

UNIT: MATTER AND MATERIALS (GRADE 4)

DURATION: 4 Lessons

OBJECTIVES

Students should be able to:

1. Measure volume and mass of materials.

PROCESS SKILLS

Manipulating, Recording, Observing

MATERIALS

Rulers, assorted cuboids, measuring cylinders, balances/scales, assorted objects.

CONTENT SUMMARY

- All objects occupy space.
- The amount of space that an object takes up is called its volume.
- The volume of a regular solid, like a box, can be found by measuring the length, width and height (with a ruler) and then multiplying the length by the width by the height.
- The volume of a liquid can be found using a measuring cylinder marked in cm^3 .
- The mass of an object is the amount of matter in the object. Mass is measured with a balance and the unit of mass is grams or kilograms.

STUDENT ACTIVITIES

Activity 1

- Let students examine measuring cylinders and discuss how to use them correctly
Get 3 cups of different sizes. Fill each cup with water and label the cups 1, 2, 3.
Let students estimate the volume of water in each cup.
Pour the water from 1 into the measuring cylinder and record the volume.
Repeat the process and record the volume of water in cups 2 and 3 Compare the volume of water that each cup can hold.

- Create some problem situations for students:- For example:
What happens to the volume of each liquid as we pour them from one cup to another of a different shape etc?
Let students predict and test their predictions.

Activity 2

- Give students an assortment of cubes and cuboids. Pupils identify the length, width and height. (N.B. ensure that the dimensions are regular).
Discuss the formula for calculating volume. (Link with Mathematics)

Using rulers, students measure and record the length, width and height of the boxes/books.

Students record their measurement on a recording sheet.

Object	Length	Width	Height	Volume

Activity 3

- Explain the concept of mass.
Present balances/kitchen scales and discuss their use and how they work.
Students are given an assortment of objects and use the balances/scales to Record the mass of each unit.

Activity 4

- Create problem situations for students: For example -
Would the same volume of different materials have the same volume? Let students predict and test their predictions.

ASSESSMENT

- Assessment of record sheets.
- Students write instructions on how to find the volume/mass of an object
- Students estimate the mass/volume of an object and measure and record the actual mass/volume of the object.

DURATION: 3 Lessons

SPECIFIC OBJECTIVES

Students should be able to:

- (i) List the physical properties of matter.
- (ii) Determine the physical properties of matter by using instruments.
- (iii) Construct an instrument to measure mass or volume.

PROCESS SKILLS

Manipulating, Recording, Observing

MATERIALS:

Rulers, thermometers, balances, measuring cylinders
An assortment of objects (hot, cold, warm, water)

CONTENT SUMMARY

- An object or material has various characteristics which include length, temperature, mass, volume.
- Some of these characteristics depend on the amount of material we have (mass, volume, length) while others do not (temperature).
- We use a variety of instruments to record the properties of matter:

Length – ruler
Temperature – thermometer
Mass – balance
Volume – measuring cylinder

- When making things it is important to measure accurately.

STUDENT ACTIVITIES

Activity I

- Students are given an assortment of objects and asked to compare them using terms such as:

Heavy – light,
Long – short
Wide – narrow
Warm – cool

Discuss the physical properties of the object using terms such as length, temperature, mass.
Relate the terms used to compare the objects to the properties e.g. warm/cool – temperature.

Activity II

- Students are given rulers. Teacher explains how to use the rulers. Students are given assortment of objects and rulers. Students use their rulers to record the length of the objects (N.B. students may also record the length of objects in the classroom).

Activity III

- Present students with thermometer. Discuss the use of thermometers. Put students in groups and present students with an assortment of liquids at varying temperatures. Students use the thermometers to record the temperature of the liquids. Compare. Students also record room temperature and their body temperature.
- **(Safety precaution – Use underarm thermometers and observe proper hygiene when going from one student to another)**

Activity IV

- Present students with balances/scales. Explain their use. Students use the balance/scales to record the mass of various objects. Group members compare their results.

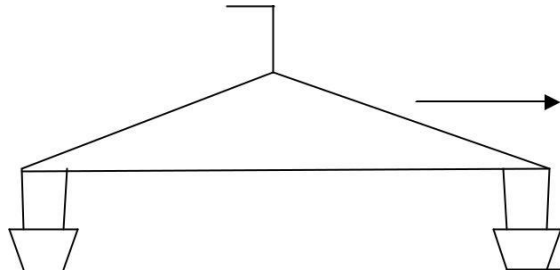
Activity V

- Present students with graduated measuring cylinders. Discuss the use of measuring cylinders. Students are given a variety of containers filled with water and asked to use the measuring cylinder to determine the volume of water in each container.

Students pour specified, volume of water into their measuring cylinder.

Activity VI

- In groups students construct an instrument using everyday material and demonstrate its use. e.g. A balance



ASSESSMENT

- Given pictures of instruments, pupils identify them and the property they are used to measure.

INSTRUMENT PROPERTY I. _____

II. 

III. 

- Assessment of students records from the activities
- Individual students make a book of measurement which should include
 - (i) Diagrams/pictures/model of each instrument
 - (ii) The length of their body, toes, feet, fingers, etc
 - (iii) Their body temperature, temperature of the classroom
 - (iv) Their mass

Students collect and display various containers that have varying volumes.

Rating scale to assess students skills in using measuring instruments.

- Let students follow a recipe or write their own recipes where precise volumes and masses and temperatures are important. By observing the product, teacher can determine how accurate the students were in their measurements of volume, mass, temperature

DURATION: 3 Lessons

OBJECTIVES

Students should be able to:

1. Give examples of physical change.

PROCESS SKILLS

Observing, Manipulating, Analyzing

MATERIALS

Hot water, wax, butter, chocolate, chalk, salt water, candle, matches, containers, plastic cups, stones

CONTENT SUMMARY

- Materials can change.
- We can change their shape, colour, physical state, etc.
- If they only change in appearance e.g. (colour, shape, size, state) the change is known as a **physical change**. Physical changes include change of state, such as from liquid to gas, liquid to solid and the reverse.
- Physical changes can often be reversed easily.

STUDENT ACTIVITIES

Activity I:

- Put students in groups and give each group chocolate, candle wax, butter, styrofoam cups, hot water, metal bottle stoppers. Students place a small amount of each substance into the bottle stoppers. Float the bottle stoppers on the surface of the hot water, observe what happens to each substance. Record the observation. Remove the stoppers and allow the substances to cool. Observe and record what happens in the table provided.

Items	Appearance before	Appearance after

Activity II

- Put students into groups. Provide each group with chalk. Students wrap the chalk with paper and use the stone to pound the chalk into a powder. Students observe the powder and discuss whether the change is physical.

Activity III

- Students are given salt and some water to make a salt solution. Discuss with students whether the salt has gone through a physical change. Students (with teacher's supervision) use a heat source to evaporate the water from the salt solution. Discuss the observations.

ASSESSMENT

- Assessment of students' record sheets.
- Given a description of changes students determine whether they are physical or not.

UNIT : FORCES, MOTION AND STRUCTURES (GRADE 4)

DURATION: 6 Lessons

OBJECTIVES

Students should be able to:

- Observe that the material used in a tower affects its strength.
- Infer that the strength and stability of a structure depend on its shape.

PROCESS SKILL

Observing, Manipulating, Inferring

MATERIALS

Drinking straws, cardboard, pair of scissors, tape, small sticks, pins, paper fasteners

CONTENT SUMMARY

- The strength of a structure is its ability to maintain its shape and to remain in one piece.
- The stability of a structure is its ability to maintain its original position despite the forces that push on it. Unstable structures will topple over easily.
- The shape of structures affects their strength.
- Structures may have shapes such as triangles(pyramids), circles (spheres) , squares (cubes), rectangles.
- Rectangular structures with the long side at the bottom are very stable.
- Rectangular structures with the short side at the base are not very stable.
- Triangular structures are very stable.
- Towers are very tall structures. The materials from which they are made must be very strong.

Activity 1:

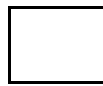
Let students construct a tower using two different materials—drinking straws, and sticks. Let them apply approximately the same force on both structures, and compare the results.

Activity 2:

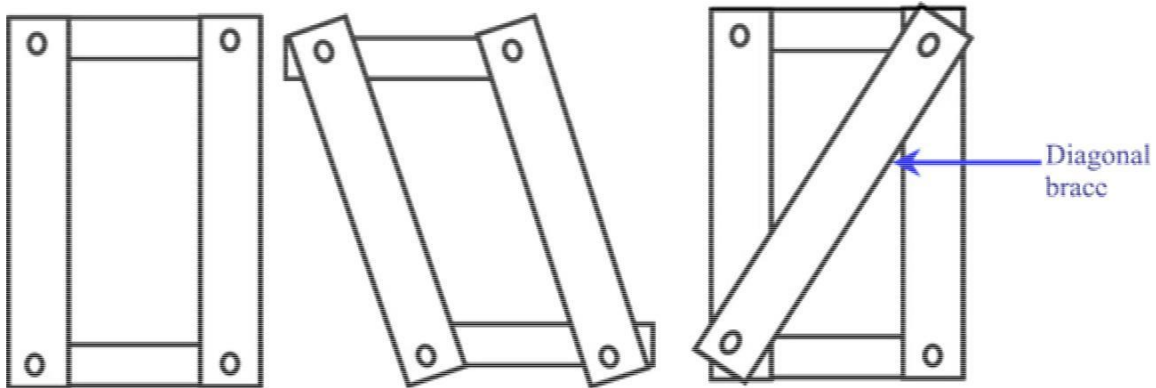
Let students make simple rectangle with strip of card. Let them secure the corners with paper fasteners. Let students also make triangles with strip of the same card. Let students press down on the structures with their fingers and see what happens. Let students add a diagonal strip as a brace to the rectangular structure and see what happens to its strength.



- Triangle



- Square



Activity 3:

Pictures of structures of bridges, roofs of houses, arches and other suitable structures could be presented for discussions.

ASSESSMENT

- Paper and pencil test
- Let groups compete in designing structures with greatest strength and stability.

TOPIC: THE FORCE OF GRAVITY

DURATION: 2 Lessons

OBJECTIVE:

The students should be able to:

- Observe the effects of gravity on the motion of objects.

PROCESS SKILLS

Inferring, Observing

MATERIALS

Strings of different thickness, objects of differing masses, strong chairs.

