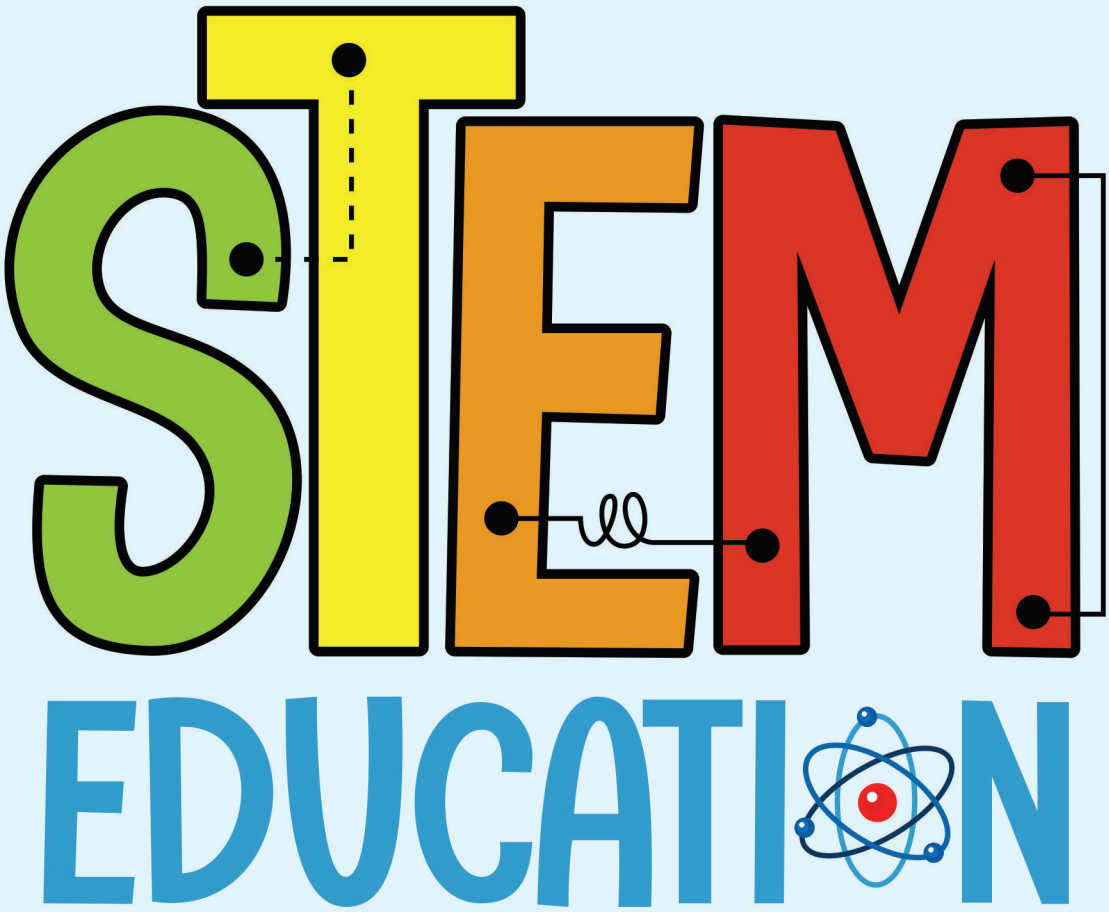
শিক্ষা আনে সভ্যতা
সভ্যতা আনে মানবিকতা

সমগ্র শিক্ষা
Samagra Shiksha

TEACHERS' MANUAL FOR



EDUCATION

Part - 1

Prepared by: West Bengal Board of Secondary Education and Paschim Banga Samagra Shiksha Mission

Teachers' Manual for STEM Education

Part - 1

Introduction:

Science is the study of nature. It is not a subject taught only from books. Science is about discovering relationships between causes and effects in the world around us. Therefore, it is important to develop students' critical thinking and scientific temperament. A lot of information is available to students on the internet; consequently, the ability to apply that information is an essential 21st-century skill. STEM encompasses the disciplines of Science, Technology, Engineering and Mathematics. These skills are important both for national progress and for individual and career growth. Because these disciplines are interrelated, conceptual understanding requires a learning-by-doing approach.

This STEM hands-on activity manual is designed to make learning engaging by connecting classroom concepts with real-world applications. Hands-on activities help students see how curricular concepts are used in daily life. When students actively participate in these activities, they develop deeper understanding, improve practical skills, and appreciate the connection between school learning and the real world.

The manual includes a variety of activities that allow students to explore science and mathematical concepts through practical experience. For example, students will build a model of the heart's circulation, make parachutes, and create simple machine toys to learn concepts such as force and pressure. They will learn about microorganisms, nutrition, food preservation, and food processing by making curd, pickles, and healthy food items. Agriculture, biology, and environmental science will become more engaging as students perform soil testing to study soil properties and texture, and water testing to examine contamination and microbiological quality. To make mathematics fun, students will create puzzles such as tangrams, build integer models, construct models to understand algebraic expressions and fractions, and learn area and perimeter using geoboards.

Technology is introduced in simple, practical ways. Students will explore solar drying, build electric circuits and solar cars, construct light torches, and learn basic automation using microcontrollers and sensors. Arts-based activities such as dyeing, sewing, crochet, and painting will let students express creativity while reinforcing mathematical concepts like measurement, area, and spacing. Together, these activities make learning multidisciplinary, breaking down barriers between subjects and making education more relevant to everyday life.

In addition to hands-on work, students are encouraged to interact with their local communities to learn about different skills and professions. They will conduct surveys and meet local experts such as gardeners, carpenters, potters, and artisans to understand their work. Field visits to nurseries and workshops will provide practical exposure to various trades and professions. During projects and activities, students will observe, measure parameters, keep records, analyze

gathered data, and reflect on their findings in discussions with teachers, peers, and family members. This process develops problem-solving, critical thinking, communication, and creativity.

Care must be taken to ensure that both boys and girls participate in all types of activities. Societal prejudices that assign certain activities to a particular gender (for example, assuming food processing is for girls or engineering is for boys) should be avoided. Teachers should organize most activities in groups so students can collaborate, share ideas, and learn from each other. It is essential that everyone receives an equal opportunity to participate and develop a range of skills.

Most of the activities suggested in this manual are already included in the "Suggested Activities" section of the science textbook. Here they are presented systematically with full details to support implementation. This will help middle and secondary schools enhance the quality of STEM education.

This STEM Handbook was developed during the implementation of the STEM Learning Program in 100 schools in Murshidabad district. The program is implemented by the Department of Education, Government of West Bengal, UNICEF, and STARS Forum — Vigyan Ashram. By combining hands-on activities with real-world experiences, the program helps students develop both subject knowledge and practical skills, preparing them for higher education and future careers. Activities in the manual were designed in consultation with expert teachers nominated by the State Education Department.

1. Guide to use the handbook

This handbook is an instructional manual for school teachers. It provides ideas for various project-based activities for students. The suggested activities are designed considering students' age, curricular areas, and learning objectives. Teachers should explain the related textbook concepts after the hands-on activities to help students understand the topics more effectively. Materials used for the activities should not be wasted but reused or repurposed whenever possible.

'Learning by doing' is a non-negotiable principle of the program. Therefore, teachers must ensure that every student participates in the activities. It is important for teachers to check the availability of sufficient raw materials before conducting a session.

A teacher must be present at all times while students are performing activities. Safe handling of tools is essential, and students should be regularly reminded of safety instructions.

The activities given in this book are suggestive. Teachers are encouraged to propose new activities based on their classroom needs and local context.

2. The Principles Behind the STEM Program Initiative

2.1) Learning by doing in real-life situations is the natural way of learning

Children learn their mother tongue through learning by doing. Similarly, we learn cooking, swimming, cycling, or operating a computer through practical experience. Learning through doing leaves a deep and lasting impact—what is learned this way is rarely forgotten. This method is effective because students learn without stress or a sense of burden.

2.2) Activities that engage the hands stimulate the intellect

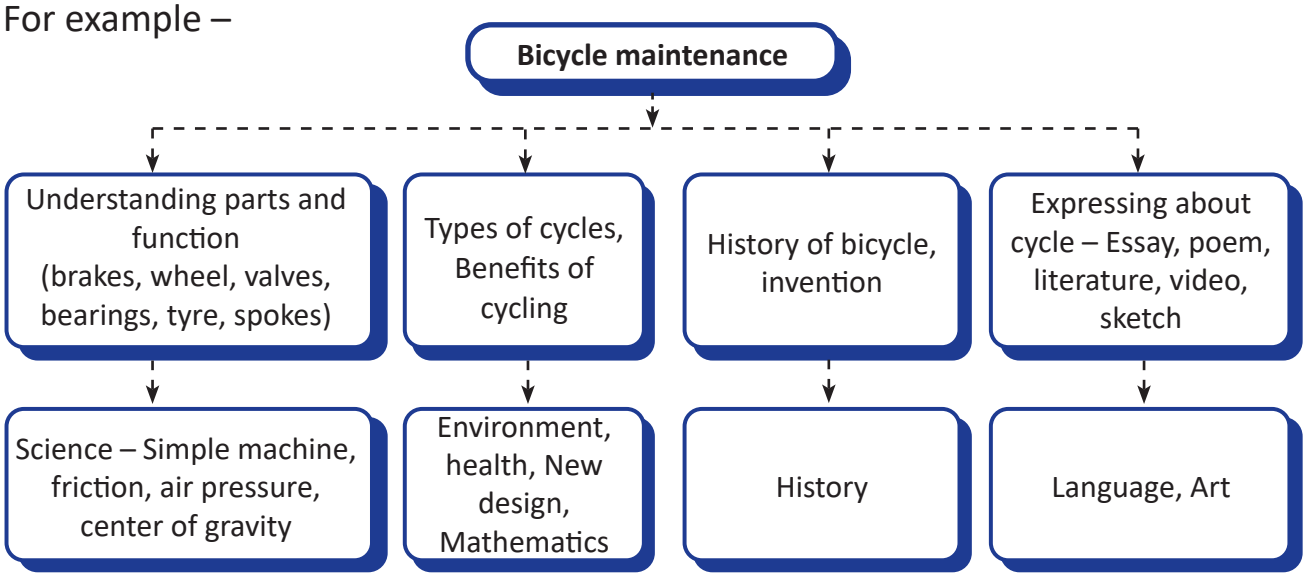
Education is a process of training the head, hand, and heart.

Many great innovators and entrepreneurs—such as Thomas Alva Edison and the Wright Brothers—became pioneers because of the rich variety of experiences they had during childhood. The goal of 'working by hand' is not merely to provide skill training for livelihood; it is to broaden a child's experiential horizon and nurture creativity and problem-solving abilities.

2.3) STEM education is best delivered through project-based learning

Project work requires knowledge from different curricular areas and naturally integrates multiple disciplines. For example, a project on bicycle maintenance can help students learn concepts from science, environmental studies, and mathematics. This interdisciplinary approach makes learning more meaningful and connected to real life.

For example –



3. Conducting the activities

The lesson plans in this manual explain the steps to be followed while conducting each activity. While carrying out activities, the following points are non-negotiable:

3.1) Safety precautions must be followed at all times, and it is the responsibility of the teacher or instructor to ensure this.

3.2) Activities should be selected based on the availability of raw materials and the needs of the school.

3.3) All required materials must be arranged before the class begins. There should be enough materials so that every student can participate actively.

3.4) Many activities—such as agriculture-related tasks and arts & crafts—can be conducted with students of any class. Teachers must guide students on proper documentation, record-keeping, calculations, and using internet searches to gather additional knowledge.

3.5) After each activity, the teacher and students must sit together and reflect on the work done. Students should be encouraged to ask questions such as "Why?", **"What?", "How?", "When?",** and **"Where?"** in relation to the activity. These discussions help develop understanding and build connections with curricular concepts. This reflection process is a non-negotiable part of every activity.

3.6) Students must document the project or activity after the hands-on work. The project or activity report format is provided in the annexure. Writing notes, calculating costs, keeping records, and documenting measurements are essential and non-negotiable components of the activity.

4. Consumables and Materials Management

4.1) Certain types of consumables—such as glue, wires, soldering materials, plywood, cardboard, rubbers, pins, nails, screws, adhesive tapes, PVC pipes and fittings, etc.—should be stocked in the school.

4.2) Perishable items such as paints and seeds need to be purchased in a planned manner. Instructors must ensure the seasonal availability of perishable goods and plan their activities accordingly.

4.3) A scrap bank should be created in the school. It should include broken appliances, old bearings, plastic bottles, empty cans, carton boxes, and other scrap materials. These items should be properly sorted and stored, as they serve as useful raw materials for various projects.

4.4) Project materials should always be used purposefully. Do not allow materials to remain unused or gather dust in the school. If models or toys are created, they should be used by students—either for classroom activities or to take home.

Registers to be Maintained

1. Inventory Register: Record all materials purchased and used, along with their quantities and value.
2. Activity Register: Record daily activities conducted, the number of students participating, the purpose or use of each activity, and details of costs incurred and sales amounts (if applicable).

Important Instruction- One or more QR codes are given at the end of most activities. Scan these given QR codes through your smart phone. Through these QR codes, you will get audio-visual material and additional information related to the activity for studying-teaching purpose.

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Science

Activity Name

1. Human Blood Circulation System - Model

Syllabus reference:

Standard/ Lesson No.: Class 6: Chapter 8 - Human Body

Concept/Principle: The Heart - Blood Circulation

Materials and tools required:

Cardboard, 4 x 10 ml syringes, 2 pipes, hand gloves, glue gun, pencil, scale/ruler, scissors, utility cutter/ paper cutter, cutting mat

Time required: 60 minutes

Objectives:

1. Students will learn to make a model of the blood circulation system using simple materials.
2. Students will understand how the heart functions and how blood circulates through the body.

Introduction:

- The heart, lungs, and blood play essential roles in circulating oxygen throughout the body.
- In this model, students will observe how oxygen-rich (red) and carbon-dioxide-rich (blue) blood move through different parts of the heart and how valves prevent them from mixing.

Hands-on activity:

1. Scan the QR code #1 to download the human blood circulation system template and print it on A4 size paper. Stick the template on a cardboard sheet.

QR Code#1

Figure – 1

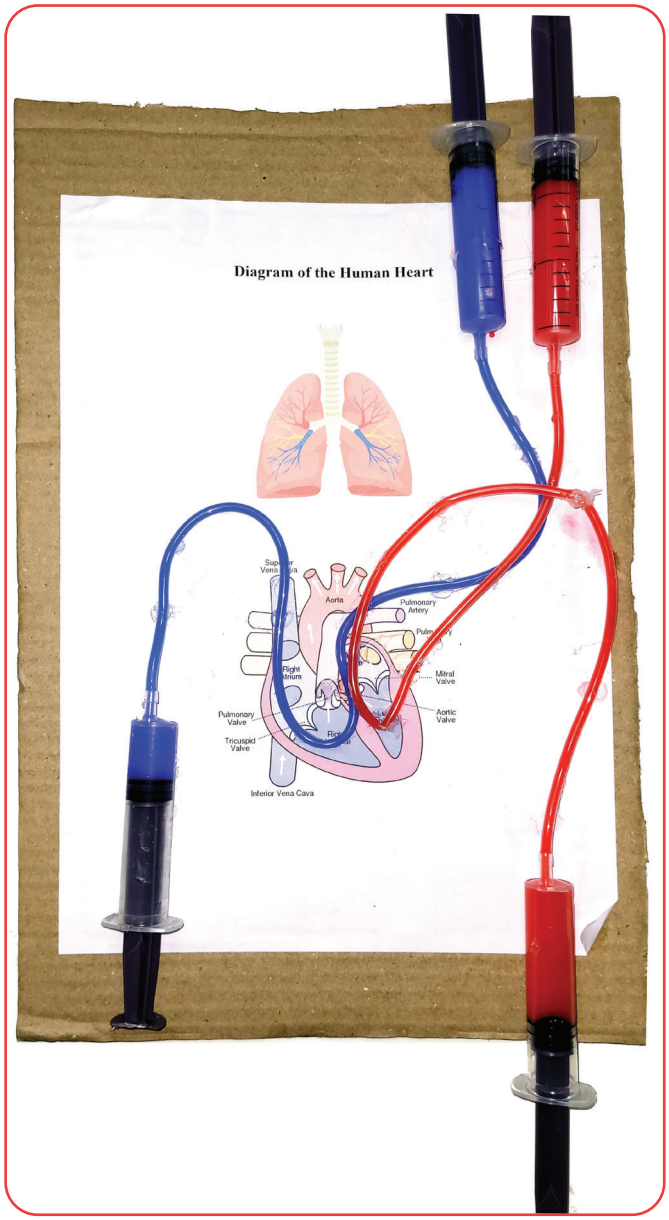
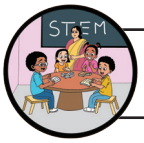


Figure – 2

2. Take some water and mix a red colour in it so that it represents "oxygen-rich" blood in the human body.
3. Take a syringe, fill it with the red coloured water and connect its tip to a pipe/tubing.
4. Take a second syringe, remove air from it by pulling the plunger, and connect it to the other end of the pipe/tubing.
5. Take some more water and mix a blue colour in it so that it represents "carbon-dioxide-rich" blood in the human body.
6. Repeat Step 2 using the blue coloured water along with two new syringes and a pipe/tubing
7. Connect the syringe and pipe/tubing assembly as per the template shown below.
8. The tabletop model of the human blood circulation system is now ready.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Make sure all students follow safety precautions –
   - ➨ Wear hand gloves when using the glue gun.
   - ➨ Never touch the hot tip of the glue gun.
   - ➨ If students use a utility knife for the first time, then ensure that they wear gloves.
3. The teacher should assist and supervise students during use of glue guns, cutters and utility knife.



Discussion with students:

1. How does the human blood-circulation system work?
2. What is the importance of blood circulation in our body?
3. What are the various parts/ sections of the heart?
4. What is the difference between inhaled (oxygen-rich) air and exhaled (carbon-dioxide-rich) air?
5. How is blood separated inside the heart?

Resources:

Scan this QR code#2 to watch a video on how to make a model of the blood circulation system.

QR Code#2

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Activity Name

2. Inflatable Lungs

Syllabus reference:

Standard/ Lesson No.: Class 6 : Chapter 7 - State and Motion of Liquids and Gases Chapter 8 – Human Body; Class 8: Chapter 1 (1) – Force and Motion

Concept/ Principle: Demonstrating lung inflation and deflation with diaphragm movement

Materials and tools required:

Large plastic bottle, 2 small balloons, 1 large balloon, Y-shape (three-way) joint or two straws, scissors, two rubber bands

Time required: 60 minutes

Objectives:

1. Students will learn to make a model of the lungs using balloons and a plastic bottle
2. Students will understand the role of the diaphragm in the respiratory system and lung expansion and contraction

Introduction:

Breathing is one of the most important processes that keeps us alive. Our lungs help bring oxygen into the body and remove carbon dioxide, but they cannot do this on their own. They work together with a strong, dome-shaped muscle called the diaphragm, which sits below the lungs. When the diaphragm moves down, it creates space for the lungs to expand and fill with air. When it moves up, the lungs are pushed to release air.

In this activity, students will build a simple model using balloons and a plastic bottle to show how the lungs, ribcage and diaphragm work together during breathing. By pulling and releasing the "diaphragm" in the model, students will observe how the lungs inflate and deflate—just like what happens inside our body.

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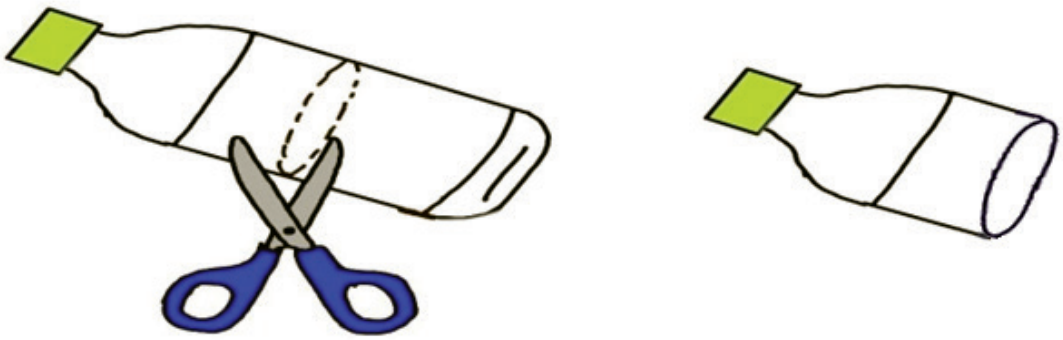

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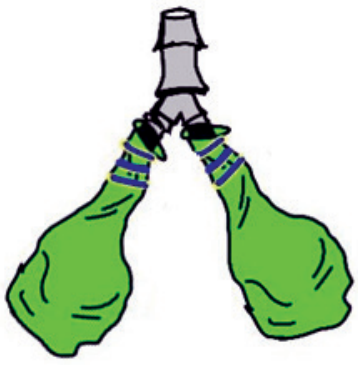
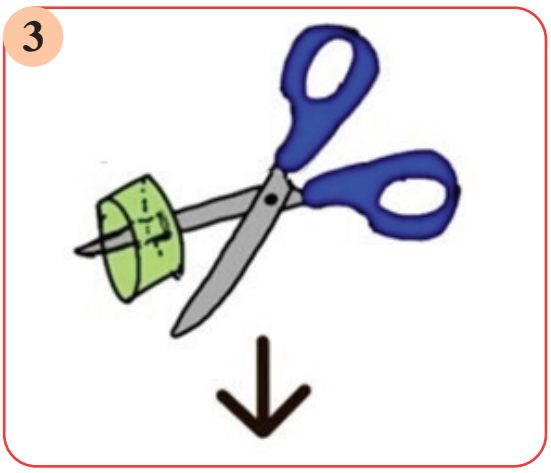
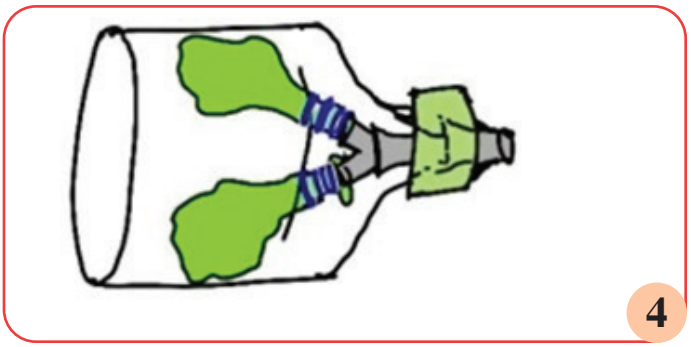


Hands-on activity:

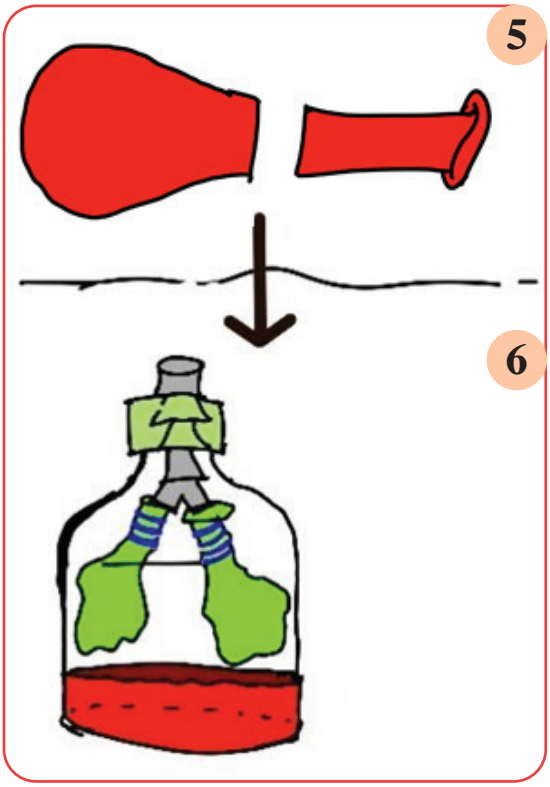
1. Cut a plastic bottle 15 cm from the top and discard the bottom portion. The remaining top section represents the chest cavity.

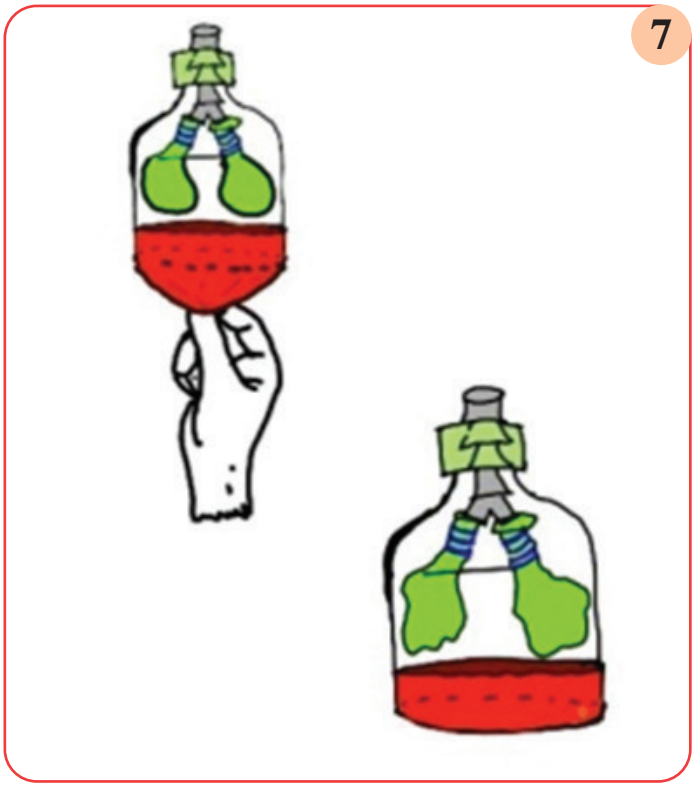
2. Take a Y-shaped 3-way plastic joint (you can make this from two straws) and tie 2 small balloons to the lower outlets with the rubber band so that there are no air leaks and they are airtight.
3. Make small holes in the bottle lid with the help of scissors
4. Press fit the Y- joint (with balloons) into the hole of the bottle.





5. Cut the large balloon and stretch it over the cut bottom of the bottle to act as the diaphragm, securing it with tape if necessary.
6. Gently pull the diaphragm balloon down to observe how the inner balloons inflate, then release to let them deflate.





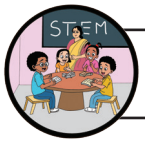
7. Repeat step 8 to observe the working of the lungs.

How it works:

- Pulling the balloon at the bottom of the model (diaphragm), increases the internal volume of the bottle (chest cavity).
- This draws the air into the balloons (lungs)
- Releasing the (diaphragm) balloon, makes it move back to its original position, decreasing the internal volume.
- This pushes air out of the balloons (lungs), just like when we breathe out.
- By doing this activity, students can observe how the diaphragm's movement controls the flow of air going in and out of the lungs.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Supervise students when they are using cutting tools/scissors.



Discussion with students:

1. What happens to the lungs when we breathe in?
2. How does the toy model represent lungs' function?
3. Why do the lungs expand and contract when we breathe?
4. How does the diaphragm help in breathing?
5. How do the lungs stay protected from damage or infection?
6. How can we keep our lungs healthy?
7. How does air move in and out of the lungs? What role do the airways play?
8. Why is it important to understand how the respiratory system works?
9. What would happen if our lungs couldn't expand or contract properly?

Resources:

You can search on Google using the search words–

1. Inflatable lungs + toys from trash
2. Lungs model using balloon + Youtube
3. How to Build a Model Lung

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Activity Name

3. Balloon Hovercraft

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 2 - Time and Motion

Concept/Principle: Force and motion, Newton's Third Law of Motion

Materials and tools required:

CD, plastic bottle cap (with pop-out nozzle), balloon,
glue guns with glue sticks, or duct tape

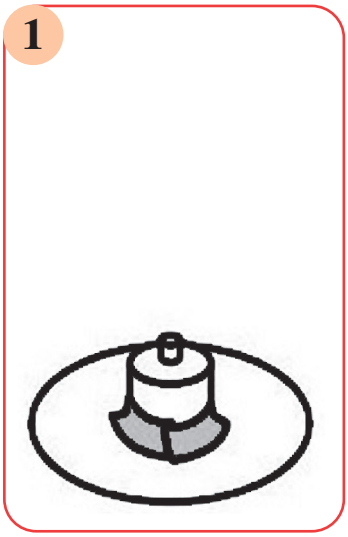
Time required: 60 minutes

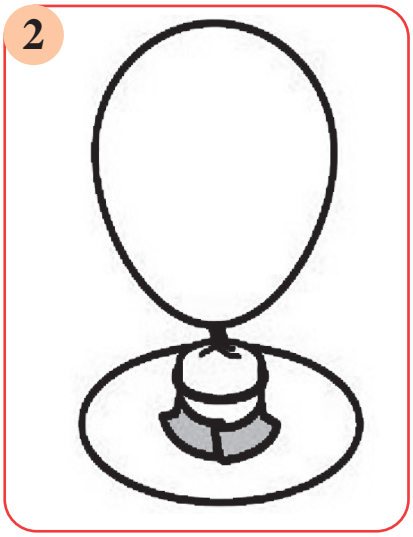
Objectives:

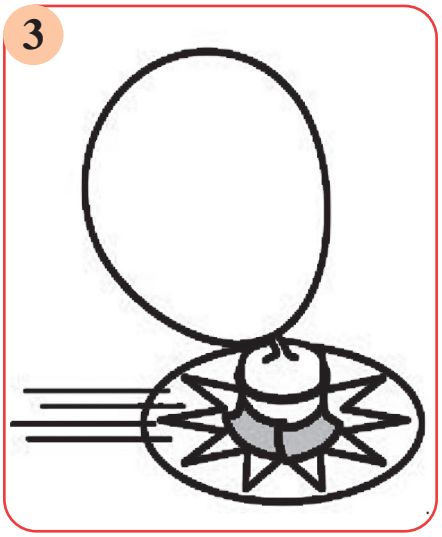
1. Students will learn to design and assemble a simple hovercraft using a balloon, CD, and bottle cap
2. Students will understand Newton's Third Law of Motion and observe how friction affects motion

Introduction:

A hovercraft is a vehicle that can glide smoothly over a surface by floating on a thin layer of air. In this activity, students will build a simple hovercraft using a balloon, a CD, and a bottle cap to understand the science behind this movement. A balloon hovercraft demonstrates Newton's Third Law of Motion. When the balloon releases air downward, it creates an action force. The action force creates an equal and opposite reaction force that can lift the hovercraft upwards, from the ground. The CD helps spreads this upward force evenly, while the escaping air forms a thin layer (cushion)between the CD and the ground, reducing friction and allowing the hovercraft to glide smoothly.







Hands-on activity:

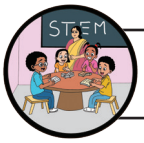
1. Set up four hot glue gun stations around the classroom.
2. Give each student a CD, a plastic bottle cap, and a balloon.

3. Use hot glue to attach the bottom of the plastic bottle cap to the shiny side of the CD. Make sure the hole in the cap is aligned with the CD center. Hold it in place until the glue dries.

4. Stretch the balloon over the top of the plastic bottle cap.
5. Inflate the balloon through the hole in the CD.
6. Pinch or twist the balloon's neck to stop the air from escaping.
7. Place the hovercraft on the floor and release the balloon.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ensure safety while working (students should wear gloves when using cutters etc)
3. Supervise the use of glue guns and other tools



Discussion with students:

1. What happens when you release the balloon?
2. How does the escaping air make the hovercraft move?
3. Why does the hovercraft lift off the ground, and how does Newton's Third Law of Motion explain this?
4. Try different surfaces like carpet, grass, or tile and observe the motion of your Hovercraft. On which type of surface does it work smoothly?
5. How does the size of the balloon or the material of the base (e.g., a vinyl record instead of a CD) affect the working/motion of hovercraft?
6. Why does the hovercraft slide easily, and how does friction affect its movement?
7. What improvements or changes could you make to the hovercraft to make it work better?

Resources:

You can search on Google using the search words-

1. How to make a balloon hovercraft
2. Hovercraft – toys from trash

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Activity Name

4. Magnetic Levitation

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 6 - Basic concept of Force and Energy;
Class 7: Chapter 1 (3) - Magnet

Concept/Principle: Force at a distance; electromagnet,
Use of magnet and electromagnet

Materials and tools required:

10-12” piece of sponge or small cardboard box, foam, old CD case, nail, permanent marker, 6 ring magnets, wooden pencil (sharpened), cutter or knife, compass, hammer.

