SCIENCE AND ELEMENTARY TECHNOLOGY PRACTICAL ACTIVITIES USER GUIDE

UPPER PRIMARY (P4-P6)

MARCH, 2022

FOREWORD

Dear teachers,

Rwanda Basic Education Board (REB) is honoured to present the user guide for practical activities of Science and Elementary Technology for Upper Primary (P4-P6). This book will serve as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of Science and Elementary Technology (SET).

In this user guide, special attention was paid to experiments and practical activities that facilitate the learning process in which students can manipulate concrete materials, develop ideas, and make new discoveries during activities carried out individually in pairs or in small groups.

In competence-based curriculum, practical activities open students' minds and provide them with the opportunities to interact with the world, use available tools, collect data, and effectively model real life problems.

For efficiency use of this book, your role as a teacher is to:

- Plan your lessons and prepare appropriate teaching materials.
- Organize groups for students considering the importance of social constructivism.
- Engage students through active learning methods.
- Provide supervised opportunities for students to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication, and cooperation.
- Support and facilitate the learning process by valuing students' contributions in the practical activities.
- Guide students towards the conclusion on the results of the experiments.
- Encourage individual, peer, and group evaluation of the work done and use appropriate competence-based assessment approaches and methods.

To facilitate you in teaching activities, the content of this guide is self-explanatory so that you can easily use it. It is divided in 3 parts:

The part 1 explains the structure of this guide and gives you the general introduction on the role of practical activities and experiments in the implementation of Competence Based Curriculum (CBC).

The part 2 gives the list of items in the Science kit and their uses.

The part 3 explains experiments and practical activities and how you can facilitate them.

Even though this guide contains practical activities and experiments, they are not enough; As expert and experienced teacher, you can guide students to carry out more experiments and practical activities using improvised teaching resources.

I wish to sincerely appreciate the people who contributed towards the development of this guide, particularly REB staff who organized the whole process from its inception. Special appreciation goes also to University lecturers, teachers and independent experts in education who supported the exercise throughout. Any comment or contribution would be welcome for the improvement of this book for next versions.

Dr. MBARUSHIMANA Nelson

Director General, REB

ACKNOWLEDGEMENT

I wish to express my appreciation to all the people who played a major role in the development of the user guide for practical activities of Science and Elementary Technology for Upper Primary (P4-P6) . It would not have been successful without their active participation.

Special thanks are given to IEE, AIMS, independent people, teachers, illustrators, designers and all other individuals whose efforts in one way or the other contributed to the success of the development of this user guide.

I owe gratitude to the Rwanda Basic Education Board staff particularly those from Curriculum, Teaching and Learning Resources Department who were involved in the whole process of the development work.

Finally, my word of gratitude goes to RQBE Project for its financial support towards improving the quality of education.

Joan MURUNGI

Head of Curriculum, Teaching and Learning Resources Department

LIST OF ACRONYMS

CBC: Competence-based curriculum

ICT: Information Communication Technology

Lab: Laboratory

STEM: Science, Technology, Engineering and Science

KBC: Knowledge Based Curriculum

SET: Science and Elementary Technology

SPIU: Single Project Implementation Unit

RQBE: Rwanda Quality Basic Education

Table of content

PART 1: GENERAL INTRODUCTION

1. Structure of the user guide

The user guide for practical activities is divided in 3 parts:

The part 1 explains the structure of this guide and gives you the general introduction on the role of practical activities in the implementation of CBC.

The part 2 gives the list of items in Science kit and their uses.

The part 3 details the practical activities and how you can facilitate them in lessons.

2. Experiments and practical activities in the Competence Based Curriculum

A competence-based curriculum (CBC) focuses on what learners can do and apply in different situations by developing skills, attitudes, and values in addition to knowledge and understanding. This learning process is learner-focused, where a learner is engaged in active and participatory learning activities, and learners finally build new knowledge from prior knowledge. Since 2015, the Rwanda Education system has changed from KBC to CBC for preparing students that meet the national and international job market requirements and job creation. Therefore, implementing the CBC necessitates qualitative practical activities and experiments in teaching and learning Science.

In addressing this necessity, practical activities and experiments play a major role. A child is motivated to learn Science by getting involved in handling various concrete manipulations in various activities. In addition to activities, games in Science also help the child's involvement in learning by strategizing and reasoning.

For learning scientific concepts through the above-mentioned approach, a child-centred Science kit has been availed for the students of primary schools. The kits include various items along with the user guide for performing activities.

The kit has the following advantages:

- Availability of necessary and common materials at one place
- Multipurpose use of kit items
- Economy of time in doing the activities
- Portability from one place to another
- Provision for teacher's innovation
- Low-cost materials and use of local resources.

Apart from the kit, the user guide for practical activities to be used by teachers was developed. This user guide is designed to help science teachers to perform high-quality experiments and practical activities for Science by inducing learner's interest, achievement and motivation. In CBC, learners hand on the materials and reveal the theory behind the experiment done. Here, experiments are done inductively, where experiments serve as an insight towards revealing the theory. Thus, the experiment starts, and theory is produced from the results of the experiment.

Note: The content of different lessons related to the experiments in this guide was not put in the guide as it is well elaborated in the student book.

3. Types of experiments

The goal of the practical activity or experiment defines its type and how it is organized. Therefore, before doing experiment or practical activity, it is important to have a clear idea of the objective.

The three types of practical activities or experiment are:

- **Equipment-based experiment:** The goal is for students to learn to handle scientific equipment like using lens, using electronic balance, making an electric circuit, etc.
- **Concept-based experiment:** The goal is for students to learn new concepts.
- **Inquiry-based experiment:** The goal is for students to learn process skills. Examples of process skills are defining the problem and good research question(s), installing an experimental setup, observing, measuring, processing data in tables and graphs, comparing, drawing conclusions, defining limitations of the experiment, etc.

Note:

To learn the new concept by practical activity, the lesson should start with the practical activity, and the theory can be explained by the teacher afterward (explore – explain).

Starting by teaching the theory and then doing the practical activity to prove what they have learned is demotivating and offers little added value for student learning.

4. Organising experiments

a) Methods of organizing experiments and practical activities

There are 3 methods of organizing practical activities:

- Each group does the same experiments at the same time
- Experiments are divided among groups with group rotation
- All experiments are divided among groups without group rotation

b) Preparation of a practical activity

When preparing a practical activity, do the following:

- Have a look at the available material at school and make a list of what you can use and what you need to improvise.
- Determine the required quantities by determining the method (see above).
- Collect all materials for the experiments in one place. If learners' group is small, they can come to get the materials on that spot, but with more than 15 learners, this will create disorder. In that case, prepare for each group a set of materials and place it on their desk.
- Test all experiments and estimate the required time for each before the experiment.
- Prepare a nice but educational extra task for learners who complete their task before the end of the allocated time..
- Write on the blackboard how groups of learners are formed.

c) Preparation of a lesson for practical activity

In the lesson plan of a lesson with practical activity, there should be the following phases:

1. The introduction of the practical activity or the 'excite' phase consists of formulation of a key question, discrepant event, or a small conversation to motivate learners and make connections with daily life and learners' prior knowledge.
2. The discussion of safety rules for the practical activity:
    - Only work at the assigned place; do not walk around in the class if this is not asked.

- Long hairs should be tied together, and safety eyeglasses should be worn for chemical experiments.
- Only the material needed for the experiment should be on the table.
- The practical activity instructions: how groups are formed, where they get the materials, special treatment of materials (if relevant), what they must write down…
- When the practical activity materials aren't yet at the correct location, then distribute them now. Once learners have the materials, it is more difficult to get their attention.

3. How to conduct a practical activity:
   - Learners do the experiments, while the teacher coaches by asking questions (Explore phase).
   - The practical activity should preferably be processed immediately with an explain phase. If not, this should happen in the next lesson.
4. How to conclude the lesson of a practical activity:
   - Learners refer to instructions and conduct the experiment,
   - Learners record and interpret recorded data,
   - Cleaning the workspace after the practical activity (by the learners as much as possible).

5. Role and responsibilities of teacher and learners in experiment

i. The roles and responsibilities of teacher during experiment and practical activity

Before conducting an experiment, the teacher will do the following:

- Decide how to incorporate experiments into class content best,
- Prepare in advance materials needed in the experiment,
- Prepare or read protocol for the experiment,
- Perform in advance the experiment to ensure that everything works as expected,
- Designate an appropriate amount of time for the experiment - some experiments might be adapted to take more than one class period, while others may be adapted to take only a few minutes.
- Match the experiment to the class level, course atmosphere, and your students' personalities and learning styles.
- Verify equipment before experiment.

- *During practical activity,* the teacher's role is to coach instead of helping with advice or questions. It is better to answer a learner's question with another question than to immediately give the answer or advice. The additional question should help learners to find the answer themselves.
- Prepare some pre-experiment questions for each practical activity, no matter what the type is.
- Use coaching questions during the practical activity: 'Why do you do this?', 'What is a control tube?', ''What is the purpose of the experiment?', 'How do you call this product?', 'What are your results?' etc.
- Use some questions to end the practical activity: 'What was the meaning of the experiment?', 'What did we learn?', 'What do we know now that we didn't know at the start?', 'What surprised you?'etc.
- Announce the end of the practical activity 10 minutes before giving learners enough time to finish their work and clean their space.

ii. The learners' responsibilities in the experiment

During the experiment and practical activity, learners have different activities to do; Their key activities are:

- Experiment and obtain data themselves,
- Record data or observations,
- Answer questions which help to interpret their observations,
- Link their observations with the theory/content,
- Cleaning and arranging materials after a lab experiment.

6. Safety rules and precautions during experiments and practical activities

Regardless of the type of experiment you are in, there are general rules enforced as safety precautions. Each member must learn and adhere to the rules and guidelines to minimize the risks of harm that may happen to them within the working environment. These include:

- Use personal protection equipments when available like coat, gloves, safety glasses (goggles), breathing masks, …
- To read the experiments guidelines.
- Avoid eating and drinking during experiment or practical activity.
- Never holding hot objects with bare hands.
- Make sure that you know where the fire extinguishers are in your school, and there should also be a bucket of sand to extinguish fires in case of burning.

7. Guidance on the use and management of science kits materials

There are different materials in the science kits available in many schools. Those materials together with other local materials found in school surrounding will be used to perform different experiments and practical activities while teaching SET lessons for its effective use and management. For its effective use and management, the following should be catered for:

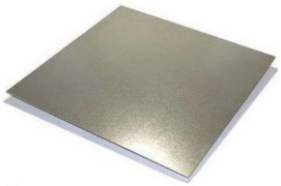
- Working spaces must always be kept neat and cleaned up before leaving. Equipment must be returned to its proper place.
- To avoid contamination and possibly violent reaction, do never return unwanted chemicals to their container.
- Sharp and pointed tools should be stored properly.
- All glassware should be inspected before use, and any broken, cracked.
- All hot equipment should be allowed to cool before storing it.
- All glassware must be handled carefully and stored in its appropriate place after use.
- Never leave a hot plate unattended while it is turned on. It is recommended to handle hot equipment with safety gloves and other appropriate aids but never with bare hands. You must ensure that hands, hair, and clothing are kept away from the flame or heating area and turn heating devices off when they are not in use.
- The wastes should be collected in appropriate containers and disposed safely.
- To keep equipment in working order by maintaining, repair and record any damage.

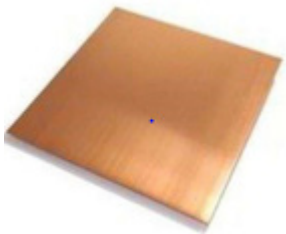
8. Using improvisation in teaching and learning

In many schools, experiments and practical activities may not be fully performed because of scarcity of science experiments materials as well as improvising skills. Sometimes, standard materials produced in the factory are rare, not enough and expensive to buy. Therefore, teachers must also use improvised materials.

Improvisation is the act of providing teaching materials from our locality when there is shortage of the standard ones. In addition, improvisation is all about teachers to produce teaching materials in time of need from low-cost and local materials available in the environment to make teaching meaningful, effective, and efficient. As teacher, your role is to produce such improvised materials depending on the lesson to be taught and try to meet characteristics of good teaching and learning materials.

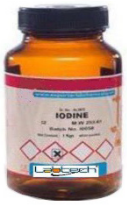
PART 2: LIST OF MATERIALS IN THE SCIENCE KIT FOR PRIMARY AND THEIR USES

No	Name of material	Photo	Some uses and examples of corresponding units in the syllabus
1	Aluminium plate		• Identifying metal properties • Identifying state of different materials Unit 16: Materials (P5) Unit 16: State of matter (P6)
2	Balloons		• Identifying the properties of air • Showing mechanisms of respiration (Inspiration & expiration) Unit 2: Air and wind (P2) Unit 7: Air, wind and sound (P4)
3	Bar magnets		• Showing magnetic field • Identifying magnetic and non-magnetic substances • Showing magnetic properties Unit 8: Types of energy (P3) Unit 10: Magnet (P3)

4	Beaker		Measuring volume of objects Unit 8: Water (P5) Unit 16: Materials (P5) Unit 16: State of matter (P6)
5	Compass needle		• Showing north-south directions of earth • Detecting the direction shown by the home-made compass Unit 10: Magnet (P3) Unit 15: Magnetism (P6)
6	Copper plate		Identifying metal properties Unit 16: Materials (P5)
7	Cotton wool		• Identifying different types of soil • Experiment on dramatizing in case of external haemorrhage Unit 8: Soil (P4) Unit 9: Soil (P5) Unit 16: Materials (P5) Unit 11: Circulatory system (P6)

8	Stainless spatula		Measuring mass for different objects Unit 8: Types of energy (P3) Unit 10: Magnet (P3) Unit 16: Materials (P5)
9	Densimeter/ Hydrometer		Experiment on measurements of relative density Unit 16: Materials (P5) Unit 16: State of matter (P6)
10	Dry cell holder		Making a simple circuit Unit 8: Types of energy (P3) Unit 9: Electricity (P3) Unit 15: Electricity (P5) Unit 16: Materials (P5)
11	Electric bulb holder		Constructing simple electric circuit Unit 8: Types of energy (P3) Unit 9: Electricity (P3) Unit 15: Electricity (P5)

12	Gas jars		• Showing transparent material • Demonstrating the presence of oxygen in air • Demonstrating the presence of carbon dioxide in air Unit 14: Light (P5) Unit 16: Materials (P5) Unit 7: Air, wind and sound (P4) Unit 16: State of matter (P6)
13	Pairs of vinyl gloves		Prevention against contamination Unit 14: Energy management (P6) Unit 8: Soil (P4) Unit 9: Soil (P5)
14	Claw hammer		Fixing and removing nails in a wood Unit 1: Carpentry tools (P5) Unit 2: Masonry tool (P5) Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)

15	Iodine		Demonstrating sublimation Unit 16: Materials (P5) Unit 16: State of matter (P6)
16	Iron plate		Identification of metal properties Unit 8: Types of energy (P3) Unit 10: Magnet (P3) Unit 16: Materials (P5)
17	Iron fillings		Showing magnetic field Unit 10: Magnet (P3) Unit 15: Magnetism (P6) Unit 16: Materials (P5)
18	Knitting thread		Making the clothes Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)
19	Knitting needles		Making textiles products Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)

20	Lever switch		Constructing electric circuit Unit 8: Types of energy (P3) Unit 9: Electricity (P3) Unit 15: Electricity (P5)
21	Magnifying lens		• Differentiating transparent and opaque objects • Magnifying the size of objects including some sensory organs Unit 12. Human sensory Organs (P4) Unit 14: Light (P5)
22	Markers		Drawing and writing Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)
23	Metallic saw		Using various hand tools and identifying their use. Unit 8: Types of energy (P3) Unit 1: Carpentry tools (P5) Unit 2: Masonry tool (P5)

24	Metal file		Identifying various hand carpentry tools and their use. E.g.: Sharpening metallic saw Unit 1: Carpentry tools (P5) Unit 2: Masonry tool (P5)
25	Metallic stick		• Investigating electrical conductivity • Identification of metallic materials Unit 9: Electricity (P3) Unit 15: Electricity (P5) Unit 10: Magnet (P3) Unit 15: Magnetism (P6)
26	Model respiratory system		Demonstrating inspiration and expiration mechanism (Respiration) Unit 12: Respiratory system (P6)
27	Modeling clay		Making a cow and other objects Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)

28	Naphthalene		Demonstrating Sublimation Unit 7: Air, wind and sound (P4) Unit 16: Materials (P5) Unit 16: State of matter (P6)
29	Plane mirror		Demonstrating reflection of light Unit 14: Light (P5)
30	Plug		Plugging electric materials Unit 9: Electricity (P3) Unit 15: Electricity (P5)
31	Roberval scale		Finding the mass of some objects Unit 16: Materials (P5)
32	Sand paper		Smoothing a rough wood Unit 1: Carpentry tools (P5)

33	Scissors		• Cutting materials using scissors • Giving first aid in case of accident • Demonstrating simple machines Unit 16: Materials (P5) Unit 2: Simple machines (P6) Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)
34	Tester Screwdriver		Detecting the presence of electricity in the circuit Unit 9: Electricity (P3) Unit 15: Electricity (P5)
35	Screwdriver		Identifying some hand tools used in carpentry and masonry Unit 9: Electricity (P3) Unit 15: Electricity (P5) Unit 1: Mechanics and blacksmith tools (P6)

36	Sewing threads		• Repairing the clothes and buttons • Making different objects from different materials Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)
37	Single pulleys		• Rifting objects • Identifying simple machines • Making some simple machine Unit 2: Simple machines (P6) Unit 2: Objects production (P4) Unit 3: Objects production (P5) Unit 3: Objects production (P6)

38	Spirit lamp		• Manipulating sources of light and heat • Identifying physical properties of some metals • Demonstrating that Air support combustion • Making objects like balls • Repairing plastic materials • Illustrating heat transfer by conduction, convection and radiation • Illustrating good and poor conductor of heat • Demonstrating formation of shadow • Illustrating some forms of energy e.g :-Burning paper, Boiling water • Identifying good and poor conductors of heat • Experimenting the changes of matter from one state to another Unit 7: Light and heat (P2) Unit 8: Types of energy (P3) Unit 8: Water (P5) Unit 16: Materials (P5)
39	Standard mass		• Finding the mass of some object • Making models of some simple machines Unit 16: Materials (P5)

40	Steel plate		Demonstrating properties of metals Unit 16: Materials (P5)
41	Syringes		• Measuring the volume • Demonstrating air properties (Compressibility) Unit 7: Air, wind and sound (P4) Unit 16: Materials (P5)
42	Thermometer		Measuring and calculating temperature of objects Unit 7: Light and heat (P2) Unit 8: Types of energy (P3) Unit 8: Water (P5) Unit 16: Materials (P5) Unit 16: State of matter (P6)
43	Torch		• Demonstrating formation of shadow • Demonstrating light propagation Unit 7: Light and heat (P2) Unit 8: Types of energy (P3) Unit 14: Light (P5)

44	String balance		• Finding the mass of some objects • Making models of some simple machines Unit 16: Materials (P5)
45	Paper filters		Purifying water Unit 8: Water (P5)
46	Wires		Constructing simple electric circuit Unit 9: Electricity (P3) Unit 15: Electricity (P5)
47	Electric meter		Measuring electricity in electric circuit Unit 8: Types of energy (P3) Unit 9: Electricity (P3)
48	Double ended spanner		Identifying mechanics tools and their use Unit 1: Mechanics and blacksmith tools (P6)

49	Plier		• Identifying mechanics tools and their use • Cutting materials Unit 9: Electricity (P3) Unit 15: Electricity (P5) Unit 1: Mechanics and blacksmith tools (P6)
50	Stethoscope		Detecting the heart beats Unit 11: Circulatory system (P6)
51	Blood pressure meter		Measuring the blood pressure Unit 11: Circulatory system (P6)
52	Electronic balance		• Measuring small masses • Identifying the properties of air (air has weight) Unit 2: Air and wind (P2) Unit 7: Air, wind and sound (P4) Unit 16: Materials (P5) Unit 16: State of matter (P6)

53	***First aid sub - kit***		
53.1	Sterile stickers		• Preventing mistaken double doses in the preparation of medications and contaminations in medications for repeated use. • Marking medication syringes ready for use, medications and more.
53.2	Chlorhexide Gauze		• Preventing against bacteria contamination. • Treating burns, skin grafts, ulcers & other injuries.
53.3	Roller of band-aid		Providing support for joints and pressure to reduce edema and assist in venous return.
53.4	Antiseptic spray		Eliminating germs on hands and other parts of the skin, disinfects scrapes, cuts and abrasions
53.5	Pair of tweezers		Using in disinfection process

53.6	Safety pins		Holding the band-aid, stretchable bandage and clothes during drying on sunlight
53.7	Stretchable bandages		Providing first aid using bandage
53.8	Compressive sterile bandage		• Sealing the wound; Soak up blood, plasma, and other fluids exuded from the wound, • Removing slough and foreign objects from the wound; • Removing slough and foreign objects from the wound; • Protecting from infection i.e to defend the wound against germs and mechanical damage
53.9	Medicated dressing		• Covering the wound for preventing pain in case of wound; • Removing slough and foreign objects from the wound to expedite healing; • Obscuring a healing wound from the view of the patient and others.

PRACTICAL ACTIVITIES FOR PRIMARY FOUR (P4)

PART 3: PRACTICAL ACTIVITIES

Practical Activity 1. Demonstrating that air has weight

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Air is a mixture of gases. Air is what everybody breathes in the daily life. Many people may think that air has no weight, but it has it and it is possible to demonstrate it. In this activity, learners will demonstrate how air has weight.

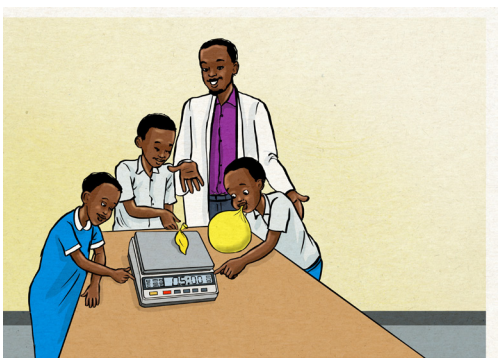
Objective

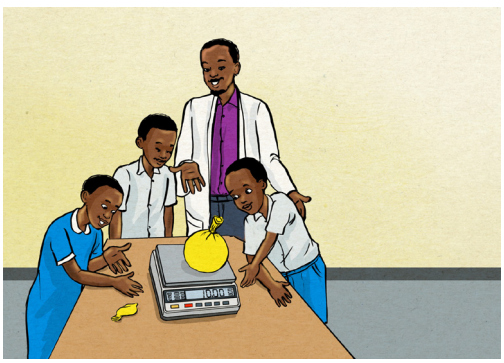
Learners will be able to demonstrate how air has weight.

Required materials

- Deflated air balloons
- Strings
- Electronic balance

Illustration of the activity





Steps for the activity

1. Collect before required materials to be used in the activity
2. Avail materials to be used and distribute them to learners

3. Invite and guide learners to do the following
   - To take one empty air balloon
   - To weight it together with a piece of string on the electronic balance
   - To read the weight of the empty balloon together with a piece of string and write it on sheet of paper (W_1).
   - To blow air in it but without breaking it.
   - To tie well its end with a piece of string
   - Now to place it on the pan of electronic balance
   - To read the weight of the balloon inflated with air and write it on sheet of paper ($W_{2)}$
   - To do the difference between the two weights (W).
   - To complete the following table:

Weight of empty balloon with a string (W_1)	Weight of balloon inflated with air (W_2)	Difference between the two weights ($W=W_2-W_1$)

4. Ask the learners the following questions: Do the empty balloon and the balloon with air weight the same? What cause the difference? What does it mean? How much did the air blown in the balloon weight?

Results

The empty balloon together with a piece of string put on electronic balance has a certain weight.

The same balloon inflated with air weights more than the empty balloon.

The inflated balloon weight recorded is greater than weight recorded on empty balloon.

Conclusion

The inflated balloon weight is greater than the one of empty balloon simply because it has air inside. This shows that air has weight.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What are other examples that show that air weights?
2. Apart from balloon, how will you demonstrate that air weights?

Practical Activity 2. Demonstrating that air occupies space

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Air is a mixture of gases. Though we can't take or touch the air around us, it is like other matters made of particles that occupy space. In this activity; learners will explore how the air occupies space/ volume.

Objective

Learners will be able to demonstrate that air occupies space.

Required materials

- Deflated air balloons
- Pieces of strings

Illustration of the activity

Steps for the activity

1. Collect before required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To take an empty air balloon
   - To blow it until it increases in size
   - To let the balloon be deflated
   - To blow it again until it increases again in size
4. Ask the learners the following questions: What makes the air balloon to be inflated, Explain why?

Results

When air is blown in a balloon, the balloon inflates.

When you tie the balloon inflated with air, the air stays inside and the balloon stays inflated.

When you remove the string on the inflated balloon, the air moves out and the balloon is deflated. This means that it occupied the space in the balloon.

Conclusion

The air occupies the space. It is in the same way that air causes football and bicycle tubes to inflate.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. How will you demonstrate in other ways that air occupies space?
2. What are materials used in daily life that demonstrate that air occupies space?

Practical Activity 3. Demonstrating that air can be compressed

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Air is a mixture of gases. The air compressibility is useful in real life as it can be source of the energy such as in power pneumatic machinery, drills, hammers, wrenches and grinders. In this activity learners will discover and apply compressibility properties of air in real life experience.

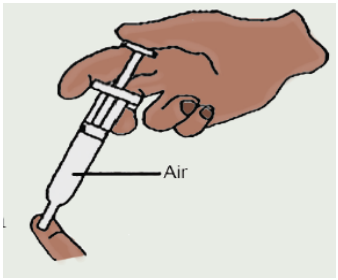
Objective

Learners will be able to demonstrate how the air can be compressed .

Required materials

- a syringe
- a Plunger

Illustration of the activity



Steps for the activity

1. Collect before required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following
   - To take a syringe
   - To take its plunger and pull it at 15ml of air
   - To put your finger to cover its nozzle
   - To push slightly the plunger down, what do you feel?
4. Ask the learners the following questions: Why can you push the plunger into a certain extent? Why when you press the inflated balloon, it reduces its volume?

Results

When you pull a syringe, the piston of the syringe is moved inwards and a certain quantity of air enters in it and occupies the whole space provided. This implies that the air inside the syringe is expansible.

When you push the syringe being covered with the finger, the space occupied by air reduces. The air is expansible.

Conclusion

The air in a container or a space can be compressed without removing any quantity of air in that space. There is more space between air particles so they can be pushed closer together so that air can be compressed.

Guidance on the evaluation

Ask questions related to the activity performed by learners:

1. How can you demonstrate to your parents that air can be compressed?
2. What are the uses of compressed air in daily life?

Practical Activity 4. Demonstrating the existence of oxygen in air

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Air is a mixture of gases. Most living things need oxygen to survive. Oxygen helps organisms to grow and to reproduce. Learners need to know existence of oxygen in the atmosphere. This activity will allow learners to discover the presence of oxygen which exists in air, gain knowledge and skills linked to the importance of oxygen in the daily life.

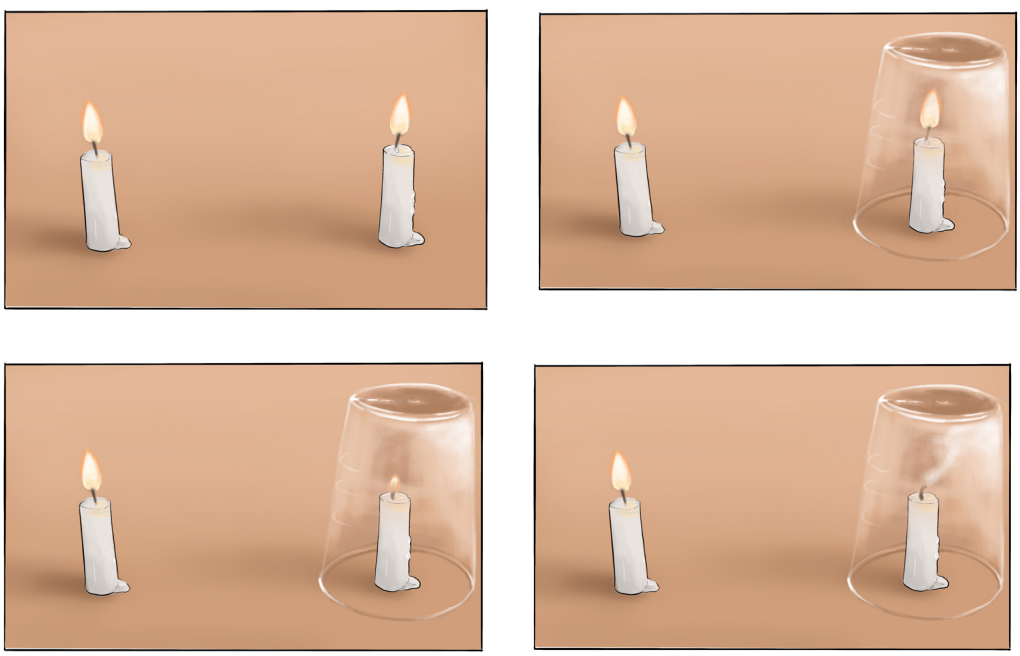
Objective

Learners will be able to demonstrate the existence of oxygen in air.

Required materials

- Beaker
- Two wax candles
- Box of matches or gas lighter

Illustration of the activity



Steps of the activity

1. Collect the required materials
2. Invite and guide learners to do the following:
   - Take two wax candles and light them at the same time
   - Take the beaker and lower the open end of a beaker, such that it inverted on one of those lit candles and write down what you observe?
   - Observe for a while and write down what you see and make a comparison for two wax candles.
3. Ask the learners the following questions: Which gas in the air is consumed by the burning candle?

