UNIT: THE EARTH'S WEATHER (GRADE 3)

DURATION: 2 Lessons

OBJECTIVES

The students should be able to:

1. Explain what is weather.
2. List elements of weather (air/wind, clouds, water vapour, precipitation, temperature).

MATERIALS

Worksheets

PROCESS SKILLS

Communicating
Observing
Experimenting

CONTENT SUMMARY

Weather:

- **Weather** is the condition of the atmosphere at a certain place and time.
- The **atmosphere** is a blanket of air that surrounds the earth. The atmosphere determines the weather. The Earth's weather occurs in the thin layer of the atmosphere that is closest to the earth.

Elements of weather:

- There are many elements of weather. They include: temperature, water vapour, precipitation, clouds and air/wind.
- Heat from the **sun** warms up the earth's surfaces. Some surfaces are warmed more than others.
- **Air temperature** and the amount of **water vapour** in the air vary and have a great effect on weather.
- **Precipitation** is any form of water that forms in the air or on the cold ground. It occurs in a variety of forms: rain, dew.

TEACHING STRATEGIES

Discussion
Inquiry
Discovery
Question and Answer

SUGGESTED ACTIVITIES

1) *Finding out about the weather:*

The teacher will give students a handout with the following questions:

- What is the weather today?

Sunny ? Cloudy ? Rainy ?

- How do you feel?

Cool ? Hot ? Very hot ?

- I can see _____ cloud/s.

No ? Few ? Many ?

- The clouds are _____.

White ? Grey ? Dark ?

2) <u>Making predictions:</u>

Use the worksheet below to record weather for a few days and then predict the weather for the following day. Compare your predictions to the real weather on the following day using a newspaper or listening to the radio. Draw the following symbols to show the weather for each day: umbrella - rainy day; sun - sunny day; kite - windy day, cloud - cloudy day.

Morning		Midday	Afternoon
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			

ASSESSMENT

Sample question:

1. As Mary went out to play, she noticed the following conditions outside:
   - Strong wind
   - Grey clouds
   - Almost no sunlight present
   - Cold temperature

   a) Is it a good idea for her to stay out and play?

_____

   b) What kind of weather did she see?

_____

_____

_____

Sample answer:

1. a) No, she should not stay outside and play.

   b) The weather conditions indicated that rain was approaching.

WIND (ONE ELEMENT OF WEATHER)

DURATION: 4 Lessons OBJECTIVES

Students should be able to:

1. Discuss the useful and harmful effects of the wind.
2. Use a wind vane to determine wind direction.
3. Design and construct a wind vane, with four cardinal points, to observe wind direction.
4. Design and construct an anemometer to measure wind speed.

SCIENCE PROCESSES

Observing

Measuring

Communicating

Interpreting data

Making and using models

Collecting, Recording, and Interpreting Data

Inferring

TEACHING STRATEGIES

Project Approach

Guided Discovery

Experimenting

Cooperative Learning

MATERIALS

A. How Fast the Wind Blows (Building an Anemometer)

Materials:

- Goggles
- staple
- plastic straws
- small paper cups
- tape
- crayon
- straight pin
- pencil with a new eraser
- timer

OR

Materials:

- plastic bottle
- stiff wire
- sand
- 4 empty juice containers
- pen covers
- 2 pieces of stick
- nail
- hammer
- plasticine
- 8 thumbtacks.

B. A Windy Day (Building a Wind Vane)

- Goggles
- wooden board with hole in centre
- marker
- dropper
- middle section from plastic bottle (I l)
- wire hanger (with hook straightened)
- tape
- cardboard
- pair of scissors
- magnetic compass

OR

- Bottle
- stiff wire
- sand
- 2 pieces of cardboard
- straw
- knife
- plasticine
- pen top
- paper base
- pointer with arrow

head *C. Making a Wind Sock*

Materials:

- piece of manila file folder
- a large paper clip
- pieces of kite string
- pieces of crepe paper
- construction paper
- hole punch
- stapler

CONTENT SUMMARY

Wind:

- **Wind** is the movement of air over the Earth's surface.

Useful and Harmful Effects of the Wind:

A. Useful-

- Wind helps in seed dispersal (scattering) by blowing seeds from place to place. Example is silk cotton.
- Wind provides transportation by sea/water. The wind allows sailboats to move as the sails trap the wind to push the boat forward.
- Aeroplanes move with the help of the wind. Windmills use the wind energy to produce electricity by turning generators.
- Wind builds up the land when sediments from one area are deposited in another. Piles of sand are deposited, forming sand dunes on beaches and in deserts.
- Wind dries clothes by blowing, and carrying off the water vapour from around the wet clothes.

B. Harmful-

- Strong winds may blow down trees, and wooden houses and signs. These strong winds usually occur in storms or hurricanes.
- The wind blows loose sand and soil away, resulting in a wearing away of the land.

Wind Direction

To find the direction in which wind is blowing, two instruments may be used.

- The first is the **wind vane** (Figure 1) is a device which shows the direction from which the wind is blowing. Common wind vanes are shaped like a long arrow with a tail. When the wind blows, the arrow points into the wind. For example, if the arrow points east, the wind is an east wind.

- A **windsock** (Figure 2) is another device used to show wind direction. It consists of a cloth bag that is opened at both ends and is hung on a pole. Air enters the wide end of the windsock and causes the narrow end to point away from the direction from which the wind is blowing. Windsocks are usually found at airports.

Figure 1. A Wind Vane

Wind Speed

Figure 2. A Windsock

Wind Speed

- The device to measure the wind speed is called an **anemometer**. It consists of cups on spokes attached to a pole. (See Figure 3)

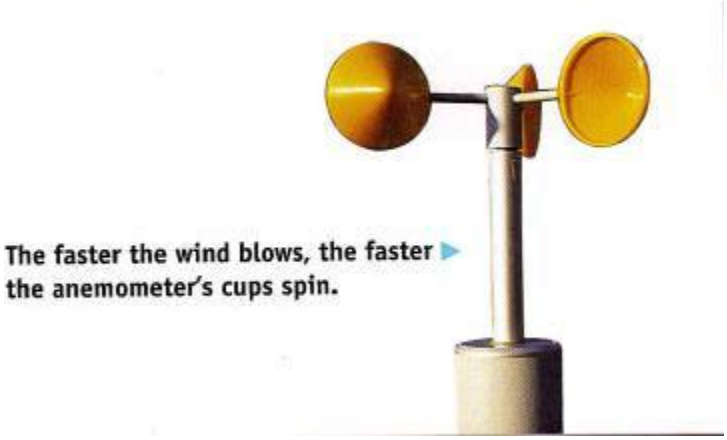


Figure 3. An anemometer.

- We can also tell the speed of the wind by observing the movement of things around us. The Beaufort Scale helps to determine the wind speed without the anemometer.

The Beaufort Scale is used to measure how strong the wind is blowing. Wind speed may be estimated using this scale.

Wind Speed MPH	**World Meteorological Organization (WMO) Description**	**Wind Effects on Land**
Under 1	Calm	Clam, smoke rises vertically
1 – 3	Light air	Smoke drift indicates wind direction, still wind vanes
4 – 7	Light breeze	Wind felt on face, leaves rustle, vanes begin to move
8 – 12	Gentle breeze	Leaves and small twigs constsntly moving, light flags extended
13 – 18	Moderate breeze	Dust, leaves, and loose paper lifted, small tree branches move
19 – 24	Fresh breeze	Small trees leaf begin to sway
25 – 31	Strong breeze	Larger tree branches moving, whistling in wires
32 – 38	Near gale	Whole trees moving, resistance felt walking against wind
39 – 46	Gale	Whole trees in motion, resistance felt walking against wind
47 – 54	Strong gale	Slight structural damage occurs, slate blows off roofs
55 – 63	Storm	Seldom experienced on land, tree broken or uprooted, "considerable structural damage"
64 – 72	Violent storm	Very rarely experienced; accompanied by wide spread damage
73 and over	hurricane	Massive and wide spread damage to structures

Table C.1. The Beaufort Scale (modified version)

SUGGESTED ACTIVITIES

1. Useful and harmful effects of the wind

Let students brainstorm as many effects of the wind as they can. They then categorize them as useful or harmful

2. How Fast the Wind Blows (Building an Anemometer)

Group work (4-5 students per group)

Teacher challenges students to suggest how they could tell how fast the wind is blowing. They discuss signs that may indicate the speed of the wind. Teacher then introduces students to the Beaufort scale.