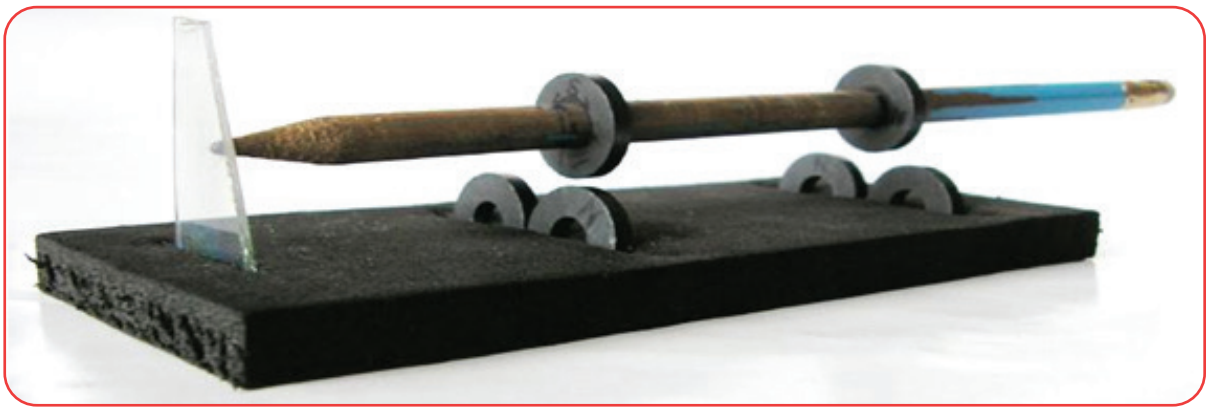
Time required: 60 minutes

Objectives:

1. Students will learn to construct a simple magnetic levitation setup using everyday materials.
2. Students will understand how magnetic and gravitational forces interact to make an object float, and explore the principle of force at a distance/ electromagnetism

Introduction:

- Magnetism is a force of attraction or repulsion that acts between objects with a magnetic field.
- Opposite poles (North and South) attract each other, while same poles repel each other. Magnetic levitation works by placing strong magnets with the same poles (charges) facing each other. These magnets repel each other, creating a force strong enough to lift objects and overcome gravity.
- Magnetic levitation is used in transportation, like maglev trains.
- These trains have magnets on their bases and run on magnetic tracks, allowing them to float above the tracks using the repelling force.
- Since the train does not touch the tracks, there's less friction, allowing it to travel much faster than regular trains.



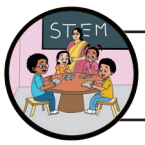
Hands-on activity:

1. Use a cutter to cut a trapezoid (2.5 inches tall, 1 inch wide at the base) from an old CD case. Make a small dent near the top using a nail and hammer.
2. Cut a sponge or cardboard of about 4–5 inches width and 10–12 inches long. Make a 1-inch slit at one end for the trapezoid to fit in.
3. Measure and cut two 1-inch-wide slits in the board for the magnets: one 1.75 inches and the other 4.25 inches away from the trapezoid.

4. Slide two ring magnets onto a pencil with the North pole toward the tip. Point the pencil tip towards the trapezoid.
5. Hang a ring magnet near the pencil tip to find the attracting side of the base magnets. Place base magnets into the slits accordingly, without flipping their position.
6. Repeat the process for the pencil's eraser end, but flip the base magnets 180° so they repel the eraser-end magnet.
7. Fit the pencil tip into the dent on the trapezoid. Adjust the magnets on the pencil to align them above the base magnets. Release the pencil slowly and watch it float. Spin the eraser end for a twirling effect.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ensure that the students wear gloves while working and handle all materials, especially scissors, carefully under your supervision.



Discussion with students:

1. How do magnets attract or repel each other?
2. What is magnetic levitation, and how does it make objects float?
3. Why do you think magnets with the same charge push away from each other?
4. Why is reducing friction important for moving objects?
5. How are magnetic forces different from push/pull forces applied by hand?

Resources:

You can search on Google using the search words –

1. Simple magnetic levitation toy
2. Magnetic levitation – toys from trash

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Activity Name

5. Parachute

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 6 - Basic concept of Force and Energy; Class 8: Chapter 1 (1) - Force and Pressure & Chapter 1 (2) - Force Active without Contact

Concept/ Principle: Class 6: Force at a distance; Class 8: Gravitational force of Earth and Gravity, Air pressure

Materials and tools required:

A4 size paper, 15 gram weight object, thread, cellotape/ duct tape, scissors, pen, ruler, measuring tape, stop watch

Time required: 60 minutes

Objectives:

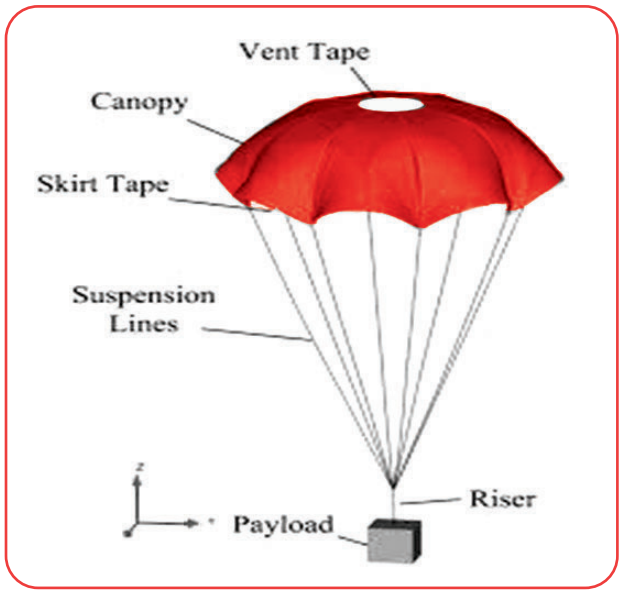
1. Students will make a parachute and study forces acting on objects in the air.
2. Students will explore how weight, height, and material affect descent time.

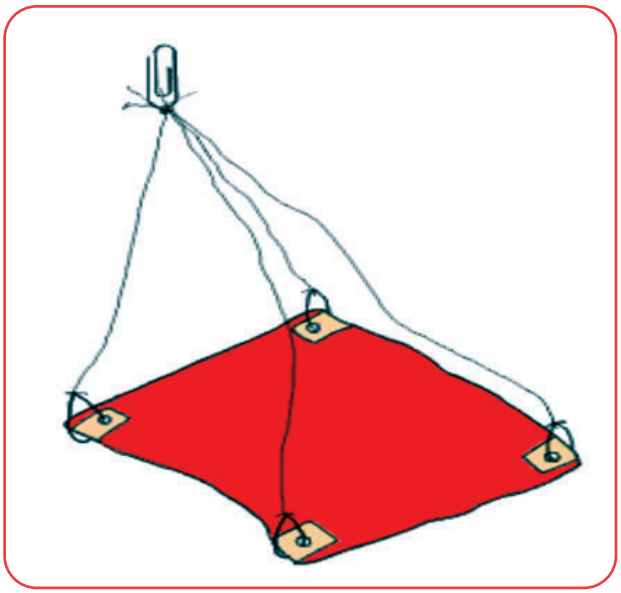
Introduction:

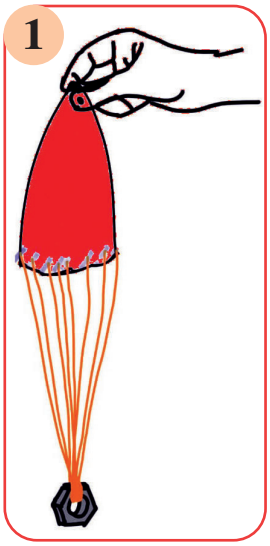
- When an object falls, gravity pulls it downward.
- A parachute is a device that slows down the fall of an object.
- The wide surface of the parachute pushes against the air and creates an upward force. This force is called air resistance, and it balances some of gravity's pull, making the fall slower and safer.
- In this activity, students will build a simple parachute and explore how different factors—such as the weight attached, the material of the parachute, and the height of the drop—affect the time it takes to reach the ground.
- Through this activity, they will understand how gravity (pulls the object towards the ground) and air resistance (the wind slows the object down during the faling) work together.

Process:

1. Cut a circle or square from paper.
2. Cut 4-6 strands of the thread into lengths of 25 cm each.
3. Tape each thread to one of the corners or edge of the paper as shown below.
4. Tie all the 4-6 threads together to form the payload attachment joint.







Experiment and Observation:

Task 1: Weight, Height, Time

a. Tie a weight at the parachute's payload point.

b. Stand at a height of 1.5 meters and drop the parachute and start the stopwatch.

c. Stop the stopwatch when the parachute lands on the ground.

d. Record the flight time (time gap between the drop and landing of the parachute)

Weight	Height	time
15 g	1.5 meters	

Task 2: Same weight, different heights

a. Tie a 15 g weight at the parachute's payload point.

b. Drop the parachute from each of the following listed heights and record the flight time for each.

Weight	Height	Time
15 g	1st floor of any building	
	2nd floor of any building	

Task 3: Same height, different weights

a. Go to a point at a height of 4 meters

b. Tie the following listed weights at the parachute's payload point

c. Drop the parachute from the height of 4 meters and record the flight time for each weight

Height	Weight	Time required
4m	20 g	
	50 g	

Task 4: Same weight and height, different materials

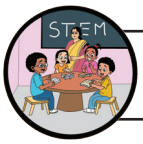
a. Take 3 different materials (for example: thin paper, thick paper, polythene) of varying thickness.

b. Make a parachute from each material by following the above given instructions.
c. Tie a 15 g weight at the payload point of each parachute
d. From a height of 4 meters drop each parachute and record the flight time for each.

Weight	Height	Material	Time
15 g	4m	Paper	
	50m	Polythene	

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ensure safe handling of scissors.



Discussion with students:

1. Why does the parachute fall slowly instead of dropping quickly?
2. What would happen if we use a heavier weight?
3. How does the height of release affect the parachute's flight time?
4. Which forces are acting on the parachute as it falls?
5. How does air resistance help real parachutes slow down skydivers?

Resources:

You can Google with the search words –

1. How to make a simple parachute
2. DIY parachute experiment for students

❋ ❋ ❋

Activity Name

6. Water Filter

Syllabus reference:

Standard/ Lesson No.: Class 7 : Chapter 5 - Human Food and Chapter 8 - Environment and Public Health

Concept / Principle: Water filtration, separation of substances

Materials and tools required:

Two-litre plastic bottle, coarse sand, fine sand, impure water, pebbles, rocks, gravel, cotton, charcoal, mug, scale, cutter

Time required: 60 minutes

Objectives:

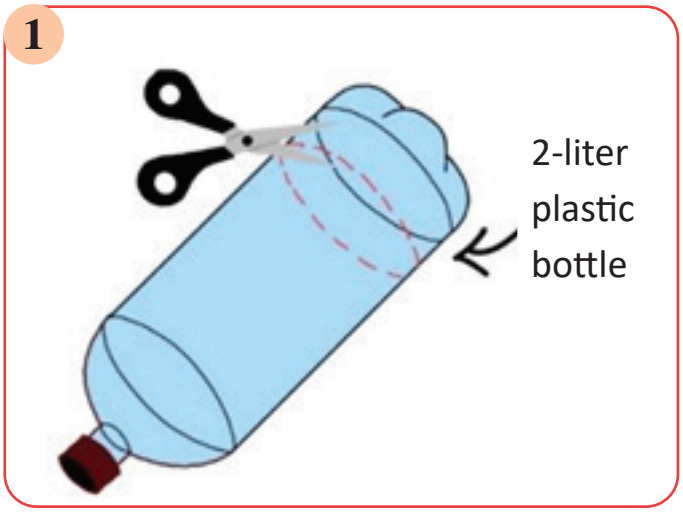
1. Students will learn to make a simple water filter using simple materials.
2. Students will learn and understand basic filtration methods.

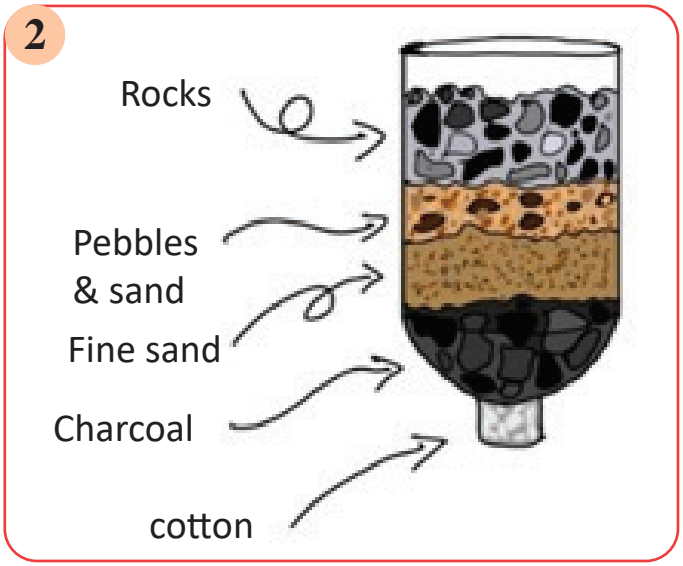
Introduction:

- Filtration is about removing visible impurities, while purification is about making water safe to drink by removing harmful germs and chemicals that are not visible.
- During the water purification process, one important step is filtration.
- Filtration is like using a sieve to separate solids from liquids.
- During the filtration process, water passes through different filters with varying pore sizes and materials (such as sand, gravel, cotton, and charcoal).
- Water filters have different layers, like gravel, sand, charcoal, and cotton. These layers act like a team of cleaners, trapping any dirt and particles as the water passes through them. So, when the water comes out of the other side, it is clear of solid impurities, and much safer to use.

Hands-on activity:

1. Cut the 2-liter bottle circumferentially about 1/2 or 1/3 of the way down. Keep both the cut parts.
2. Insert the top half of the plastic bottle upside-down (like a funnel) into the bottom half. Make sure the cap is off. The top half will be the filter and the bottom half will hold the filtered water.
3. Layer the filter materials (sand, gravel, charcoal, cotton etc.) inside the top half of the bottle.
4. Make a hole in the cap.





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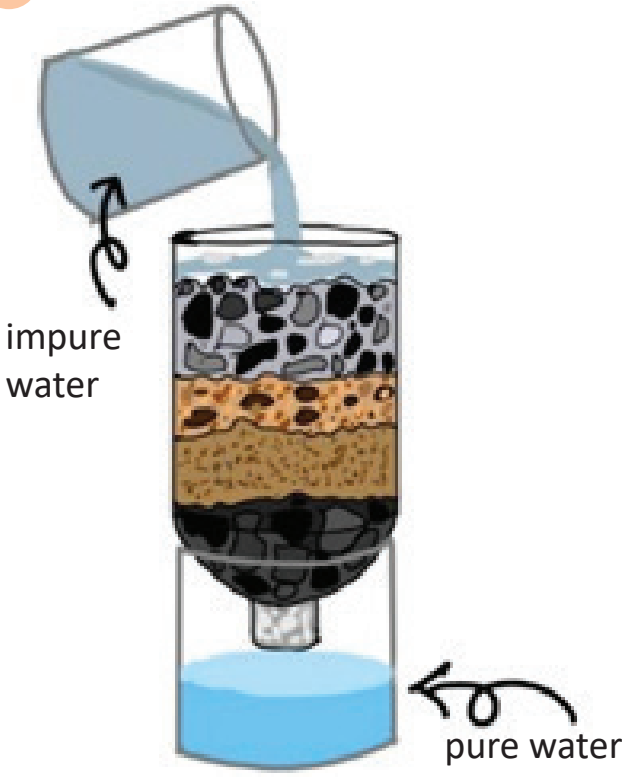


5. Pour dirty water into the filter and observe the filtration process.

Observations:

Part 1 - Observe and write which type of "pollution" is removed by each layer in the filter:

	Filter layer 1	Filter layer 2	Filter layer 3	Filter layer 4
Filter material				
Pollution filtered out				

Part 2 — Filtered water

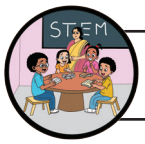
Record: solid particles, colour, smell, transparency, cleanliness, possible uses, drinkable (yes/no).

Look carefully at the filtered water and note down your observations here:

Component	Observations
Are there any solid particles present in the water?	
Is there any change in colour?	
Is there any smell ?	
Is it cleaner than before?	
Can we use this water? For what purpose?	
Is the water drinkable? If not, why?	

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ask each group to collect water from different locations.
3. Students should wear gloves and a mask while working.
4. Students should use cutter under supervision of the teacher.



Discussion with students:

1. Why is water important in our lives?
2. What are some sources of water pollution?
3. What pollutants were removed by the handmade filter?
4. What pollutants could not be removed by the hand-made filter?
5. Even if the water looks clean, is it safe to drink?

Resources:

You can search Google using the search words –

1. How to make a water filter
2. How to make DIY water filter + Youtube

❋ ❋ ❋

Activity Name

7. Map of the School Campus

Syllabus reference:

Standard/ Lesson No.: Class 6: Chapter 5 - Measuring or Measurement

Concept/ Principle: Measurement, units of measurement, scale, and map reading

Materials and tools required:

Markers, chart paper, pencils, magnetic compass, measuring tape

Time required: 60 minutes

Objectives:

1. Students will measure the area and draw a school campus map to scale.
2. Students will learn about map elements (scale, index, symbols, title, north arrow) and know how to read maps.

Introduction:

Measurement is very useful in many ways, and one important use is in making maps (cartography). All buildings around us were constructed with the help of maps. Imagine what would happen if those maps were not drawn correctly!

Maps are also useful in planning cities and finding directions. Accurate maps save a lot of time and resources. To make a good map, measurements must be taken carefully, using the smallest possible units.

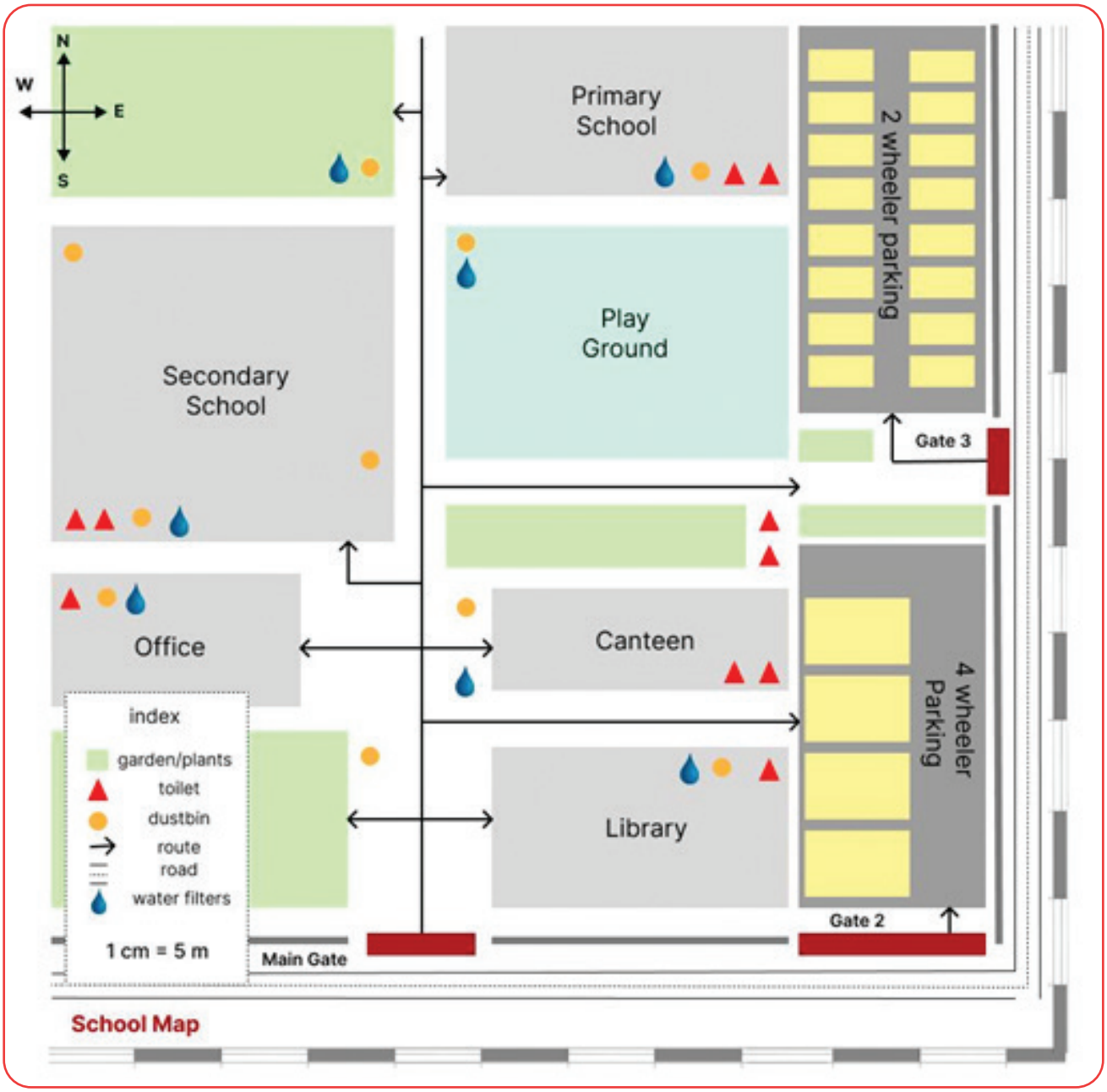
In this activity, students will measure the school campus, note down the details, and draw a scaled map of the campus.

Hands-on activity:

1. Stand in an open area on the school campus.
2. Use the magnetic compass to identify the north, south, east, and west directions. The red needle of the compass always points to the north .
3. Identify landmarks in each direction. E.g., there is a big banyan tree in the west, and a school building in the south etc.
4. Starting from one corner of the school campus, measure the length and breadth of the boundaries in metres and centimetres using the measuring tape. Note them down.
5. Measure the length and breadth of all major objects and places. Draw their rough diagrams and write the measurements along each side.
6. If a place/ building is not rectangular, measure and record the length of each wall, noting the positions of all corners.
7. After measuring all places, also measure and record the distances between different places. .
8. Now, scale down the measurements so that they can fit on chart paper. Choose an appropriate measuring scale for this. For example, real-life 1 metre = 1 cm on paper OR real-life 5 metres = 1cm on paper.
9. Convert all measurements according to your scale and note these measurements.
10. First draw the boundary of your school on the chart paper using a ruler and pencil. Try to keep all measurements accurate to the scale.

11. Then start drawing places and buildings. Maintain the sizes, shapes and distances to the scale. Complete the whole map in this way. Remember to draw all the important parts of your school that make your school unique.
12. Make sure you indicate the north direction correctly on your map.

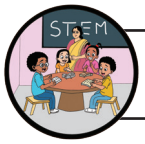
You can visit Google maps, select satellite view, find your school and check how accurate your map is to the real picture of your school from top. (maps.google.com)



Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.

2. Ask students to list down places, buildings and landmarks on the school campus. If the campus is very big, student groups can select a specific area for the mapping purpose instead of the entire campus.
3. Provide materials as required to each group.
4. Ensure that students start drawing the final map only after they measure everything.



Discussion with Students:

1. Why do we need maps?
2. What is the science of map-making called?
3. Why is it important to maintain size, shape, and distances accurately (to scale) when we make a map?
4. Where are accurate maps used in daily life?

Resources:

You can Google with the search words–

1. Make a school map+ wiki How
2. Draw a map of the school

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Activity Name

8. Smartphone Projector

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 1(2) – Light;
Class 8: Chapter 1(4) – Light;

Concept/Principle: Source of Light, sources of light, refraction, reflection, optical image formation

Materials and tools required:

Cutter/scissors, smartphone, shoebox, convex lens

Time required: 120 minutes

Objectives:

1. Students will learn how to make a simple projector using a smartphone and basic materials.
2. Students will understand how light travels and how lenses are used to form images.

Introduction:

1. A projector works by bending light through the lens to display a larger image on a wall.
2. The path of light can be changed by using glass, and the shape of the glass determines how the light will bend.
3. When we use a convex lens, the light coming from a source converges to one point, creating a sharp image on the wall.
4. If a concave lens were used, the light would diverge instead.
5. A convex lens has a focal length where light rays from a distance are concentrated (focused).
6. If the smartphone is placed farther than this distance, an image will form on the screen.
7. Changing the distance between the object and the lens, will also change the image position and size accordingly.

Hands-on activity:

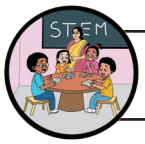
1. Cut out the entire shorter side of the cardboard shoe box carefully using a cutter or scissors.
2. Keep this cut portion aside for later use (you will place the lens on this later).
3. Line the insides of the box with black paper or paint.
4. Use a cutter to make a hole the size of your convex lens in the centre of the side you had put aside.

Cover the box with a lid.

5. Fix the convex lens on the hole using glue or tape .
6. Cover the remaining portion of the cut side with black paper, making sure you do not cover the lens.
7. Stick the cut portion back on to the box so that the lens is now installed on one side of the box.
8. On the opposite side of the box, place a mirror at a 45-degree angle. Cover the box with its lid.
9. Make a rectangular hole slightly smaller than the size of the smartphone, on top of the lid, towards the edge just above the mirror.
10. Play any video on your smart phone and place the phone face down on a hole on the lid and aim the convex lens end towards the wall in front of it. See how your projector works.
11. If the image on the screen is not clear, move the box and adjust distance until you get a clear image.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students .
2. Ensure the safe use of cutters under your supervision.



Discussion with students:

1. What would happen if the insides of the box were not black?
2. How will you adjust the sharpness of the image?
3. Why is a convex lens used in the projector?
4. Where should you place the lens to get the largest clear image?

Resources:

You can Google with the search words –

1. How to Make DIY Projector
2. How to build a smartphone projector
3. How to build a projector out of cardboard

QR Codes

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Activity Name

9. Solar Cooker

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 6 - Basic concept of Force and Energy; Class 7: Chapter 1 (5) - Environment-friendly Energy

Concept/Principle: Types and sources of energy, energy conversion, energy chain, energy problem; Solar Energy

Materials and tools required:

Cardboard, cardboard box, aluminium foil, glue, black paint or black paper, transparent plastic lid, scissors, paintbrush, blade cutter, thermometer

Time required: 60 minutes

Objectives:

1. Students will learn how to build a simple solar cooker using simple available materials and understand how solar energy works.
2. Students will observe how reflective surfaces concentrate sunrays to create heat.
3. Students will learn to appreciate how using solar energy can reduce the use of fossil fuel and promote sustainable energy use. They will understand the importance of using conventional sources of energy.

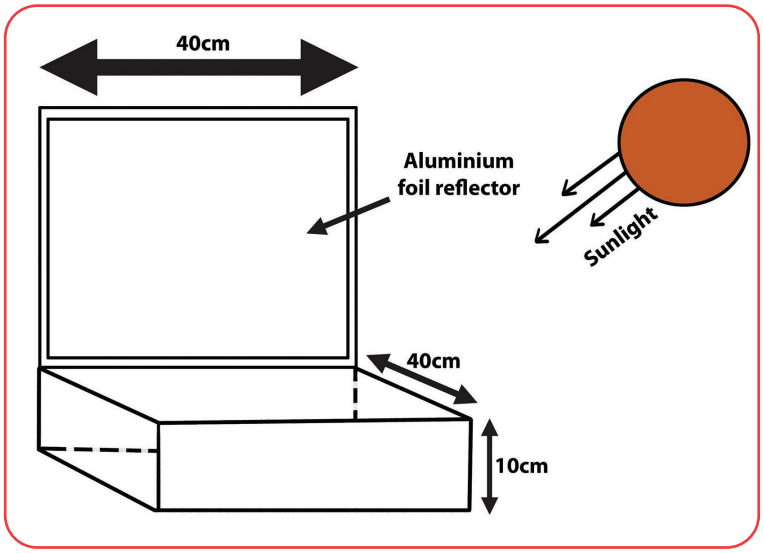
Introduction:

A DIY Solar Cooker shows how sunlight can be turned into heat. It typically utilizes a box or panel design lined with reflective material like aluminum foil to concentrate sunlight. This trapped solar energy is converted into heat within an insulated chamber, creating a "greenhouse effect" that can reach temperatures high enough to bake, boil, or steam various food items.

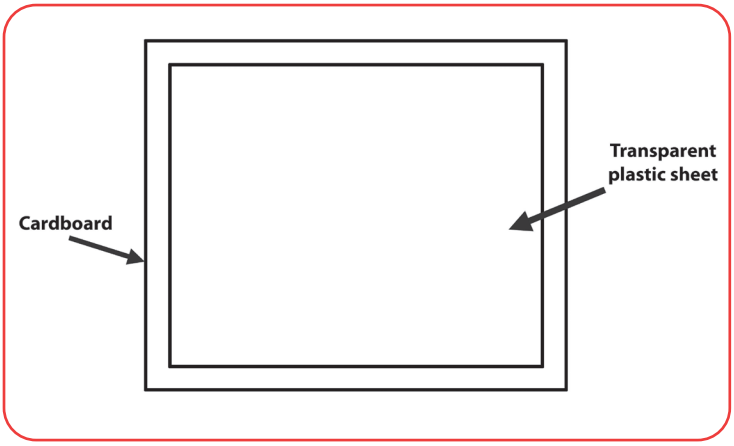
Hands-on activity:

Part 1: Making solar cooker

1. Cut four pieces of cardboard of 10 cm x 40 cm dimensions each, and one piece of 40 cm x 40 cm dimension for the base. Alternatively, you may use a cardboard box of approximately similar size.



2. Apply glue to one side of each of the four cardboard pieces and stick black paper on them OR paint the inside of the cardboard box with black paint.



3. Make a box by assembling the cut cardboard pieces as shown in the image.
4. Make a frame of transparent plastic sheet and cardboard to cover the box.

5. Cut another piece of cardboard measuring 40 cm x 40 cm to make a reflector. Cover one side with aluminium foil. Place this reflector in a standing position (upright) facing the sun. The aluminium foil side will be kept in such a way that sunlight will get reflected into the cooking chamber.

Part 2: Using a solar cooker

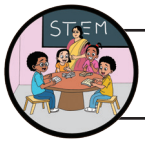
1. Place the solar cooker in a place where there is no obstruction to sunlight.
2. Place a bowl filled with water inside the cooker.
3. Cover the cooker with a transparent glass lid.
4. The aluminium foil reflector side is kept facing toward the sun. Sunlight should be reflected inside the cooking chamber.
5. Record the temperature of the water at regular intervals using a thermometer.

Observation:

The time when the water bowl was placed in the cooker	The initial temperature of the water	Record temperature at regular intervals of 10 min		

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ensure that students wear gloves when using scissors or cutters.
3. Gather all the necessary materials and resources needed for the activity.



Discussion with Students:

1. Where should we place a solar cooker?
2. How does a solar cooker work?
3. Why do we use aluminium foil and black paper?
4. Can we cook anything in a solar cooker?
5. Are solar cookers environment friendly?
6. What are the other uses of solar energy?

Resources:

You can Google with the search words –

1. How to make a simple solar cooker to understand the use of solar energy
2. DIY solar cooker using cardboard
3. Step-by-step guide for making a cardboard solar cooker

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Activity Name

10. Smartphone as a Measuring Instrument

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 5 - Measurement
Chapter 7 - State and Motion of Liquids and Gases;
Class 7: Chapter 1 (2) - Light
Chapter 1 (3) - Magnets
Chapter 8 - Environment and Public Health;
Class 8: Chapter 1 (1) - Force and Pressure

Concept/Principle: Measurement requirements and Units of Measurement in daily life, Pressure/Stress and its effect of Pressure/Stress, Source of Light, Different properties of magnets, Air pressure

Tools Required:

Smartphone

Time required: 150 minutes

Introduction:

1. Smartphones have many inbuilt sensors.
2. These sensors help the phone sense light, sound, orientation, location, movement, pressure, magnetism, etc.
3. There are various apps available on the internet which take advantage of these features to turn the smartphone into a measuring instrument.
4. These apps give you direct data from the sensors as well as processed data.
5. There are various such free or paid apps available on play store.
6. We will see one such app named 'phyphox' as an example. There are 7 measurements related to 7 sensors.

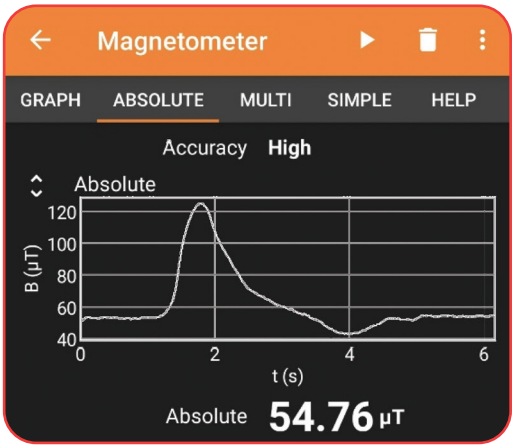
Picture 1

Hands-on activity:

Example: Magnetometer measures the magnetic field near the phone. When a magnet is brought near the phone and then taken away, the following live graph is seen on the screen. The unit of magnetism is 'micro-Tesla'. This can be used for performing experiments related to magnetism and electromagnetism.