Results

Learners observed that when a lit wax candle is covered by a beaker, the burning progressively failed to continue due to insufficient oxygen because the oxygen in air contained in the beaker was consumed by the burning candle.

Conclusion

Normally the air contains oxygen. Since the oxygen got finished, the burning failed to continue.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Give 3 examples of activities that can prove the existence of oxygen in air?
2. Which gases in the air are not used for burning?

Practical Activity 5. Demonstrating the existence of carbon dioxide in air

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Carbon dioxide is one of the gases found in the atmosphere and important for the green plants as they use the gas to make their own food. In this activity learners need to know the existence of carbon dioxide and its source, and gain knowledge and skills on how it is usefully in the daily life.

Objective

Learners will be able to demonstrate the presence of carbon dioxide in the air.

Required materials

- A patch on a green grass lawn.
- A large stone.

Illustration of the activity

Steps of the activity

1. Collect the required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To select a small patch of green grass on the school compound.
   - To note the colour of the grass, and cover it with a large transparent jar about 1 week
   - To remove the jar after this duration, and observe the colour of the grass which was covered by the jar. What do you notice?
4. Ask the learners the following questions: what is the colour of the grass after one week? Why did the color of the grass change?

Results

The grass patch became pale-yellow because the jar cover was air-tight. The grass under the jar did not get carbon dioxide from the air needed to make the green colouring matter of the leaves.

Conclusion

Carbon dioxide is present in the air, as the un-cover part of the lawn remained green, whereas the jar -covered part could not form green matter. The covered part lacked air or carbon dioxide in the air, and was unable to make the green colouring matter of the leaves.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What is the importance of carbon dioxide for living beings?
2. What results would you expect if a sheet of cardboard was used in the experiment instead of a jar? Give a reason for your expectation

Practical Activity 6. Investigating the dangers of carbon monoxide

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Carbon monoxide is known to be emitted by burning of fuels in a limited supply of air. The dangers of carbon monoxide are therefore worth investigating, since learners may at one time, be exposed to the gas and the adverse effect of the gas to the animal. The animal's response to carbon monoxide will demonstrate to the learners, the danger of the gas.

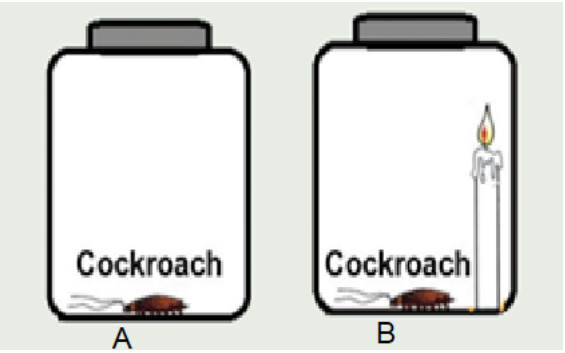
Objective

Learners will be able to demonstrate the danger of carbon monoxide on living animal.

Required materials

- Two transparent glass or plastic jars with their lids.
- A wax candle and a box of matches or gas lighter.
- Two living cockroaches.If these are not available, use crickets or grasshoppers or living rats or mice.

Illustration of the activity



Steps of the activity

1. Collect the required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To collect 2 jars, label them A and B
   - To stick a burning wax candle at the bottom of jars B, while jar A is left.
   - To place a living cockroach in each of the jars and close the jars tightly with their lids
   - To closely observe the animals in the two jars for about 30 minutes and write your observation. Explain your observations in jar A and b
4. Ask the learners the following questions: Explain why a burning candle was placed in jar B? What happened to the cockroach in jar A and B?

Results

The cockroach in jar B becomes unconscious because it was exposed to carbon monoxide, which was produced by the candle. The cockroach in jar A is not affected, as there was no carbon monoxide in the air which it breathed in.

Note: The teacher gives short explanation about effect of carbon monoxide mainly on human being.

Health hazard: Carbon monoxide is a poisonous gas that has no colour, no smell or taste. Breathing it in can make people unwell, and it can also kill them if exposed to high levels. It is a suffocating poisonous gas.

Precaution: Never burn gas stove, kerosene stove, charcoal stove or other fuels inside or in enclosed room, especially sleeping areas.

Guidance on evaluation

1. A burning candle and other fuels burn in air to produce carbon dioxide. Explain why the candle in the above activity produces carbon monoxide which affects the rat in jar B.
2. What will happen to a person if he/she burns a charcoal stove in a closed room and he/ she sleeps in it?

Practical Activity 7. Demonstrating the existence of wind

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Wind is a moving air and a major factor in determining weather and climate. Wind carries heat, moisture, pollutants and pollen to new areas. Many daily weather patterns depend on wind, also wind is the source of the energy that can be as electricity . This activity will lead learners to discover the existence of wind in their environment.

Objective

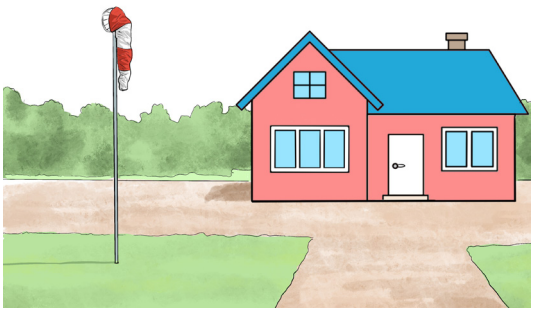
Learners will be able to demonstrate the existence of wind.

Required materials

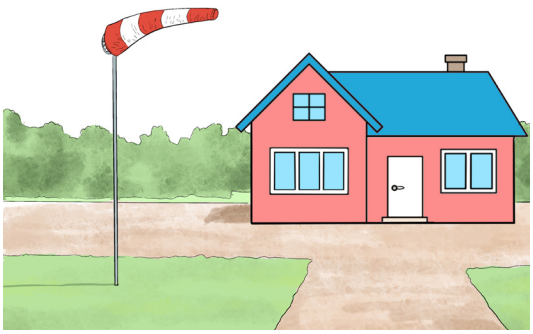
- A candle
- A box of matches
- Sacks
- Stick

Illustration of the activity

A



B



Steps for the activity

1. Collect the required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:

A

- To light Candle with source of a light
- To place it in the classroom near window where there is free movement of air.
- Ask learners the following questions: What do you observe? What makes the candle flame to be disturbed?

B

- To build a wind socks from the stick with a locally based sacks
- To put it near your school where there is a free movement of air
- Ask learners the following questions: What makes the socks moving to one direction or changing the direction?

Results

Learners observed that the candle flame is disturbed and moves to different directions. The wind sock is moving to one direction or changing the direction and realized that the changes observed is depending to the existence and the moving air direction.

Conclusion:

a) For the light candle, moving air disturbs the flame and this moving air is called wind.
b) For the Windsocks, moving air blows from a particular direction and at a certain speed and this shows some of the properties of the wind.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What do you understand by wind?
2. Briefly explain how the wind helps us?
3. What is the use of windsock?
4. Which area uses the windsock most?

Practical Activity 8. Demonstrating the use of wind

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

The wind can be used in the daily life activities and make works easy. In this activity, the learners will be aware that they can use wind to conduct effectively different activities in their daily life such as winnowing or separating mixtures, drying clothes and others.

Objective

Learners will be able to demonstrate the importance and the use of wind.

Requirement materials

- Different crops (beans' crops) associated with lighter husks material (lighter waste).
- Winnower
- An open area where there is free movement of wind

Illustration for the activity

Picture A

Picture B

Steps for the activity

1. Collect the required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:

A. Winnowing

- To put a mixture of beans and lighter husk particles on a winnower
- To go to an open area where there is free movement of air
- To move the mixture up and down using a winnower,
- To repeat the activity and make sure light husk particles are separated from bean's crops

B. Drying clothes

- To take two wet clothes.
- To hang them in the open area.
- To observe these clothes just after two hours.

1. Ask learner the following questions: what do you observe? What happen to wet clothes?

Results

From the activity, learners observed that the grains separate from the light waste in the mixture, the experiment provides good results when the air moves to one side direction. The moving air blowing to different directions affects the grains separation from the mixture and also makes clothes to dry.

Conclusion

Farmers separate lighter husk particles from heavier grains (separating from grains and light waste) like corn, Millet, Sorghum, Maize etc… by wind help and this process is called winnowing. The moving air also helps clothes to dry.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. After two hours, you will find the clothes become dry. What make the clothes dry?
2. What makes grains to separate from lighter husk particles and crops/ grains?
3. Give other uses of wind in your daily life?
4. Discuss the advantages and disadvantages of wind?

Practical Activity/Project 9. Planting trees

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

We always use and benefit from trees. Most often we plant trees recognizing their importance on our life. Trees provide obvious benefits such as: social (homes for many species of wildlife and mammals), communal (protection), environmental (provide shade and beautify our landscapes, reduces erosion and pollution in our waterways and reduce the effect of flooding) and economic benefits (provide food). This activity will allow learners to gain skills and knowledge of how planting trees and their uses in their daily life.

Objective

Learners will be able to identify plant growth requirements and the importance of plants in environment.

Required materials

- Empty jars or small buckets
- Lids
- Soil
- Water
- Knife
- Hoe, shovel, spade
- Watering can.
- Seedling
- Tape measure
- Gloves
- Hoe, shovel, spade
- Watering can
- Seedling
- Tape measure
- Gloves

Illustration of the Activity

Steps of the Activity

1. Find the empty jars or cut plastic bottles or request learners to bring empty jars or small buckets from home;
2. Find the seeds available in your school community.
3. Have soil mixed with manure.
4. Invite and guide the learners to do the following:
   - To take and put dry soil in four jars.
   - To put the seed into jars with soil.
   - To place some jars on class veranda and other inside classroom and water them every day.
   - If the school has enough space in school garden, it is better to make a whole project in garden of the school where all learners have full participation and involvement.

5. Invite learners to observe the plants in the jars every day. Every observation ask them the following questions: In which jars plants grow well? Why? What is the progress compared to the day before? What are the changes and differences in growth? What are the benefits of plants in environment? Can plant prevent effect of wind?

Results

As learners plant the trees, they observed that the plant need manure to grow well as they add in it, plant need water to grow as they will notice the plants inside the class will not grow in the same way as the plants planted outside. So, they will notice that plant need light also and plant can protect wind.

Conclusion

The project of planting trees will enhance the skills and knowledge about tree and know the requirement for trees to grow

N.B This planting tree project can be used in different level from P4 up to P6 in all units related to the plant.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What is the importance of planting trees?
2. Explain briefly what have you learned?
3. What are difficulties in your activity?
4. Can you make it at home?

Practical Activity 10. Field visit on the effects of the wind in the environment

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

The wind blows trees, destroys houses, causes soil erosion and destroys environment and home for wild animals, birds etc. This field visit is for learners to observe the effect of the wind in the environment and surrounding and acquire knowledge, skills on the effect of wind and how to prevent it.

Objective

Learners will be able to identify effect of the wind in the environment.

Logistics and required materials:

- Visiting site (Mountain, Destroyed houses, plant, Field)
- Select a date and notify authority
- Transportation (bus)
- Arrangements for lunch and restroom
- A parent permission form for them to sign
- Budget and its source
- Attendance sheets for trip
- Dressing code for trip depending on visiting site
- First aid kit

Illustration of the activity

Steps of the activity

1. Put students in bus or line
2. Give the rules and guidelines to follow on visiting site
   - To be safe on site
   - To be on line while observing
   - Never leave students alone
   - Make small groups and select leaders
   - Arrange the learners so they can see and hear.
3. Provide learners with a story tell so they are engaged in a meaningful examination and interaction while on-site.

4. As learners observe ask them some questions to find out the effect of wind on visiting site, consequences of wind on environment, effect of wind on development, the lesson learnt from the Field visiting.
5. If the school has the digital material, they may conduct virtual field visit on effect of wind in environment such as boats sink**,** Flying plane crash and other.

Field visit results

On visiting site, learners observed the uprooted trees, destroyed houses and the erosion caused by the wind and the effect of the wind on the environment.

Conclusion

Going on a field trip enhances learners' critical thinking skills and gives students a chance to think about a topic or theme from a different perspective. A school trip gives students the chance to experience new venues and allows learners to see firsthand how environmental impacts have occurred. Thus, learners are aware on effect of wind on the environment.

Guidance on evaluation

Ask questions related to the field visit:

1. What are the effects of wind have you observed?
2. Discuss measures that can be taken to prevent the effect of wind on the environment?
3. What are the bad effects of wind on the environment?
4. How does wind affect plants and animals?

Practical Activity 11. Investigating the propagation and transmission of the sound

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Sound propagation and transmission can be used in many ways to transmit information from one place to another through the medium (air, liquid etc). This is the principle behind of the function of telephone, and television and other form of communication. In this activity, learners will investigate how the sound is propagated and transmitted.

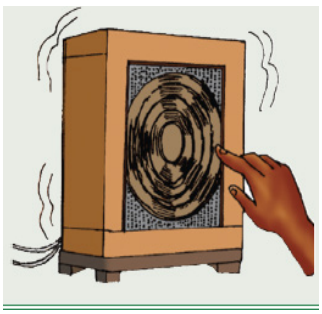
Objective

Learners will be able to investigate the sound transmission and its medium of transmission.

Required materials

- Music system
- Two paper cups
- A string

Illustration of the activity



A

B

Steps for the activity

1. Collect the required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:

A. **Sound propagation**

- To play a music on radio
- To put your hand on its speaker. What do you feel?

B. Medium of transmission

- To take two paper cups.
- To make a hole at the bottom of each cup.
- To insert a string in both holes and tie a knot.
- To give one cup to your friend. Ask him/her to hold it to his/her ear.
- Walk away until the string is stretched tightly.
- Ask learners the following questions: speak into your cup; can your friend hear you? Try it the way round? Why do you think to string must be stretched tightly, and what can you hear when it is not stretched?

Results

Learner feels the vibrations of the speaker. Its back and forth movements make the sound propagate towards ears. This movement creates sound waves. If learner's ear is within range of the vibrations, learner hears the sound.

When learners are separated, one group at one side another group on the other side taking distant according to the length of the string, stretched string provides sound within the cups and learners can interact through sound transmission.

Conclusion

This shows that sound move**s** through a medium of propagation and sound transmits through solids.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Why we use string between the cups?
2. What are other sources of sound can make vibration?
3. How is sound propagated and transmitted?

Practical Activity 12. Demonstrating sound reflection

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

Sound reflection known as an echo has much application in real life. A faint sound similar to original sound is heard after a while. This can be experienced in big empty rooms or halls. This activity will allow learners gain skills and knowledge of sound reflection.

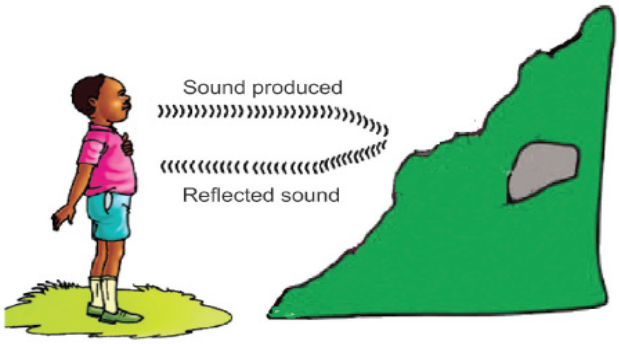
Objective

Learners will be able to demonstrate the existence of sound reflection in our environment.

Required materials

- A partially closed big container (a big conference room, classroom , dining room)
- Source of sound

Illustration of the activity



Steps for the activity

1. Collect the required material
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To use a big conference room or dining room and your classroom
   - To close the windows and doors
   - To shout loudly when in middle of the class. What do you hear after a while?
   - Do it several times, and make your observation

Results

It was observed that when a source of sound is incident in an empty container (conference room, dining room and empty classroom), it is reflected back making an echo. When there is a heavy sound (loud speakers), echo sounds much more, while low sound's echo sounds much lower.

Conclusion

This activity shows the existence of a sound repetition or a partial sound repetition due to the effect of reflection. The reflection of sound is called an echo.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What causes an echo in a room?
2. What is the example of echo sound?
3. Can you make an echo at home?
4. Discuss other places we can create an echo?

Practical Activity 13. Demonstrating ear protection against noise

P4 **Unit 7: Air, wind and sound**

Rationale for the activity

During the daily life activities, we face noise from different sources of sound that make people feel bad. In this activity, learners will learn the ways of protecting ear against noise and learners will acquire knowledge and skills on how to protect the ear from noise from different sources of sound.

Objective

Learners will be able to identify the method and material which can be used to protect ear from the noise

Required materials

- School bell
- Hammer
- Protective earmuffs

Illustration of the activity

Steps of the activity

1. Collect the required materials
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
    - To strike a hammer on a school bell and hear the sound it produces when ringing.

- Wear protective earmuffs and strike again. What do you hear?
- Compare the sound heard for both strikes and give the difference of sounds?

4. As learners observe, asks them the following questions: what is the importance of ear protection? Why is it important to protect you hearing? What is the importance of ear protection on health?

Results

When learners do this activity for the first time, they hear the strong sounds (strong ringing) that seem like a noise but for the second time when they wear protector earmuffs, they hear moderate sounds (moderate ringing). Therefore, learners hear the difference in sounds and appreciate the importance of ear protector.

Conclusion

It is very important to protect our ears from the noise. Ear protection helps to protect our hearing from damaging noise that may be present at any given time around us. Long exposure to these loud noises can cause serious long-term damage that only gets worse over time; so protecting our ears is an important part of protecting our hearing from these damaging noises.

Guidance on evaluation

Ask questions related to the activity performed by learners?

1. What are the sources of noise?
2. What have you learned from the activity?

Practical Activity 14. Identification of different types of soil

P4 **Unit 8: Soil**

Rationale for the activity

When we look around us, we find that the soil is much used in our daily life. Soil is used in different activities like construction, cultivation etc. This is why it is good to know the types of soil according to its uses. In this activity, learners will be in position to identify the different types of soil by using water.

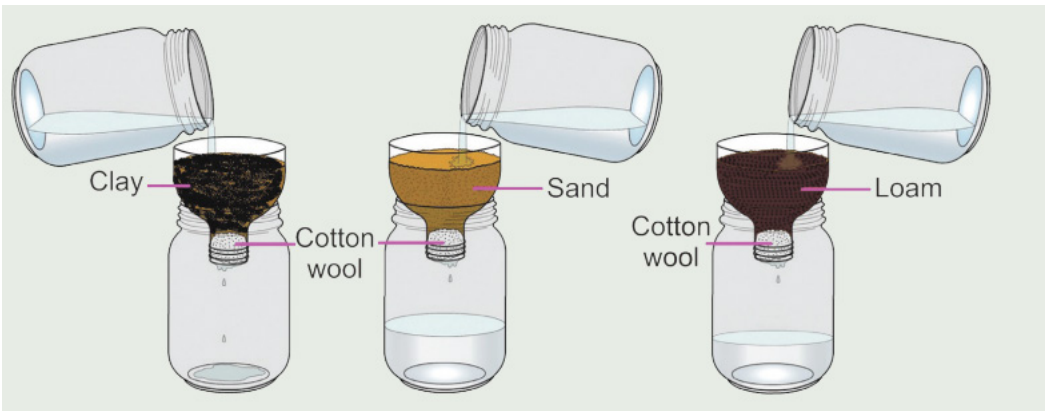
Objective

Learners will be able to identify different types of soil using water.

Required materials:

- jam jars
- funnels
- Some clay
- Sand
- Loam
- Water
- Cotton wool or cloth

Illustration of the activity



Steps of the activity

1. Collect required materials (three jam jars, three funnels, some clay, sand, loam and water)
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To put some cloth at the neck of the funnels
   - To put each type of soil in different funnels
   - To put funnels above the jam jars
   - To set up the experiment
   - Slowly pour the water onto each funnel
   - Wait for 5 to 10 minutes
4. Ask learners the following questions: What soil that has allowed much water to pass through? What soil has not allowed water to pass through? What soil that has allowed little water to pass?
5. Ask learners to put on order the soils depending on quantity of water that passed through the soil.

Results

As the learners pour water through different funnel, they will observe that the clay soil will not allow water to pass through it easily. The sand soil will allow all water to pass through easily and the loam soil will allow some water.

Conclusion

There are three main soil groups: **clay, sandy, and loamy soils**. They each have different properties and it is important to know these to make the best choices and get the most from your garden.

For example: The clay soil will not allow water to pass through but sand soil will allow water pass through it easily and loam soil will allow some water to pass.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Which type of soil is suitable for agriculture?
2. Which type of soil is suitable for construction?
3. What have you learned?

Practical Activity 15. Identification of composition of soil

P4 **Unit 8: Soil**

Rationale for the activity

Soil is structured by arrangement of its particles (clay, silt and sand) into aggregates. A good soil structure is important because it allows air and water into the soil, which are vital for healthy plant growth and soil aggregates increase the soil's ability to avoid breaking down when acted on by water, wind and tillage. Without a good structure, soils will suffer from a lack of oxygen, water logging and nutrient lock-up, which means plants are unable to absorb nutrients from the soil and will ultimately perish.

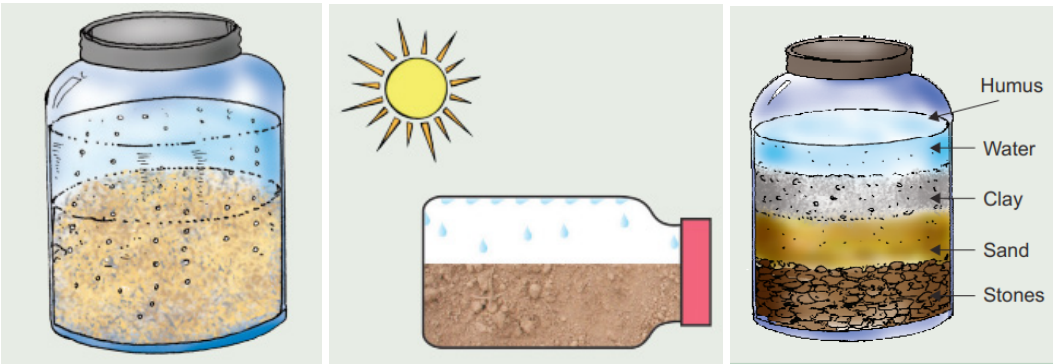
Objective

Learners will be able to identify the different parts of soil

Required materials:

- Three jam jars
- Garden soil (dry)
- Water
- Stick

Illustration of the activity



Step A Step B Step C

Steps of the activity

1. Collect required materials (transparent jars, soil, water and sticks)
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:

Step A.

- To take a jar and half-fill it with dry soil
- To pour water into the soil.
- Ask the following questions: What do you observe? Do you observe it bubbling out?

Step B.

- To take another jar and half-fill it with soil
- To close its lid and keep it under the sun
- Observe the inside of the jar after about a half an hour
- Ask questions of what they are observing, is any change inside jar?

Step C.

- Take a handful of garden soil.
- Pour it into a wide mouthed transparent bottle or jar.
- Add water to it

- Stir the soil and water vigorously with a stick
- Allow it to settle for a few hours
- Ask questions of what they are observing. Is there any different layers of soil?

Results

In step A, when soil is watered, water fills up the spaces between the grains of soil. The air is then pushed up as bubbles. This shows that air is trapped in the spaces between the grains of the soil.

In step B, you will see droplets of water on the sides of the jar. This shows that soil contains water or moisture.

In step C, you will see that the soil settles in different layers.The largest particles (stones) go down to the bottom. Above this layer, bigger grains of sands settle. Over the sand, you will find a layer of clay. On the top of water floats the humus. This shows that soil contains stone, sand, clay and humus

Conclusion

This activity demonstrates the component of the soil. Soil have air, moisture, clay, sand, stones and humus.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What is the *composition of soil*?
2. What is the importance of water in this activity?
3. What have you learned?
4. How do you determine the composition of soil?

Practical Activity 16. Demonstrating the process of soil erosion, its prevention and control

P4 **Unit 8: Soil**

Rationale for the activity

In our community we may face the disasters caused by water and wind. For instance, there is surface runoff reduce soil fertility, water pollution, etc. Learner need to know the process of soil erosion and the effect of soil erosion. In this activity, learners will gain knowledge and skills on the process of soil erosion and how to prevent or control it..

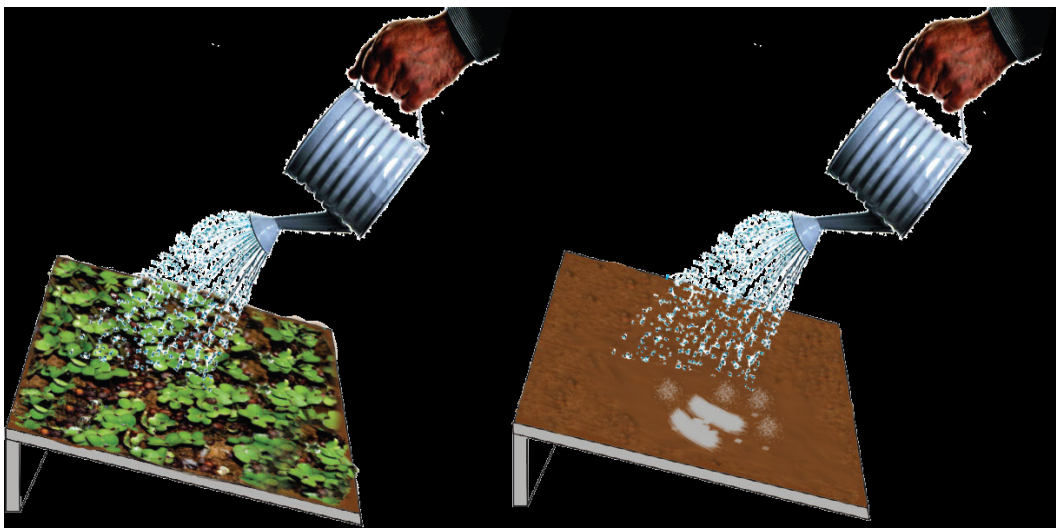
Objective

Learners will be able to identify the process of soil erosion, the effect of soil erosion and how to prevent it.

Required materials

- Garden soil
- Two trays
- Seeds
- watering can

Illustration of the activity



Steps of the activity

1. Collect required materials (garden soil, two trays, seeds, watering can)
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:

Step A.

- To take some garden soil and place it on a flat surface
- To take a watering can fill with water.
- To pour water on the soil piled up on the flat surface. What's happened?
- Ask questions about what they are performing. What causes soil to wash away?

Step B.

- To take two trays and fill them with soil
- To cultivate some mustard or gram seeds in the first tray.
- To water the first tray for a few days, till it is covered with plants
- To tilt both the trays at equal angles.
- To pour water gently on both the trays.
- Ask questions about what they are observing. Ask the difference due to water?

N.B: The teacher can organize the field visit on a mountain or valley that has been damaged by erosion

Results

In step A, learners observed that when water is poured on the soil, it washed away some soil. The teacher should discuss with the learners that the process of carrying away of soil by wind, water or other agents is called soil erosion.

In the step B, learners observed that a certain amount of soils is washed away from the tray without transporting the plants.

Conclusion

When water is poured on the soil without plants, it will wash away some soil. When the are plants on soil, the water will not wash away the soil in the same way.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. From the activity, what is the importance of plants?
2. From your observation, what is the raindrop impact on the soils?
3. Explain how soil erosion occur?
4. Discuss causes of erosion?

Practical Activity 17. Field work on soil erosion control

P4 Unit 8: Soil

Rationale for the activity

In daily agricultural activities, people are confronted with the effect of soil erosion; to overcome it, the necessary preventive measures must be taken. Thus, since there are many techniques for controlling erosion, learners must know some of these techniques. In this activity, learners acquire skills to control soil erosion in their life.

Objective

Learners will be in position to control soil erosion by using the process of making bench terraces.

Required materials

- 26 trees(imambo)
- Sacks
- Manure
- Soil
- Vegetable seeds
- Watering can.
- Spade
- Hoe

Illustration of the activity

Steps of the activity

1. Collect required materials (26 up 36 trees, sacks, soil, spade, manure, vegetable seed)
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
    - To use trees and sacks construct U-shape as first floor of kitchen garden
    - To add soil in first floor
    - To use trees and sacks construct U-shape above first floor
    - To add soil in second floor
    - To use trees and sack construct U-shape above second floor
    - To add soil in third floor
    - To add manure and planting vegetable seed after construction
4. Ask questions of what they are observing: How this kitchen garden can facilitate in soil prevention? When you pour water above kitchen garden did the soil wash away?

Results

After building the kitchen garden and pour water on it, learners observed that soil did not washed away as it was taken. This demonstrate the way terraces are made and help in soil erosion control.

Conclusion

Kitchen garden helped to demonstrate soil erosion control and can be used in the family and school feeding programs. The kitchen garden is constructed in the same way of terraces which help in soil erosion control.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What do you understand by soil erosion control?
2. What makes soil do not wash away?
3. What are types of soil erosion control techniques?

Practical Activity / field visit 18. To identify animals according to their major characteristics

P4 **Unit 9: Animals**

Rationale for the activity

In our community, we have different kind of animals. Those animals have different characteristics regarding their modes of locomotion, feeding and shelter. In this activity, learners will enhance their skill to identify animals according to their major characteristics and the ways they survive (locomotion and feeding).

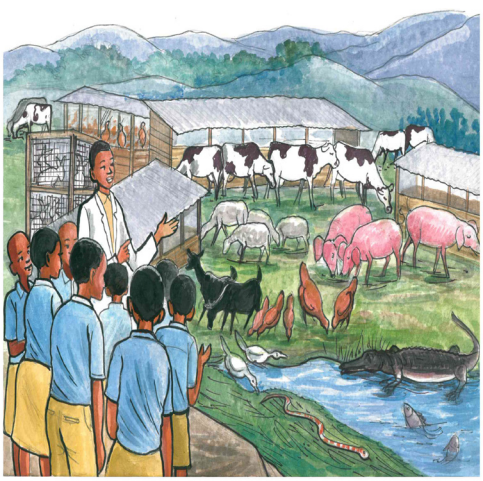
Objective

Learners will be able to identify animals according to their major characteristics.