CONTENT SUMMARY

- All objects pull on other objects around them with a force called **gravity**.
- Very large objects like the earth have very strong gravity and their pull affects the motion of other objects.
- All objects on Earth experience the earth's gravity which pulls them vertically towards the centre of the Earth..
- Gravity, like magnetism, is a force that can affect an object from a distance (without touching it).

SUGGESTED ACTIVITIES

Ø Students consider the following:

When they throw up a ball (in an upward direction), it eventually changes direction and falls.
Fruits fall from trees.
Water falls to the Earth, etc.

∅ Students are asked to jump up on to a strong chair and to jump down from the same chair. They indicate which is easier to do and suggest why?

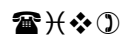
∅ Students consider how we keep things from falling, e.g. by strings, by hanging, by putting supports under them. They suggest why these things do not fall. What happens if you remove the support?

Students investigate the thickness of string needed to keep objects of different masses suspended from the same height, and make inferences.

∅ Students consider examples where objects do not fall or remain suspended e.g. aeroplanes. Students try to explain how this happens.

∅ Students consider the effects of the Earth's gravity and what would happen without it. Teacher mentions that the Earth's gravity also affects other heavenly bodies. Teacher points out that all objects have gravity but unless the object is very large, their gravity cannot easily be detected and does not affect human activities.

ASSESSMENT



Students write an essay on "The Earth without gravity".

UNIT: ENERGY (GRADE 4)

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

1. Explain how a thermometer works.

PROCESS SKILLS

Observing, Designing

MATERIALS

Small clear bottles (heat resistant), drinking straws, Styrofoam plates (the sort in which meats/burgers are packaged), play dough/plasticine, tape, water, red dye, alcohol thermometers, ice cubes, heat source (spirit burner, candle, Bunsen burner)

CONTENT SUMMARY

- ☺☺☺👉 How hot or cold something is known as temperature. A thermometer is used to measure temperature.
- ☺☺☺👉 There are different kinds of thermometers. The most common is one which contains a liquid in a glass tube.
- ☹☹☹👉 The glass tube has a bulb which contains most of the liquid and a narrow hole which runs through the length of the tube. The two most common liquids used are mercury and alcohol.
- 💧💧💧👉 As temperature increases, the liquid in the bulb expands and moves further up the tube.
- ☠☠☠👉 The glass tube has markings and numbers on it, similar to those on a ruler. These markings and numbers, however, represent degrees, the unit in which temperature is measured.

SUGGESTED ACTIVITIES

- ∅ Divide class into groups and distribute a thermometer (alcohol) to each group. Instruct students to be very careful in handling the thermometer since it can break easily. Let students do the following:
 - record all the features they observe (2) make a drawing of the thermometer.

When these two activities have been completed, lead a whole class discussion aimed at establishing the features of a thermometer.

- ∅ Distribute a container containing some warm water (about 50°C) and one containing some water and ice to each group. Let students place the bulb of the thermometer in each of the containers. Use questions to stimulate class discussion on what happened to the alcohol when the thermometer was placed in the warm water? Why did that happen? How would you explain what happened? Do you think the same thing would happen if it was water in the thermometer instead of alcohol? etc. Tell students that alcohol used in thermometers is colourless, but a red dye is added to the alcohol in thermometers. Ask students if they could suggest why.

ASSESSMENT

Quiz on reasons for movement of alcohol level in the thermometer.

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

- ∅ Use a thermometer to measure temperature.
- ∅ Use an appropriate form to display results of experiments.
- ∅ List situations where the use of a thermometer is important.

PROCESS SKILLS

Measurement, Recording

MATERIALS

Thermometers (preferably alcohol), worksheets

CONTENT SUMMARY

- The thermometer is used to measure temperature.
- The bulb of the thermometer must be placed in the substance/ material whose temperature is being measured.
- Thermometers are used to measure body temperature, atmospheric temperature, temperature of meats that are being cooked or stored, etc.

SUGGESTED ACTIVITIES

- ∅ Divide class into working groups and let each group conduct the following investigations:

To measure and record the atmospheric temperature over a five-day period.

To measure the atmospheric temperature at different times during a particular day.

Each group should be provided with a thermometer and a worksheet for each of the activities and should be given specific instructions as to how the investigation should be conducted.

For investigation (a) the temperature reading must be taken at the same place and same time each day.

For investigation (b) the temperature reading should be taken at the same place.

WORKSHEET A

DAY	TEMPERATURE	WEATHER CONDITIONS

WORKSHEET B

TIME	TEMPERATURE
9:00 AM	
11:00 AM	
1:00 AM	
3:00 AM	

Engage students in a whole class discussion around the results of the worksheets:-

- Ø Why was it necessary to record the temperature at the same place and time of day in Activity A?
- Ø Why was it important to take the reading at the same place in activity B?
- Ø Why were the readings the same/different in Activity A?
- Ø Why did the temperature change/not change in Activity B?

Describe situations where it is important to record/know temperature.

2. Let students display the information collected in an appropriate form: Bar Chart, Line Graph.

ASSESSMENT

- Grade students' presentations of bar charts and line graphs

DURATION: 4 Lessons

OBJECTIVES

Students should be able to:

1. Investigate the effect of light on materials.

PROCESS SKILLS

Observing, Communicating, Experimenting

MATERIALS

A piece of brightly coloured (uniform) material, pair of scissors, corn seeds/pigeon pea seeds, cotton wool, petri dishes/wide-mouth jar covers, water, shoe box with cover.

CONTENT SUMMARY

- Both living and non-living materials can be affected by light.
- Exposure to strong light can cause some colours to fade.
- Light is needed by plants to produce chlorophyll and light energy and chlorophyll are needed by plants to make food.
- Some reading glasses are photosensitive/light sensitive. They become darker as the light gets stronger.

SUGGESTED ACTIVITIES

Inform students that they would be conducting a set of investigations aimed at observing the effects of light on materials and that some of these investigations would be done over an extended period of time (2 weeks).

1. Cut several 4-inch squares from a piece of brightly coloured material. Give each working group a piece of the material and let them place it in a selected area exposed to direct sunlight. Keep the rest of the material in a cupboard for later comparison. Each group should place their material in the sun daily for a period of about 2 weeks. Comparisons should be made with the piece retained and kept away from light, at selected intervals: after 2 days, after 4 days etc., and then at the end of the period.

Discuss the observed differences:

- How was the material placed in the sun different from the piece from which it was taken?
 - What was responsible for the change?
2. Distribute the following to each of the working groups: - two pots (containers) with identical seedlings.

These instructions should be followed:

- place one container in a dark cupboard;
 - place the other container in an area exposed to bright light;
 - compare seedlings at the end of one week, and then two weeks.
3. Use a pair of photo-sensitive reading glasses to demonstrate how it is affected by light intensity. Let students observe the colour of the glass within the classroom, and then outside in strong sunlight.

ASSESSMENT

1. HOME SURVEY

Let students conduct a survey in the home to identify places/materials that have been affected by exposure to light (faded curtains, furniture, paint on walls).

Students should also identify situations where people use the bleaching action of the sun.

Reports should be presented to class.

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

1. Investigate the effect of heat on materials.
2. State some effects of heat on materials.
3. Infer that the sun's heat helps to produce wind.

PROCESS SKILLS

Observing, Inferring

MATERIALS

Water, candle wax, plastic, nails, coin, a beaker, saw dust, heat source, alcohol, test tube.

CONTENT SUMMARY

Heat affects materials in the following ways:-

- It causes liquids like water to boil.
- It causes liquids like water to evaporate.
- It causes some materials to melt.
- It causes some materials to expand.
- It causes some materials to ignite and burn.

SUGGESTED ACTIVITIES

1. Place 50 ml-100ml water in a metal container or beaker and ask students to observe the water at the room temperature. Heat water until it begins to boil. During the time of heating let students observe the water and note any changes.
2. Pour about 10ml alcohol into a test tube. Turn heat source off and place the test tube containing the alcohol into the hot water bath. (**SAFETY – ALCOHOL SHOULD NOT BE USED WITH A NAKED FLAME!**)
Give students the opportunity to explain their observations.
3. Place some candle wax in metal container and ask students to say what would happen when the container is placed over the heat source.
Heat container and let students observe what happens. Ask students to list other materials that would melt upon heating.

4. The expansion principle may also be demonstrated using two nails inserted into a piece of wood and a coin.
 - Place nails firmly into the piece of wood with a distance that would just permit the coin to pass between them
 - Heat coin then try to pass it through
 - The nails may also be heated instead of the coin.
5. Demonstrate the burning of materials such as paper, splints, magnesium ribbon. (Be sure to observe safety procedures and warn students of the dangers of children playing with fire.
6. Mix some saw dust with water in a temperature beaker and heat the beaker at one end to set up convection current. Let students describe what they observe. Explain that air in the atmosphere behaves in a similar way to water in this respect. That is, when one part is heated more than the other it begins to move in a particular direction. (This should help students to better understand and appreciate how land and sea breezes are caused:- a concept covered in "Earth's Weather – objective 8"

ASSESSMENT

- Oral question-and-answer

session: Possible questions

1. What happens to water when it is heated
2. Give some examples of other substances which would be affected in a similar way.
3. In what other ways does heat affect substances?
4. Give some examples of substances that will burn or melt or expand when heated.

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

1. List examples of fuels used in the home, for transportation and for industrial production.
2. Discuss some of the consequences of using these fuels.
3. Suggest ways of reducing and controlling undesirable consequences of the use of fuels.

PROCESS SKILLS

Communicating, Researching

MATERIALS

Sample of charcoal, wood, gasoline, diesel, kerosene, picture of liquid petroleum gas LPG cylinders, pictures of equipment that use various types of fuels. Pictures of factories/generating plants emitting smoke.

CONTENT SUMMARY

- A fuel is any substance/material that is burned to produce energy.
- Several kinds of fuels are used in our homes and communities to generate energy.
- LPG is used in some cookers to produce heat for cooking and baking.
- Kerosene is used in some stoves to produce heat for cooking.
- Gasoline and diesel are used by motor vehicles to provide the energy they need to travel.
- Diesel is used in generators to produce electricity.
- Charcoal and wood are used in some homes to provide heat for cooking and baking.
- The uses of these fuels have some negative effect on the environment. e.g. pollution of the air, oil spills on the oceans, cutting down of trees etc.
- *(Optional) The green-house effect is one of the ill-effects of the use of these fuels. Acid rain is another.*
- *Explain the green-house effect in simple terms(Note: Just an awareness is required).*
- Heavy air pollution causes respiratory problems.
- Reducing our use of these fuels can help to reduce the ill effects.