Activity - Take a magnet and find out its magnetic strength.

Heat it for some time, then again check its magnetism.

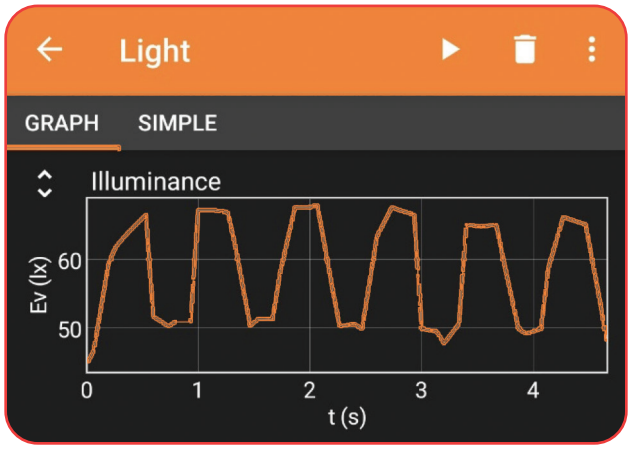


Picture 2

Example 2:

Light sensor measures the brightness of light falling on the phone. When a light is turned ON-OFF-ON-OFF... in front of the phone, the following graph is seen. Brightness is measured in 'Lux' units.

Activity - Use this sensor to measure light intensity inside and outside your classroom. Find out how much light is required to have sufficient brightness inside the room.



Picture – 3

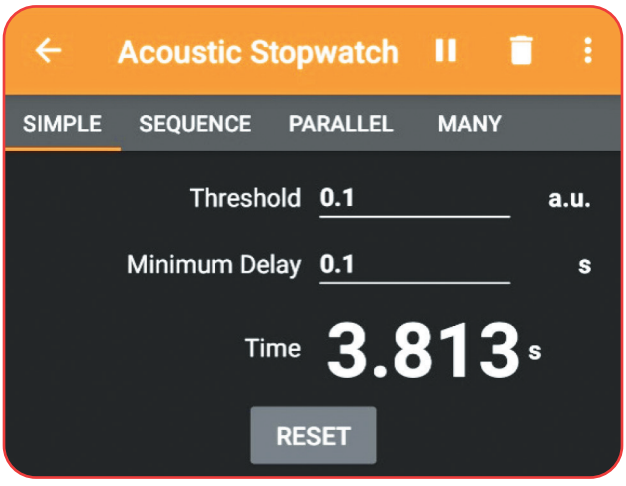
Time (s)	Illuminance (lx)
0.000438493	44.61750031
0.06710443	46.7100029
0.200436357	59.46750259
0.267102399	61.96500397
0.40043443	64.39500427
0.533766305	66.55500031

Picture – 4

For all sensors, not only graphs can be seen, but all the data in the form of numbers can also be taken out as shown in the image. This can be useful for advanced analysis.All this might seem complicated, but these sensors can be used to make difficult tasks easier by using options in the app.

Example 3:

The app has a 'acoustic stopwatch' which uses sound to start and stop a timer. When a loud clap or any loud noise is heard, the stopwatch starts. When another loud noise is heard, it stops.



Picture – 5

Activity: This can be used to measure time for running races. Arrange a race and use this app.

There are many tools built into apps, such as GPS location, Audio level meter, Motion stopwatch, Magnetic ruler, Optical stopwatch etc.

Example 4:

There are also some other apps such as 'compass' which are used to detect north direction.

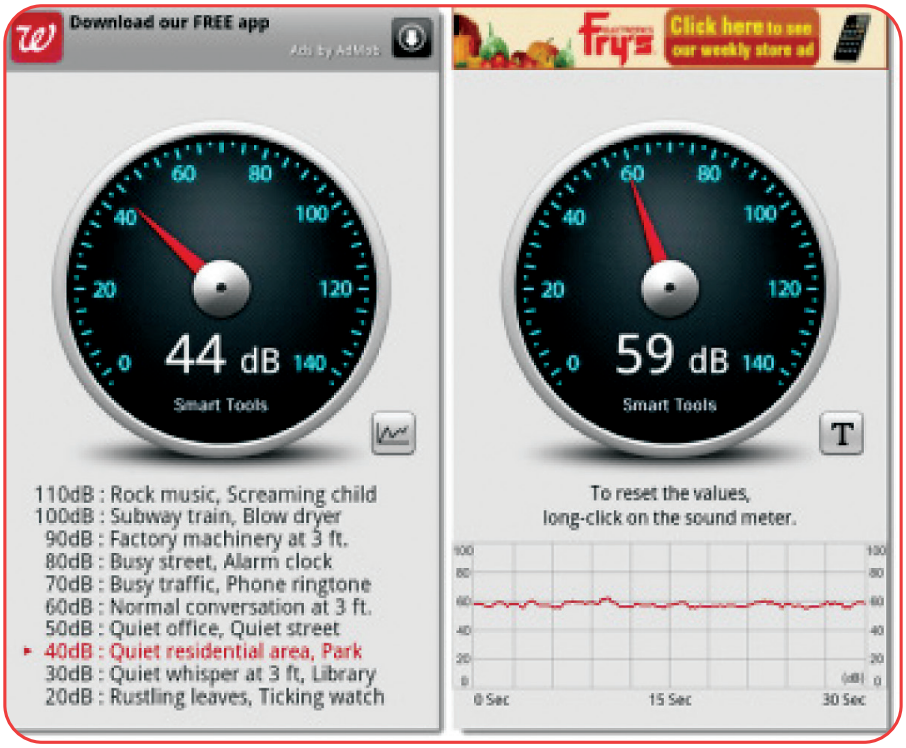
Activity - Use this app to find the north direction inside your classroom.

Picture – 6

Example 5:

'Sound meter' is an app which can measure sound level and alert when it is too high. It has scales to indicate which noise produces how many decibels of sound.

Activity - Use this app during festivals and celebrations to detect when noise levels get too high.



Picture – 7

Smartphone/ Computer as data source:

In the previous section, we saw how to use a smartphone as a measuring instrument.

Globally, there are various satellites and sensors which are used to collect data.

There are many websites and apps which provide access to this data allowing us to view and gather information.

Example 1:

Google Maps can be used to find location, measure distances, and calculate areas.

Visit www.google.com/maps or MapmyIndia (https://mapmyindia.in). GPS (Global Positioning System) is a system used to find coordinates- latitude and longitude, of a location. Latitude tells how far north or south of the equator (-90° to 90°). Longitude tells how far east or west of the prime meridian (-180° to 180°).

Picture – 8

Picture – 9

In this image, one school 'P.S. Dilra Raipur' is searched on Google maps.

Right-click on the school to find its GPS coordinates (28.82199,78.83602).

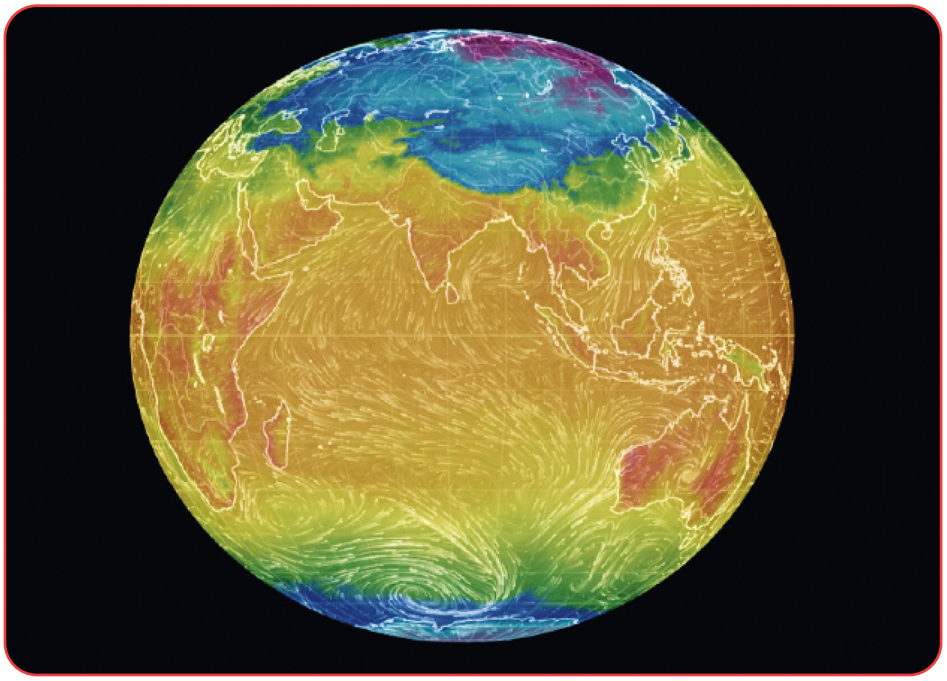
You can click on 'Measure distance' to measure distances and calculate areas, as shown in image two.

The perimeter of the school is around 79.42m and the area is around 232.49m².

Activity - Locate your school on map. Measure its area, perimeter, and the distance from another (nearest) school.

Example 2:

'Earth nullschool' can be used for seeing weather patterns Visit www.earth.nullschool.net to look at the whole earth and see weather parameters such as temperature, wind speed, humidity, pollution level, ocean currents etc.



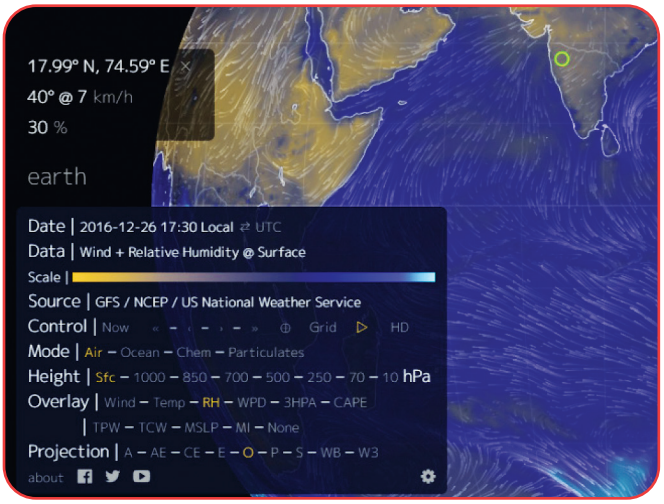
Picture – 10

Activity - Temperature and humidity related information about any location can be obtained by clicking on it and selecting suitable options.

Make a 'Weather Board' in your school to write and display today's temperature and humidity.

If humidity and temperature are very high, there is a risk of heatstroke.

Issue warning to fellow students in such cases by referring to the table below.



Picture – 11

Relative Humidity %	Air temperature °C										
	21	24	27	29	32	35	38	41	43	46	49
0	18	21	23	26	28	31	33	35	37	39	42
10	18	21	24	27	29	32	35	38	41	44	47
20	19	22	25	28	31	34	37	41	44	49	54
30	19	23	26	29	32	36	40	45	51	57	64
40	20	23	26	30	34	38	43	51	58	66	
50	21	24	27	31	36	42	49	57	66		
60	21	24	28	32	38	46	56	65			
70	21	25	29	34	41	51	62				
80	22	26	30	36	45	58					
90	22	26	31	39	50						
100	22	27	33	42							

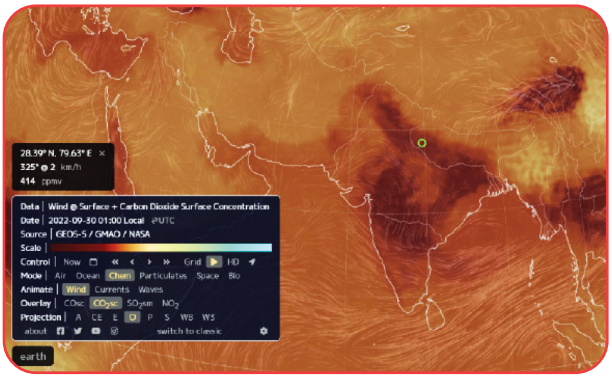
Serious risk to health - heatstroke imminent

Prolonged exposure and activity could lead to heatstroke

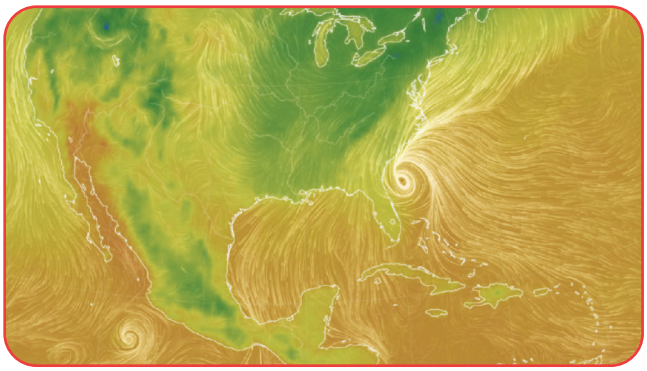
Prolonged exposure and activity may lead to fatigue

Picture – 12

You can also track CO_2, SO_2 pollution levels near your school and issue warnings if levels are too high.



Picture – 13

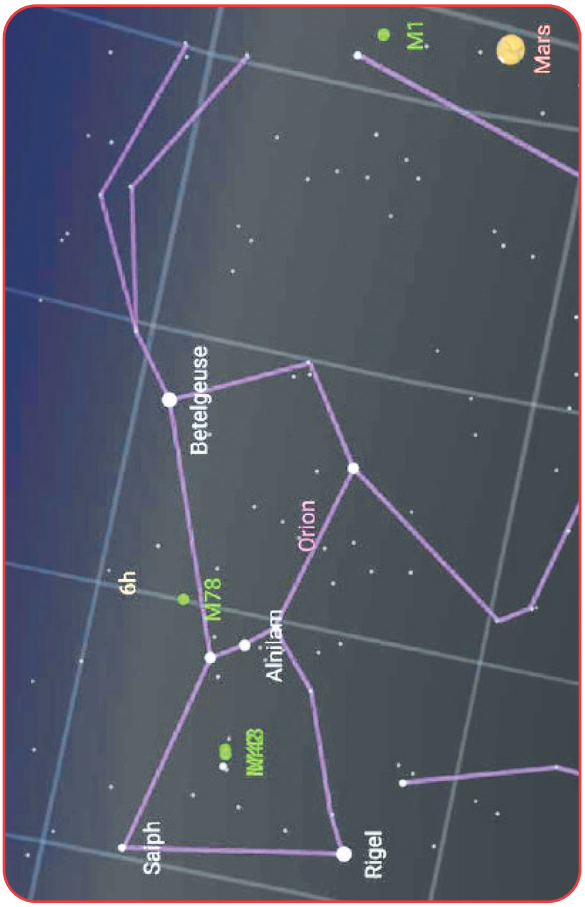


Picture – 14

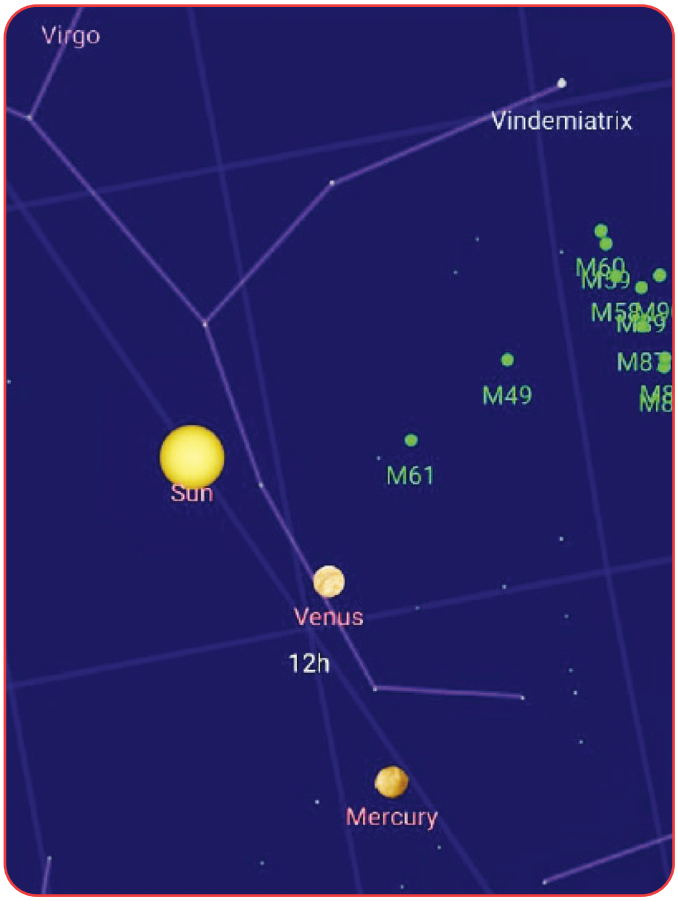
You can track the status of hurricanes and cyclones. In the image you can see 'hurricane Ian' near the USA.

Example 3:

'Sky Map' app can be used for observing live locations of planets, stars, galaxies, meteor showers etc.



Picture – 15



Picture – 16

Using the Sky Map app on the smartphone, you can view objects in the sky in real time. Planets and constellations in the direction where the mobile is pointed will appear on the screen. If comets are present, they will also be visible

Activity - At night, try to identify constellations with the naked eye.

Then use the app to confirm your observations.

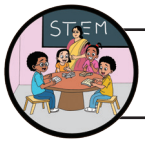
Note the rising and setting times of various planets.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students .
2. Introduce one app/website at a time.
3. Let students familiarize themselves with it before moving on to the next one.

Specific apps for relevant situations:

- ‘Sky Map’ can be used during meteor showers, eclipses.
- ‘Earth.nullschool’ can be introduced after/ during a weather calamity/ disaster situation.
- ‘Sound meter’ can be introduced before festivals in which noise is usually produced (e.g. use of loudspeakers, drum beating, cracker explosions etc).



Discussion with students:

1. Which appliances in your house have a magnet inside it? Measure using magnetometer sensor.
2. How fast can you clap ? Measure using ‘acoustic stopwatch’.
3. Use Google Maps to find the Taj Mahal location coordinates?
4. Compare humidity and temperature in different cities using earth.nullschool.net
5. In which constellation is the sun today? Use Sky Map to find out.

Resources:

QR Code

❋ ❋ ❋

Activity Name

11. Periscope

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 1 (2) - Light;
Class 8: Chapter 1 (4) - Light

Concept/Principle: Reflection and refraction of light, optical Image

Materials and tools required:

Periscope pattern print, cardboard sheet, two mirrors (5cm x 5cm), scissors, glue, ruler, pencil, hot glue gun

Time required: 60 minutes

Objectives:

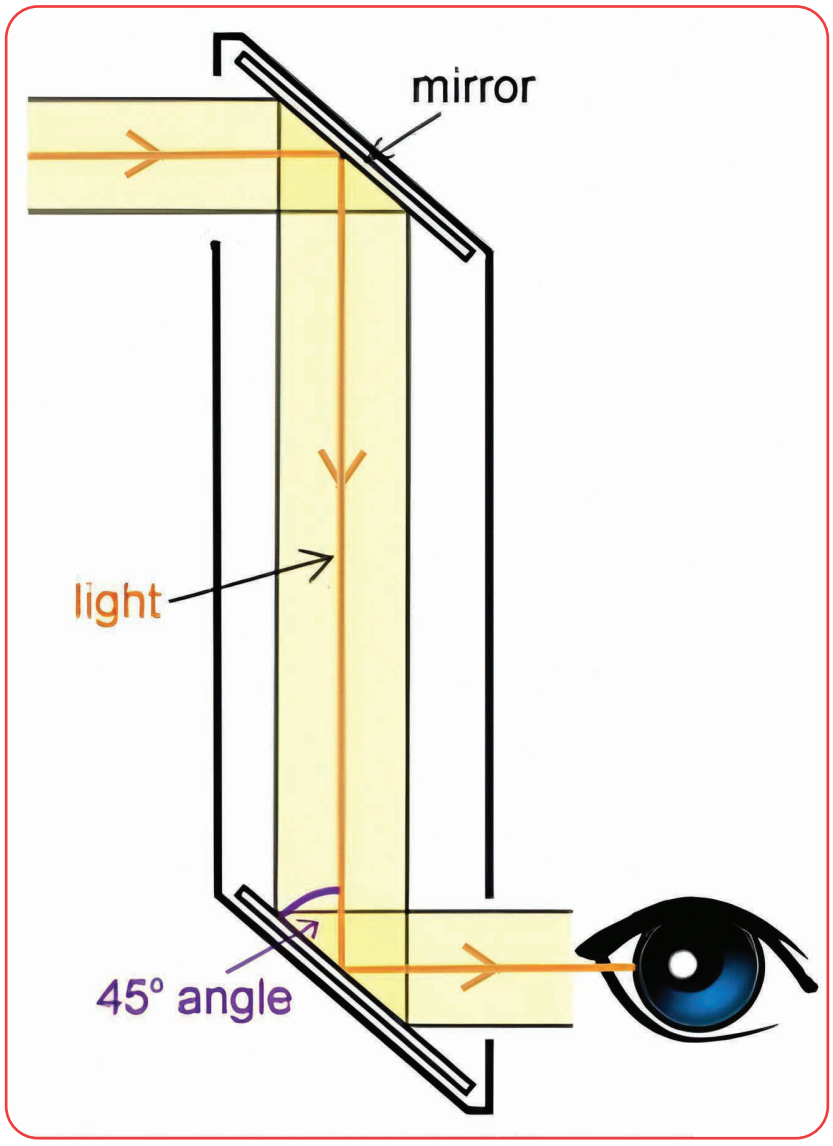
1. Students will learn to make a periscope by using mirrors and other basic material
2. Students will understand the basics of optics - light, shadows, mirrors, lenses as well as principles of reflection and refraction

Introduction:

A periscope is a device that allows us to see objects that are not directly visible, such as around corners or over obstacles. It works by reflecting light using mirrors placed at specific angles.

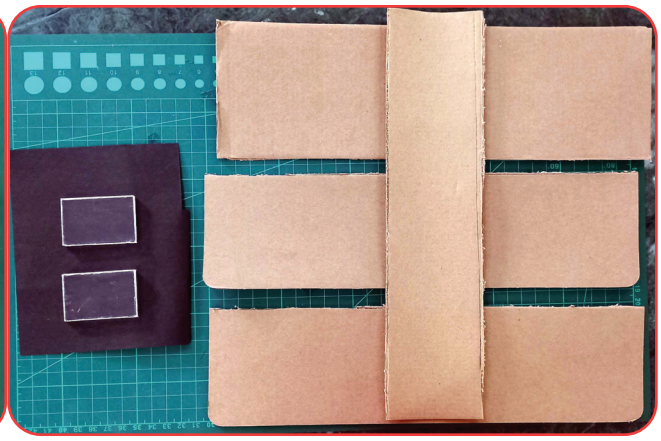
Periscopes are used in submarines to observe above the water surface, in tanks to view the surroundings safely, and even by soldiers in trenches during wars.

Sketch:



Hands-on Activity:

Tools required



Material required

Step 1:

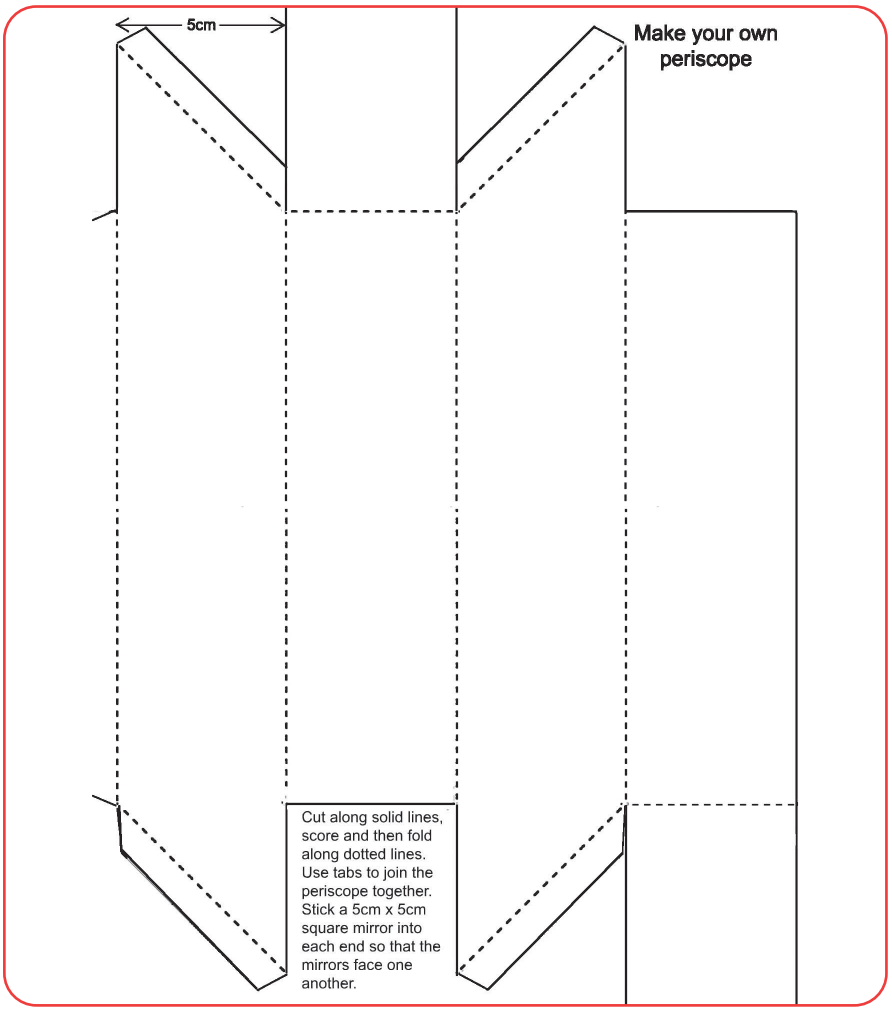
➠ Take a cardboard sheet and cut it into an A4 size.

Step 2:

➠ Scan the QR code given here, download and print the periscope template on an A4 size paper sheet.

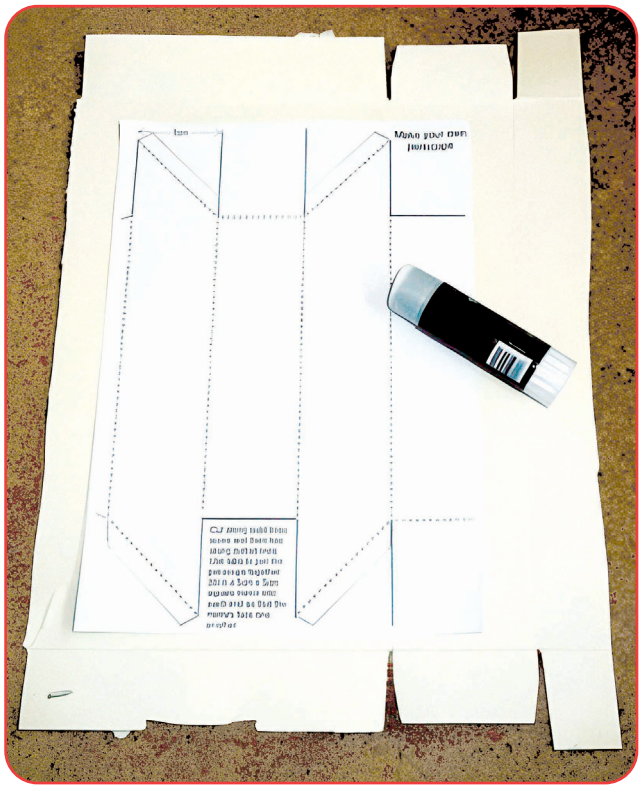
QR Code

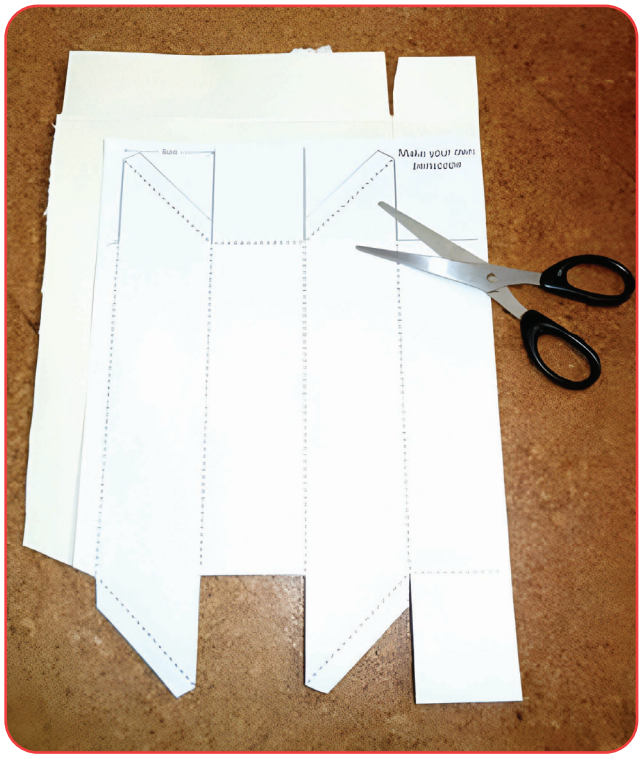
Periscope template



Step 3:

- Paste the A4 printed pattern onto cardboard. You can use an old notebook hardcover. This will serve as the top part of your periscope.



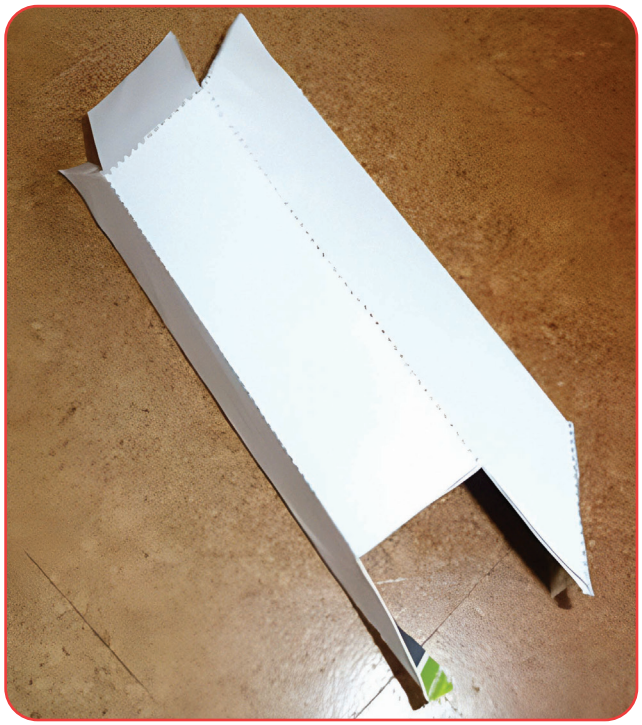


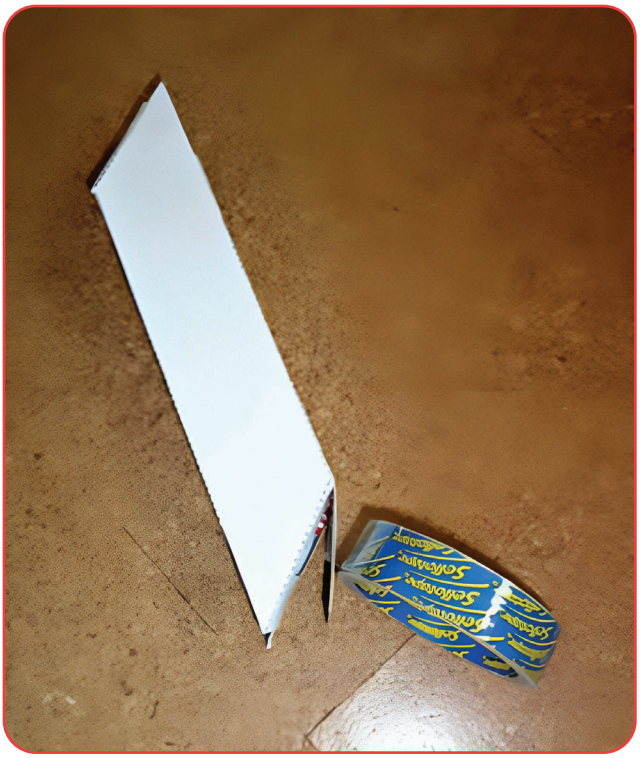
Step 4:

- After pasting on the cardboard, cut out the template carefully along the solid lines. Do not cut the side tabs that will be used for folding.

Step 5:

- Fold carefully along all the scored dotted lines (you can fold around the ruler).





Step 6:

- Use tape or strong glue/ hot glue to stick the periscope together using the tabs.