Required materials:

- Identification of the nearest animals farm
- Select a date and notify authority and farm owner.
- Transportation (bus)
- Arrangements for lunch and restroo
- A parent permission form for them to sign
- Budget and its source
- Attendance sheets for trip
- Dressing code for trip depending on visiting site
- First aid kit

Illustration of the activity



Steps of the activity

1. Put learners in bus or on line when they are going in school surrounding.
2. Give the rules and guidelines to follow on visiting site
   - To be safe on site
   - To be on line while observing
   - Never leave students alone
   - Make small groups and select leaders
   - Arrange the learners so they can see and hear
   - Make an observation on animals feeding, moving, etc…..and take notes.
3. Provide learners with a story tell so they are engaged in a meaningful examination and interaction while on-site.
4. As learners observe, ask them the following questions: what are different characteristics of animals? How animal differ from another according to the movement, feeding?
5. To make sure every learner returns in the school on time, no one left behind.
6. If the school has the digital materials they may conduct virtual field visiting on animals which are not in school surrounding and environment like wild animals.

Results

From the field visit, learners observed how animals behave, feed and move. This enhanced their knowledge about the animals and how differentiate them according to their major characteristics (locomotion, feeding, etc…).

Conclusion

Animals can be divided into groups or ‹classified’ by looking at their physical characteristics and behaviors or looking at the similarities and differences between them.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What are different characteristics of animals?
2. What are modes of locomotion?
3. What is the type of feeding mode?

Practical Activity 19. Identification of location of spiracles in insects

P4 Unit 9: Animals

Rationale for the activity

The human being survive because of the air. The insects also need air to survive, but they have different mode of respiration. Human use the pulmonary, but some insects use spiracles. This activity is for learners to learn the location of spiracles in insect and its respiration.

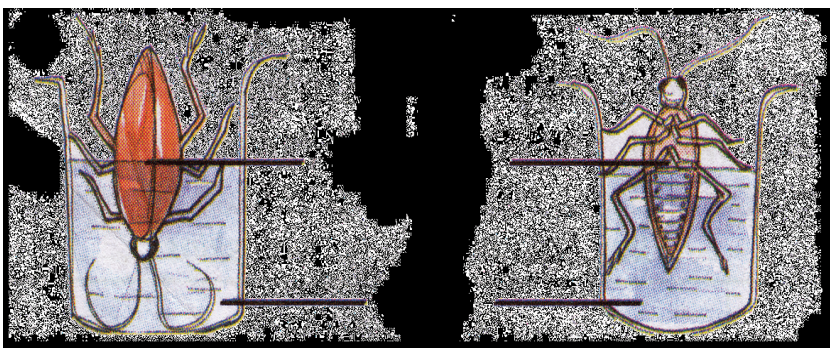
Objective

Learners will be able to locate the spiracles in insects.

Required materials

- Two insects for example cockroach, locust, grasshopper
- Water
- Glass or plastic cup, used bottle.

Illustration of the activity



Steps of the activity

1. Collect required materials (garden soil, two trays, seeds, watering can)
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To take two insects and two glasses of water.
   - To dip one insect in water by its abdomen and the other one by its head.

- To keep these insects in water for about 5 minutes
- Remove the insects from water after 5 minutes

4. Ask questions about what they are observing: Which of these two insects died? Explain why?

Results

Learners observed that the insect dipped in water by abdomen died. This shows that the spiracle of the insects is located near the abdomen.

N.B: The teacher gives other examples of insects that breathe through spiracles such as caterpillar, grasshopper, housefly and butterfly.

Conclusion

Some insects breathe through spiracles. The openings (called spiracles) are located laterally along the thorax and abdomen of most insects — usually one pair of spiracles per body segment.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What are spiracles and their function?
2. Describe the location of spiracles in insect?
3. Give example of other insects that use spiracles in breathing?

Practical Activity/ Play role 20. To simulate animals' locomotion:Crawl, walk, fly

P4 **Unit 9: Animals**

Rationale for the activity

In our community we find different animals with different mode of locomotion. In this activity, learners will have the skills and knowledge on the locomotion mode of different animals frequently found in the community.

Objective

Learners will be able to demonstrate different mode of locomotion of some animals.

Required materials

- Paper
- Scissors

Illustration of the activity

Steps of the activity

1. Collect required materials (garden soil, two trays, seeds, watering can)
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To choose one member of group as judge
   - Other members of group will imitate the locomotion mode of animals
   - Judge choose the best performer
   - The best performer from each group presents in front of class.
4. As learners observe ask them the following questions: what is that locomotion? Which animals use that kind of locomotion?

Results

As role playing in class, the learners got the skills and knowledge about the type of locomotion mode and also the animals using that mode of locomotion, as they were imitating them.

Conclusion

Animals move for a variety of reasons, such as to find food, a mate, a suitable microhabitat, or to escape predators. For many animals, the ability to move is essential for survival and, as a result, natural selection has shaped the locomotion modes and mechanisms used by moving organisms.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Discuss different types of locomotion in animals?
2. Give an example of animal that can walk and fly?
3. In your community, give different examples of animals according to their locomotion?

Practical Activity / Field visit 21. Rabbits farming project visit

P4 **Unit 10: Animals Management**

Rationale for the activity

In the farm, there are many activities of taking care the animals. Learners need to know how to take care of rabbit. This activity will allow learners to observe the farmer taking care the rabbits and gain knowledge and skills of how they can care the rabbits and their importance in their daily life.

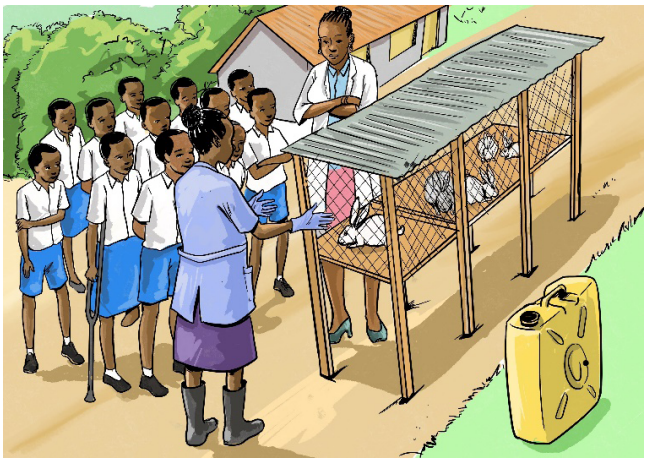
Objective

Learners will be able to know about rabbit farming and their daily needs.

Requirements

- Identification of nearest rabbit farm
- Select a date and notify authority and farm owner
- Transportation (bus)
- Arrangements for lunch and restroom
- A parent permission form for them to sign
- Determine the cost and who will pay
- Attendance sheets for trip
- Dressing code for trip depending on visiting site
- First aid kit

Illustration of the activity



Steps of activity

1. Put learners in bus or on line when they are going in school surrounding.
2. Give the rules and guidelines to follow on visiting site
   - To be safe on site
   - To be on line while observing
   - Never leave learners alone
   - Make small groups and select leaders
   - Arrange the learners so they can see and hear
   - To take note of every step on site
   - To ask related questions to the rabbit's farmers
3. Provide learners with a story tell so they are engaged in a meaningful observation and interaction while on-site, also teacher guide them to observe and note the different conditions necessary for rabbits farming.
4. As learners observe, ask them the following questions: What did you observe in the rabbit farm? What is the difference between male and female rabbit? What is the characteristics of good rabbits? What is proper way to feed rabbits? What are diseases that affect rabbit?

Results

As the learners are in field visit in rabbit farm, they may cover all the content, on distinguishing between a male rabbit and a female rabbit, proper way to feed rabbit, the characteristics of good rabbits and so on….

Conclusion

There are many advantages of rabbit farming. Most of the people are considering starting rabbit farming as a commercial business or for meat consumption or again for procuring compost manure. The rabbit farming is low costable because it has alternatives in breeding: rabbit kid care and rabbit feed management. This field visit covered all content that needed in this unit.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Is rabbit farming profitable?
2) Distinguish male from female rabbits?
3) What make good rabbit hutch?
4) What are common diseases in rabbits?

Practical Activity 22. Project on rabbits farming

P4 **Unit 10: Animals Management**

Rationale for the activity

Rabbits are the family-friendly animals and their farming is low costable because it has alternative breeding methods. Raising rabbits as a pet or grow them for meat can both be profitable and some people are raising them on a small farm as a profitable business. Therefore, in this activity learners will acquire knowledge and skills how to make rabbit cage, rearing rabbit and other so they can make it at home.

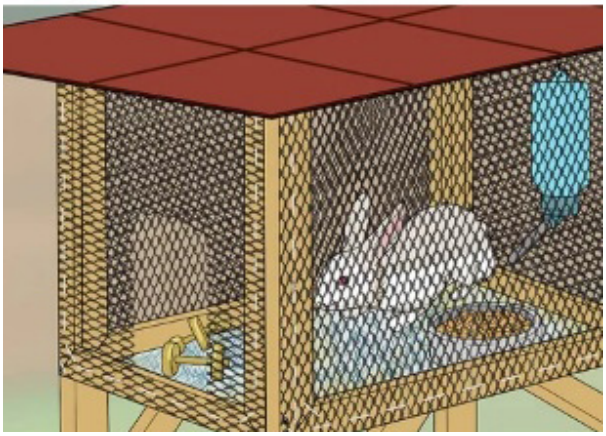
Objective

Learners will be able to make a rabbit cage or hutches and to take care of rabbit

Required materials

- Wood
- Iron net
- Nail
- Hammer
- Saws
- Hinges
- Sliding bolt lock
- Tape
- clean water
- fresh vegetable
- fiber pellet
- hay
- carrots

Illustration of the activity



Steps of Activity

1. Collect required materials before (wood, iron net, nail, hammer, saw, hinger, sliding bolt lock
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
    - To get sturdy wood for frame and support, the length of wood will depend on the hutch length and width
    - To choose wood for the floor and roof, like plywood in large sheets or use the iron net depending on available materials
    - To measure your wood pieces, lay out all of your wood pieces, so that you can see exactly what you have to work with
    - To cut your wood pieces, put on your safety gloves
    - To cut your iron net, you will more pieces for the side depends on the length and width of your hutch.
    - To set out the rest of your supplies like simple hingers, sliding bolt lock
4. Setting up the basic structure by doing the following:
    - Use hammer and nail to attach 2 of the width pieces to 2 of the height pieces. They should form a rectangle once connected. The width pieces should be opposite one another, the same with the height pieces. Then, do the same process again with your remaining 4 short pieces of wood. You should now have rectangles that will form the end of hutch. All will depend on the length of the hutch
    - Attach the length pieces to the ends. Use hammer and nail to secure each single length piece of wood.

- Attach the iron net to the wood frame. Rotate the frame on the ground until it is properly positioned, minus the supports. This will help you to visualize how to attach iron net.
- Attach the top and bottom last. With the hutch facing upright, position your roof on top of the frame. And flip the hutch over on to its top, so the bottom if securely. Using simple piece of cut plywood as a divider.
- Create the door using one flame and add some simple hingers and sliding bolt lock
- On the top of hutch, you can put an iron sheet to prevent rain
- To put in safe place like school garden
- Rabbit need a clean water, fresh vegetable, fiber pellet, hay, carrots and cleaning hutches much as possible

Results

This activity is for learners to learn how to take care of rabbit and the requirement of being rabbit farmer. They will make their own rabbits hutch at home so they can imitate it at home and get the different benefits.

Conclusion

Learners got skills and knowledge about rabbit farming

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Why should you consider starting a rabbit farming project?
2) What make good rabbit cage?
3) Why we need to clean cage?

Practical Activity/Project 23. Investigation on the germination of beans and maize seeds

P4 **Unit 11: Plants**

Rationale for the activity

The propagation of some plants is only possible by seed, and if they are difficult to germinate, this threatens their continuous existence. Seed germination determines continuous plant production necessary for human survival, food for animals, and sometimes for supply of medicinal plants. Learners need to know how plant germinates from seeds. In this activity, learners will demonstrate germination of beans and maize and describe how is useful in their daily life.

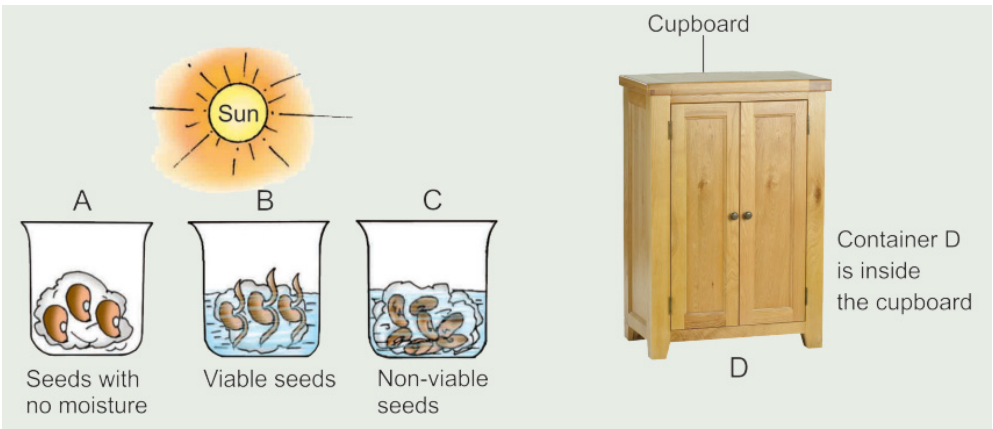
Objective

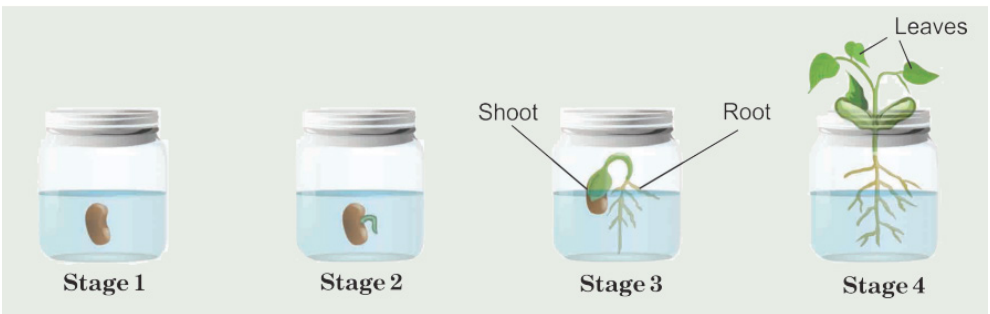
Learners will be able to know the germination and necessary condition for plant to germinate.

Required materials:

- Empty water plastic bottles
- Scissors
- Bean seed
- Maize seed
- Watering can
- Cupboard
- Soil
- Water

Illustration of the activity





Steps of the Activity

1. Collect required materials before (water, soil, watering can, bean and maize seeds, scissors, transparent jars or empty water plastic bottles)
2. Avail materials to be used and distribute them to learners

3. Invite and guide learners to do the following:
    - Cut a half of empty water plastic bottles
    - To take a half of plastic bottles and fill it with soil
    - To take one half of plastic bottles place in it beans seed and take another place in it maize seed
    - To keep the half of plastic bottles at school veranda
    - Sprinkle water everyday
    - Ask learners to observe every day?
    - To take also four containers marked A, B, C and D
    - A with dry cotton wool
    - B, C, D with moist cotton wool
    - Place 3-4 healthy beans seeds at the top of the cotton wool in containers A, B, and D and unhealthy beans seeds in container C
    - Place containers A, B and C in sufficient light and air
    - Place container D in the cupboard
    - Observe them daily for 3-4 days.
4. As learners observe, ask them the following questions: what are difference in plastic bottles? The seeds in containers A, B, C and D are there any change? What should be the cause of change or no change? What do seeds need to germinate well?

Results

Learners observed that the process of germination occurs in the following four stages:

1. The seed takes in water and becomes swollen. The seed coat splits.
2. Baby roots begins to grow. It grows downwards
3. Baby shoot begins to grow
4. The first leaves grow. The seed leave shrivel has been used up by the baby plant;

They also remarked that for beans seed leaves or cotyledons come out of the soil (Epigeal germination) and that for maize seed leaves or cotyledons remain under the surface of soil (hypogeal germination).

Conclusion

This activity will develop the stage of germination and condition necessary. The container A received suitable temperature and oxygen but no moisture. Container C received suitable temperature, oxygen and moisture but the seed were unhealthy. Container D did not receive suitable temperature though it had oxygen and moisture. Only container B received suitable temperature, oxygen and moisture with healthy seed. These conditions helped the seeds in container B to germinate.

Thus, oxygen, water and suitable temperature are the necessary condition for viable seeds to germinate.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) How many stages plant takes to germinate?
2) Discuss the importance of health and unhealthy seed?
3) How many types of germination did you observe? Discuss them?
4) Discuss necessary condition for viable seeds to germinate.

Practical Activity 24. First aid intervention in case of skin accident

P4 **Unit 12: Human Sensory Organs**

Rationale for the activity

In the daily life, we face some different accidents. To learn the immediate assistance person suffering from either a minor or serious accident may help. In this activity, learners will simulate and exercise the first aid and the intervention in case of the skin accident.

Objective

Learners will be able to do first aid for intervention in case of skin accident

Required materials

- First aid kits

Steps of the activity

1. Collect required materials before.
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
    - To form different group of learners
    - One member of group will act as a victim
    - Other member of group will provide necessary first aid
4. As learners observing ask them the following questions: if his/her friend has severe wounds on his/her skin, what would they do?

Results

As the learner are providing necessary first aid, they will use first aid kits so know how it works

1. In case of wounds: wounds are injuries that break the skin. They include cuts, scrapes and scratches.
    - Clean the wound with cotton soaked with antiseptic lotion. It removes dirt.
    - Put another ball of cotton soaked with antiseptic lotion. Tie a bandage around it. It will help to stop the blood flow.
2. In case bruises: a bruise is appearing as areas of skin that are darker than the surrounding skin. It is caused by blood trapped under the skin. Bruises are often painful and swollen.
    - Put an ice pack over the bruise. You can put a cloth soaked with cold water on the affected area.
    - Rest the affected area
3. In case burns and scalds

    A burn is damage to your body's skin caused by heat. Hot metal and burning are the most common cause of burns

    Scald is skin injury caused by wet heat. Hot liquids cause scalds. Both burns and scalds can cause swelling, blistering and scarring.
    - Wash the affected are with cold running water
    - Put an ice pack over the affected area for about 5 to 10 minutes
    - Apply an antiseptic cream over the affected area.

Conclusion

The learners practiced necessary first aid that needed in injuries of the skin.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Describe what you should do when you arrive at an incident scene?
2) What is the first aid method for injury treatment?
3) Can you perform it at home?

Practical Activity 25. Demonstrating the eye defects

P4 **Unit 12: Human Sensory Organs**

Rationale for the activity

Eye defects are referred to different anomalies of the eyes; there are mainly three common refractive defects of vision. Learners need to know this defect of vision. In this activity learners gain skills and knowledge on eyes defection as one of disease people are suffering these days.

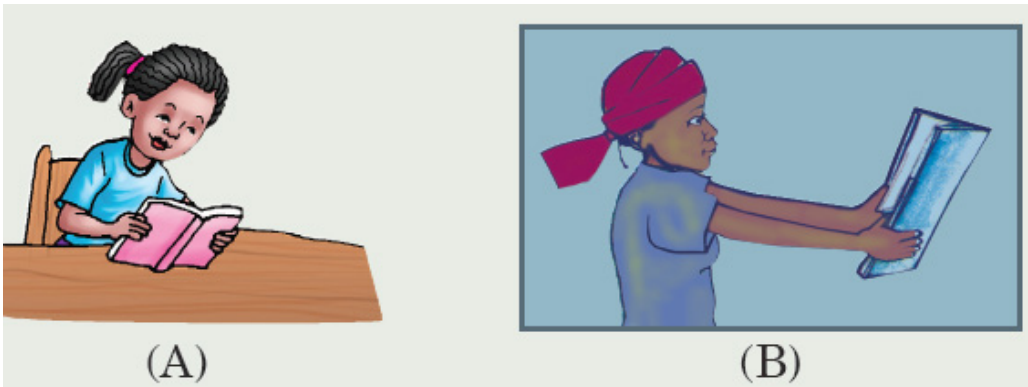
Objective

Learners will be able to demonstrate effectively the eye defects and visualize things through different types of lens to understand how lens can be used as ways of correcting eye defects.

Required materials

- Lenses

Illustration of the activity



(A) (B)

Steps of the activity

1. Collect required materials from the science kits and distribute them to learners
2. Invite and guide learners to do the following:
   - To take a book at a certain maximum distance and try to read. How is the size of letters in the book?
   - To read again by using the lens. How is the size of letters in the book?
   - Compare the size of letters for two readings.
3. Ask learners the following questions: Why there is a difference in size of letters? Why some people wear the eyes glasses?

Results

Learners observed that it is not easy to perform readings when a book is taken at a certain maximum distance from their eyes but when they use lens, the letters have been magnified and find readings easy (lens correction).

Conclusion

Defects of the eyes are varied depending on their types which sometimes caused mainly by cornea that is not functioning properly. To appropriately correct the defects of eyes, better to consult the physicians but you can also try adapting to the situation depending to the defection level of your eyes.

Guidence on evaluation

Ask questions related to the activity performed by learners:

1) Can eye defects heal?
2) How a lens can be used to correct the vision of a short sighted person?
3) Briefly discuss on the main causes of short-sightedness, long-sightedness and their corrections?
4) What are the main causes of presbyopia and astigmatism and provide their corrections?

Practical Activity 26. Demonstration of first aid for bone accident

P4 **Unit 13: Human Skeleton**

Rationale for the activity

In the daily life we face some different accidents. To learn the immediate assistance to person suffering from either a minor or serious accident may help for its life. In this activity, learners will simulate and exercise the first aid and the intervention in case of the born accident.

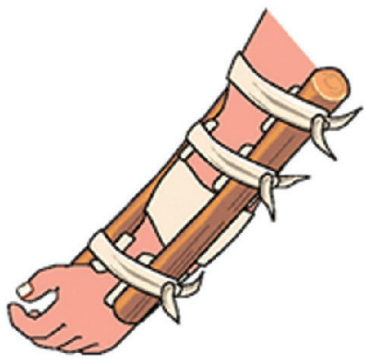
Objective

Learners will be able to learn the first aid for bone accident.

Required materials

- First aid kits
- A piece of wood

Illustration of the activity



Steps of the Activity

1. Collect required materials before.
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To do not move the fractured part.
   - To cover the wound with a sterile dressing or a clean non-fluffy cloth

- To apply pressure around the wound and not over the protruding bone to control any bleeding
- To tie a piece of wood with a piece of cloth around the fractured part
- In case of hand fracture, use a sling to restrict the movement of the hand (a sling is a triangular piece of cloth)

4. As learners observe ask them the following questions: Whyfractured part movement is prohibited?

N.B: Do not secure the splint too tigh as its may cause the circulation of blood to show or to stop. Rush the victim to a nearby health Centre.

Results

For fractured part is restrict for the movement to protect the part and also using the piece of cloth for protection. Fracture part will be protected and stop further fracture and rush the victim to nearby health Centre.

Conclusion

For this activity, learners will get knowledge and skill on first aid and its uses.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) How many steps needed to put splint?
2) How many steps needed to put sling?
3) Can you try it at home?

Practical Activity 27. Role-play simulation: as first aid, apply a splint on an arm or leg

P4 **Unit 13: Human Skeleton**

Rationale for the activity

In the daily life we face some different accidents. To learn the immediate assistance to person suffering from either a minor or serious illness may help for its life. In this activity, learners will simulate and exercise the first aid and the intervention in case of accident by applying a splint on arm or leg.

Objective

Learners will be able to learn the first aid to apply a splint on arm or leg

Required materials

- First aid kits
- Wood

Illustration of the activity

Steps of the activity

1. Collect required materials before
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
   - To form different groups of learners
   - One member of group will act as a victim
   - Other members of group will provide necessary first aid
   - To apply a splint to the injury.
   - To tie a piece of wood with a piece of cloth around the fractured part
4. As learners observe ask them the following questions: if his/her friend has fractured part, what would they do?

Note: do not secure the splint too tight. The circulation of blood will be show or stopped.

Results

As the learners are providing necessary first aid, they will use first aid kits to know how it works to apply a splint to the injury.

Conclusion

The activity helped learners to apply splint on injury as first aid.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Discuss the effect of splint if is too tight?
2) Discuss the importance of wood in intervention of fractured part?

Practical Activity 28. Demonstrating techniques of maintaining a healthy skeleton (sitting position, physical exercises, as part of hygiene).

P4 **Unit 13: Human Skeleton**

Rationale for the activity

Sitting, standing and carrying bags with proper alignment improves blood flow, helps keep your nerves and blood vessels healthy and supports your muscle, ligaments and tendons. In this activity learners will learn how to maintain a healthy skeleton through appropriate sitting position and physical exercises.

Objective

Learners will be able to maintain a healthy skeleton by applying appropriate sitting position and physical exercise

Required materials

- Desk
- School bags

Illustration of the activity

Steps of the activity

1. Collect required materials before
2. Avail materials to be used and distribute them to learners
3. Invite and guide learners to do the following:
    - To sit correctly
    - To keep feet flat or rest them on either the floor or a footrest
    - To avoid crossing knees or ankles
    - To maintain a small gap between the back of the knees and the chair
    - To position knees at the same height or slightly lower than the hips
    - To place ankles in front of the knees
    - To relaxi the shoulders

- To keep the forearms and knees parallel to the floor where possible
- To hold elbows at the sides creating an L-SHAPE in the arms
- To keep the back against the chair
- To avoid sitting for long period at a time, ideally taking at least a 10-minute break for every hour of sitting.
- To wear correctly schoolbags
- To avoid carrying heavy schoolbags
- To take regular exercises

4. As learners observe ask them the following questions: what are good sitting positions? What is the effect of carrying incorrectly schoolbags? What is effect of carrying heavy bags?

Results

Learners have found the best sitting position and the way to carry bags. They also found that carrying improperly bags lead to deformation of back.

Conclusion

This activity enhanced the skills and knowledge of proper ways to sit in desk and carrying the bags

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What are effects of sitting incorrectly?
2) What are effects of carrying heavy school bags?

PRACTICAL ACTIVITIES FOR PRIMARY FIVE (P5)

Practical Activity 1. Fixing and removing nails from the wood

P5 | Unit 1: Carpentry Tools

Rationale for the activity

In life, we need nails to make wood materials. When damaged or broken at home, the nails come out of the wood. To continue using materials, we need to repair them. Sometimes when fixing the nails, we may need to take it out when we want to change the badly fixed nail. This activity will help learners to get skills of how they can fix or remove a nail.

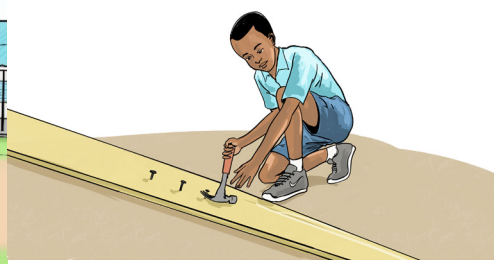
Objective

Learners will be able to fix and remove nail from wood.

Required materials

- Nails
- Claw hammer
- Wood

Illustration of activity



Steps of the activity

1. Avail the collected materials to be used in the activity.
2. Invite and guide the learners to do the following:

Step A: Fixing nail in wood

- To take nail in hand with 2 finger
- To take claw hammer in another hand
- To ensure that the handle is firmly attached to the head of the hammer
- To hold a nail onto a piece of wood
- To hold the hammer firmly and hit the nail several times until it enters.

3. Ask to the learners the following questions: what makes the nail enter in the wood?

Step B: Removing nail from wood

- Locate the nails you want to remove from wood surface.
- Hold the claw hammer firmly and place it under the head of the nail to be removed.
- Begin pulling slowly towards yourself, to lift the nail head from the surface until it is removed.

4. Ask the learners the following questions: Why and how to remove the nail? where to keep the nail?

Results of the activity

Learners practice fixing and removing nail from the wood so they can be helpful in their daily life.

Conclusion

A claw hammer is used for driving nails in wood and for pulling them out. If nails are well fixed, it make woody materials last long for their use.

Guidance on the evaluation

Ask questions related to the activity performed by learners:

- Discuss all the tools that can be used to remove nails from wood?
- What kind of dangers when you fix or remove the nails from the wood?
- Discuss the safety way when fixing or removing nail?

Practical Activity 2. Smoothing a rough surface wood

P5 Unit 2: Masonry Tools

Rationale for the activity

In our daily life, when working with wood, there are many challenge that you may face, one of these challenges may involve trying to remove any roughness the wood may have. Luckily, smoothing the surface of rough wood is easy and can be done quickly and effectively when using the correct tools.

Objective

Learners will able to apply smoothing of wood rough surface.

Required materials

- Sand paper
- A piece of wood
- Scissor

Illustration of the activity

Steps of the activity

1. Collect before the required materials (sand paper, a piece of wood, scissor) in the school environment.
2. Avail the collected materials to be used in the activity

3. Invite and guide the learners to do the following:
    - To cut the piece of sand paper
    - To hold the wood with one hand
    - To lap the sand paper forward and backward on the wood with one hand (avoid side side lap)
    - To brush the dust away
4. Ask the learners the following questions: why we do not need lap side to side? How does the wood surface become?

Note : Wear a mask when sanding to protect your eyes and lungs.

Results of the activity

When you touch on wood, it is now smooth as you use sand paper forward and backward on the wood.

Conclusion

Appying the sand paper on a rough surface wood ends in a smooth surface wood.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- Discuss the clothes to wear while performing this activity so you protect you healthy?
- Can you perform this at home?