SUGGESTED ACTIVITIES

- Display pictures of various pieces of equipment that use the different fuels. Let students identify each and state their various uses.
- Next, let students specify the source of energy (what fuel is used) in each case.
- Display pictures of smoking industrial plants and vehicles and use them as stimulus material for a discussion on the ill effects (pollution) caused by the use of these fuels.
- Lead discussion on ways in which we can reduce our dependence on these fuels.

ASSESSMENT & FOLLOW – UP

1. A written exercise :

Use the words in the list to complete the table below:
Gasolene, coals, diesel, LPG (gas), kerosene

Equipment	Fuel Used
Gas cooker	
Bus	
Coal pot	
Car	
Factory(emitting smoke)	
Aeroplane	
Bulldozer	
Motorbicycle	
Candle	
Kerosene lamp	

2. Which of these problems are caused by the use of fuels such as coal, wood and gasolene?
 - A. floods
 - B. acid rain
 - C. the greenhouse effect
 - D. water shortage/drought
 - E. respiratory diseases

- 3. (Optional) Let students do some research on the green-house effect and acid rain. What are they? How do they affect us? What causes them? What can we do about them? Students make oral presentations.*

DURATION: I Lesson

OBJECTIVES

Students should be able to:

1. Trace the flow of energy through a food chain.
2. Infer that the sun provides the energy needed by all living organisms.

PROCESS SKILLS

Communicating, Inferring

MATERIALS

Pictures of various animals and humans feeding. A video clip can be used alternatively.

CONTENT SUMMARY

- All living things need energy to carry out their activities. This energy is obtained from the food they make(plants) or eat (animals).
- Plants use light energy from the sun to make the substances they need to grow and carry out the activities. The process by which this is done is photosynthesis.
- Some animals eat plant materials to obtain the substances they need to grow and carry out their activities. These animals are called herbivores.
- Some animals feed on the flesh or products of other animals from which they obtain the substances they need to grow and carry out their activities. These animals are called carnivores.
- The sun is the source of all energy available to living organisms.

SUGGESTED ACTIVITIES

1. Display picture chart/show video clip of animals feeding and use this to stimulate class discussion. Guiding questions:

What are these animals doing?
Why do they need to feed/eat?
What do they get from the food?

Why do we need energy?

2. Ask students to list the things they had for lunch/breakfast/(or which they normally eat). Make list on board. Challenge students to determine the origin of bread, meat, etc. (The idea here is to show that plants are the source).

ASSESSMENT

- Let students construct flow charts (food chains) consisting of at least three stages to show how food passes from one organism to another, beginning with plants. They can either write the words or draw diagrams.

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

1. List other forms of energy apart from heat and light.
2. Infer that energy can be changed from one form to another.
3. Give simple examples of energy transformation.
4. List devices/appliances that are energy changers.

PROCESS SKILLS

Inferring, Observing

MATERIALS

Pictures depicting various forms of energy, a lighted bulb, electrical iron, radio (battery operated), electrical fan, flashlight, spring, rubber band, food samples

CONTENT SUMMARY

- There are other forms of energy apart from heat and light. These include energy stored in foods and batteries (chemical energy); the energy moving objects possess (kinetic energy); the energy contained in a stretched spring or piece of rubber (potential energy); sound energy and electrical energy.
- Energy can be changed from one form to another. For example, chemical energy in a dry cell (battery) can be changed to electrical energy, which is then changed to heat and/or light energy.
- Chemical \longrightarrow Electrical \longrightarrow Heat + Light

SUGGESTED ACTIVITIES:

(This must be kept very simple. Students may not know the terms for the form of energy e.g. chemical. They can use "energy in batteries" to "light " for example.)

1. Display a few devices, which produce heat and light energy and ask students to state what form of energy each produces. Ask if anyone knows of any other form of energy apart from heat and light. List them and complete list. Solicit and offer simple explanation of each type using pictures or actual objects as reinforcement.

2. Display a number of devices (radio, flashlight, fan, etc.) and challenge students to figure out how each of the devices is able to produce the form of energy it does.

For example: - How is a flashlight able to produce light?

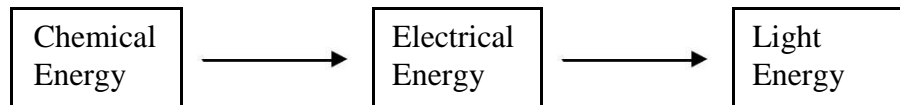
: - How is radio able to produce sound?

: - How is an electrical iron able to produce heat?

: - How are our bodies able to produce heat?

: - How is the fan able to produce motion
(kinetic energy):

Record students' explanations in the form of flow charts: - e.g. flash light






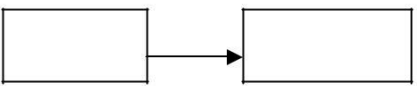

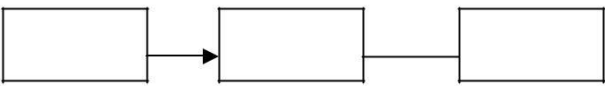



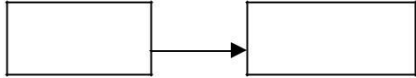
Once this is done ask students to write down a concluding statement about energy, based on what was observed. (Energy can be changed from one form to another).

ASSESSMENT

- Display pictures and ask students to either explain orally or draw flow charts to depict the energy transformation.
- Alternatively, students could be presented with a work sheet on which the transformation is to be written.

WORK SHEET

<p>EQUIPMENT/OBJECT (Use pictures instead)</p>	<p>ENERGY CHANGES</p>
<p>Flashlight showing light</p> 	
<p>Radio</p> 	
<p>Coal pot with burning coals</p> 	
<p>A moving vehicle</p> 	

 <p>An athlete on the run</p>	
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1. Challenge students to design and make a simple device that is able to change energy from one form to another (sling shot, cotton reel carts, etc.)

DURATION: 2 Lesson

OBJECTIVES

Students should be able to:

1. Investigate how specific forms of technology have changed over time.
2. Draw a time line/flow chart to show how a specific form of technology has changed over time.
3. Suggest reasons for the improvements observed.

PROCESS SKILLS

Communicating

MATERIALS

Pictures of radio, refrigerator or motor car.

CONTENT SUMMARY

- Human beings are constantly seeking ways of improving technological devices to make them more efficient.

SUGGESTED ACTIVITIES

1. Divide students into working groups and give to each group one form of technology (motor vehicle, televisions, irons, cookers, radios, etc.). Instruct groups to conduct research into the development of each form.
Guiding Questions: -
 - When was it first invented?
 - Who invented it?
 - What did the earlier ones look like?
 - How different are they today?
 - What are some advantages of newer models over the older? What are some disadvantages of the new models?
 - Projects could be presented in the form of a time chart of pictures.

ASSESSMENT

1. Students could be graded for their group effort, the time chart and their presentation.

Criteria:

Amount of information	10 points
Presentation/Arrangement/Organization	10 points
Effort	5 points

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

1. Develop a set of questions that can be used to compare devices used to provide heat or light.
2. State at least one advantage and one disadvantage of each of the devices.

PROCESS SKILLS

Observing, Recording, Reporting

MATERIALS

Coal pot, iron/electrical iron, filament bulb/fluorescent bulb, small pocket light/large flashlight, etc.

CONTENT SUMMARY

- Some forms of technology are easier and/or better to use than others made for the same purpose.
- There are advantages and disadvantages in using technology, for example:
 - Some use more energy than others and are therefore more expensive to operate.
 - Some pollute the atmosphere more than others.

SUGGESTED ACTIVITIES

1. Organize working groups and give to each group a pair of devices (performing similar function) and ask students to determine how well they do what they are made to do. Ask students to write down the questions they will ask someone in order to determine which technology is better.
2. Ask students to list at least one advantage/disadvantage of one technology over the other.

ASSESSMENT

1. Students' work from the activities should be used for assessing performance.

UNIT: STRUCTURE AND FUNCTION (GRADE 4)

Topic: Growth and Development in Plants and Animals

Duration: 15 Lessons (30 minutes each)

Objectives

Students should be able to:

1. State the conditions necessary for germination in plants.
2. Observe and describe the stages in the process of growth in plants.
3. Discuss the importance of growth, development and reproduction in plants and animals.
4. State the various ways in which technology is utilized in growth and propagation in plants.
5. Describe the external structure of animals.
6. Relate the features of these structures to their function.

Process Skills

Observing
Measuring
Communicating
Inferring

Content Summary

Conditions necessary for germination are suitable temperature/warmth, air/oxygen, moisture/water.

Stages in the process of growth:

Seed Takes in water and becomes swollen and soft
Young root (radicle) emerges and grows down
Young shoot (plumule) emerges and grows up
Cotyledons (food store) decrease in size as food is used up

Seedling Young shoot elongates and develops new leaves
Root system extends and roots become more numerous, more branched and longer

Mature plant stem increases in rigidity, branches develop

Leaves increase in size and numbers
Root system becomes fully developed
Flowers are produced

Growth and development in plants is a continuous process. Growth ensures the replacement of plant parts. (e.g. leaves and branches and storage organs and fruits).

Growth and development are essential to complete the life cycle of plants. Reproduction continues throughout the life of a mature plant.

Reproduction is important for the production of new plants.

Technology is utilized in several ways in enhancing growth and propagation of plants.

- Addition of fertilizers Increase in size of parts (fruits, leaves, plant size)
- Greenhouses Ensure year-round supply of seasonal plants and fruits
Allow for plant growth in otherwise unfavourable conditions
- Grafting Produces new and improved varieties
Maintains quality control
Increases yield of plant
- Pruning Reduces or eliminates parts and improves food production
- Tissue culture Increases volume and reduces growth time
Controls undesirable traits
Conserves food since less of the storage organs are used up to produce new plants
- Creating hybrids Produce new varieties of greater yield and that are disease resistant
- Irrigation Provide suitable growth conditions in otherwise unsuitable areas
- Mechanization Ploughing to increase aeration of soil
- Addition of plant growth hormones Speeds up growth and development of plants

External structures in animals

N.B. Objectives 5 & 6 deal with external features of animals that pertain to movement, response and feeding as the body parts/organs/tissues involved in other life processes are for the most part not visible externally.

