.

(a) Write word equations for the reaction between

(i) Sodium hydroxide and sulphuric acid

……

……

(ii) Copper (II) oxide and sulphuric acid

……

……

(b) In the preparation of hydrated copper (II) sulphate crystals, an excess of copper (II) oxide was added to warm dilute sulphuric acid. The excess copper (II) oxide was removed by filtration. Describe how you would obtain pure dry crystals of hydrated copper (II) sulphate from the filtrate collected.

……

……

……

……

……

……

……

PROJECT 1: PREPARATION OF COPPER(II) SULPHATE FUNGICIDE

By the end of the activity you should be able to:

1. Prepare copper (II) sulphate from copper (II) oxide.
2. Use copper II sulphate to control fungi.

What you need

- 2 glass beakers (250cm3)
- filter funnel
- filter papers
- stand and clamp
- glass rod
- spatula
- Bunsen burner (heating apparatus)
- tripod stand and wire gauze
- dilute sulphuric acid
- copper(ii) oxide
- Water
- Dessicator

What to do

1. Measure out 50cm3 of dilute sulphuric acid, pour into the glass beaker and warm it for 5 minutes.

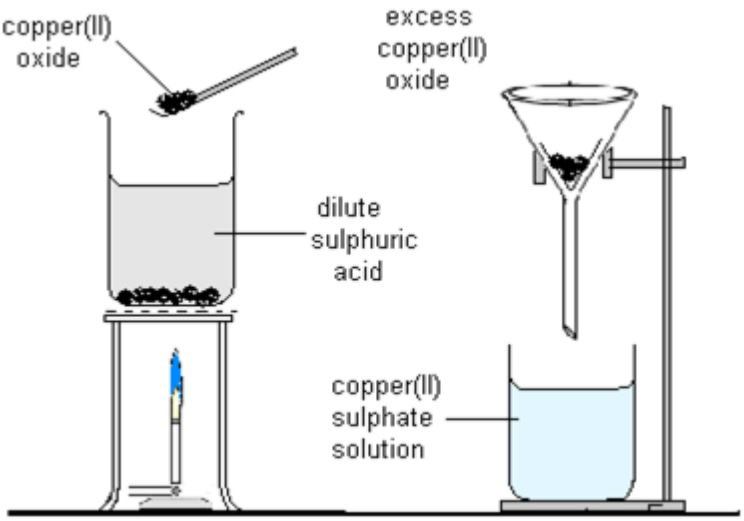


Fig. 7.2a Fig. 7.2b

2. Using a spatula, add copper(II) oxide to the hot acid a little at a time with constant stirring until the solid can no longer dissolve. What do you observe?
3. Filter off the excess copper(II) oxide and collect the filtrate in a separate beaker shown in Figure 7.2 (b). What is the colour of the filtrate?
4. Evaporate the filtrate and at intervals check for the formation of crystals on a glass rod after dipping it in the hot solution. Once crystals begin to form, remove Bunsen flame and leave the hot saturated solution to cool.
5. Filter off the crystals and dry them between filter papers or under sunshine or in a desiccator.
6. Make a 50% copper(II) sulphate solution and use it for dressing seeds.

Discussion of the product

……
……
……
……
……

Follow-up activity

Use the principle of preparing salt by evaporation and crystallisation to prepare local salt by burning grass, leaves and branches of trees to form ash; obtaining the ash filtrate and then evaporating it to get the salt.

Describe the salt formed

……
……
……

……
……
……

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

PROJECT2: **PREPARATION OF BARIUM SULPHATE PAINT**

By the end of this activity, you should be able to:

prepare a sample of barium sulphate from barium nitrate.

use barium sulphate to prepare a paint.