Practical Activity 3. Investigating the properties of water

P5 **Unit 8: Water**

Rationale for the activity

Water is a liquid mostly used by man at home and in manufacturing drinks and food in industries.

This activity of investigating properties of water is important, since it provides a guide to learners on how to identify properties of water and use it accordingly in different situations.

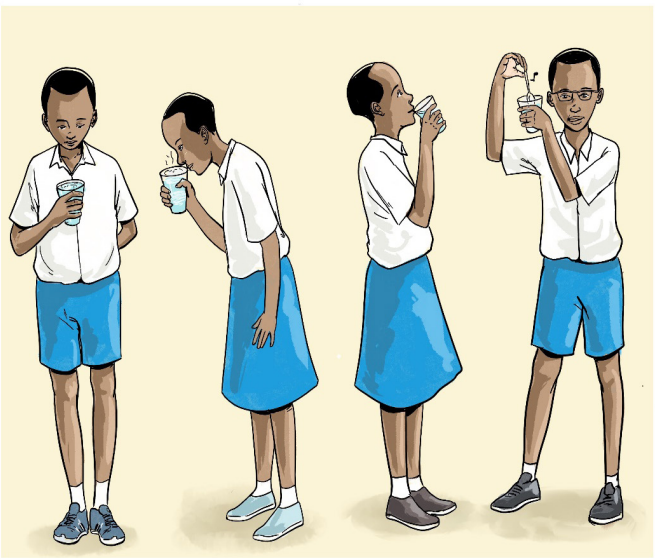
Objective

Learners will be able to investigate the properties of water

Required materials

- A glass jar
- Water
- Table salt
- Teaspoon or spatula

Illustration of the activity



Steps of the activity

1. Collect before the required materials
2. Avail the collected materials to be used in this activity
3. Invite and guide the learners to do the following:
   - To pour some water in a glass container and observe its colour. What colour is it?
   - To pour a little water on a bottle cap, and taste the liquid. What is the taste of the liquid?
   - To place half a spatula-full of table salt in a glass bottle and add about 100 cm^3 of water, and stir the mixture.
   - Stir the mixture and taste the water. What is the taste of the water ?
4. Ask learners the following quetion: What do you notice as properties of water?

Results

The investigation has shown that water is colorless, tasteless, and that table salt can dissolve in water and affect its tasteless.

Conclusion

Pure water does not contain any compounds that may elicit tastes, and has a neutral scent, so we deem it "tasteless" and "colorless".

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What happens when salt is added to water (colour, taste and odour perception)?
2. What happen when we pour water in green cup?

Practical Activity 4. Demonstrating a simple water cycle

P5 **Unit 8: Water**

Rationale for the activity

The water cycle is an extremely important process because of the role water plays in biological processes, climate, and other elemental cycles. This means that it enables the availability of water for all living organisms and regulates weather patterns on our planet. If water did not naturally recycle itself, we would run out of clean water, which is essential to life. This activity will help learners to explore the water cycle and be able to demonstrate it.

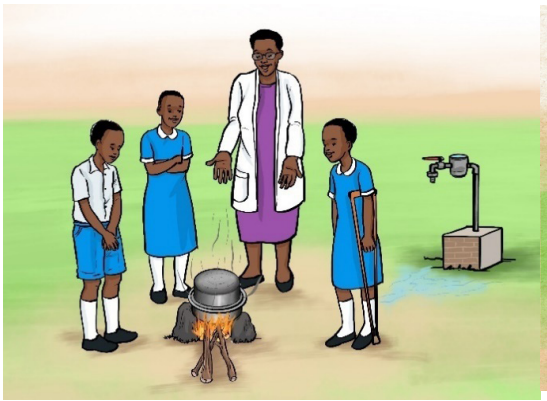
Objective

Learners will be able to demonstrate simple water cycle

Required materials

- Two sauce pans.
- Source of heat.
- Water
- A piece of cloth

Illustration of the activity



Steps of the activity

1. Avail the collected materials to be used in the activity.
2. Invite and guide the learners to do the following:
   - To turn on the source of heat.
   - To place water in one sauce pan and heat it until it boils,
   - To put cold tap water in the second sauce pan
   - To hold the sauce pan above the boiling water using a piece of cloth
3. Ask the learners the following questions: What do you observe on the bottom of the cold saucepan? What do you think has happened?

CAUTION: Do not expose your fingers to hot water vapour as it can burn them.

Results

The learners observed hot water vapour from the boiling water, the only sure sign that water had boiled. This can be likened to evaporation of water from water bodies, such as lakes.

They also observed hot water vapour condensing to liquid water on the cold bottom of the sauce pan. This is likened to condensation of water vapour in the atmosphere to form rain-bearing clouds in the water cycle.

Conclusion

This activity reveals that the water cycle is the process by which water circulates around the Earth. If water did not naturally recycle itself, we would run out of clean water, which is essential to life.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What would you expect if hot water were used in the second beaker?
2. Sunshine warms ascending water vapour from a lake, how will this affect formation of clouds in the water cycle?

Practical Activity 5. Make ditches in the school surrounding

P5 **Unit 8: Water**

Rationale for the activity

Ditches are typically used for the purpose of irrigation, drainage of agricultural land or taking running rain water and this help in preventing soil erosion. Therefore, learners need to know how to make ditches and their importance as they should be using them in their community to protect soil from erosion.

Objective

Learners will be able to make ditches

Required materials

- Shovel
- Hoe
- Wheelbarrow
- Landscaping cloth

Illustration of the activity

Steps of the activity

1. Collect the required materials to be used and avail them to learners.
2. Invite and guide the learners to do the following:
   - To remove grass and plants from the path of the ditch.
   - To use hoe to help remove tough rooted grass and plant
   - To dig the ditch using the shovel. When digging, place the removed soil into the wheelbarrow for use later
   - As you progress in digging the ditch, it must slightly slope downward.
   - To line the bottom of the ditch with the large stones or large-sized gravel.
   - To plant tree above the ditch
3. Ask the learners the following questions: Have you see ditches in your community? What is the importance of ditches? How water collected in ditches is used?

Results of the activity

Learners have made their ditches. They found the use of ditches around the school and they can make ditches at their home.

Conclusion

Ditch take water from rain, and this can help in preventing soil erosion and learners gain the uses of ditches in their daily life.

Guidance on the evaluation

Ask questions related to the activity performed by learners:

- Why do we need to dig ditches on hills?
- Wht is the importance of plants planted on ditches

Practical Activity/ Field visit 6. Discovering pollutants of water

P5 **Unit 8: Water**

Rationale for the activity

Polluted water is dangerous to human and livestock consumers of water. It is of utmost importance for the learners to be capable of recognising polluted water and common water pollutants.

Objective

Learners will be able to identify pollution of water

Logistics' arrangement

- Decide the site to be visited such as nearest river, pipe or channel (those used for discharge from home or an industrial facility), mining site from which a variety of pollutants enter the water body.
- Select a date and notify school authority and site leaders
- Transportation(bus)
- Arrangement for lunch and restroom
- A parent permission form for them to sign
- Budget and its source
- Attendance sheets for trip
- Dressing code for trip depending on visiting site
- First aid kit
- Notebooks and pens

Illustration of the activity

Steps of the activity

1. Put learners in bus or line to visiting site
2. Give the rules and guidelines to be followed on visiting site
   - To be safe on site
   - To be on line while observing
   - Never leave students alone
   - Make small groups and select leader
   - Arrange the learners so they can see and hear
3. Provide learners with a story tell to be engaged in a meaningful examination and interaction while on-site.
4. As learners observe, ask them the following questions:
   - What are the effect of water pollution?
   - What are the measure to prevent water pollution?

Results

Learners discovered the source of pollution that include solid wastes such as garbage, rubbish, electronic wastes, construction and demolition wastes. Polluted water loses clarity and becomes cloudy due to solid waste and products of the decay/rotting process.

Conclusion

Water pollution can cause some disease like cholera, dysentery, typhoid and poliomyelitis. To prevent water pollution makes our life better and fights against some water borne diseases

Guidance on evaluation

At the end of the visit, each pupil is provided with a questionnaire including the following questions:

1. Define water pollution?
2. Name the major water pollutants identified during the visit?
3. What are the negative effects of water pollution did you notice during the visit?
4. How can water pollution be prevented?

Practical Activity 7. Purification of water by boiling

P5 **Unit 8: Water**

Rationale for the activity

Human being and other animals need water. Water need to be purified to remove any harmful particles for its safe use. This activity will make learners gain knowledge and skills of purification of water by boiling.

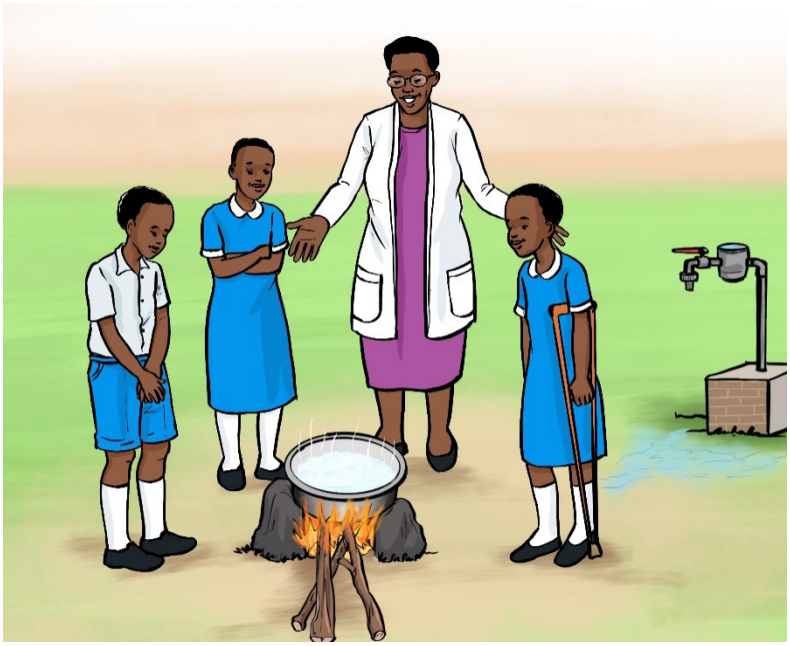
Objective

Learner will be able to purif water by boiling

Required materials

- Source of heat (gas stove or charcoal stove).
- Saucepans or beakers

Illustration of the activity



Steps of the activity

1. Collect before the required materials
2. Avail the collected materials to be used in the activity
3. Invite and guide the learners to do the following:
   - To obtain impure water nearest water body.
   - To Put impure water in a saucepan
   - To place it above the source of heat and boil it. What shows that the water is boiling?
   - Boil the water for 10 minutes and let it cool at room temperature.
   - Filter the water and keep it in a clean container (jerrycan)
4. Ask the learners the following questions:
   - What is the importance of boiling water?
   - why was the water boiled for a further duration of 10 minutes?

Results

Boiling was ascertained by production of hot water vapours. The boiling duration of 10 minutes was meant to prolong killing of harmful microbes.

Conclusion

Boiling water makes it safe to drink. Boiling is the surest method to kill disease-causing organisms, including viruses, bacteria, and parasites.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Why is river water, which has been boiled for only 5 minutes and cooled is not safe to drink?
2. Why are we advised to drink the boiled water?

Practical Activity 8. Purification of water using a chemical treatment method

P5 **Unit 8: Water**

Rationale for the activity

In situations where apparatus for boiling are not available such as long journeys and to check, chemical treatment of water remains the only option. This activity is meant to provide to learners, an additional method to boiling, by which water can be purified.

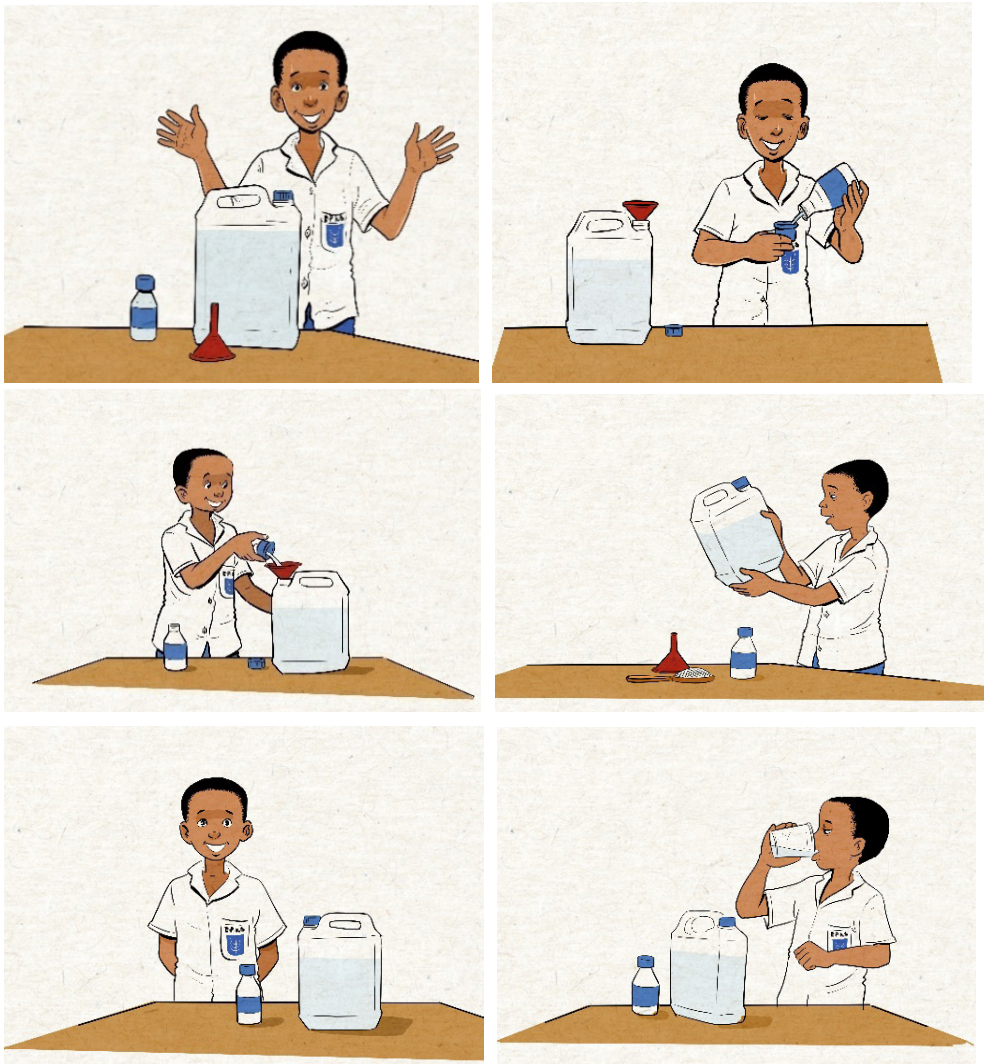
Objective

Learners will be to able purify water using chemical treatment

Required materials

- A water- purifying chemical substance e.g:*Sur eau.*
- A clean jerrycan of 10 litres capacity.
- A funnel
- A watch

Illustration of the activity



Steps of the activity

1. Collect before the required materials
2. Avail the collected materials to be used in the activity
3. Invite and guide the learners to do the following:
   - To add tap water or river water to the jerrycan up to the 10Litre mark.
   - To measure a cap-full of *Sur eau* from the bottle.
   - To pour the *Sur eau* into a jerrycan.
   - To cap the jerrycan and shake the mixture. Open the jerrycan for any gases liberated, to escape.
   - Let the jerrycan stay at room temperature for at least 30 minutes.

4. Ask the learners the following questions:
    - Do the member of your community use the sur-eau to prepare drinking water?
    - How do you think chemicals purified the water to be safe for drinking?

Results

Learners have found tap water in the jerrycan. After adding a well measured quantity of sur-eau, they wait for 30 minutes to have drinkable water.

Conclusion

Using chemicals is an alternative method of water purification rather than boiling it. Not all chemicals are used to purify water. The use of sur-eau is the common way to purify small quantities of drinking water.

N.B: The teacher tells learners that it is not any amount of sur eau to be added to any amount of water. The volume of both have to be measured accurately.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Why is shaking of the mixture of water in the jerrycan necessary?
2. a) What would be the effect of using a half cap of Sur eau to 1 jerrycan of water?

    b) Would there be any harm, if two caps of Sur eau were used in 1 jerry can of water?

Practical Activity 9. Making a domestic filter and practicing filtration

P5 **Unit 8: Water**

Rationale for the activity

Water in some sources looks muddy and it must be cleaned for drinking purposes. The filter to be made is meant to be used for filtering muddy water to clear water. At this stage, water can be made germ-free by boiling, or by chemical treatment for human consumption. In this activity, learners will make a filter and use it to filter and clear muddy water.

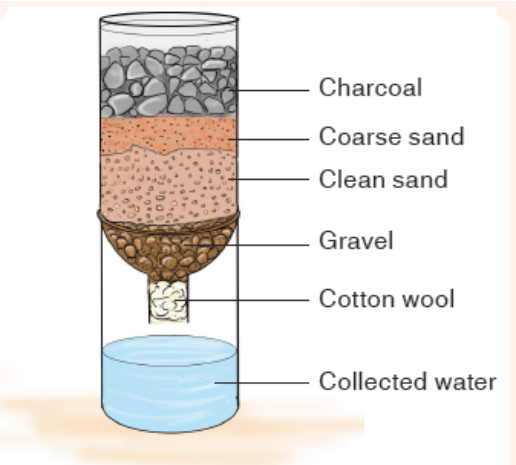
Objective

Learners will be able to make an improvised water filter to clear muddy water

Required materials

- An empty plastic bottle (*Inyange, Nil, Akandi etc...)*
- A sharp kitchen knife.
- Wood charcoal
- Coarse sand and fine sand
- Small gravel
- Cotton wool
- A clean beaker

Illustration of the activity



Steps of the activity

1. Collect before the required materials
2. Avail the collected materials to be used in the activity
3. Obtain an empty plastic bottle, and cut it horizontally half-way. Dispose of the bottom half and retain the upper half which has a neck.
4. Invite and guide the learners to do the following:
   - To plug the neck of the half bottle tightly with cotton wool.
   - To make a layer of small gravel on top of the cotton wool. What role is played by the layer of small gravel?
   - Next add a layer of fine sand followed by a layer of coarse sand of the same thickness.
   - To top up, add a layer of charcoal in the water filter.
   - Finally, filter the water with the filter which they have made into a beaker.

5. Ask the learners the following questions:
    - Why materials need to be superposed in this way?
    - Is the water obtained from this method drinkable?

Results

The learners observed the clear filtrate from the filter and noted the role played by materials in it. The obtained water is not muddy as it was before filtration.

Conclusion

This filtration technique allows muddy water changing to clear. The coarse and fine sand retain solid particles of different sizes. The small gravels support the layers above it. Chemical method or boiling method with filtration is required to kill microbes within water to be safe for drink.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Which part of the filter removed colour from the muddy water to make it colourless?
2. Define the role of the cotton plug in the neck of the half bottle?
3. Why and when to use such purification method?

Practical Activity 10. Preparing plots to cultivate vegetables

P5 **Unit 9: Soil**

Rationale for the activity

The soil is a storehouse for all the elements plants need to grow: nutrients, organic matter, air, and water. Soil also provides support for plant roots. When properly prepared and cared for, soil can be improved each year and will continue to grow plants forever. Before cultivating any crop, it is necessary to prepare the soil depending on the type of crop. Learners need to know how to prepare plots for cultivation as they will need to grow crops in their community.

Objective

Learners will be able to prepare plots to cultivate vegetables.

Required materials

- Hoe
- Spade
- Good soil
- Watering can
- Levelling
- Manure fertilizer
- Seeds
- Tape measure

Illustration of the activity

Steps of the Activity

1. Collect before the required materials(hoe, spade, rake, Watering can, Manure fertilizer, Seeds, Tape measure from school environment)
2. Avail the collected materials to be used in the activity
3. Invite and guide the learners to do the following:
   - To clear the land by cutting bushes and unwanted grasses and trees
   - To cultivate and break the soil using hoes.
   - To level the soil by using rake
   - To use hoes to dig small hoes but on straight line

- To keep spacing of 50 cm between every hole using tape measure
- To use spade to put (manuring) small quality in each hole
- To put or sow the seeds into soil in each hole
- To cover the seed with soil
- To use watering can to irrigate each seed in each hole

4. Ask learners the following questions:
   - What are steps involved in plot preparation?
   - What is the importance of keeping space?
   - Do farmers in your community respect such steps?

Results

Learners have prepared plot to cultivate. The seeds sowed are ready to germinate in the next days.

Conclusion

Before cultivate any crop, you need to prepare the plot so they can produce enough crops.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Discuss on materials we need before preparing plot?
2) What is the importance of manure?

Practical Activity/project 11. Preparation of organic fertilizers

P5 **Unit 9: Soil**

Rationale for the activity

Organic fertilizers which are prepared from plant materials are essential for healthy growth of plants. In this activity, learners are trained on how to prepare organic manure or compost using green plant material.

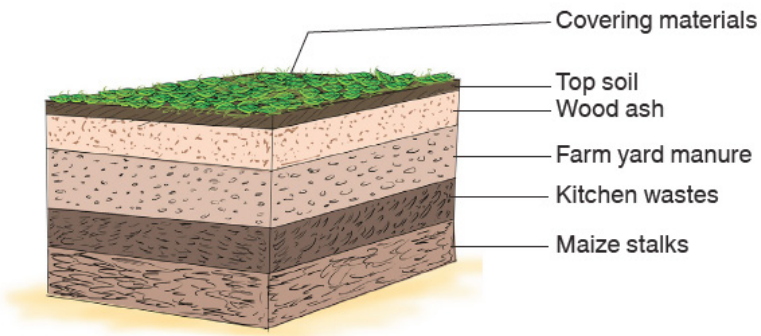
Objective

Learners will be able to prepare organic fertilizers

Required materials

- Hoe and spade
- Dry plant parts ex: maize stalks, grass, dry bean stems etc.
- Degradable (which rot easily) plant material ex: potato, fruit, and banana peelings
- Farmyard manure ex: poultry droppings, goat waste, rabbit waste and cow dung.
- Wood ash
- Top soil

Illustration of activity



Steps of the activity

1. Collect before the required materials
2. Avail the collected materials to be used in the activity
3. Invite the learners to carry out the following activities:
   - To make a trench in the ground using a hoe and a spade.
   - Using dry plant material, to make the first layer at the bottom of the trench.
   - Add degradable plant material (a layer of about 7 cm thick).
   - Add farmyard manure (about 5 cm thick). What is the role of this manure in the compost heap?
   - Add wood ash (about 7 cm hick). What is the purpose of using wood ash?
   - Put top soil on top of the heap.
4. Ask the learners the following questions: Why are plants like beans, peas and soyabeans the best for making green manure? Do farmers in your community make green manure? How do they do it?

Results

Learners have notice that to produce manure need decaying material. In addition, they found out that plant like peas, beans, soybeans can make best manure as they contain more protein.

Conclusion

Prepare organic fertilizers using the decaying crops is best advice to protect our soil and to produce natural crops which are good to health of people.

Guidance on evaluation

- Why is top soil put on top of the compost heap and on top of the middle layers?
- What would be the effect of not using farmyard manure in the preparation of the compost heap?

Practical Activity/ project 12. Investigating the effects of fertilizers on plant growth

P5 **Unit 9: Soil**

Rationale for the activity

The importance of the fertilizers can not be underestimated. Fertilizers provide crops with nutrients like potassium, phosphorus, and nitrogen, which allow crops to grow bigger, faster, and to produce more food/products. Nitrogen in particular is an essential nutrient for the growth of every organism on Earth. Learners need to know well the effects of fertilisers so that they will use them effectively in their life.

Objective

Learners will be able to investigate the effect of fertilizers on plant

Required materials

- A hoe
- A rake
- Viable maize seeds or bean seeds
- Compost manure

Illustration of the activity

Garden A without fertilizer **Garden B with fertilizer**

Steps of the activity

1. Collect before the required materials
2. Avail the collected materials to be used in this activity
3. Invite the learners to carry out the following activities:
   - To prepare gardens of the size 1 meter by 1 meter using a hoe and rake.
   - To apply fertilizer on one garden, mixing the fertilizer thoroughly with the soil and sowing maize seeds.
   - To sow maize seeds on the second garden without applying fertilizer.
   - To water gardens, the same way per day, if there is no rain.
   - After germination, to observe seedlings and assess their growth status.

N.B: Remember to keep the same distance between planting holes in a line and the same distance between the lines.

Results

The learners observed the plants in both gardens. The plants in the garden where fertilizer was used look healthier, while for other were unhealthier.

Conclusion

Using fertilizers in the agriculture increases the harvest on the market, make the farmer gain more income.

Guidance on evaluation

1. Observe the photographs and compare garden A to garden B. Based on your observation, what do you think is the effect of fertilizer on:

   a) The number of leaves

   b) Breadth of (surface area) of the leaves.

c) Colour of the leaves

d) Expected crop yield of the two gardens

Practical activity/ Project 13. Preparing and managing a small scale poultry farming at school

P5 **Unit 10: Animals**

Rationale for the activity

Human being to be healthy needs some important nutrients, that can be found in meat and eggs. When we want money, we have to practice income generating activities. The small scale poultry farming when efficient should generate income in terms of money, and we need to raise poultry for meat and eggs. To sufficiently benefit from that, the preparation and management should be efficient. Learners need to practice such activities from their early ages to grow in entrepreneurs and self reliant people.

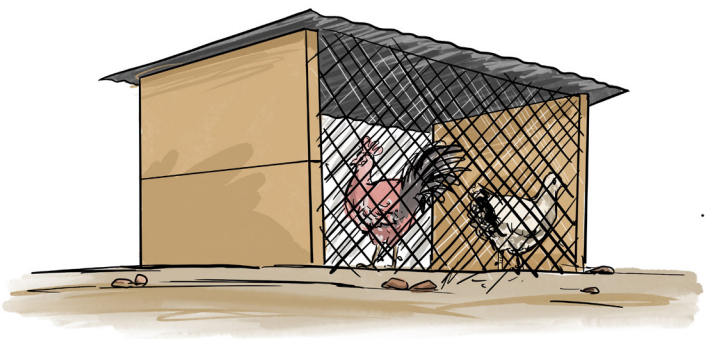
Objective

Learners will be able to prepare and manage small poultry farming

Required materials

- Wood or timber
- Iron net
- Nail
- Hammer
- Saws
- Tape
- Clean water
- Poultry house with length 120cm, width 36cm, height 30cm
- Grains

Illustration of the activity



Steps of the Activity

1. Avail the collected materials to be used in the activity and distribute to learners
2. Invite and guide the learners to do the following:
    - To put together the wood at same length and connect them to reach 120 cm
    - To build the rectangle using wood
    - This rectangle built acts as basement and after build pillar of the wood after then build other rectangle to put above those pillar
    - To use the iron net to cover side from one side to another
    - To use the hammer with nail to put iron net with poultry house and fix this iron net properly
    - To build the doors using wood and cover with iron net
    - To make a roof using iron sheets
    - To put water container and feeding troughs
    - To add food like maize and millet, crushed cereals, small insect soft vegetation
    - To bring the bring the poultry in the house
    - To ensure you clean the poultry house daily.
    - Give the chicken clean water and feeds to prevent chicken diseases
    - To vaccinate and treat them with medicine when they are sick
    - To sell eggs on the market place
3. Ask learners the following questions: what are the benefits of poultry in economy?

N.B: Learners should imitate this at home and make this project involving the parents.

Results of the activity

Learners know to make the poultry house. They are aware that chickens should always have sufficiently feed. They are also aware on daily cleanliness of poultry house and chickens themselves and make a business by selling chicken, eggs and meat.

Conclusion

Poultry provides food to humans in the form of eggs and meat. It is also a source of income for many people and families.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Discuss conditions and steps in building chicken house?
2) What are the benefits of chicken farming?
3) Why the poultry house should be always clean?
4) Why the chickens should be always given clean water and feeds?

Practical Activity/Field visit 14. Visiting deforestation and afforestation sites

P5 **Unit 11: Plants And Environment**

Rationale for the activity

The importance of forests can not be underestimated. We depend on forests for our survival. They create oxygen, they are a natural habitat of various types of animals, they affect the water cycle, they are source of raw materials, they provide timber products like paper and furniture, they provide non-timber products like medicines or herbs. Deforestation cause the loss of trees and other vegetation that leads to climate change, desertification, soil erosion, fewer crops, flooding and increased greenhouse gases in the atmosphere whereas the afforestation grows more trees to generate more forest cover and this can help in the growth of plants and provide natural habitat to animals. Learners need to explore afforested and deforested areas to be aware of effects of deforestation and benefits of afforestation.

Objective

Learners will be able to describe deforestation and afforestation

Required materials / Logistics' arrangement

- Visiting sites (forests)
- Select a date and notify authority
- Transportation (bus)
- Arrangements for lunch and restroom
- A parent permission form for them to sign
- Budget and its source
- Attendance sheets for trip
- Dressing code for trip depending on visiting site
- First aid kit
- Hand books and pencils

Illustration of the activity

Steps of the activity

1. Put learners in bus or line to visiting planted forest and
2. Give the rules and guidelines to follow on visiting site
    - To be safe on site
    - To be on line while observing
    - Never leave students alone
    - Make small groups and select leaders
    - Arrange the learners so they can see and hear
3. Provide learners with a story tell so they are engaged in a meaningful examination and interaction while on-site.
4. As learners observe, ask them the following questions:
    - What the difference between two places?
    - What are the effects of deforestation on the environment?
    - What are the effects of afforestation on the environment?

Results

Learners are able to differentiate the places where happened the afforestation and deforestation and identify the effects of deforestation and the benefits of afforestation.

Conclusion

Knowing the importance of forests, the harmful effects of deforestation and the benefits of afforestation, the learners have raised their awareness on the protection of forests/environmental protection .