Structures in Mammals (Humans)

- Limbs long; provide points for muscle attachment to bring about movement. The longer the bones, the greater the degree of movement.

- Feet Flat; enhances balance and is the area of contact with surface.
- Eyes Transparent at the front to allow light to pass through.
- Ears Pinna/ear lobe traps sound waves and directs them internally.
- Nose Lined with hairs to trap particles; openings allow for entry and emission of air.
Position of nose – aligned parallel to body. This prevents easy entry of foreign objects.
- Skin Continuous layer over entire body. It serves as a barrier between organism and its environment. It allows for direct contact of body with the surroundings. This allows for quick detection and response. (Heat and force).
- Mouth Opens and closes to allow for intake of food. Contains teeth.
- Teeth Bite and crush food; physically break down food.

Structures in Birds

- Wings Modified for flight.
- Feathers Light to allow for easy movement.
- Beak Various shapes and sizes. (Shape of beak and size of beak depend on diet).
- Legs With claws for gripping. Claws may be webbed for swimming. Length of leg on depends where the bird lives and how it feeds.
- Eyes Position depends on feeding habits and reaction time and the need to respond to events in the environment. (Compare the hawk and the pigeon).

Structures in Fish

- Scales Outer body covering; overlapping and waterproof. Provides protection against predators and environmental conditions.
- Eyes Positioned so as to allow for wide field of vision and quick response. Lidless. Flat and horny to avoid damage by objects in the water.
- Tail and fins For movement in water and for balance.
- Mouth Open and close – allow for intake of food and water.

Structures in Reptiles

- Scales Outer body covering for protection against predators and environmental conditions.

- Limbs With claws for gripping.
- Claws With sticky pads for clinging to surfaces.
- Tail For balance and defence.
- Fangs Present in some reptiles for defence and seizure of prey.
- Shell Present in reptiles such as turtles and tortoises – provides additional protection.
- Mouth Can open wide with teeth and tongue.
- Tongue Broad and sticky for easy capture of prey.
- Eyes Positioned to allow for wide field of vision.

Structures in Amphibians (Frogs and Toads)

- Limbs Hind limbs longer, more developed and larger than front limbs – modified for jumping.
- Eyes Positioned high on head providing wide field of vision to allow for quick detection of movement.
- Mouth Very wide with a long sticky tongue attached to front lower jaw; allows for quick capture of food.
- Germination is the process in which a seed starts to develop into a young plant or seedling.
- The three main conditions for germination are air, moisture and a suitable temperature.
- A seedling undergoes changes and grows and develops into a mature seed bearing plant.
- Animals also undergo changes in size, mass and physical appearance as they mature into adults.
- Growth and development are important processes in the lives of plants and animals.
- Technology is being used in various ways to influence growth and development in plants. In all instances it is always for Man's benefit.
- There are a wide variety of physical structures among the five classes of vertebrates.
- These differences are related to differences in habitat, feeding habits and their types of movement.

Activities

Plants

- Teacher and students may set up experiments to investigate the conditions necessary for germination.
- Let students observe plant growth over an extended period of time e.g. wet and dry seasons.
- Let students observe growth in plants with short life cycles e.g. beans, corn, balsams, ochroses, sunflower, daisies.
- Let students observe a plant, e.g. coconut or corn, at various stages of development.

- Observe several different plants in nature at different stages of development. For each plant let students note differences in changes in size of parts, e.g. size of stem, presence or absence of flowers and fruits. Record observations and infer the importance of growth and development of a plant.
- Visit a farm to observe plants at different stages of development.
- Visit a market to identify different produce/items. Let students identify the source of these items.
- Visit to an agricultural/experimentation station and/or botanical gardens to observe plants and animals at different stages of development.
- Let students search to obtain information on growth and development in selected plants.
- Interview farmers/Agricultural officers/Forestry officers to obtain information on selected plants.

Animals

- Outdoor visits- school yard/farm/zoo/ rivers/ponds (places where animals can be found) for students to observe variety of animals.
- Let students record physical appearance and note external structures and let them state the functions of the structures observed.
- Have discussions to relate structure to function.
- Interview personnel on visits so as to obtain information on external features and their significance.
- Let students collect photographs/pictures of animals and have class discussions on prominent external features.
- Let students view videos/television programmes on animals looking at external features
- Let students search to obtain relevant information on external structures of selected animals.
- Storytelling/Poetry reading looking at animals.

Assessment

- Case Studies e.g. Let students observe an animal (e.g. parrot, lizard, frog, fish). Let students record observations. Let students relate observed structures to function in the animal.
- Short descriptive paragraphs on named animals.
- Poetry writing on chosen animals.
- Written report on visits made or interviews conducted.
- Record observations using drawings.
- Completion type items.
- Matching items e.g. matching body part to named animals.
- Sequencing diagrams of a germinating seedling in the correct order.

UNIT: ECOSYSTEMS (GRADE 4)

Topic: Ecosystems (Local)

Duration: 4 Lessons

Specific Objectives

Students should be able to:

OOO. Investigate the characteristics of mangrove swamps, rainforests, ponds, etc.

PPP. Explain the importance of mangrove swamps, rainforests and ponds.

QQQ. Construct a model of an environment (habitat).

Process Skills

Observing, Investigating, Communicating, Constructing

Materials

Play dough/plasticine

Cardboard

Content summary

There are various ecosystems in your country. They may include, river/pond, mangrove, rain forests. The existing ecosystems of a country have important resources that people depend on for food, clothing and other things.

Suggested Activities

- Ø Go on field trip to see different ecosystems (mangrove, rainforest, pond). Record findings on a given worksheet.
- Ø Discuss the importance of these ecosystems (to animals, humans, the economy, etc.).
- Ø Build or paint a mangrove model/mural in groups. (You may choose another ecosystem.)

Assessment

- Ø Completed worksheet of field trip discoveries.
- Ø Grade model/mural.
- Ø Write a poem that tells the importance of a specified ecosystem.

Topic: Local and Regional Ecosystems: Distribution and Location

Duration: 4 Lessons

Specific Objectives

Students should be able to:

- Ø Explain the links between landform and type of ecosystems.
- Ø Discuss how ecosystems contribute to social and economic development (-e.g. fish, ecotourism, etc.
- Ø Name the different types of ecosystems found in your country and indicate their location on a map.
- Ø Investigate the characteristics and importance of ecosystems in the OECS/Caribbean region (other than own country).
- Ø Name the main types of Caribbean ecosystems.
- Ø Identify the countries in which specific ecosystems are located.
- Ø Indicate the Distribution/location of some regional ecosystems (*hilly/wet/rainforest*) on a map of given countries.
- Ø Explain how ecosystems provide useful resources.

Process Skills

Observing, Inferring, Manipulating, Communicating, Investigating, Reporting.

Materials

Relief map (*your island/country*)
Charts (*different types of ecosystems*)
Crayons/pencils
Video (*documentary on Caribbean ecosystems*)
Map/maps of Caribbean territories

Content summary

The **distribution** and **location** of **local** and **regional ecosystems** are many and varied. They include **rainforests, wetlands** and **hilly/mountainous** areas. The existence of ecosystems benefits our countries in a number of ways, such as for **recreation, food** and **tourist attractions**.

Suggested Activities

- ∅ Go on island tour to investigate different types of ecosystems on the island. Take note of their distribution.
- ∅ Engage in follow-up discussion of the following:
 - types and location of ecosystems
 - links between landforms and ecosystems
 - the importance of ecosystems to development.
- ∅ Identify the location of different types of ecosystems displayed on a map.
- ∅ View documentary video showing ecosystems found in various countries.

Assessment

- ∅ Indicate the location of different types of ecosystems on an outline map, using a specified set of legends. (keys)
- ∅ Make models to/represent/simulate named ecosystems.
- ∅ Develop chart/table indicating the existence of different ecosystems by country.
- ∅ Make oral/written presentation on the benefits of ecosystems to different countries.

Topic: Environmental Destruction

Duration: 3 Lessonss

Specific Objectives

Students should be able to:

- ∅ Identify ways in which humans interact with the environment.
- ∅ Investigate the effect of wave action on the environment (*e.g. beach, coral reefs.*)

Materials

Pictures/videos (*coastal features*)
Worksheets (*Puzzle*)

Content summary

Environmental destruction is the upsetting of the balance of nature. The balance in nature can be destroyed by **natural processes**, such as **hurricanes, earthquakes, volcanic eruptions, droughts** and **floods**. The balance may also be disturbed by activities of humans. **Pollution** of air and water resources, **deforestation** and **excavations** of portions of the earth are some of the ways in which human, destroy the environment.

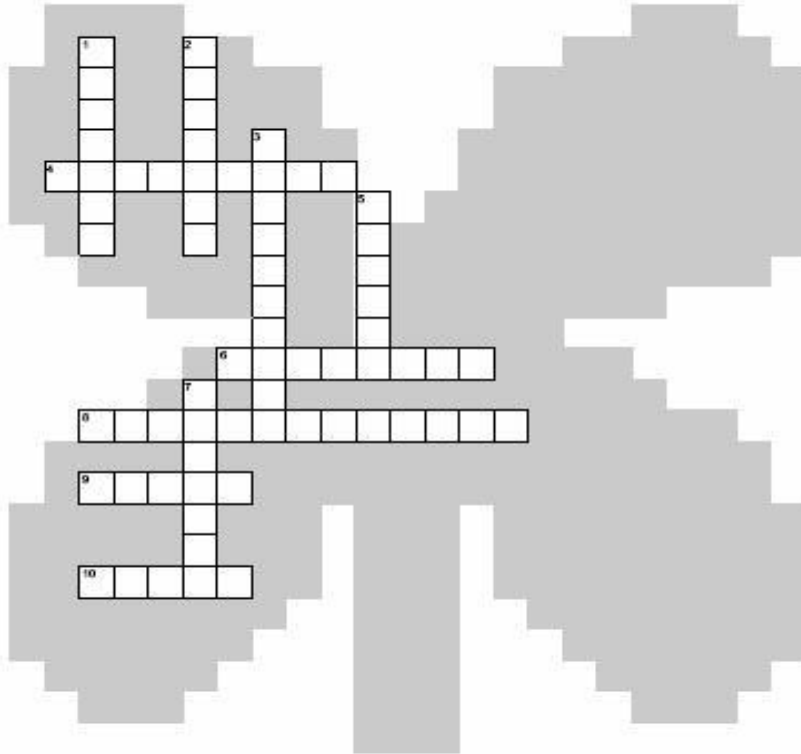
Suggested Activities

3. Observe the immediate environment and identify areas that have been destroyed. Discuss how people activities contributed to the destruction.
4. Go on field trip to coastal area (beach, mangrove swamp, etc.).
Observe the environment: litter, erosion, depletion of sand, etc.
5. Write a report on the destruction caused to the environment by humans. Suggest ways in which humans may prevent destruction of the environment.
6. Examine picture/view documentary of coastal features formed by waves.

