UNIT: MATTER AND MATERIALS (GRADE 5)

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

1. Identify and describe different ways in which materials can be changed.

PROCESS SKILLS

Observing, Communicating, Classifying

MATERIALS

Sheet of paper
Pair of scissors
Water, ice,
Salt
Plastic cups
Spoons
Sticks
Lime
Baking soda
Sand
Kool Aid

CONTENT SUMMARY

- In everyday life, materials undergo changes.
- Some ways in which materials can be changed include: change of state(melting, boiling, freezing, etc.); change of size or shape; by mixing (e.g. making solutions and suspensions) ; by reacting (e.g. baking soda and lime juice); by cooking (boiling eggs)

SUGGESTED ACTIVITIES

- Let students cut a sheet of paper into small bits and compare with the original.
- Break sticks and compare with the original.

- Let students make mixtures with water and salt or sand and other mixtures.
- Teacher will place a few drops of bleach on a piece of fabric and then ask students to observe any changes taking place
- Let students place a few drops of limejuice on baking soda and then observe the changes.
- Teacher presents students with cooked and uncooked eggs and ask students to compare them.
- Teacher lets students melt ice and boil and freeze water and describe the changes.
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- Students are to record all changes observed. Students conclude that some ways we can change materials are: by changing their state (solid, liquid or gas); change of shape or size or physical appearance; by mixing, by reacting, by cooking.

ASSESSMENT

In the space provided, classify each of the following changes as change of state, change of shape etc; change by mixing, change by reacting

1. Melting butter	5. Chopping wood
2. Mixing salt and water	6. Mixing flour and water
3. Waxing a floor	7. Breaking glass
4. Boiling water	8. Painting wood

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

1. Identify melting and freezing as changes of state.
2. Infer that change of state can be reversed
3. Infer that the mass of water remains the same when water changes from solid to liquid.

PROCESS SKILLS

Observing, Inferring.

CONTENT SUMMARY

- When we change the same substance from liquid to solid to gas we refer to this as a change of state.
- Changes of state are **reversible;** this means that the change can go in both directions. For example, we can melt butter (solid) to form a liquid (liquid butter) and we can freeze the liquid to get back the solid.
- When a substance changes its state, its mass remains the same.

MATERIALS

Large Ziploc bag/2-lb can with plastic lid
Small jar/small Ziploc bag
Crushed ice, about ½ kg per student
Metal spoon/wooden spoon
Chocolate milk or other milk mixture to fill each jar/small Ziploc bag 2/3 full
Newspapers to protect work surfaces
Sponge to clean the jar
Ice cubes/pieces of ice
Gloves or old towels to hold pan with
Butter/shortening
Candle wax
Matches
Spirit burners/hot plates/spirit lamps
Test tubes/metal bottle caps
Worksheet for students

STUDENT ACTIVITIES

Activity 1

- Students find the mass of a quantity of butter provided by the teacher, students record its mass. The teacher then heats the butter in a test tube or metal bottle cap until it just melts. The mass of the melted butter is then found before it solidifies. The activity is again repeated using candle wax. Students record all results on their work sheet.

- From results, students infer that (a) the change of state from solid to liquid is reversible (b) the mass of butter and candle remain the same when they change from solid to liquid.

- From observations previously made, students infer that the mass of water will remain the same when water changes from solid to liquid.

Activity 2

- Let students find the mass of a piece of ice/ice cube, and record observation. Ask students to then leave ice undisturbed until it melts, at which time the mass is again found. Students record results on their work sheet.

- Let students fill each jar/small Ziploc bag with milk mixture and close lid/zipper tightly. Pack salt and ice in the bottom of the milk can/large Ziploc bag. Put jar/small Ziploc bag into tin/large Ziploc bag. Pack salt and ice around and above jar/small Ziploc bag containing milk mixture. Cover can with lid/close zipper of large Ziploc bag. Using towel /gloves, shake can/Ziploc bag until the mixture freezes.

- Students then classify the changes noted as reversible or non-reversible.

- Ask students to state whether the ice cream contains the same materials they started with and to describe what has happened to it.

EXTENSION

Teacher can discuss with students the reasons for:

i) adding salt to the ice
ii) for shaking ice cream.

Let students write a poem about their favourite ice cream

ASSESSMENT

1. State what will happen if ice cream is left on counter.
2. Discuss storage of ice cream after it is produced
3. Provide other examples of freezing and melting to show that these changes are reversible.

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

1. Identify condensation and evaporation as changes of state.
2. Infer that condensation and evaporation are changes that can be reversed.

PROCESS SKILLS

Inferring, Observing, Communicating

MATERIALS

Wide plastic cups
Tall plastic cups
Boiling water
Ice cubes/pieces of ice
Magnifying glasses

CONTENT SUMMARY

- When liquid water is heated, water on the surface turns into water vapour and disappears into the atmosphere. This process is called **evaporation**.
- When water exists as a gas (water vapour) the particles are very far apart. However, when water vapour is cooled, the particles slow down and move closer together forming the liquid again. This process is called **condensation**.
- The changes from water to water vapour and vice versa are reversible changes.
- These changes occur in nature in the water cycle (*cross reference – Weather).*
- People use these processes also such as when we put our clothes to dry (evaporation).

STUDENT ACTIVITIES

Activity 1

- Boil some water, in a beaker, tin or pot. Let students observe what is happening. Put a glass with cold water on the desk, again ask students to observe and record what is happening.

Activity 2

- Pour hot water into a clear plastic cup up to two-thirds full. Quickly place a clear plastic cup over the cup.
  Place a piece of ice on the top of cup and wait 2 minutes.
  After this time, remove the ice and use a paper towel to dry off the water from the melted ice.
  Look closely at the top of the cup. Use a magnifier if one is available. Ask students what they notice.

- Ask students if they notice what happens when they remove a pot cover from a pot with boiling water. Some students will have observed water droplets. Ask students to explain what they think is happening in each activity.

- After students identify the processes taking place in the experiment they then infer if these processes are reversible or non-reversible.

ASSESSMENT

Ask students to define condensation and evaporation.
Let them identify other situations where condensation and evaporation are involved. State the importance of these processes in everyday life.

DURATION: 4 Lessons

OBJECTIVES

Students should be able to:

1. Identify burning, rusting and decay as changes that are irreversible.
2. Identify examples of reversible and irreversible changes in everyday life.
3. Realise that people change materials all the time for different purposes.

PROCESS SKILLS

Observing, Communicating, Classifying, Inferring

CONTENT SUMMARY

- Burning is a process in which a substance reacts with oxygen and produces heat and light. The substance is changed to new materials. Everyday examples of burning – the burning of fuels, paper, garbage, leaves.

- Rusting is a process in which oxygen from the air reacts with iron, in the presence of water to form reddish-brown iron oxide, or rust. Rusting is the commonest form of corrosion. Objects made of iron such as nails, wrought iron furniture, car bodies rust when exposed to the air.

- Decay is a process whereby wood or other plant and animal material is disintegrated through the action of micro-organisms which breakdown the organic matter into simpler compounds. Plants, dead animals, and fruits decay.

- Burning, rusting and decay are examples of changes that cannot be reversed.

- People change materials all the time in daily life.

STUDENT ACTIVITIES

Activity 1

- Students weigh a sheet of paper; place the paper in a pie plate. Burn the paper. Note observations. Weigh the remains. Students then note the colour, odour, texture, thickness and mass of the remains and

compare with the original sheet of paper. (Note: New substances have been formed some of which have escaped into the air).

Activity 2

- Students place a painted nail and an unpainted nail in a clear container with water. Ask them to leave the nail undisturbed. Observe nail each day for a period of four days.

Activity 3

- Place a ball of wet steel wool in a test tube. Invert the test tube in a tray of water. The water should only be a few cm deep. Leave tube undisturbed for a few days; observe the tube each day for a period of one week. Record observations.

Activity 4

- Let students place a slice of bread, a piece of ripe fruit, a piece of cheese, a few spoons of cooked rice on individual paper plates. Cover each plate with clear plastic. Plates should be left undisturbed for about one week. Students should note changes each day.

- Let students identify the processes taking place in each experiment and then decide whether the processes investigated are reversible or non-reversible.

Activity 5

- Let students compile a booklet "Changes in matter". Students collect pictures, write descriptions, make drawings of changes they observe happening in their daily lives. Ask them to concentrate on changes that happen naturally and those that people make happen.

ASSESSMENT

- Each group can report the results of their experiments, giving reasons why each process investigated is reversible or irreversible.

- Students define: burning, rusting and decay.

- Students' booklets can be assessed using selected criteria.

UNIT : MATTER AND MATERIALS (GRADE 6)

DURATION: 3 Lessons

OBJECTIVES

Students should be able to:

1. Identify a production process, taking place in the home or industry.
2. Draw a diagram to show stages in the process.
3. Identify some of the changes taking place in the production process.
4. Appreciate that people use production processes to change materials to satisfy their needs.

PROCESS SKILLS

Observing, Communicating

MATERIALS

Video/pictures showing production processes in the home
Materials to demonstrate a production process, such as jam making.

CONTENT SUMMARY

- In a production process, people use technology to make goods and structures.

- Stages in the production process

  - Identify and select raw materials and equipment needed
  - Determine pre-processing preparation, e.g. washing
  - Prepare materials for processing e.g. chop, grind, sand, cut
  - Processing stage – heat, assembly, etc.
  - Sort, package, label, i.e. prepare for distribution
  - Determine storage conditions before and after distribution
  - Determine mode of transportation
  - Calculate cost of production

- Some processes in the production process, such as chopping and sanding, involve change of shape and size. Other changes are brought about by mixing, cooking, baking, reacting with chemicals.