Guidance on evaluation

Ask questions related to the activity performed by learners:

- Describe your observation by comparing the two visited places?
- What are advantages and disadvantages of afforestation?
- How can afforestation help in protecting both plants and animals?
- What are dangers of deforestation?

Practical Activity 15: Preparation of balanced diet

P5 **Unit 12: Digestive System**

Rationale for the activity

Every living being needs nutrients to survive. Particularly, human body needs a balanced diet to grow strong and healthy. This diet contains a variety of different types of food and provides adequate amounts of the nutrients necessary to maintain good health (carbohydrates, fats, proteins, vitamins, minerals, and water). Therefore, a healthy diet requires proper and efficient preparation.

Objective

Learners will be able to prepare a balanced diet.

Required materials

- Protein component: Beans, small fish
- Carbohydrate components: potatoes and Irish potatoes
- Vitamin component: carrots, dodo
- Fruit: avocado, pineapple,
- Milk
- Onion
- Tomato
- Oil
- Nut flour
- Water
- Knife
- Source pan

Illustration of the activity

Steps of the Activity

1. Collect different foods component (protein, carbohydrate, vitamin, fats and fruits) from school environment.
2. Avail the collected materials to be used in the activity.
3. Invite and guide the learners to do the following:
   - To wash their hand
   - To clean all materials
   - To Peel potato, Irish potato, carrot,
   - To cut green vegetable, onion, carrots into small pieces
   - To put saucepan on fire source
   - To add oil and after sometime add carrots and green vegetable and tomato
   - To add potato and Irish potato
   - To add water and cover
   - To add small fish
   - To left it for some time to boil
   - To add nut flour and left for short period
   - While waiting the food to be ready they starting to peel the avocado and pineapple.
4. As learners observe, ask them the following questions: what are the importance of cleaning the material before using it? What is the importance of each ingredient? Do members of your family prepare balanced diet? What about other families in your community?

Results

Learners prepared a balanced diet using the available food in the community. Learners are aware of the importance of cleaning the materials before using them; know importance of ingredients in food and the benefit of a balanced diet to their health.

Conclusion

A *balanced diet* supplies the nutrients your body needs to work effectively. It provides the energy and nutrients required to survive and stay healthy. Without a *balanced nutrition*, your body is more prone to diseases. Combining a healthy diet with an active lifestyle has huge benefits and helps reduce the risk of heart disease.

Guidance on evaluation

- What do you mean by a balanced diet?
- What is benefit of balance diet?
- What food groups should a balanced diet contain?
- Why are you washing your hand and all materials before preparing food?
- What will you advise to a family with children suffering from kwashiorkor?

Practical Activity 16. Demonstration of light transmission through different media

P5 **Unit 14: Light**

Rationale for the activity

There are different materials (media) that transmit the light. Learners need to demonstrate and know how the light behaves through those different materials and gain knowledge and skills of how those phenomena occurred and when are needed in daily life.

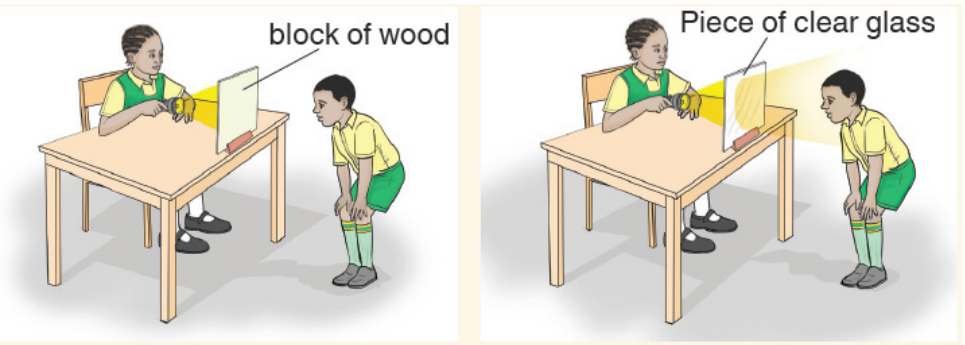
Objective

Learners will be able to demonstrate how light travels through different media.

Required materials

- A transparent water bottle full of water
- Oiled paper
- Notebooks
- Block of wood
- Clear polythene paper
- Torch or candle
- Clear glass

Illustration of the activity



Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide the learners to do the following:
   - To light a torch on the materials listed above.
   - To stand on the opposite side of the materials being illuminated by the torch. Ask the second learners about her/ his observation?
   - To interchange the role so that all learners make the observations
3. Let each group discuss and report about the observations made.

Results

Learners demonstrated how light can be transmitted through different materials or media such as Transparent, translucent and opaque media.

Conclusion

Some materials let light passing through, others do not. Light illuminated to a block of wood does not pass through the material (learners on the opposite side do not observe any light). Light illuminated to a piece of clear glass or a transparent water bottle passes through the material and learners on the opposite side can observe the light.

Guidance on evaluation

Can light travel through all meterials?

How does light transmit in transparent, translucent and opaque materials?

Practical Activity 17. Demonstrating the reflection of light

P5 **Unit 14: Light**

Rationale for the activity

The reflection of light allows us to see everything around us, even those things that do not produce their own light because they reflect the light of the sun. In this activity, learners will demonstrate the reflection of light and explain its importance in our daily lives.

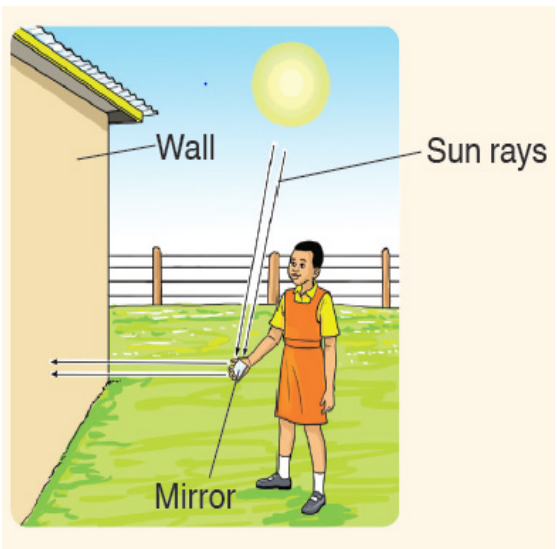
Objective

Learners will be able to demonstrate the reflection of light perfectly.

Required materials

- A plane mirror
- Source of light (the sun or torch)
- Wall

Illustration of the activity



Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide the learners to do the following:
    - To hold a mirror in the direction of the sun
    - To observe the light reflected to the wall by the mirror.
    - Change the angle of the mirror, does the light patch changes the position?
    - Continue changing the angle of mirror and make further observations
3. Ask the learners the following questions:
    - What are other objects can reflect light?
    - How the light behave when it reaches the mirror?

Results

Learners have demonstrated how light reflected when it hits a shiny surface. They also demonstrated that the change of angle of mirror affect the angle of light reflection in the same medium.

Conclusion

Reflection is the change of direction back into the medium as the light hits a shiny surface. The angle of light incident equals to the angle of light reflection in the same medium and smooth shiny surfaces reflect most of the light that falls on them. They are good reflectors of light.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- What object reflects most light?
- What happened when there is a change in the angle of the mirror?
- Discuss the reflection of light on smooth shiny surfaces

Practical Activity 18. Demonstrating the refraction of light.

P5 **Unit 14: Light**

Rationale for the activity

Light moves at certain speeds through a given material. Some substances let it move at a constant speed, but others slow it down. When the speed changes, it causes the light to bend. This bending of light is called **refraction**. In this activity, learners will demonstrate the refraction of light and identify where it can be met in their daily life.

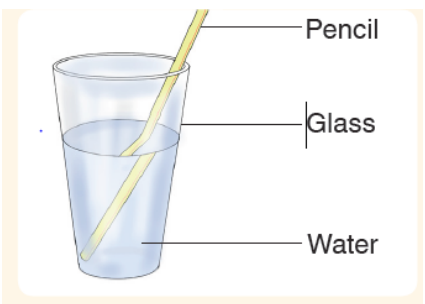
Objective

Learners will be able to demonstrate the refraction of light.

Required materials

- Five (5) pencils or a ruler
- Five (5) clear glasses of water

Illustration of the activity



Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide learners to do the following:
   - To Put a pencil into a clear glass of water,
   - To make clear glass nearly a half filled of water,
   - To change the direction of the pencil or the ruler
3. Ask learners to write down their observations about the behaviour of the pencil or ruler. What did you observe?

Results

Learners have demonstrated how light traveling from the air is bent at the surface of water (just at the contact surface between air and water) and that both pencil and light are travelling into two media, where one is the air while the other one is the water.

Conclusion

The bending of light occurs because light travels at different speeds in different media, from one medium to another.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- Why does the part of pencil in water look bent?
- Give some examples of refraction of light?

Practical Activity 19. Demonstrating the formation of shadow

P5 **Unit 14: Light**

Rationale for the activity

The opaque material does not let the light pass through it. When an opaque object or material is placed in the path of rays of light, the light rays that go past the edges of the material make an outline for the shadow formation. In this activity, learners show the formation of the shadow and learn the phenomena of what happen at night when they are at home.

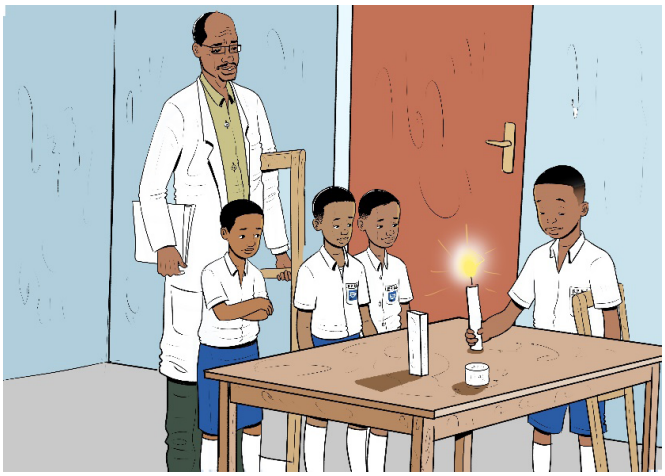
Objective

Learners will be able to show formation of shadow of an object.

Required materials

- Match box
- Spirit lamp, candle, phone's torch
- White board
- Table

Illustration of the activity



Steps of the activity

1. Avail materials to be used and distribute them to learners
2. To form the groups of learners
3. Invite and guide the learners to do the following:
   - On the table put the candle erect, at one side;
   - Hold the white board on the other side of the table to get the shadow
   - Place the pencil (whose shadow you want to study) between white board and candle in distance;
   - Light the candle and the whiteboard will appear on the screen;
   - Ask friend to trace out the outline/shape of the shadow on the white board.
   - Repeat steps for different objects and by changing the distance of object to the candle. What do you observe? How is the shadow formed?
4. Ask to the learners the following questions: What are the colour and the size of the shadow? what will happen when the intensity of light is reduced? Can you see The shadow in the dark?

Results of the activity

Learners demonstrated how shadow is formed on the whiteboard from the illuminated object. They are aware of three things which are required to form a shadow and that will not form if any of these is absent. These are: A source of light, an opaque object and a screen or surface behind the object. This explains why we cannot see a shadow in the dark. It is only when light rays are obstructed by an opaque object that we get a shadow of the object.

Conclusion

An opaque object blocks the light falling on it and creates an area of darkness on the side of the object away from the source of light. This area of darkness formed by an opaque object obstructing light is called a shadow.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- Discuss shortly how a shadow is formed?
- What are the essential conditions for the formation of shadow?
- Why we cannot see a shadow in the darkens?
- What happened to the shadow if you changed the distance from the object to the candle?

Practical Activity 20. Production of electricity using a simple dynamo

P5 **Unit 15: Electricity**

Rationale for the activity

Electricity is an essential part of modern life. People use electricity for many purposes (lighting, heating, cooling, and refrigeration and for operating appliances, computers, electronics, machinery, and public transportation systems). Dynamo is able to generate electricity from mechanical energy to electrical energy, and end up making the light bulb to light up. Knowing how electricity is produced using a simple dynamo will help to easy life of many people.

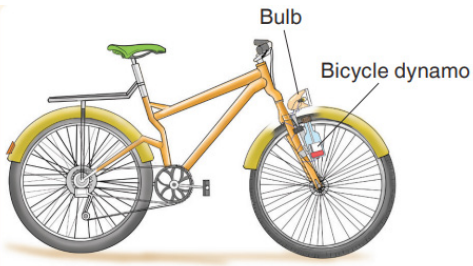
Objective

Learners will be able to generate the electricity by using a simple dynamo.

Materials

- A bicycle with dynamo
- A bulb

Illustration of the activity



Steps on the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide the learners to do the following:
   - To turn the bicycle upside and down and touch smoothly the head of dynamo to the wheel and make sure the system is connected.
   - To switch the bulb when the bicycle wheels are not moving. What happen to the bulb?
   - To rotate the bicycle pedals slowly at first. Switch on the bulb and observe what happen;
   - To rotate the bicycle very fast while the bulb is switched on. How the bulb does appear?
   - Allow the wheels to rotate until it stops. What happen to the bulb?

Results

Learners have shown that when the bicycle is at rest (wheels not moving), the bulb does not light up. When the pedals are rotating to make the wheels move, the bulb lights up and when the wheels rotated very fast the light gets brighter.

Conclusion

A bicycle dynamo generates electricity when the bicycle is being pedalled. The higher the speed of bicycle the higher electrical energy produced and bulb lights much more. Other electricity source we can mention are diesel, petrol, water and fuel.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) From the above activity, can you please state what makes the light bulb from the dynamo to light up?
2) What happened to the bulb when the bicycle wheels are not moving?
3) If the bulb is switched on, what happened when the bicycle is rotated very fast?

Practical Activity 21. Producing electricity using a solar panel

P5 **Unit 15: Electricity**

Rationale for the activity

The electricity is very important in human life. People use electricity for many purposes like house lighting. Knowing how electricity is produced helps to perform many different household tasks. In this activity, learners will learn as many techniques as possible including using a solar panel to produce or provide electricity.

Objective

Learners will be able to generate the electricity by using a solar panel:

Required materials

- A simple solar panel;
- A solar lamp,

Illustration of the activity

Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide the learners to do the following:
   - To ensure that lamp does not have power,
   - To switch on solar lamp, what do you observe?
   - To place your solar lamp in the sun (30 minutes to 1 hour) and ensure the part having solar cells faces the sun. What happens?
   - To switch on your solar lamp, what do you observe?

Results

Learners have found that when the solar lamp does not have power, it cannot light up. After exposing the solar panel to the sun for a while, the solar lamp lights up.

Conclusion

A solar panel generates electricity when exposed to the sun. The more the size of the panel, the more electricity produced. The solar panels are usually placed where they can receive maximum sunlight.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Discuss benefits of using solar light?
2) What are the other methods of producing electricity?
3) Why do you need to expose the solar lamp to the sunlight to be able to light up?
4) What may change the sunlight energy to electrical energy?

Practical Activity 22. Constructing a simple electric circuit

P5 **Unit 15: Electricity**

Rationale for the activity

In our daily life, we face many applications involving simple electrical circuits such as home installations, the adjustment of radio frequency, self-starter of vehicles etc. In this activity, learners acquire how to construct a simple electric circuit, which in long term would be helpful where in need.

Objective

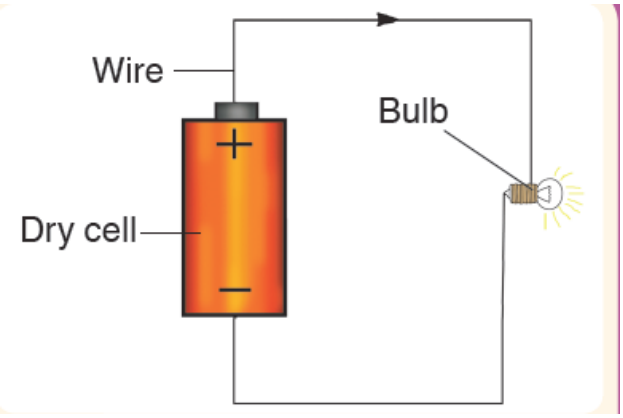
Learners will be able to construct the simple electric circuit by using available materials.

Required materials

- Dry cells
- Dry cell holder
- Switch

- Bulb holder
- Conducting Wires
- Bulbs

Illustration of the activity



Steps of the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide learners to do the following:
   - To connect wire to both ends of the dry cell,
   - Connect a switch to the circuit
   - To connect the bulb with the two ends of the wires.
   - To switch on to observe how the light bulb behaves, and what do you observe?
   - Remove one end of the wire from the dry cell. What happens?
   - Make other circuits by connecting two or more dry cells. What do you observe?
   - Connect positive terminals of dry cells to negative terminals of another dry cell.
3. Ask learners to make their observations and compare the brightness of the bulb when one dry cell is connected and when two dry cells are connected?

Results

Learners found that the brightness of the bulb is observed when dry cell is connected and that an increased brightness is produced when two dry cells are connected. They found also that when you switch off the circuit, the light bulbs do not light up.

Conclusion

It is seen that electricity flows through a path, which is called an electric circuit. The flow of an electric circuit exists only when there are three major parts or components that are: (a) Source of energy or power supply (dry cell or battery) (b) Conducting wires (c) A bulb (d) Switch (Controller).

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What are the three basic things / components do you need to make a simple circuit?
2) How the light bulb behaves after switch on?
3) What happened while removing one end of the wire from the dry cell?
4) Discuss brightness of the bulb when one dry cell is connected and when two dry cells are connected.

Practical Activity 23. Investigating the density of different objects

P5 **Unit 16: Materials**

Rationale for the activity

When we want to identify pure substances and to characterize and estimate the composition of many kinds of mixtures, densities are widely used. It allows us also to determine what substances will float and what substances will sink when placed in a liquid. In this activity, learners will investigate the density of different objects.

Objective

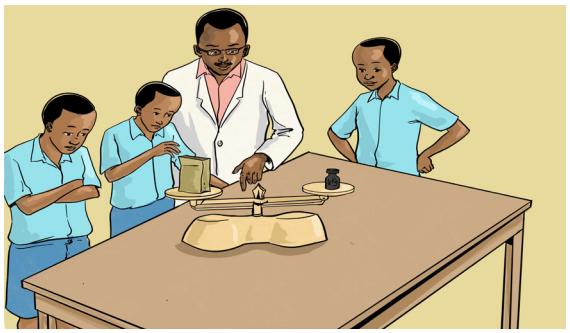
Learners will be able to measure the density of different objects

A) Measuring the mass of materials

Required materials

- Weighing balance
- Wood
- Nails
- Water in the container
- Stone,
- Metallic harmer or knob

Illustration of the activity



Steps of the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide the learners to do the following:
   - Use a weighing balance to measure the mass of wood, nails, stones and metallic hammer or knob,
   - Record their mass in a table shown below

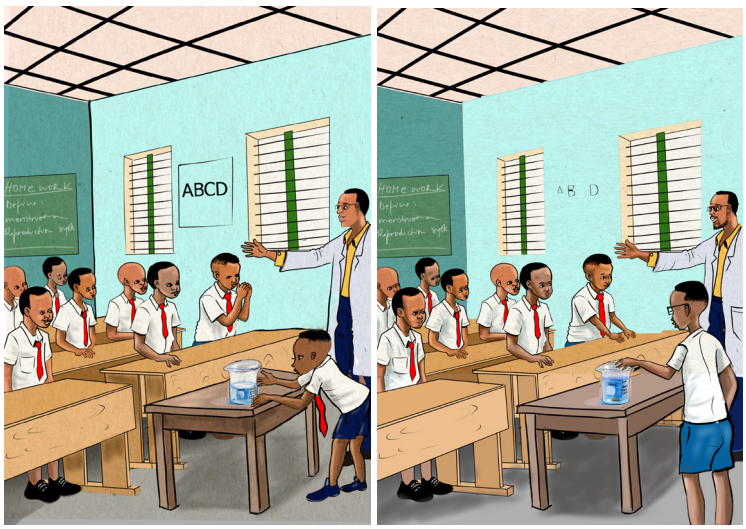
Material/ object	Mass
Water	
Wood	
Nails	
Stone	
Metallic Hammer	

B) Measuring the volume of irregular materials

Required materials

- Water in a container
- Metallic hammer or knob
- Wood
- Stone
- Thread
- Nails
- Measuring cylinder or container or marked container

Illustration of the activity



Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide learners to do the following
   - Pour water in a measuring cylinder or marked container
   - Note initial level of water in the cylinder.
   - Tie a piece of thread around a stone
   - Lower the stone gently into the measuring cylinder or a container.
   - Note the final level of water after lowering the stone into container. Record it as final volume of water
   - Find the volume of the stone by making the difference of initial and final readings levels of water in the cylinder (**Volume of material = Final volume of water – Initial volume of water)**.
   - Repeat the same above (measure the initial and final volumes) for all other objects and record them in a table as shown below:

Material/ Object	Initial volume of water	Final volume of water	Volume of material
Water			
Wood			
Nails			
Stone			
Metallic Hammer			

3. Ask learners to summarize all records obtained from the measurements (a) and (b) in a table below:

Material/ object	Mass	Volume
Water		
Wood		
Nails		
Stone		
Metallic Hammer		

4. Ask learners to calculate the ratio between measured mass and volume of each of the objects used in this activity to determine their different densities (the formula: $D = \frac{m}{v}$ is applied**).**

Results

Learners found that the mass of objects is obtained by weighing them while the volume of objects is a measure of the amount of space an object immerged of water takes up (the displacement method of water).

Conclusion

By the displacement method of water, a volume is a measure of the amount of space an object takes up when immerged in water. When a stone is submerged in the water it pushes water out of the way. If you measure the amount the water level increases, you can find the volume of the water pushed out of the way which is equal of that immerged stone. The density of an object is the ratio of mass of object to its volume.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- Why changes in water level when an object is lowered into the water?
- Why do different objects have different densities?
- Explain why two objects have the same mass but different densities?

Practical Activity 24. Measuring the density of different liquid materials

P5 Unit 16: Materials

Rationale for the activity

The density of pure water serves as a benchmarking dimension where other liquids densities are compared. By disposing different liquids in a container, you will experience a superposition of those liquids, forming the layers of liquids depending on their densities.

Objective

Learners will be able to measure the density of different liquids using a densimeter

Required materials

- Densimeter
- Clean water
- Unclean water
- Cooking oil
- Paraffin
- Juice
- Milk
- Salt water

Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide learners to do the following
    - Using a densimeter, measure the density of available liquids such as clean water, unclean water, cooking oil, paraffin juice, milk, and salty water among others.

- Record your findings in a table below:

Liquid	Density
Clean water	
Unclean water	
Cooking oil	
Paraffin	
Juice	
Milk	
Salty water	

3. Ask learners to compare different values of densities of measured objects with the density of water.

Results

Learners found that each liquid has its own characteristic density. Some liquids have a lower density compared to that of water, while others have a higher density compared to water. If you weigh an equal amount (volume) of two liquids, the one that weighs more is denser.

Conclusion

If you weigh equal amounts or volumes of two different liquids, the liquid that weighs more is denser. If a liquid that is less denser than water is gently added to the surface of the water, it will float on the water. If a liquid that is denser than water is added to the surface of the water, it will sink.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What liquids are denser than water?
2. How do you compare the density of liquids?

Practical Activity 25. Measuring relative density of liquids

P5 **Unit 16: Materials**

Rationale for the activity:

In our daily life we face many applications of relative density. Relative density tells us how heavy the substance is in comparison to water. Knowing how to measure relative density of liquids can be helpful for quantifying the buoyancy of a substance in a fluid or gas, or determine the density of an unknown substance from the known density of another. In this activity, learners will use the hydrometer/densimeter and practice how to measure relative density of liquids.

Objective

Learners will be able to measure the relative density of liquids.

Required materials

- Different liquids (clean water, unclean water, cooking oil, paraffin, juice, milk and salty water).
- Plastic object
- Hydrometer

Illustration for the activity

Hydrometer

Using a hydrometer

Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide learners to do the following:
   - Put a liquid in a plastic object (up to ¾).
   - Measure the density of available liquid using of hydrometer
   - Record the value of the hydrometer readings in below table.
   - Repeat the steps in the above bullets for all available liquids

No	Liquid	Density readings
1	Clean water	
2	Unlearned water	
3	Cooking oil	
4	Juice	
5	Paraffin	
6	Milk	
7	Salty water	

3. Compare different values of densities of measured objects / liquids with the density of water
4. Ask leaner the following question: Why the density of materials available differs from one another?

Results

Learners found that some liquids have a lower density while others have a higher density compared to that of water due to the mass of constituent atoms, their size and the way they are arranged.

Conclusion

Relative density tells us how heavy the substance is in comparison to water. Densities values of different liquids measured differ from one another because of variation of materials these objects are made.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Why do liquids available have different densities?
2) Differentiate the relative density from the density of materials?

Practical Activity 26. Demonstrating the behavior of different objects in water

P5 Unit 16: Materials

Rationale for the activity

Relative density has many applications in our daily life. It is applied when designing the structures like ships and planes. A ship has to be hallowing such that it can float because making it hallow reduces its density. Relative density is also used to determine purity of some substances. Learners need to know those applications of relative density as they are useful in daily life.

Objective

Learners will be able to demonstrate the behavior of different objects in water due to relative density.

Required materials

- Water
- Basin or sink
- Paraffin
- Stone
- Cooking oil
- Metallic spoons
- Water in the saucepan
- A bottle (with lid) full of water
- An empty bottle with lid (full of air)
- Feather
- Metallic hammer
- Plastic object

Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide learners to do the following:
   - Put water in a basin or sink (up to ¾)
   - Gently put the objects listed above in water one by one. Observe how objects behave and ask why some of the object sink, while other just float in water?
   - Record in your notebook all objects, which sink in water?
   - Record in your notebook all objects which float on water?
3. Ask learners to make a conclusion concerning relative density of objects?

Results

Learners found that objects that have a lower density than water float on water while that have a higher density than water sink in water.

Conclusion

If an object is denser than water it will sink when placed in water, and if it is less dense than water it will float. Density is a characteristic property of a substance and does not depend on the amount of substance.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Discuss behaviour of different objects in water?
2. Explain why do some objects float on water and some sink?
3. What happens when two objects have the same density?

Practical Activity 27: Illustrating poor and good conductor of heat

P5 **Unit 16: Materials**

Rationale for the activity

The heat helps us to prepare our food and it is an interesting form of energy. Materials are different in conducting heat. Some materials allow the heat to flow through them easily and they are known as good conductors of heat others do not easily allow the flow of heat, and they are poor conductors of heat. In this activity, learners will illustrate poor and good conductor of heat and relating them to their uses in daily life.

Objective

Learners will be able to illustrate the poor and good conductor of heat

Required materials

- Small glass bowl
- Three Spoons (1 made out of wood, 1 made out of plastic and 1 made out of metal)
- Butter/ Vaseline/ petroleum jelly
- 3 beads or small stones
- Boiling Water
- Beaker

Illustration of the activity

Steps of the activity

1. Collect before the required materials
2. Avail the collected materials to be used in the activity
3. Invite and guide the learners to do the following:
    - Begin by positioning 3 spoons in a small glass bowl.
    - Place a small pat of butter at the top of each spoon
    - Put a bead in each pat of butter
    - Carefully pour hot boiling water into the bowl until it is almost completely full. Be careful not to allow the spoons to fall into the bowl.
4. Ask learners to watch carefully and see what happens to the beads. Note: It will likely need to watch the experiment for 5-10 minutes before anything happens.

Results of the activity

Learners show that as the metal spoon gets hotter, the butter begins to melt and the bead slides down the spoon.

Conclusion

Metal is a good **conductor** of heat, while wood and plastic are good **insulators**. A conductor transfers thermal energy (heat) well, while an insulator does not transfer thermal energy (heat) .

Guidance on evaluation

Ask questions related to the activity performed by learners:

- Discuss behaviour of all the beads in three spoons?
- Why did the bead slide down the metal spoon faster than the wooden spoon or plastic spoon?

Practical Activity 28. Investigating heat conductivity of metals

P5 **Unit 16: Materials**

Rationale for the activity

Metallic materials or objects find their applications in everyday life. Some metals have specific qualities or properties that sictate teir use. The heat conduction by metals is one of metal properties and is observed in our daily life. The metallic container gets heated from a hot liquid. If you take a metallic cup that has hot coffee or tea in it, the cup itself is hot and your hands will feel it. When ironing clothes, there is heat conduction. In this activity, learners will demonstrate how the metals conduct heat easily.

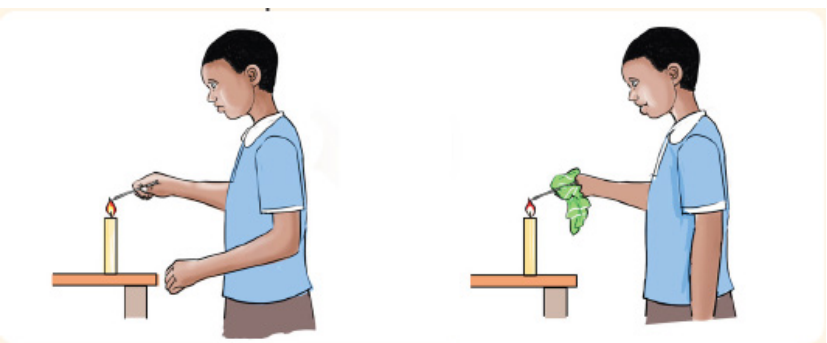
Objective

Learners will be able to investigate the heat conductivity of metals

Required materials

- Heat source
- Iron rod or nails
- Wooden handle or piece of cloth

Illustration of the activity;



Steps of the activity

1. Avail the collected materials to be used in the activity and distribute them to the learners.
2. Invite and guide the learners to do the following:
   - Light the heat source.