Assessment

- ∅ Graded reports (after field trips).
- ∅ Design posters to be used in a campaign against environmental destruction by man.
- ∅ Worksheet: match key concepts to their meaning (use a puzzle).

Environmental Destruction



Down

1. to make unclean
2. the wearing away of top-soil
3. violent shaking of the earth
5. garbage or rubbish not properly discarded
7. a place where magma can escape from inside the earth

Across

4. severe storm with very strong wind
6. vegetation found in the swampy areas near sea
8. removing or destroying many trees
9. where the sea meets the shore
10. large amount of water flowing over land

Topic: Conservation Needs (Your country)

Duration: 3 Lessons

Specific Objectives

Students should be able to:

- Ø Appreciate that the environment needs to be protected.
- Ø Investigate conservation needs of countries (*focus on terrestrial*).
- Ø Identify ways of conserving the environment.

Process skills

Communicating, Creating, Experimenting, Manipulating, Constructing, Communicating

Materials

Plants/trees

Vegetable peelings (*for compost*)

Plot of fenced land (*to build compost*)

Resource person (*from environment/solid waste management department*)

Soil in shallow container (*for soil erosion experiment*)

Water

Watering can (*to simulate rain*)

Content Summary

The wise use of our **natural resources** is called **conservation**. It is important to practise conservation of our resources in order to save the environment. Conservation methods include **reducing** waste, **recycling** and **reusing** resources as far as possible. Practising conservation can bring positive results to the environment. One method of reducing waste, while at the same time recycling useful materials, is **composting**. **Compost** is a soil conditioner and fertilizer, and is the product of the decomposition of animal and plant matter. It is used by gardeners to replenish the humus in soil.

Suggested Activities

Students will do the following:

2. Hold discussion with resource person from the solid waste management authority in the area. Write a report on what they have learnt about managing solid waste.
3. Build/construct a compost heap.
4. Art project: Use old and discarded items to create a useful artefact.
5. Write a petition to your parliamentary representative, requesting protection for the terrestrial environment.
6. Tree planting exercise.
7. Write a poem/song about the importance of terrestrial conservation.
8. Carry out an experiment to demonstrate soil erosion.
9. Carry out a clean-up campaign.

Assessment

4. Teacher-made Test
5. Letter/poem/projects
6. Grade reports on solid waste management.

UNIT: DIVERSITY AND CLASSIFICATION (GRADE 4)

Topic: Producing Plants from Different Seeds

Duration: 4 Lessons

Objectives:

Students should be able to:

1. Identify seeds as a means of reproducing different plants.
2. Define sexual reproduction.
3. Link the seed to sexual reproduction in plants.
4. Define germination.
5. List the factors needed for germination to occur.
6. Describe the processes of germination in plants.
7. Compare the rate of germination in a variety of seeds.

Process Skills:

Observing, Communicating, Investigating, Manipulating

Materials

Seeds
Water
Containers
Centimetre squares graph paper
Observation schedules (worksheet)

Content summary

Plants reproduce either **sexually** and/or **asexually**. In sexual reproduction new plants are grown from **seeds**. Asexual reproduction does not require seeds as new plants are grown from plant parts.

A seed consists of an **embryo** and its food reserves, enclosed in a protective coat. Under suitable conditions, the seed produces a small plant. This small plant is referred to as a **seedling**. A seedling can grow into a mature plant.

Activities

1. Field trip to a farm/nursery.
2. Discuss the importance of seeds for obtaining new plants.
3. Work in groups to set up experiments in which plants are grown from different seeds (for at least one week). Record the results in a daily observation schedule (see activity sheet in Figure 1): record the changes that take place in each seed; observe when roots and shoots appear; measure and record their length daily, plot a graph of length of plant (*X axis*) or number of leaves against (*Y axis*) time (*in days*). Compare the graphs to see which seed grows fastest.
4. Discuss:
 - i. the meaning of germination;
 - ii. the advantages and disadvantages of growing plants from seeds (sexual reproduction).

Assessment

1. Give the meaning of (i.) Seed (ii.) Germination
2. List the factors that are needed for a seed to germinate.
3. State two advantages and two disadvantages of sexual reproduction in plants. Write your answers in the table below.

Advantages	Disadvantages

4. 'Show and tell' about the different plants that they have grown, and then submit their observation schedules to be graded.
5. Grade graph of plant growth over one week.

Work Sheet: Observing Germination

Date: _____ **Class:** _____

Names of group members:

.....

Instructions

Set up seeds in the containers provided. Grow the plants either in water or on moist tissue paper, so that all of the parts can be seen as they grow. Observe the changes for at least 7 days. Record your observations in the table below.

Day	Changes that have occurred
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	
Day 6	
Day 7	

Figure 1: Observation schedule for activity 3

UNIT: THE EARTH'S WEATHER (GRADE 4)

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

- Ø Demonstrate how clouds are formed.
- Ø Describe how clouds are formed.

PROCESS SKILLS

Communicating

Inquiry

Observing

Exploring

Investigating

TEACHING STRATEGIES

Discussion

Role playing

Demonstration

Pictorial representation

Inquiry learning

Discovery learning

Question and Answer


MATERIALS

Activity 1: Making cloud pictures:

2. White water soluble paint
3. Blue paper
4. Paint brushes
3. Cotton balls

- Ø Feathers
- 2. Glue

CONTENT SUMMARY

 **Clouds** help us to forecast weather. Evaporation changes liquid water to water vapour as the large area of warm, moist air rises. It expands and cools. The water vapour condenses into tiny droplets of water. The droplets come together to form clouds.

Clouds are grouped by their height above the ground. Some clouds are close to the ground, some are high in the atmosphere, and some are in between.

Clouds and Weather

- When water particles in clouds become too heavy to remain suspended in the air, they fall to the earth as rain.

SUGGESTED ACTIVITIES

1) Making cloud pictures:

Let students use paint, blue paper, brushes, cotton balls and feathers to make pictures showing different types of clouds.

2) Kinds of Clouds:

Are there different types of clouds in the sky?

Observe clouds in the sky; draw illustrations of the different types of clouds.

Compare and discuss findings with other members of the class in relation to:

5. How many different cloud shapes did you see? Did any of the clouds change shape?
6. What colours were the clouds?
7. Explain how you grouped clouds.

Journal writing:

Ø The Weather:

Give each student a table similar to the one below.

Put in the month at the top.

Draw a picture of the main type of cloud in the sky and state the type of weather present each day.

Month:						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
Weather	Weather	Weather	Weather	Weather	Weather	Weather
Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
Weather	Weather	Weather	Weather	Weather	Weather	Weather
Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
Weather	Weather	Weather	Weather	Weather	Weather	Weather
Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
Weather	Weather	Weather	Weather	Weather	Weather	Weather

ASSESSMENT

Sample questions:

2. Look at the pictures below and do the following: Describe in your own words the clouds that you see.



A _____ B _____ C _____

3. Clouds are formed by:

4. You are going on a picnic when you notice that the sky is filled with a layer of grey clouds. Should you go to the picnic or should you stay inside? Explain.

TEMPERATURE

DURATION: 3 Lessons

OBJECTIVES

The students should be able to:

- Ø Use a thermometer to measure temperature.
- Ø Design and construct a working thermometer.
- Ø Explain how temperature affects weather (evaporation, condensation, and air movement). *Cross reference – Energy.*

PROCESS SKILLS

Observing

Communicating

TEACHING STRATEGIES

Question and Answer

Co-operative learning

Experimenting

MATERIALS

Activity #1: Measuring temperature

2. Thermometer

Activity # 2: Formation of wind

4. Aquarium
5. Clamp lamp
6. 100 watt light bulb
7. Ice
8. Splint or paper
9. Matches
10. Plastic wrap

CONTENT SUMMARY

Temperature is another factor which affects weather.

- **Temperature** means how hot or cold something is. How can we tell the temperature of the air around us?
- What instrument does your mother or the nurse/doctor use when you have a fever? A thermometer is used to measure temperature.
- The unit for measuring temperature is $^{\circ}\text{C}$ or $^{\circ}\text{F}$, although degrees Celsius $^{\circ}$ is more commonly used.

The simple mercury or alcohol thermometer:

- 📖 The thermometer is made from a glass bulb connected to a tube of glass with a numbered scale written on the outside. There is a narrow tube running from the **bulb** to the top of the thermometer; this is called the **capillary tube**.

The bulb contains mercury, which is a liquid metal (or alcohol, often dyed red so that it is visible). The mercury/alcohol inside the thermometer rises when heat is applied;

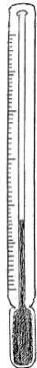



Figure A Thermometer

SUGGESTED ACTIVITIES

Reading a thermometer

 When you read the temperature on a thermometer, it should be vertical and your eyes should be level with the top of the liquid in the glass.

Remember: The temperature reading is taken from the top of the column of mercury or alcohol.