SUGGESTED ACTIVITIES

Activity 1

- Teacher discusses with students what a production process is. He/she then asks students to list some of the activities taking place in the home. Students then identify one or more production processes in the home.

- He/she then shows a video/pictures to students of bread/jelly production. Let students identify and describe what is happening at each stage of the production process.

- Students draw a flow chart of the stages they have identified

- Students then identify changes at each stage of the production process, and say how these changes were brought about.

Activity 2

- Teacher demonstrates an actual production process e.g. jam-making, bread making. Students identify and list processes at each stage of production.

- Students discuss how people use production processes to change materials to get the products they want.

ASSESSMENT

1. Give students a project on a production process. Students list the ingredients they would need to make a simple production process, and then draw a flow chart of the stages they have identified.

2. From the flow chart drawn students then identify changes at each stage of the production process and explain how these changes have been brought about.

DURATION: 3 Lessons

OBJECTIVE

Students should be able to:

1. Appreciate that humans use production processes to change materials

PROCESS SKILLS

Observing, Communicating, Inferring

CONTENT SUMMARY

- Humans use a variety of production processes to change materials so that they can make more effective use of these materials.
- Production processes include:
    - Flour production:
    - Oil production:
    - Sugar production

STUDENT ACTIVITIES

Activity 1
Students are shown pictures/videos of a wide variety of production processes used by man; students identify the stages and processes

Demonstration of jam making

Demonstration of bread making

Activity 2
Field trip to an industry.

Students write down the stages in the production process seen at each industry

Activity 3
Students prepare a scrapbook of drawings/pictures showing the various stages for project work

ASSESSMENT

1. Students are divided into groups; Groups makes an oral presentations on a production processes they have selected.

2. Rubric is prepared by teacher and used to grade students on their attitude toward the group activity.

3. As their class project, students set up a mini-ice cream factory, using the apparatus from a previous science lesson. They then write down the stages in the ice cream production and calculate how much it would cost to produce the ice cream.

UNIT: FORCES, MOTION AND STRUCTURES (GRADE 5)

TOPIC : MEASURING FORCES ON OBJECTS

DURATION: 4 Lessons

SPECIFIC OBJECTIVES

Students should be able to:

1. Name the instrument used to measure force and name the unit of force.
2. Measure the force acting on an object, using a spring balance.
3. Design a simple instrument/device that can be used to measure force.

PROCESS SKILLS

Manipulating, Observing, Communicating. Designing

MATERIALS

Spring balance (N), plasticine, masses, paper clips, rubber bands, rulers

CONTENT SUMMARY

- Forces can be measured.
- The unit of force is the Newton. That is, forces are measured in Newtons.
- A spring balance is used to measure force.

SUGGESTED ACTIVITIES

Activity 1 : Collapsing a paper bridge

For this activity you would require two blocks of wood (4 inches x 4 inches), one sheet of letter size paper, a spring balance, and a quantity of paper clips for each working group.

Instruct students to place wooden blocks about 8 inches apart, and then place the sheet of paper across the span so that one end rests on each of the blocks. Students would then place paper clips on the paper bridge one at a time until the bridge collapses. Let students record, and then state the number of paper clips it took to collapse the bridge. Explain that it is possible to know/measure the amount of force the paper clips brought to bear on the bridge causing it to collapse; and that the spring balance can be used to determine that.

Activity 2. Looking at the spring balance.

- For this activity each working group should have at least one spring balance.

Let students examine the spring balance and try to gain an understanding as to how it works. Pay attention to the markings and numbers. Let students make a rough diagram of the spring balance on paper.

Activity 3 : Measuring force

- Let students use the spring balance to measure the force that caused the bridge to collapse in activity 1. Let the groups compare their findings.

Activity 4: Dragging masses

- Provide each group with a set of masses (*pebbles of various sizes can be used but there must be some way of attaching the spring balance to them. Bits of string can be tied around them for this purpose*). Let students measure the force required to drag the masses across the table top. Students record their observations on a table.

	Mass #	Force needed to move mass
1		
2		
3		
4		

Activity 5 : *Designing and making a force-measuring device*

- Provide each group with a set of rubber bands and challenge them to try to come up with a device similar to the spring balance which they may use to measure and compare force.

Students should be given about a week to complete this assignment. Once it has been completed each group should demonstrate its use and explain how the group went about making it.

ASSESSMENT

- Let students measure and record the force exerted by a set of known masses using a spring balance. A table similar to that in activity 4 can be used for this exercise. Check their results for correctness/accuracy.

- Activity 5 can be assessed as follows:

Each group should be given a grade based on the following criteria:

- having a completed project – 10 points.
- demonstrating the use – 5 points.
- explaining how it was made – 5 points.
- design – 10 points.

TOPIC: LEVERS

DURATION : 1 Lesson

SPECIFIC OBJECTIVES

Students should be able to

1. Predict the position of forces in balancing a non-uniform object.

PROCESS SKILLS

Manipulating, Observing, Measuring, Predicting and Communicating.

MATERIALS

Non-uniform objects (e.g. pen, pencil with eraser at the end), a non-uniform stick, strips of cardboard of varying lengths (4 – 12 inches) and shapes, 12-inch rulers, paper clips.

CONTENT SUMMARY

- **Lever -** a simple machine consisting of a rigid bar pivoted about a central point called the fulcrum.
- A metre rule balances at the mid-way point, while for a non-uniform object the balance point is closer to the heavier end.

SUGGESTED ACTIVITIES

Group students for these activities. Each group should be provided with a triangular block, a twelve-inch ruler, a variety of objects both uniform and non-uniform for balancing.

Activity 1: Balancing the ruler

- Direct students to balance the ruler on the triangular block. Let them observe closely the point that rests on the block when the ruler balances. Let them make a diagram of the apparatus as it was at the time of balance. Introduce and explain terms such as lever and fulcrum.

Activity 2: Balancing other objects

- Direct students to balance the other objects (pencil, pen, non-uniform pieces of cardboard etc.). In each case let students mark the point that rests on the block at the time of balance, and then measure the distance between that balance point and the two ends. These measurements should be recorded and should form the basis of a whole class discussion.

ASSESSMENT

- Present students with a set of non-uniform objects to determine their balance points. First let them predict and mark the point at which they think the object would balance, and then perform the experiment to test their prediction.

TOPIC: LEVERS AS SIMPLE MACHINES

DURATION: 4 Lessons

SPECIFIC OBJECTIVES

Students will be able to:

2. Identify a number of common levers and describe how they work.
3. Appreciate that levers make work easier.
4. Name the different points of a lever.

PROCESS SKILLS

Observing, Manipulating, Interpreting, Communicating.

MATERIALS

A pair of scissors, bottle opener, crowbar, hammer, pliers, tongs, knife, metre ruler, empty cans, charts showing other simple machines, a bottle of carbonated beverage, a piece of wood with a nail three quarters of the way in.

CONTENT SUMMARY

- Levers are simple machines that make work easier. They allow us to use smaller forces to raise heavy objects. They also make the application of the force much easier.
- Levers have three major points: (i) pivot, or balance point (fulcrum); the point where the effort or force is applied; and (iii) where the work is done.
- The closer the load is to the fulcrum the easier it is to lift with the lever.

SUGGESTED ACTIVITIES

Activity 1 : *The story of Mr. Joe*

- Mr. Joe had a very large stone in the middle of his yard. He wanted to shift it to the side of his house to beused as a seat, but it was too heavy for him to move. He had no one to help him either. He went into his store room and found a thick long plank. He tried to push the stone with it but the stone did not move. "How am I going to get this stone to move?" he asked. "What advice would you give to Mr. Joe?" Let students share their ideas and demonstrate them.

Use this scenario to bring out the idea that levers make work easier and that it is one of a group of devices called simple machines.

The different points of the lever should be introduced here as well. As the demonstration is done, identify and explain the points of fulcrum, effort and work. Let students draw a diagram and label these points.

Activity 2: Demonstrating the use of other common levers

- Display a bottled drink and try to remove the crown cork with hands only. (This would not be possible). Let students suggest how that problem may be solved. (Object to the use of the teeth since this may damage the enamel) Ask a student to demonstrate the use of the bottle opener. Explain that this is also a lever then challenge students to identify the three points of the lever in that operation.

Activity 3: Identifying other common levers

- Ask class for suggestions of other common devices that may be classified as levers. Each time a suggestion is given let the student draw a rough diagram and explain how it is used. In each case challenge them to identify the different points. Look out for such things as hammer (when removing nails), crow bars, see-saw.

Activity 4: <u>Demonstrating that a lever makes work easier and that the length matters</u>

For this activity you will require a text book, a rubber band, two rulers, a paper/clip with one end straightened to form a right angle. (This activity may be done in groups).

Distribute the materials to each group and direct students to follow these steps:

Fix the rubber band to the remaining curved area of the paper clip.

Place the text book flat on the desk then place the straightened part of the paper clip under the book.

Try to raise the book off the desk one inch, and measure the length of the rubber band when this is accomplished. Record the measurement in a table.

Lay one of the rulers flat on the desk with a part hanging over the edge (about 3 inches); then place the text book on the other end.

Attach the paper clip to the free end of the ruler and pull downward in an effort to raise the book 1 inch. Measure and record the length of the rubber band.

Move the book closer to the edge by increasing the overhang of the ruler by an inch. Then repeat step (e).

Repeat step (f) until the book is very close to the edge of the desk.

Use results to make a graph and guide students in the interpretation of the data. (*This part of the activity can form part of assessment*)

ASSESSMENT

Ø Present a work sheet with diagrams of several levers and let students label the three points on each leaver.