<u>One model of an anemometer can be made as follows:</u>

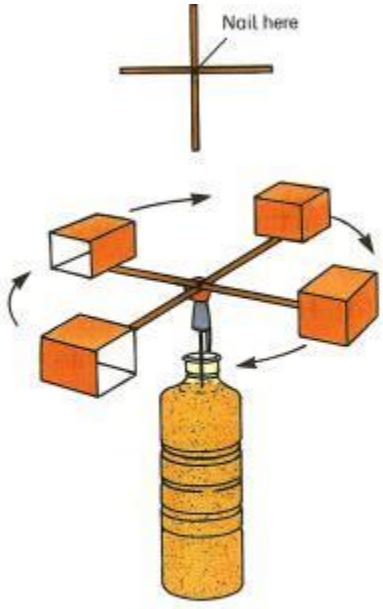
<u>Procedure</u>:

- Staple one end of a plastic straw to the outside of a paper cup, near the rim. Do the same thing with three other straws and paper cups. Each straw should be sticking out to the right of its cup.
- Place two cups on their sides with the straws pointed toward each other. The open ends of the cups should be facing in opposite directions. Overlap the tips of the straws about 1 cm and tape them together.
- Repeat step 2 with the other two cups. Then crisscross the two pairs of straws together at their midpoints. Mark the bottom of one cup with an X.
- Insert a straight pin through the centreof the cross and into the top of a pencil eraser. (CARE!) Don’t push the pin all the way in. Your anemometer is complete.
- Test your anemometer by holding the pencil and blowing into the cups. The cups should spin freely. You can watch for the cup marked X on the bottom to tell when the anemometer has made one complete spin.

- Make a chart like the one below. Take your anemometer outside. Count how many times it spins in one minute. Record the number of spins at different times of day or at the same hour each day of the week. Record other observations about weather conditions at the same time.

Date	**Time**	**Spins in 1 minute**	**Weather conditions**

Safety Precautions:
Teacher should supervise the use of the stapler.
Teacher should insert the straight pin.



Activity:
Group work (4-5 students per group)

Procedure:
Use materials to make an anemometer. Teacher should encourage students to design their own anemometer.

3. A Windy Day (Building a Wind Vane)
Group work (4-5 students per group)

Materials:
Students' choice

Procedure:

a. Students will use the materials to construct a wind vane. (Note: a picture of a wind vane should be presented before assigning this task).
b. Students will use their wind vane to record wind direction at different times of the day.
c. Students will compare wind direction under different weather conditions.

4. Making a Windsock

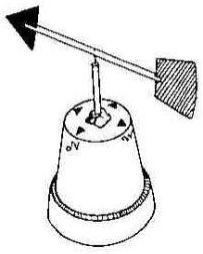
Group work (3-4 students per group)
(See materials listed above)
Procedure:

1. Show students a picture of the wind sock.
2. Place students into groups.
3. Ask students to make a windsock using the materials provided.

ASSESSMENT

Sample Questions:
For the following questions, circle the correct answer.

1. What can we use the instrument below to measure?
   (a) Air pressure
   (b) Temperature
   (c) Wind direction
   (d) Wind speed



3. A windsock and a wind vane show _____
   (a) air pressure
   (b) temperature
   (c) wind direction
   (d) wind speed

4. A wind of 120 miles per hour is a _____.
   (a) gentle breeze
   (b) hurricane
   (c) storm
   (d) strong breeze

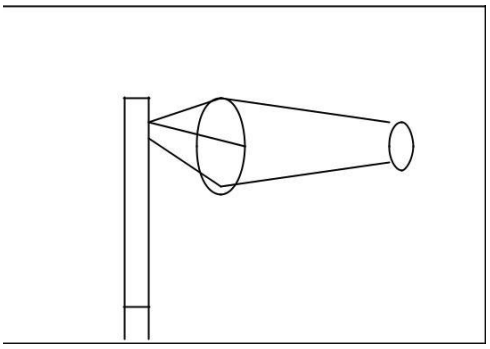
Part B

1. In the space below draw a windsock in a heavy wind and draw one where there is no wind blowing.

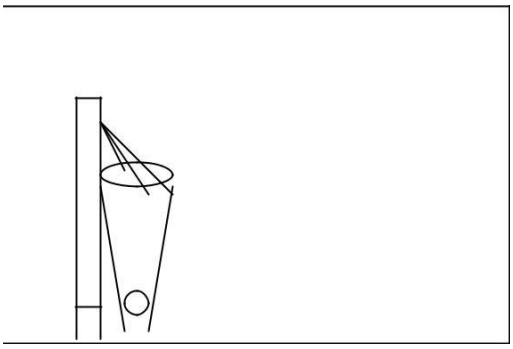
Windsock in heavy wind

Windsock in no wind (calm)

Sample Answer for Part B



Windsock in heavy wind



Windsock in no wind (calm)

WATER

DURATION : 4 Lessons

OBJECTIVES

Students should be able to:

1. List the two main sources of water in nature's water cycle (ground water and surface water).
2. Observe the evaporation and condensation of water.
3. Identify the evaporation and condensation of water.
4. Identify the heat source that powers nature's water cycle.

PROCESS SKILLS

Observing
Recording
Measuring
Experimenting
Communicating
Interpreting data

TEACHING STRATEGIES

Discussing
Questioning
Demonstration Laboratory

MATERIALS

Activity 1: Finding out how water changes from a gas to a liquid

- *A clear plastic cup*
- *5 ice cubes*
- *cold water*
- *food colouring*
- *white napkin*

Activity 2 : Changing water from a liquid to a gas

- *small pan or test tube*
- *pot or test tube holder*
- *dropper*
- *bunsen burner or other heat source*

***Extension**: Does the amount of water matter?*

- *2- 150 ml beakers or two clear drinking glasses*
- *labels*
- *ruler*

CONTENT SUMMARY

- All living things need water.
- A source of water which already exists on the land, is called **surface water**. Examples are ponds, streams, rivers, oceans and lakes.
- A source of water that is found under the ground is called **ground water**.
- The water on Earth is constantly recycled in a process called the water cycle. As water goes through this cycle we notice changes in our weather.
- The **water cycle** is the continual evaporation and condensation of water.
- **Evaporation** occurs when liquid water is heated and turns to a gas. The gas is invisible and is called water vapour.

Examples:

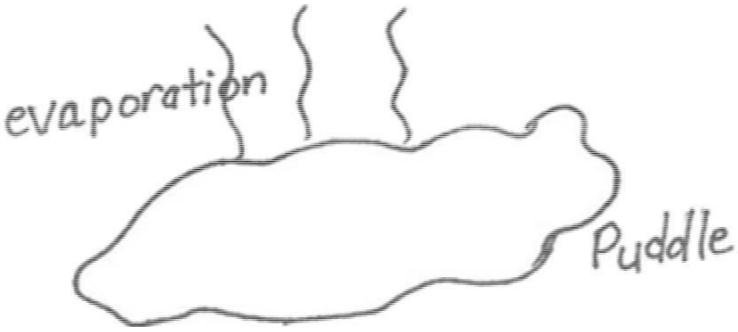


Fig 1: The sun heats the water. The water goes into the air; as a gas water vapour is invisible.

Fig 2: The water from wet clothes evaporates.

Examples:

- **Condensation** occurs when a gas (water vapour) cools and changes back to a liquid.

The water vapour in the air cools and turns into tiny droplets (condenses). Sometimes these drops of water collect on plants and is called dew.

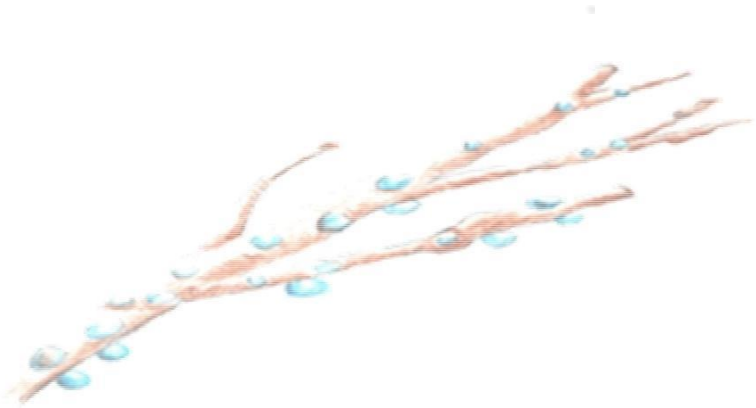


Fig. 3: Dew drops on a plant

The Water Cycle:

- The sun is the main engine which drives the water cycle. Heat from the sun evaporates water from the surface of the oceans, ponds, lakes, and rivers into a gas called water vapour. The water vapour rises into the air. As it rises the water vapour cools and condenses (changes into tiny droplets of liquid water) to form clouds. The water falls back to the earth in the form of rain.

Although surface water (water already on land) and ground water (water underground) are the two main sources of water in nature's water cycle, there is water in the air.

This picture below shows how evaporation occurs. The water vapour rises into the atmosphere and condenses to form clouds. Eventually the water returns to the Earth as rain.