What you need

• 2 glass beakers (250 cm^3)

• filter funnel

• filter papers

• stand and clamp

• zinc sulphide

• glass rod

• dilute sulphuric acid

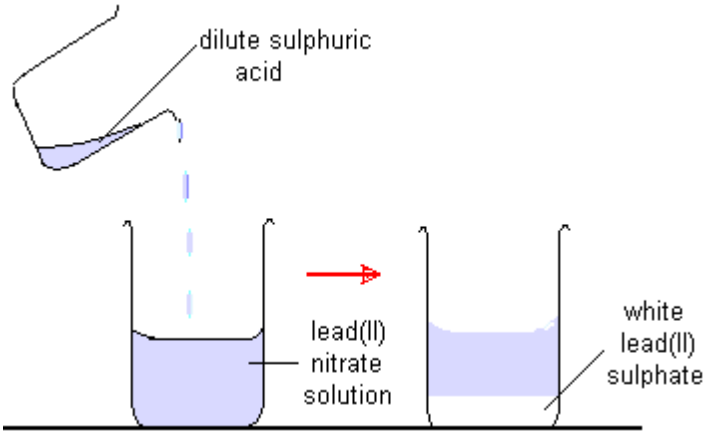
• barium nitrate solution

• water

What to do

1. Measure 50cm^3 of 0.5M barium nitrate solution and pour it into a glass beaker.

2. Add about 60cm^3 of dilute sulphuric acid into a beaker containing barium nitrate solution as in Figure 7.2.



3. Stir the mixture with a glass rod and then filter.

4. Wash the residue with cold distilled water and spread it on a filter paper to dry.

5. Mix the product with zinc sulphide in a ratio of 2:1 to obtain water paint.

Follow-up activity

Investigate which other salts as can be used paints.

……
……
……
……
……

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

CHARPTER 3: THE PERIODIC TABLE

What you have learnt:

- Element are metals, metalloids or non metals.
- On moving from left to right in a period, the metallic character of elements decreaces whereas the non-metallic character increases.
- On going down in a group of the periodic table, the metallic character of elements increases whereas the non-metallic character decreases.
- Metals are are lustrous, mellable, ductile and good conductors of heat and electricity.
- Metals are solids at room temperature, except mercury which is a liquid.
- Non-metals have properties opposite to that of metals. They are nither malleable nor ductile. They are bad conductors of heat and electricity, except for graphite which conducts electricity.
- Metals form positive ions by losing elecrons.
- Non-metals form negative ions by gaining electrons.

END OF CHARPTER QUESTIONS

1. (a) What is meant by the following

(i) Atomic number

……
……

(ii) Mass number

……
……

(b) the electronic structure of selected elements are

Element	Electronic structure
A	2,8,2
B	2,8,6
C	2,1
D	2,8
E	2,6

(i) Which element belongs to group II of the periodic table? Give a reason for your answer.

……
……

(ii) Which elements belongs tpo the same group in the periodic table?

……

……

(iii) Which of the elements has the highest proton number? State how you arrived at the answer.

……

……

……

(iv) Draw the electron structure of element E.

(v) Write of the most likely ion formed by element B.

……

(vi) State two physical properties of element A that differentiates it from element E.

……

……

……

2. The figure below is an outline of part of the periodic table with some elements shown.

I	II											III	IV	V	VI	VII	O
						Fe			Cu								
																I	
Cs	Ba														Po	At	Rn

From your knowledge of periodic trends in properties of elements, answer the following questions:

a) Which element would have an electronic structure in which the outermost orbit

(i) Has 2 electrons?

……

(ii) Is fully filled?

……

b) Cu is used for making coins while Cs and Ba cannot be used for this purpose. Why not?

……

……

……

……

c) Element X (not indicated on the table above) has the electronic structure 2,8,6.

(i) Locate the position of X on the periodic table. (its period and group)

……

……

(ii) Is X a metal or non-metal?

……

(iii) Name one element (not shown on the table above) which you expect to have chemical properties similar to those of X.

……

PROJECT 1: BUILDING A MODEL OF AN ATOM

By the end of this activity, you should be able to make a model of an atom showing the fundamental particles.