Ø Alternatively, a chart with the diagrams could be placed on the chalk board. In this case, students will be required to draw diagrams and label them.

TOPIC : BALANCING MASSES

DURATION : 2 Lessons

SPECIFIC OBJECTIVES

Students will be able to:

- Ø Measure the mass of an object using a simple lever.
- Ø Predict the force that will balance a lever with an off-centre fulcrum.

PROCESS SKILLS

Manipulating, Observing, Communicating, Predicting, Manipulating variables

MATERIALS

Metre ruler, scale pans, strings, clips, wooden rod, rails, a clamp stand or a wooden stand from which to suspend balance, rice, flour, beans, object of known mass.

CONTENT SUMMARY

- ➢ When two masses are placed on either side of the fulcrum of a lever at equal distance from the pivot, the balance point is obtained at the point where the arm of the lever is in a horizontal position. At this point the masses are equal (Diagram A). Some scales operate on this principle.
- ➢ A smaller force is necessary to balance out a larger force on a lever with an off-centre fulcrum. (Diagram B)

Diagram A

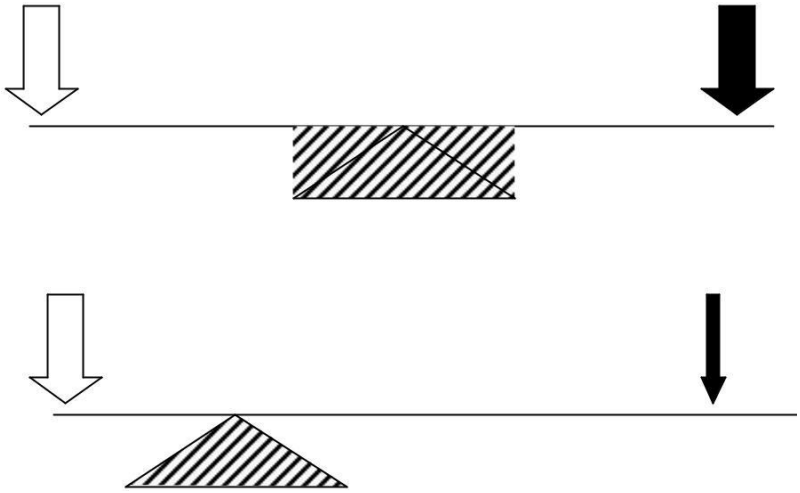
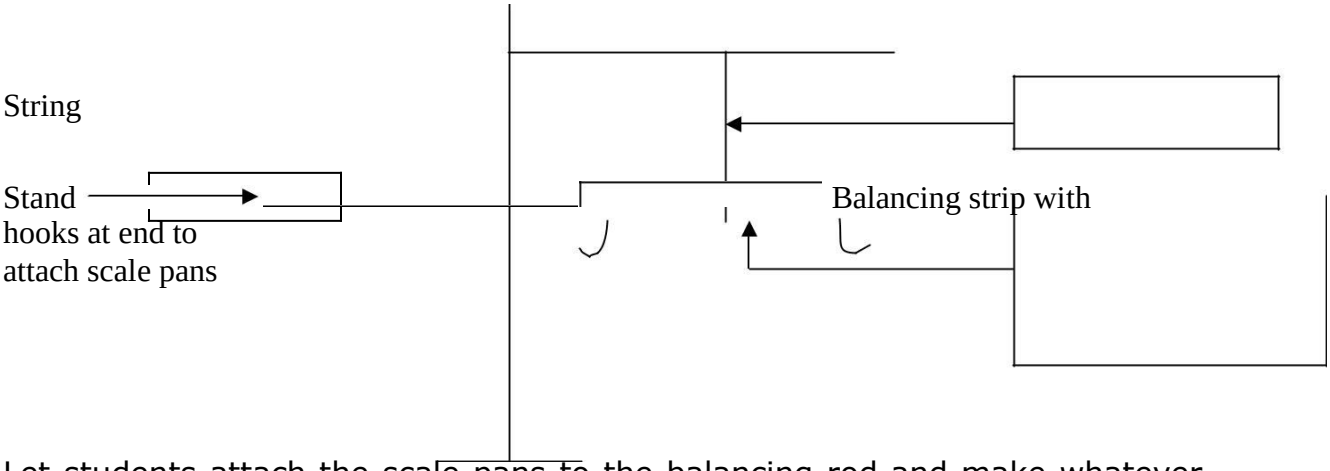


Diagram B

SUGGESTED ACTIVITIES

Activity 1: *Constructing a balance*

- For this activity you will require a clamp stand or its equivalent, a piece of string, a strip of wood with two hooks securely fastened at both ends, two scale pans (these could be made from jar covers and string), some dried peas or rice.
- Let students design and construct a simple balance with the materials. The balance may look like this:



Let students attach the scale pans to the balancing rod and make whatever adjustments are necessary to restore the balance. Once this has been achieved, let students place a known mass (a small one) in one scale pan and direct them to place some of the peas or rice in the other until balance is restored.

Question students in an effort to establish that balance was restored because the two sets of objects in the scale pans are of equal mass. Having done this, using known masses, allow students to experiment freely in an effort to determine the mass of a variety of objects.

Activity 2: <u>Balancing an off-centre lever</u>

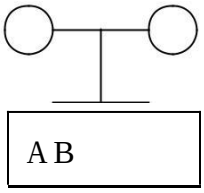
- For this activity you will need a scale, the balance constructed earlier and objects to serve as masses.
- Using the lever constructed earlier, let students shift the fulcrum from the central point so that the distance between the fulcrum and the two ends are no longer equal. Let them place a known mass in one pan and then balance it by placing objects in the other pan. Use the scale to determine the second mass. This process could be repeated several times, with the results recorded on a table. However, students should

first be asked to predict what mass would be required to balance the other.

Shift the fulcrum even further away from the centre and repeat the process. By using the known masses with the fulcrum in this new position, students should be able to infer that as the distance between the fulcrum changes a different mass is required to restore balance, and that the greater the distance between the fulcrum and the mass, the greater the force the mass creates.

ASSESSMENT

Present work sheet something like this:



Scale pan A	**Scale pan B**	Will balance (Yes/No)	Will not balance (Yes/No)	What to do to make it balance
4 ounces	3 ounces			
10 grams	9 grams			
12 grams	12 grams			

TOPIC: WHEELS AND AXLES

DURATION: **3 Lessons**

SPECIFIC OBJECTIVES

Students will be able to:

4. Identify the parts of a wheel and an axle.
5. List examples of wheels and axles.
6. Explain the function of the wheels and axles listed in the examples.
7. Appreciate the fact that this machine makes work easier.

PROCESS SKILLS

Observing, Communicating, Designing, Measuring.

MATERIALS

Chart showing wheel-and-axle and their operations: Door knobs, knobs from radio, pedal of bicycle, etc. Where possible the actual devices could be used.

CONTENT SUMMARY

- A wheel-and-axle is another simple machine.
- It is made up of two basic parts: a wheel and an axle. Both the wheel and the axle are cylindrical in shape. However, the axle is usually smaller than the wheel. The axle is fastened to the wheel so that they turn together.
- When the axle is turned, the wheel moves a greater distance than the axle but less force is needed to move it. It is easy to move things from place to place with a wheel-and-axle.
- Examples of wheel and axle include door knobs, bicycle pedals, vehicle wheels, roller skates, clocks, radio dials.

SUGGESTED ACTIVITIES

Activity 1: Identifying the parts of a wheel-and-axle

- For this activity you will require examples of wheel-and-axles or a set of pictures of these devices.

Present students with the objects and ask them to identify them. Then write down the things that are common to the devices. Establish the fact that the wheel-and-axle is another simple machine. Let students identify the parts of the wheel-and-axle presented, and compare the size of the wheel and the axle in the examples presented.

Ask students to suggest other examples of this simple machine. For each example given, let students explain the use/importance of that device.

Activity 2: Making a wheel-and-axle (this could be done in groups)

- For this activity you will require pieces of cardboard, a pair of blunt end scissors, cylindrical rods (razor-grass flower stalks can substitute) about 6 inches long, rulers or metre rules, jar covers of varying sizes.
- Follow these steps:

  Direct students to mark and cut out a pair of wheels of equal size, and then fasten them to the cylindrical rod to make a wheel-and-axle.

- Ø Once this is done, have them place a mark at a point on the wheel close to the outer edge, and a similar mark on the axle.
- Ø Next, line up both marks then roll the wheel-and-axle forward until the mark on the wheel makes one complete revolution.
- Ø Mark that point on the desk and then use the ruler to measure the distance between the two points. Record this measurement.
- Ø Dissect the wheel-and-axle then repeat steps b to d using the axle (cylindrical rod). Compare the distances.
- Ø Repeat the entire process using wheels of different sizes diameters). Let students measure the diameters of the wheels and the distances they cover in one revolution, and display the information on a table. Next, let them display the data on a bar chart.

ASSESSMENT

- Grade students' table and bar charts.
- Let students research the topic, and make up their list of wheel- and - axle systems which are used as simple machines. Students should be given the opportunity to present their findings. In their presentations, students should be challenged to suggest the difficulties we would face without these machines.

UNIT: FORCES, MOTION & STRUCTURES (GRADE 6)

TOPIC: FALLING OBJECTS I

DURATION: 2 LESSONS

SPECIFIC OBJECTIVES

Students should be able to:

- Ø Determine experimentally that varying the **mass** of an object and the **height** from which it is dropped will vary the force exerted by the object.
- Ø Design a device to prevent an egg from breaking on impact after being released from a raised platform.

PROCESS SKILLS

Manipulating, Observing, Communicating, Interpreting, Manipulating variables, Measuring

MATERIALS

A scale to measure weight of plasticine, metre ruler plasticine or clay, string, known masses.