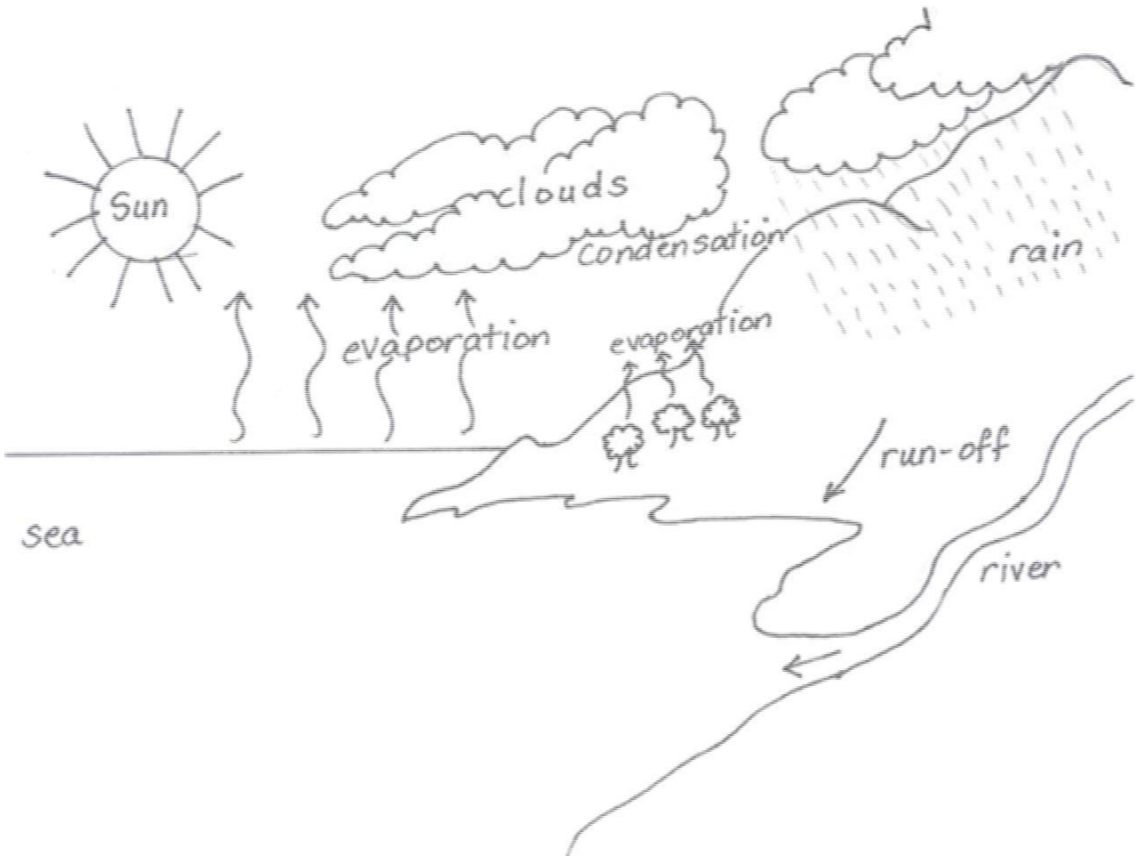


Fig 4: The Water Cycle

SUGGESTED ACTIVITIES

a) Finding out how water changes from a gas to a liquid

This activity allows the students to develop further the skills of observing, communicating and interpreting. Questions are provided to assist in stimulating meaningful discussion in an attempt to bring about higher order thinking skills.

Students should work in pairs.

(See materials listed above)

Instructions:

1. Fill the cup with cold water and ice cubes.
2. Add two drops of food colouring to the water and ice cubes.

3. Let the cup sit undisturbed for 5 minutes or until there are drops of water on the outside of the cup.
4. Wipe the outside of the cup with the white paper napkin. Record what happens.

Questions:

a. Where do you think the water on the outside of the cup came from?
b. How do you know?
c. What caused the water drops to form on the outside of the glass?

b) Changing Water from a Liquid to a Gas

It may be best to use this activity as a demonstration.

(See materials listed above)

Instructions:

- Using the dropper, place a drop of water in the test tube or several drops in the pan.
- Light the bunsen burner or other heat source.
- Heat the container or test tube (about 3 cm above the flame).
- Move the container/test tube back and forth over the flame until the drop(s) disappear/s.
- Turn off the heat.

This activity can also be done by placing the container with the water in the sun.

Questions:

a. What happened to the water?
b. What is this process called?
c. Where is the water now?

Extension1: Does the amount of water matter?

(See materials listed above)

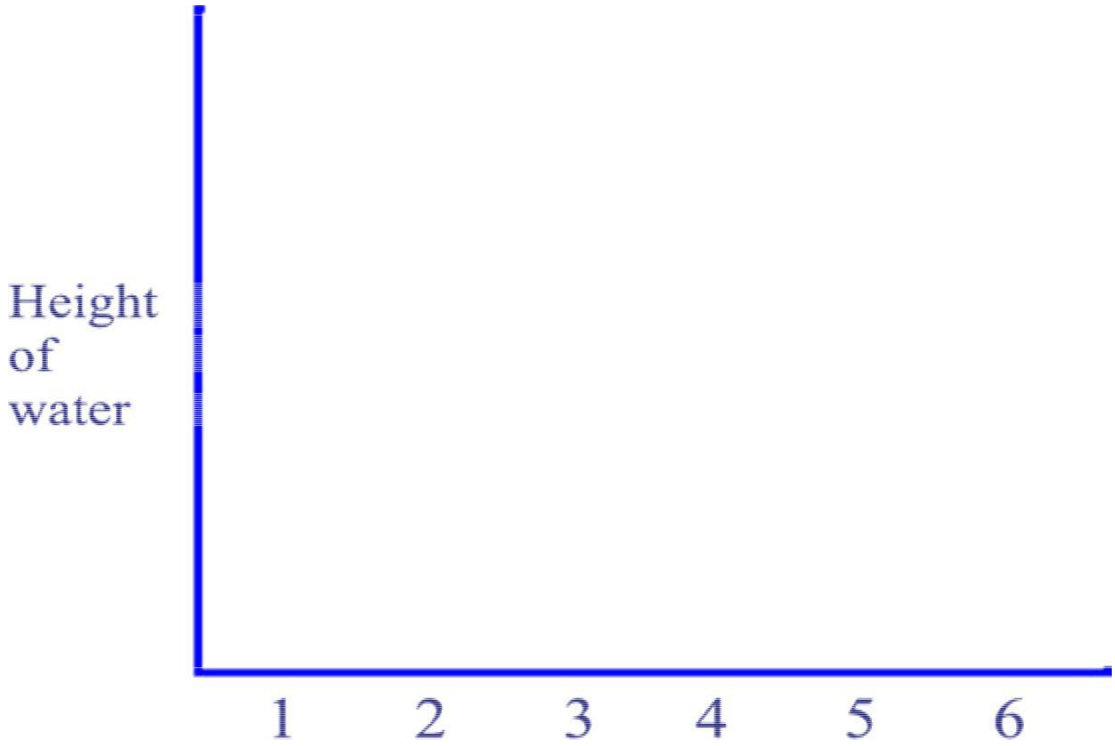
Instructions:

Students should work in pairs.

a. Label the beakers/glasses 'A' and 'B'.
b. Put water 10 mm deep in beaker/glass A
c. Put water 20 mm deep in beaker/glass B.
d. Place the beakers in the same place in the room.
e. Every day use a ruler to measure how deep the water is in each beaker.
f. Record your observations in a table like the one below.

Day	1	2	3	4	5	6 etc
Height of water in A in mm						
Height of water in B in mm						

g. Repeat steps e and f until there is no water in either beaker.
h. Draw line graphs of the results



Question:

Which is correct? Tick the right box.	True	False
1. The more water there is, the longer it takes for it to dry up.	☐	☐
2. The more water there is, the less time it takes for it to dry up.	☐	☐
3. The amount of water does not affect how long it takes to dry up.	☐	☐

<u>Comparing rates of evaporation using different conditions</u>

Teacher poses a problem or question such as: "When there are puddles of water on the road, what will make them dry up quickly?" Let students make suggestions of factors that affect the rate of evaporation.

(Several factors affect the rate of evaporation, e.g. (1) When more heat is applied, the faster evaporation occurs. Direct heating (fire) causes evaporation to occur faster than indirect heating (from the Sun). (2)Breeze affects evaporation. The stronger the breeze the faster is evaporation. (3)Surface area e.g. water in a wide shallow dish, will evaporate faster than water in a deep narrow container).

ASSESSMENT

Students will be asked to design an experiment to test the rates of evaporation under different conditions. Students are expected to carry out their experiments.