Step 7:

- Place one mirror each at a 45-degree angle onto the bottom and top corners of the pattern. Glue them securely, ensuring that they reflect the area above the cardboard.

Step 8:

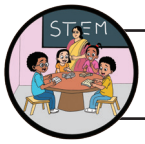
- Test your periscope. Look through the open end of the periscope and observe the reflection in the mirrors. Adjust the mirrors if needed to ensure a clear view.

Step 9:

- You can paint or decorate your periscope if you like. Be creative and make it your own.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ensure use of safety equipment, such as gloves or safety glasses, as needed.
3. Make sure students are working under supervision especially while using cutting tools and handling mirrors
4. The template pasted on the cardboard should not be cut directly on the table. Use a cutting mat or old cardboard.
5. Avoid excessive force when assembling or adjusting the mirrors in periscope to prevent damage.



Discussion with students:

1. What is the working principle of a periscope?
2. Where and in what situations will you use a periscope in real life?
3. What aspects of the project did you find most enjoyable or interesting?
4. What are different types of mirrors?
5. What is the difference between a mirror and a lens?
6. What challenges did you face during the construction of the periscope, and how did you overcome them?

Resources:

1. Reference link- how to make periscope using cardboard and template.

QR Codes

You can Google with the search words
"how to make a periscope using cardboard"

Home Science

Activity Name

12. Lemonade

Syllabus reference:

Standard/ Lesson No.: Class 6: Chapter 3 - Elements, Compounds and Mixtures
Chapter 5 - Measurement

Concept/ Principle: Mixtures of different types, Solubility, Units of Measurement in daily life, Volume, Mass and Time

Materials and tools required:

Lemons, sugar, salt, water, vessel, glass cup, marker pen, knife, measuring cup, squeezer, spoon

Time required: 45 minutes

Objectives:

1. Students will learn to measure various items, including solids and liquids.
2. Students will learn to practise basic cooking skills such as cutting, juicing, mixing/dissolving and measuring, etc.
3. Students will calculate the final cost of making lemonade

Introduction:

1. A measurement unit is a standard way of defining quantities, with systems like SI (International System of units) and CGS (centimetre-gram-second) commonly used.
2. In food preparation, both measurement systems are used at different stages, such as measuring ingredients and quantities.
3. In this activity, students will practice measuring, mixing, and scaling while making lemonade.
4. Students will learn how measurements affect taste and understand the importance of accuracy, and how proportions can be altered as per needs and preferences.

Hands-on activity:

1. List down, collect and arrange all the components or ingredients required for making nimbu-paani or lemonade neatly in their respective containers.
2. Spend some time preparing a sweet-sour nimbu-paani for a friend. Try changing or altering the quantity of water, lemon juice, sugar, and salt to understand how each component changes the taste.
3. Use spoons, cups, etc., as your measuring references. You may mark the levels of water, etc., on the cup before pouring .
4. Keep making new lemonade by varying the quantity of ingredients like sugar, salt, and fresh lime juice in a glass until you get the desired taste. Note down the amount of each ingredient every time you make a fresh glass.
5. For example: 2 cups water, 1 tablespoon of lemon juice, 2 teaspoons sugar, 1 pinch of salt.
6. Once you feel that you have made a lemonade of your desired taste, circle the final proportion of ingredients.
7. Now, if you have to make lemonade for 10 people, multiply each ingredient used to prepare one glass of lemonade by 10.
8. Take a large vessel and make the lemonade for 10 people.
9. Serve it to your friends and observe their responses.

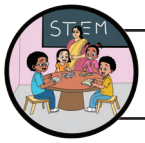
Costing: Calculate the cost required to prepare one glass of lemonade.

Refer to the table below to calculate the cost:

Sr. No.	Particular	Quantity	Rate	Amount
1	Fresh Lemons			
2	Sugar			
3	water			
4	Salt			
		Total Amount =		

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students
2. All students should strictly follow all hygiene norms, such as washing hands, wearing headgear or aprons, cleaning the cooking area before and after processing, and cleaning utensils properly.
3. Ensure that students handle knives only under teacher supervision.
4. Any spills must be cleaned up immediately.



Discussion with students:

1. What happened to the sugar when we stirred it in the water?
2. How do our parents measure ingredients while cooking?
3. What are the traditional tools used for the measurement of things, especially food grains?
4. What is the importance of measurement in food processing or cooking?
5. Can you cook well without measuring the ingredients?

Resources:

You can search on Google using the search words -

1. How to use measuring cups and spoons in the kitchen
2. Fun cooking activities to learn measuring and mixing

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Activity Name

13. Curd

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 1 - Interdependence of Environment;
Class 7: Chapter 4 - Role of Matter in Formation of Environment;
Class 8: Chapter 7 - World of Microbes

Concept/Principle: Curd making, Identification of acidic substances based on general experience; Concept of acids, indicators; Role of microbes in the environment (Food processing)

Materials and tools required:

Cow milk, curd culture, gas stove, utensils, thermometer, pH paper, small earthen pot

Time required: 60 minutes

Objectives:

1. Students will make curd from fresh milk by applying the fermentation process.
2. Students will learn to use and apply pH paper for testing acidity.

Introduction:

- Boiling the milk (pasteurization) kills harmful bacteria, allowing beneficial Lactococcus bacteria in curd culture to grow. These bacteria convert milk sugar (lactose) into lactic acid. The acid causes milk proteins to coagulate and thicken, transforming milk into curd.
- During fermentation, the pH of milk also changes from basic to acidic, depending on factors like temperature, the quantity of curd culture, and milk sugar content. This activity helps students understand the role of microbes in food processing.

Hands-on activity:

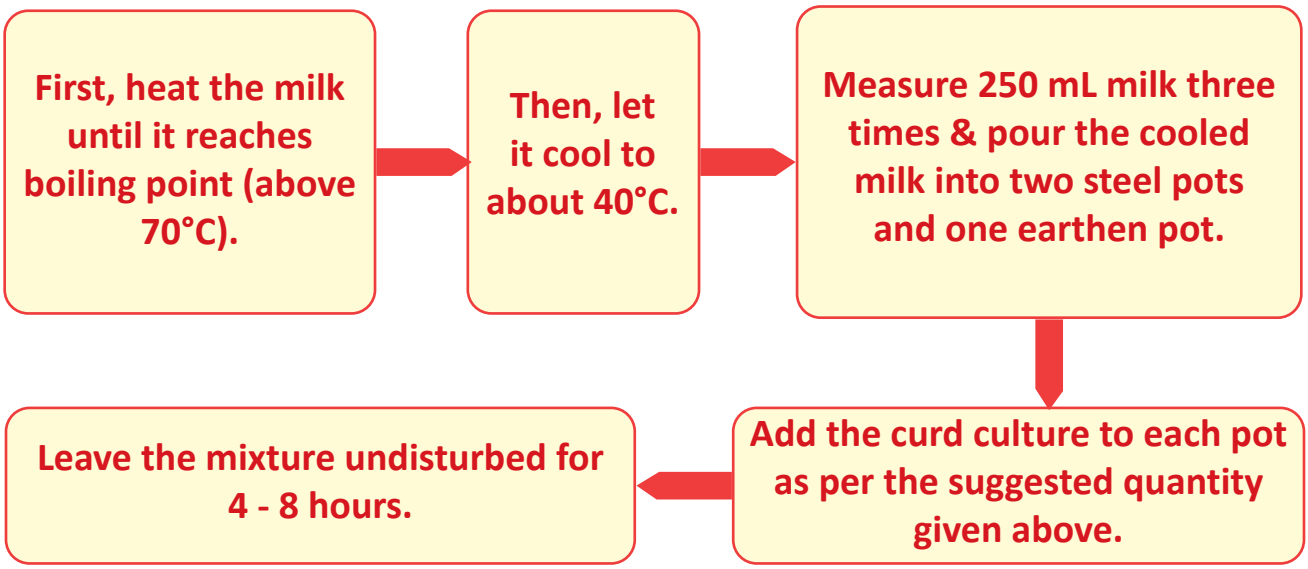
Making curd from fresh milk:

Make three groups of students for the activity.

Steps for conducting the activity:

- Group 1 – 250 mL milk + 2 g (1/2 table spoon) curd culture
- Group 2 – 250 mL milk + 8 to 10 g (2 tablespoons) curd culture
- Group 3 – 250 mL milk + 2 g (1/2 tablespoon) curd culture using earthen pot

Process of making curd (process flow):



Application of the fermentation process:

Fermentation is a process where beneficial microorganisms convert sugars (carbohydrates) into organic acids.

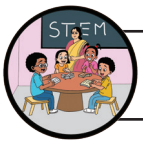
In curd making, the lactose (milk sugar) is turned into lactic acid by Lactobacillus bacteria.

Observations:

- How does the consistency of the milk change once the fermentation process is complete?
- Compare the quality of the curd in all three groups with respect to taste, smell, consistency, and texture.
- Note the time required for curd to form and the temperature at the time of inoculation.
- What is the difference between packaged curd (bought from the market) and curd made by us in school? Why is there a difference? Is the process for packaged curd different from the process we followed?

Teacher Guidelines:

1. Make three groups (max. 6 students per group) and ask the students to handle the whole process of making curd independently.
2. The teacher should operate the gas stove themselves to ensure safety.
3. Students and teachers will taste curd and make different products from it.



Discussion with students:

1. Why has the consistency and taste of milk changed?
2. What is present in the curd culture? Were these bacteria helpful?

3. Under what conditions do bacteria (microbes) grow faster? Why?
4. Is there any difference when curd is prepared in a steel vessel and an earthen vessel?
5. Are there any other uses of these friendly bacteria in cooking?
6. What are some traditional recipes for making curd?
7. How do you ensure that the curd sets properly during the fermentation process?

Resources:

You can search on Google using the search words –

1. How to make curd at home?
2. What is fermentation?

❋ ❋ ❋

Activity Name

14. Paneer

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 1 - Interdependence of Environment ; Class 8: Chapter 7 - World of Microbes

Concept/Principle: Microorganisms, Role of Microbes in the environment (coagulation)

Materials and tools required:

Milk, lemon juice or vinegar, cotton cloth, strainer, gas stove, utensils

Time required: 120 minutes

Objectives:

1. Students will understand the science behind making paneer (protein coagulation) by making paneer in school

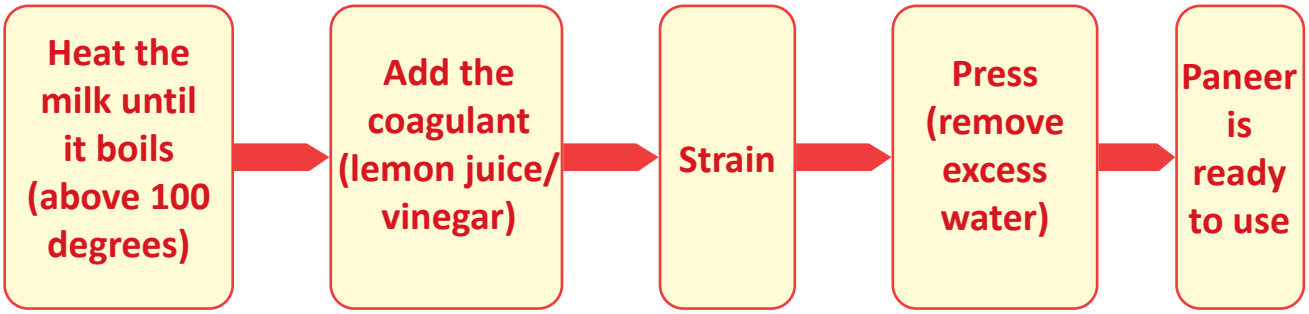
Introduction:

- Paneer is a type of cheese made from milk. To make paneer, sour or acidic ingredients like lemon juice or vinegar are added to milk. This causes the milk to separate into solid curds (paneer) and liquid (whey). The solid curds are collected and pressed to make soft paneer.
- This happens because the sour (acidic) ingredient changes the milk proteins, making them coagulate and stick together.
- In this activity, students will learn how milk turns into paneer using simple kitchen ingredi-ents.

Hands-on activity:

1. Heat the milk in a pot on medium flame, stirring occasionally to prevent it from burning.
2. When the milk starts boiling, add 2-3 tablespoons of lemon juice or vinegar slowly while stirring.
3. The milk will start separating into white solids (paneer) and liquid (whey).
4. Turn off the heat and let it rest for 2-3 minutes.
5. Place a clean cloth over a strainer and pour the mixture into it to separate the paneer from the whey.
6. Rinse the paneer with cold water to remove the sour taste.
7. Gather the cloth and squeeze out excess water, then place a heavy object on top and leave it for 30 minutes to set.
8. After 30 minutes, unwrap the cloth, and your paneer is ready.

Process Flow Chart:

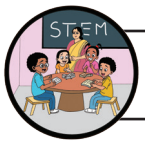


Observation Table:

S.No.	Observation parameter	Value/measurement
1	Amount of milk used	
2	Amount of lemon juice/vinegar	
3	Total time required to make paneer	
4	Weight of paneer	

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students
2. Students should always wear gloves and a mask while working.
3. The cooking stove should be used only when the teacher is present.
4. Make sure the workspace is kept clean.



Discussion with students:

1. Why do we need to heat the milk before adding lemon or vinegar?
2. What is the role of an acid (like lemon juice or vinegar) in the process of making paneer?
3. What happens to the milk molecules when they coagulate to form curds?
4. How do you store homemade paneer to keep it fresh?
5. With 1 litre of milk, how much paneer is made?
6. How is homemade paneer different from store-bought paneer?

Resources:

You can search on Google using the search words –

1. How to make paneer?
2. Step-by-step process to make paneer at home + YouTube

Activity Name

15. Khichudi

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 5 - Human Food

Concept/Principle: Food Ingredients

Materials and tools required:

Rice (250 g), dal or lentils (100 g), vegetables (50 g), potatoes (50 g), oil (10 ml), spices, water, gas stove, pressure cooker (2 litre capacity), kitchen utensils

Time required: 120 minutes

Objectives:

1. Students will prepare different types of khichudi and learn to calculate the approximate calories of one portion of khichudi.
2. Students will learn about the calorific value of fuel and calculate the cost of fuel required to make the khichudi
3. Students will learn about the nutritional value of the various ingredients used in making khichudi.

Introduction:

Khichudi is a simple, wholesome dish made from rice, lentils, and vegetables, widely eaten for its nutritional balance. In this activity, students will prepare a healthy and nutritious "khichudi," and explore the science behind its preparation by understanding how different ingredients contribute different nutrients including carbohydrates, proteins, fats, vitamins, and minerals. They will learn how to calculate the calorific value of food, the energy required for cook-ing, and the cost of different cooking fuels. This hands-on activity connects cooking with concepts of nutrition, fuel efficiency, and food and fuel costing.

Hands-on activity:

Part 1: Make khichudi and calculate the cost and calorie count.

Flowchart:

Table 1: Ingredients used in KHICHUDI and their approximate cost

S.No.	Ingredient	Quantity	Unit cost	Amount	Nutritional component
1.	Rice	250 g	₹30 /kg	7.50	Carbohydrate rich
2.	Dal	100 g	₹80 /kg	4.00	Protein rich
3.	Potato	50 g	₹20 /kg	1.00	Carbohydrate rich
4.	Vegetables	50 g	₹50 /kg	2.50	Mineral rich
5.	Oil	10 g	₹180 /kg	1.80	Fat rich
6.	Spices	5 g	₹1000 /kg	5.00	Mineral / flavour-rich
				Total = ₹21.80	

Nutrition/Calories:

- 1 g carbohydrate = 4 calories
- 1 g protein = 4 calories
- 1 g fat = 9 calories

Calories in khichudi /:

Raw rice	Raw rice carbs per 100 g	28 g
Raw dal (moong)	Raw dal protein per 100 g	24.2 g

Part 2: Calories used for cooking

Make the same amount of khichudi (1kg) using different fuels.

No.	Source	Time taken for cooking in minutes	Fuel Consumed in g/mL	Price of fuel used (in Take)
1.	Wood			
2.	Kerosene			
3.	Cooking gas			

Calorific value: It can be defined as the amount of heat liberated in KJ or Kcal by the complete combustion of 1 Kg of fuel.

E.g. – calorific value of wood = 3500 Kcal/kg

Calories Used for Cooking = Calorific value of fuel * Fuel Consumed

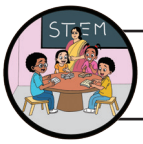
e.g, Wood - Calories Used for Cooking = 3500*1.9 = 6650 Kcal

Part 3: Cost of fuel required

Fuel Source	Fuel Consumed	Market Cost in ₹	Total Cost of fuel in Rs.
Wood	1.9 Kg	___ ₹/Kg	
Kerosene		___ ₹/litre	
Cooking gas		___ ₹/ Kg	

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students
2. Collect all required materials in advance.
3. Ensure strict adherence to safety and hygiene measures. Students must work under teacher supervision while using gas stoves, knives, etc.
4. Identify locally available alternative ingredients with similar properties that can be used for making khichudi
5. Choose any two recipes for the actual activity (or as per the number of groups)



Discussion with students:

1. How is khichudi healthy for humans?
2. What alternative ingredients can be used in making khichudi ?
3. How is khichudi prepared in different parts of India? (Traditional recipes)
4. How many students consumed khichudi? How many calories did each get?
5. What is the mean calorific value? How many calories are required by adults per day?
6. How can the cooking process be made more efficient? (consider using ready mixes or a pres-sure cooker)

Resources:

You can search on Google using the search words –

1. Make simple and healthy khichudi
2. How to calculate calories in homemade food
3. Calorific value of fuel
4. How to calculate food calories

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Activity Name

16. Peanut Chikki

Syllabus reference:

Standard/Lesson No: Class 7: Chapter 5 - Human Food

Concept/Principle: Food Ingredients, Cooking, labeling, Marketing, Nutritional factors

Materials and tools required:

Peanut (500 g), jaggery (200g), ghee (10 g), gas stove, utensils, grinder mixer or pestel mortar, cutting knife, square tray (mould)

Time required: 120 minutes

Objectives:

1. Students will learn how to make 'PEANUT CHIKKI' or 'LADDOO' by using locally available raw materials like peanuts, sesame, coconut, etc. while understanding the principles of food preservation.
2. Students will explore the nutritional composition of ingredients and understand the health benefits of the peanut chikki.

Introduction:

- Peanut Chikki is a popular Indian sweet that is made from peanuts, jaggery, sugar and ghee.
- This activity will help students understand how to make a healthy snack at home while learning the importance of packaging, labeling, and the science behind preserving food.

Hands-on activity:

What is food preservation?

Food preservation is the process of treating and/or handling (packaging) of food to slow down spoilage. Food preservation helps in –

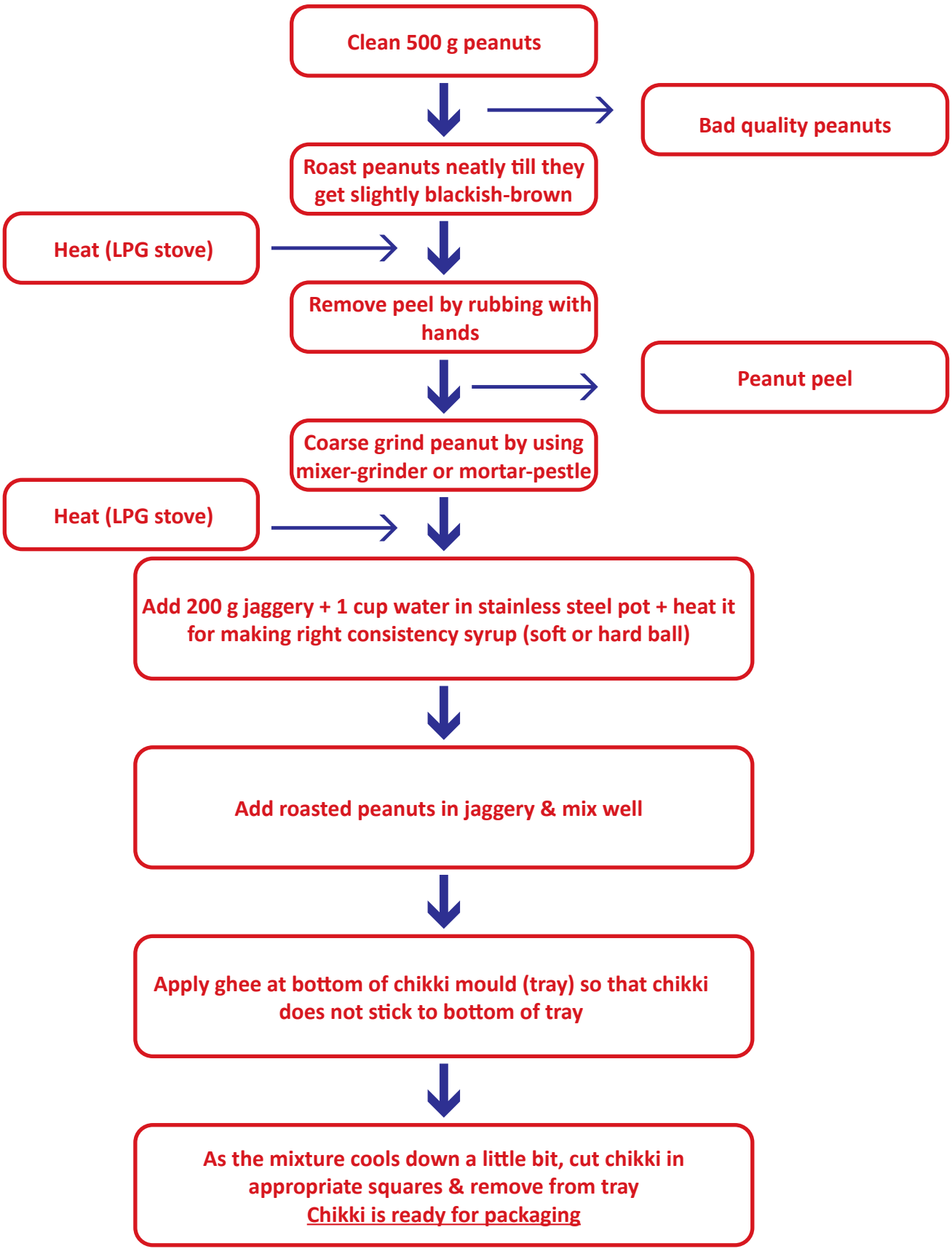
1. Increasing the shelf life of food
2. Preserving its nutritional value
3. Preserving and enhancing taste, flavour, colour, etc.
4. Some types of food preservation techniques are: sugar-syrup-based preservation, pickling, drying, canning, fermentation, etc.

What is sugar-syrup-based preservation?

In food preservation, sugar is used as a dehydrating agent (desiccation via. osmotic process). Sugar also forms a thin coat on food products to protect them.

Flow chart of process:

Arrange all required material for chikki making as per recipe list.



Sugar syrup string consistency is checked by the 'finger-thread' method.
The following are some of the consistency standards for sugar syrup:

Consistency of sugar syrup	Used in a food product
Single-thread consistency	For Candy (Amla or Papaya)
Double thread consistency	Jam / Gulab jamun
Softball consistency	Laddoo
Hardball consistency	Chikki
Soft or hard crack and caramel stage	Sonpapadi

Importance of Food Packaging & Labeling:

1. Packaging protects food from outside damage (handling during transport), climatic factors, and loss of nutrients (drying/ spilling).
2. Packaging also helps in displaying food labels properly

Importance of food labels

Food Safety and Standards Authority of India (FSSAI) is a Government of India (GOI) organization. It has made food labels compulsory for all processed foods. As per FSSAI norms, a food label must have-

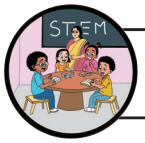
- Name of Food
- List of Ingredients
- Nutritional information
- Declaration regarding whether it is vegetarian/non-vegetarian
- Added additives/preservatives
- Name & address of manufacturers
- Date of Packaging
- Quantity
- Maximum Retail Price

Observation Table:

S. No.	Raw material	Quantity	Unit cost	Amount	Remark
1					
2					
3					

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Make sure all students follow safety precautions – wear gloves and a mask while working.
3. Handle all materials carefully under the supervision of the instructor.
4. Keep the working area neat and clean.



Discussion with students:

1. Name various recipes in which sugar syrup is used as a preservative.
2. What are the different types of packaging commonly used in food products?
3. Does packaging create environmental pollution? How can we reduce it?
4. Which nutrients do we get from peanut chikki?

Resources:

You can search on Google using a search words –

1. How to make groundnut chikki at home + YouTube

QR Code

Activity Name

17. Jam and Jelly - Mango

Syllabus reference:

Standard/ Lesson No.: Class 7: Chapter 5 - Human Food
Chapter 6 - Morphological Diversity and Functions of Living Components of the Environment

Concept / Principle: Food Ingredients, Natural food, Processed food, Synthetic food, Osmosis

Materials and tools required:

Mango, sugar, lemon juice, guavas, water, citric acid, basic kitchen utensils and apparatus

Time required: 120 minutes

Objectives:

1. Students will make jam or jelly and learn methods of food preservation and the use of preservatives.

Introduction:

- Jam and jelly are sweet spreads made from fruits, sugar, and a thickening agent. They are a great way to preserve fruits and enjoy their flavours when they are not in season. Jam is made by cooking crushed fruit with sugar, while jelly is made from fruit juice and has a smooth texture.
- In this activity, students will learn to make homemade jam and jelly using simple ingredients like fresh fruit, sugar, and lemon juice.

Role of Ingredients in Jam

1. **Sugar:** Adds sweetness and acts as a natural preservative by preventing microbial growth.
   - It should be around 60% of the total mixture for proper preservation and consistency.
   - For sweet fruits (e.g., apple, guava), the sugar-to-fruit ratio is 1:3 (1 part sugar + 3 parts pulp).
   - For sour fruits (e.g., strawberry, orange), the ratio is 1:1 (equal parts sugar and pulp).
   - For juicy fruits (e.g., pomegranate), the ratio is 1:2 (1 part sugar + 2 parts pulp).
2. **Citric Acid (or Lemon Juice):** Enhances flavour, acts as a preservative

Hands-on activity:

Activity 1: Preparation of Mango Jam

Ingredients:

Mango pulp	Sugar	Lemon juice	water
750g	250g	1 tbsp	375 mL

Steps to Make Mango Jam:

1. Wash the mangoes and dry them thoroughly.
2. Cut the mangoes, scoop out the pulp, and chop the flesh.
3. Peel the seed and squeeze out any remaining pulp.
4. Measure sugar in a 1:3 ratio (sugar to mango pulp).
5. In a non-stick pan, add mango pulp, sugar, a pinch of salt, and lemon juice or vinegar.

6. Cook on medium flame, while stirring continuously.
7. Once the sugar melts and starts boiling, adjust the heat and cover if necessary.
8. After 30 minutes, check readiness by placing a spoonful on a plate. If it doesn't drip when tilted, it's done.
9. Sterilize a glass jar, lid, spoon, and spatula by boiling them in water and then dry them
10. Pour the hot jam into the sterilized jar and let it cool before sealing.
11. For longer shelf life, dip the sealed jar back into a boiling water bath.
12. Store in the fridge.

Activity 2: Preparation of Jelly

Ingredients:

- 1 kg fresh fruit (apple, guava, grapes, berries, etc.)
- 4 cups water
- 2 cups sugar (adjust as needed)
- 1 tbsp lemon juice

How to make Fruit Jelly:

1. Clean the fruit and cut it into small pieces. There is no need to remove seeds or peel for pectin-rich fruits.
2. Add fruit and water to a pot and boil for 30-40 minutes until soft.
3. Strain the mixture using a muslin cloth or fine sieve, pressing gently to get clear juice.
4. Add sugar and lemon juice to the strained liquid and cook on medium heat.
5. Stir continuously and let it simmer until the mixture thickens.
6. Drop a little jelly on a cold plate—if it sets without spreading, it's ready.
7. Sterilize glass jars, pour the hot jelly in, and let it cool before sealing.

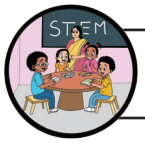
Label for Jam/Jelly:

Name of the Product: _____
Manufactured by: _____
Date of Manufacturing: _____
Date of Observation: _____
Ingredients: _____
Preservatives added: _____

Nutritional Information : _____ (Chart given on the pack)
Packed by: _____
Marketed by: _____

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Use aprons, head caps, and hand gloves should be ensured during food preparation.
3. Use of the gas oven should be done under strict adult supervision.
4. Always turn off the regulator of the gas cylinder after cooking.
5. Do not touch hot utensils.



Discussion with students:

1. Can all fruits be preserved as jam?
2. Do we add water while preparing jam?
3. Why is washing fruits necessary before using them?
4. Why is cooling necessary before bottling?
5. What is jelly?
6. What is the standard requirement of citric acid to be poured into the jelly preparation?
7. Why is boiling necessary during jelly making?
8. Which fruits are used for jelly preparation?

Resource:

You can search on Google using the search words –

1. How to make mango jam at home + YouTube
2. How to make guava jelly at home + YouTube
3. Learn food preservation of fruits - Make jam and jelly

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Activity Name

18. Pickles

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 4 - Role of Matter in Formation of Environment
Chapter 5 - Human Food
Chapter 6 - Morphological Diversity and Functions of Living Components of the Environment;
Class 8: Chapter 7 - World of Microbes

Concept/Principle: Identification of acidic substances based on general experience, Concept of acids, Natural food, Processed food, Synthetic food, Osmosis; Role of Microbes in the environment (Food processing)

Materials and tools required:

Acidic fruits (0.5 kg) (any one from lime, raw mango, or other sour fruits), Non-acidic fruits or vegetables (0.5 kg) (any 2 from cauliflower, chilli, ginger, carrot, etc.), Salt, Spices (mustard seeds- 300 g, red chilli powder- 10 g, Black pepper powder- 3g, Asafoeti-da- 2g, etc.), Oil (500 mL), Vinegar (150 mL), Tamarind (25 g), etc.
Gas Stove, stainless steel utensils, packaging bottle (200 to 250 g), sticker paper for the label

Time required: 120 minutes

Objectives:

1. Students will learn about scientific principles behind pickling, including acidity, osmosis, etc.
2. Students will apply these principles to prepare different pickles from available fruits and vegetables.
3. Students will learn about packaging and storing methods to maintain quality and shelf life of pickles

Introduction:

- Pickling is a method of preserving food by creating an environment that slows down the growth of harmful microorganisms, by letting it ferment without air, usually in saltwater or vinegar.
- This process changes the texture, taste, and acidity of the food. The food that comes out of this process is called a pickle, and it usually tastes salty or sour.
- We can prepare pickles with the seasonally available fruits and vegetables. For example, mango, chilli, amla, lemon, and more.

Food Preservation - Once pickles are prepared, they can be stored and eaten for a long time. This is because they contain preservatives, which can be natural or chemical. These preservatives stop the growth of bacteria, mould or fungi, keeping the pickles fresh and safe to eat.

Primary vs other preservatives:

- **Primary (Class I) preservatives:** Natural preservatives like acidic fruits/ lime Juice, oil, spices, vinegar, sugar/ honey, and salt are commonly used in certain recipes like pickles.
- **Other (Class II) preservatives:** Chemical preservatives like sorbates, benzoates, benzoic acid, sodium benzoate, potassium metabisulfite, etc., are commonly used in food processing to extend shelf life.

Science of Pickling:

- **Osmosis:** Osmosis in pickling happens when water moves from an area of high water concentration (like vinegar or brine surrounding fruit/vegetable being pickled) to an area of low water concentration (inside the fruit/vegetable being pickled). As water enters the fruit/vegetable being pickled, it becomes swollen, softer and juicier. So, osmosis essentially helps pickles absorb the salty or sour brine, making them juicy and flavourful.
- **Acidity:** Acidity in pickles comes from adding vinegar, a weak acid, or through natural fermentation processes during which helpful bacteria produce acids

like lactic acid. This acidity not only gives pickles their tangy flavour but also acts as a preservative, inhibiting the growth of harmful bacteria and prolonging the shelf life of the pickles.