CONTENT SUMMARY

- ➢ The greater the height and mass from which an object is released the greater the force exerted by the object on reaching the surface beneath.

SUGGESTED ACTIVITIES

Activity 1:

- Distribute materials to students in small groups. Let students mould plasticine or clay balls of equal mass. Let them release the plasticine/clay balls from different heights (using the metre ruler to measure the heights).

Let the students observe the shape of the ball after each drop.
(Balls are to be kept after each fall so as to compare with balls from successive falls).

Repeat activity this time keeping the height constant with varying sizes of balls.

Activity 2:

- For this activity you will require a set of known masses with some way of attaching a piece of string to them, several lengths of string (5 to 50 cm), the metre ruler, a rubber band with a paper clip attached to each end.
- Place metre ruler in a vertical position. Attach the string of one mass to one of the paper clips. With the other paper clip held firmly between the index finger and thumb and the mass held in the hand, place hand at the top of the metre ruler and then release the mass. (Close attention should be paid to determine the extent of maximum stretch in the rubber band). Record this distance.
- Repeat the procedure several times using a different mass in each case with the same length of string.
- Having done this, repeat the entire procedure this time keeping the mass constant and varying only the length of the string.
- Use the information obtained to plot a bar chart. (This could form part of assessment).

ASSESSMENT

- Let students write down statements explaining (a) the relationship between distance of fall and the force generated and (b) the relationship between the mass of a falling object and the force generated. (These are actually concluding statements for the activities carried out).
- Challenge students to design and build a device which will prevent an uncooked egg from breaking on impact after being released from the platform. (**This activity could be done as Activity 3**)

TOPIC: FALLING OBJECTS II

DURATION: 2 Lessons

SPECIFIC OBJECTIVES

Students will be able to:

- Ø Determine experimentally that the surface area of a free-falling object affects the time for free-fall.

PROCESS SKILLS

Manipulating, Observing, Communicating, Predicting, Classifying, Designing.

MATERIALS

Library cards, tape, feathers, aluminium foil, small stones (different masses).

CONTENT SUMMARY

- ➢ Objects of different masses released from the same height at the same time will reach the surface at the same time.
- ➢ When the surface area of a falling object is large, then it offers more resistance to air. This slows down the object.

SUGGESTED ACTIVITIES

Activity 1: <u>Free falling pebbles (different masses, same shape)</u>

This activity should be conducted from a raised platform or balcony. Students should be placed in working groups. Each group should be provided with three pebbles of varying sizes/masses. Students

should be told that they would be having a race between the pebbles to see which one will hit the ground first after being released from the platform. Students are asked to make a prediction of the order in which the pebbles will hit the ground. Having done so, one member of the group will release the pebbles while the others observe closely to determine which hits first. Repeat the experiment to verify results.

Activity 2: Free falling objects (same mass, different shapes)

- Cut four pieces of aluminium foil (three-inch square). Let students form them into different shapes and then release them simultaneously from the platform to see which one hits first. Discuss observations.

Activity 3: *Free falling objects (different masses and different surface area)*

- Let students conduct an activity similar to the previous one, but this time releasing a pebble, a feather and a playing card simultaneously. Students predict which will fall first and then test their predictions

ASSESSMENT

Ø Let students write a statement explaining the relationship between surface area and the rate at which an object falls through the air.

TOPIC: FORCES AND MATERIALS

DURATION: 1 session

SPECIFIC OBJECTIVES

Students should be able to:

- Ø Investigate the strength of materials with reference to the forces materials can withstand.
- Ø Suggest ways of strengthening materials in an effort to make them more resistant to forces.

PROCESS SKILLS

Manipulating, Communicating, Interpreting. Manipulating variables

MATERIALS

Spring balance, string, objects of known weights, tape, wood, plastic and metal strip of approximately 2 feet in length and equal thickness, ruler for measuring distortion (degree of bending), clamp stands or substitute.

CONTENT SUMMARY

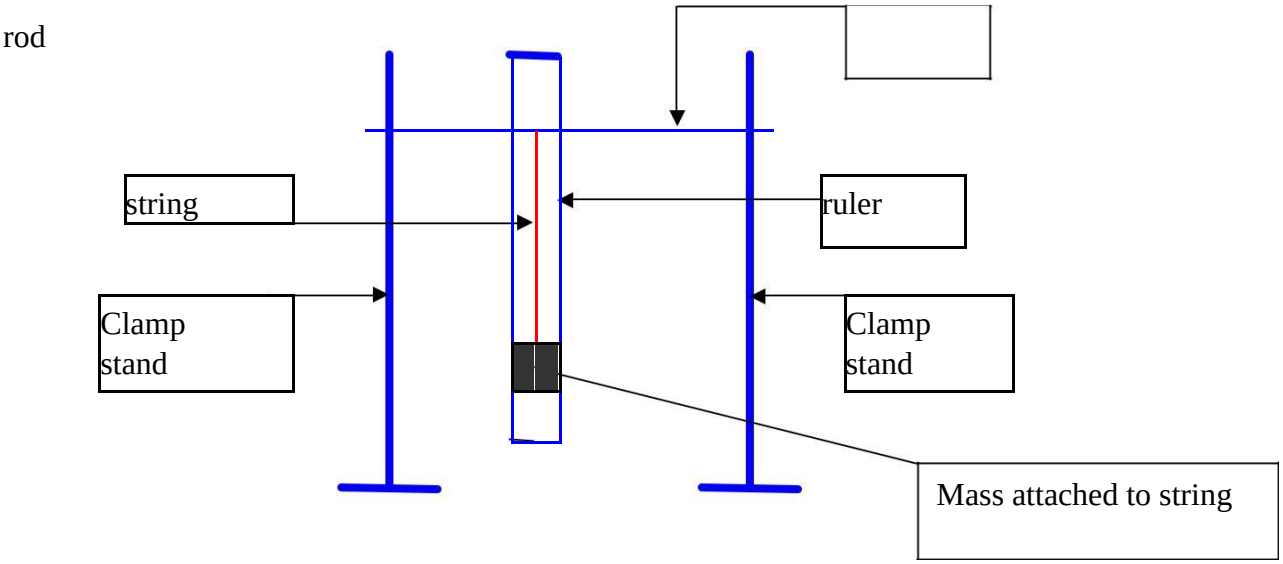
When heavy masses are attached to a wooden or plastic rod of uniform cross sectional area, it will cause the material to bend. The degree of bending is related to the strength of the material. The stronger the material, the less is the tendency to bend under the load.

- The strength of a material may be changed by altering the mass and the shape.

SUGGESTED ACTIVITIES

Activity 1: <u>Comparing the strength of materials</u>

Set up apparatus as shown in diagram:



Once this is done let students do the following:

- Attach a known mass to one of the rods and record the degree of bending as indicated by the ruler. Repeat the procedure using the other rods. Record the information on a table and bar chart.
- Increase the amount of mass and repeat the procedure.
- Ask students to suggest ways of reducing the amount of bending observed.

Activity 2: <u>Increasing the strength of materials</u>

- Repeat the procedure using smaller masses and then doubling up the rods to increase thickness. Record and compare results to those obtained previously.

- Let students investigate how folding paper cards in different ways (e.g. accordion, curved, u-shaped, v-shaped, etc.) would alter their strength.

Activity 3:

- Discuss the importance of the strength of materials in daily activities of people.

ASSESSMENT

- Focus on the graphs and tables that arose from the experiments.

TOPIC: SIMPLE MACHINES

DURATION: 2 Lessons

SPECIFIC OBJECTIVES:

Students should be able to:

1. Operationally define a simple machine.
2. List examples of simple machines.
3. Infer that an inclined plane decreases the force required to lift an object.
4. Identify examples of inclined planes in common use.

PROCESS SKILLS

Observing, Communicating, Inferring, Manipulating, Predicting, Manipulating variables.

MATERIALS

Rulers (12"), rubber bands, small weights of known mass, paper clips, string.

CONTENT SUMMARY

- A simple machine is any device that helps to perform work more easily. There are six simple machines: the lever, the wheel and axle, the screw, the inclined plane, the wedge and the pulley.
- An inclined plane is a flat sloping surface. That is, one end is higher than the other. This simple machine can be used to move an object to a lower or higher place.

- Less energy is needed to move an object up an inclined plane than if the object is lifted straight up.
- Examples of inclined plane include a ramp, and a slide.

SUGGESTED ACTIVITIES

Activity 1: <u>How does an inclined plane affect the force needed to lift an object?</u>

- For this activity you will need some large books, a ruler, a quantity of rice or other similar material (about 1 cup), a plastic bag, a spring balance, a thick rubber band strip. Follow these steps:
  (a) Stack the books in one pile, and lean one book or a flat piece of wood against the others to create an inclined plane.
  (b) Place the rice in the plastic bag and secure the mouth of the plastic bag with a twist tie.
  (c) Tie the rubber band strip to the top of the bag.
  (d) Place the bag with the rice on the table and while holding the rubber band, lift the bag of rice straight up to the top of the book stack. Use the ruler to measure the length of the rubber band. Record this measurement.
  (e) Now put the bag of rice at the bottom of the inclined plane and drag it to the top of the book stack by pulling on the rubber band.
  (f) When it is almost at the top, measure the length of the rubber band. Compare this to the first measurement.
  (g) Let students answer this question: Why was the rubber band more stretched when the bag was lifted straight up than when pulled along the sloping book?
  (h) Repeat the activity using a spring balance to quantify the force used in the two trials.

Activity 2: <u>What is the effect of changing the gradient of the inclined plane?</u>

- Increase the gradient of the inclined plane and let students predict whether a larger or smaller force would be required to move the load along the steeper inclined plane. Let students test their predictions by performing the experiment.