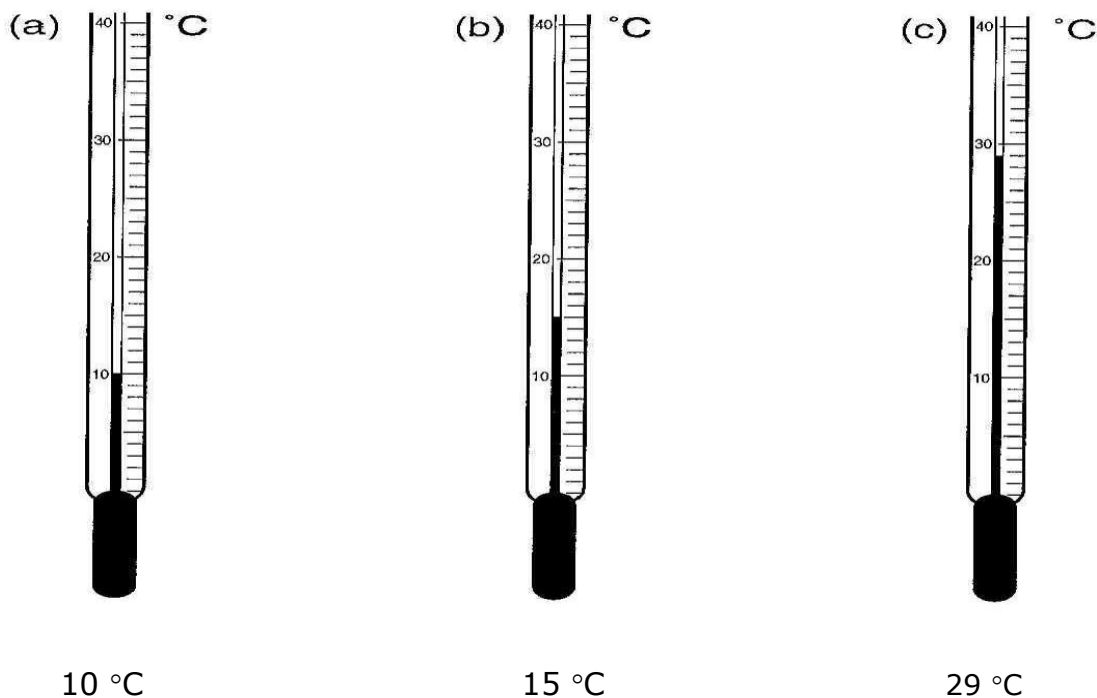


Figure Thermometer Readings


To measure the temperature of hot water, put the thermometer into the container of water. The mercury/alcohol will begin to rise up the capillary tube. When the mercury/alcohol stops rising, then read the temperature.


In cold water, on the other hand, the mercury/alcohol will not rise. The mercury/alcohol will go down. However, the reading would be taken

again, from the top of the column of mercury/alcohol. Would the temperature be high or low?

To measure the temperature of the air in the laboratory or in your classroom, wave the thermometer gently in the air.

Temperature affects the weather.

 Whether we stay home or go to the beach or river depends on how hot or cool it is. How do you feel on a hot day? Do you prefer to stay indoors or go outside to play?

 You will notice that you sweat very much on a hot day. However, this sweat on your skin will evaporate quickly.

 Air Movement

Wind is moving air. The Sun shines through our atmosphere all of the time. It heats the ground which in turn heats the air. Some places receive more than others. Hot air is light and rises. Cool air is heavier and sinks. As warm air rises, air from cooler areas flows in to take the place of the heated air that has risen. This movement of air is wind.

Ø Measuring temperature

Instructions:

3. Give each student a thermometer or use a set of thermometers for the class.
4. Let students read the temperature of the classroom and record their findings in their notebooks.
5. Go into the hallway and let students read and record the temperature.
6. Go outside. Let students read their thermometers and write down readings.
7. Let students hold the thermometer in their hands for a few minutes. Let students read and record their readings.
Let students discuss their readings.

Safety Precautions

Handle the thermometer with care. Alcohol thermometers are preferable.

Activity 3: Exploring wind

Demonstration:

Instructions: Use materials for Activity #3.

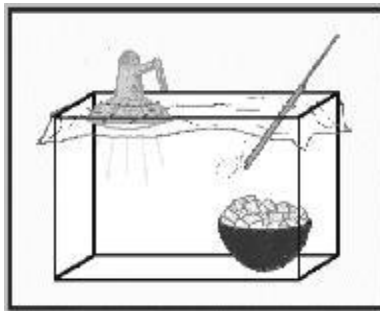
Tell students that the demonstration shows how temperature affects wind formation. The demonstration is like the way wind is produced on Earth. As they observe this demonstration, let students look for evidence of wind.

Insert a 100 watt bulb into the lamp socket. Set up the clamp lamp so that the light shines down on one end of the aquarium.

Place the bowl of ice at the other end of the aquarium and cover the aquarium with plastic wrap.

Make a small amount of smoke by lighting the end of a splint or paper. Let it burn for a few moments and then blow it out.

Puncture a hole in the plastic wrap with the lit splint near the bowl of ice. Describe what happens to the smoke.



ASSESSMENT

Sample questions

2. What does the word, temperature mean?
3. What is the name of the instrument used to measure heat?
4. Read the temperature, in °C, on a thermometer.

Inquiry skills

Teacher can also assess students' observations and interpretation of the demonstration of how wind is formed.

DURATION:

OBJECTIVES:

The students should be able to:

1. Record weather using standard symbols.
2. Summarize and represent data from their recordings of the weather by using simple graphs.
3. Distinguish between weather conditions by examining weather charts.

PROCESS SKILLS

Observing

Classifying

Measuring

Communicating

Inferring

Recording and Interpreting

TEACHING STRATEGIES

Question and answer exercises

Pictorial demonstration

Co-operative learning

Experimenting

MATERIALS

Observing weather conditions:

Materials: thermometer, weather symbols, crayons, pair of scissors, glue, copy of simplified Beaufort Scale, Science notebook

CONTENT SUMMARY

Weather charts

Weather charts use a set of meteorological symbols to show wind, rain, temperature and other weather conditions.

Below are some of the symbols that students may use to show different weather conditions.

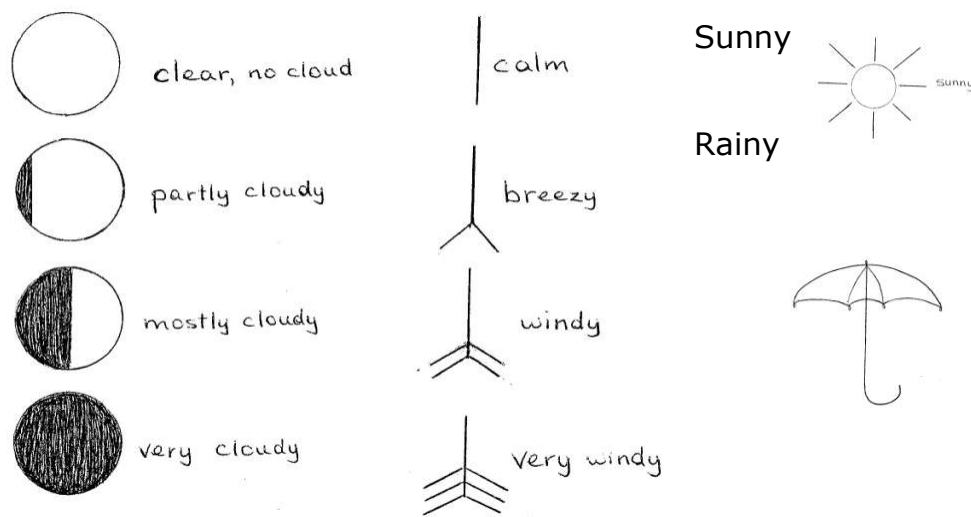


Figure Weather Symbols

SUGGESTED ACTIVITIES

Activity 1: Observing weather conditions

Instructions:

1. Look at the sky. Record whether it is sunny or cloudy.
2. Measure and record the temperature.
3. Look for signs of wind blowing. Record what the wind is doing to leaves, flags, or trees.

4. Look for rain. Record what you see.
5. Repeat steps 1 to 4 each day for one week.
6. How did the weather change?

Source: Discovery Works.(2003). Houghton Mifflin: U. S. A.

Safety Precautions:

If using a mercury thermometer, remember that the mercury is poisonous, so students must be careful that they do not let the thermometer fall.

Students should exercise care when using pair of scissors and pushpins.

Students should be warned not to look directly at the sun.

Students should not sniff glue.

Journal writing:

Recording weather:

Let students use the worksheet below to record weather for a month. Put up a chart with the weather symbols in the classroom. Let students record the weather by drawing the appropriate symbols to show the weather for each day.

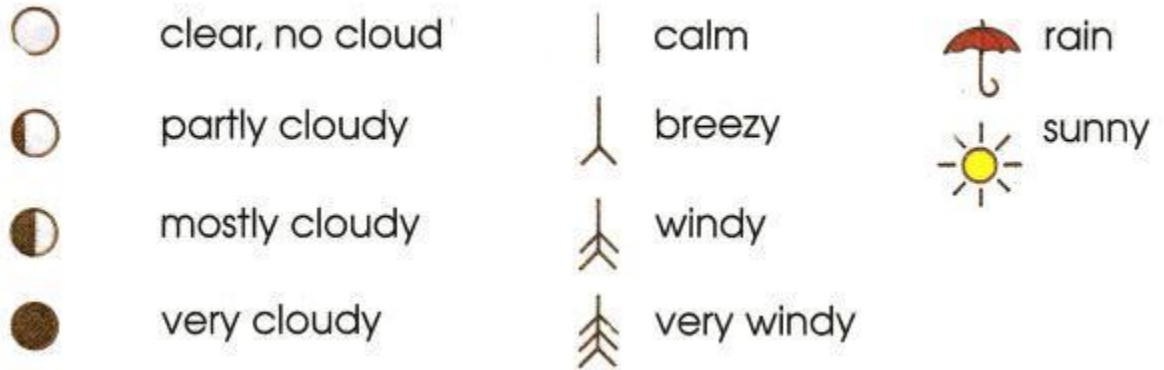
At the end of the month give a short description of the weather week by week.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

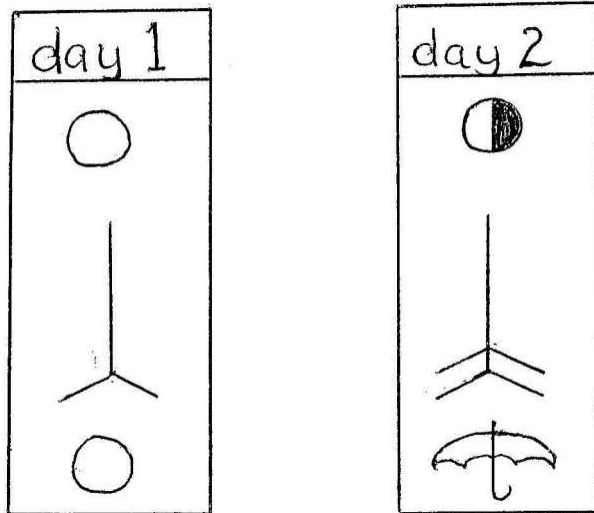
Let students draw bar graphs to show conditions like cloudiness, temperature, etc. for specific periods in the month.