Teacher should let students explain their experiments first and help them to set up **fair experiments** to investigate different conditions: e.g. Will water evaporate faster in a breeze than where the air is still? Will water evaporate faster in a flat dish or in a tall glass, etc?

UNIT: THE SOLAR SYSTEM (GRADE 4)

DURATION: 3 Lessons

OBJECTIVES

The students should be able to:

a) Name the planets of the solar system and place them in their relative position to one another.
b) Construct a model of the solar system.
c) 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

χ) Pair of scissors
δ) Cardboard
ε) Crayons/Markers
ϕ) Pencil

1. 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

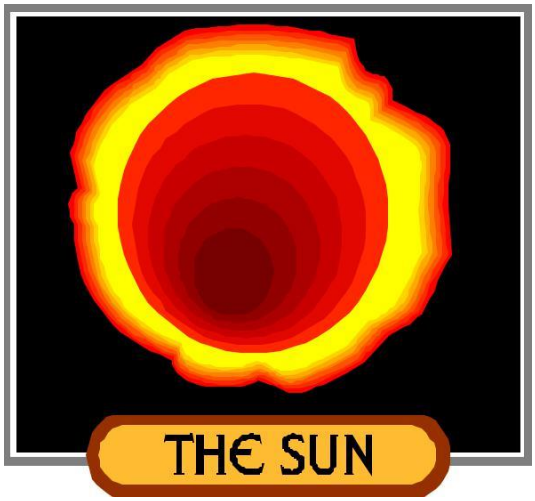
Fig. 1 The Solar System

- 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 ¼ 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 a 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:

- o Cut out ten circular shapes from one sheet of blank paper.
- p Colour one yellow – to represent the Sun- and the others a different colour to represent each of the nine planets.
- q Place another blank sheet of paper on top of cardboard.
- r 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:

- o Let nine students stand in a circle in front of eight chairs.
- p Each student will represent a planet.
- q The name of each planet will be called out.
- r 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

o The planet that is closest to the sun is

- ○ Earth
- ○ Jupiter
- ○ Mercury
- ○ Pluto

p 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				

References:

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UNIT: CLASSIFICATION AND DIVERSITY (GRADE 3)

Topic: Classifying Flowering Plants

Duration: 3 Lessons

Specific Objectives:

Student should be able to:

1. Classify plants into flowering and non-flowering; monocotyledons and dicotyledons
2. Describe the differences between monocotyledonous and dicotyledonous plants.

Process Skills

Observing, Classifying, Communicating, Investigating, Recording

Attitudes

Curiosity, respect for living things and the environment, stewardship of the environment

Materials

Seed samples (*genip, kidney beans, black-eyed peas, corn, rice, barley, mango, peanuts, etc.)*
Pictures (*flowering and non-flowering plants*)
Multimedia CD-ROM (*information on plant propagation*)
Video (*documentary on plant propagation*)
Computer (*Internet access + CD Drive*)
Up-rooted plant samples

Content summary

Plants can be classified into **flowering** (seed-bearing) or **non-flowering** (non-seed bearing). Sugar cane, mango and corn are examples of flowering plants. Ferns and mosses are examples of non-flowering plants.

Flowering plants can be further classified as into **monocotyledons** and **dicotyledons**. A monocotyledonous plant has one **seed leaf** or **cotyledon** in one of its seeds, **parallel-veined leaves**, **jointed stems** and a **fibrous root system**, while a dicotyledonous plant has two **seed leaves** or **cotyledons**, **net-veined leaves**, **un-jointed stems** and a **tap root system**.

Suggested Activities

Ø Students work in groups to look at pictures of plants or go outdoors to look at plants and classify them into flowering and non-flowering, giving three examples in each group.

Ø Students work in groups to examine seed samples, by peeling away their seed coats, to see the number of seed leaves/cotyledons present in each. Record the information in a table with two headings –monocotyledons and dicotyledons. (*Use the seeds listed under materials*.)

Ø Students work in groups to investigate up-rooted plant samples such as corn and mango (*seedling*) or other monocotyledons and dicotyledons. After describing the leaves, roots and stems in each case, they link their findings to the number of seed leaves present in each type of plant and draw conclusions about the features of monocotyledons and dicotyledons.

Assessment

Ø Let students formulate definitions for each of the following: flowering plant, non-flowering plant, monocotyledon, dicotyledon, and give two examples of each.

Ø Complete the classification key in figure 1 below.

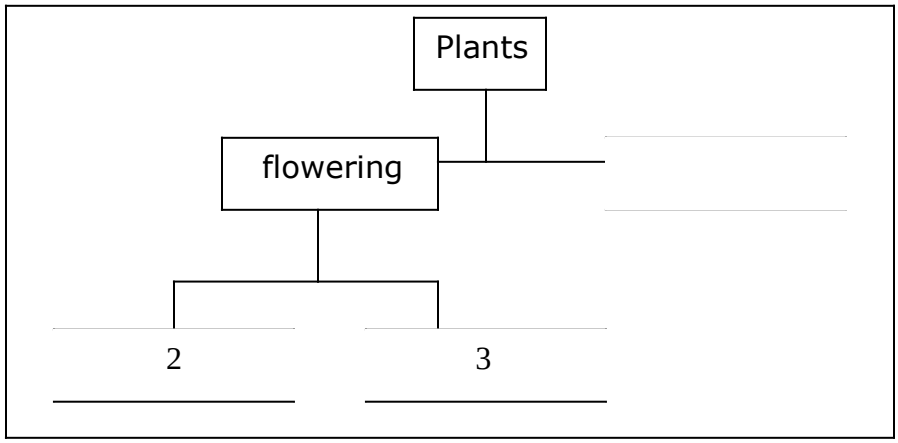


Figure 1: Classification of plants

3. Make a table of differences for monocotyledons and dicotyledons.

monocotyledons	dicotyledons

Ø Create a chart/power point presentation/website showcasing flowering and non-flowering plants or monocotyledons and dicotyledons.

Ø Engage in a tree planting exercise.

Ø Plan and implement a campaign in which posters are made that depict the importance of trees and what people ought to do to preserve them.

Topic: The Different Ways of Growing new Flowering Plants

Duration: 3 Lessons

Specific Objectives

Students should be able to:

Ø Define propagation.

Ø State two natural methods by which flowering plants can be propagated.

Ø Define 'seed'.

3. Describe common methods of vegetative propagation.

4. Demonstrate respect for plants in their environment.

5. Suggest appropriate methods of propagation for (i.) obtaining diversity and (ii.) Keeping the same characteristics in plants.

6. Describe people's use of artificial plant propagation and materials (*production technology*) to satisfy their needs.

Process Skills and Attitudes

Observing, Manipulating, Recording, Caring for the environment

Materials

Plant organs- seeds (monocot, dicot), stem tuber, root tubers, bulbs, corn, runners (vines).
Plants growing from different plant organs.
Charts/texts/websites with diagrams of plant reproductive organs.
Seedlings/Potted plants (*for tree planting exercise*)

Content summary

Propagation is the production of large numbers of new plants. Flowering plants may be **propagated** by **seeds** and/or **vegetatively.**
A **seed** consists of an **embryo** and its food reserves, enclosed in a protective coat. Under suitable conditions, the seed **germinates. Germination** is the

initial growth of a seed as it changes into a small plant. This new plant is referred to as a **seedling**. A seedling is capable of becoming a mature plant.

The vegetative production of a new plant involves growing it from existing plant parts such as **root tubers**, **stem tubers**, **bulbs**, **corms**, **runners**/**vines** and **leaves**.

Teacher Notes:

Vegetative Propagation

4. **Leaves** – leaf of life (bryophyllum)can produce hundreds of tiny new plants from buds that grow out of its leaves.
5. **Stem Tubers** – Irish potato has buds or 'eyes'; each bud can produce a new plant.
6. **Bulbs** – Onion, garlic have buds between the leaves; these buds develop into new stems, leaves, and flowers.
7. **Root Tubers** – Sweet potatoes, cassava; each tuber can grow into a new plant
8. **Runners** – have stems that grow out along the ground. A bud at the end of the runner develops roots and leaves and forms a new plant (e.g. water grass).
9. **Suckers -** Banana grows many plants from the original shoot.
10. **Corms** – Short swollen underground stems which develop into new plants (e.g. coco).

New plants may also be produced by **artificial** means. These include:

Cuttings – sections of stem, which develop root and form new plants. (e.g. cassava, sugar cane, hibiscus)

Tissue Culture – Here cells are grown in a special fluid containing all the nutrients the plant needs for growth and development. Each cell grows into a new plant. (e.g. banana, carrots, breadfruit, cocoa)

Grafting – a small twig is cut off and joined to a short stem attached to a good root system of another tree. (e.g. roses, mango).