- Use a wooden handle or piece of cloth to hold the iron rod.
- Put on the heat source the iron rod gently.
- As you continue to heat the iron rod, hold the hot iron rod by using a wooden handle or piece of cloth. What do you feel? Why?

Caution: Do not hold the iron rod when it is very hot or you will get burnt.

Results

From the activity, learners realized the following:

1. When they hold the iron rod in their hand and heat it, it will get hot. They will feel the heat in their hands.
2. When they hold the iron rod with a wooden handle or a piece of cloth, they will not feel the heat. The wooden handle or piece of cloth is not a good conductor of heat.

Conclusion

When the hot iron rod was held with a piece of cloth, heat was felt in the hand less fast, as the piece of cloth (non-metal) is a poor conductor of heat. Metals are conductors of heat.

Guidance on evaluation

1) Explain the feeling and non-feeling of heat during this activity?
2) Why when you hold the iron rod with a wooden handle or a piece of cloth, you do not feel the heat?

Practical Activity 29. Investigating electrical conductivity of metals

P5 **Unit 16: Materials**

Rationale for the activity

Metals are frequently used in everyday life because some of them have specific qualities that dictate their use. Some metals allow electricity to pass through them while others do not. It is why electrical conductivity plays a crucial role in many industrial processes. In this activity, learners will investigate good electrical conductivity of metals by relating them with their uses in real life.

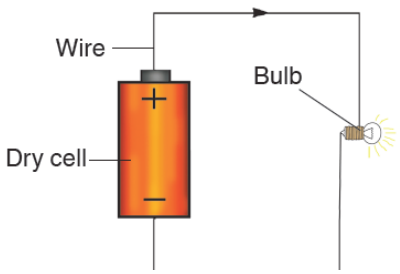
Objective

Learners will be able to investigate good electrical conductivity of metals

Required materials

- Battery
- A light bulb and switch
- Conducting Wires
- A piece of copper metal
- Trimmed wood stick
- Crocodile clip
- Thread

Illustration of the activity



Steps of the activity

1. Dispose the above materials and invite learners to perform the following activities under the supervision:
   - Set up a simple electrical circuit a shown above
   - To connect wire to both ends of the dry cell,
   - Connect a switch to the circuit
   - To connect the bulb with the two ends of the wires.
   - To switch on to observe how the light bulb behaves, and what do you observe?
   - Remove one end of the wire from the dry cell. What happens?
   - Repeat the same steps with a thread or wood stick. What do you observe to the bulb?
2. Ask learners what conclusion can be drawn from the activity performed?

Results

From this activity, learners observed that when a piece of copper metal wire is hold between the terminals A and B, the bulb glows but when a piece of copper has been replaced by a trimmed wood stick or thread, the bulb does not glow.

Conclusion

When metaly wives are connected to a dry cell, the bulb glows which shows that metals are good conductors of electricity, whereas the bulb does not glow when samples of nonmetals are uded which shows that non-metals are poor conductors of electricity. The metals are good conductors of electricity.

Guide on evaluation

1) What could be happen if the switch is still off?
2) Why the bulb is lit when switched on?

Practical Activity 30. Investigating the sonority of metals

P5 **Unit 16: Materials**

Rationale for the activity

Metals are distinguishable from the non-metals on the basis of sonority. Some metals have the ability to produce a specific sound when struck with a hard object or when we drop them on a hard object or they strike against each other. In this activity, learners will gain the skills and competence to investigate that ability of metals.

Objective

Learners will be able to investigate the sonority of metals

Required materials

- Metal plates of aluminium, iron and copper.
- A hammer
- A wood block

Steps of the activity

1. Avail the required materials and invite learners to carry out the following activities:
   - Hit the metal plates with a hammer each in turn. What is your observation?
   - For comparison hit the wood block with the hammer. Do you notice any difference? If you do, what is it?

Results

From observations made in the above steps of the activity, it is clear that metals are highly sonorous (emit sound). On the contrary, non-metals like wood block are not sonorous.

Conclusion

Metals when struck with a hard surface, when we drop them on a hard object or when strike against each other produce or make a ringing sound while non-metals do not. Such metals are said to be sonorous.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What happens when hit the plates?
2. What happens when you hit the wood block?
3. Compare and explain the difference noticed after hitting both plates and wood block?
4. After hitting on them, which of the materials below would prefer to use for construction a door, if you want to avoid noise?

   a) Iron sheets.
   b) Wood
   c) Plastic materials

Practical Activity 31. Investigating the shininess of metals

P5 **Unit 16: Materials**

Rationale for the activity

Metals are frequently used in everyday life. Some of them have specific qualities that dictate their use. Metals with smooth surface appear shiny. Due to this shiny property, metals such as copper, silver and gold are widely used for decorative arts, making jewelry and coins. Strong metals such as iron and metal alloys such as stainless steel are used to build structures, ships, and vehicles including cars, trains, and trucks. It is in this line that, by this activity learners will investigate the shininess of metals.

Objective

Learners will be able to investigate the shininess of metals

Materials

- Some pieces of aluminium, iron and copper.

Steps of the activity

1. Obtain the above materials and invite the learners to do the following:
   - Let them look at pieces of aluminium, iron and copper. Are they shiny or dull coloured? Why do they behave to be new?
   - Repeat the observation as above but at this time look at a wood stick. How does it compare with pieces of metals?

Results

From the activity, learners observed that the metals (pieces of aluminum, iron and copper) are shiny in appearance whereas non-metals (wood stick) are dull-coloured.

Conclusion

All metals have a *shiny* appearance (at least when freshly polished).

Guidance on evaluation

1) Are non-metals or metals shiny?
2) Name some 3 examples for shiny materials?
3) Based on shininess, determine whether the following objects are metals or non-metals:
   1. A sauce pan.
   2. A plastic pipe.
   3. A brick

PRACTICAL ACTIVITIES FOR PRIMARY SIX (P6)

Practical Activity/Field visit 1. Visiting a garage to explore how to use mechanic tools

P6 **Unit 1: Mechanics and Blacksmith Tools**

Rationale for the activity

There are different mechanic tools used in the garage. Learners need to know those materials and how they are used. This activity will allow learners to observe the mechanic in their work and gain knowledge and skills of how they are used in daily life.

Objective

Learners will be able to use mechanic tools

Requirements/ logistics

- Selection of nearest garage
- Select a date and notify authority
- Transportation (bus)
- Arrangements for lunch and restroom
- A parent permission form for them to sign
- Budget and its source
- Attendance sheets for trip
- Dressing code for trip depending on visiting site
- First aid kit
- Notify garage leader

Steps of the activity

1. Prepare in advance the visit by working on requirements listed above
2. Give the rules and guidelines to follow on visiting site:
    - To be quit and stable on site
    - To go with a notebook and a pen
    - To be on line while observing
    - Never leave other students alone

3. Give to learners the questions that they will be answering while observing: What are the main materials observed in the garage? Are there strange materials have you observed? Can you draw the materials you found strange? Do they mechanics gain enough money from their work? What have you generally learnt in the garage?
4. Put students in bus or line to visiting nearest garage
5. Arrange the learners on semi-circle so they can observe and hear.
6. Let the chief mechanic give learners with a story tell so they are oriented on garage site
7. Give time to learners to tour the garage by observing materials and how mechanics are using them. They will write/draw their observations.
8. While observing, ask them the following questions: What are the main materials used in the garage? What is used to open a car tire? Can you repair a car tire?

Results

Learners have visited garage. They have found mechanics working on cars. They have observed different mechanic tools. They have observed how to use mechanic tools. They can use some mechanics tools.

Conclusion

Learners have experience of what happen in garage and how to use mechanics tools.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- What are the four main mechanics tools used in garage?
- What does a mechanic use to replace tire in a car?
- What have you excited while touring the garage?

Practical Activity 2. Lifting an object using a simple machine: single pulley

P6 Unit 2: Simple Machines

Rationale for the activity

Sometimes, it is not easy to lift heavy object with only human force. A simple machine like a pulley helps to perform work by changing the direction of forces and making easier the moving of large object. In this activity, learners need to know how the simple machine is used and gain skills and knowledge how they simplify the work in their daily life.

Objective

Learners will be able to lift an object using single pulley

Required materials

- One or two wheels
- A rob
- A fixed support
- A pen

Steps for the activity

1. Avail materials to be used and distribute them to learners
2. Invite and guide learners to do the following:
   - To build a simple pulley with one wheel
   - Loop a string over the top of the pulley
   - Tie weight (a pen) to one end of the strings
   - Starting pulling the strings
3. Ask learners the following questions: Can you compare the amount of force used to lift the load when a pulley is applied and when it is not applied? When you pull the rope to lift the load, what do you observe? What happen to the load? Does it move or lift from one point to another?

Results

The use of a simple machine such as a pulley, helps us to lift workload with heavier mass while using a simplified force. If effectively multiplying the number of wheel in a pulley, it becomes very easier to uplift heavier masses.

Conclusion

When pulleys are used to lift load from one position to another in a vertical distance, it helps to simplify the effort that would be applied if the pulleys are not there.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Explain why the application of more than one wheel in a pulley helps to simplify much more the effort to be used?
2) Identify other areas do you think pulleys can be applied?

Practical Activity 3. Carrying heavy weights and opening bottles using simple machines

P6 **Unit 2: Simple Machines**

Rationale for the activity

Sometimes, it is not easy to carry heavy weight or open some materials with only human force. Simple machines like a wheelbarrow, bottle opener helps to perform work by changing the direction of forces and making easier the moving of heavy objects. In this activity, learners need to know how the simple machines are used and gain skills and knowledge how they simplify the work in their daily life.

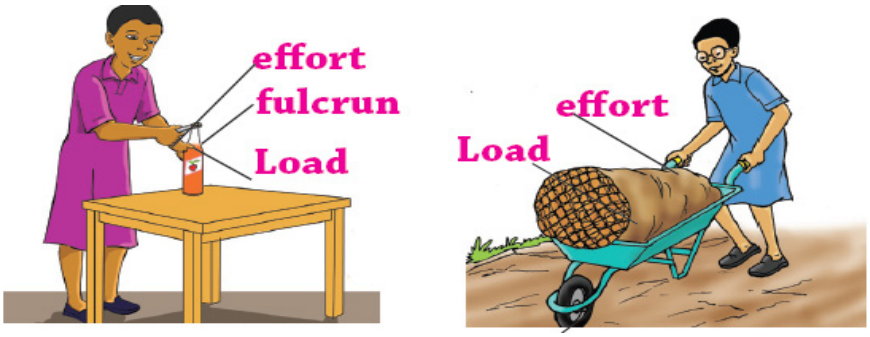
Objective

Learners will be able to carry heavy weight and open bottles using simple machines

Required materials

- Wheelbarrows
- Heavy loads
- Soda bottle
- Bottle opener

Illustration for the activity



Steps of the activity

1. Avail the required materials and distribute them in learners
2. Invite and guide the learners to do the following:

Sub-activity A: Using a wheelbarrow

- Before loading the wheelbarrow, point the empty wheelbarrow in the direction of travel.
- To stack the load closer to the wheel, not the handle, so it'll be easier to lift.
- To keep your arms and back straight, and lift with your legs.
- To push the wheelbarrow

3. As learners observe, ask them the following questions: Compare the amount of force used to carrying the heavy load and that of when using wheelbarrows?

Sub-activity B: Using a bottle opener

- Hold the soda bottle in hand on the table and the bottle opener in opposite hand
- Wedge the sharp edge of the opener under the side of the bottle cap
- Lift the handle of the opener up with your dominant hand
- Discard the bottle cap in dustbin.

Results

With a wheelbarrow, the learner moved easily a heavy load that was not possible to move without it. The learner also easily opened the bottle using an opener, which was almost impossible when using only hand.

Conclusion

The use of a simple machine such as a wheelbarrow or bottle opener help us to carry heavy mass while using a simplified force.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What type of simple machine is the wheelbarrow?
2) How important is the wheelbarrow?

Practical Activity 4. Demonstrating air pollution

P6 **Unit 7: Air Pollution**

Rationale for the activity

Air is very important in life. Good air is needed for good health. Sometimes, air gets polluted. Learners need to have knowledge on air pollution. Knowing how air is polluted will help to avoid polluting the air and combat bad practices that pollute air in their environment and wherever they may be.

Objective

Learners will be able to demonstrate how air is polluted.

Required Materials

- Clear plastic container
- A piece of white cloth
- Petroleum jelly or Vaseline
- Spoon
- Chalkboard duster
- A box of matches
- A piece of rubber cut from a bicycle tyre or other plastics
- Scotch
- Lighter or match sticks
- Used school garbage can

Illustration of the activity

Steps of the Activity

1. Collect before the required materials: (clear plastic container, a piece of white cloth, Petroleum jelly or Vaseline, Spoon, Scotch, lighter or match sticks, Used school garbage can).
2. Avail the collected materials to be used in the activity
3. Invite and guide the learners to do the following:

Sub-activity A: Burning the garbage

- To take small quantity of petroleum jelly or Vaseline using a spoon
- To put into clear container or on a piece of white cloth the petroleum jelly or Vaseline
- To spread the petroleum jelly at the bottom of clear container or a piece of white cloth
- To burn the garbage in garbage can
- To place the container or the piece of white cloth in the direction of the fumes. The container may be left out during a night and observe it in the morning.
- To observe the difference on the container or white cloth before and after burning the garbage.

4. As learners observe, ask them the following questions: What happened on the container and piece of white cloth? Is it a pollution? What cause the pollution? Do you know other cases of air pollution in your environment? Is it possible to avoid such cases?

Sub-activity B: Raising dust in air

- To rub the chalkboard with a cloth duster
- To raise chalk dust by clapping hands when the duster is between the palms of hand.
- Ask them the following questions: What do you notice? What are other pollutants similar to that?

Sub-activity C: Burning plastic rubber

- Again, invite and guide learners to do the following:
- To burn a piece of rubber cut from a bicycle tyre or piece of plastics
- To smell the air from the burning.
- Ask them the following questions: What do you observe? What type of pollutant has been released from the rubber?

Results

Sub-activity A:

Learners have found in the container left out over night the piece of dirty particles that pollute the Vaseline in container. The dirty particles also are found on a piece of white cloth and pollute it.

Sub-activity B:

The learners observed emission of chalk, a pollutant in form of dust, into the air and noted that cement and maize flour/wheat flour fall in the same category.

Sub-activity C:

On burning a piece of rubber, smoke or gas was emitted into the air as a gaseous pollutant, much in the same way carbon dioxide and carbon monoxide would be emitted into the air.

Conclusion

There are different types of air pollutants namely dusts, gases, aerosols. Burning of garbage is one of sources of air pollution. It produces the non-visible particles that pollute the air needed for respiration. It is not good to burn wastes in open air to avoid pollution.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Does burning of dry grasses on the hill pollute air? How?
2) What are the source of air pollution?
3) What are the dangers of air pollution?
4) How will you avoid air pollution in your community?

Practical Activity 5. Finding mass of some objects using a beam balance

P6 **Unit 7: Air, wind and sound**

Rationale for the activity

Today, most items, which are bought or sold, must be weighed to determine their money value, as the cost is directly proportional to the mass of the object. In the kitchen, some foods are mixed in definite proportions (recipe) in order to come up with the desired food taste. In the manufacture of drinks and certain canned foods, food items and chemicals added to make the manufactured products last long, must all be weighed and mixed in definite proportions by mass. It is therefore worthwhile, knowing how to find the mass of different objects.

Objective

Learners will be able to find the mass of different objects using a beam balance, standard masses, and objects whose masses are to be found.

Required materials

- A beam balance.
- Standard masses of 250g, 500g, and 1000g (1kg).
- Objects e.g. sugar in a paper bag, nails etc.
- A table

Illustration of the activity

Steps of the activity

1. Avail the materials to be used in the activity
2. Invite learners to carry out the following activities:
   - Place the beam balance on the table and avail standard masses of 250g, 500g, and 1000g each in turn.
   - Put the standard mass of 250g on the left weighing pan of the balance and try to counter-balance it with some sugar in a paper bag on the right pan. If the beam becomes horizontal (at right angle to the vertical plane), then the unknown mass of the object is exactly 250g.

     a) If the standard mass **is lowered** by the unknown mass, then the mass of standard mass is greater than the object. This shows that you have to ***add*** more of the unknown, until they balance horizontally.

     b) If the standard mass is raised, this implies that the object of unknown mass is greater than the standard mass of 250g. It becomes necessary to remove some sugar from the paper bag until the standard mass on the left and the unknown mass on the right are horizontally opposite.
   - Repeat the activity (2a) and (2b) using standard masses of 500g and 1000g respectively.

Results

By using a beam balance and standard masses, the learners have found the unknown mass of any object.

Conclusion

The unknown mass of any object can be measured using a beam balance and standard masses.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. A shopkeeper placed a standard mass of 100g on the left pan of a beam balance, and rice of unknown mass placed on the right pan. The standard mass was raised.
   a) Of the standard mass of 100g, and the mass of the object, which one was greater?
   b) Suggest what the shopkeeper should do to make the rice equal to 100g.

Practical Activity/Project 6. Planning a livestock project

P6 **Unit 8: Animals**

Rationale for the activity

Animals keeping is one of generating income activity for many people. It requires knowledge and skills for doing it effectively. This activity will allow learners to have knowledge and skills required for running livestock projects such that they can advise or support their parents in their projects and start running effectively their small projects from their early ages.

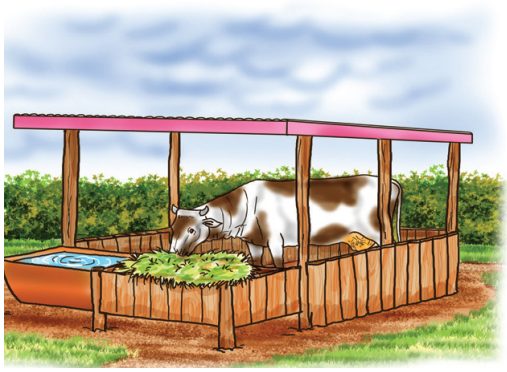
Objective

Learners will be able to make small livestock project for generating income.

Required materials

- Shelter
- The cow, goat, sheep
- Water
- Grasses as food

Illustration of activity



Steps of the activity.

1. Collect all materials available in school environment to build a livestock shelter.
2. Invite and guide the learners to do the following:
   - To prepare the ground to build on the livestock shelter.
   - To build the shelter respecting the criteria for a good shelter
   - To put the sheep or goats in the shelter
   - To feed and provide clean water for livestock
   - To visit and clean every day the shelter
   - To provide vaccines and medications periodically.

N.B. After conducting such project, learners may perform this activity at home by involving their parents.

Results

Learners noticed that the livestock project requires money to buy materials for constructing the shelter and the livestock. Shelter respecting the criteria, appropriate food and medicines are needed.

Conclusion

Learners have got knowledge and skills about running livestock project. They will plan to run the projects at their home supported by their parents.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What are the main materials needed to build a livestock shelter?
2) What is the importance of keeping animals?
3) Will you run a livestock project at your home? How?

Practical Activity 7. Practicing cutting as asexual reproduction

P6 **Unit 9: Plant Reproduction**

Rationale for the activity

Plants reproduce differently. People need to produce plants for their use. One methods used to allow plants to reproduce asexually is using cuttings. This activity will allow learners to get skill and knowledge on cutting technique and practice cutting to produce more and more plants.

Objective

Learners will be able to use cutting as an asexual reproductive technique to produce new plants.

Required Materials

- A piece of plant like cassava, sugar cane
- Machete
- Hoe
- Prepared field(soil)
- Watering can

Illustration of the activity

Steps of the activity

1. Collect before and avail the required materials:
2. Invite and guide the learners to do the following:
   - To cut parent plant into small pieces length 20-30 cm
   - To dig small holes in soil
   - To put the cuttings into moisture soil but in oblique positions
   - To cover each cutting in hole with soil without covering the whole upper part out of soil.
   - To water the cuttings when it is during the dry season.
   - To visit the planted cuttings after a certain time to observe if they have developed the roots and new plantlets.
3. As learners work, ask them the following questions: Have you ever used cutting technique at your home? What are the plants have you used? Have the planted cuttings developed into new plants?

N.B:

- Budding is almost the same as cutting. In budding they use the bud instead of cutting.
- For cutting technique, teacher can use cassava trees and others in place of sugarcane.

Results of the activity

Learners have planted the cuttings in the soil. After sometimes, the planted cuttings developed roots and grow into new plantlets.

Conclusion

The cutting technique allows to produce many plants using one plant cut into small pieces. Learners will practice the cutting technique at their home to produce more plants needed for food production and protection of environment.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What are the importance of using cutting technique?
2) Is it possible to use cutting technique on all types of plants? Why?

Practical Activity 8. Practicing grafting as asexual reproduction

P6 **Unit 9: Plant Reproduction**

Rationale for the activity

Plants reproduce differently. People need to produce plants for their use. One methods used to allow plants to reproduce asexually is using grafting. This activity will allow learners to get skills and knowledge on grafting technique and practice grafting to produce more and more plants.

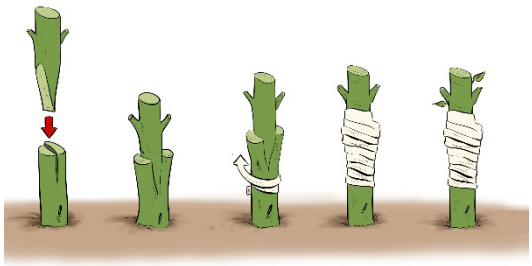
Objective

Learners will be able to use grafting to produce new plants.

Required Materials

- Machete and knife
- Part of plant from which the root system is taken “stock”
- Part of plant from which the shoot system is taken “scion or graft”
- Part of cloth and small piece of plastic bag (polyethylene sheet)
- Small basket filled with soil
- Avocado trees and Mango trees

Illustration of the activity



Steps of the Activity

1. Collect the Required materials: before and avail them to learners.
2. Invite and guide the learners to do the following:
   - To make slanting cut on both stock and scion
   - To fit the stock into the scion
   - To bound them tightly with piece of cloth
   - To cover it with polyethylene sheet or piece of plastic bag
   - To plant it into the small buckets filled with soil
3. As learners observe, ask them the following questions: Have you ever done the grafting at your home? Why do we use different parts of trees? Why is it necessary to cover after grafting?

Results

Learners have practiced the grafting. After sometimes, the grafts developed leaves and grow into new plantlets.

Conclusion

The grafting technique allows producing new improved plants using one plant graft into another plant. Learners will practice the grafting technique at their home to produce improved plants needed for food production and protection of environment.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What are the importance of using grafting technique?
2) Is it possible to use grafting technique on all types of plants? Why?

Practical Activity 9. Practicing layering or marcotting as asexual reproduction

P6 Unit 9: Plant Reproduction

Rationale for the activity

Plants reproduce differently. People need to produce plants for their use. One methods used to allow plants to reproduce asexually is layering or marcotting. This activity will allow learners to get skills and knowledge on layering technique and practice layering to produce more and more plants.

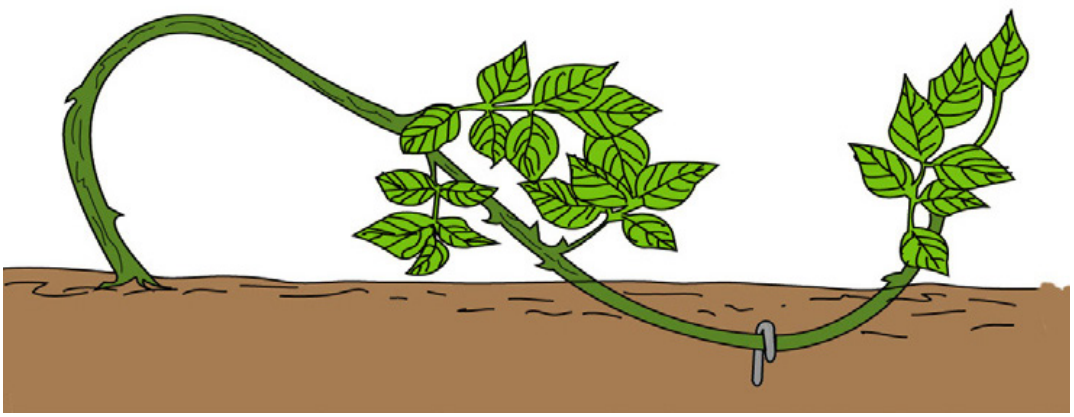
Objective

Learners will be able to use layering or marcotting technique to produce new plants.

Required Materials

- Sharp knife or machete
- Wood peg

Illustration of the activity



Steps of the activity

1. Avail the required materials: collected before
2. Take learners out of classroom to the school garden where there are plants
3. Select appropriate trees to be used in layering
4. Invite and guide the learner to do the following:
   - To bend one of the branches of parent tree
   - To use wood peg to fix the branches in soil at point of bending
   - To cover the branches with soil at point of bending
   - To leave it for one or two weeks and check if roots have developed
   - To cut off the branch from the main plant
   - To plant it in different garden
   - To monitor the growth of plant until fruiting
5. As learners observe, ask them the following questions: Have you ever practiced the laying technique at your home? What is the importance of wood peg? What cause the branches to develop roots?

Results

Learners have noticed that all plants cannot be used in layering. The creeping plants are the most appropriate ones. They have noticed that after bending the plant in the soil, it develops roots at the point of bending after a certain period. The bent part with new roots can be cut off and planted at the new place as a new young plant.

Conclusion

The layering or marcotting technique allows producing new improved plants using one plant for developing other plants. Learners will practice the layering or marcotting technique at their home to produce improved plants needed for food production and protection of environment.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What are the importance of using layering technique?
2) Is it possible to use layering technique on all types of plants? Why?

Activity 10. Practicing use of suckers as asexual reproduction

P6 **Unit 9: Plant Reproduction**

Rationale for the activity

Plants reproduce differently. People need to produce plants for their use. One methods used to allow plants to reproduce asexually is using suckers. This activity will allow learners to get skills and knowledge on using suckers techniques and practice it to produce more and more plants.

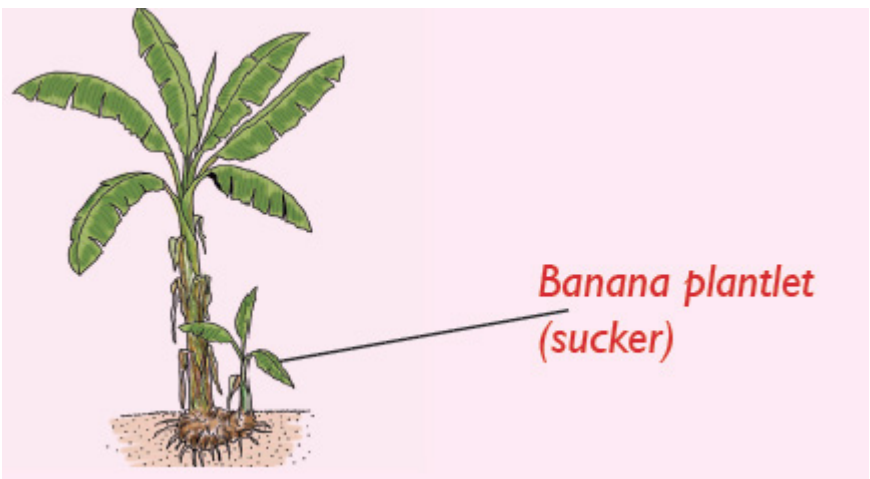
Objective

Learners will be able to user suckers in producing other plants.

Materials

- Hoe
- Machete
- Banana plantlet

Illustration of the activity



Steps of the activity

1. Avail the required materials collected before
2. Invite and guide the learners to do the following:
   - To prepare the place where to plant suckers
   - To visit a banana farm to choose banana plantlet

- To separate the plantlets from main plant carefully
- To plant it in a prepared place. For banana, plant it into prepared hole.
- To water the plantlet for few days

3. As learners go through different steps, ask them the following questions: Have you seen in your community people using suckers to produce new plants? What are the names of plants used? What will you tell parents about using suckers?

Results

Learners have used the suckers to get new plants. After sometimes, the suckers planted in the soil developed grow into new plantlets.

Conclusion

The technique of using suckers allows producing new plants using suckers from already existing plant. Learners will practice this technique at their home to produce new plants needed for food production and protection of environment.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What are the importance of using suckers in plants?
2) Is it possible to use suckers on all types of plants? Why?

Practical Activity 11. Dissecting a complete flower

P6 **Unit 9: Plant Reproduction**

Rationale for the activity

A flower is a part of flowering plants. It has different parts playing different roles. Dissecting a flower will allow learners to identify every part of the flower and locate those parts appropriately when meeting with flowers.

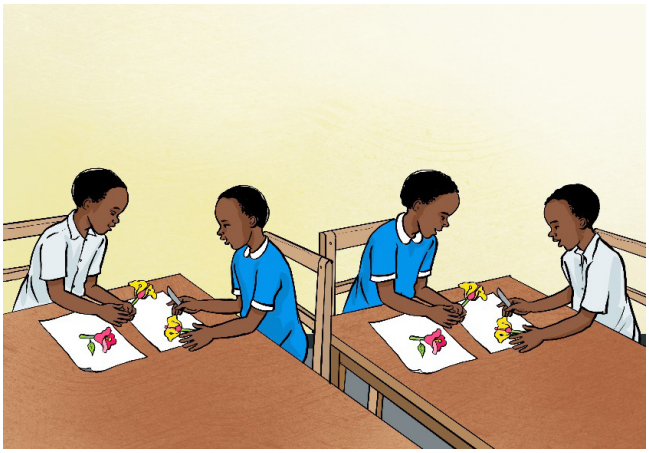
Objective

Learners will be able to identify different parts of a complete flower by dissecting it.