ASSESSMENT

Let students list examples of common inclined planes found in the home and workplace and explain how they make work easier.

TOPIC : THE WEDGE

DURATION: 1 Lesson

SPECIFIC OBJECTIVES

Students will be able to:

1 Define the term, wedge.
2 Explain how a wedge functions in making work easier.
3 List examples of wedges in common use and explain how they work.

PROCESS SKILLS

Observing, Manipulating, Communicating.

MATERIALS

Axe, saw, chisel, nails, knife, door wedge, a hammer, a bolt, an orange or another fruit. Pictures of some objects may be used in cases where the actual object may not be available.

Note: The teacher should retain possession of the dangerous items such as saw, knife, chisel and use them only for demonstration purposes.

CONTENT SUMMARY

- A wedge is a simple machine used to push two objects apart. It is made up of two inclined planes. These planes meet to form a sharp edge. This edge can split things apart.
- Examples of wedges include knives, cutlasses, saws, forks, axes, nails.

SUGGESTED ACTIVITIES

1 Perform the following demonstrations:

- Try to hammer a bolt into a block of wood. Let students explain the apparent difficulty.
- Repeat the process using a nail. Let students explain why this was easier.
- Let students compare the bolt and the nail, and draw diagrams to represent each.

2 Perform the following demonstration:

- Try to cut through an orange with the blunt back edge of a knife. Let students explain the difficultly experienced.
- Repeat the process using the sharp edge of the knife. Let students explain why this was easy.
- Direct students to draw a diagram to represent the blunt edge and the sharp edge.
- Make representative diagrams on chalk board as well and use these diagrams to explain the concept of the wedge, and how it works.

ASSESSMENT

- Direct students to list other example of objects considered to be wedges in the home or work place, and explain how each one works.

UNIT: ENERGY (GRADE 5)

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

- Ø Set up simple electrical circuits.
- Ø Name the parts of a simple electrical circuit.
- Ø Explain the functions of each of the components in the circuit.

PROCESS SKILLS

Observing, Manipulating, Communicating, Problem solving

MATERIALS

Dry cells, connecting wires, bulbs, tape

CONTENT SUMMARY

- ➢ The path taken by an electric current is called a circuit. In a circuit there must be a source of electricity, connecting wires, and an electrical appliance that can use the current.

  - Ø A dry cell (what we commonly call a battery) is a source of electricity. It contains chemical energy which it changes to electrical energy.
  - 4 The connecting wires provide a path through which the current passes.
  - Ø A bulb changes the electrical energy to light and heat energy.
  - p The current will flow only when all these part are correctly connected (the circuit is closed).

SUGGESTED ACTIVITIES

Divide students into groups and present each group with a bulb. Ask students to identify what it is and state its use. Then, ask them to demonstrate its use (make it show light). It is expected that students will express the need for other things to make the bulb light.

Ask students to determine what is needed and collect them from a designated supplies area.

Once they are successful in lighting the bulb let students make a schematic diagram of their set-up. Explain then that what they have just made and drawn is called an electrical circuit. Review the parts of the circuit and let students explain the role of each component within the circuit.

Ask for suggestions as to other components that can be introduced into the circuit. Try these things in a subsequent lesson.

ASSESSMENT

- Use review questions to ascertain that students can name parts of a circuit and state the function of each part.

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

- Describe the energy transformations that take place in specific electrical circuits.
- Name appliances in the home that transform electrical energy to other forms of energy, and explain these transformations/changes.
- Design and make a device that demonstrates energy transformations.

PROCESS SKILLS

Observing, Manipulating, Communicating, Problem-solving, Drawing

MATERIALS

Dry cells, connecting wires, bulbs, tape, small electrical motors

CONTENT SUMMARY

- Electrical energy can be changed to other forms of energy: heat, light, sound.

- Many different devices in our homes and around us are able to change electrical energy to other forms of energy. For example, a light bulb changes electrical energy to heat and light; a television changes electrical energy to light, sound and heat; an electrical iron changes electrical energy to heat; an electrical fan changes electrical energy to movement (kinetic) energy, sound and heat.

SUGGESTED ACTIVITIES

- Let students examine a bulb and point out the various parts. Let them offer explanations as to the use of each part. Pay particular attention to the filament inside. Let them draw a simple diagram of the bulb.
-

- Let students construct a simple circuit using connecting wires, a dry cell, and a bulb. Let them try to explain what happens within the circuit to produce light. Pay particular attention to the filament. Establish that the bulb changes the electrical energy to light. As the current (the electrical energy) travels through the filament, it causes it to glow. This is how the light is produced.
- Ask for other devices which convert electrical energy to light.
- Repeat the procedure with a slight adjustment. This time let students touch the bulb prior to and after the activity and note any differences

in temperature. Establish that some of the electrical energy is also changed to heat. Let them give examples of other devices which change electrical energy to heat

- Ø Replace the bulb in the circuit with a small electrical motor. Allow students to explain the transformation in this case (movement- Kinetic energy and sound energy). Let them give examples of other common devices which change electrical energy to movement, or sound.

ASSESSMENT

- ➢ Present a worksheet with a list of common electrical appliances and let students complete it by filling in the transformation that takes place, e.g.

APPLIANCE	WHAT IT CHANGES ELECTRICAL ENERGY TO
Iron	
Radio	
Television	

FOLLOW-UP PROJECT ACTIVITY

Challenge students to design and make

(a) a useful device/structure that incorporates a circuit that changes electrical energy to light (e.g. a lamp or torchlight) or

(b) a device that changes electrical energy to another form of energy (e.g. a simple electrical bell or an electromagnet).

DURATION: 2 Lessons

OBJECTIVES

Students should be able to:

1. Distinguish between conductors of electricity and insulators.
2. Explain how insulators can be useful.

PROCESS SKILLS

Observing, Manipulating, and Communicating.

MATERIALS

A pre-constructed circuit with bulbs, cells connecting wires and a testing gap; bits of materials such as insulated wire, paper, strips of aluminium foil, iron nails, strips of plastic, strips of rubber, match sticks, etc: a pair of scissors, pliers, work sheets.

CONTENT SUMMARY

- Some materials allow electrical current to pass through easily while others do not. Materials which allow electrical current to travel through them easily are called conductors. Those which do not are called non-conductors or insulators.

- Metals are good conductors of electricity. Copper is a common metal used to make electrical wires.

- Insulators are important to prevent electric shock. They are used to cover materials through which electricity passes. Common insulators include plastic and rubber.

SUGGESTED ACTIVITIES

1. Let students examine and account for the structure of a piece of insulated electrical wire. This could be done as a group activity.

   Ask: What is it made of?
   What is the use of the metal wire inside?
   What is the use of the plastic around the metal wire?

2. Let students (in groups) use the circuit with a testing gap to test for conductivity of the outer covering of the piece of insulated wire, and then piece of the inner wire. Repeat this procedure using the other bits of materials in the collection. Let students complete a table on a prepared work sheet.

Material	Did the bulb light? **(Yes/No)**	**Conductor**	**Insulator**
Plastic			
A metal paper clip			
A nail			
Paper			
A metal coin			

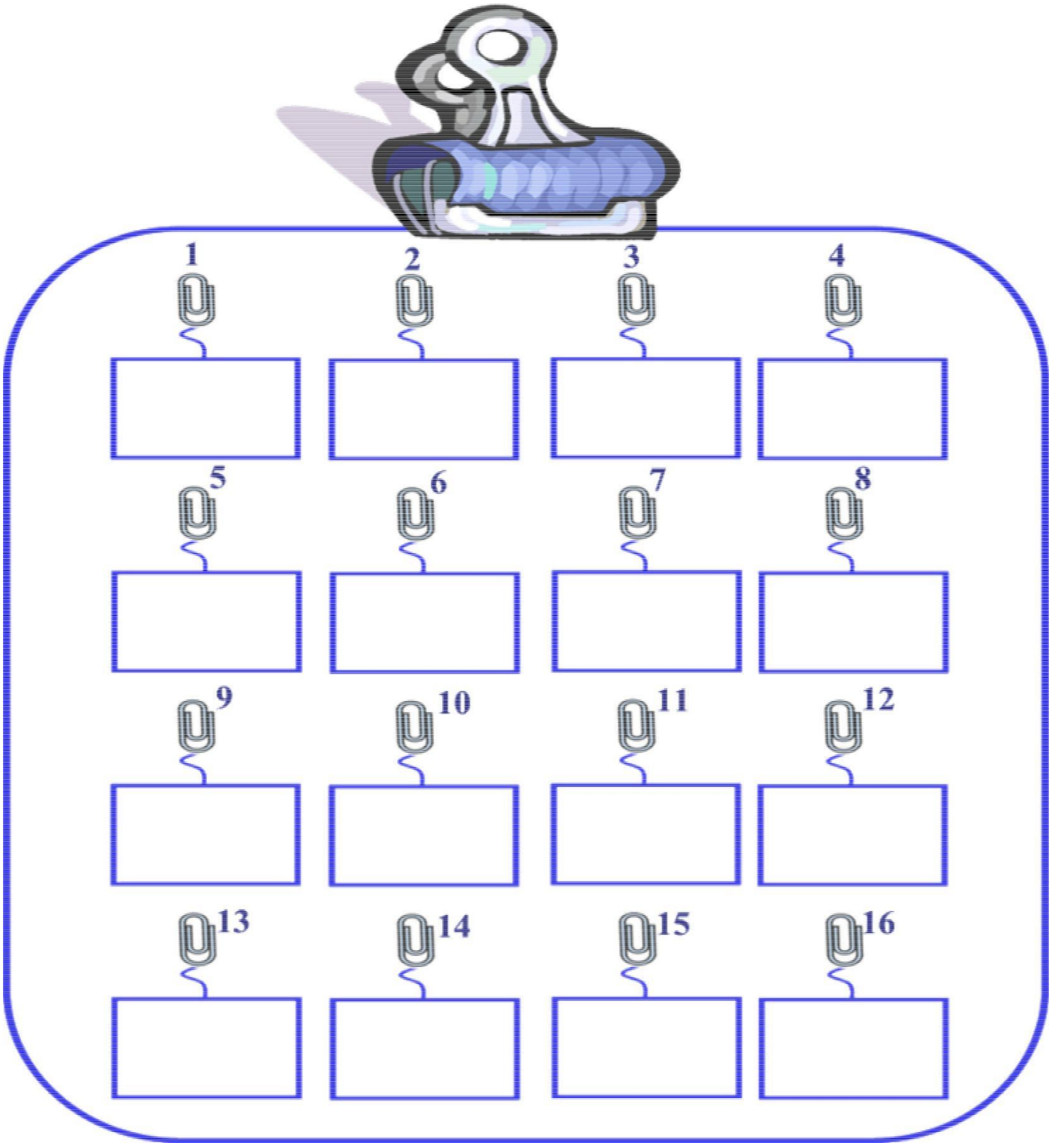
3. Discuss the results of the activity and establish the importance of the rubber or plastic covering on electrical wires.
4. As homework activity, let students find out about the kind of material such things as plugs, switches, electric iron handles, etc. are made of, and why.