Hands-on activity:

Vegetable Pickle (Please use available vegetables)

Prerequisites:

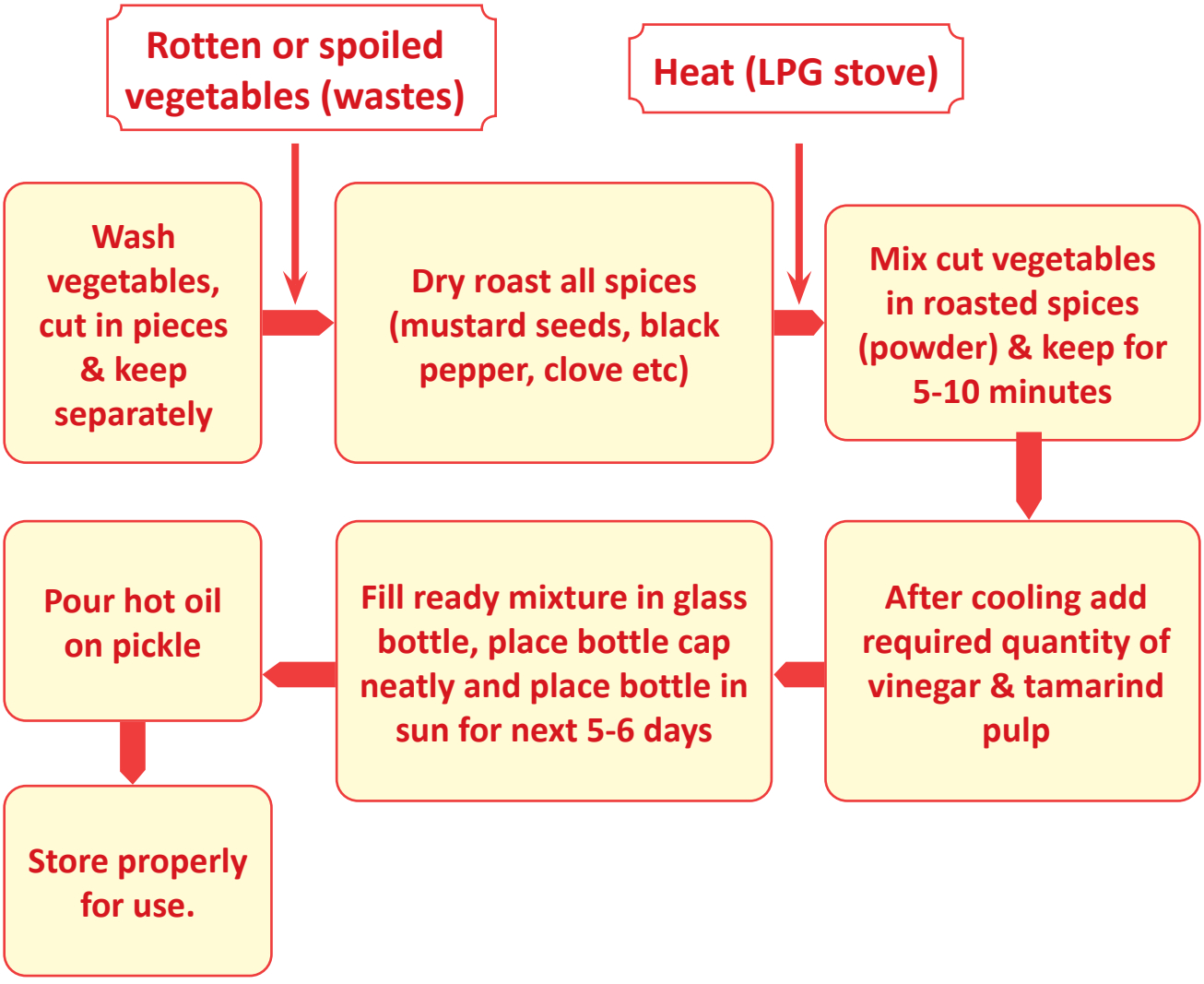
1. Purchase good-quality fruits/ vegetables from the market that will be used to make pickles.
2. Get a ceramic or glass jar to store the pickle.
3. Keep all required utensils and ingredients ready in one place.

Activity 1: Make a vegetable pickle and calculate the total cost

Pickle recipe (flow chart):

Gather all the necessary ingredients for making vegetable pickle.

Follow the recipe given in the process flow chart below.



Ingredient used with approximate cost:

This is a costing table for making approximately 1.5 kg of vegetable pickle.

Note: The cost of each item might change as per season & locality.

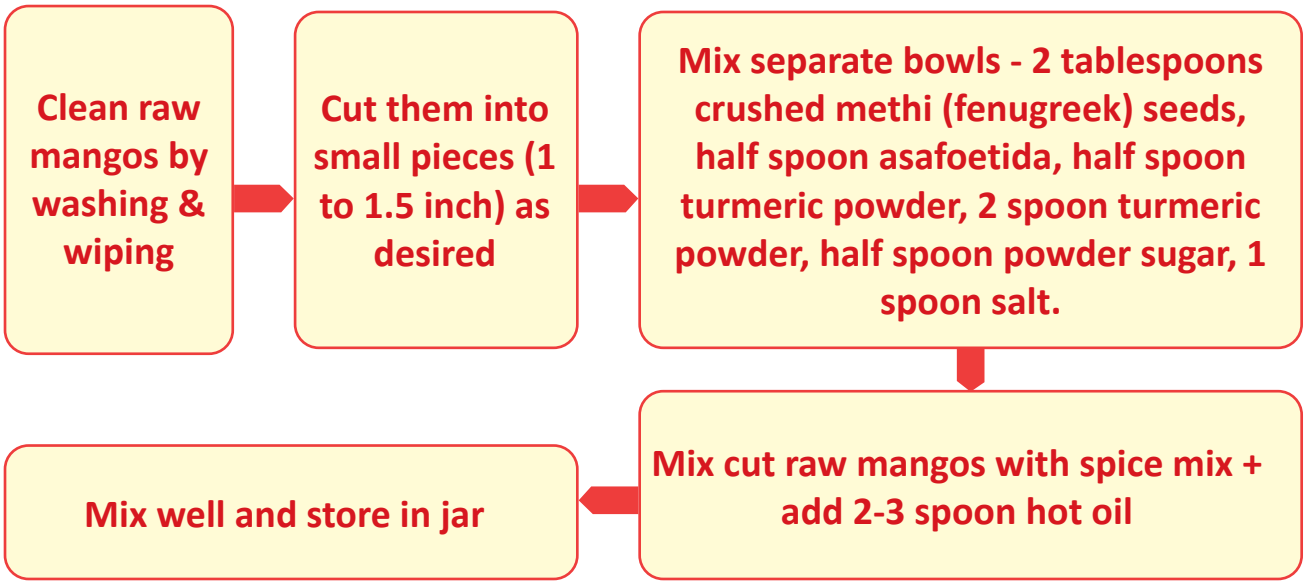
S.No	Ingredient	Quantity	Approx. cost (₹)
1	Vegetables (cauliflower, carrot, pea, onion, etc.)	1 kg	10.00
2	Salt	150 g	3.00
3	Vinegar	150 ml	12.00
4	Spices– Clove, Black-pepper, Cumin, Cardamom	3 g each	15.00
5	Mustard seeds	50 g	5.00
6	Mustard oil	400 ml	35.00
7	Tamarind	25 g	4.00
8	LPG fuel	20 g	1.50
9	Packaging bottles (500 g)	2	40.00
10	Labour charges	20 %	25.1
		TOTAL	**150.6**

Mango Pickle

Activity 2: Make mango pickle and calculate the total cost

Flow chart of instant raw mango pickle:

Arrange all required material for instant raw mango pickle. Prepare recipe as per following flow chart



Some tips to keep pickles fresh for a long time without spoiling:

Daily use:

Always take pickles from a separate daily-use pickle jar or a small container. Use a clean, dry spoon every time to scoop the pickles out of the jar.

After removing the pickles:

After removing the pickles, close the lid tightly immediately so that moisture does not enter, because the pickles become sticky and spoil when exposed to moisture.

Storage:

Keep the pickles in a cool, dry place away from direct sunlight.

Packaging and selling of the product:

To prevent food items from getting spoiled, they should be packed properly so that they are not affected by weather and moisture and can remain safe for a long time. The Food Safety and Standards Authority of India (FSSAI) has been established by the Government of India to determine food quality. It mandates the following information on all canned food items.

1. Name of food item: _____
2. Material used: _____
3. Nutritional information: _____
4. Is the food item vegetarian or non-vegetarian (green/red mark)?: _____ _____
5. Details of food preservatives used: _____
6. Name and address of the manufacturer: _____
7. Date of packing: _____
8. Expiry date: _____
9. Volume or weight of the product: _____
10. Maximum retail price: _____

Activity 3: Packaging and selling of the different pickles

1. Students will pack different types of pickles in different quantities like 150 g, 250g and 500 g in glass jars or pouches.
2. Students will make labels with all required information for different pickles.
   - ➨ Students will develop marketing strategies (posters which can be displayed outside the lab in school, put up a food stall during school events) to sell the packaged pickles.

Observation Chart:

Task 1: Weigh and note down all the required measurements during the preparation of the pickle.

S.No.	Details	Value
1	The variety of fruit used	
2	Number of fruits	
3	Weight of fruits	
4	Weight of fruit pieces	
5	Weight of prepared spices	
6	Weight of prepared pickle	
7	Total weight of pickle	

Task 2: Observe the pickle stored in a glass jar and take daily observations.

Type of pickle	Day	Colour of the pickle	Taste / Smell of the pickle	Any other observations/ comments
Vegetable pickle	Day 1			
	Day 2			
	Day 3			
	.. & so on			
Mango Pickle	Day 1			
	Day 2			
	Day 3			
	.. & so, on			

Task 3:

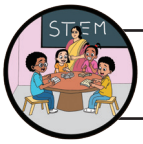
1. Find out the role of preservatives in the pickle
2. Note: Add more preservatives and describe their roles in the given table.

Role of preservatives in the pickle –

Ingredient	Purpose or Reason
Salt	Salt helps keep food fresh by pulling moisture out of it. This is important because microbes, like bacteria, need moisture to grow. So, when salt removes moisture from food, it makes it harder for microbes to survive.
Oil	Oil stops pickles from drying out by creating a protective layer. It also blocks oxygen from reaching the pickles, which helps prevent spoilage. However, if there isn't enough acid in the mix, oil can encourage the growth of harmful bacteria.
Spices	...
Vinegar	...
Sugar	...
...	...
...	...

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students. You can plan this activity season-wise as per the availability of local fruits/ vegetables.
2. Discuss with students the science of pickling along with different types (sweet, sour, brine, etc.) of pickling methods.
3. Ensure that all hygiene norms are strictly followed, like washing hands, wearing a head-cap/aprons, cleaning the cooking area before and after processing, cleaning utensils properly, etc.
4. Only the teacher should light the gas stove.
5. All tools, especially knives, should be handled carefully under the supervision of the teacher.
6. Be careful with hot surfaces, sharp utensils, and materials like glass jars.



Discussion with students:

1. What is the importance of pickling seasonal fruits and vegetables?
2. What are the different traditional recipes for pickles in India based on geographical location?
3. How do pickles get spoiled, and why does it happen?
4. What are some of the common preservatives used at home?
5. Apart from pickles, what other foods use osmosis and dehydration in their preparation ? Where is food processing applied?
6. How do you store pickles properly? How did your parents store them?
7. What are some of the different names of pickles in various Indian languages?
8. How does water come out from fruits after the addition of salt or sugar? How are the flavours released by spices while heating?

Resources:

Scan the QR code shared here to know more about pickle-making

https://slidetodoc.com/role-of-preservatives-used-in-pickle-preparation-vigyan/

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Health

Activity Name

19. First Aid Kit/Box

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 8 - Human Body
Class 7: Chapter 8 - Environment and Public Health

Concept/Principle: Safety, hygiene, and basic emergency response through organizing and maintaining a first-aid kit.

Materials and tools required:

First-aid box, disposable gloves, sanitized or surgical cotton, bandages (gauze, adhesive, elastic, crepe), antiseptic cream, non-alcoholic disinfectant (e.g.- Dettol), pain relief spray, antiseptic soap, distilled water (100 mL), sanitizer, ORS sachet, thermometer, first-aid scissors

Time required: 60 minutes

Objectives:

1. Students will assemble a first-aid kit/box in school.
2. Students will understand the purpose of each item in the first-aid kit and the importance of having it available for emergencies at school, home, and other places.

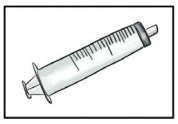
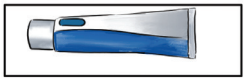
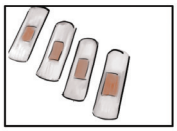
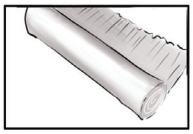
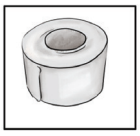
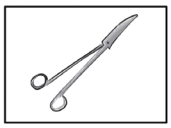
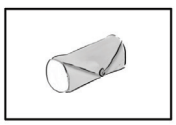
Introduction:

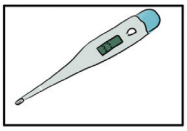
- Having the first aid box is essential in school, home, offices, and community places, as it can be used to provide immediate treatment for small injuries, cuts, or burns quickly before medical help is available.
- In this activity, students will learn about the key items in a first-aid kit, how to arrange them neatly, the correct use of each item, and why checking expiry dates is necessary.

Hands-on activity:

1. Take an empty box or container with a lid. Make sure it is clean and easy to open.
2. Write "FIRST AID KIT" on the box using a marker or stick a bold label.
3. Collect all materials and medicines for the first-aid kit and show them to the students.
4. Explain the role of each item - such as bandage, anti-septic cream, etc., to students.
5. Make a list of all materials in the first-aid kit, along with their uses and expiry dates etc.
6. Arrange the materials neatly in the box so they are easy to find when needed.
7. You may use small compartments or zip-lock bags to separate items.
8. Place the kit in a safe and easily accessible location in the school.
9. Check the kit regularly and replace used or expired items.
10. Ensure that it is always clean, dry and easily accessible to everyone at all times.

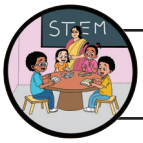
Common medicines & materials used in First-Aid

S.No.	Component of First-Aid	Sample Photo	Recommended use
1.	Disposable gloves		Personal protection to prevent infection while treating others.
2.	Sanitized Cotton		Cleaning wounds with clean water and disinfectant. It is also used to cover the wound after applying antiseptic cream before putting on a bandage
3.	10 mL Syringes		Injecting necessary medicines if needed
4.	Non-alcoholic disinfectant		Cleaning wounds to prevent microbial infection.
5.	Antiseptic cream		Healing wounds and protecting them from microbial infection
6.	Water-proof Disposable Bandage		Covering wounds, keeping dressings in place and applying pressure to control bleeding.
7.	Gauze bandage		Covering wounds, holding dressings in place, and providing compression for injuries like cuts, burns, and sprains.
8.	Adhesive bandage		Covering small cuts or scratches and protecting them from dirt and infection
9.	First-aid Scissors		Cutting bandages, tape, or gauze
10.	Pain Relief Spray		For external use only on swellings, pains, sprains, etc. not for applying directly on wounds.
11.	Crepe Bandage		Used for providing support for sprains, joint pain in the arms, and legs

S.No.	Component of First-Aid	Sample Photo	Recommended use
12.	Digital Thermometer		Measuring body temperature

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, with each having not more than 4 students.
2. Care should be taken while handling disinfectants, medicines, scissors, etc.
3. Scissors should be cleaned and dried after every use to avoid rusting and should only be used under the supervision of a teacher.
4. Frequently check the expiry dates of all items in the first-aid kit.
5. Wastage of first-aid kit items should be avoided.
6. Teachers should monitor the kit whenever students use it.
7. Items such as antiseptic cream, disinfectant, pain-relief spray, hand sanitizer should be used as instructed on the bottle or as per medical guidance.



Discussion with students:

1. Why is first-aid important?
2. Why is it important to keep a FIRST AID KIT ready in school?
3. Why should we check the FIRST AID KIT regularly?
4. How are common diseases treated at home by your parents?
   For example- fever, loose motion, swelling, joint pain, cough, etc.
5. Make a list of home remedies.
6. How can we decide if a medicine in the FIRST AID KIT has expired?

Resources:

You can search on Google using the search words –

1. FIRST AID KIT guide for beginners
2. How to make a first aid kit for school
3. Essential items for a school first aid kit
4. FIRST AID KIT materials and their uses

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Activity Name

20. Using Thermometer

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 1 - Heat

Concept/Principle: Concept of Cold and Hot, Measurement of heat, Role of heat in physiological processes of organisms

Materials and tools required:

Sanitized cotton, spirit, tissue paper/disposable cloth, digital thermometer

Time required: 60 minutes

Objectives:

1. Students will measure temperature using different types of thermometers and learn about the different units of temperature measurement.
2. Students will learn to prepare Oral Rehydration Solution (ORS) that helps keep the body hydrated during illness.

Introduction:

- Body temperature is an important indicator of health. It helps us determine if someone is sick or has an infection.
- A normal body temperature usually ranges between 36.5°C to 37.5°C (97.7°F to 99.5°F), but it can vary slightly from person to person and may change at different times of the day or during different seasons.
- We can measure body temperature in different ways, such as by placing a thermometer under the tongue, in the armpit, or on the forehead. These areas are used because they are sensitive and provide an accurate reading of body heat.
- Temperature can be affected by the time of day, physical activity, weather, and illness.
- If your body temperature is above 99.5 °F, this means you may have a fever and need medical advice.

Different types of the thermometers:

1. **Mercury Thermometer:**

   It works on the principle that mercury expands when heated and rises in a glass tube to show the temperature.

2. **Digital Thermometer:**

   It uses electronic sensors to measure temperature and displays the reading on a digital screen.

3. **Infrared (IR) Thermometer:**

   It measures temperature without touching the object or body. It detects heat (infrared radiation) and converts it into an electrical signal, which is then displayed as a temperature reading.

Hands-on activity:

Activity 1: Measure Temperature

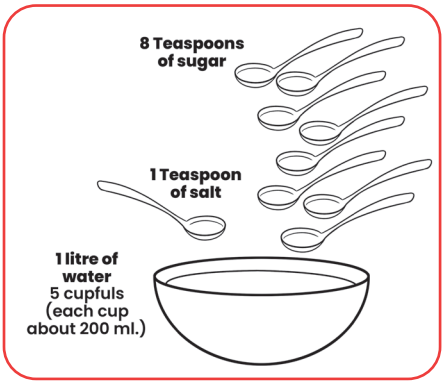
1. Choose different types of thermometers available. Make sure they are clean and working properly.
2. Students will measure the body temperature of their classmates in °F or °C.
3. After each use, clean the tip of the digital or mercury thermometer with spirit and wipe it dry with a tissue or disposable wipe.
4. Check and write down the reading shown on the thermometer for each of your classmates in the table below:

Record the temperatures of your classmates according to the table below:

S.No.	Student Name	Temperature (degree Fahrenheit/Celsius)	Note (Fever/no Fever)
1.			
2.			
3.			
4.			
5.			

Activity 2: Preparing 'Oral Rehydration Solution' (ORS)

- When we have a fever, our body loses water and important salts through sweating, which can lead to weakness and dehydration.
- ORS (Oral Rehydration Solution) helps replace lost fluids and balance essential salts like sodium and potassium. This keeps the body hydrated, prevents dizziness, and supports faster recovery.
- Oral Rehydration Solution (ORS) is a mixture of salt and sugar. It helps the body absorb water more quickly



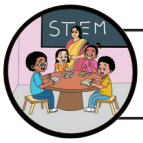
Steps to make ORS at home:

1. Take 1 litre of clean, boiled, or filtered water.
2. Add 8 teaspoons of sugar and 1 teaspoon of salt.
3. Stir well until the sugar and salt dissolve completely.
4. Drink it sip by sip throughout the day to stay hydrated.

Teacher Guidelines:

Divide students into two groups of 7-8 students each. Ensure that the students -

1. Clean the thermometer before and after each use.
2. Wear gloves and a mask while conducting this activity.
3. Wait for the thermometer to show a stable reading. Digital thermometers will beep once the final temperature has been measured and stabilized.
4. Do not share thermometers without cleaning them properly, to prevent infections.
5. Store the thermometer in a clean, dry place, away from heat and sunlight.
6. Wash hands with soap and water before and after using the thermometer to prevent the spread of germs.
7. If using a battery-operated thermometer, check and replace the batteries when needed to ensure accurate readings.



Discussion with students:

1. At what temperature can we say that a person has a fever?
2. What treatment should be taken if someone has a fever?
3. Why do we clean the thermometer before and after each use?
4. Why is it important to measure body temperature?
5. What is the normal range of body temperature in °C and °F?
6. How will you know that the digital thermometer has finished measuring body temperature?
7. Why should you wear gloves and a mask during the activity?

Resources:

You can search on Google using the search words –

1. How to use a thermometer
2. Types of thermometers
3. How to make ORS at home

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Activity Name

21. Body Mass Index (BMI)

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 5 - Measurement; Chapter 8 - Human Body

Concept/Principle: Measurement of Animal Growth, Growth and Development of the Body

Materials and tools required:

Pencils and erasers, chart paper or large sheets of paper, rulers, weighing scale, measuring tape, colour marker (optional), calculator

Time required: 90 minutes

Objectives:

1. Students will learn to calculate their BMI or Body Mass Index.
2. Students will make a growth chart to track their height and weight.

Introduction:

- In this activity, students will measure their height and weight and then calculate their Body Mass Index (BMI) using a simple formula.
- Body Mass Index (BMI) is a medical screening tool that compares weight with height to estimate the amount of body fat in the body
- It is a quick way to check whether your weight is appropriate for your height and to identify possible health risks.
- After calculating BMI, students will compare their results with a BMI chart.

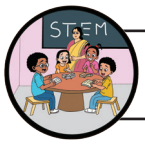
Hands-on activity:

1. Ask a friend to help you measure your height and weight.
2. Stand straight and measure your height in metres. If your measuring scale is in centimetres, convert your height to metres by dividing the number by 100.
3. Record your height
4. Next, stand on a weighing scale to measure your weight in kilograms
5. Calculate your BMI : $BMI = \frac{Weight\ (kg)}{[height\ (m) \times height(m)]}$
6. Check your BMI by comparing your result on the BMI chart.

BMI	Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and above	Obese

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having no more than 4 students.
2. Make sure the weighing scale is on a flat surface and the measuring tape is straight.
3. Check that weight is measured without heavy clothing or items in pockets.
4. Ask students to remove shoes and stand straight while measuring height.
5. Remind students that BMI is only an estimate and encourage healthy habits.



Discussion with student:

1. Why is it important to maintain a healthy weight?
2. What are some healthy habits to stay within a normal BMI range?
3. Does BMI alone determine if someone is healthy? Why or why not?
4. Why is it important to track our height and weight as we grow?

Resource:

You can search on Google using using the search words –

1. What is BMI?
2. How to calculate BMI + YouTube

Activity Name

22. Testing Drinking Water

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 5 - Human Food
Chapter 8: Environment and Public Health;
Class 8: Chapter 7 - World of Microbes

Concept/Principle: Source of drinking water, water purification, pure water, bacteria, water testing, water pollution, waterborne diseases, microbial diversity, interrelation with organisms.

Materials and tools required:

H_2S strip test bottle, TDS Meter, glass containers for collecting water samples, samples of water from various sources (tap water, pond water, bottled water).

Time required: 60 minutes

Objectives

1. Students will learn how to collect water samples and test their quality
2. Students will interpret the results to assess water quality

Introduction:

- Clean water is essential for drinking and cooking.
- Pure water should have a pH of around 7 and Total Dissolved Solids or TDS should be between 50 to 150 mg/L for it to be safe for drinking.
- Drinking water can contain bacteria, salts, and chemicals. Testing is necessary to determine whether water is safe to drink.
- Sometimes drinking water may appear muddy or taste different, especially during monsoon.
- Contaminated water contains bacteria and viruses which may cause the spread of diseases such as cholera, typhoid, and dysentery.
- Regular testing helps detect harmful contaminants like E. coli bacteria.
- Hydrogen sulphide (H_2S) test strips provide necessary conditions for faster bacterial growth and are used to test the presence of harmful bacteria in drinking water.
- Water contaminated with E. coli turns black in this test due to bacterial growth which indicates the presence of harmful bacteria in the water.

Hands-on activity:

Part 1: Collect different water samples

Collect 2-3 drinking water samples from different sources (such as wells, bore wells, tap water, etc.) on the school campus or nearby community places.

How to collect water samples?

1. Take a half-litre bottle with a tight lid.
2. Rinse the bottle 4 - 5 times using the same water.
3. Fill the bottle with water and test it within 24 hours after filling.

Observations:

Label and observe all collected water samples:

Observations	Sample 1 (well)	Sample 2 (tap water)	Sample 3 (river water)	Sample 4 (bore well)
Any odd smell or visible impurities in water				
Any other observations/ comments				

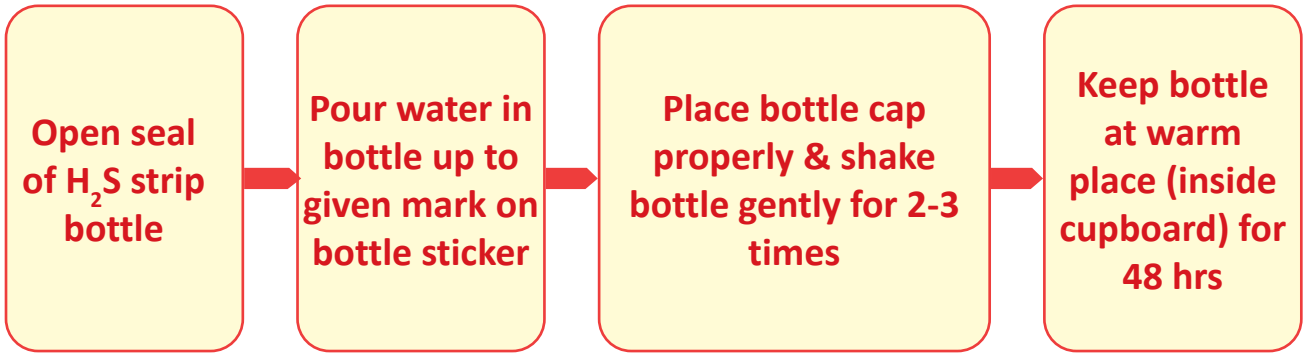
Part 2: Test all the water samples

Note - Take only one sample at a time for testing. Do not test by mixing water from different sources.

Procedure:

1. The water to be tested should be filled in the H2S Strip bottle up to the specified mark.
2. Slowly shake the sample bottle filled with water. This will cause the water to react with the strip in the bottle. Keep the bottle in a closed room at 30 to 37°C for 24 hours.
3. Check the colour of the water after 24 hrs.
4. If the colour of the water turns black, the water is not suitable for drinking. But if the colour of the water remains yellow, then the water should be considered suitable for drinking.
5. Prepare a water health card report.

Flowchart:



H_2S Strip Bottle

Ready to use medium, Water to be tested is filled up to the mark.

Fit for drinking

Unfit for drinking

Action to be taken after result –

1. If H_2S test results are positive (water colour turns to black) then boil the water to 100°C for 2-5 minutes or add Sodium Hypochlorite (NaClO) as per the prescribed quantity.
2. Prepare a water testing report & share with school administration and/or community leaders.
3. Place a display board near the drinking water source with the date of testing.

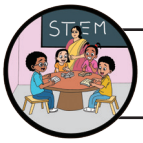
Water testing display board example:

Sample collection date: 25th September
Sample name: School water tank
Testing date: 25th September
Testing result: +ve (Water color changed to black)
Remark: Water not fit drinking. Boil water before drinking or add sodium hypochlorite drops as per prescribed dose.
Signature of instructor

Note: See QR Code for water test report card format.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students When to take activity: At least 4 times a year preferably when the season changes.
2. Make sure all students follow safety precautions – masks, gloves, etc.
3. Ask students to collect water from different sources. Teachers need to accompany students when they are collecting water samples from community places.
4. Ask students to observe the drinking water source area, such as its cleanliness, any nearby drainage line, waste, plastic dumping, etc..



Discussion with students:

1. Why is pure water important for us?
2. How much water is required per day by the human body?
3. What is E. coli? How does it spread?
4. When do bacteria (microbes) grow faster?
5. Are all bacteria harmful?
6. Which bacterial cultures are beneficial in daily life?
7. How does the H_2S strip test work?
8. How does Sodium Hypochlorite (NaClO) kill germs?
9. What are other methods of water disinfection?

Resources:

You can search on Google using the search words –

1. How to check for bacterial contamination using H_2S kit + YouTube
2. How to test your water quality at home using strips

QR Codes

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Activity Name

23. Dressing for Simple Cuts

Syllabus reference:

Standard/Lesson No.: Class – 6: Chapter 8 - Human Body

Concept/Principle: First-Aid for wounds, healthcare, and minor cuts

Materials and tools required:

First Aid Box

Time required: 30 Minutes

Objectives:

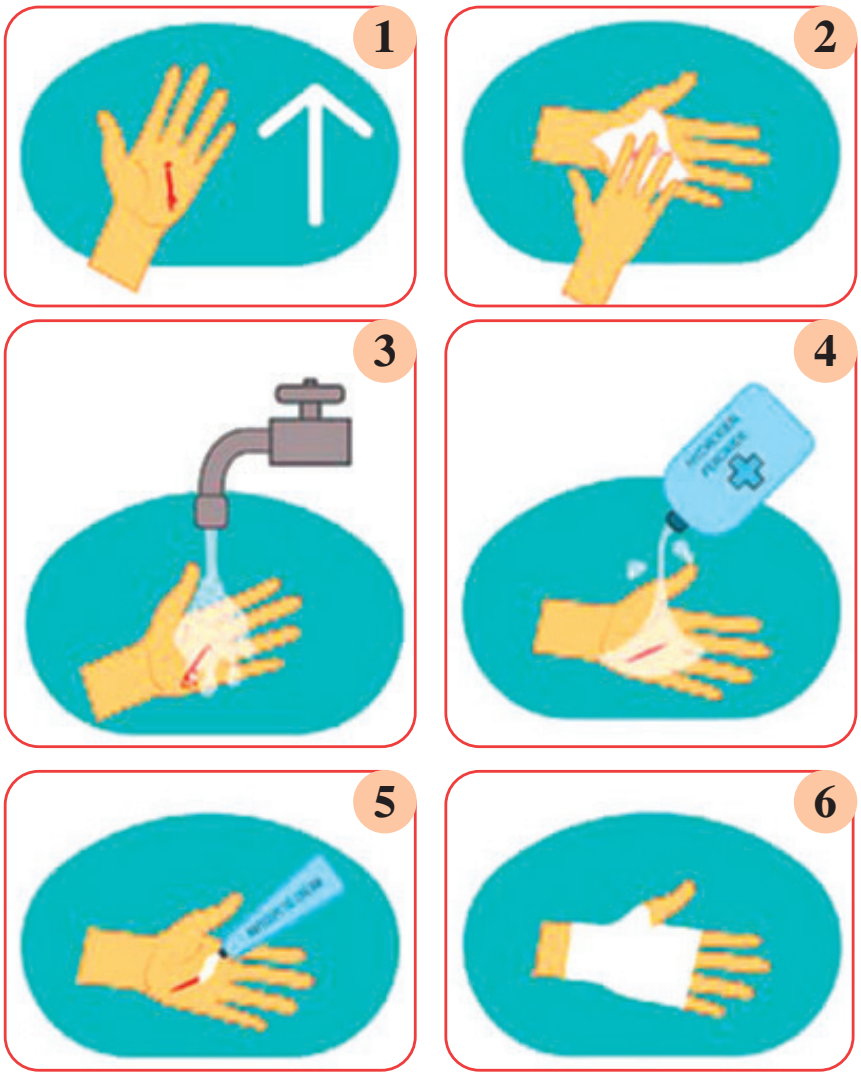
1. Students will learn to use a first-aid box.
2. Students will learn to give basic first aid to a person in need

Introduction:

1. One can protect minor wounds from getting infected and exposure to dust by cleaning and dressing it at home if a proper first-aid kit/box is available.
2. Usually, minor wounds on the surface of the skin can be treated using first aid without going to the doctor or physician.
3. Press the wound lightly with clean, sanitized cotton to stop bleeding.
4. Care should be taken so that the wound heals faster with minimal scar.
5. For deep wounds, one should seek immediate medical attention.

Hands-on activity:

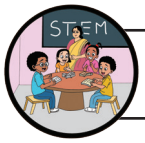
1. Hands should be washed with soap and water before dressing.
2. In case of minor injury, first wash the wound with clean water.
3. Remove any dirt from the wound.
4. Wash the wound with an antiseptic (Iodine/ Dettol).
5. Wipe the surrounding area and apply an antiseptic powder or cream.
6. Cover the wound with sterile gauze from the first-aid kit
7. Wrap a bandage over the sterile gauze to keep it in place over the wound.



8. Avoid talking, sneezing or coughing near the patient, while the wound is open and being dressed.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Keep the first aid box ready.
3. The teacher should have knowledge of the use of a first aid box
4. Always wash hands before and after giving first aid.
5. If the wound is deep, go to a doctor immediately.
6. Go to the doctor if the wound is caused by an animal bite.
7. Avoid using harsh antiseptics on the wound, as they can damage and irritate the skin. Running water, soap, and a mild saline solution are sufficient
8. If you see that the wound is getting worse with pain, swelling, redness, or discharge, consult the doctor right away.