What you need

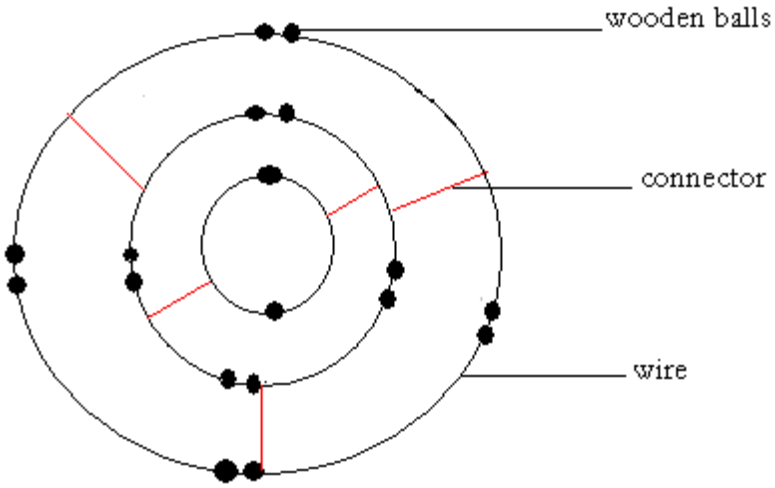
• Wooden spherical balls

• Wire

What to do

1. Mould spherical wooden balls to represent electrons
2. Drill a small hall through the centre of each ball

3. Weld, pass the balls through the wire according to their electronic arrangement.
4. Weld the wires into a circular shape and distribute the balls on the circular wires.
5. Connect the wires perpendicularly by welding them as shown.



Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

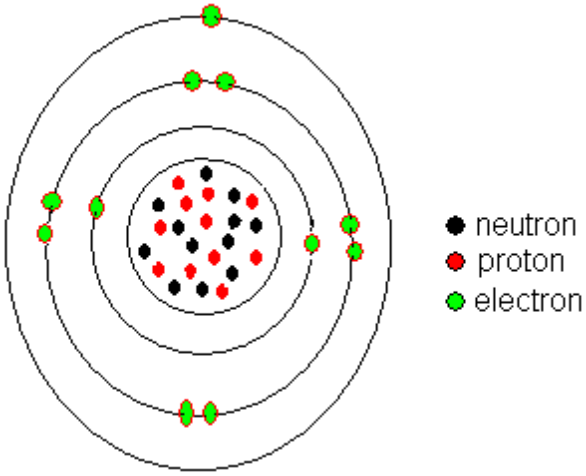
PROJECT 2: TO MAKE A SODIUM ATOM MODEL

By the end of this activity, you should be able to construct a model of the sodium atom.

What you need

- 23 small balls, such as table tennis balls or styrofoam, one to two inches in diameter
- two colours of paint
- paint brush
- glue

- 11 beads, all of the same colour
- wire or pipe cleaners
- wire cutter



What to do

1. Divide the balls into two groups, one containing 11 balls (the protons) and the other with 12 (the neutrons). Paint all the balls in one group the same colour. Paint all the balls in the other group with the second colour. Allow the paint to dry thoroughly.

2. Glue all the balls into one cluster to represent the atom's nucleus, making sure to distribute the protons and neutrons evenly throughout the cluster.

Set the nucleus aside to until the glue has set.

3. Cut a length of wire or combine several pipe cleaners to be long enough to form a circle around the nucleus. Repeat this step three more times, making each wire or set of pipe cleaners long enough to form a slightly larger circle than the previous one. These circles are the electron shells.

4. Glue two beads to represent electrons onto the first circle, positioned so they are across the circle from each other. The second circle also has two beads, again positioned opposite each other on the circle. On the third shell, attach six beads spread evenly around the circle. The last shell has only one bead, or electron.

Report

Phase	Indicators	Score
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

PROJECT 3: PLATING A BRASS KEY WITH COPPER

By the end of this activity, you should be able to construct an electrolytic cell for copper plating a brass key.

What you need

• 1.5-V D battery with battery holder

• two crocodile clips or insulated wire

• beaker or glass

• copper sulphate

• copper electrode (or coil of copper wire)

• brass key

• safety equipment

What to do

1. Prepare the key for copper-plating by cleaning it with toothpaste or soap and water. Dry it off on a paper towel.
2. Stir copper sulfate into some hot water in a beaker until no more will dissolve. Your solution should be dark blue. Let it cool.
3. Use one alligator clip to attach the copper electrode to the positive terminal of the battery (this is now the *anode*) and the other to attach the key to the negative terminal (now called the *cathode*).
4. Partially suspend the key in the solution by wrapping the wire lead loosely around a pencil and placing the pencil across the mouth of the beaker. The alligator clip should not touch the solution.

5. Place the copper strip into the solution, making sure it doesn't touch the key and the solution level is below the alligator clip. An electrical circuit has now formed and current is flowing.
6. Leave the circuit running for 20-30 minutes, or until you are happy with the amount of copper on the key.