ASSESSMENT

1. These symbols show us what the weather is like.



Here are the weather records for two days.



(a) Which day was sunnier? (1 mark)

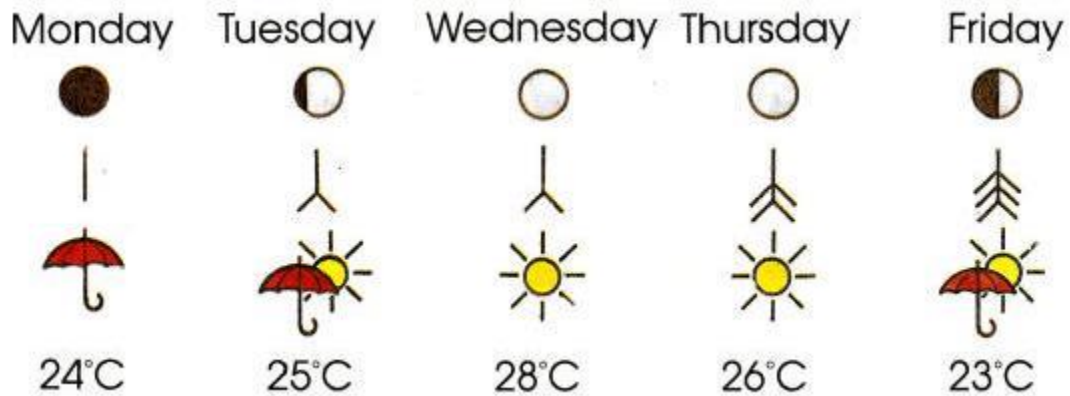
(b) Which day was wetter? (1 mark)

(c) Which day, do you think, had the better weather?

Why? (2marks)

2. Give students maps of different islands with weather symbols in different areas. Ask them to say what the weather is at different locations.

3. Below is a weather chart.



(a) Which day was the cloudiest?

(b) On which day do you think children did not play outside?

Adapted from: Bailey, A., Douglas, O. & Walker, E. (1994). England: Longman Group Limited

Sample answers:

1. (a) Day 1

(b) Day 2

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UNIT: THE SOLAR SYSTEM (GRADE 4)

DURATION: 3 Lessons

OBJECTIVES

The students should be able to:

- Name the planets of the solar system and place them in their relative position to one another.
- Construct a model of the solar system.
- Infer that the moon is a natural satellite to planet Earth.

PROCESS SKILLS

Discovery

Experimenting

Communicating

Co-operating

TEACHING STRATEGIES

Co-operative Learning

Pictorial Demonstration

MATERIALS

Activity #1: Construct a Model of the Solar System

- Pair of scissors
- Cardboard
- Crayons/Markers
- Pencil

- Blanks sheets of paper

Activity #2: Musical Chairs

- Chairs
- Cassette player/CD player
- Cassettes/CD

CONTENT SUMMARY

- ⌚ The planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. Mercury is the closest planet to the Sun; it takes 88 days for Mercury to orbit the Sun. Pluto is the planet farthest from the Sun; it takes 248 years for Pluto to orbit the Sun.
- ⌚ The table below shows the position of the planets in relation to the Sun and the time it takes for each to orbit the Sun.

**TABLE SHOWING ORBITAL PERIOD FOR THE PLANETS
IN THE SOLAR SYSTEM**

Planet	Time to orbit the Sun
Mercury	88 days
Venus	224 days
Earth	365 days
Mars	686 days
Jupiter	4332 days
Saturn	29.5 years
Uranus	84 years
Neptune	164 years
Pluto	248 years



Fig. 1 The Solar System

- The Earth is the 3rd planet from the Sun; it is 150 million kilometers away, the fifth largest and the only planet known to sustain life. It takes 365 $\frac{1}{4}$ days (1 yr.) for the Earth to revolve about the Sun.



Fig. 2 The Earth

- The Sun is located at the centre of the solar system with all the planets revolving about it. The Sun supplies all the light and energy for the Earth and the entire solar system. The Sun is the largest body in the solar system. It is made up of gases.

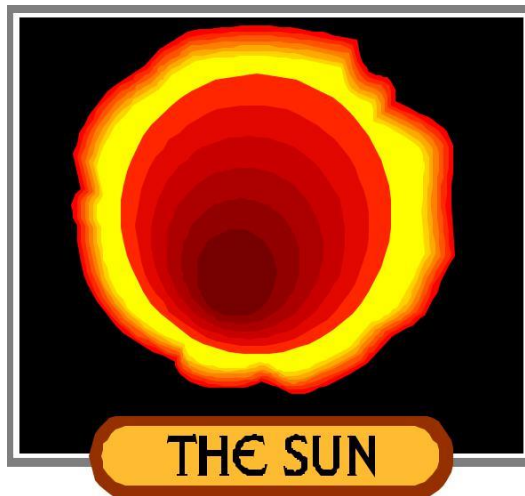


Fig. 3 The Sun

A **planet** is illuminated by light from the Sun.

Satellites are celestial bodies that orbit a planet. The moon is a satellite of the Earth. Human-made machines that orbit the Earth or moon are also called satellites.

ACTIVITIES

Activity #1: Simulation of Solar System

Teacher let students work in groups to form a simulation of the solar system using information about the planets and their position in space relative to one another. Students model how the planets revolve about the sun in different orbits.

Activity #2: Construct a Model of the Solar System

Instructions:

Students will construct a model of the Solar System. The Sun, the planets, and many smaller objects that travel around the sun make up the solar system.

The planets which orbit the sun are: **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.**

Use a drawing as a guide.

Instructions:

1. Cut out ten circular shapes from one sheet of blank paper.
2. Colour one yellow – to represent the Sun- and the others a different colour to represent each of the nine planets.
3. Place another blank sheet of paper on top of cardboard.
4. Position the shapes around the sun as shown in the drawing.

Activity #3: Naming the Planets - Musical Chairs

This activity may be modified using popular music.

Materials: chairs, cassette player/CD player, cassettes/CD

Instructions:

8. Let nine students stand in a circle in front of eight chairs.
9. Each student will represent a planet.
10. The name of each planet will be called out.
11. As the name of a planet is called out, the student representing that planet should move from his/her position and try to get to a vacant chair.

Activity #4: Mnemonics

Create a mnemonic phrase to help students learn the planets in correct order. Use names of students or let them come up with other ideas for the mnemonic to help them to learn the names.

E.g. **M**arcy **V**ega **e**ats **m**ango **j**elly **s**andwiches **u**nder **N**ancy's **p**atio.

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto

Activity 4. Solar system bookmarks

Cut out strips of paper; punch a small hole at the top of each strip of paper. Thread a few different pieces of coloured string through the hole and tie. Draw/paint/colour pictures of the sun and the planets on each strip.

Activity 5. Looking at Stars

Instructions:

Students should observe stars on a dark night and away from street light/ lamp posts.

They can write down what they see (e.g. brightness of stars, sizes of stars and how many in a particular area).

Safety Precautions

Exercise care with the pair of scissors.

ASSESSMENT

5. The planet that is closest to the sun is

- Earth
- Jupiter
- Mercury
- Pluto

6. The planet farthest from the sun is

- Earth
- Pluto
- Uranus
- Saturn

Teacher should assess students’ models of the solar system using selected criteria.

Attitudes can be included as in the following checklist:

CHECKLIST				
Accepts Responsibility				
Shows Self-motivation				
Shares Responsibility				
Shares information				
Takes initiative				
Communicates effectively				
Participates in discussion				
Listens to others				
Respects each others opinion				
Meets deadlines				

UNIT: THE EARTH RESOURCES (GRADE 4)

DURATION : 5 Lessons

OBJECTIVES

Students should be able to:

5. Classify resources as renewable or nonrenewable.
6. Illustrate how rocks and soils are related.
7. Classify soils as sand, clay and loam.
8. Distinguish between various soils on the basis of physical properties (colour, texture, structure, components, etc.).

PROCESS SKILLS

Communicating

Inquiring

TEACHING STRATEGIES

Demonstration

Inquiry learning

Discovery learning

Question and answer

MATERIALS

Magazines with pictures of natural resources

Different types of soils (sandy soil, and clay soil, loamy soil)

Magnifying glasses

Teacher prepared work sheets

Goggles

Soil from the school garden

Jar with a cover

Water

CONTENT SUMMARY

Classifying Natural Resources

- ❑ Natural resources are substances found on the earth that are used by people.
- ❑ The Earth's resources are classified as **renewable** or **nonrenewable**.
- ❑ Renewable resources are replaced in nature and will not run out. Examples of renewable resources are water, sun, wind, plants.
- ◆ Nonrenewable resources cannot be replaced in a person's lifetime; they will some day run out. Examples of nonrenewable resources are: natural gas, coal, and petroleum.
- ◆ We can even have shortages of renewable resources if we do not use them wisely

Soil

- ❑ Soil is formed as a result of physical or chemical weathering of rocks. Rocks may be broken down physically by wind, rain and organisms or chemically by acid rain and oxygen in the air.
- ❑ There are three main types of soil. They are: clay, sand and loam. **Clay** soils have very small particles, the space between the particles are small and this traps water; these soils are usually waterlogged in the wet season. **Sandy** soils have large particles with large air spaces which allow water to drain through quickly making the soil dry. **Loamy** soil is excellent for plant growth because it has medium-sized particles with medium-sized air spaces that keep the right amount of water in the soil.

The table below shows properties associated with different soil types:

	Sandy	Clay	Loam
Colour	Light	Medium	Dark
Texture	Rough	Smooth	Medium
Components	Large sand particles	Small clay particles	Mixture of clay and sand
Size of particles	Large	Small	Medium

SUGGESTED ACTIVITIES

Classifying Natural Resources

Activity 1: How are our basic Natural Resources used?

Allow students to examine picture books or magazines to find out the names of different resources.

Allow students to survey their school grounds (or use as a homework activity) and see how many ways we use air, water, and land. Allow students to discuss freely. They can represent their findings in the form of a chart.