Suggested Activities

5. Research propagation in flowering plants through the use of multimedia CD-ROM, Encyclopaedia/text, Internet or Resource person. Discuss the findings and or present a report.

2 Field trip: visit a nursery/farm to make observations and be informed about the methods used to propagate flowering plants. Students write a report of the information that is presented.

3 Invite a botanist/agriculturalist to address the students on propagation of flowering plants, to include modern technologies used. Students submit a summary of the information that is presented (*as a follow-up activity*).

4 Research an artificial method of plant propagation. Submit a project report.

5 Small group discussion:
What effect can removing flowers from plants have on the production of new plants of this type? Beside the effect on that plant itself, what other effects can removing flowers have?

6 Students' investigation:
Which type of reproduction is more common in a list of plants (reproduction by seed or without seed) Students make predictions. Students organize to collect, record, and interpret data.
Possible questions: (i.) What will be measured? (ii.) How will it be recorded?
(iii.) Are there any that use both methods of reproduction?

7 Small group discussion followed by plenary:
You have one mango tree, which bears big sweet mangoes. What method would you use to get new plants, which bear big, sweet mangoes all the time from this tree? Say why you would use the method chosen. Give one reason why people use artificial propagation in plants.

b) Students experiment with growing their own plants by the different methods (seeds, vegetative and artificial methods).

c) Comparison of growth of plant from seed and from organ of vegetative propagation. Growth of that same plant from seed and from organ of vegetation propagation e.g. onion, or compare growth of some seeds with growth from organs of vegetative propagation under similar conditions. Students measure, record and draw conclusions from data.

Assessment

b) Grade project reports/summaries on plant propagation.

c) Suggest appropriate methods of propagation for i. obtaining diversity and ii. Keeping the same characteristics in plants.

a Describe people's use of artificial plant propagation and materials (*production technology*) to satisfy their needs.

b Use of tables to record data allowing classification of plants by the way they reproduce.
Example:
Complete the following table on plant reproduction using the Numbered samples (or list of plants).

Tick the correct column.
1. Corn 2. Irish potato 3. Sweet potato4. Onion
5. Water grass 6. Garlic 7. Bean

Plant reproducing by	Plant 1	Plant 2	Plant 3
Bulb			
Seed			
Cutting tuber			
Corm			

d) Use a tree diagram to classify plants by the way they reproduce. Sample questions on tree diagram:

Name one plant which reproduces by root tuber.
f) Where would the (named plant e.g. pear) fit into this diagram?

e) Open-ended questions.
Which method of propagation would you use to get hibiscus plants? Give a reason.

f) Objective-type questions.
Which one of the following reproduces using stem tubers?
A. Sweet potato B. Irish potato
C. Onion D. Cassava

8. Complete by ticking the appropriate column.

Reproduction by	Names of plants					
	Plant 1	Plant 1	Plant 3	Plant 4	Plant	Plant 6
Seed						
Bulb						
Cutting Tuber						

Or

Name of plant	Reproduction by				
	Seed	Bulb	Cutting Tuber		
Corn					
Sweet potato					
Onion					

Topic: Classifying Different Vertebrates

Duration: 3 Lessons

Specific Objectives:

Students should be able to:

d) Define (i.) Vertebrate (ii.) Invertebrate.

e) List the five classes of vertebrates.

f) Describe the main features of each class of vertebrate.

g) Compare the main features/characteristics of the classes of vertebrates.

h) Make a model of any vertebrate from 'throw away' items.

Process Skills

Observing, Classifying, Designing, Manipulating, Communicating, Recording

Materials

Charts/CD-ROM/Website (*with Pictures a variety of vertebrates*)
'Throw away' items (bottles, paper rolls, egg shells, etc.)

Content summary

A **vertebrate** is an animal that has a **backbone** or **spine**, while an **invertebrate** is an animal without a backbone. Vertebrates are divided into five major **groups**/**classes: Mammals, birds, reptiles , amphibians** and **fish**. Each class of vertebrates has its distinguishing or **characteristic features**, which include: **body covering**, **breathing organ**, **type of blood** i.e. **warm-blooded** or **cold-blooded,** and **method of reproduction**.

Suggested Activities

g) Visit a zoo to observe different vertebrates. Gather and record as much information as possible about a variety of them (*teacher determines a good sample/list of animals to visit*). Look at their external bodies (take pictures where possible); see what kind of habitat they have; ask about how they breathe and breed and whether they are cold-blooded or warm -

blooded. Work in groups to classify the animals you saw into five distinct groups. Follow up with oral presentations and discussion.

OR

2. Research Project: Use available resources such as text/CD-ROM/Internet to view pictures of various vertebrates and find out information about them. Look at their external bodies; research what kind of habitat they have, how they breathe and breed and whether they are cold-blooded or warm-blooded. Present the findings as report/chart/slide presentation/website.

3. Tour your neighbourhood to identify any vertebrates present there. Collect the data and draw a bar graph to show the numbers of each type of vertebrate identified.

4. Design and make a model of the vertebrate of choice. Submit with a project report of the procedure.

Assessment

Ø Grade the presentation/projects resulting from any of activities 1-4 above.

Ø Teacher-made test of objective type questions, True/False and fill in the blanks items. Example:

Test: Classifying vertebrates

Section A – Indicate if the statement is true or false by circling either T or F.

Ø All vertebrates have a backbone or spine. (T, F)

Ø Amphibians are covered with scales. (T, F)

Ø Vertebrates are all warm-blooded animals. (T, F)

Ø A mammal is an animal that breathes through lungs. (T, F)

Ø Reptiles and fish are covered with scales (T, F)

Section B – Fill each blank space with the correct answer from the list below.

Mammal amphibian reptile bird invertebrate fish

Ø The whale is a/an _____ that lives in the sea.

Ø A pigeon is an example of a _____.

Ø If an animal has scales and gills, then it is a _____.

Ø A spider is an example of a/an _____.

Ø A cold-blooded animal that lives on land is in the group called _____.

Section C: Multiple Choice - Choose the correct answer for each of these.

Ø A warm-blooded animal which has hair/fur and suckles its young is a/an….
Amphibian
Fish
Mammal
Reptile

Ø Both reptiles and fish are covered with ……..
feathers
hair
scales
skin

Ø Which animal is warm-blooded?
Lizard
Parrot
Snake
Snapper

s Which of the following does not breathe through lungs?
Cow
Dog
Dove
Tadpole

t Which of the following lays eggs?
Cow
Donkey
Rabbit
Turtle

UNIT: ECOSYSTEMS (GRADE 3)

Topic: Food Webs - Balancing Nature

Duration: 3 Lessons

Specific Objectives

Students should be able to:

- Construct simple food webs to show feeding relationships among animals in a given area (a tree and places close to it; a flower garden; a pond; etc).
- Interpret simple food webs.
- Infer that food webs help to keep nature in balance.
- Identify factors that may disrupt the balance of nature.
- State the consequences of disrupting the balance of nature.

Process Skills

Constructing, Observing, Recording, Inferring, Drawing,

Materials

Pencil/crayons
Drawing paper
Chart (*food web/s*)
Worksheets (*fill the blanks*)

Content summary

A **food web** is a number of food chains that are interlinked. It represents feeding patterns of organisms within an ecosystem. Because there is **competition** for food, it is possible for the **balance** in the ecosystem to be disrupted if any of the organisms is interfered with (natural disasters floods, hurricanes, volcanic eruptions, etc.; human activities, deforestation, hunting, etc.).

Suggested Activities

- Study diagram(s) of simple food web(s) and identify the feeding relationships of animals. Indicate where there is competition.

- Tabulate the findings of feeding relationships (producers, herbivores, etc.).

- Visit a local area and record the names of organisms found there. Go back to the classroom and work in groups to construct a food web for the area.

- Construct food webs to show the feeding relationships for a list of organisms found in an area (garden, pond, etc.).

Assessment

B Students will analyze food web and answer 'True/False" questions on the feeding habits of organisms within it.

C Grade food webs that are produced in groups/individuals.

D Students will complete worksheet by filling the blank spaces for statements relevant to the topic.

Topic: Conservation

Duration: 4 Lessons

Specific Objectives

Students should be able to:

- Define conservation.
- Understand the concept of balance in the environment.
- Describe the role of recycling and conservation in maintaining balance in the environment.
- Identify local ecosystems (specifically coral reefs, mangrove swamps, rain forests) in need of conservation and the importance of conservation.
- Identify and explain the importance of other resources that need to be conserved/recycled.
- Explain environmental conservation actions that can be taken in everyday life.

Process Skills

Observing, Communicating, Predicting, Manipulating, Creating.