Discussion with students:

1. Where can one receive first-aid training??
2. Why is it necessary to wash hands before and after giving first aid?
3. Which situations require immediate medical attention (deep cuts, animal bites, severe burns, etc.)?
4. How should minor cuts, burns, and injuries be cleaned and dressed safely?
5. How do proper cleaning, covering wounds, and using sterile materials prevent infections?
6. How can we identify signs of infection or complications in a wound?

Resources:

You can search on Google using the search words -

1. Minor cuts + YouTube
2. How to dress a wound

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Agriculture

Activity Name

24. Growing Micro-Greens

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 6 - Morphological Diversity and Functions of Living, Components of Environment

Concept/Principle: Micro-greens, Seed selection and Germination, Parts of plants

Materials and tools required:

Good–quality seeds (e.g., mustard, fenugreek), cocopeat/soil/compost, planting trays or containers or plates, proper lighting — either sunlight or ultraviolet lighting

Time required: 60 minutes

Objectives:

1. Students will learn to grow microgreens in a classroom environment.
2. Students will understand how microgreens can be incorporated into meals for better health.

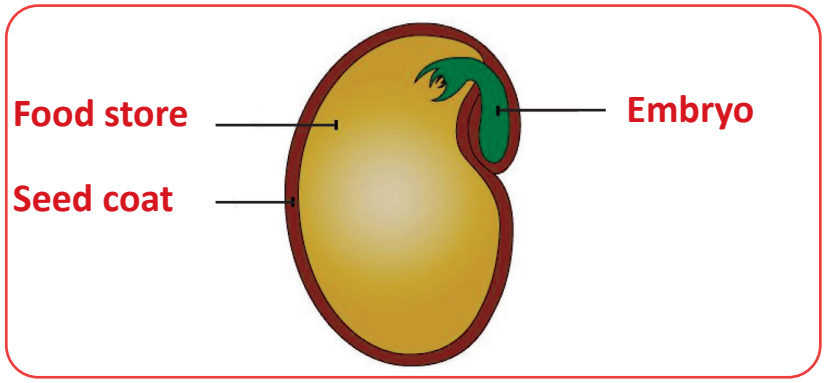
Introduction:

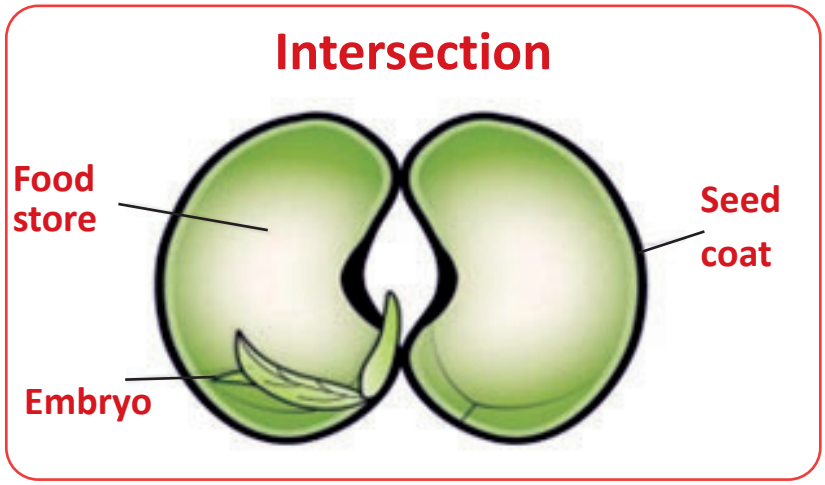
- Microgreens are tiny plants grown from seeds, just like regular vegetables, but they are harvested when they are still small. These young greens are about 1–3 inches (2.5–7.5 cm) tall and can be grown indoors or outdoors in trays using soil or other growing materials. Despite their small size, microgreens are packed with nutrients like vitamins and minerals, making them a healthy addition to any meal.
- Microgreens come in a wide variety of colours, flavours, and textures. Some types, like radish microgreens, have a spicy kick, while others, such as lettuce, are mild and refreshing.
- Students will grow their own microgreens and add them into their food. By the end of the activity, they will know how to use microgreens in meals to make them healthier and tastier.

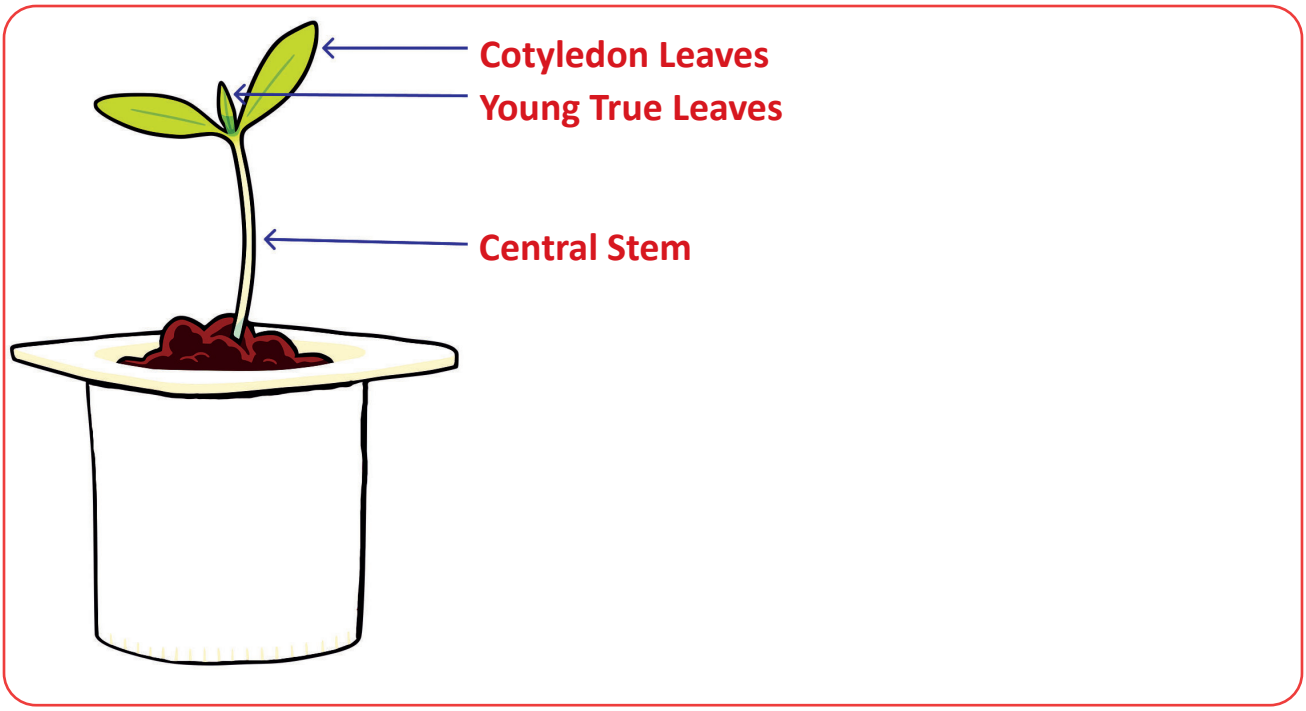
Seed germination:

Seed – A plant reproductive package containing

1. Embryo
2. Stored nutrients for developing embryo
3. Protective coating prevents damage, drying, and infection







Parts of young plant

Cotyledon/seed leaves:

Part of the embryo of the plant.

- **The first set of leaves:** Usually, they have different shapes than the rest of the leaves.
- **Young true leaves:** Leaves that develop after germination

Hands-on activity:

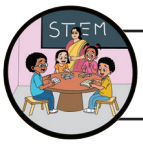
1. Fill your container with soil, making sure you don't over-compress it, and water it lightly.
2. Sprinkle the seed of your choice on top of the soil as evenly as possible.
3. Lightly mist your seeds with water and cover your container with a plastic lid.
4. Check your tray daily and mist water as needed to keep the seeds moist.
5. A couple of days after the seeds have germinated, you may remove the plastic lid to expose them to light.
6. Water once a day while your microgreens grow and gain colour.
7. After 7–10 days, your microgreens should be ready to harvest.
8. Use scissors to snip them just above the soil line when they're about 2-3 inches tall.
9. You can add fenugreek microgreens to salads, and sandwiches, or even use them as a garnish for soups and curries.

NOTE:

- Try Microgreens (from your kitchen): mustard, fenugreek, kidney beans (rajma), moong daal, matured peas,wheat grain, sunflower seeds.
- Do not try microgreens with: potato, chilli/pepper, capsicum, brinjal

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Wash hands before and after handling seeds and soil to prevent contamination.
3. Ensure microgreens are not overwatered to prevent mould or fungal growth.
4. The activity of growing fenugreek microgreens can be conducted at any time of the year, as they can be grown indoors regardless of the season.
5. The entire process typically takes about 7-10 days from planting to harvesting, allowing flexibility in scheduling the activity.



Discussion with Students:

1. What are microgreens, and why are they called “microgreens”?
2. What nutrients are found in microgreens, and why are they considered healthy?
3. Can we eat microgreens raw, or do they need to be cooked?
4. Are there any special considerations for harvesting microgreens?
5. Can microgreens be grown outdoors?
6. When is the best time to harvest microgreens?
7. How do different environmental conditions influence microgreen growth?

Resources:

You can search on Google using the search words –

1. Grow Microgreens from Indian Kitchen + YouTube
2. How to grow microgreens

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Activity Name

25. Simple Wick System

Syllabus reference:

Standard/Lesson No.: Class 8: Chapter 8 - Human Food and Food Production

Concept/Principle: Recycling of Waste Products,
Crops, Crop Diversity and Crop production

Materials and tools required:

Plastic bottles, cocopeat, coir rope, water, plant seeds or seedlings,
scissors or a utility knife

Time required: 120 minutes

Objectives:

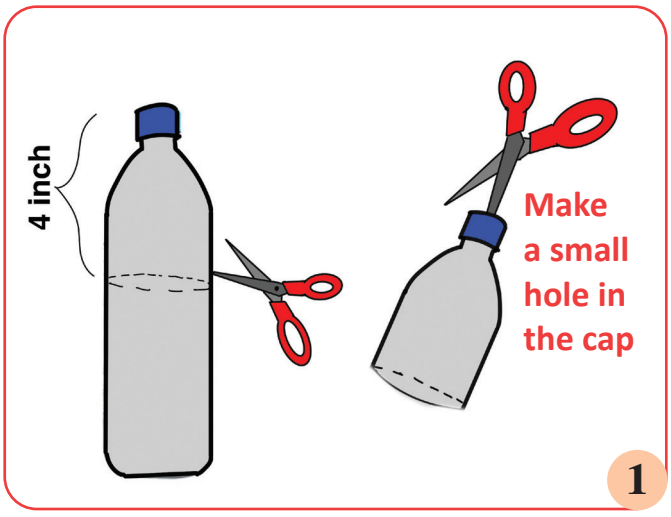
1. Students will learn how plants can grow without soil, by absorbing nutrients from water.
2. Students will learn to build a simple hydroponics system that can be used at home.

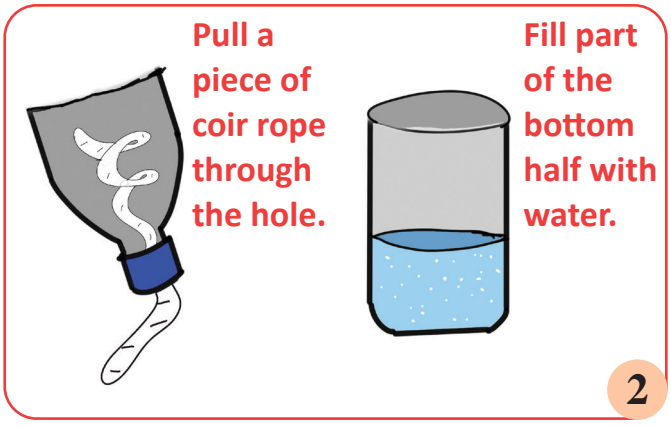
Introduction:

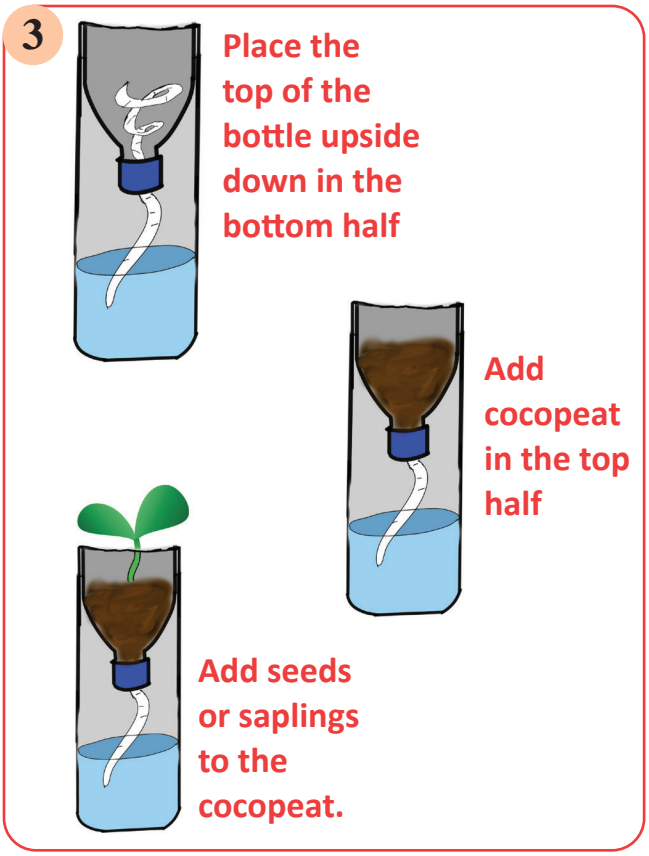
- Hydroponic system is a simple system where plants are grown in a nutrient-rich water solution without the soil. The system uses wicks to transfer a nutrient solution from a reservoir to the roots of plants.
- In this system, plants or seeds are planted in a growing medium like cocopeat/ coir/ saw dust.
- In this activity we will be using cocopeat, and a coir rope is attached between this growing medium and water, allowing the plant to absorb essential nutrients and oxygen from the water. The shorter the wick, the faster the water travels to the plants.

Hands-on activity:

1. Clean and rinse the plastic bottle thoroughly to remove any residue, cut the bottle in horizontally at a height of around 4 inches from top, creating two pieces: a top half and a bottom half.
2. Using a sharp knife or scissors, carefully cut a hole in the centre of the bottle cap large enough to fit a coir rope.
3. Fill the bottom half with water, such that it doesn't touch the top half's cap.



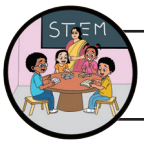




4. Place the top cut part of the bottle in the bottom half such that the coir rope is submerged in the water.
5. Add cocopeat in the upper bottle. This will hold the plants.
6. Plant seeds or seedlings into the cocopeat. Gently press the cocopeat around the roots to hold them in place.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Use scissors carefully, help students with making holes and cutting.
3. Ensure each group has access to all necessary materials and tools.



Discussion with Students:

1. What is the main function of the wick in a wick hydroponics system?
2. How does a wick hydroponics system deliver water and nutrients to plants?
3. What are the advantages of using a wick hydroponics system?
4. What types of plants are best suited for a wick hydroponics system?

Resources:

You can search on Google using the search words -

1. How to build homemade hydroponics system
2. Simple Wick System

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Activity Name

26. Waste Recycling

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 2 - Phenomena around Us & Chapter 12 - Waste Products;
Class 7: Chapter 7 - Environmental Crisis, Conservation of Plants and Environment
Chapter 8 - Environment and Public Health

Concept / Principle: Events - Intended, Unintended, Natural, Man-made, Source and Nature of Waste Products, Classification of Waste Products, Recycling of Waste, Waste and Risks for Human Health, & Nature of Health (Physical and Psychological)

Materials and tools required:

Waste plastic bottles/cans, fertilizers, soil, cow dung manure. For ornamental plants: Coloured polythene bags/kulhads/paper cups/ glasses, soil mixed with manure, seeds/stalks of flowering/ornamental/ medicinal plants, tasla, sickle, mug, paint brush

To paint pots: Ochre or terracotta colour of your choice, brush or cotton cloth and water.

Time required: 15 to 20 days

Objectives:

1. Students will learn to prepare flowering/ornamental/medicinal plant seedlings in pots.
2. Students will learn plant care, and how to beautify spaces using sustainable methods.

Introduction:

In this activity, students will learn how to reuse waste plastic bottles and tins to create pots for planting flowering, ornamental, or medicinal plants. By creatively recycling these materials, students will help reduce waste. They will also paint and decorate the pots, making them attractive and suitable for a nursery.

Names of ornamental flowers: Dianthus, Pansy, Gerbera, Daisy, Chrysanthemum, Dahlia, Calendula, Saneria, Salvia, Phlox, Cosmos, Zinnia, Rose, Marigold, etc.

Names of ornamental plants: Coleus, Christmas Tree (Araucaria) Kochia, Snake Plant, Money Plant, Jade Plant, Fern, Areca Palm, Croton, etc.

Reusable painted plastic bottles

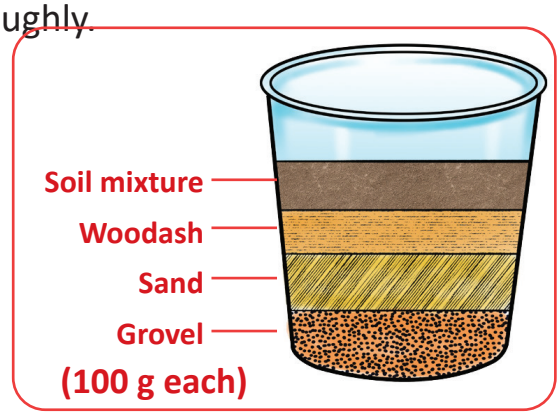
Reusable plastic tins

Decorative wall from waste GI tins

Hanging pots from waste GI tins

Steps to reuse the plastic /GI containers:

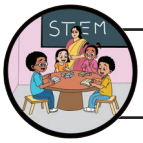
1. Cut the plastic box/utensil/container into the desired shape and size with the help of a knife/scissors. Then wash it thoroughly.
2. If the bottle is cut in the middle, both halves can be used.
3. Make 3-4 holes at the bottom of the cut vessel for water drainage. Paint it using a brush and let it dry.
4. Apart from this, plastic tape can also be used.



5. Now after taking the necessary measurements, fill the cut vessel with fertilizer, manure, sand, pebbles, wood ash, etc.. By mixing vermicompost, etc. in the soil, we will prepare a nutrient rich planting mixture.
6. Now plant the seedlings in these containers, water them and take care of them.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Care should be taken while cutting/using tin cans. This should be done only in the presence of the teacher/instructor.
3. Ensure that students do not touch the paint with bare hands. Use a wooden stick to mix the paint.
4. Old plastic/tin cans/bottles can be reused.



Discussion with students:

1. What types of paint can we use for colouring, and which type of pot is easiest to paint?
2. How can we cut and shape plastic bottles to make pots?
3. Why is it important to make holes in the bottom of the pots?
4. What types of plants can we grow in these recycled pots?
5. Why is reusing plastic bottles good for the environment?

Resources:

You can search on Google using the search words –

1. DIY plastic bottle planters
2. Plastic bottle gardening project for students
3. Steps to make a nursery with recycled plastic pots
4. Painting and decorating plastic pots for plant

Activity Name

27. Soil Testing

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 4 - Role of Substances in Environment; Class 8: Chapter 8 - Human Food and Food Production

Concept/Principle: Identification of acidic substances based on general experience, concept of acids, indicators; Crop production, basic soil testing using pH paper

Materials and tools required:

15 cm measuring scale, pH paper (range 0 to 14), Gardening tools – spade, axe, weeding hoe, pots

Time required: 45 to 60 minutes

Objectives:

1. Students will learn how to test the physical and chemical (pH) properties of different soil samples.
2. Students will be able to understand the importance of soil health for sustainable farming.

Introduction:

Soil is one of the most essential inputs for farming. Soil is formed due to weathering and natural erosion of rocks (parent material). Weathering occurs due to flow of water, change in air temperature, etc. Weathering is a very slow process. It is believed that approximately 500 years are required to form a 1-inch layer of soil. Therefore, to get better production from farming, it is very important to use the soil properly and maintain its health.

Characteristics of good cultivated soil for plants:

- It consists of approximately 25% air, 25% water, 45% minerals and 5% organic matter.
- pH should be 6.5-7.5.
- Organic carbon (OC) content should be more than 2%.
- Should have good drainage capacity.
- Should contain 16 essential plant nutrients.

To ensure good yield from the field year after year, farmers can test the soil in the soil testing laboratory. With simple tools and procedures, we can perform some primary tests of soil.

Hands-on activity:

Activity 1: Collect soil from the garden for analysis:

1. With the help of weeding hoe, dig 15 to 20 cm deep pits at 5 to 6 different places in the farming plot.
2. Collect 1-2 scoops of loose soil from each pit and place them in a pot or plastic tray.
3. Spread soil on the used newspaper and dry it in the shade for 4-6 hours.
4. Observe the colour of the soil carefully. Its colour will depend on the bedrock properties (rock from which soil is formed through the process of weathering), organic matter content, etc.
5. Use this soil for further analysis.

Activity 2: Testing of clay, silt and sand percentage of soil (physical properties)

Soil is made up of small particles. These particles are classified as clay, silt and sand particles based on their size. Clay contains the finest particles with a size of less than 0.002 mm. Silt particles are those ranging in size from 0.002 to 0.05 mm, whereas the sand particles are the largest, ranging in size from 0.05 to 2.0 mm.

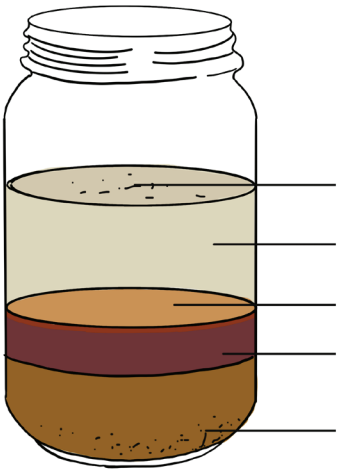
1. The percentage of these three particles affects the quality of soil in many ways like water holding capacity, cation-exchange capacity (CEC), etc. Soils with more clay and organic matter generally have a higher CEC, which means they can hold and supply more nutrient ions (like calcium, potassium, and magnesium) to plants. Whereas, sandy soils have low CEC and cannot retain nutrients for long.
2. Generally, for good plant growth, the soil should contain 40 percent sand, 40 percent silt and 20 percent clay.
3. We can find out the percentage of clay, silt and sand in our soil through a simple test called the 'MASON JAR TEST'. This is a test of the physical properties of the soil. Its name is derived from the glass jar used to conduct the test. If a mason jar is not available then we can use any glass jar with a tight lid or a measuring cylinder.
4. Steps for the Mason Jar Test:
   - Take approximately 200 grams of sample soil (collected and dried in the first activity).
   - With the help of hands, mash the soil thoroughly to remove large lumps and gravel.
   - Take a 500 ml glass bottle (mason jar) with a tight lid.
   - Put 200 grams of the soil sample in the bottle, this will fill approximately half the bottle.
   - Now add 200 ml. of water.
   - Add half a spoon of any detergent powder. Detergent powders help in removing soil particles .
   - Close the jar lid tightly.
   - Shake the jar 3-4 times for 2 to 3 minutes at intervals of 10 minutes.
   - Leave the jar undisturbed for 24 to 48 hours.
   - In about 2 minutes, sand particles settle at the bottom of the bottle, after 2 hours silt particles settle and clay particles settle in 24 to 48 hours.
   - Once the soil has settled in layers, with the help of a marker, mark the different layers on the bottle. Carefully note the width of each layer with the help of a 15 cm measuring instrument. Measure the bottle from top to bottom in mm.

- Now use simple arithmetic to calculate the thickness and percentage of sand, silt and clay.

5. For example:
   - The thickness of the sand is 45 mm.
   - The thickness of the silt is 35 mm.
   - The thickness of clay is 5 mm.
   - Total thickness will be 45 + 35 + 5 = 85 mm.

To calculate percentage, use the formula

Percentage of layer = (Total thickness/ Layer thickness) × 100.



The percentage calculations will be::

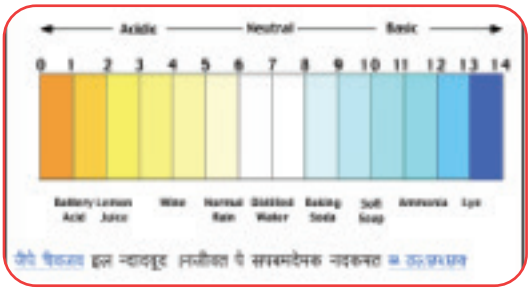
1. Percentage of sand = (45/85 x 100) = 52.94%
2. Percentage of Silt = (35/85 x 100) = 41.17%
3. Percentage of Clay = (5/85 x 100) = 5.88%

Some suggestions for improving the soil after testing (for home garden):

S.No.	Result	Suggestion for improvement
1.	If the percentage of clay is more than 20 percent, it will absorb too much water, due to which the roots will suffocate.	Add river sand or red coloured garden soil to improve drainage.
2.	If the percentage of sand and silt is more than 80 percent, then it will absorb very little water which may cause the plants to dry out.	Add river soil or coco peat or sawdust or dry leaves and manure. This will increase the water storing capacity of the soil.
3.	If the percentage of sand is more than 80 percent, it will store very little water which may cause the plant to dry out.	Add good quality vermicompost. This will increase the water storing capacity of the soil. Apart from this, also add essential nutrients.

Activity 3: Testing pH of the soil (chemical properties):

pH is the measure of acid or alkali in a substance. pH is measured on a scale of 0 to 14 points. pH 7 is considered neutral, which means the substance is neither



alkaline (salty) nor acidic (sour). If the pH is below 6 then it is called acidic pH and if it is above 8 then the substance will be alkaline pH is one of the chemical properties of soil. Soil pH affects cation exchange capacity (CEC), microbiome growth, etc. pH level of 6.5 to 8.5 is considered most suitable for major crops.

To test the pH level accurately, advanced instruments are used, but by adopting the following steps, we can still find out its fairly accurate value with the help of pH paper also.

1. Take approximately 50 grams (2-3 teaspoons) of soil sample (dried, collected from the first activity).
2. Place the soil in a small plastic cup or stainless-steel glass.
3. Add about 20 ml of distilled or pure filtered water into it. Do not put more water in the glass because the pH level of the soil can change according to the quality of the water.
4. Let the mixture sit for 30 minutes
5. Insert the tip of the pH paper into the soil and water mixture.
6. Note the change in colour of the tip of the pH paper. Now note down the pH reading from the pH paper strip measuring device.

Observation table:

S.No.	Results	Improvement suggestion
1.	Soil pH is acidic i.e. below 6	Add good quality vermicompost (3 parts soil: 1 part compost) + raw table salt (2% of total volume of soil)
2.	Soil pH is very basic i.e. above 8.5	Wash soil 2-3 times with wastewater or used water, rain water or RO filter water + add good quality compost (3 parts soil: 1 part compost)

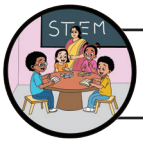
Activity 4:

1. Ask students to collect soil from different areas (from various corners of a field near home). Observe each sample carefully, noting its colour, and texture (salty, sticky, loamy, etc.) .

2. Compare the effects of different soils on plant growth.
3. Fill a small pot (plastic cup or wide-mouthed bottle) with ordinary soil, plant the seedling in and plant the second seedling in another small pot filled with river sand.
4. Now observe both the pots for the next 1 week and observe the growth of the seedlings.
5. Make a chart of plant growth.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ask each group to bring soil samples from different places in the school.
3. Ask each group to do the activity independently. Do comparative study of the results of each group.
4. This activity can be done at any time during the summer season except in the afternoon or during heavy rains.
5. Agricultural activities should not be carried out in the afternoon heat.
6. Students should do the activity after wearing a cap and drinking enough water.
7. Caution should be exercised while using sharp and edged tools/equipment during the activity.



Discussion with students:

1. What is the use of soil in plant growth?
2. Why do the colour and texture of soil vary in different geographical locations?
3. Where is the nearest soil testing lab located in your area?
4. How is the forest soil different from the soil in farmers' fields?
5. How can we keep soil healthy?
6. Apart from agricultural fields, where else is soil tested?

Resources:

You can search on Google using the search words –

1. How to do soil testing + YouTube
2. Soil sample collection for soil testing (V shape method)
3. How to test soil pH + wiki how
4. Testing soil texture + the mason jar test

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Activity Name

28. Preparing Soil For Growing Vegetables

Syllabus Reference:

Standard/Lesson No.: Class 7: Chapter 5 - Human Food,
Class 8: Chapter 8 - Human Food and Food Production

Concept/Principle: Land measurement units, unit conversions, measuring plots using tools

Materials and tools required:

Spade, wooden peg, rope, tape (meter), sickle

Time required: 60 minutes

Preliminary preparation: Preparing plots for crop production.

Objectives:

1. Students will learn to prepare a designated sized bed by performing primary farming operations (ploughing, levelling, etc.).
2. Students will understand that soil preparation is an important step in successful farming.
3. Students will be able to understand the different stages of farming.

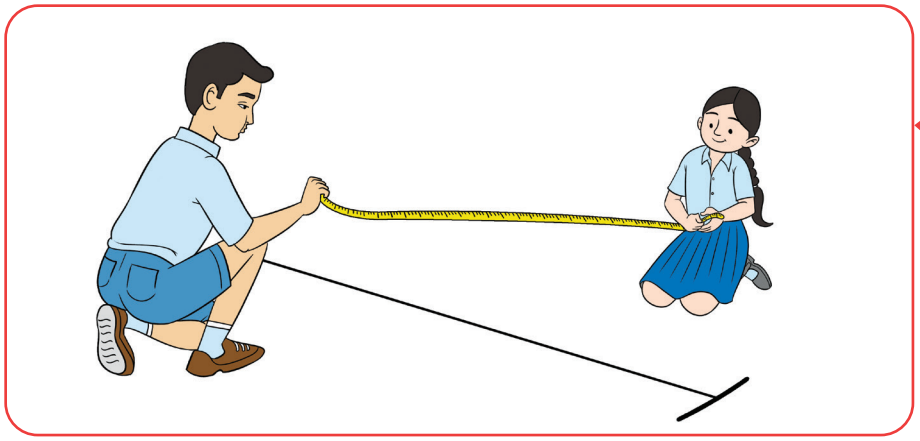
Introduction:

Soil is very important for farming. It supports plant growth, and it takes a long time to form through natural processes. We have already learned how to test soil and ways to improve its quality.

Now, we will explore different methods to prepare soil for farming. This includes measuring land for a small garden, digging the soil and getting a flat plot ready for growing vegetables.

The key steps in farming are ploughing, weeding, fertilizing, and levelling. Ploughing and weeding help to loosen the soil, allowing air to reach the roots and help the plants grow strong and healthy.