Observations

……
……
……
……
……
……
……

Discussion questions.

1. How is this process important to man

……

……

……

2. Apart from a brass key, name any other material that can be plated using the process above

……

……

……

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		

Product		
Report		
Total		

CHARPTER 4: CARBON IN THE ENVIRONMENT

What you have learnt

- Carbon based substances are around us and are commonly used as fuel
- Fuels are substances which can be used as a source of energy and that they release energy in the form of heat when they undergo combustion
- The common fuels can be either firewood, charcoal of fossil fuels.
- Fossil fuels are produced form the dead plants and animals which lived million years ago.
- The fuels can be renewable (can be easily replaced e.g. firewood and charcoal) or non-renewable (cannot be replaced, e.g fossil fuels)
- Most fuels burn in air (oxygen) according to the following equation:

Fuel+oxygen $\longrightarrow$ carbon dioxide+ water+ energy

- Burning carbon-base fuel is one of the major causes of air pollution and global warming.
- Global warming is the way in which the earth would warm causing changes in weather.
- Carbon dioxide levels in the atmosphere are slowly but alarmingly increasing. This could have catastrophic effects on the environment and leading to climate change.
- Charcoal making can only be sustainable if we replant trees that grow faster.
- Carbon dioxide can be prepared from marble chips and dilute hydrochloric acid.
- Carbon dioxide has the following properties:

(a) Is colourless

(b) Is denser than air

(c) Does not burn, neither does it support burning.

(d) Is slightly soluble in water and forms carbonic acid.

(e) Turns lime water milky.

- Carbon dioxide has several uses which may include: as a fire extinguisher since it odes not support burning/does not burn/is heavier than air, as a preservative, making soft drinks and mineral water, making rain, baking, manufacture of washing soda, and as solid carbon dioxide, it is used to create special effects on stage.
- The water samples available can either be soft or hard water.
- The hardness in water is due to dissolved calcium or magnesium salts from soils and rocks.
- The hardness in water can either be permanent or temporary depending on the effecting of boiling on the water.
- The amount of soap solution can tell us the type of water sample.
- Hard water can be made soft by distillation, boiling, ion exchange and the addition of washing soda.
- Carbon exhibits allotropy, i.e. the existence of an element in several forms in the same physical state.
- There are several forms of carbon which include diamond, graphite and amorphous carbon. The several forms of carbon are in the same physical state and are called allotropes.
- All forms of carbon have similar chemical properties in spite of their physical differences.

END OF CHARPTER QUESTIONS

1. (a) State what is meant by the following terms.

(i) Fuel

……

……

(ii) Fossil fuel

……

……

(b) The world has not yet discovered the perfect fuel. Do you agree with this statement?

……

……

……

……

……

2. (a) Carbon dioxide is a greenhouse gas; explain what this means.

……

……

……

(b) What might happen if the level of greenhouse gases in the atmosphere rises?

……

……

……

……

……

(c) Suggest some ways in which we could stop this happening.

……

……

……

……

3. Discuss the statement: ‘wood charcoal making in Uganda has done more more harm than good.’

……

……

……

……

……

4. Natural gas, petrol and paraffin are obtained from crude oil and are described as non-renewable fuels.

(a) State what is meant by the term ‘non-renewable’

……

……

(b) Name the process by which natural gases, petrol and paraffin can be obtained from crude oil. Give a reason for your answer.

……

……

(c) State one use of each of the natural gases, petrol and paraffin.

……

……

……

(d) Name the other fuel that can be obtained from crude oil.

……

……

……

……

5. Increase in carbon dioxide levels could lead to the extinction of some species of living organisms. Explain why?

……

……

……

……

6. (a) Diamond and graphite are allotropes of carbon. What does this statement mean?

……

……

(b) Why is diamond so hard?

……

……

……

(c) Using necessary drawings, explain why diamond and graphite have different properties?

……

……

……

……

……

……

7. The results of testing five samples of water from different areas are shown in the table below. The soap solution was gradually added to 25cm^3 of each sample of water while shaking until permanent lather was obtained.

Water sample	Volume of soap solution added (cm^3)	
	Before boiling	**After boiling**
P	12	1
Q	13	6
R	11	11
S	14	3
T	16	16

(a) State with reasons which water sample(s):

(i) Is/are permanently hard.