ASSESSMENT

- Use a matching pairs game to conduct a quiz based on the information covered in lesson. Pairs of pictures should be all related to the lesson (bulbs, appliances, etc.)

1. Hang pairs of pictures face down on a card-board sheet.
2. Hang the game on the chalk board.
3. Divide the class into teams.

4. Pose a question on the lesson content to one of the teams. If they answer correctly the team gets a chance to turn up two cards on the board in an effort to find a matching pair.
5. Award ten points for each matching pair uncovered.
6. Give bonus points (2) if the team is able to state one fact about the first card it uncovers.



Type of Diagram

DURATION: 1 Lesson

OBJECTIVES

Students should be able to:

1. State the dangers posed by electricity.
2. Explain safety measures that should be observed in order to prevent these dangers.

PROCESS SKILLS

Observing, Manipulating, Communicating, Inferring

MATERIALS

Circuit board or a complete circuit with cells connecting wires, additional cells and low voltage bulbs.

CONTENT SUMMARY

- Electrical energy (electrical current) can be dangerous. Faulty or overloaded circuits can result in fires. Improper handling can result in electrical shock which can kill the individual or result in serious burns and disfigurement. It can also damage electrical appliances.

SUGGESTED ACTIVITIES

1. As a group activity let students complete a circuit with one cell to light the bulb. Let them increase the number of cells progressively by one until the bulb burns out. Challenge students to offer an explanation for the result. At this point introduce the concept of the volt being one of the measures of electricity; and as voltage increases electricity becomes more dangerous. Establish the voltage of the cells used in the activity (this is usually written on the side of the cell), as well as the voltage of mains electricity used in our homes. Question students as to the reason why some household appliances require transformers (to increase or decrease the voltage).

2. Facilitate a class discussion on the dangers of electricity, and the measures that should be taken to prevent electrical shock, fires and damage to appliances. A video presentation can be used as stimulus materials if such resources are available.

ASSESSMENT

Let students compile a list of **DO'S** and **DON'T'S** about the way we use electricity.

Examples: Do not touch an electric switch with wet hands.
Do not push anything except the plug of an appliance into an outlet.
Do not touch bare electric wires.
Dry wet hands before turning on an electric switch.

Suggested Activities

Get students to create models of the various systems covered in previous lessons, using clay, play dough, styrofoam, recyclables, food, etc. Students can also be asked to create parts of a system. For example, students can create the digestive tract from play dough, tubing and plastic bags, using different coloured play dough to indicate different parts of the digestive system.

Before each model is made, review the function of the major parts of the respective system by placing a chart on the chalkboard and questioning the students.

Divide the class into groups; give each group a diagram of the respective system, materials and instructions on how to make the model of the system. Ensure that students do not waste a lot of time on each model. Students may label their models by sticking pins or toothpicks with labels attached to them.

Assessment

Marks may be awarded for each model made. Students may also be asked to explain how their models were made. In addition as a review exercise, students may be asked to state the function of each part of the system under review**.** To make the exercise more fun, students may be asked to write songs or poems about the various systems.

Objective

Students should be able to:

Identify technology utilized in the various systems in humans.

Process skills

Observation, Communication, Inference

Materials Needed

Actual example or pictures of a clinical thermometer, stethoscope, x-ray pictures, sonograph, digital blood pressure machine, and sphygmomanometer.

Content summary

Different technologies are utilized in studying the systems of the human body. Some of these technologies are listed below.

Stethoscopes are used to hear sounds generated from within the body. They are used to listen to the heart, lungs and intestinal tract. They are also used for measuring blood pressure.

The most common use of x-rays is in medicine and dentistry. X-rays are used to examine inside the body to try to see if there is anything abnormal. Broken bones, cancerous growths, and tooth decay are some of the problems that can be detected by an x-ray of a person.

Blood pressure can be measured either by using a machine called a sphygmomanometer or by using an automatic machine. A sphygmomanometer is an instrument that measures blood pressure using a column of mercury. There are also automatic digital machines that can measure blood pressure.

Ultrasound or sonography is a technique that uses sound waves to study and treat hard-to-reach body areas. In scanning with ultrasound, high-frequency sound waves are transmitted to the area of interest and the returning echoes recorded. Ultrasounds are used to study the development of the foetus, detect heart damage and to heat joints, relieving arthritic joint pain.

Clinical thermometers are used to measure body temperature. They tell us if our temperature is normal, above normal, or below normal.

An endoscope is an instrument that allows a doctor to view the inside of the body such as the stomach, without making any surgical incisions. A long, flexible, lighted tube with a camera at one end is put down the patient's throat. Images are then projected to a TV monitor.

Digital blood pressure machines

Sphygmomanometer

Clinical thermometer

Sonograph of a foetus

X-ray of the ribs

Stethoscope

Suggested Activities

Have a round-robin display of pictures/actual specimens of different technology gadgets around the class. Walk the students through the different displays, by explaining what each is, what it is used for and why it is important.

Invite a health worker in to demonstrate the use of the sphygmomanometer, stethoscope and clinical thermometer.

Ask the health worker to take the blood pressure of some of the students.

Assessment

Ø Word-find of the names of the various instruments studied.

Ø Students match instruments with their use.

Ø Students state the function of the various instruments.

Ø Students demonstrate the use of the stethoscope/clinical thermometer.

Objective

Students should be able to:

Construct models of technological devices that are used in the various systems in human.

Process skills

Communication, Measurement, Inference.

Materials Needed

Sticks
Wire
Tape
Straws
Alcohol
Modelling clay
Plastic bottles
Red food colouring
Rubber tubing
Paper clips
Bottle caps
Cardboard tubes from a paper towel roll

Content summary

Review content material covered in previous lessons re: technology utilized in the various systems in human

Activities

Let students construct models of a stethoscope, a thermometer, an endoscope and a sphygmomanometer, using their previou knowledge and the materials listed above. These models do not have to be working models.

Before each model is made, review the function of the major parts of the respective system by placing a chart on the chalkboard and questioning the students.

Divide the class into groups; give each group a diagram of the respective device, materials and instructions on how to make the model of the device. Ensure that students do not waste a lot of time on each model.

Students can create the stethoscope from cardboard, tubes, and plastic bags, or they can construct a thermometer from a straw, alcohol, modelling clay and a plastic soft drink bottle.

Using the homemade stethoscope, let the students pair off and listen to their partner's heartbeat by placing the tube over the partner's heart. They then count the number of beats per minute. Let one partner run for one minute, and then listen again. Let the students write down what they hear and calculate the new beats per minute. After five minutes let the partners switch places and do the exercise again.

Assessment

Marks may be awarded for each model made. Ask students to demonstrate their models. Also students can explain how their models were made. In addition, as a review exercise, students may be asked to state the use of each device made. To make the exercise more fun, students may be asked to write instruction leaflets for use with their models.

Topic: Using and Conserving Resources

Duration: 4 Lessons

Specific Objectives

Students should be able to:

Ø Identify marine pollutants.

Ø Suggest ways of preventing/reducing marine pollution.

Ø Investigate the impact humans have on ecosystems.

Ø Recognize the role that humans play in protecting or destroying ecosystems.

Ø Demonstrate involvement in environmental protection.

Process Skills

Observing, Communicating, Interpreting

Materials

Video (*documentary on marine pollution and conservation*)
Pictures (*destroyed ecosystems*)
Manila
Markers
Resource person

Content Summary

Pollution of air and water resources, **deforestation** and **excavations** of portions of the earth are some of the ways in which humans destroy the balance of nature.

The prudent use of our **natural resources** is called **conservation**. Conservation methods include **reducing** waste, **recycling** and **reusing** resources as far as possible. Additionally, **littering** should be avoided. Practising conservation can bring positive results to the environment.

Suggested Activities

Pupils will do the following:

Go on field trips to observe the environment around them.

Look at pictures of destruction to the ecosystem.

Engage in discussion with resource person about care of the environment.

View documentary on destruction and conservation of marine life.

Work in groups to identify ways in which they can help to protect the environment.

Draft possible laws that may be enforced to help in protecting the country's ecosystems.

Make a flow chart to illustrate how one change in an ecosystem can lead to further changes in that ecosystem.