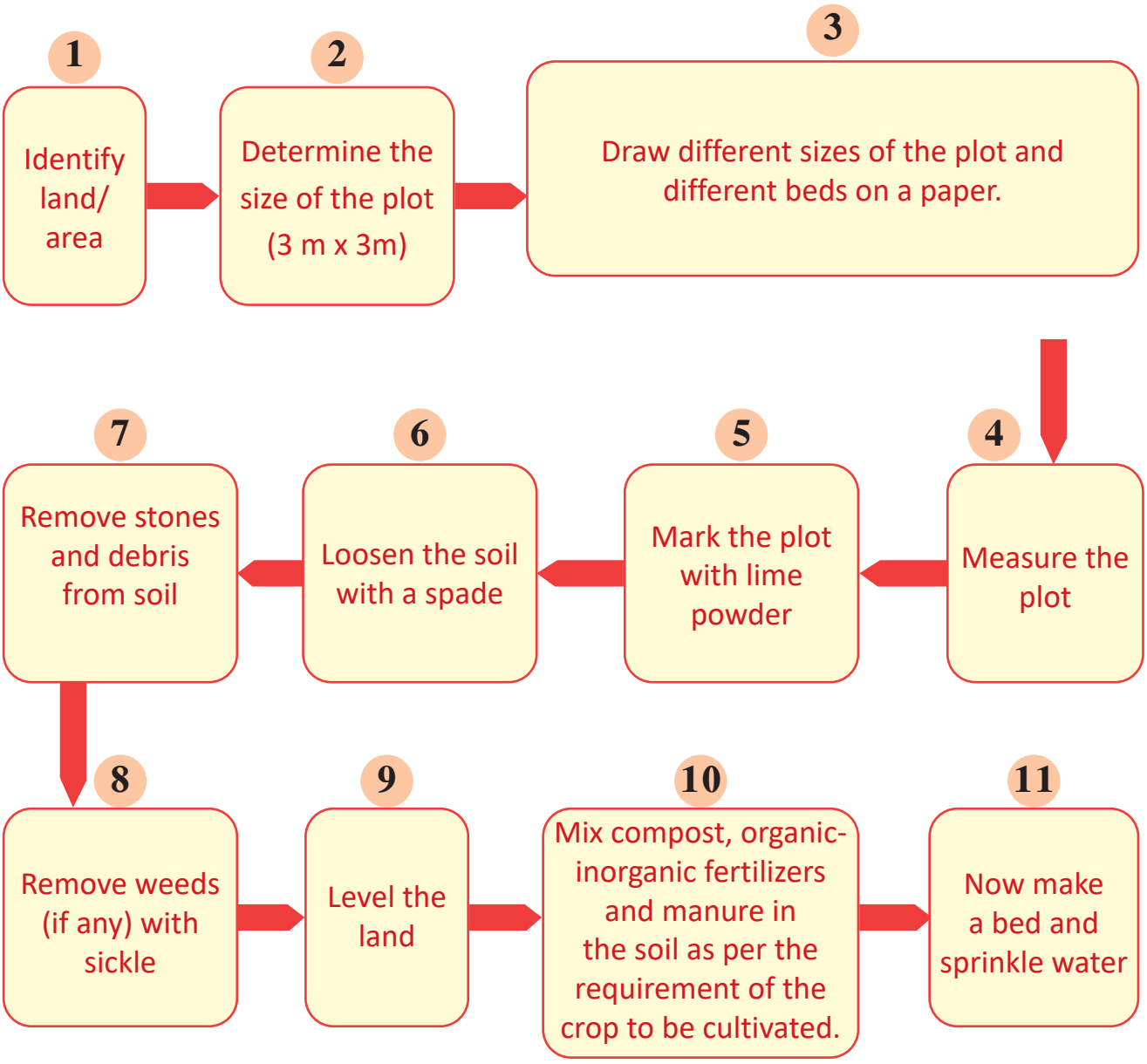
Flat Beds - Tillage Operation



Land measurement

Methodology Flow:

Flat land - farming work land measurement:



Method 1: Learning basic land measurement skills and land measurement units

In farming, land is measured in different units like hectare, acre, bigha etc.

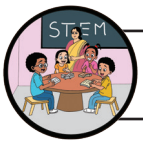
1. 1 hectare = 10,000 square meters. We can also say that this is an agricultural plot of 100 m length x 100 m width.
2. Similarly, 1 acre = 4,000 square meters and 1 bigha = 2,508 meters

Now let's measure our farming plot:

- Measure a plot of 1 bigha or 1/2 bigha by measuring with a meter tape.
- Now convert it into acres or hectares.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Explain about the common crops grown in the area, the need for measurement and the units of measurement.
3. Explain the primary steps (soil ploughing, levelling, removing weeds and delimitation etc) for preparing the soil for sowing seeds.
4. Explain the nature (properties) of the soil.
5. Ensure that students use lime powder carefully and wash hands after use. If lime is not available, wood ash can be used.
6. Ensure that students use equipment carefully while doing preliminary ploughing activities.



Discussion with Students:

1. Why is it necessary to plough the soil?
2. What are the preliminary tasks involved in tilling the land?
3. Which crops have small root systems?
4. What are the different methods of bed preparation in your area?
5. How can we select crops based on the soil's water holding capacity and overall nature?

Resources:

You can search on google using the search words -

1. Prepare soil for a garden
2. Prepare a garden plot

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Activity Name

29. Planning Of Agricultural Land

Syllabus Reference:

Standard/Lesson No.: Class 6, Class 7, Class 8 Agricultural Science- Lessons- Soil, Crop protection, Cultivation of main crops, Horticulture

Concept/Principle: Calculate the right quantity of seeds or seedlings.

Materials and tools required:

Measuring tape

Time required: 60 minutes

Objective:

1. Students will learn to calculate the actual number of plants required as per the unit area of the field.
2. Students will learn how to reduce wastage of seeds and cost/price for agricultural crops.

Introduction:

- After learning about soil and how to prepare it for planting, the next step is to calculate the right number of seeds or seedlings needed. This is called the seed rate or plant population. It is an important part of farming because it helps in proper planning, reduces costs, prevents wastage, and improves overall yield. The seed rate is usually calculated per hectare for crops like rice, maize, and sorghum.
- Hybrid seeds are developed through scientific research to improve crop yield. These seeds can be quite expensive when bought from the market, so using the right amount is important to avoid wastage and unnecessary expenditure.
- Calculating the seed rate is a basic yet essential step in farming. Using too many or too few seeds can affect crop growth and overall production.
- The seed rate in farming depends on several factors-method of planting, spacing between plants, soil fertility, and weather conditions. The quality of seeds also matters, including their viability, age, and size. Additionally, the timing of sowing also plays a key role in getting a good harvest.
- By understanding and calculating the seed rate accurately, farmers can use resources wisely, improve crop yields, and make farming more profitable.

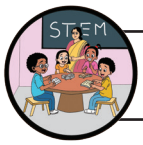
Hands-on activity:

1. Measure the length and width of the plot ready for sowing seeds.
2. Calculate the area by multiplying length x width.
3. Now calculate the space required for one plant (Formula :distance between two plants x distance between two rows= Plant distance)
4. Calculate seeding rate using the following formula.
   - **Formula:** Seed rate = Area of the farm/plant distance
5. **For example** - If the length of our plot is 10 feet and width is 10 feet, then its area will be 10 x 10 = 100 square feet.
6. If we sow maize, its seeds will be sown at a distance of 15 cm (plant to plant) x 10 cm (row to row). To grow one plant, 10 x 15 = 150 cm square area will be required.
7. The total area of our plot is in square feet while the distance between the plants is in square cm, so we have to equate both the units.

8. We know 1 square foot = 929 square cm. If we have 100 square feet of land then we can also call it 92900 square cm.
9. So according to the formula 92900/150 = 619 i.e. we will need 620 maize seeds to sow in 10 x 10 land.

Teacher Guidelines:

- Divide the class into 6 or 8 groups, each having not more than 4 students.
- Ask them to determine the distance between different crop plants.
- Let them compare the results of determining the seed rate.
- If possible, give students seeds and let them calculate it according to the seed rate calculation.



Discussion with Students:

1. Why is it important to calculate the right number of seeds before planting?
2. How does using the correct seed rate help farmers save money and improve crop yield?
3. What factors affect the seed rate in farming?
4. Why are hybrid seeds expensive, and how are they different from regular seeds?
5. What will be the problem if there is no distance between the seeds?

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Activity Name

30. Seed Treatment

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 6 - Morphological Diversity and Functions of Living Components of Environment

Concept/Principle: Germination, Conditions for germination

Materials and tools required:

100 grams of seeds, different types of seeds can be taken according to their size (e.g. peanuts, peas, black gram, green gram, wheat, millet, mustard, lentils, sunflower, urad and moong, etc.), clay mixture, salt, ash (made from cow dung), pieces of old but clean cotton cloth, hand gloves, rectangular germination tray, strainer, weighing scale, measuring vessel (500 ml), watering can, bucket, sickle, sprinkler machine

Time required:

For seed treatment: 60 minutes

Daily, water sprinkling and observation: 15 minutes

Objectives:

1. Students will learn how to do seed treatment for various seeds.
2. Students will understand about seed treatment by ascertaining/calculating how many plants are required in the field.
3. Students will learn about the different types of seed germination.

Introduction:

Seed treatment is helpful in improving the germination of seeds. This also helps in preventing microbial or other insect infestations. Treatment of seeds can be done with the help of chemical and natural compounds. We will learn about some fundamental seed treatment methods in this activity. Various crops like grains and pulses get infected by various insects/micro-organisms originating from the soil. Crop production can be increased by removing these infections through seed treatment. After treatment, the seeds will be planted in beds or seedling trays.

Hands-on Activity:

Activity-1: Seed treatment by salt and ash:

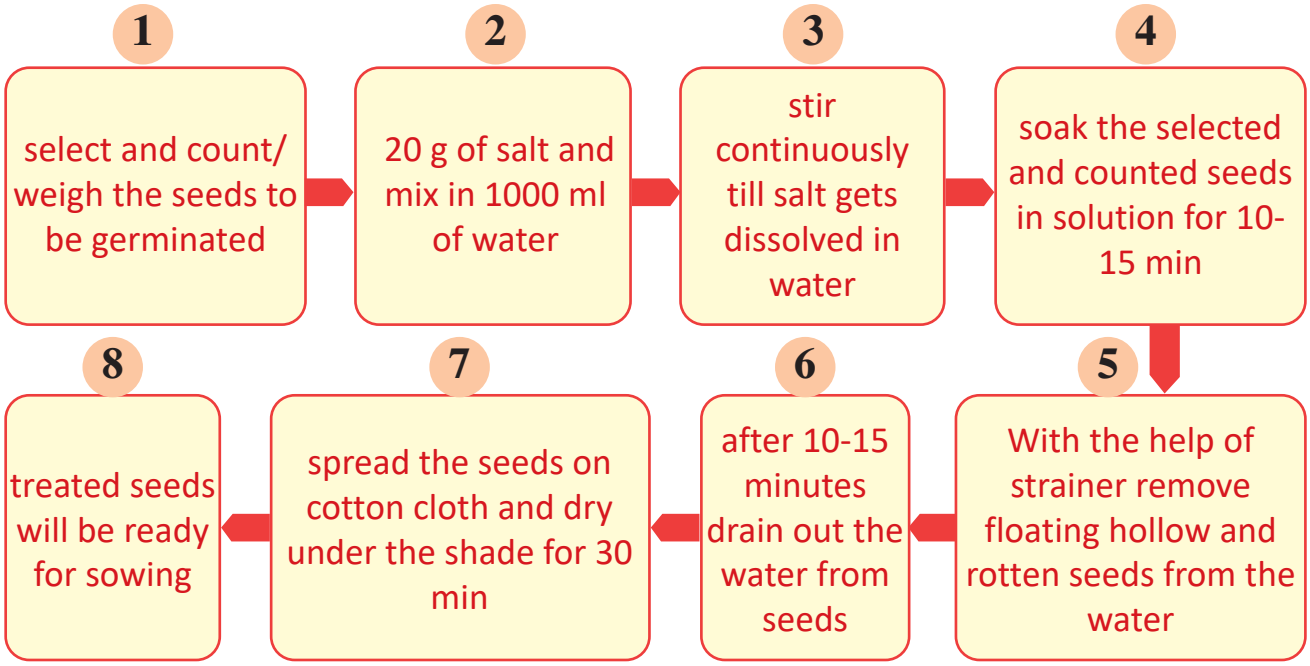
Choose at least one seed for both the methods given below:

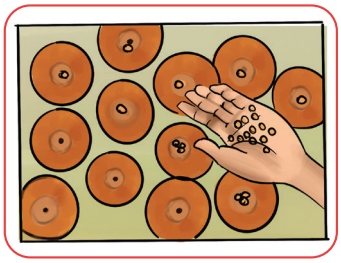
Salt method	Ash Method
Coriander, food grains like sorghum, millet, ragi, maize, etc.	Groundnut, gram, red gram, green gram, peas, etc.

Students will carry out the activity in 2 steps:

Activity 1: Seed treatment

First step: with salt





Second step: with ash

1. select and count the seeds like groundnut, gram
2. spread the seeds (to be treated) on dry cotton cloth
3. weigh 100 g of dry ash
4. coat the seeds with dry ash by rubbing them uniformly with hands and allow to dry under shade for 30 min
5. treated seeds are ready for sowing

Activity 2: Seed sowing in tray

After seed treatment, seeds will be sown for germination using the following steps.

1. Take sieved soil.
2. Add compost to the soil. (1 part soil: 1 part compost)
3. Fill the rectangular germination tray with soil-compost mixture.
4. 100 grams of seeds can be sown in one rectangular tray. If the seeds are very small, spread them evenly by hand. If the seeds are large and countable, put each seed at a designated place.
5. Water the seeds daily with a sprinkler/watering can.
6. Draw an observation table with the help of the teacher.
7. Observe the germination process of seeds.
8. Record the changes taking place along with the date.
9. After 15 days, count the seeds that have germinated
10. Calculate the percentage of germination (evaluate the effectiveness of the method)

Observation Table:

	salt method	ash method
Name of seed sown:		
Date of seed sowing:		
Amount/ quantity of seeds sown:		
No. of seeds that germinated:		

Formula:
After 15 days of germination; calculate the germination percentage by using the given formula and note the conclusion

$$Germination\ Percentage = \frac{seeds\ germinated}{total\ seeds} \times 100$$

Calculations:

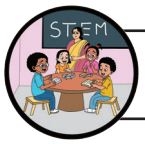
Conclusion: _____
Germination Percentage tells us the number of viable seedlings.
For example, if the germination rate is 70% then 70 out of 100 seeds are useful for planting.

Benefits of seed treatment:

- Prevents soil-borne diseases.
- Increases the germination capacity of seeds in the field.
- Crop growth is fast and good
- The production capacity of the crop increases.
- Small plants have less chance of drying/withering/destruction.
- Plants develop better resistance to diseases.
- The expenditure on seed treatment is much less as compared to the benefits from it

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Each group will choose different types of seeds for seed treatment.
3. Students will perform seed treatment (by any one method) and sowing.
4. Students will take care/irrigate the sown seeds and record their observations and calculate the germination percentage.
5. The activity can be done in summer.
6. Ensure that the students use hand gloves, mask and use the tools under supervision



Discussion with students:

1. What is a seed?
2. What types of seeds have you seen?
3. What is seed treatment? How many types are there?
4. What is the use of salt in seed treatment?
5. What is the use of ash in seed treatment?
6. Do all the seeds used in the rectangular tray germinate?
7. When did you see the first germination?
8. How many days did it take for complete germination?
9. What are the factors affecting the germination process?
10. Why is it necessary to spray water on the seeds during germination?
11. Have you noticed any disease or insect infestation on seeds or plants? What is the reason behind this?
12. How did you determine the germination percentage? Can you say what percentage is?

Resources:

You can search on Google using the search words –

1. How to treat the seeds
2. Seed treatment + traditional method
3. Salt water seed treatment

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Activity Name

31. Setting Up of A Vermicompost Bed

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 2 - Phenomena around Us & Chapter 12 - Waste Products;
Class 8: Chapter 8 - Human Food and Food Production

Concept / Principle: Events - Intended, Unintended, Natural, Man-made, &, Recycling of Waste Products; Crop production

Materials and tools required:

Water, cow dung, soil, gunny bags, earthworms, dry grass and leaves collected from fields, and waste obtained from the kitchen and fields, spade, bucket, shovel, tub, gunny bags

Time required: 120 minutes

Objectives:

1. Students will learn how to make vermicompost beds at the school.
2. Students will learn how to use compost in their school kitchen garden.
3. Students will understand about vermicomposting and its benefits.
4. Students will learn how to manage organic waste effectively.

Introduction:

Plants require proper care for farming. Use of fertilizers is one of the important activities in farming. Fertilizers help maintain soil fertility and are of two types: natural and artificial. Vermicompost is one of the natural and organic fertilizers used for plants.

Vermicompost is a natural fertilizer, which is essential for plant growth.

Earthworms are used for vermicomposting mainly because they consume organic waste and expel it through their digestive system. This converted soil is used for agriculture as organic fertilizer.

Vermicomposting takes place in dark or low-light conditions, where kitchen waste and other green materials are broken down to form nutrient-rich compost. It is an environmentally friendly process that turns organic matter into compost and produces valuable nutrients.

Definition:

"**Vermicomposting** is the process in which earthworms convert organic waste into compost with high nutritional content."

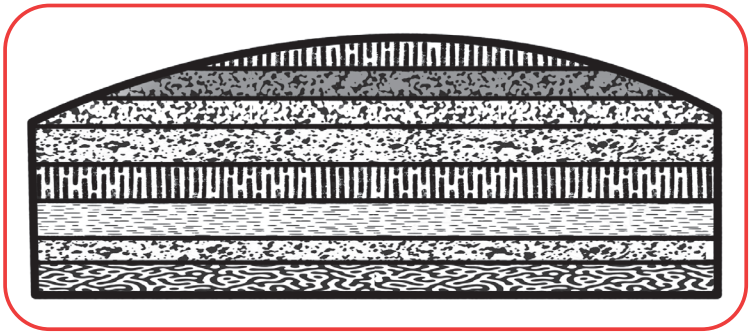
Vermiculture means "cultivation of earthworms". Earthworms eat organic waste and expel it through their digestive system in the form of castings. These castings are rich in nitrates and minerals like phosphorus, magnesium, calcium and potassium. They are used as fertilizer to improve the quality of the soil.

Hands-on activity:

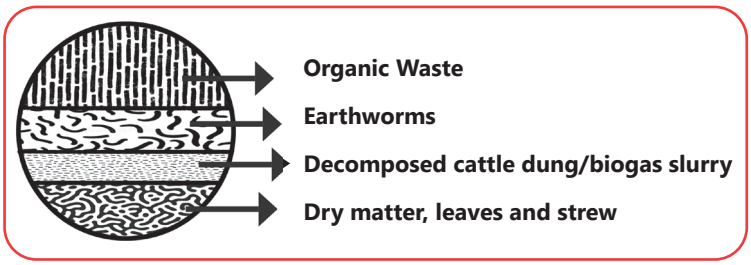
After collecting the material, students will follow the steps in the following sequence.

1. Moisten the soil with water.
2. Spread waste material like coconut husk, rice husk, grass, etc. at the bottom, making a layer about 3 to 5 cm thick.
3. Spray adequate water on this layer.
4. Spread a thick layer of decomposed cow dung and soil.
5. Bring about 1 to 1.5 kg of fully grown adult earthworms (approximately 300–500 worms) from the Krishi Vigyan Kendra.

6. Add another layer made of finely chopped decomposed peels and husks of vegetables, fruits and grains, animal dung, cow dung, grass, flowers, leaves, manure made of fish and chicken faeces.
7. Cover this heap well with a gunny sack and keep it moist by sprinkling water on it for 25 to 30 days.
8. If the pile made of organic matter becomes hard, loosen it by hoeing with your hands.
9. After 30 days, turn the stacked layers once for good aeration and proper dissolution. Do the weeding.
10. Vermicompost will be ready in 45-50 days.



Prepared Bed/Plant of Vermi-Compost



Note:

- When the raw material is fully decomposed it looks black and granular. Once it reaches this stage ready, release earthworms into the composting bed .
- Once the compost is ready, stop watering it.
- Place the compost on top of a layer of half-decomposed cow dung, allowing the earthworms to move easily from the compost into the cow dung.
- After two days, the compost should be separated from the cow dung and filtered for use.
- The vermicompost prepared in this way should be placed in the form of a conical heap.
- Remove the compost from the upper part of the heap, dried in the shade and sieved.

- The pupae and eggs of the earthworms that remain after sieving can be used again to make another batch of vermicompost.

Dosage of vermicompost:

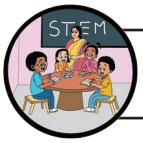
Crop	Kg/dimension
Food grain	5-6 ton/hectare
Fruit tree	3-5 kg/tree
For the pot	100-200 gram/pot

Benefits of using vermicompost in agricultural soil:

- It improves soil fertility without harming plant roots, improving air circulation around the roots and supporting healthy root growth.
- It increases the water-absorbing capacity of soil.
- It helps reduce soil erosion.
- Use of vermicompost increases organic carbonic acid in the soil.
- It reduces evaporation of water from the soil.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Arrange all materials and ensure use of gloves while doing this activity.
3. To create a vermicompost plant/heap, students of each group should collect materials and equipment from nearby areas.
4. We can also get earthworms from the nearby Krishi Vigyan Kendra.
5. The process should be done during the rainy season.
6. If earthworms are not available, you can make a different type of compost. In this case, use mostly plant-based ingredients. Avoid using animal-based materials such as carnivorous animal dung, oil, fat, dairy products, meat, bones, blood, or fish remains. Among plant-based materials, do not use grass or thick tree branches (however, green and dry leaves can be used). The process of making this compost is the same as that of vermicomposting, except that it does not involve the use of earthworms.



Discussion with students:

1. Why is it necessary to sprinkle water on the layers?
2. Where will we get earthworms?
3. What factors influence this process of preparing vermicompost?
4. How many days will it take to make vermicompost?
5. How can we increase the number of earthworms?
6. How many earthworms will be required in this process?
7. What are the uses of vermicompost?

Resources:

You can search on Google using the search words -

1. Vermicompost
2. How to make a vermicompost
3. A step-by-step procedure for vermicomposting

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Activity Name

32. Preparing Organic Pesticides

Syllabus reference:

Standard/Lesson No.: Class 8: Chapter 8 - Human Food and Food Production

Concept/Principle: Organic pesticide

Materials and tools required:

Native cow dung 1 kg, native cow urine 1 Litre (the older the better), native black jaggery – 50 grams, water 10 Litre, Plastic bucket, wood/stick, gloves

Time Required:

- Day 1: 30 Minutes
- Day 2- Day 6: 5 Minutes per days (to mix/stir)
- Total time: 5 to 6 days

Objectives:

- Students will learn how to prepare organic pesticides.

Introduction:

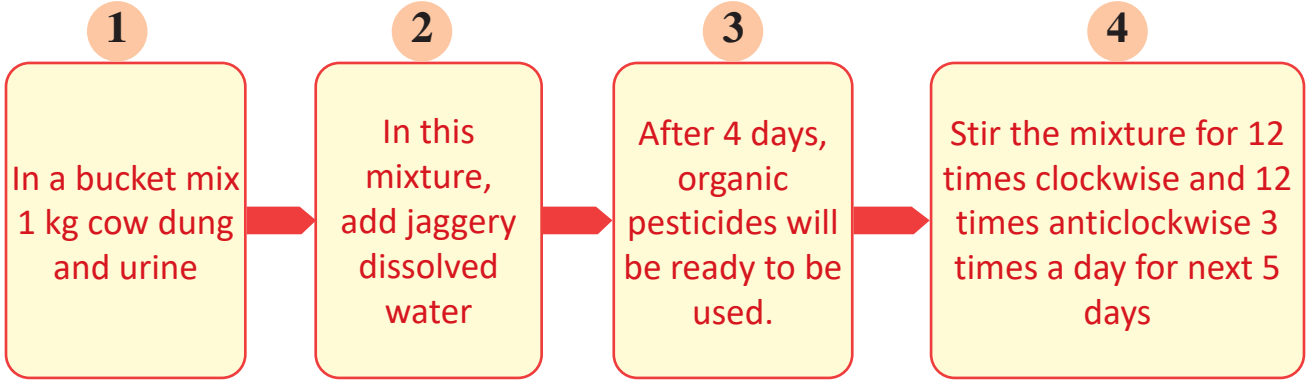
Many pests and insects are attracted to farms and can harm crops, reducing the yield. However, insects are not our enemies—they are an important part of the ecosystem. Therefore, instead of destroying them, we should focus on managing them to minimize crop losses. Chemical pesticides, though effective in the short term, are harmful to the ecosystem and can also cause various diseases in humans. Therefore, it is better to use safer and more sustainable options.

Students will learn how to make economical, useful pesticides with multiple benefits, which can protect crops while keeping the soil, environment, and human health safe.

Hands-on activity:

1. Collect cow urine and cow dung to the mixture and stir well. Use a wooden or plastic stick for mixing - avoid using metal sticks.
2. Add jaggery mixed water and cover the bucket loosely with a cloth. This will allow fermentation to occur. Keep the bucket in shade, away from direct sunlight and rain water.
3. Stir the mixture with a stick three times a day— morning, afternoon, and evening. Rotate it 12 times in the clockwise direction and 12 times in the anti-clockwise direction each time. This helps the microorganisms and bacteria to spread evenly throughout the mixture.
4. By the second day, you will notice signs of fermentation. By the fourth day, microbial activity is mostly complete. and the organic pesticide becomes ready for use.
5. From the fourth day onwards, you can take 1 litre of the liquid mixture, mix it with 10 litres of water and use it on plants.

Process Flow:

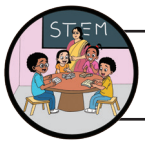


Role of the components:

1. Many types of beneficial microorganisms are found in cow dung.
2. Microorganisms found in cow urine support microbial growth. Cow urine also serves as a food source for these microorganisms.
3. Native black jaggery acts as food for microorganisms, which nourishes them and increases their growth.
4. Neem leaf powder or oil cake can also be used in the mixture. Neem leaves contain azadirachtin, which acts as an insect repellent. To make natural insecticides we can use leaves of many indigenous plants like, Giant milkweed (akanda), panchphuli etc.

Teacher Guidelines:

- Divide the Class into 6 or 8 groups, each having not more than 4 students.
- Students will collect the materials and equipment needed for the activity.
- Do it preferably during the rainy season.



Discussion with students:

1. What other organic pesticides do you know about? Write their names.
2. What are the common pesticides used for vegetables around you?
3. Without using any chemical pesticides, how can we protect crops from pest attacks?
4. Why is spraying of organic pesticides considered good to protect crops from pests?
5. For how long can we use organic pesticides on plants and crops?

Resources:

You can search on Google using the search words –

- How to make different organic pesticide at home + YouTube

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Activity Name

33. Making an Insect Trap

Syllabus reference:

Standard/Lesson No.: Class 8: Chapter 8 - Human Food and Food Production

Concept/Principle: Insect Identification, Sticky Traps – Natural Pest Control

Material and tools required:

Cardboard/unused oil cans/plastic bottles, blue/yellow colour paint or paper, castor oil or grease or homemade grease from potato, stick, scissors, brush

Time required: 60 minutes

Objectives:

1. Students will learn how to create sticky traps for their school kitchen garden.
2. Students will learn how to place the traps in an agricultural field to reduce crop damage.

Introduction:

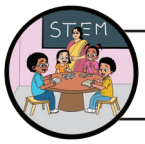
Many insects attack crops like vegetables and cotton. Farmers often use chemical pesticides, but these can be harmful to humans and the environment. Instead, we can control pests naturally using sticky traps. These traps attract insects due to their colour and help reduce crop damage. Certain insects, especially sap-sucking insects, are drawn to blue and yellow colours.

Hands-on activity:

1. Take a piece of cardboard, foam, or an MS sheet (from an unused oil can) and cover it with yellow paper or paint it yellow or blue. You can also use a plastic bottle.
2. Let the paint dry completely. Make at least 4-5 traps.
3. Once dry, attach each trap to a stick using wire, thread, or cable ties.
4. Place the traps in the field in a zig-zag pattern at the same height as the crops.
5. Apply castor oil grease or homemade potato grease on the traps to make them sticky.

Teacher Guidelines:

- Divide the class into 6 or 8 groups, each having not more than 4 students.
- Guide students on where to place the sticky traps.
- Instruct students to use scissors carefully.
- Ensure that students wear gloves, mask while working with paints or grease.



Discussion with Students:

1. Why do insects like blue and yellow colours?
2. How do sticky traps help catch insects?
3. Why should we avoid using chemical pesticides?
4. What would happen if farmers stopped using pesticides?

Resources:

You can search on Google using the search words -

1. How to make sticky traps at home + YouTube
2. DIY sticky traps to protect plants

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Activity Name

34. Vertical Bag Farming

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 12 - Waste Products;
Class 8: Chapter 8 - Human Food and Food Production

Concept / Principle: Recycling of Waste Products; Crop production

Materials and tools required:

Soil, compost, sand, pebbles, well-rotted or decomposed cow dung, plastic bag (compost bag, cement bag or gunny sack), wood ash, rice husk, green manure, PVC pipe (12 cm diameter), 7-9 small vegetable plants, sickle, spade, spade, watering can, strainer, tub/pot

Time required:

- About 45-60 days (depending on plants selected)
- Initial planting time - 60 minutes
- Daily time for plant care and observation - 5 minutes

Objectives:

1. Students will learn how to make kitchen gardens using vertical bags at school.
2. Students will understand new techniques of organic vegetable cultivation and new farming techniques.
3. Students will learn how to grow necessary vegetables in less space at home/ school.

Introduction:

Farming is often believed to require large areas of land. However, with modern techniques such as hydroponics and indoor farming, it is now possible to grow crops even in small spaces. One such innovative method is vertical bag farming. This technique is perfect for small areas like balconies and terraces and can be used in schools to learn agricultural skills. It works well in places with poor soil or on rooftops, making it a great option for urban farming.

Vertical bag farming can produce 3 to 5 times more crops in the same area compared to traditional farming. It requires careful management of water, fertilizers, and pests.

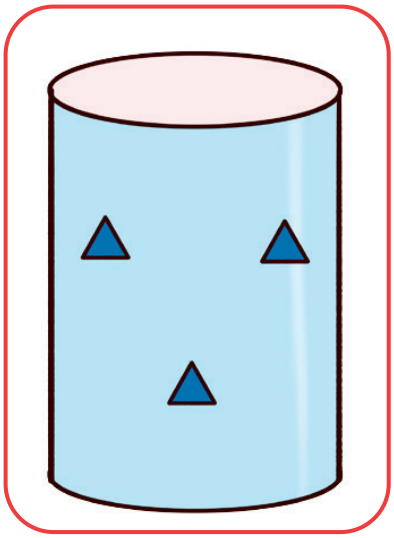
Hands-on activity:

Vertical Bag Farming:

1. Take polythene bags. To ensure proper drainage of water through the polythene bag, make holes at several places at the bottom of the bag.
2. Place some broken brick pieces at the bottom of the polythene bag. Fix the PVC pipe in the middle of the polythene bag and then fill the PVC pipe bag with pebbles/gravel.
3. Prepare soil mixture by mixing cow dung manure, wood ash, sand, paddy husk and organic fertilizer in equal quantities.
4. Fill the soil mixture in the polythene bag to about 10 cm from the bottom.
5. Surround the PVC pipe with the prepared soil mixture, leaving 6-10 cm space from the top.
6. Gently remove the pipe and allow the gravel to remain at the centre of the bag.
7. Make 4-5 triangular holes on the sides of the polythene bag, from which the plants will come out.
8. Transfer a healthy seed or plant and plant it in the bag.
9. Keep watering the plants from time to time and remove weeds as per requirement.

Note: If there is no proper drainage, the plant may die.

A triangular or inverted 'V' shaped hole made through the edge of the bag



Triangular notches to the side of the bag

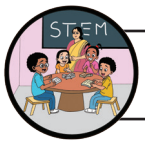
Vertical bag farming

Observation:

1. Total number of polythene bags used: _____
2. Number of seeds sown per bag: _____
3. Number of plants sown per bag: _____
4. Identify different plants sown (name with the number of plants)
   i. _____ ii. _____ iv. _____
   v. _____ iii. _____ vi. _____
5. Size of used polythene bags: _____
6. Age of transplanted plants: _____
7. Initial height of transplanted plants: _____
8. Number of leaves on a seedling: _____
9. Types of soil mixture with proportions of ingredients used:
10. Conclusion: _____

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ensure that students are careful while using tools and equipment.
3. Each group will select different types of plants like vegetable plants, medicinal plants, etc. for different bags (one bag for 5 students).



Discussion with students:

1. How many types of plants can be grown in one bag?
2. Have you seen any disease or disease-causing insect or any type of fungus? Describe it.
3. Which plants are suitable for polythene bag farming?
4. Which fertilizers are added to the bag?
5. How did you water the plants in polythene bags?

Resources:

You can search on Google using the search words –

1. Vertical bag farming at home/school
2. How to use growing bags for plants
3. Vertical gardening

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Activity Name

35. Setting Up A Plant Nursery

Syllabus reference:

Standard/Lesson No: Class 8: Chapter 8 - Human Food and Food Production

Concept/Principle: Area Selection

Materials and tools required:

Nursery area, water, pot/polythene bag (used milk bags) filled with soil, 5 small bamboo sticks (2000 mm length * 25 mm diameter), a polythene sheet or green shed net (2-meter length * 3-meter width) gardening tools (e.g., spade, rake, watering can), measuring tape, shovel

Time required: 120 minutes

Objectives:

1. Students will learn how to set up a plant nursery.
2. Students will learn how to select an appropriate area for a nursery.