……

(ii) Is/are temporarily hard.

……

(iii) Contains both temporary and permanent hardness.

(b) Name a compound which could be present in

(i) Sample S but not un sample T

……

(ii) Sample R

……

(c) Explain how the compound you have named in b(i) gets into the water.

……

……

……

(d) Write a word equation to show the effect of heat on the substance named in b(i)

……

……

(e) Name one method that can be used to reduce the amount of soap solution required to form permanent lather with water sample T.

……

(f) Suppose you are an analytical chemist working for an environmental health organization. You have been given a sample of water which is thought to have been contaminated by one of the salts that cause hardness in water.

(i) Describe how you could confirm the presence of the type of water hardness by simple chemical tests.

……

……

……

……

(ii) Write a report on what piece of advice the organization sholoud give to the community.

……

……

……

……

……

……

(g) When soap solution was added to a sample of water, a white precipitate was formed. But when the soap solution was added to another portion of the water that had been boiled, no precipitate was formed. Explain. (Your answer should include equations where possible).

……

……

……

……

……

……

8. Discuss the statement; ‘use of wood charcoal as a source of energy should be preferred to use of fossil fuels.’

……

……

……

……

……

……

9. (a) Complete the following word equation:

Calcium carbonate+ dilute nitric acid →……

(b) Briefly describe how gaseous product in (a) can be identified in the laboratory.

……

……

……

(c) One of the uses of carbon dioxide as dry as is used as a refrigerant.

What:

(i) Properties make it better refrigerant than other substances?

……

……

……

(ii) Are some of other uses of carbon dioxide?

……

……

……

……

10. Three forms of carbon are graphite, diamond and wood charcoal.

(a) State two structural differences between graphite and diamond.

……

……

……

……

(b) Suggest reasons why

(i) Graphite is used to make pencil lids.

……

……

……

(ii) Diamond is used to make earrings.

……

……

(iii) Wood charcoal is used in gas masks.

……

……

(c) Describe briefly how it can be shown by chemical means that both graphite and diamond contain carbon atoms. Your answer should include word equations where necessary.

……

……

……

……

PROJECT 1: MANUFACTURING ANIMAL CHARCOAL

What you need

- Bones
- heat source

What to do

1. In a group of about five students, dig a pit which is about one square metre wide and half metre long.

2. Pile the bones collected in the pit in such a way that a small opening is left at the bottom. Carefully cover the bones with soil. Using the opening left at the bottom, a fire is lit and the bones left to burn in limited supply of oxygen until no further change occurs.

3. Leave the black spongy product formed to cool and collect in bags as animal charcoal.

4. Crush the black spongy bones into fine powder and mix it with oil and candle wax in small containers to obtain shoe polish.

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

PROJECT 2: MAKING WOOD CHARCOAL

What you need

- A hoe
- an axe
- trees and dry logs

What to do

1. As a group, cut a tree (planted) and chop into pieces of about one metre in length.
2. Using the hoe, dig a pit in the ground of about half a metre deep and two metres in diameter.
3. Pile the logs inside the hole in such a way that a small opening at the bottom is left to allow for firing the logs.
4. Cover completely the logs with soil, then fire and allow it to continue burning until no more further change occurs.
5. After cooling, remove the charcoal and process them for packing in bags ready for use or sale.

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

PROJECT 3: MAKING SHOE POLISH

By the end of this activity, you should be able to make shoe polish and use it.

What you need

- pot
- bee wax
- bar of soap
- stove

- potassium carbonate
- sugar
- charcoal powder
- gun powder

What to do

1. Put some water in a pot and place in a stove. Bring it to boil on high heat and add bee wax. Melt it completely, stir in your bar soap, which should have graded into flakes.

2. Add potassium carbonate to the water-wax mixture. You may see more foaming and this is normal. Keep boiling the mixture until it begins to form a paste.

3. Turn your stove off and remove the pot. Add the gun powder, sugar and charcoal into the pot and mix.

Report

Phase	**Indicators**	**Score**
Identification, planning, deign		
Project implementation		
Product		
Report		
Total		

CHARPTER 5: REACTIVITY SERIES

What you learnt

- Some metals react with water to produce mteal hydroxides and hydrogen gas.
- Metals usually react with acids to give am teal salt and hydrogen gas.