Materials:

- Niddle
- Razed or knife
- Hibiscus flower

Illustration of the activity



Steps of the activity

1. Avail the required materials collected before
2. Invite and guide the learners to do the following:
   - To take a complete flower and materials
   - To remove first sepal
   - To remove secondary petal
   - The style of the flower is split open
   - To remove the ovary
   - To use razed to open ovary to reveal the tiny ovules
3. As learners observe, ask them the following questions: What are the parts of the flower? What are the first parts removed? What are the second parts removed? How are they attached to the entire flower?

Results

Learners have dissected a flower. Every part of the flower was removed and observed by learners. The removed parts are sepals, petals, style and the ovary that contains ovules.

Conclusion

Learners can dissect a complete flower to demonstrate different parts of a complete flower.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- What have you observed on the flower?
- What are main parts of the complete flower?
- What have you found as new during the activity?

Practical Activity/ Field visit 12. Discovering hazardous, organic and recyclable wastes

P6 **Unit 10: Waste Management**

Rationale for the activity

Humana activities produce wastes in the environment. Some types of waste are hazardous as they may cause disease. Organic degradable organic waste, however, is advantageous as it is a source of organic fertilizer. It is therefore important to the learners to be able to identify the different types of wastes, dangers associated with them, and how they can be safely handled and disposed.

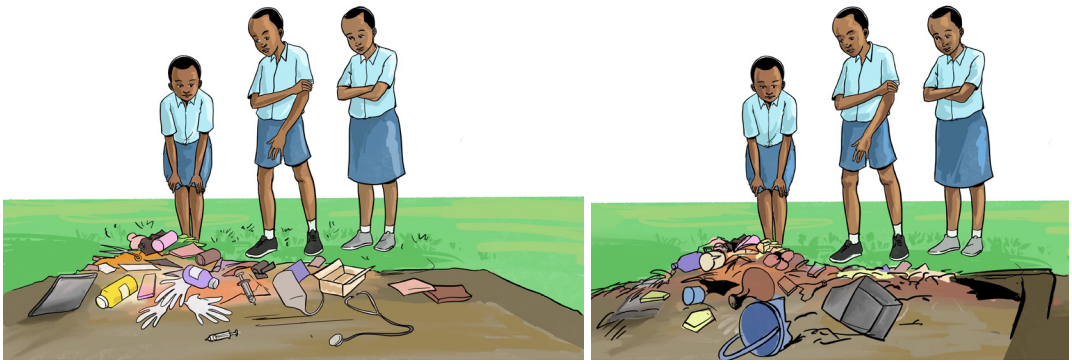
Objective

Learners will be able to identify different types of wastes and manage them appropriately.

Requirements/ logistics

- Selection of nearest healthy centre, pharmacy selling pesticides, municipal waste pit with bio-degradable and recyclable waste
- Select a date and notify authority
- Transportation (bus)
- Arrangements for lunch and restroom
- Notebooks and pens
- A parent permission form for them to sign
- Budget and its source
- Attendance sheets for trip
- Dressing code for trip depending on visiting site
- First aid kit

Illustration of the activity



Steps of the activity

1. Prepare in advance the visit by working on requirements listed
2. Give the rules and guidelines to follow on visiting site:
   - To be quit and stable on site
   - To go with a notebook and a pen
   - To be on line while observing
   - Never leave other students alone
3. To Put students in bus or line to visiting nearest garage
4. Arrange the learners on semi-circle so they can observe and hear.
5. Let the physicians or pharmacist give them the details how they recycle the materials.

Results

Learners have identified different types of wastes, dangers associated with them and the safe means by which they can be disposed.

Conclusion

There are different types of waste most of which are dangerous. Organic biodegradable waste is, however, profitable, as it is a source of organic fertilizer.

Guidance on evaluation

A homework exercise in the form of the table below will be issued to the learners and it will be handed in for marking and evaluation.

Fill the blank spaces in the table:

Place/Site visited	Name of waste	Type of waste: Hazardous/ toxic/ recyclable	Safe means of Disposal
District Hospital	• Syringes • Needles • Blood and • urine specimen bottles		
Gas dealers	Cooking gas		
Municipal garbage pit	• Kitchen • peelings • Plastic objects and polythene bags	Organic : biodegradable Recyclable	
Agro-Veterinary pesticide dealers.	• Insecticide • Acaricides (tick killers)		

Practical Activity 13: Detecting heart beats

P6 **Unit 11: Circulatory System**

Rationale for the activity

Heartbeats can be an indicator of cardiovascular status. An increased heart rate of a resting person is critical and has to be reported to medical doctor. Knowing how to use a stethoscope to detect heartbeats is essential for proper maintenance of health body.

Objective

Learners will be able to detect heartbeats using a stethoscope

Required materials

Stethoscope

Illustration of the activity

Steps of the activity

1. Collect Stethoscope from the science kit.
2. Invite and guide the learners to do the following:
   - To form the groups of learners one acting as doctors and other as patients
   - Ask learners to sit on their desks and rest for five minutes
   - Ask the doctor to do the following:

- Place the earpieces into ears
- Put the stethoscope's flat disc on chest
- Listen to the heartbeat and count how many times it beats in 15 seconds

3. Ask each group member to multiply the number of beats counted by four and find their resting heart rate in **beats per minutes** (**bpm**).
   - Ask learners to jump high or run in place.
   - Ask the other group member to act as a doctor, listen to the heartbeats, and count how many times it beats in 10 seconds.
   - To multiply this number by six, this is the heart rate right after exercising in bpm.
4. Ask the learner the following questions:
   - Do you feel your heartbeats?
   - What is your resting heartrate?
   - What is your heartrate after jumping?
   - Why do you think you do this for only 10 seconds instead of 15?

Results

Someone's heart rate is increased by physical activity.

Conclusion

When people exercises, their bodies need more oxygen and consequently their hearts beat faster and their heart rates increases. After exercises, it is better to count the number of beats for 10 seconds and multiply that value by six (to get bpm). Because the heart will quickly slow down after exercise ceases.

Guidance on the evaluation

Ask questions related to the activity performed by learner

1. How did the heart rate change after exercises?
2. Why do you think it changed in that way?
3. If a person regularly exercised, how do you think this would change his or her heart rate?

Practical Activity 14. Measuring blood pressure

P6 **Unit 11: Circulatory System**

Rationale for the activity

The ideal blood pressure is considered 120 / 80 mmHg. High blood pressure is considered to be 130/80 mmHg or higher. Lower blood pressure is considered to be 90/60mmHg or lower. This activity is for learners to know how to measure the blood pressure and gain skills and knowledge of how to use the blood pressure meter in their daily life.

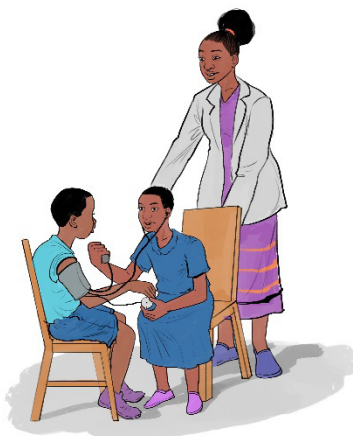
Objective

Learners will be able to measure blood pressure

Required materials

Blood pressure meter (sphygmomanometer)

Illustration of the activity



Steps of the activity

1. Collect blood pressure meter from the science kit or from the nearest health center.
2. Invite and guide the learners to do the following:
   - To sit quietly for three to five minutes beforehand

- To place your feet flat on the floor not crossed, rest your arm on a table top.
- To learn against the back of the chair, stretch out your arm, palm upward
- To place the cuff on you bare upper arm one centimeter above bend of you elbow
- To make sure the tubing falls over the front center of your arm so that the sensor is correctly placed
- To pull the end of the cuff so that it is evenly tight around your arm
- To place it tight enough so that you can only slip two fingertips under the top edge of the cuff.
- To make sure your skin doesn't pinch when the cuff inflates
- To get started, wait a moment, then press start, remain still and quiet as the machine begins measuring
- The cuff will inflate, and then slowly deflate so that the machine can take your measurement. When the reading is complete the monitor displays your blood pressure and pulse on digital panel
- If the monitor doesn't record a reading, reposition the cuff and try again. Rest quietly and wait about one or two minutes before taking another measure.

3. Ask to the learners the following questions: What is the importance of blood pressure meter? Can help in daily life?

Results of the activity

The blood pressure meter displayed the measuring of the blood pressure.

Conclusion

This equipment helps in preventing non-transmission diseases. By checking your body daily.

Guidance on the evaluation

Ask questions related to the activity performed by learners:

1. What is the normal blood pressure?
2. Why we need to stretch out your arm and palm upward?

Practical 15. Demonstrating human respiration process

P6 **Unit 12: Respiratory System**

Rationale for the activity

Respiration is one of the main functions of living organisms including animals. Human being uses gas exchange in respiration. Learners must know how respiration is conducted and demonstrate the process of respiration.

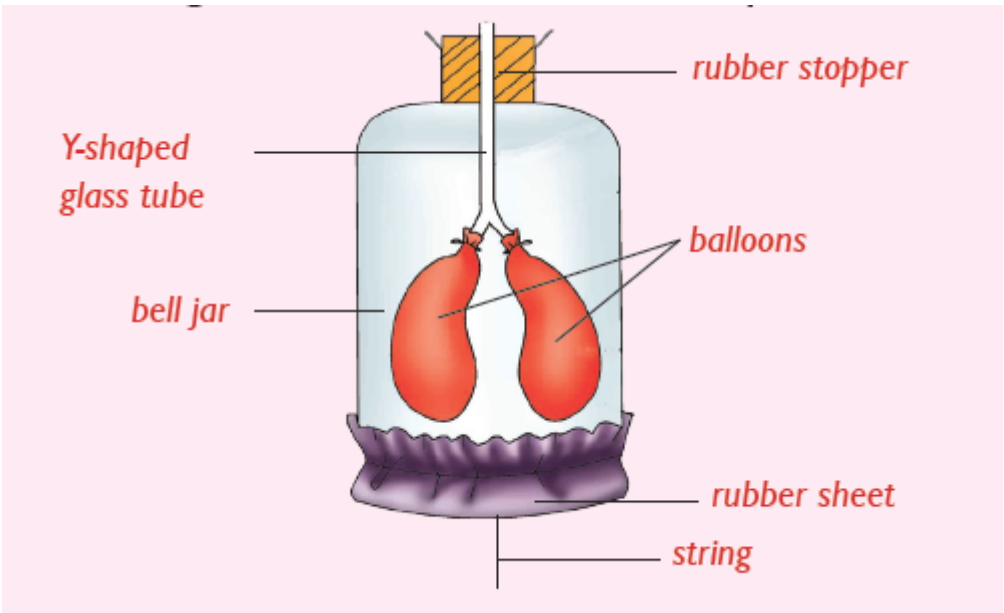
Objective

Learners will be able to demonstrate the process of respiration

Materials:

- Model respiratory system

Illustration of the activity



Steps of the activity

1. Avail the model respiratory system from the science kit.
2. Request learners to observe the respiratory model

3. To ask learners their observations and considerations by asking the following questions:

   What do you think the following parts represent in the respiratory system?

   a) Bell jar

   b) Balloons

   c) Rubber sheet

   d) Y-shaped tube

4. Invite and guide the learners to do the following:
   - To take the respiratory model
   - To pull the rubber sheet
   - To release the rubber sheet
5. As learners observe, ask them the following questions: What happen when we pull the rubber sheet? What are the change happening inside the respiration model? What happen when we release the rubber sheet? Can you compare what is happening in respiratory model to what happen in human respiration process?

Results

Learners have performed the activity using respiratory model. When they pull the rubber sheet , the balloon inside fill with air the same as inhalation and when they release the strings the balloon will be back in the normal situation as exhalation.

Conclusion

This activity demonstrates the inhalation and exhalation that happen during the respiration process.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What happened when the rubber sheet on respiratory model is pulled?
2) What happened when the rubber sheet on respiratory model is released?
3) What happen to the diaphragm during respiration?

Practical Activity 16. Demonstrating effect of smoking

P6 **Unit 12: Respiratory System**

Rationale for the activity

Smoking is not good for human health. Many people do not know well the effects of smoking on their health. This activity will allow learners to demonstrate the effects of smoking and will enhance the skills and knowledge about what happen during smoking.

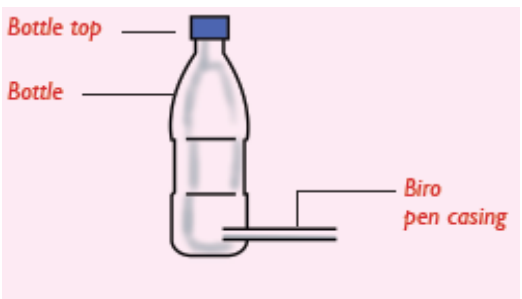
Objective

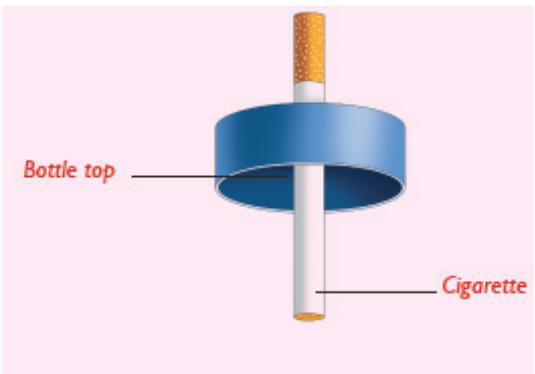
Learners will be able to demonstrate the effects of smoking using bottle experiment

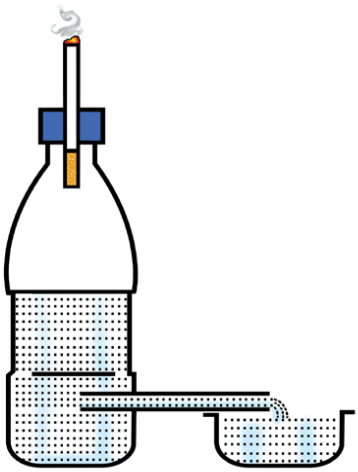
Required Materials

- Transparent plastic bottle with cap
- Tissue paper
- Cigarette
- Nail
- Water
- Rubber band
- Match box
- Biro-pen casing with cap

Illustration of the activity







Steps of the activity

1. Avail the collected materials.
2. Invite and guide the learners to do the following:
   - To make a hole at the bottom of the plastic bottle
   - To insert the biro pen casing
   - To fill the bottle almost three-quarter way with water
   - To take cap off the bottle, make a hole
   - To insert the piece of cigarette
   - To screw the bottle cap into the bottle with the cigarette filter inside the bottle
   - To light the cigarette using the match stick and match box
   - To remove the cap of the biro pen casing to let water out
   - Once all water is drained out of the bottle, remove the bottle cap and wrap the tissue paper round the mouth of the bottle. Tie it using the rubber band.
   - To blow air through the biro pen using the bottom of the bottle
   - Unwrap the tissue paper
3. As learners observe, ask them the following questions: What do you observe on the tissue paper? What are the effects of smoking? What will you tell people in your community about the effects of smoking?

Results

Learners have used the bottle and cigarettes to demonstrate the effects of smoking. They have observed the dark particles on the tissue paper after removing it on the bottle. They have compared the dark particles found out on tissue paper with what happens in one's lungs after smoking.

Conclusion

Smoking is not good as the particles from smoking attach in lungs causing different diseases.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) What have you observed during the experiment?
2) What are the effects of smoking on one's health?
3) How will you explain to the people of your community the effects of smoking?

Practical Activity 17. Demonstrating the movement of the thorax and diaphragm during inspiration and expiration

P6 **Unit 12: Respiratory System**

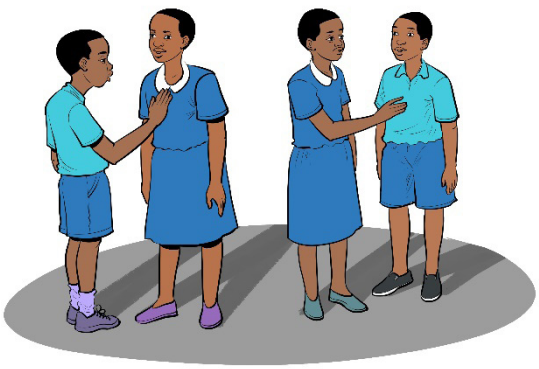
Rationale for the activity

Respiration involves inhalation and expiration. Every person must know how this works in the body. This activity will allow learners to experience the movement of the thorax and diaphragm during inspiration and expiration.

Objective

Learners will be able to demonstrate the movement of the thorax and diaphragm during inspiration and expiration

Illustration of the activity



Steps of the activity

1. Explain to the learners about the activity
2. Invite and guide the learners to do the following:
   - To form different pairs of students
   - Two learners face each other
   - One learner touch to the chest of his/her colleague, vice-versa.
   - To ask learners to breath in and out
   - To fill the movement of chest/diaphragm during breathing in and out.
3. As learners perform the activity, ask them the following questions: What have you felt on the chest? What is the difference during the breathing in and breathing out?

Results

Learners felt different movements of diaphragm during breathing in and breathing out.

Conclusion

The activity covered the movement of diaphragm.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1) Discuss the difference between breathing in and breathing out on thorax?
2) What have you learned?

Practical Activity 18. Demonstrating the correct use of condom

P6 Unit 13: Reproductive System

Rationale for the activity

HIV/AIDS is one of sexually transmitted diseases and infections. Use of condom is one method of preventing such infections and unplanned pregnancies. To ensure that a person is well protected, he/she should use correctly the condom. This activity is for learners to learn the correct use of condom as mean of preventing sexually transmitted diseases, infections and unplanned pregnancies.

Objective

Learners will be able to demonstrate the correct use of condom

Required materials

- Penis model or ripe banana
- Condom

Illustration of Activity

Steps of the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
    - To wash the penis model or the banana (without peeling) to ensure that it is clean.
    - To check on the expiry date on the condom. If expired, do NOT use.
    - To open the condom with you hand; don't use any sharp material or your teeth
    - To remove the condom from its packet carefully,
    - Determine which way the condom is rolled.
    - Ensure that the reservoir at the tip of the condom is facing away from you.
    - To Remove the trapped air by using thumb and index finger
    - To roll the condom down the length of the penis model or the banana.
    - Continue rolling until it reaches the end of the banana or model.

    Note: As for penis, make sure that it is erect and roll the condom down the shaft.
3. As learners do the activity, ask them the following questions: What is the importance of using condom? What are other methods used to prevent sexually transmitted diseases and infections? What the best method that you will advise others?

Results of the activity

Learners have correctly enrolled the condom on penis model. They have discussed on its correct use and importance.

Conclusion

Learners have enhanced their knowledge and skills on prevention of sexually transmitted diseases and infections.

Guidance on the evaluation

Ask questions related to the activity performed by learners:

1. What are the importance of condom?
2. Are the children allowed to have sex? Why?
3. What are the best way of preventing sexually transmitted diseases and infections?

Practical Activity 19. Role playing communication, negotiation and refusal as sexual behaviour and decision-making

P6 **Unit 13: Reproductive System**

Rationale for the activity

In life people behave differently. There are good and bad behaviors. People should behave appropriately in regard to sexual behavior and make adequate and voluntary decision. This activity will allow learners to practice communication, negotiation and refusal skills needed in their daily life for good sexual behaviour and decision making.

Objective

Learners will be able to practice the decision making, communication, negotiation and refusal skill for good sexual behaviour

Illustration of the activity

Steps of the activity

1. Invite and guide the learners to do the following:
    - To form different groups of learners
    - To tell to the groups how they are going to role play the sexual behaviors.
    - To role play the sketches where one learner, a boy starts dating the girl by asking her love and touches her, and the girl refuses
    - They continue their discussion and the boys insist but girl continue to refuse.
    - The boy ends up by asking pardon to the girl for insisting and demonstrating such bad behaviors.
2. After two groups have role-played, ask the whole class the following questions: What are the bad behaviors demonstrated by the boy? What make the boy to insist the girl? Is it good or bad? How the girl behaves towards the boy? What makes the girl to refuse?

Results

The girl have demonstrated the good behavior towards boys demanding love. The boys have learnt that they should not insist on girls demanding them love. They have learnt the best ways of behaving and communicating between boys and girls.

Conclusion

Learners have learnt the communication skills, negotiation and refusal skills when interacting with others including boys and girls.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What is good way of asking girl love?
2. What is good way to refuse without harming anyone?

Practical Activity 20. Demonstrating energy transformation

P6 **Unit 14: Energy Management**

Rationale for the activity

Energy transformation is when energy changes from one form to another; like in a hydroelectric dam, that transforms the kinetic energy of water into electrical energy. Learners need to know about energy transformation for satisfying their needs and make the life easy by using any kind of energy they need.

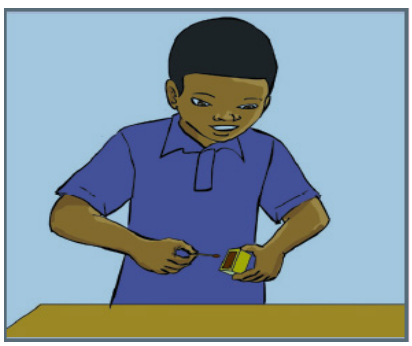
Objective

Learners will be able to demonstrate effectively the energy transformation.

Required materials

- Two dry cells
- A torch
- Box of matched
- Whistle
- Flute

Illustration of the activity



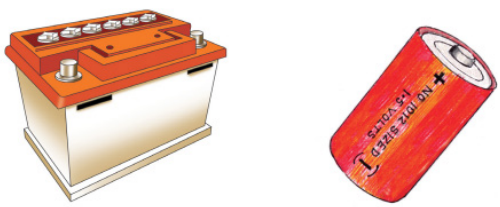


Fig 14.2 (a) Car battery (b) Dry cell

Fig.14.1.1: *Mechanical energy is transformed in light energy (by lighting matches)*

Steps for the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Put dry cells in a torch.
   - Put on the switch. What does it happen?
   - Strike a matchbox using a matchstick. What does it happen?
   - Blow a whistle or flute. What does it happen?
3. Ask the following question: What does it happen to the torch and box of match?

Results

From the above activity, learners observed that there are many forms of energy transformation. By lighting matches, mechanical energy has been transformed in light energy, while by putting the dry cells in a torch and putting on the switch, chemical energy is transformed into light energy, etc.

Conclusion

Energy is never lost or created in our environment; it can be transformed from one form to another form. This is the law of conservation of energy.

Guide on evaluation

Ask questions related to the activity performed by learners:

1. State and explain the law of conservation of energy.
2. Which type of energy transformation when:
   a. A solar panel is used to light up our house.
   b. Plant use light during photosynthesis.
   c. You blow a whistle or a flute.
   d. Light up the bulb
   e. Rub your hands against one another for some time.

Practical Activity 21. Demonstrating the installation of biogas power plant

P6 **Unit 14: Energy Management**

Rationale for the activity

Biogas plant is a facility that is able to produce renewable energy constantly in the form of a gas. Knowing how to install a simple biogas will help in proper installation and its maintenance at home.

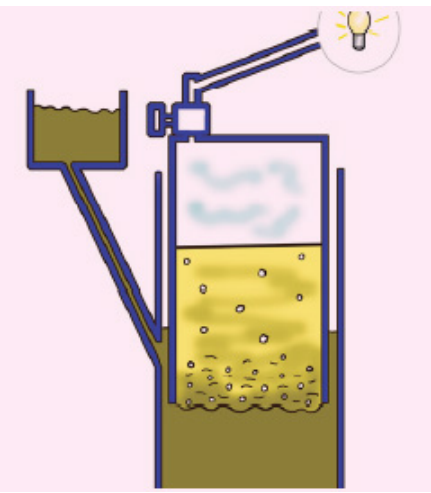
Objective

Learners will be able to demonstrate successfully the main components of installation biogas power plant at home.

Required materials

- Three containers.
- Enough cow dung and water mixed in the ratio of 4:1.
- A long wire and a pipe.
- A delivery tube (rubber) of about 60 m long.
- Candle wax, plasticine or clay.

Illustration of the activity



Steps for the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
    - Set the biggest drum of the three with open end facing up.
    - Add the cow dung-water mixture.
    - Cut open end of the second drum to make three stands. These stands should be about 7 cm long.
    - Make a hole on the extreme right of the closed end (bottom).
    - Make another hole (pipe-size) on the extreme left.
    - Place the small drum upside down into the large drum. Tie it with wires to keep it in central position.
    - Insert the pipe with bigger diameter through the bigger hole.
    - Insert the delivery tube through the hole on the small drum.
    - Make a hole the size of delivery tube at the top right side of the third tin. Seal round it with wax to close all the spaces. Connect the delivery tube from the first tin to this tin.
    - Connect this tube to a tap (regulation of gas).
    - After one week, connect the tube to the gas cooker open the tap and light the matchbox
    - What happens to the system when it is switched on?

Results

When biogas plant is properly installed, a sufficient methane gas is generated to be used for burning or lighting.

Conclusion

In this activity, students noticed that:

- It is good to continuously cross check and monitor the production of the methane gas and electricity by providing proper maintenance mechanisms to maintain biogas plant production.
- When the cow dung is not properly mixed, at the ratio set, it can affect the production of methane gas,
- When holes are not channelling well the waste into a digester, it also affects the productivity of the methane gas.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What are the use of biogas at home?
2. From the biogas plant, what are the precautions to take in order to maintain the production of methane gas?
3. What are advantages of having a biogas plant at home?

Practical Activity 22. Demonstrating the installation of solar energy plant

P6 **Unit 14: Energy Management**

Rationale for the activity

The energy is sometimes costing. It is why we need to minimize our daily energy consumption. As the sunlight is enormous, it is possible to generate energy to power up our home and perform other activities requirING the energy consumption. It is in this line that we can use the solar plants to convert the sunlight into energy. Knowing how to install a simple solar system, will help to generate energy and further proper our home installation and its maintenance.

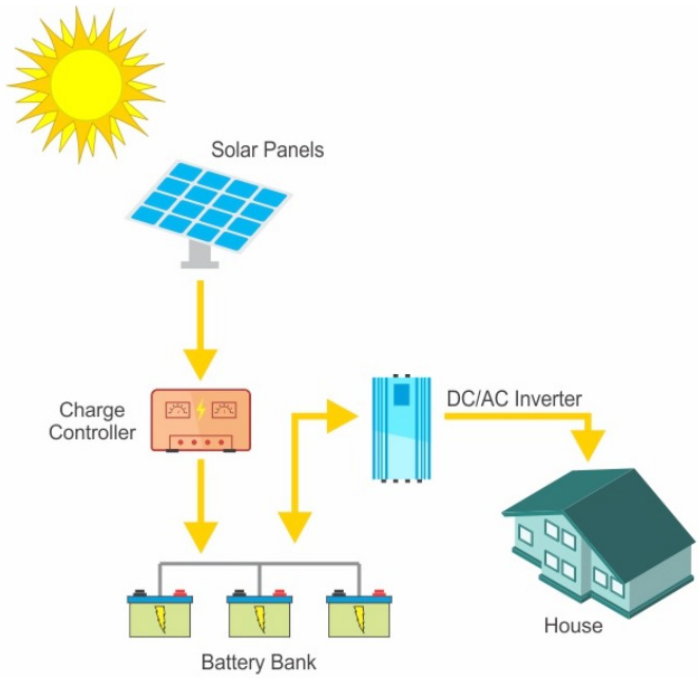
Objective

Learners will be able to demonstrate effectively the main components of installation of solar energy plant at home.

Required materials

- Solar panels
- Charge controller
- Power inverter
- Battery

Illustration of the activity



Steps for the activity

1. Avail the Required materials: collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Install the solar panels.
   - Do electrical wiring.
   - Connect a charger controller to solar panels
   - Connect a battery to charger
   - Connect the solar inverter to battery.
   - Connect a the load (bulb)
   - Start solar inverter.
   - Connect a bulb

Results

The solar panels trap solar energy from the sun. The solar system convert the solar energy into energy that can be used at home like light energy, mechanical or chemical energy.

Conclusion

The sun is the main source of energy. This is called **solar energy**. It is a renewable source of energy. Solar panels trap solar energy from the sun, the solar battery stores charge in form of chemical energy following conversion of light energy from the sun.

The inverter converts direct current (D.C) which is the form in which chemical energy is stored into battery to alternating current (A.C) which is the form that can be utilised by the bulbs and other electrical equipments.

Guidance on evaluation

Ask question related to the activity performed by learners

1. What are the components of a solar power plant?
2. Draw a sketch of what you observe to show the installation of the solar power plant.
3. What are advantages of having a solar power plant at home?

Practical Activity 23: Demonstrating the characteristics of non-magnets and magnetic materials

P6 **Unit 15: Magnetism**

Rationale for the activity

There are many materials around us which are different because of their uses. Those materials include those made in iron, steel, plastic, wood, etc. It is important for learners to be able to classify those materials into magnetic and non-magnetic materials and detecting their uses.

Objective

Learners will be able to identify effectively the characteristics of non-magnets and magnetic materials.

Required materials

- Two bar magnets
- Items such as pins, paper clips, nails, rubber, pencil, pieces of wood, coin
- String

Illustration of the activity

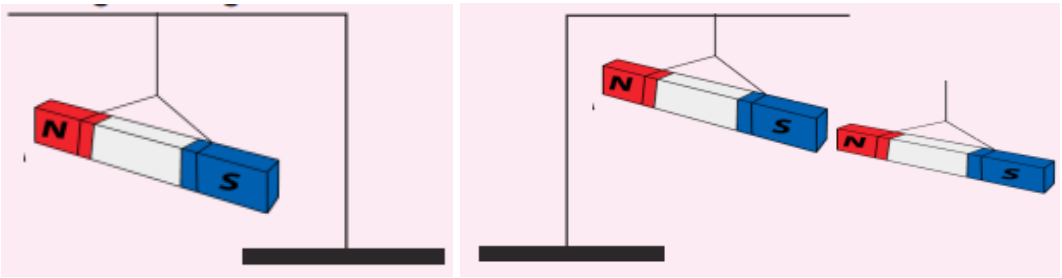


Figure: (a)Suspended bar magnets (b) Behavior of two close magnets

Steps of activity:

1. Avail the Required materials: collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Put the items above on a table. Move a magnet over them as shown below. What happens?
   - Suspend one bar magnet using a string as shown on the illustration (a) above.
   - Bring the North Pole of the second magnet near the South Pole of the suspended magnet (as shown on the illustration (b) above. What happens?
   - Now bring the North Pole of the second magnet close to the North Pole of the first magnet. What happens?