Assessment

Ø Oral questions based on field trip(s).

Ø Students write a summary of the marine conservation documentary.

Ø Students design a poster to help sensitize the public on how to protect the environment.

Ø Teacher Grades flow-charts made by students

Topic: Volcanoes

Duration: 2 Lessons

Specific Objectives

Students should be able to:

Ø Identify volcanic activity as a natural process in the environment.

Ø Explain how volcanoes are formed.

Ø Discuss the impact of volcanic eruptions on the ecosystem.

Ø List useful and harmful effects of the presence of a volcano in an environment.

Process Skills

Observing, Communicating, Inferring, Predicting.

Materials

Video (*documentary on volcanoes*)
Clay/play dough
Antacid (e.g. Eno)
Worksheets (*pros and cons of volcanic eruption*)

Content Summary

Natural processes can affect the balance in nature**.** One such natural process is a **volcanic eruption.** . A **Volcano** forms when there is a fault in the earth's crust. Since the temperature inside the earth is very high, the rocks there are molten and under very high pressure. Any weakness in the earth's crust allows **magma** (molten rocks) to be forced out of the earth. This ejection constitutes a volcanic eruption. Such eruptions have a great impact on the environment.

Suggested Activities

Ø View video documentary on volcanoes.

Ø Build a working model of a volcano.

Ø Look at picture showing erupting volcano and/or aftermath; discuss the impact that eruptions have on the environment.

Assessment

Ø Grade model of volcano .

Ø Complete work sheets.

UNIT: ECOSYSTEMS (GRADE 6)

Topic: Feeding Relationships

Duration: 4 Lessons

Specific Objectives

Students should be able to:

- Ø Give examples of interactions among biotic factors in an ecosystem.
- Ø Identify food chains and food webs in an ecosystem
- Ø Explain competition among living organisms in an environment.

Process Skills

Observing, Investigating, Classifying Manipulating, Interpreting, Recording.

Materials

Nets
Hand lenses
Aquaria/fish bowls
Pond water with organisms (fish, snails, pond-weed, etc).

Content Summary

In some feeding relationships, both organisms benefit; this is called **symbiosis**. There are some relationships where only one organism benefits; this is **commensalism**. In the feeding relationship called **parasitism,** the animal that is fed on is called the **host** while the organism that feeds is called a **parasite**. The parasite has a negative effect on the host and can make it sick.

Suggested Activities

Ø Examine pictures of birds riding on the backs of cattle. Discuss the reason for this.

Ø Discuss the relationships betweens dogs and fleas.

Ø Look at pictures of different ecosystems (e. g. ponds, swamps, flower garden, etc.). List the organisms that live in each ecosystem and construct food chains and food webs based on the information.

Ø Examine food webs to identify producers, consumers, predators and prey. Discuss how the organisms compete for food.

Ø Set up ecosystems in the classroom (aquaria; 'pour-a-pond'). Use hand lenses to examine the organisms in these ecosystems.

Ø Observe and record changes in the population of organisms in the (classroom) ecosystems over a period of a few weeks. Write a report on the findings.

Assessment

Ø Teacher-made test/quiz .

Ø Group project: simulate an ecosystem.

Ø Integrate given food chains to create food webs.

Ø Grade reports.

Topic: Our Changing Environment

Duration: 4 Lessons

Specific Objectives

Students should be able to:

Describe the immediate environment.

Identify some ways in which an ecosystem can change.

Examine and describe a local ecosystem that has experienced change.

Appreciate the fragile nature of ecosystems.

List factors that can bring about changes to ecosystems.

Process Skills

Observing, Investigating, Reporting, Communicating

Materials

Pictures/video
Cardboard
Empty cans
Empty bottles
Tape

Content Summary

The balance in nature can be affected by **natural processes** such as **hurricanes**, **earthquakes**, **volcanic eruptions, droughts** and **floods,** and also 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 humans destroy the balance of nature.

Suggested Activities

Ø View pictures, taken at an earlier period, of a well-known area (neighbourhood, popular beach, etc.). Discuss how this area has changed.

Ø Identify the changes in the area and suggest how they may have come about.

Ø Discuss ways in which named natural processes/disasters have an impact on an ecosystem to change it (earthquakes, hurricanes, etc.).

Ø Investigate the contribution of human activities to the changes in a given local ecosystem and write a report on it (highlight its original state, effects of technology, and so on).

Assessment

Ø Construct model ecosystems, depicting before-and-after major changes brought on by natural disasters and/or human activities.

Ø Make a collage of before-and-after pictures, illustrating major changes in a local ecosystem.

Ø Prepare a graded report on 'Impact of Human Activities' on a named ecosystem.

Ø Write a description/make a presentation of how life can be affected by changes in an ecosystem.

Topic: Conservation

Duration: 4 Lessons

Specific Objectives

Students should be able to:

Ø Compare the degree of air pollution in two different areas.

Ø Hypothesize about the reason for the differences.

Ø Investigate the cause(s) of air pollution in the two areas (to test hypotheses).

Ø Design and construct a device to detect air pollution.

Ø Discuss the importance of having clean air.

Ø Identify natural sources of water.

Ø State ways in which water may be polluted.

Ø Discuss how people's activities may result in air and water pollution.

Ø Construct a device to determine the turbidity of water.

10. Arrange water samples according to their degrees of turbidity.

11. Plan and design an experiment to make polluted water clean.

12. Discuss ways of reducing air and water pollution.

Ø Design and make brochures, posters, etc. on conservation of air and water.

Process Skills

Observing, Manipulating, Designing, Communicating, Hypothesizing, Planning, Experimenting.

Materials

Video
Pictures
Markers
Manila
Water samples

Content Summary

Pollution of air and water sources is one way in which humans destroy the balance of nature.
The wise use of our **natural resources** is called **conservation**. Conservation methods include **reducing** waste, **recycling**/**reusing** resources as far as possible, and avoiding littering. Practising conservation can bring positive results to the environment.

Suggested Activities

Visit various areas to investigate the amount of air pollution found in each area. Discuss reasons for any differences discovered.

Design and make a device for detecting air pollution.

List natural sources of water.

View a video documentary on polluted water sources. Discuss how the water may have become polluted.

Project (groups): Plan and design an experiment to make polluted water clean.

Investigate how human activities may contribute to air and water pollution, and ways in which this pollution may be reduced/prevented. Make a presentation based on the findings.

Carry out an experiment to arrange given water samples according to the degree of turbidity of each sample.

4. Make a device to be used to determine the turbidity of water; demonstrate how it works.

Project (groups): Design and make poster, brochures, etc., suitable for public awareness programme on air and water conservation.

Assessment

Ø Teacher-made test.

Ø Graded devices (i) for detecting air pollution and (ii) for determining turbidity of water.

Ø Graded group experiments (arrange water samples by turbidity).

Ø Graded research and presentations on human contribution to air/water pollution and methods to reduce or prevent pollution.

Ø Graded group projects (public awareness programme brochures, posters, etc.)

Topic: Earthquakes

Duration: 4 Lessons

Specific Objectives

Students should be able to:

Describe an earthquake as a natural process and state what causes it.

Identify ways in which earthquakes have an impact on the environment.

State the safety measures to be carried out during an earthquake, and demonstrate each measure.

Process Skills

Observing, Communicating

Materials

Worksheets
Video
TV & VCR or
PC & Projector

Content Summary

The balance in nature can be affected by **natural processes** such as **earthquakes**. The earth's **crust** is made up of pieces called plates; these are in constant motion as they ride on the **mantle** below. Earthquakes occur when the plates that make up the earth's crust move against or slide past one another.

Suggested Activities

Discuss personal experience(s) with earthquakes.

Examine diagrams representing the structure of the earth and identifythe parts.

View documentary on earthquakes and identify ways in which earthquakes affect life.

Role play on what to do during earthquakes.

Assessment

Complete worksheets on dangers associated with earthquakes.

Oral questions on causes of earthquakes.

Assessed role play of emergency measures in an earthquake.

UNIT: DIVERSITY AND CLASSIFICATION (GRADE 5)

Topic: Reproduction in Animals

DURATION: 6 Lessons

OBJECTIVES

The students should be able to:

Ø Name different animals and state the method by which they reproduce.
Ø Explain the need for reproduction.
Ø Explain what the life cycle of an animal is.
Ø Describe the life cycle of an animal where the young and adult are alike(cockroach).
Ø Describe the life cycle of an animal where the young and adult are not alike (butterfly).
Ø Classify insects according to their type of life cycle.
Ø Describe the role of the butterfly in nature.
Ø Compare the human life cycle to that of another animal.

Process Skills

Observing, Measuring, Recording, Classifying, Communicating, Experimenting, Interpreting

Materials

Charts of stages in human development.
Hand lens, glass jars, leaves for feeding insects, insects' eggs, frogs' eggs.