For example:

Metal + hydrochloric acid → metal chloride + hydrogen.

- Copper does not react with dilute acids.
- Different metals have different reactivity with water and dilute acids.
- The arrangement of common metals in order of their decreasing reactivity is known as an activity series or reactivity series.
- Metals above hydrogen in the activity series can displace hydrogen from dilute acids.
- More reactive metals displace metals from their compounds in aqueous solutions.
- Metals form positive ions by losing electrons.
- Metals below carbon in the reactiitvity series can be extracted form their compunds by the use of carbon.

END OF CHARPTER QUESTIONS

1. (a) What happens when:

   (i) Dilute sulphuric acid is poured on a copper plate?

……

…….....

(ii) Iron nails are placed in a copper (II) sulphate solution?

……

……

……

(b) Write word equations of the reactions involved if any.

……

……

2. Normally copper is used to make hot water tanks and not steel (an alloy of iron). Explain.

……

……

……

3. Discuss with your parents/neighbours/goldsmiths why gold is preferred for making jewellery.

……

……

……

4. Can you store lemon slices in an aluminium foil? Explain.

……

……

……

5. The following five metals were made to react with water as shown below. Study the table and answer the questions that follow.

Metal	**Observations**
A	No reaction with water
B	Reacts vigorously with water
C	Very slow reaction with water bu fast when heated in steam.
D	Fairly vigorous in cold water.
E	No reaction in water but fairly vigorous when heated in steam.

(a) Identify the metal which is

(i) The most reactive.

……

(ii) The leat reactive

……

(b) Put the five metals A-E, in order of their increasing reactivity using above data.

……

……

6. Would a ring made of gold react if you put into a beaker of dilute acid? Explain.

……

……

……

PROJECT 1: MAKING CHART SHOWING METALS SHOWING ORDER OF REACTIVITY

By the end of this activity you will be able to arrange metals according to their reactivity.

What you need

- Aluminium foil
- Zinc granules
- Copper turnings
- Iron fillings
- Copper (II) sulphate solution
- Aluminium sulphate solution
- Zinc sulphate solution
- Four $50cm^3$ beakers
- Test tubes
- Test tube rack
- Manilas
- Markers

What to do

1. Wash four beakers with distilled water, dry them and label them A, B, C, D.
2. Prepare solutions of aluminium, copper, iron and zinc sulphate solutions by 5g of each substance into $100cm^3$ of distilled water each in different beakers.
3. Wash four test tubes with distilled water and dry them.

4. Put them in test tube stands (rack) and label them A, B, C and D
5. Measure $10cm^3$ of each solution into the different test tubes.
6. Take metal strips of aluminium, iron, copper and zinc and dip one of them in all the four test tubes and observe if any colour change occurs in all four test tubes.
7. Repeat step 6 with all the remaining metals by dipping them in fresh solutions and observe the reaction.

Observation:

Metal	**Dipped in**	**Observation**
Aluminium	Zinc sulphate	
Aluminium	Copper (II) sulphate	
Aluminium	Aluminium sulphate	
Aluminium	Iron sulphate	
Iron	Zinc sulphate	
Iron	Copper (II) sulphate	
Iron	Aluminium sulphate	
Iron	Iron sulphate	
Zinc	Zinc sulphate	
Zinc	Copper (II) sulphate	

Zinc	Aluminium sulphate	
Zinc	Iron sulphate	
Copper	Zinc sulphate	
Copper	Copper (II) sulphate	
Copper	Aluminium sulphate	
Copper	Iron sulphate	

Discussions

Explain the observations and make conclusions

……

……

……

……

……

……

……

……

……

Using a manila and colours draw a chart showing the arrangement of metals starting from the most reactive to the least reactive. Pin the charts in the laboratory and the different classes

Phase	**Indicators**	**Score**
Identification, planning, deign		

Project implementation		
Product		
Report		
Total		

RECORD OF ASSESSMENTS

COMPETENCY	C1			C2			C3		C4	C5	
ACTIVITY OF INTEGRATION											
PROJECT WORK	P1	P2	P3	P1	P2	P3	P1	P2	P1	P1	P2