Materials

Water
Juice
Marbles
Word search
Pictures
Charts
Materials to be recycled: Glue
Paper
Empty cans
Candy sticks
Candy wrappers Cardboard rolls for toilet paper/paper towels

Content summary

Conservation is the careful use of our **natural resources**. It is imperative for the balance in nature to be maintained; conserving what we have is one of the ways in which we may help to maintain the balance. Methods of conservation include **recycling**, **reducing** and **reusing** resources whenever possible.

Suggested Activities

- Ø Students each will have a glass of water/juice from one jug, or each takes a marble from a bag. Observe what happens if this action is not balanced by replenishing the water and marbles. Predict what will happen in other scenarios in the environment if resources are over-used.

- Ø Discuss meaning of conservation and recycling and their role in maintaining balance in the environment.

- Ø Go on field trips to a mangrove swamp, rainforest and/or coral reef (via glass bottom boat) and observe the surroundings. Discuss importance of each of these ecosystems.

- Ø Review need for conservation and recycling other items in environment, such as water, trees, sandy beaches, etc.

- Ø Listen to presentation by resource person who is involved in conservation work and ask questions as necessary.

- Ø Identify ways in which people do or can conserve, and actions that do not help conservation.

- Ø Create and implement a plan to conserve or recycle a resource at school or in community, e.g. posters to educate, tree planting/care, etc.

- Ø Make useful items from recycled materials, e.g. pen & pencil holder from paper and popsicle sticks.

Assessment

C. Let students write down what they understand by (i.) balance and (ii.) conservation.

D. Prepare word search and have students find as many words as possible related to the topic.

- Identify an ecosystem discussed in class and explain in writing why and how it should be conserved.
- Group work: choose a resource, habitat/ecosystem, species, etc. that should be conserved and illustrate best and worst practices.
- Students' (peer/individual) assessment of projects and activities.
- Students suggest measures that could be taken to conserve specified ecosystems (mangrove swamps, rainforest, ponds, etc.).

UNIT: STRUCTURE AND FUNCTION (GRADE 3)

Topic: Plants: Their Structure and Uses

Duration: 10 Lessons (30 minutes each)

Specific Objectives

Students should be able to:

11. Describe the physical features of the main parts of plants.
12. Relate the features of these external structures of plants to their function.
13. Discuss the uses of plants to humans.

Processes

Observing
Communicating
Inferring
Classifying

Materials

Variety of leaves, flowers, fruits
Pictures of various plants
Charts showing a variety of leaves, flowers, fruits
Samples of modified roots and stems
Encyclopaedia
Storybooks
Worksheets

Content Summary

The main parts of a plant are the leaves, stem, root, flowers, and fruits.

Leaf Colour –green - to help the plant make food
Shape – thin and flat – large surface area to trap sunlight
Veins - numerous – to transport water and food

Stem Rigid – to support leaves and fruits. Large trees have large stems called trunks. Therefore, a large tree has a hard, woody stem

Stems are normally above the ground. Some stems are found underground. e.g. underground stems are dasheen, eddoes,

arrowroot, Irish potato, ginger, tannia, yam.

Root Branched, long and numerous – to provide support and anchor the plant firmly in the soil; roots absorb water from the soil. Some roots are swollen and serve as storage organs for food e.g. carrot, sweet potato, cassava.

Flowers Brightly coloured and scented – to attract birds and insects They vary in size, shape, colour, texture and smell. Flowers develop into fruits.

Fruits Vary in shape, size, texture, colour, scent; these features allow the fruits and seeds to be dispersed. Fruits contain seeds.

Uses of Plants

Humans use plants in various ways:

Food - for humans and other animals
Shelter/buildings –e.g. lumber and branches
Medicine – e.g. herbal/non-traditional and traditional
Aesthetics (Decoration) e.g. ornamental flowers, shrubs, wood carvings
Furniture
Jewellery e.g. earrings and bracelets
Art and craft – e.g. Banana art, baskets, mats,
Clothing e.g. cotton
Manufacture - paper and its products
Fuel

Activities

6. Take students on nature walks to observe the variety of plants and trees in the environment. Focus their observation on the physical appearance of the stem/trunk, leaves and flowers and fruits.
7. Collect sample of plants, leaves, flowers and fruits.
8. Encourage students to collect samples of plants, leaves, flowers, and fruits.
9. Let students orally describe the physical structures of the leaves, stem, flowers, fruits, and roots.
10. Prepare work sheets for students to record observations.
11. Let students do a literature search to collect information on plants and parts of plants.
12. Read stories which contain information on plants and plant parts

- Games Guessing games/Riddles
  E.g. *Who Am I ?*
  Green and flat
  Round or Long
  I make food by day
  And rest by night

8 Trace the origin of items found around the home and in the classroom, e.g. baskets, mats. Students should be able to infer the different uses of plants to humans.
9 Class discusses the uses of plants.
10 Interview gardeners/farmers to obtain information on plants.
11 Students do literature search to obtain information on 'Famous trees' e.g. the tallest tree, oldest tree, national trees, trees of historical significance (nationally, regionally or internationally).
12 Visit a Botanical Garden to observe and collect information on plants/trees of national significance.
13 Invite farmers/agricultural officers/gardeners to talk about trees/plants in the environment/on farms.

Assessment

δ) Games - Guessing games; puzzles, Find-a-Word
ε) Paragraph writing e.g. *My Favourite tree*, *My Favourite flower*
ϕ) Matching items e.g. structure and function
γ) Completion-type items

UNIT: ENERGY (GRADE: 3)

DURATION: 3 Lessons

OBJECTIVES

Students should be able to:

- Recognize heat as a form of energy.
- Identify/list objects that produce heat.
- State ways in which heat is used in everyday activities.
- Appreciate the role of human-made devices that provide heat.
- Infer that heat is sometimes produced as wasted energy.

PROCESS SKILLS

Observing, Communicating and Predicting

MATERIALS

Extension cord with light bulb, etc., work sheets.

CONTENT SUMMARY

- Heat is a form of energy.

- Heat is useful in many different ways:
  - To cook our food
  - To melt things
  - To make our clothes smooth
  - To keep us warm
  - To dry things.

- Some natural objects, materials and living things produce heat. Fuels when lit, and the sun produce heat. Our bodies produce heat.

- People have invented many devices to conveniently and safely provide heat in the home and around us (stoves, ovens, irons, coal pots).

- Sometimes heat produced is wasted, for example, some devices and appliances such as light bulbs produce heat when they work and this heat is not put to any useful purpose.

- People invent devices to solve problems.

SUGGESTED ACTIVITIES

2. Ask students to make a list of all the things they can think of that produce heat. They distinguish between those that are natural and those that are made by people.

3. They review fuels and the Sun as sources of heat. Students discuss their own body temperature – e.g. Is it usually warm? Is it warmer that the room temperature? If possible they take their body temperature and compare it with the temperature of the room. They discuss whether the body temperature of people changes in cold climates. They conclude that their bodies produce heat.

4. They discuss the devices made by humans to make it easier for us to get heat in our homes. This can be done on a prepared worksheet with two columns.

Human-made devices/appliances for that produce heat	**What it is used**

Let students share information on the worksheets and use this information to stimulate discussion on the usefulness of these devices.

c) Let students discuss those instances where heat produced by devices and appliances is not actually used but is wasted instead. Let students discuss examples, such as fans, transformers, light bulbs. Students say what the devices are actually used for. Let students touch these devices before and after a demonstration of their use. Discuss the observed temperature difference and infer that heat produced in these cases is wasted.

d) Divide class into groups and give to each group a picture of a heating device: sun, stove, iron, etc. Let them think of, and write down how different their lives would be without that particular thing. Students investigate how these devices work, how they make it convenient and safe for humans to use the sources of heat. Let them share the ideas with the whole class.

e) Different groups of students can do research to find out the inventors and invention dates of the heating devices identified. They share their information and draw a time line.

ASSESSMENT

Students are asked to complete the table by placing a tick (v) in the appropriate cell

Device (use pictures)	**Produces useful heat**	**Produces wasted heat**	**Produces no heat**
Light bulb in bedroom			
Electric iron			
Transformer			
Gas oven			
Coal pot			
Refrigerators			
Curling iron			

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

2. Recognize that light is a form of energy.
3. List objects that emit light.
4. State ways in which light is used in everyday activities.
5. Appreciate the role of human-made devices that provide light in our everyday lives.

PROCESS SKILLS

Observing

MATERIALS

Camera (with a flash), a room that can be made very dark, objects that produce/emit light, pictures of persons engaged in activities during the night using artificial light: working, playing soccer/cricket, etc., reading/studying.

CONTENT SUMMARY

- Light is a form of energy
- We need light in order to see things
- Some devices such as calculators use light energy to work
- Many objects, both natural and human-made, produce/ emit light
- Artificial light has made it possible for us to work and play in the night or in otherwise dark places.