Content Summary

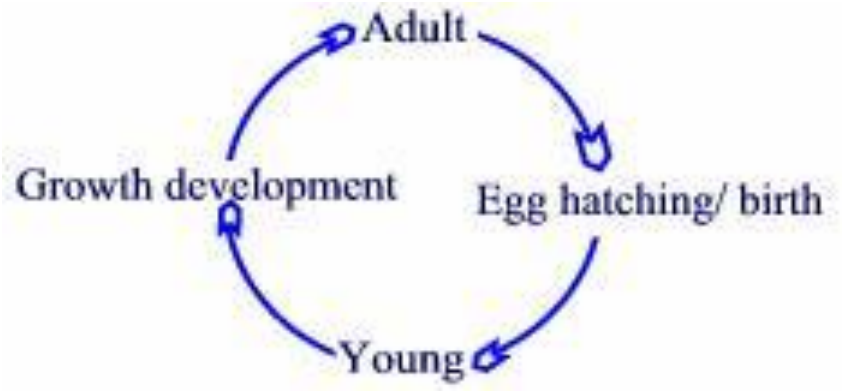
Animals reproduce in different ways:
e.g. birds, some fishes, insects lay eggs
Mammals and some fishes give live birth
Earthworms – segments

Reproduction is necessary to ensure the survival of the species.
Living organisms produce young ones. The young ones grow and develop into adults. These adults in turn produce more young. This period of growth

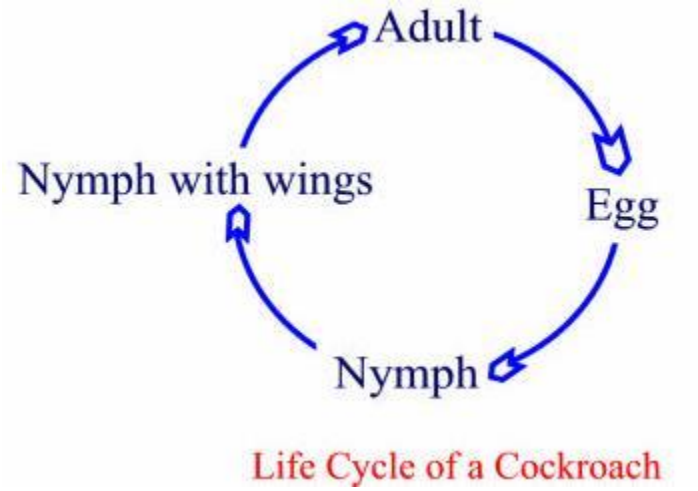
from young to adult with all its changes is known as the life cycle of the organism

- **typical life cycle**:

➢

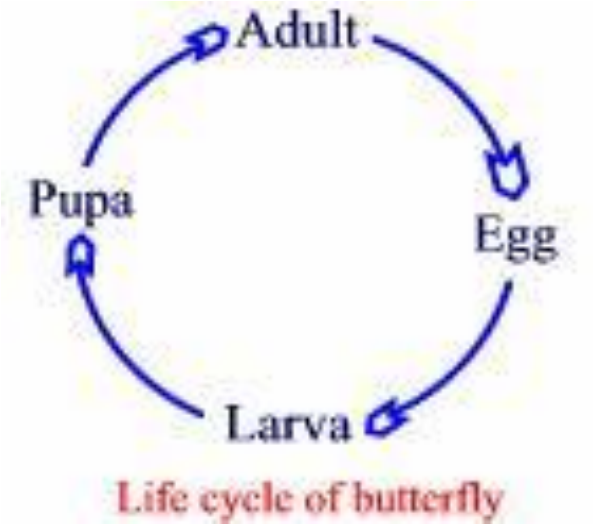


☐ Some young insects (nymph) look like their parents; the only difference is that they are smaller. They change into adult insects e.g. cockroach



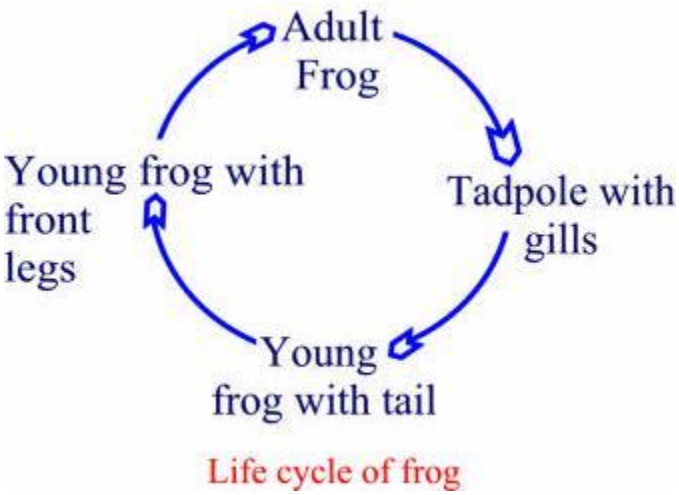
Life Cycle of a Cockroach

☐ Some young insects do not look like their parents at all. The egg hatches into a larva. The larva feeds and grows, then it stops feeding and charges into a pupa. Inside the pupa an adult insect forms and eventually emerges, e.g. butterfly. See the following diagram.



Life cycle of butterfly

- Young frogs do not look like their parents at all. The egg hatches into a tadpole which lives in water and breathes by means of gills.
  As the tadpole grows its gills disappear. It grows a pair of hind legs and later a pair of front legs.
  The tail gets shorter and in the end disappears completely.



Life cycle of frog

- Human baby is born alive and looks like its parents
- Main changes are in size and characteristics, such as growth of facial hair.

Activity

Ø Students investigate the life cycle of a butterfly.
Students collect butterfly's eggs and keep them in transparent jars for observation.
Students describe the characteristics of the different stages of the life cycle.

Students record the length of time for changes from stage to stage. Students report on their observations.

Ø Students complete diagrams of life cycle.
Small group discussion
At what stage of the life cycle is it easiest to control the butterfly?
Why would you want to protect plants from butterflies?
What can be used to protect plants from butterflies?

Ø Students arrange stages in the life cycle of named animals in order.

Ø Students complete tables of comparison of life cycle of humans and named animals.

Feature	**Humans**	**Named animals**
Resemblance of young to adult	(Looks like/Does not look like)	(Looks like/Does not look like)
Changes in feeding	(No change/Change)	
Nature of growth	(Simple/Moulting)	(Simple/Moulting)
Type of movement	(No change/different type of movement)	(No change/different type of movement)
Development	(Gradual/Different stages)	(Gradual/Different stages)

1. Classifying animals according to whether the young look like the parents or do not look like the parents .

Assessment

Many of the activities listed above can be assessed as the students engage in them.
Written or oral descriptions of stages in the life cycle of animals from specimen or drawings.

Students make checklist of features shown by different stages in the life cycle of named animals.

Checklist

Stage	**Feature**			
	Gills	Back legs	Front legs	Tail
Newly hatched tadpole				
Large tadpole				
Immature frog				
Adult frog				

Objective type questions
Example: Nymphs occur in the life of …..

A. Butterfly B. cockroach
C. frog D. human

Open-ended questions e.g. How are butterflies important?

UNIT: DIVERSITY AND CLASSIFICATION (GRADE 6)

Topic: Pollination and Fertilization

Duration: 4 Lessons

Specific Objectives:

Students should be able to:

Ø Define pollination, cross-pollination and self-pollination.

Ø Describe the processes of (i.) self-pollination and (ii.) Cross-pollination .

Ø Distinguish between self-pollination and cross-pollination.

Ø Classify flowering plants according to the type of pollination they undergo.

Ø Name the agents of pollination.

Ø Identify pollen grains and ovules as the reproductive cells/gametes in a flower.

Ø Define fertilization as the fusion of male and female gametes.

Ø Explain how fertilization occurs in a flower.

Ø Appreciate the significance of the processes of pollination and fertilization in plants, as a means of obtaining seeds.

Process skills

Observing, Classifying, Communicating, Manipulating

Materials

Chart (diagram of flower)
Flowers

Activities

Ø Use text/listen to lecture to find out what are pollination and fertilization.

Ø Discuss the various means by which pollen may be transferred from one flower to another.

Ø Examine a flower and locate the reproductive parts (pollen grains, stigma style and ovary).

Ø Indicate the location of pollen grains and ovules on a diagram of a flower and trace the path from the stigma to the ovary of a flower.

Ø Discuss why farmers sometimes have to transfer pollen for themselves.

Assessment

Ø Answer the following questions.

Give the meaning of (i.) pollination (ii.) fertilization.

List the reproductive parts of a flower.

Identify the male and female reproductive cells that are present in a flower.

Briefly explain how pollen grains are transferred to the stigma of a flower.

Distinguish between self-pollination and cross-pollination.

Make a drawing of the reproductive parts of a flower. Show the path of the pollen tube .

Explain why the processes of pollination and fertilization are important.

Topic: Seed Dispersal

Duration: 2 Lessons

Specific Objectives

Students should be able to:

1. Define 'seed dispersal'.

2. List the agents of seed dispersal and give examples of seeds that are dispersed by each method.

3. Explain why it is important for seeds to be dispersed/scattered.

Process skills

Observing, Classifying, Investigating, Communicating

Materials

Seeds (mahogany, burr grass, coconut, sandbox, warri)
Worksheets (*match the type of seed to its method of dispersal*)

Content Summary

The **scattering** of seeds is called **dispersal**. These include **self**, **animals**, **wind** and **water**. Self dispersal means that the seeds are dispersed by the plant itself (e.g. sandbox, warri/nickel). In animal dispersal, seeds are scattered by animals. In wind dispersal the wind disperses the seeds and in water dispersal seeds, are dispersed by water.

Activities

Examine a number of different seeds. Discuss how they are scattered/dispersed and link their physical structure to the way in which they are scattered in nature. Record the findings in a table. (Look for weight, wing-like structures, spurs, whether animals eat them).

Ø Use a text/chart to find out about the methods by which seeds are scattered. List the methods and name two examples of seeds that are dispersed by each method.

Ø Write a short story called "the journey of a (named) seed", to depict any one of the dispersal methods.

Assessment

1. Complete matching exercise in which each type of seed is matched to its method of dispersal.

2. Grade the short story, "The Journey of a Seed".

3. Draw lines to match each type of seed to its method of dispersal.

Type of seed	**Agent of dispersal**
coconut	**Wind**
guava	**Water**
mahogany	**Self**
burrs (grass)	**Animals**
sandbox	