They should also be able to conclude that air, water, and land (rocks and soil) are three natural resources that we cannot do without.

Activity 2: Renewable and non-renewable resources

Students review the water cycle and discuss how water replaces itself in nature.

Students identify other resources such as the sun, and the air, that will not run out.

Students discuss how people use petroleum and where petroleum comes from. Students consider what would happen if we used up all the available petroleum. Would the petroleum be replaced quickly?

Students view magazines with examples of drought and discuss water shortages and infer that we still need to be careful with renewable resources.

Activity 3: Examining different kinds of soils

Prepare parcels of clay, sand and loam. Allow students to look at and touch the three different types of soil. They should then examine the soils under a hand lens. They can examine the colour, texture, structure and components.

To examine the components of loam, allow them to spread it thinly on a sheet of paper or a paper plate and use another paper or paper plate to separate out the different components they find.

They can then choose characteristics to classify the different components they find in soil (e.g. living things, non living, once living, different sized particles)

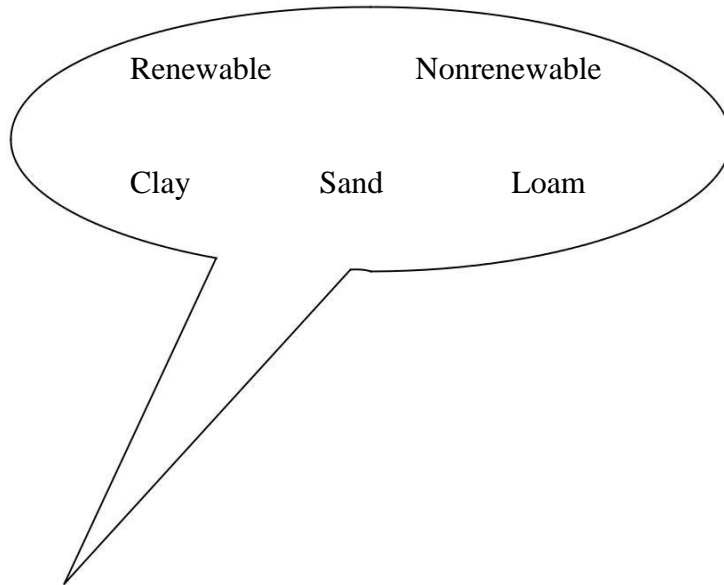
Activity 4: What type of soil is present in our schoolyard?

Half fill the bottle with soil from the school garden/yard. Continue to fill the bottle almost completely with water. Shake until mixed thoroughly. Allow mixture to settle overnight. Observe the layers of soil present.

The large particles that sink to the bottom are sand particles, if this layer is much larger than the others, then you have sandy soil. If there are lots of small particles and small amounts of large particles then you have clay soil. If there are mostly medium sized particles with lots of material floating on top of the water then you have a loam.

ASSESSMENT
Sample questions

1. Fill in the blanks using the words provided:



- a. _____ resources are Earth's resources that are able to replace themselves.
 - b. This type of soil is waterlogged _____
 - c. This is excellent for gardening since it has medium sized air spaces. _____
- 2 The gas that we use for cooking is a _____ resource.
 - 3 These are Earth's resources that are not able to replace themselves. _____.
- 2 Allow students to make picture cards to show how we use air, land and water. Challenge them to show examples of how all three are linked together.

AIR

DURATION: 4 Lessons

OBJECTIVES

The students should be able to:

7. Observe and describe the force exerted by air.
8. Demonstrate that air has mass.
9. Infer that air exerts pressure.
10. Observe the effects of air on falling objects.
11. Design and construct an object to show how air affects the rate of fall.
- 12.** Compare their designs with the designs of others.

PROCESS SKILLS

Observing

Inferring

Communicating

Experimenting

TEACHING STRATEGIES

Co-operative Learning

Experimenting

Pictorial Demonstration

MATERIALS

Activity #1: Does Air Have Mass?

- Two balloons (same size)
- Length of stick (straight)/ ruler
- Strong thread

Activity # 2: Investigating air pressure

4. Sheets of paper
5. A can of milk or juice
6. A can opener

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Activity #3: Exploring the Effect of Air on the Rate of Fall – Group Activity


- Pen
- Sheets of paper
- Feathers


CONTENT SUMMARY

- Air is a valuable resource.
- Air exerts pressure.
- Air offers resistance to falling objects.

The Pressure of Air

 You have already learnt that air is made up of gases. A gas is a state of matter and so has mass. Air exerts a force or pressure on objects. We are surrounded by air, which exerts a force on us.

 **Air pressure** is the weight of the atmosphere, or the amount of 'push' in the air.

 Our bodies are not crushed by air pressure because we exert high-pressure from inside us. The air inside an empty plastic bottle balances the air outside.

Air Pressure at Work

Using a rubber sucker

If you pushed a rubber sucker against a flat surface and you squeezed most of the air from under the sucker, you would find it hard to pull the sucker away from the surface, because the pressure of the trapped air has dropped as the air spread to fill a larger space.

The difference in air pressure – low pressure underneath the rubber sucker, and high pressure outside it – holds the sucker firmly against the glass. Rubber suckers are used to hold towels, in kitchens and bathrooms.

Pouring liquids

When you punch holes in a can of evaporated milk the liquid flows freely through one of the holes. If you had punched only one hole, would the milk flow? Why?

Effects of Air on Falling Objects

(Cross reference – Forces, Motion and Structures)

Air resistance slows down falling objects.

The shape of the object affects the air **resistance***. When leaves fall, they float and drift because of air resistance.

Resistance* - a force which opposes motion

SUGGESTED ACTIVITIES

4. Does Air Have

Mass? Instructions:

- A. Mark the centre of the stick/ruler.
- B. Tie a piece of thread tightly at the centre mark.
- C. Blow some air into one of the balloons and knot it. Then tie it to one end of the stick/ruler with a piece of thread.
- D. Do not blow the other balloon. Tie it to the other end of the stick/ruler.
- E. You have now made a balance. (Be sure that the balloons are tied tightly so that they do not shift.)

Now hold the balance up by the thread.

Write down your observations.

Explain what happens.

4. *Finding out about Air Pressure*

Ø Instructions:

Hold two sheets of paper three inches apart. Then allow a student to blow between the two sheets.

What happens?

Discuss your observation.

Ø Instructions:

Use the opener to cut a small opening on one side of the can.

Try pouring out the liquid. What happens?

Cut another small hole opposite the first one.

Try pouring the liquid. What happens?

Explain .

3. Exploring Effect of Air on the Rate of fall of an object

Group 1

One student will drop a pen and the other a sheet of paper, simultaneously, two metres above the floor.

Record your observations.

Group 2

4. Another student will drop a sheet of paper while the other will drop a feather, simultaneously, two metres above the floor.

5. Record your observations.

The groups will compare and discuss their findings.

Teacher can challenge students to use identical sheets of paper to investigate what happens when different variables are changed e.g. the shape of the paper, the height from which the paper is dropped, the mass of the paper etc.

Students can then compete to design from identical size of newspaper sheets, the slowest falling object/ the fastest falling object, etc.

Teacher asks students to think of everyday occurrences where objects are designed to increase or decrease air resistance. For example, parachutes are slowed down by air resistance, racing cyclists wear a special type of helmet to reduce air resistance.

ASSESSMENT

Sample questions:

- Ø What is the atmosphere made of?
- Ø What do we call the pressure caused by air around us?
- Ø Summarise the effect of air on a falling object.

Sample answers:

8. *The atmosphere is made of a mixture of gases.*
9. *The pressure caused by the air around us is called atmospheric pressure.*
10. *Air slows down the motion of falling objects.*

WATER

DURATION: 2 Lessons

OBJECTIVES:

The students should be able to:

- ∅ Classify substances as soluble or insoluble by their ability to dissolve in water.
- ∅ Classify samples of water as hard and soft by their ability to form lather with soap.
- ∅ Identify situations where water is useful because of its solvent properties.

PROCESS SKILLS

Observing

Communicating

Classifying

Planning and Designing

Experimenting

Inferring

TEACHING STRATEGIES

Project Approach

Guided Discovery

Experimenting (Deductive Inquiry)

Cooperative Learning

MATERIALS

Soluble or not?

3. Transparent plastic cups or other suitable containers, water
4. Samples of soluble substances (salt, sugar, Kool Aid)
5. Samples of insoluble substances (sand, wood chips, flour, leaves, chalk)
6. Spoons/ spatulas.

Hard and Soft Water

5. Hard water (river, sea, or spring)
6. Soft water (rain, distilled, drinking)
7. Soap solution (soap without softeners. **Note: it is important to use soap and not detergents**)
8. Container (beakers, plastic cups, etc.)

CONTENT SUMMARY

- Water is an important solvent.
- Water has the ability to dissolve many substances. Substances that dissolve in water are **soluble** in water, while those that do not dissolve in water are **insoluble** in water. Sugar and Kool aid are examples of soluble substances in water, while sand is insoluble in water.
- Sometimes water has substances dissolved in it that make it **hard**. **Hard water** does not form a lather easily with **soap**, for example spring water. **Soft water**, like rain or distilled water, lather forms easily with soap.
- We use the solvent properties of water in cooking, and, in cleaning.

SUGGESTED ACTIVITIES

Properties of water:

Activity #1: Soluble or not?

Group work (4-5 students per group)

Procedure:

Students will:

3. Place water into their containers.
4. Add different substances to each container and stir.
5. Make observations.
6. Classify substances as soluble or insoluble.
7. Find examples in their everyday life where solubility in water is an advantage/disadvantage.

Hard and Soft Water

Group work (5-6 students per group)

Materials:

Samples of hard and soft water, soap solution and container

Procedure:

Students will:

11. Place samples of hard and soft water into different containers.
12. Add equal amounts of soap solution into each container.
13. Shake each container for an equal amount of time.
14. Make observations (check for lather and how much)
15. State which water is hard and which is soft.

ASSESSMENT

- ∅ Teacher can assess students' practical work, for example, for observing, classifying, manipulation, inferring, communication, etc.

Skills	Poor	Fair	Good	Excellent
Observing				
Measuring				
Manipulating				
Recording				
Classifying				
Communicating				
Experimenting				
Designing				
Problem Solving				
Inferring				

- Teachers can let students compile a scrap book about the solvent properties of water they come across in their everyday lives.

References:

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