SUGGESTED ACTIVITIES

- Take students (in group) into the dark room for a short while and ask them to note any three things they see in the room. Once all students have done this let them share with the rest of the class what they saw. Repeat the activity, this time with the lights on in the room. Now engage students in a discussion aimed at establishing the usefulness of light.

- Display pictures and let students describe the activity taking place in each picture. Engage them in a discussion aimed at establishing the importance of light to these activities. Questions such as these may be used:

What is happening in this picture?
At what time of day is it taking place?
How is it possible for this to happen in the night?
If the lights were to go out what will happen?

- Ask students to list the things in their environment that give off light.

ASSESSMENT

- Students do an assignment to:
  find out the inventors of (a) incandescent and (b) fluorescent lights.
  compare an electric lamp and a candle as sources of light to do their homework.

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

E State ways in which solar energy is used in the home.
F Appreciate the role of the sun as the main provider of heat and light in the world.

PROCESS SKILLS

Observing, Inferring, Measuring

MATERIALS

Water, metal containers, solar powered calculators, pictures of solar water heaters, clocks/stop watches, thermometer, black electrical tape.

CONTENT SUMMARY

- Energy from the sun is called solar energy. This comes to us in two main forms: heat and light.
- The sun's heat evaporates water and therefore is useful in drying things.
- The sun's heat can be trapped by solar panels in solar water heaters.
- The sun's light can be used to power calculators and other similar devices.
- Plants use the light of the sun to make food. We get some of this energy when we eat plant products.
- Without the sun the world would be a very cold dark place and plants and animals could not survive.

SUGGESTED ACTIVITIES

Organize class into working groups for these activities.

Ø Let each group place (approximately) the same amount of water in two metal cans. Record the temperature of the water. Place one can on a table where it is exposed to direct sunlight and place the other on a table in the classroom. Let students measure and record the temperature of the water at intervals. Let students make simple time/temperature graphs. Let them study the graphs and then make a prediction as to what the temperature would be by a particular time.

E. Let students spill some water on the concrete in two places: one in a shaded area and the other in an area exposed to direct sunlight to determine how quickly they evaporate. Let them make predictions as to what would happen. *(Cross link with the water cycle).*

F. Distribute a solar powered calculator to each group and let students perform some basic mathematical operations. Let them place a strip of black electrical tape over the solar cells, then try to repeat the operations. (It should not work). Let them remove the tape and then try to do the operations again.

G. Let students focus on plant foods that we eat to get energy. Discuss where plants get their food. *(Cross link with food chains)*

H. Engage students in a whole-class discussion focusing on the findings of each of the activities done.

ASSESSMENT

- Let students write a paragraph or poem on what life/ the world would be like if the sun were to stop shining. Let students draw a concept web on the importance of the sun.

UNIT: FORCES, MOTION AND STRUCTURES (GRADE 3)

DURATION: 2 Lessons

TOPIC: WHAT FORCE CAN DO

OBJECTIVES

Students will be able to:

5. Identify forces as pushes or pulls.
6. Describe the effects of forces acting on a variety of every day objects.

PROCESS SKILLS

Observing, Manipulating

MATERIALS

Boxes, toy car, string, charts showing objects being pushed and pulled, rope

CONTENT SUMMARY

- A push usually moves an object away from the body, while a pull moves an object towards the body. (N.B. the human body is used as the reference point.)

- Forces:
  - ∅ can start an object in motion.
  - ○ can also stop an object.

- can also bring about a change in shape.

STUDENT ACTIVITIES

Activity 1:

- Attach string to small car.
- Let student push the car to initiate movement.
- When the car stops let students to pull the car towards them.
- Two groups of students could be used for a-tug-of-war activity.

Activity 2:

- Let students demonstrate using the car and string that they can set the car in motion and also stop it.
- Let students make spherical balls with plasticine; then let them drop it from table top and make observations.
- Place plasticine in one hand and press it with other hand.

Activity 3:

- Let students view pictures of the following:
  Material being bent, for example, a PVC pipe being bent by someone.
  A person lying on an inflated tube in the sea.
  Houses being blown by the wind.
  Students identify the force and the effect of the force.

ASSESSMENT

- Let students study charts with objects set in motion under forces, and then let them identify which is a push or pull.
- Let them list other ways they could change the shape of the plasticine ball.

TOPIC: MAGNETS

DURATION: 4 Lessons

OBJECTIVES

Students will be able to:

- Demonstrate how a magnet works.
- Distinguish between magnetic and non-magnetic materials.
- Identify ways magnets are used in the home.

PROCESS SKILLS

Observation, Communication, Inferring

MATERIALS

Magnets, paper clips, pieces of wires (copper, aluminium) plastic ruler, wood, paper, screw driver with magnetic tip, steel screws.

CONTENT SUMMARY

Some objects can exert forces on other objects from a distance

Magnets are materials (metals) that attract other metals. Magnets can also repel other magnets.

Not all metals are attracted to magnets, metals such as aluminum and copper will not be attracted by magnets.

Plastic, wood ,and paper are non-metallic and are not attracted by magnets.

Magnets exert a magnetic force that attracts or pulls magnetic materials towards them.

SUGGESTED ACTIVITIES

Place students in groups.
Let them predict which objects will be attracted by the magnet. Let them now place magnet close to objects and observe what happens.

Let them place results in table form as shown below

Materials	Attracted	Not Attracted

Key: V Attracted

X Not Attracted

Demonstrate the use of a magnetic tip screwdriver.
Show picture with refrigerator with objects stuck to the door.
Have small piece of rug from the home normally found in the living room. Place a few steel pins on the rug so that they are not visible. Then use the magnet to search for pins.

Show students how magnets can also exert pushing forces by placing two north poles or two south poles of magnets close together.

Give students magnets. Challenge students to suggest:

- how they might determine the maximum distance from which the force of their magnet can be felt. Let students, in groups, plan their investigations and perform them, record their results and draw conclusions;
- how they might compare the strength of different magnets. Let students plan their investigations, make their predictions and perform them, and record their results and draw conclusions.

ASSESSMENT

Questions based on activity:

What are the items in the magnetic group made of?

Suggest a way you would remove iron from a mixture of iron dust and small pieces of plastic materials.

Let students list all materials at home that are attracted by magnet. Let them identify the effect of the force of the magnet. Let students suggest novel ways for using magnets in the home. Assess the originality of their ideas.

TOPIC: STRENGTHENING STRUCTURES

DURATION: 3 Lessons

OBJECTIVES:

Students should be able to:

- Describe ways in which the strength of materials can be altered.
- Observe and describe how natural and human-made structures are strengthened.

PROCESS SKILLS

Observing, Manipulating

MATERIALS

Wooden blocks, thin cardboard, small masses

CONTENT SUMMARY

The strength of a material relates to how much load the material can bear without bending/breaking.

Materials can be strengthened in many ways e.g.:

1. Materials can be reinforced by increasing their thickness e.g. by

   adding additional layers, (having layers of blocks, sheets of paper).

   Small twigs can be prevented from bending by having them tied to a stick in the ground.

Building blocks can be filled so as to strengthen them. ○
Materials such as paper can be strengthened by folding.

SUGGESTED ACTIVITIES

Activity 1:

Place wooden blocks in a pile.
Have a single block placed next to the pile.

Let students in small groups apply forces to both groups of blocks, until they begin to move.

Let them identify which groups used the greater force to be moved. Let students discuss their findings.

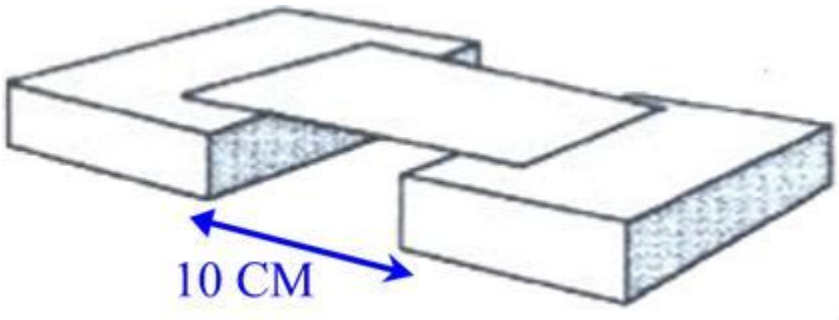
Activity 2

- Let students observe instances in their experience of strengthening by the means listed in the content summary.

Activity 3

- Place wooden blocks about 10 cm apart. Lay a card like a bridge between the blocks.

  Place one mass at the centre of the bridge and observe what happens. Continue to add masses one at a time until the card bridge starts bending.



Students must find ways to prevent the card from bending (glueing several cards together, folding in different ways, e.g. accordion shaped, curved, U-shaped, etc.)

ASSESSMENT

Assess students' efforts in Activity 3.