Results

Learners observed that magnets attract magnetic materials but do not attract non-magnetic materials. When a bar magnet is suspended, it rests with its South Pole pointing north of the earth's magnetic pole.

Unlike poles of magnet attract while like poles repel. Magnetic force can pass through non-magnetic materials.

Conclusion

A magnet attracts magnetic materials. These are objects made up of iron, steel, nickel etc. On the other hand, a magnet does not attract things like plastic, wood, paper, glass, copper and aluminum foil. They are non-magnetic materials.

They have two poles - North Pole and South Pole. Unlike poles of magnet attract while like poles repel.

Guidance on evaluation

Ask questions related to the activity performed by learners :

1. Which materials among the following are magnetic? Iron fillings, sewing needle, Pieces of glass, pen, Paper clip, Staples, Nails.
2. What happens when:
   a) The South Pole of one magnet is near the North Pole of the other.
   b) The South Pole of one magnet is near the South Pole of the other.
   c) The North Pole of one magnet is near the North Pole of the other.

Practical Activity 24: Demonstrating the properties of a temporary magnet

P6 **Unit 15: Magnetism**

Rationale for the activity

Temporary magnets only retain their magnetism while near a permanent magnetic field or electronic current. Knowing the properties of a temporary magnet will help learners to make their own magnets which can be a base for future invention.

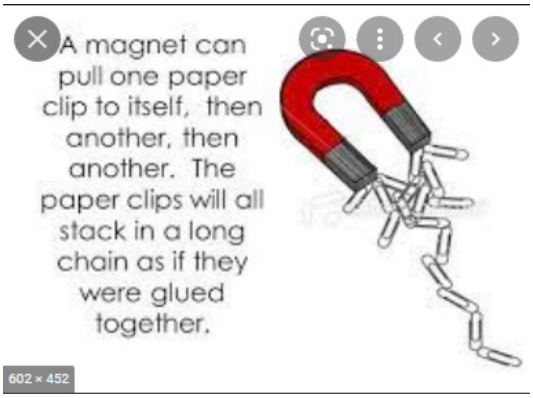
Objective

At the end of this activity, learners will be able to demonstrate effectively the properties of temporary magnet.

Required materials

- Magnet in form of U
- Paper clips or nails or needle or pin
- A table

Illustration of the activity



(a) (b)

Steps for the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Put in place a table
   - Place on the table a magnet
   - Place on the table paper clips or nails
   - Make sure paper clips and magnet are closer each other
3. Ask them what happen to the magnet? What is the behaviour of paper clips?
4. Explain this phenomenon, properties of magnet

Results

Learners observed that the paper clips attract each other and when you remove the magnet to the system, paper clips do not attract each other.

Conclusion

Temporary magnets have the property to produce temporary magnetic field thus attract iron made materials.

When placed in magnetic fields, iron made materials attract each other. Iron made materials behave like magnets when they are placed in a magnetic field; they are now called magnetized objects. When the magnet is disconnected to the system, the iron made material loose the property to attract other iron made materials.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What are magnetized objects?
2. Why do materials attract each other when connected to a magnet?
3. What happened when the magnet is disconnected to the system?

Practical Activity 25. Demonstrating magnetic field

P6 **Unit 15: Magnetism**

Rationale for the activity

A magnetic field is a vector field that describes the magnetic influence on moving electric charges, electric currents, and magnetic materials. Knowing the behavior of magnetic field will help to identify the direction lines of magnetic field of a magnet.

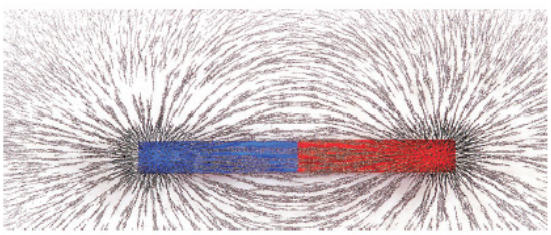
Objective

At the end of this activity, learners will be able to demonstrate the location of magnetic field.

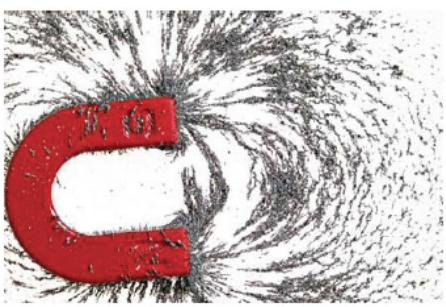
Required materials

- Permanent magnets of different types (horse-shoe and bar magnets)
- White sheet of paper
- Iron fillings
- A table

Illustration of the activity



(a)



(b)

14.4.1: a) Magnetic field of a bar magne b) Magnetic field of a horse shoe magnet

Steps for the activity

1. Avail the Required materials: collected before to be used in this activity
2. Invite and guide the learners to do the following:
    - Place the bar magnet and the horse-shoe magnet one at a time below a white sheet of paper.
    - Sprinkle the iron fillings on the white paper. What do you observe? Draw the pattern formed by the iron- fillings.
    - Now, bring two bar magnets with their North Poles close to one another below the piece of paper. Sprinkle the iron fillings. What happens to the iron fillings?
    - Repeat step 3 above but this time with the north and South Poles of the two magnets facing one another.
    - Draw the patters that follow iron fillings,

Results

Learners observed the following:

- For horse shoe magnet, the patterns from iron fillings show the direction from North to South Poles.
- For bar magnet, the patterns from iron fillings show the direction from North to South Poles of the bar magnet.

Conclusion

Magnetic field is the area around a magnet or materials that are magnetic where magnetic force is experienced. When two poles of two bar magnets are brought together, their magnetic fields interact with one another to form different patterns of magnetic field lines.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What patterns do the iron filings show when placed in magnetic field?
2. According to our activity, what direction from poles does magnetic field follow? From north to south or from south to north.

Practical Activity 26. Demonstrating characteristics of magnetic compass

P6 Unit 15: Magnetism

Rationale for the activity

Magnetic compass, in navigation or surveying is an instrument for determining direction on the surface of earth by means of a magnetic pointer that aligns itself with earth's magnetic field. A compass works by detecting and responding to the earth's natural magnetic fields. Knowing how to make a magnetic compass will help to adapt in situation of unknown direction.

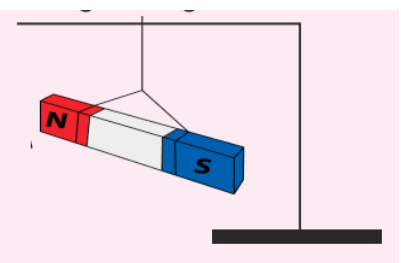
Objective

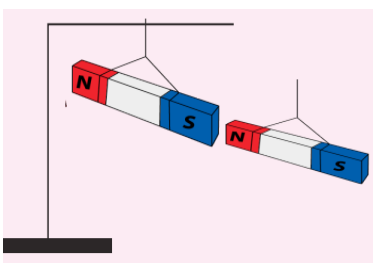
At the end of this activity, learners will be able to demonstrate effectively the characteristics of a magnetic compass.

Required materials

- Two bar magnets
- Items such as pins, paper clips, nails, rubber, pencil, pieces of wood, coin
- Thread, or string

Illustration of the activity





Steps for the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Put the items above on a table. Move a magnet over them. What happens?
   - Suspend one bar magnet using a string as shown below.

- Bring the north pole of the second magnet near the south pole of the suspended magnet. What happens?
- Bring the north pole of the second magnet close to the north pole of the first magnet. What happens?

3. Ask learners to write short notes about what you think magnets are. What they are made of and their characteristics.

Results

From this activity, learners observed that magnets have the following characteristics:

1. They have two poles - North Pole and South Pole.
2. Unlike poles of magnet attract while like poles repel.
3. When a bar magnet is suspended, it rests with its South Pole pointing North of the earth's magnetic pole.
4. Magnets attract magnetic materials but do not attract non-magnetic materials.
5. Magnetic force can pass through non-magnetic materials.

Conclusion

Magnetic compass is an instrument that uses magnetized steel bar to indicate direction relative to the earth's magnetic poles. Therefore, being a magnet, it has poles. When the magnetic compass is placed at any point on the surface of the earth, the steel bar rests with its head pointing in the magnetic north direction of the earth.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. What instrument do we use to locate the earth direction while we are at a certain point on the surface of the earth?
2. Why do needles align with the respective magnet poles?

Practical Activity 27. Making a compass needle

P6 **Unit 15: Magnetism**

Rationale for the activity

People use compass for navigation, location and direction or to find their way on a trip to a new location. Compass is an instrument composed of a suspended magnetic pointer that is attracted to the polarity of the North Pole. It is a light weight magnetic, generally a magnetized needle, on a free rotating pivot. Knowing how to make a magnetic compass needle will help to adapt in situation of unknown direction.

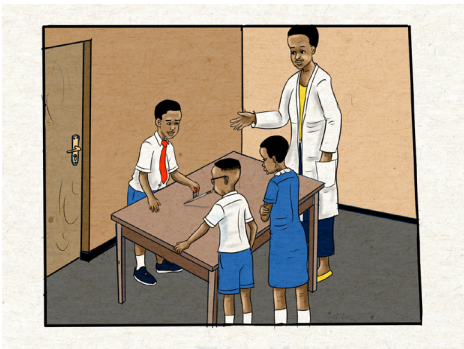
Objective

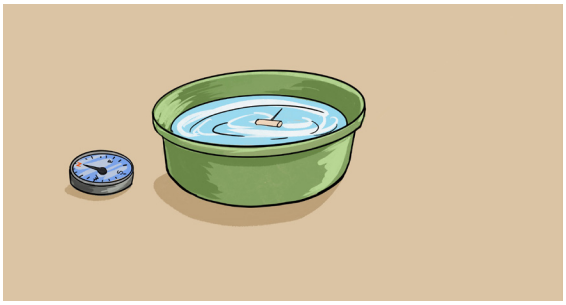
By the use of appropriate materials, learners will be able to make effectively a compass needle.

Required materials

- A bowl of water cork
- Sewing needle
- A compass

Illustration of the activity





Steps for the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Rub the needle several times along the magnetic strip.
   - Insert the magnetized needle or place the needle onto the piece of cork.

- Push the needle through until the same amount of needle protrudes from either side of the cork
- Gently place the needle inserted in the cork into the bowl of water. What do you realized?
- The magnetized needle will align itself with the earth's magnetic field to point north to south and then come to a complete stop.

NB: Currents will also disturb the direction of the compass, so you can't expect to get an accurate reading if you suspend it in a lake or pond. You might be able to use a still puddle.

3. Ask them the following questions: what happened to the needle according to the poles? Why do needles align with the respective magnet poles?

Results

Learners observed that by being magnetized needles align with the magnetic poles when pooled in water. As they put the needle in a piece of cork, then to the bowl water, it turns to its original position and magnetized needle in clear bowl water has directed its poles to the earth's poles.

Conclusion

The compass needle react to nearby magnetic fields. Since opposites poles attract, the southern pole of the needle is attracted to the earth's natural magnetic North Pole. Compass needle always directs its poles to the earth's poles.

The magnetic compass was an important advance in navigation because it allowed mariners to determine their direction even if clouds obscured their usual astronomical cues such as the North Star.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. State clearly the importance of a compass needle in our daily life experience?
2. How many poles does a compass needle has? Which ones?

Practical Activity 28. Measuring mass and volume of different matters

P6 **Unit 16: States of Matter**

Rationale for the activity

Matter in different states has mass and volume. It is thus worthwhile knowing how mass and volume of different materials (gas, liquid, and solid) can be measured.

Objective

Learners will be able to measure the mass and volume of water using different pieces of apparatus.

Sub-activity A. Measuring the mass of air in a balloon

Required materials

- Two balloons
- A thread
- An electronic balance.

Illustration of activity

Steps of the activity

1. Avail the materials to be used in the activity.
2. Invite and guide the learners to do the following:
   - Using an electronic balance, which has been zeroed, measure the mass of a balloon and thread about to be used. Record the mass (M_1) in grams.

- Inflate the balloon using your mouth and tie it such that the air does not go out.
- Weigh the inflated balloon and record the mass (M_2) in grams.

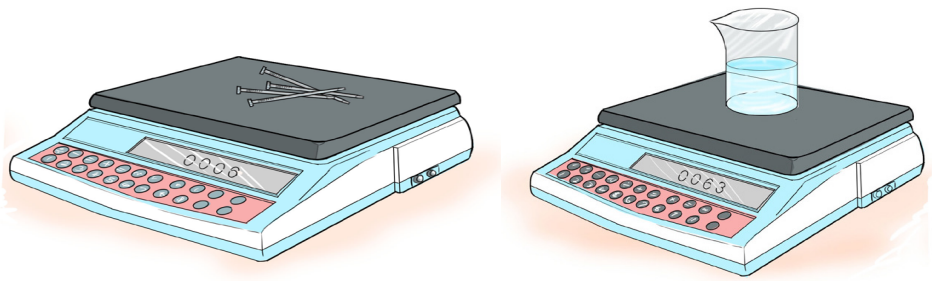
The difference between the mass M_2 and the mass M_1 is the mass of air (M_{air}) that was introduced into the balloon ($M_{air} = M_2 - M_1$).

Sub-activity B. Measuring the mass of a given volume of water (or any liquid)

Required materials

- Electronic balance
- Beaker
- Measuring cylinder

Illustration of the activity



Steps of the activity

1. Avail the materials to be used in the activity.
2. Invite and guide the learners to do the following:
   - To zero the electronic balance and weigh a well dried empty beaker. Record the mass (M_1) of the beaker.
   - To measure about 50 cm^3 of water in a measuring cylinder and pour it into the beaker. Record the total mass (M_2) of the beaker and water.

Results

The mass obtained in step 1 (M_1) subtracted from the mass obtained in step 2 (M_2) gives the mass of the water. The mass of liquids is therefore measured using a solid container ($M_{Water} = M_2 - M_1$).

Guidance on evaluation

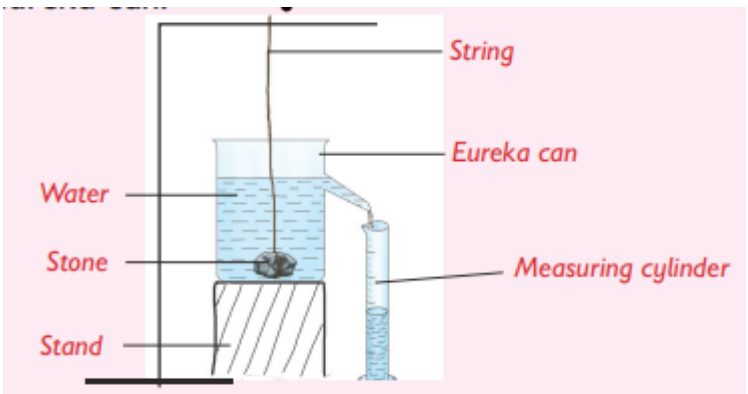
The mass of an empty beaker is 27.00 g and when half-filled with water it weighs 49.23 g. Find the mass of the water?

Sub-activity C. Measuring the volume of an irregular solid

Required materials

- Graduated beaker
- Beaker or sauce pan
- Water
- A thread

Illustration of the activity



Steps of the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Pour water in a graduated beaker mid-way. Write the reading in cm^3
   - Tie a stone with a thread and carefully lower the stone into the beaker. Write the reading on the beaker (cm^3)
   - Make the difference between two readings. This difference equals to the volume of the stone.

Results

When the stone was lowered into the Eureka can, the stone displace a volume of water equal to its volume. The volume of displaced water in the measuring cylinder is the volume of the stone.

Guidance on evaluation

How would a splash made by a stone on the surface of the water in the Eureka can, affect the determination of the volume of the solid. Explain your answer.

Practical Activity 29. Investigating the effect of temperature change on the physical states of water

P6 **Unit 16: States of Matter**

Rationale for the activity

Matter including water, exhibits different physical states according to the temperature to which it is exposed. It is worth to appreciate the role played by temperature in the determination of physical states of matter.

Objective

Learners will be able to predict the effect of heat/cooling water on its physical appearance

Required materials

- A beaker
- Water
- Source of heat
- A thermometer

Steps of the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
    - Place some water in a beaker and measure its temperature in ^{0} C. Record this temperature.
    - Heat the beaker with the water as you observe temperature change on the mercury thread of your thermometer.
    - Continue heating as you continue observing the mercury thread of your thermometer. Note and record the temperature in ^{0} C, at which hot vapour begins to come off.

Results

Learners observed that as water temperature increases, the level of mercury in the thermometer rise. Water starts boiling at a temperature of 100 ^{0}C.

Conclusion

The temperature at which the water started boiling is the boiling point of water. The boiling point is the temperature at which water in liquid state become vapor. The boiling point of water at high altitude is slightly lower than 100 ^{0} C. It is exactly 100 ^{0} C at sea level.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. On heating cold water, bubbles are observed during the first few minutes. What are these bubbles?
2. Explain why bubbles cannot be seen when boiled water is heated.

Practical Activity 30. Investigating physical change on heated ice

P6 **Unit 16: States of Matter**

Rationale for the activity

In our daily life we need ice for cooling both solid foods and drinks. Thus, it is useful to know what range of temperature at which the ice should be kept if one wants to keep it long time or the temperature where it starts melting.

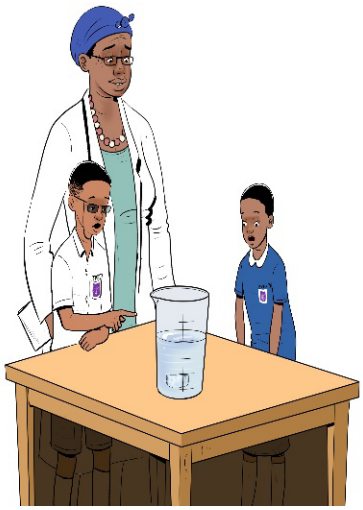
Objective

Learners will be able to predict the effect of increasing temperature of ice.

Required materials

- Ice cubes
- A beaker
- A thermometer

Illustration of activity



Steps of the activity

1. Avail the required materials collected before to be used in this activity
2. Invite and guide the learners to do the following:
   - Place ice cubes in a beaker and measure its temperature using a thermometer. Record the temperature in ^{0} C.
   - With the bulb of the thermometer in the bottom of the beaker, expose the set-up to direct sunshine. Observe temperature change on the thermometer. What do you notice?
   - Keep observing until the ice melts or assumes liquid state uniformly. Record the temperature at which the ice melts.

Results

Learners realized that when the ice was exposed to direct sunshine, the thermometer indicated a rise in temperature and part of the ice started melting. Ice melts until it becomes liquid and the thermometer displays a temperature of 0 ^{0} C.

Conclusion

The temperature at which the ice melts uniformly (is totally liquid) is the melting point of ice, that is 0 ^{0} C. So we have to maintain the temperature of water below 0 ^{0} C if we are to keep ice not melting.

Guidance on evaluation

Explain why a person in the front seat of a car should not carry ice packs on a sunny day.

Practical Activity 31. Investigating physical change of cooled water vapours

P6 Unit 16: States of Matter

Rationale for the activity

Water is more easily stored in the liquid state. It is therefore important to investigate physical change of water vapor because it is sometimes desirable to recover liquids from their gaseous state.

Objective

Learners will be able to predict the effect of decrease in temperature of water vapours.

Required materials

- Two beakers or small saucepans.
- Source of heat (gas stove, or charcoal stove)
- Water

Illustration of activity

Steps of the activity

1. Avail the materials to be used in the activity
2. Invite learners to carry out the following activities:
   - Place some water in small saucepan/beaker and boil it using a suitable source of heat.
   - When vapour starts coming off, boiling has started.
   - Hold another saucepan/beaker containing cold water, above the vapour that is coming off.
3. Ask learners to observe and record their observations?

Results

Learners observed that water droplets form on the underside of the saucepan with cold water. This means that on cooling, water vapour condenses to liquid state.

Guidance on evaluation

Describe what you would observe if the beaker above the vapour contained hot water.

Activity 32. Measuring the freezing point of water

P6 **Unit 16: States of Matter**

Rationale for the activity

Water can change its state depending on temperature. It is therefore worthwhile to know at what temperature water change from one state to another.

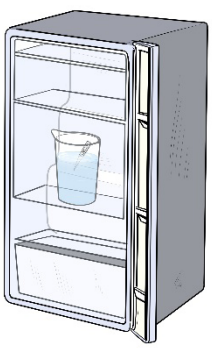
Objective

Learners will be able to determine the freezing point of water.

Required materials

- A beaker, plastic cup, or drinking glass.
- Water
- A fridge or freezer

Illustration of activity



Steps of the activity

1. Avail the materials to be used in the activity
2. Invite learners to carry out the following activities:
   - Place the water in a beaker and measure its temperature at room temperature in ^{0}C. Record the temperature.
   - Place the containing water in the freezing chamber of a fridge and at 1 hour intervals, open the fridge and quickly examine the water for signs of freezing. When the water is deemed to have frozen completely (totally solid) record the temperature of the ice.

Results

Water freezes at 0^0 C, which is the freezing point of water.

Conclusion

At 0^0 C it is the freezing point of water. The freezing point of water can change due to impurities in it.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Why was distilled water used and not tap water?
2. Why is the freezing point measured when the water is totally solid?

Practical Activity 33. Investigating changes between the three states of matter using naphthalene

P6 **Unit 16: States of Matter**

Rationale for the activity

It is evident that matter in solid form can change to liquid state when the temperature is raised. Raising the temperature of the liquid change its state to gaseous state. It is worth experimenting on naphthalene, to find out if it behaves as described above.

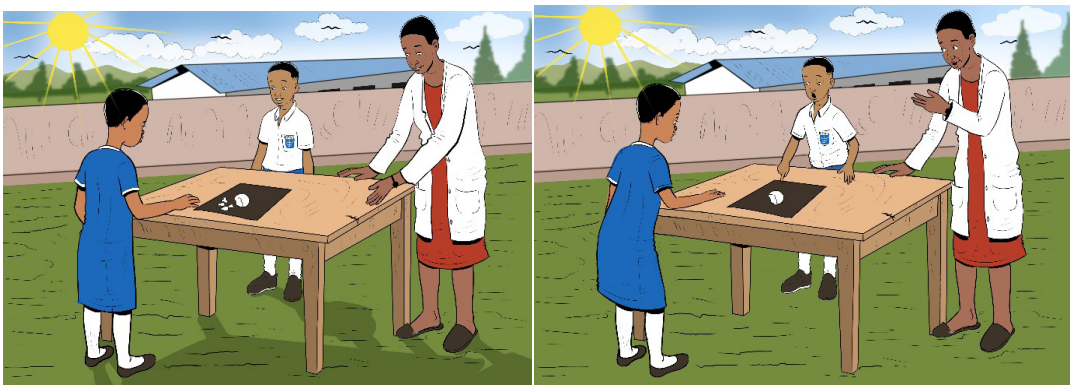
Objective

Learners will be able to investigate the changes of state of solid naphthalene to other state of matter.

Required materials

- A piece of paper
- A glass bottle
- Solid naphthalene

Illustration of activity



Steps of the activity

1. Obtain solid naphthalene from a nearby shop.
2. Invite learners to carry out the following activities:
   - Gently crush the naphthalene on a piece of paper to get small granules.
   - Expose the granules to direct sunlight and observe what happens.

Results

The naphthalene granules exposed to sunlight turned into gaseous naphthalene and no liquid state was observed.

Conclusion

Solid naphthalene changed from solid state directly to gaseous state, skipping the liquid state. This process is sublimation. Some substances therefore do not take the normal route of transformation from one physical state to another.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. Based on the findings in the above activity, what do you think would happen if naphthalene was kept in an open container?
2. Explain why naphthalene is kept away from direct sunlight?

Practical Activity 34. Investigating changes between the three states of iodine

P6 Unit 16: States of Matter

Rationale for the activity

Given that naphthalene has displayed unusual transformation from solid state directly to gaseous state, it is worth investigating the behavior of iodine. If it is found to sublime, the conditions under which it should be transported and stored will be established.

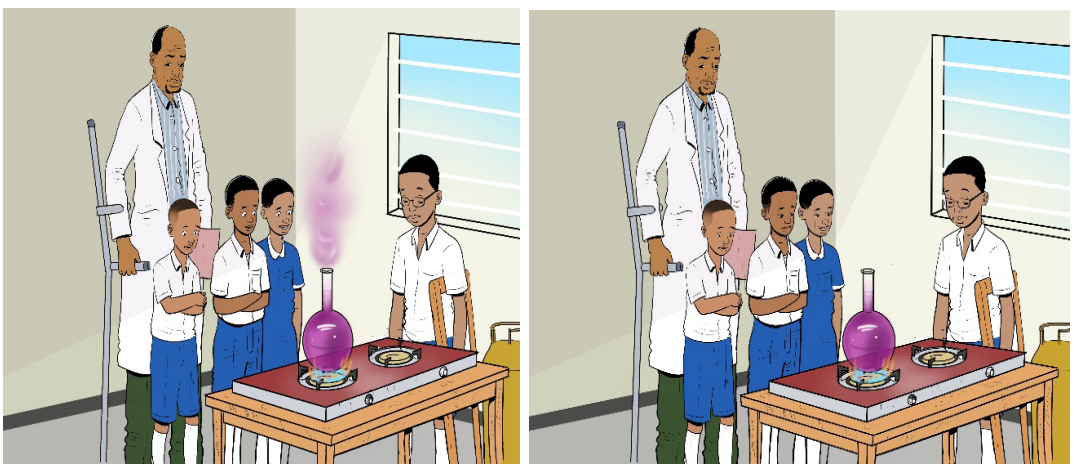
Objective

Learners will be able to investigate the trend followed by iodine changing from one state of matter to another.

Required materials

- Iodine crystals
- A beaker
- A glass plate
- A source of heat

Illustration of activity



Steps of the activity

1. Avail the materials to be used in the activity
2. Invite learners to carry out the following activities:
   - Get ready the source of heat (gas stove or small charcoal burner).
   - Place a spatula full of iodine crystals in a beaker and hold a cold glass plate over the heated beaker and contents.
3. Ask the following questions. What do observe between the beaker and the glass plate? What do you observe on the underside of the glass plate?

Results

Iodine crystals, when heated, turn to iodine vapor, which condenses on the underside of the glass plate.

Conclusion

The solid iodine sublimes to gaseous iodine, skipping the liquid state. The iodine vapor condenses/sublimes to solid iodine, again skipping the liquid state.

Guidance on evaluation

Ask questions related to the activity performed by learners:

- What is sublimation?
- Since iodine vapor sublimes to a solid, how should the experimenter protect himself/herself against the vapor?

Practical Activity 35. Measuring temperature of the body and different objects

P6 **Unit 16: States of Matter**

Rationale for the activity

Measuring temperature of air (ambient temperature) makes the weather forecasters predict the weather of a particular day. This also determines what type of clothing a person can wear on that day. The body temperature of a person above 37^0 C indicates that he might be ill. The melting temperature in ^{0} C (melting point) of a solid shows whether the solid is a pure substance or mixed with other materials. Therefore it worthwhile being capable of measuring the temperature of different objects.

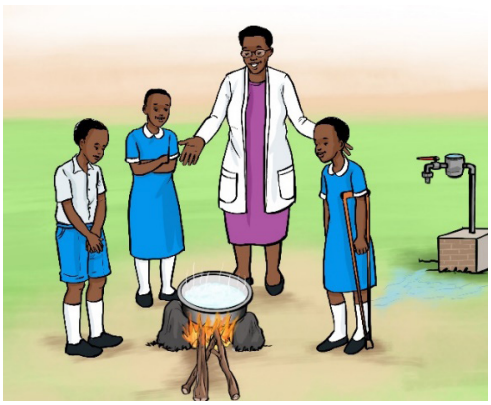
Objective

Learners will be able to measure the temperature of their body and different objects, using a thermometer.

Required materials

- A thermometer graduated in ^{0} C.
- A beaker
- Tap water
- Source of heat

Illustration of the activity



Precautions:

- Handle the thermometer with care as you handle any glass articles
- Don't hold the thermometer by the bulb while reading it
- When measuring the body temperature thermometer should be washed before and after each use, preferably with an antiseptic solution
- Do not wash a thermometer with hot water

Steps of the activity

1. Obtain the above materials and invite learners to participate in the following activities:
   - Demonstrate the learners how a thermometer is used stressing the fact that a thermometer should never be held by its bulb, as a person's body temperature would make the mercury or alcohol thread rise.
   - In groups, learners measure the temperature of the air of the classroom and each group reports its reading in ^{0} C.
   - In groups, the learners measure the temperature of tap water in a beaker and report their readings.

- In groups, learners measure the temperature of their body and report their readings.
- **Learners tabulate their Results as follows.**

	Material whose temperature was measured	Temperature (^{0} C)
	Air	
	Tap water	
Group member 1	Body temperature	
Group member 2		
Group member 3		
Group member 4		
Group member 5		

Results

The temperatures of air, water, and bottle cap were found to be different.

Conclusion

A thermometer is used to measure the temperature of different materials and these materials have different temperatures even if they are in the same room. This is due to the fact that the quantity of heat retained by the materials after they have lost some heat varies from object to object.

Guidance on evaluation

Ask questions related to the activity performed by learners:

1. A piece of metal and tap water obtained from the same room. Which of the two will show a lower temperature and why?
2. Why would it be wrong to use an ordinary thermometer in measuring body temperature of a person?

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