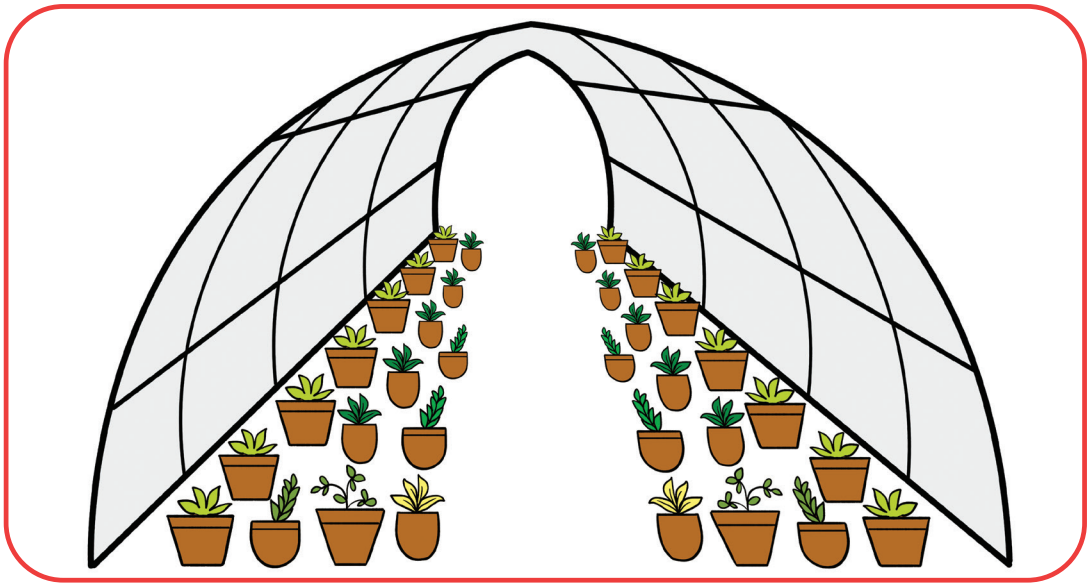
Introduction:

- Plant propagation is the process by which new plants grow from a variety of sources: seeds, cuttings, and other plant parts. A plant nursery is a place where plants are propagated and grown.
- Plant seedlings (baby plants) need a proper environment to grow. They need moist soil (50 to 60 % moisture in soil), shade (50 % less sunshine than normal), humidity (60 % to 70 %). These environmental parameters have to be properly maintained & monitored in plant nursery.

Hands-on activity:

Making a plant nursery in school premises (near kitchen garden) using the following steps:

1. Clean around a 5 sq. m area at a corner of the school-kitchen garden.
2. Remove all big stones, bricks, debris etc
3. For a small nursery structure, use bamboo sticks or similar materials to make a tunnel measuring about 1 metre in length and 1 metre in width. Fix the bamboo sticks firmly so that the structure remains stable and does not collapse.
4. Cover the tunnel with a plastic sheet on three sides. Secure the sheet at the ground level using soil, bricks, or similar materials. Ensure that the plastic sheet can be easily removed and fixed again for watering the plants, or for removing seedlings for sale or plantation.

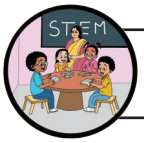


Nursery tunnel sketch

5. Keep the front side of the plastic open to keep new plants or to remove seedlings as needed.
6. This tunnel will serve as a nursery for keeping new plants .

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Make sure all students follow safety precautions – masks, gloves, etc.



Discussion with students:

1. What factors should be considered when selecting an area for a nursery?
2. Why is it important to choose a location with adequate sunlight for a nursery?

Resources:

You can search on Google using the search words –

1. How to make plant nursery in school using polythene sheet or green shed net
2. How to make plant garden/nursery

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Activity Name

36. Potting Mixture For Garden

Syllabus reference:

Standard/Lesson No.: Class 8 : Chapter 8 - Human Food and Food Production

Concept/Principle: Understanding Components of Potting mixture, Planting seeds or seedlings.

Materials and tools required:

Garden soil, dried leaves, compost, sand, sawdust, cocopeat, garden containers or pots of various sizes, trays, trowel or gardening scoop, gloves (optional),watering can, hose

Time required: 60 minutes

Objectives:

1. Students will learn how to make a garden potting mixture.

Introduction:

- For healthy and strong growth, plants need the right kind of soil. A potting mixture is a specially prepared blend of materials that provides seedlings and young plants the right amount of air, water, and nutrients to grow well.
- In this activity, students will prepare a suitable potting mixture by combining garden soil, compost, sand, dried leaves, sawdust, or cocopeat. They will then fill garden containers and pots with the mixture, making them ready for planting seeds or seedlings. This hands-on exercise helps students understand the components of a potting mixture and their role in supporting plant growth.

Hands-on activity:

Activity 1: Preparation of Potting Mixture

1. Before preparing the potting mixture, mix the required components in proper proportions.
2. Mix active fertilizers as per the guidelines given on bags or bottles with the potting mixture.
3. Use appropriate quantities of propagation media to create four types of potting mixtures:

Mixture A

1:1

Garden Soil: Manure

Mixture B

1:1:1

Garden Soil: Manure: Sand

Mixture C

2:1:1:1

Garden Soil: Manure: Sand: Cocopeat

Mixture D

1:1:1:1

Garden Soil: Manure: Sand: Dry Leaves

Activity - 2: Filling the pots

Required Materials or Equipment: Pots, appropriate soil mixtures, big/small containers.

Process:

1. Check the drainage holes at the bottom of the pots. Clear them if blocked.
2. Select appropriate soil mixtures as per the guidelines for filling the pots.
3. Clean the pots. If the pots are new, soak them in water before filling.
4. Apply a layer of coarse soil at the bottom.
5. Fill pots with mixtures of soil, sand, cocopeat and manure as per the recommended proportions, leaving a 1-2 inch gap below the rim for watering.
6. Water the filled pots immediately or the next day.
7. Sprinkle fungicides or pesticides in required proportion.
8. Fill the pots with soil mixtures suited for the growth of specific plant species.
9. Sow seeds, plant saplings, or set seedlings as per the planting guidelines.
10. Water the pots regularly with care.
11. Keep the pots in shaded or semi-shaded areas for better care and management.

Mix the compositions and plant saplings or seeds in each pots and note the observations.

Mixture A

1:1

Garden Soil: Manure

1:1:1

Garden Soil: Manure: Sand

Mixture B

Mixture C

2:1:1:1

Garden Soil: Manure: Sand: Cocopeat

1:1:1:1

Garden Soil: Manure: Sand: Dry Leaves

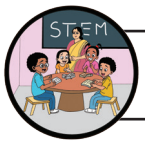
Mixture D

Observation Table:

S. No.	Name of the plant	Type of pot	Size of the pot	Type of soil mixture	Number of filled pots
1.					
2.					
3.					

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 student.
2. Make sure all students follow safety precautions – masks, gloves, etc.
3. Students will use gardening tools and equipment safely.



Discussion with Students:

1. What are the main components of a potting mixture?
2. How does the potting mixture affect plant growth?
3. Why is it important to ensure proper drainage in the potting mixture?

Resources:

You can search on Google using the search words –

1. How to make potting mixture
2. How to fill gardening pots using potting soil

Activity Name

37. Setting up a Kitchen Garden in School

Syllabus reference:

Standard/Lesson No.: Class 6: Chapter 2: Phenomena around Us
Class 7: Chapter 6: Morphological Diversity and Functions of Living Components of Environment

Concept/Principle: Leaf propagation

Materials and tools required:

Plant leaf, blade/ cutter/ sharp knife

Time required: Initial time to perform cutting: 10 minutes
Daily time for watering, plant care and noting: 5 minutes

Objectives:

Students will understand basic plant propagation methods like leaf cutting, stem cutting, seed propagation etc.

Introduction:

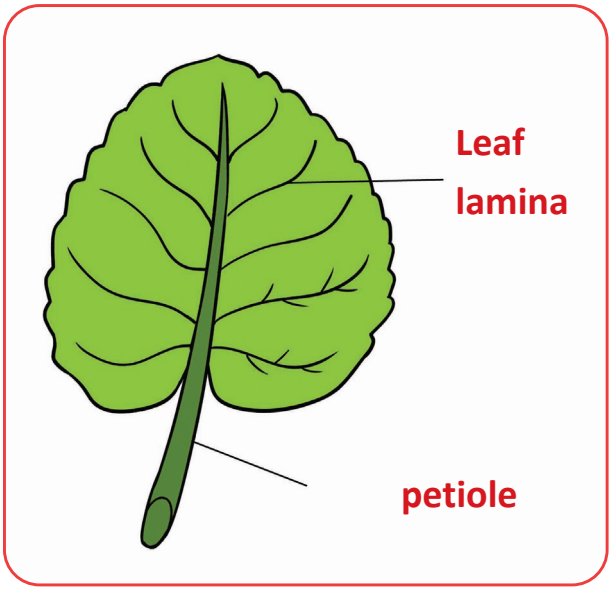
- Plant propagation is the process by which new plants grow from a variety of sources: seeds, cuttings, and other plant parts. A plant nursery is a place where plants are propagated and grown. Plant seedlings (baby plants) need a proper environment to grow. They need moist soil (50 to 60 % moisture in soil), shade (50 % less sunshine than normal), humidity (60 % to 70 %).
- These environmental parameters have to be properly maintained & monitored in school plant nursery.

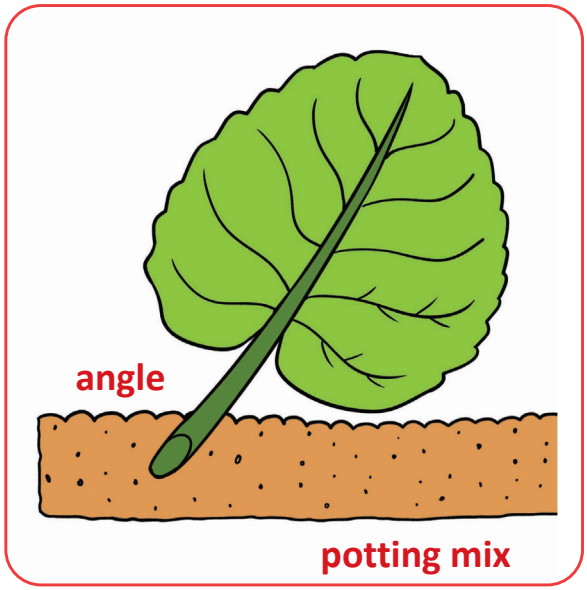
Hands-on activity:

Activity I: Preparing new plants by leaf cutting (leaf-propagation)

A. Propagating new plants by leaf cutting-

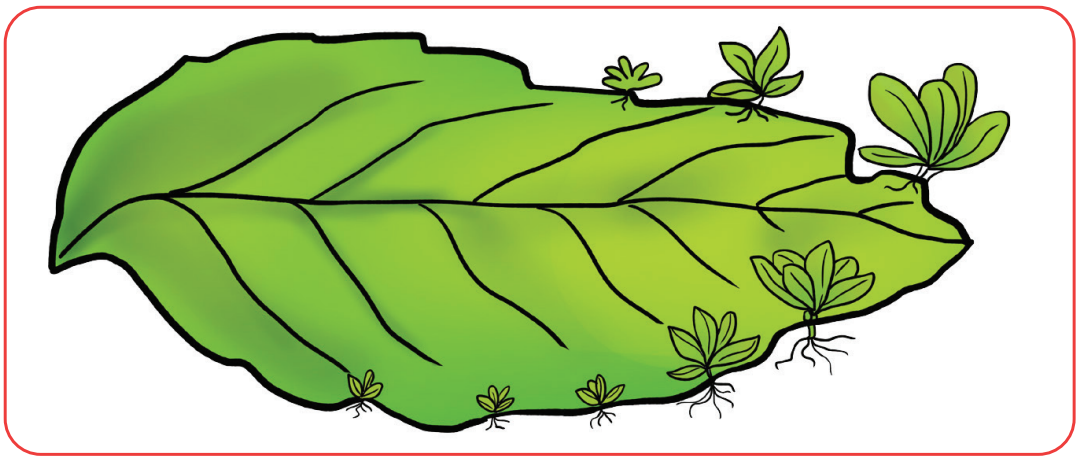
1. Get *kalanchoe pinnata* plant (Bengali/Hindi name: পাথরচাটা / पथरचट्टा) leaf from school premises or local area.
2. Prepare at least 10 new plants by using the following methods. For this, fill 10 polythene bags with soil.





Flow chart:

1. Choose a healthy leaf.
2. Cut off the leaf with about 2.5 cm of petiole.
3. Place the leaf in the potting mix at a slight angle so the base of the leaf is clear of the surface.
4. Firm the mix gently around the cutting.
5. Place in a warm place. They are susceptible to disease, so don't place them in a mist unit.
6. Keep the media moist.



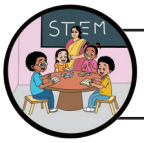
B. Making new plants by seed propagation:

Seed propagation is the method of plant propagation by use of seeds.

- Collect some common seeds like Marigold, Tulsi, Brinjal, Tomato, Bhendi (Ladyfinger) etc
- Prepare at least 10 new plants by using the prescribed method.
- For this, fill 10 polythene bags with soil.
- Keep all these plants (prepared with leaf cutting, step cutting and seeds) in the nursery tunnel.
- Water them regularly.
- Use these plants for plantation in school premises, gifting to guests, selling etc.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Make sure all students follow safety precautions – masks, gloves, etc.
3. Students will use gardening tools and equipment safely.



Discussion with Students:

1. What are advanced methods of plant propagation?
2. Which method did you like most? Why?
3. Do all plants bear seeds? If not, why?
4. Which factors affect the growth of a new plant?

Resources:

You can search on google using the search words –

1. How to make plant propagation for nursery
2. How to propagate your plants

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Activity Name

38. Stone Grafting - Mango Plant

Syllabus reference:

Standard/Lesson No.: Class 8 : Chapter 8 - Human Food and Food Production

Concept/Principle: Selection of rootstock, Selection of scion, Grafting

Materials and tools required:

Mango scion (desired variety), rootstock (healthy mango seedling), grafting tape, pot with potting soil, grafting knife, scissors

Time required: 120 minutes

Objectives:

1. Students will learn how to do mango grafting by themselves.
2. Students will learn hardwood grafting through hands-on experience.

Introduction:

- Mango grafting is a simple method used to grow new mango plants by combining two different parts of mango trees—a rootstock (the lower part with roots) and a scion (a branch from a healthy, productive mango tree).
- This process helps produce plants that grow faster, are more resistant to diseases, and yield better-quality mangoes.
- Grafting is commonly used by farmers and gardeners to ensure they grow mangoes with consistent taste, size, and quality. By learning the technique of mango grafting, you can understand how to grow improved and high-yielding mango trees.

Hands-on activity:

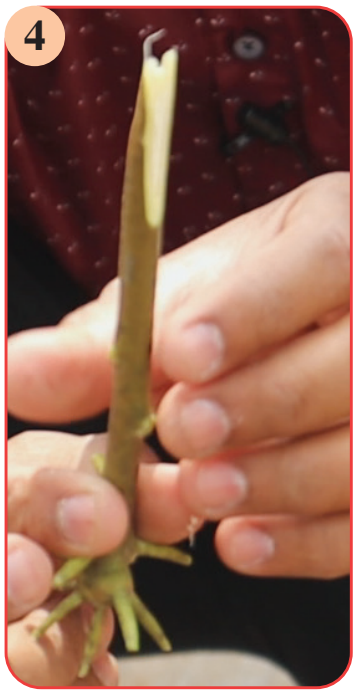
1. Prepare the materials needed for grafting and ensure they are clean and sterilized to prevent the spread of diseases.

2. Cut the scion wood from a healthy mango tree, making sure it contains several nodes with buds. Cut the scion as shown in figure.

1

2

3. Select a healthy mango seedling to serve as the rootstock for grafting.
4. Follow the given steps of hardwood grafting:
   - ➨ Make a sloping cut on the rootstock.
   - ➨ Ensure the cuts match each other for proper alignment.



- ➨ Align the cuts so the inner layers (cambium) of both pieces touch.

- ➨ Wrap the joint tightly with grafting tape to hold it in place.

5. Check that the scion and rootstock are securely joined and won't move during growth.

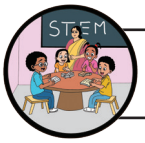
6. This process helps the scion and rootstock grow together to form a healthy mango tree.

Observation Table:

S.No.	Observation Parameters	Your observations
1	Date of grafting	
2	Variety of mango being grafted	
3	Source of scion (desired variety)	
4	Source of rootstock (selected mango seedling)	
5	Time taken for graft union formation	
6	Time taken for scion buds to break	
7	Rate of growth of the scion	
8	Any specific observations during the process	

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.
2. Ensure that students handle scissors and knives carefully under supervision.



Discussion with students:

1. How do we join two plant parts in grafting?
2. What care is needed after grafting a mango tree?
3. How long does it take for a grafted mango plant to grow?
4. What are the benefits of grafting compared to growing from seeds?
5. Can we graft any two plants together? Why or why not?

Resources:

You can search on Google using the search words –

1. How to graft mango tree + YouTube
2. How to grow mango at home through grafting + wiki How

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Activity Name

39. Rose Grafting (T-Budding)

Syllabus reference:

Standard/Lesson No.: Class 8: Chapter 11 - Environment Around us and Plant Kingdom

Concept/Principle: Learning the T- Budding grafting method

Materials and tools required:

Rootstock, scion, sharp knife,
grafting tape

Time required: 60 minutes

Objectives

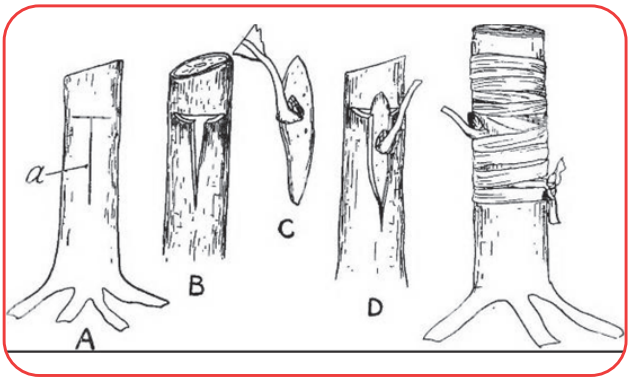
1. Students will learn how to graft rose plants.
2. Students will understand about T-budding grafting.

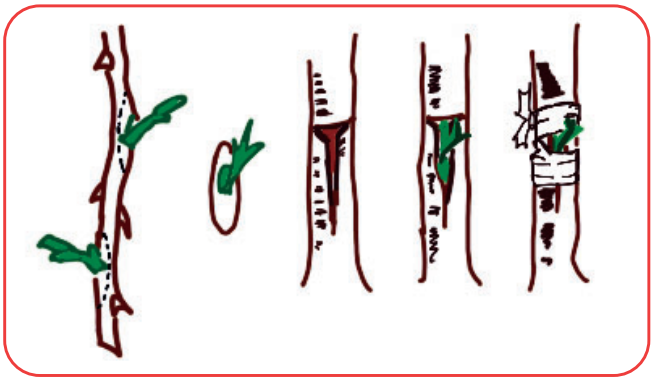
Introduction:

Grafting is a technique where two plants are joined to create a new plant. In this process, the scion (a small part of the desired plant) is attached to the rootstock (a healthy plant with strong roots). Rose grafting is the most common example of bud grafting, and it is mainly done in mid-summer for the best results.

Hands-on activity:

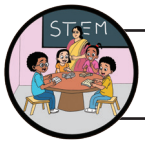
1. Clean the sharp knife before use.
2. Choose a strong rootstock with a stem diameter of ½ to ¾ inch.
3. Select a branch with healthy buds from the desired rose plant.
4. About 6 inches above the ground, make a T-shaped cut on the bark of the rootstock. Gently peel back the bark to expose the inner layer (cambium).
5. Cut a 1–2 inch section with bud from the scion (budwood).
6. Place the scion bud inside the T-cut on the rootstock.
7. Secure the bud using grafting tape to hold it in place.
8. Keep the plant in good conditions, ensuring proper watering and nutrients.
9. Once new growth appears, prune the rootstock above the graft to help the scion grow.





Teacher Guidelines:

1. Divide the Class into 6 or 8 groups, each having not more than 4 students.
2. The activity can be done at least 2 times in a year.
3. Make sure all students follow safety precautions e.g. wear gloves when cutting with knife.



Discussion with students:

1. What are the methods of grafting?
2. Why is mid-summer the best time for rose grafting?
3. Why do we clean the knife with alcohol before grafting?
4. What is the purpose of grafting tape in T-budding?
5. How can we know if the grafting was successful?

Resources:

You can search on Google using the search words –

1. New Method of Grafting Roses Very Simple + YouTube
2. How to graft roses

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Activity Name

40. Record Keeping of Plants Nursery

Syllabus reference:

Standard/Lesson No.: Class 8 - Chapter 8 - Human Food and Food Production

Concept/Principle: Importance of record keeping, Costing, and Profit.

Materials and tools required:

Notebook, pen/pencil for noting, card paper, sketch pens & markers, writing pad, paper makers (black, red, blue, green), card sheets (A3 size), table (2 x 4 ft size)

Time required: 60 minutes

Objectives:

1. Students will learn how to keep a record of their kitchen garden.
2. Students will learn the importance of cost calculation of farming activities.

Introduction:

Record keeping is one of the very basic skills and an important habit for doing any work. Farming is supposed to be a very dynamic enterprise. Farming activities depend on many external factors like weather, market rate, etc. Many farming activities are interdependent, so one has to link activities properly and plan accordingly.

Farming is a major livelihood enterprise in our country. Based on profit (earnings) we can plan further activities, correct mistakes, decide selling price, etc. Cost-break for different farming activities like land preparation, seeds, seed treatment, fertilizer (compost), labour, etc. has to be properly recorded.

Hands-on activity:

Activity 1: Prepare a record sheet for the school kitchen garden

A) Recording plant growth & input given:

1. Each student will keep an individual record and also work in small groups to keep collective records.
2. Explain the chart to students and ask them to make a table in the daily record notebook.
3. Select any 5 to 10 plants in the kitchen garden (in school). Tie a tag to each plant with a unique number. The tags can be made from chart sheets & thread. Cover the tags with plastic paper (lamination) to protect them from water.
4. The teacher will also maintain a master-record sheet as reference

Sample observation table:

S. No.	Plant identification number	Date of plantation	Date of recording	Plant height (cm)	Number of leaves	Number of flowers or fruits	Remark (any pest or damaged leaf, fruit, etc.)
1*	A1 (tomato)	10th Sep	20th Sept	15 cm	12	2	2 leaves found damaged by pest

(Note: *Sample data filled only for understanding)

B) Recording time of work

1. This chart has to be filled for every major activity (like preparing land, seed sowing, application of compost, pesticide, harvesting, etc.)
2. Record only actual work time and not the time of preparation of the activity.
3. Total time required for the farming activity will be used in the next activity (cost calculation)

S. No.	Name of activity performed	Date of activity	Number of students worked	Time taken to complete work	Total time required for activity	Remark (work complete or not)
1.	Land preparation	5th to 9th Sept	20	20 min	400 min	Work complete
2.	Sowing of seeds*	10th Sept	10	10 min	100 min	Work complete

(Note: *sample data filled only for understanding)

Activity 2: Prepare costing sheet for school kitchen-garden

1. Before every activity, discuss with students about the material to be used for the activity along with its rough cost estimate.
2. Prepare individual cost sheets for bigger activities like preparing vermicompost, vertical bag farming, etc. as given below-

Costing table (example): Costing break-up for seed treatment & sowing activity

S. No.	Raw Material - Name/Method	Quantity used/time	Unit price/ labour cost	Amount	Remark
1	Land preparation	400 min (6.6 Hrs.)	₹20 /hr	₹133.00	Time Taken for Activity (from the Record-Keeping Chart)
2	Coriander Seeds	50 g	₹200 /kg	₹10.00	
3	Seed treatment (application of wood ash + salt to seeds)	Wood-ash – 50 g + Salt – 50 g	₹30 /kg	₹1.50	Wood-ash collected from school free of cost. The cost of salt is taken for the calculation.
4.	Seed sowing labour charge	100 min (1.66 Hrs.)	₹20 /hr	₹33.00	Time Taken for Activity (from the Record-Keeping Chart)
		Total cost		**₹177.50**	

(Note - The above costs are just indicative. Students & instructors have to use the actual cost of activities.)

1. Total cost of cultivation will be in addition to all activity costs.
2. After getting all costs, 'profit margin' of around 25 to 40 % has to be added.
3. Cost + profit margin will be our selling cost of product.
4. The cost of the cultivation chart can be made as per the following format.

Costing table (example): Cost of cultivation of crop-

S. No.	Activity name	Cost incurred (as per individual activity costing sheet)	Any additional cost	Total cost	Remark
1	Land preparation & sowing	177.50	5.00	₹182.5	25 g extra seeds planted due to loss by heavy rains
2	Making & application of compost	4 kg compost @ 40.00	0	₹40.00	
3	Application of organic pesticide	2 Lit @ ₹10/ lit	0	₹20.00	
4	Cleaning (removal of weeds)	20.00	20.00	₹40.00	From Time Taken for Activity (from the Record-Keeping Chart)
		TOTAL		**₹282.50**	

(Note: Students will fill in the actual information.)

Harvesting & production table (example):

S. No.	Name of crop	Dates of harvesting	Quantity harvested	Total harvest	Remark
1.	Coriander	25thOctober	7 kg (28 bundles)	28 bundles	Total crop harvested = (28 + 12) = 40 bundles
2.	Coriander	5th November	3 kg (12 bundles)	12 bundles	

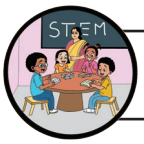
Selling & profit table (example):

S. No.	Name of crop	Total Cost of Production	Production	Cost per unit	Profit margin	Selling price	Total amount earned	Profit earned
Crop 1	Coriander	282.50	10 kg (40 bundles)	₹ 7.06	50 %	₹ 10.00	40 x 10 = 400	₹117.5

Note: From the above table we can see that the total profit from the coriander crop is ₹117.50 in 60 days (5th September to 5th November) duration. All the above tables/charts are only indicative. Students have to fill in original (actual) data in the table and consider the above table only as a sample.

Teacher Guidelines:

1. Divide the class into 6 or 8 groups, each having not more than 4 students.



Discussion with students:

1. What are common records maintained by farmers?
2. What will be the use of these records in school kitchen activity?

Resources:

You can search on Google using the search words –

1. Farm record keeping + crop tracker

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Activity Name

41. Tabletop Hydroponic Nft (Nutrient Film Technique) System

Syllabus reference:

Standard/Lesson No.: Class 7: Chapter 6 - Morphological Diversity and Functions of Living Components of Environment;
Class 8: Chapter 8 - Human Food and Food Production

Concept/Principle: Class 7: Role of osmosis in the survival of organisms in the environment;
Class 8: Crops, Crop Diversity and Crop production

Materials and tools required:

PVC pipe with 2 lids, net pots or cups, water, growing media (cocopeat), plants, plastic container with lid, water pump, tube, drill and drill bits, scissors or a cutting tool, measuring tape, marker or a pencil

Time required: 120 minutes

Objectives:

1. Students will learn hydroponic gardening and the Nutrient Film Technique (NFT).
2. Students will learn to build a small hydroponic system using everyday materials.

Introduction:

- Hydroponic gardening involves growing plants in water and nutrient solution without using any soil. Hydroponic gardens are easy to set up at home, allowing you to grow plants year-round.
- One of the most common hydroponic methods is the NFT systems. In this system,a thin film of water/ nutrient solution continuously flows over the roots, which are suspended in a sloped trough or channel. This provides the roots with both nutrients and oxygen. In this activity, students will explore the basics of hydroponic gardening and learn how to set up a small NFT system.

Hands-on activity:

1. Remove the lid of the plastic container (that will serve as your water reservoir) and place the fish tank pump and air pump firmly at the bottom of the tub on one side. Then attach the 10-14 mm tubing to the pump and cover with the lid.

2. Drill two 10mm holes on the opposite sides of the lid. One hole is for the pump to send water and the second is for the pipe that will bring water from the PVC to the reservoir.
3. Take a 110cm PVC pipe and cut three 10cm diameter holes, such that they are 20cm away from the ends as well as from each other. These holes are for placing the seedlings.
4. Use a drill to make two holes of 1cm each, one on the opposite side of the larger holes and

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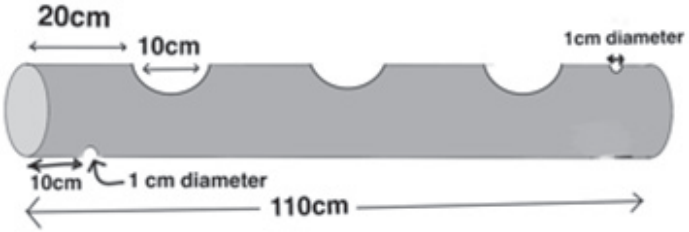
Place water and air pump in the tank. Drill 2 holes in the lid opposite to each other.

Small water tank

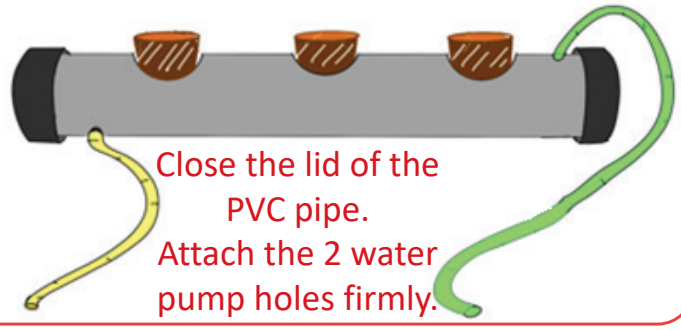
Water tank lid

2

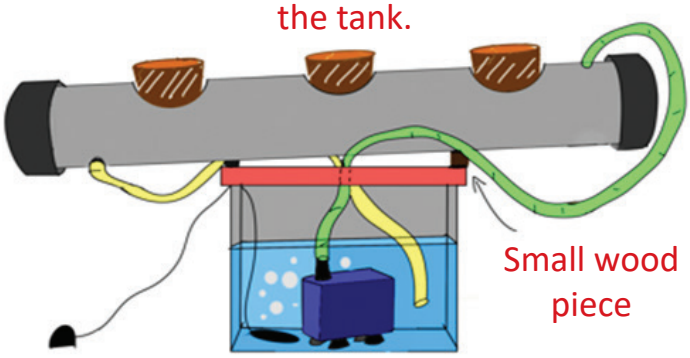


Take a PVC pipe of 110 cm and make the respective 5 holes.

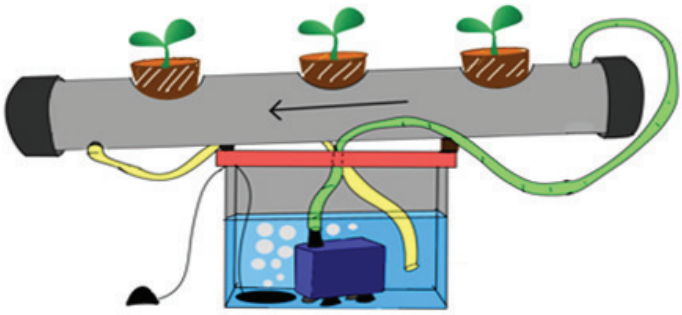
3 place the net pots or cups, in the Upward holes.



4 Now place the PVC setup across the water tank's lid, with a small piece of wood under one end.
Seal everything properly and add water to the tank.



5 Plant seedlings in the net pots and turn on the system



another on the same side, such that they are 10cm away from the ends of the PVC pipe. These are for the reservoir inlet and outlet.

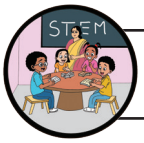
5. Once the holes are done, clean the pipe and fix the lids of the PVC pipe on both ends.
6. Fix both the inlet and outlet pipes, using glue, tape or any other adhesive. This should not leak.
7. Place the net pots/ cups of the appropriate size(10cm diameter) with the growing medium, like cocopeat in the larger holes.
8. Mount the pipe in the centre and across the tub. Fix the pipe to the top of the tub using adhesive plastic glue. The easiest way to angle the pipe is to place a small piece of wood under the end where the water enters .
9. Once the pipe is firmly attached to the tub and lid, insert the reservoir tubes into the holes made on the lid. Attach one tube to the pump and place the other in the reservoir.
10. Fill the reservoir with water and test the system's dynamics. Ensure a mild flow of water is passing through and lightly dripping. If you need to adjust the angle of the pipe, use a smaller piece of wood to raise the pipe. Add seedlings to the growing medium pots when the system works proper

Note:

- Every 5-7 days, the old water should be changed and new water should be added.
- Size of small holes for tubes may depend on the pump, and pot sizes.

Teacher Guidelines:

- Divide the class into 6 or 8 groups, each having not more than 4 students.
- Ensure that students handle sharp tools such as scissors or cutting tools carefully to avoid cuts or injuries.
- Use tools such as drills and saws under adult supervision and follow proper safety procedures.



Discussion with Students:

1. How does the NFT system deliver nutrients to plant roots?
2. What is the main difference between traditional farming and hydroponic gardening?
3. Where can hydroponic systems like the NFT be used, and what types of plants are suitable for them?
4. What are the advantages of hydroponic systems for growing plants?

Resources:

You can search on Google using the search words –

1. DIY guide to NFT + Hydroplanner
2. How to build own hydroponics system + YouTube
3. How to build homemade hydroponics system

Notes

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