UNIT: MATTER AND MATERIALS (GRADE 3)

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

- Ø Identify properties of materials that make them suitable for specific purposes.
- Ø Compare objects used for the same purpose but made of different materials and list the advantages and disadvantages of using each type of material.

PROCESS SKILLS

Observing, Manipulating, Inferring.

MATERIALS

A wide variety of objects including cooking pots, various boxes, bottles, cans, pot holders, thermometers, coins, sunglasses, etc.
Pictures of large pieces of equipment e.g. aero-planes, cars, furniture etc.

CONTENT SUMMARY

- ➢ The properties of a material determine its use.
- ➢ The most suitable material is chosen for a particular purpose.

SUGGESTED ACTIVITIES

- ➢ Introduce a piece of equipment to the children (e.g. cooking pot) and ask them to list the materials that the item is made of.
  Ask students why they think the particular materials were chosen to make the item.
  Ensure that students are connecting the material with its properties and use by asking questions such as:

  Why has wood been chosen to make the handle of the pan?
  Why hasn't the same material been chosen to make the pan?
  What might happen if plastic had been used for the pan and metal for the handle?

- Let students examine other items themselves discussing their ideas within groups and recording their findings.
- Students examine pictures of larger items e.g. cars. Students list as many materials as they can that the item may be made of and say what property of the materials make them suitable for their use.

  For example a car:

  Glass (windshield windows),
  transparent Rubber (tyres), flexibility
  Metal (frame etc), strength
  Glass (mirror), reflective.

  Teacher displays objects (or pictures) made for the same purpose, but made of different materials (e.g. furniture, floors, school bags etc). Teacher has students list the properties they would want in the particular object. Students use these to draw up a list of criteria. Students draw up a table with the criteria.
  They evaluate the objects (made from the different materials) using these criteria.

ASSESSMENT

Complete the table

Item	Materials	Reason
An envelope	Rubber, Glass Metal, Paper	
A waterproof coat	Paper, Plastic Wood, Cloth	
A fireguard	Plastic, Metal Wood, Rubber	
A kite	Stone, Metal Wood, Paper	

DURATION: 3 Lessons

OBJECTIVES

Students should be able to:

- Give examples of soluble and insoluble materials.
- Compare and contrast the ability of materials to dissolve in water.

PROCESS SKILLS

Observing, Manipulating, Experimenting, Recording.

MATERIALS

Sugar, salt, flour, sand, coffee, talcum powder, kool Aid, plastic spoons, transparent containers, water, hand lens.

CONTENT SUMMARY

- ❑ Some materials can dissolve in liquids. They are said to be soluble. A dissolved material and the liquid in which it is dissolved make a mixture called a **solution.**
- ❒ Some materials do not dissolve in water. They are insoluble.

SUGGESTED ACTIVITIES

Dissolving

Explain to students that they are going to investigate which materials dissolve in water.
Discuss the concept of dissolving.
Put students into groups and distribute the materials.
Students examine the materials using a hand lens.
Students put a spoonful of each material into separate jars of water and stir. Record observations on a recording sheet provided.

Record sheet

Name of material	What happened when the material was mixed with water?	Was it soluble or insoluble?

When testing is finished, students group jars according to whether the mixture they contain is a solution or not.
Students compare their results with those of other groups.

Students name solutions in the classroom and at home. They discuss their use.

ASSESSMENT

- Students do the following: Plan and carry out experiments to compare how well certain materials dissolve in water.
- Classify a list of given substances as soluble or insoluble.

- Make a list of instances where dissolving is useful in everyday life. e.g. cooking.
- Teachers will assess students' record sheet.

DURATION: 4 Lessons

OBJECTIVES

Students should be able to:

- Give examples of materials that conduct heat and those that do not (insulators).
- Compare and contrast the ability of materials to conduct heat.
- Design and make a device to keep a liquid warm or cold.

PROCESS SKILLS

Observing, Manipulating, Experimenting, Planning, Designing

MATERIALS

Similar items made from different materials (wood, plastic, glass, metal, rubber) hot water.

CONTENT SUMMARY

If heat travels easily through a material the material is a good conductor of heat.
If heat does not travel easily through a material, that material is an insulator.
Examples of conductors of heat are metals.
Examples of non-conductors of heat are wood and plastic.

SUGGESTED ACTIVITIES

Teacher asks students to consider what happens when they put pans on the stove. Parts of the pan that are not directly heated also get hot. Why do we need pot holders? What do we use for potholders?

Simple discussion on the idea that heat travels through some materials but not others. Teacher introduces the terms 'conductor' and 'insulator'.

Students are shown similar objects (of the same size, thickness, shape) e.g. plastic, wooden and metal rulers or plastic, wooden and metal spoons, etc.
Discuss with students how they could find out which materials conduct heat best. Teacher asks students to make hypotheses as to which material would conduct heat best.
In groups, students are given a container of hot water and the similar materials. Each material is placed into the container of hot water for a set amount of time. (Remind students to be careful) After the time

elapses, students feel the dry end of the materials to determine which one feels warmest. Students record observations. Students rate the materials as conductors or insulators.

Students provide examples of other conductors and insulators. They discuss how these materials are useful in different situations.

*(*Optional) To demonstrate how heat is conducted through materials tell the students that all things are made up of very small particles. Each of them is going to pretend to be a particle and you, the teacher, are the heat source*.*

The students should sit fairly close together. As the heat source approaches the first student (particle), the student begins to vibrate (jiggle) but remains in the same spot. The student in contact with the first student begins to jiggle. The pattern continues until all the students are moving.

Explain to students that the molecules of an insulator would be affected by heat slowly so there will be less vibrating and so very little heat will be passed on. Demonstrate this as in the activity above. NB - Most of the students should remain still.

Challenge: Students in groups, design and make an object which can be used to keep liquids hot/cold. They have a competition to see whose design will keep the liquid hot or cold longest.

ASSESSMENT

- ✓ Given a list of materials students classify them as insulators or conductors.
- ✓ Given specific situations students decide whether a conductor or insulator would be appropriate. For example, what type of material is best suited to make pot handles?
- ✓ Make a list of instances of conductors/insulators in the home.
- ✓ Assess certain skills and attitudes as students make the Technology product.

DURATION: 3 Lessons

OBJECTIVES

Students should be able to:

- Demonstrate that certain materials reflect, transmit or absorb light.
- Describe and give examples of transparent, translucent and opaque materials.
- Identify uses of transparent, translucent and opaque materials.
- Compare objects used for the same purpose but made of transparent, translucent or opaque materials.

PROCESS SKILLS

Observing, Classifying, Analyzing, Manipulating

MATERIALS

Clear plastic, wood, coin, cup, glass, light bulb, white paper, and flashlight.

CONTENT SUMMARY

- Different materials react differently to light.

- Some materials transmit light while others do not.
  Transmit – the material allows light to pass through it.
  Materials that allow most of the light to pass through them are ***transparent e.g.*** clear glass and clear plastic.
  Materials that allow some light to pass through them are ***translucent*** e.g. wax paper, some types of plastic and glass.
- Materials that do not allow light to pass through them are ***opaque*** e.g. wood, clay, rubber, some plastics.

  Opaque materials may reflect or absorb light.

  Reflect – the material 'sends the light back or in another direction, e.g. smooth, shiny surfaces which act like mirrors reflect light.

Absorb – the material takes the light in e.g. dark, dull clay

SUGGESTED ACTIVITIES

Put students into groups and distribute clear plastic, wood, coin, cup, glass, light bulb, aluminium foil, a mirror, white paper and flashlight.

Activity 1:
Students set up the activity by placing each object between the flashlight and the white paper, and turning on the flashlight. For each item students' record:

a. If the light shines through the object.
b. If the light is stopped by the object.
c. If some light goes through the object.

Students also hold the white paper on the same side as the light and see if they can see the light on the paper.
Discuss students observations and introduce and discuss the concepts of transmit, reflect, transparent, translucent and opaque.

Ask questions such as:

- Ø Which objects formed shadows? Why?
- Ø Can transparent objects form shadows? Why?

Activity 2
Provide students with a variety of other objects. Students make predictions as to which ones they think will allow light to pass through them and which will stop light from passing through them. Students test their predictions by repeating Activity 1.
Students record their observation and write a description of transparent, translucent and opaque materials.

Activity 3
Teacher presents students with three drinking containers or bags, one transparent, one translucent and one opaque. Students discuss the disadvantages and advantages of using one or the other.

Activity 4
Students carry out an inventory at home to identify transparent, translucent and opaque materials and to state how it is important for them to have the particular property e.g. frosted glass-privacy.

ASSESSMENT

Given a list of materials students classify them as transparent, translucent, or opaque`.

Teacher can assess students' performance on Activities 2, 3 and 4.

Students design and make a sundial and explain how it works.