

FINAL REPORT

Seminar on Innovative Communication Tools For Secondary School Science Teachers Using Low Cost Teaching Aids -to Improve Science Teaching In Aspirational District Gajapati of Odisha

**Seminar held at
Centurion Public School, Paralakhemundi
Dist-Gajapati, Odisha**

Date : 23 July 2026



Funding Agency

**GIAC,
National Institute of Educational Planing & Administration
New Delhi**



Organised by:

**Socio Cultural Development Centre, Odisha
(SCDC)**

PREFACE

Odisha is a State consisting of 30 districts. The State always suffers from cyclone, flood and other natural calamities. The State is full of natural mineral resources having forest, river and mountain. The positive attributes of the State are advantages for livestock and crop production as well as nature based farming tradition which still prevails. Due to many hardships and the difficult natural calamities, the people of the state have created livelihood opportunities with great determination. Socio Cultural Development Centre (SCDC) established in the year 2001 to create opportunities of gainful self employment of rural families, especially disadvantaged sections, ensuring sustainable livelihood enriched environment, improved quality of life, education and good human values. This is being achieved through development research, effective use of local resources, extension of appropriate technologies and up gradation of skills and capabilities with community participation. **SCDC is a National Awardee Organisation from Ministry of Science & Technology, Govt. of India dedicated for the welfare of faculty of University and College teachers (21 days Geospatial Training), Low Cost teaching aids training programme for Secondary School Science teachers, nurturing scientific talents through organising District Level Science Fair, Industrial Tour for the Students of backward District of Odisha since last 25 years.**

SCDC organised a **Seminar on Innovative Communication Tools For Secondary School Science Teachers Using Low Cost Teaching Aids -to Improve Science Teaching In Aspirational District Gajapati Of Odisha held at Centurion Public School, Paralakhemundi, Dist-Gajapati, Odisha on 23 July 2026.**

SCDC greatly acknowledges the contribution of success of the Seminar funded by GIAC, NIEPA, New Delhi. SCDC is grateful to Registrar, NIEPA, New Delhi, District Education Officer, Gajapati for their valuable guidance and all the Science Teachers of different schools of Gajapati District for their enthusiastic participation. We hope this publication, documenting the information shared in the Seminar will serve as an useful reference material for Science teachers participants using Low Cost teaching aids.

Banamali Sahoo,
President
SCDC

FINAL REPORTS OF THE SEMINAR

1. Executive Summary/Abstract of the Seminar

Low-cost teaching aid refers to the aid prepared with simple materials costing very little by involving science teacher and student. Inexpensive aids could be prepared easily with little or no money to make learning effective, comprehensive and fascinating. The science teacher with a certain amount of skill and enthusiasm can replace many pieces of apparatus by low-cost teaching aids as a substitute of procuring costly science apparatus and equipment. Low-cost teaching aids have an advantage of offering learning by doing approach to the teaching learning process. When teachers and students plan, produce or create their own educational materials, they invariably manifest pride and pleasure in utilizing them to the maximum. Effective science teaching depends on three factors, teacher, equipment and materials. Locally produced low-cost equipment, teaching aids or models can serve the needs of the teacher, the student and the curriculum more effectively and is easier to maintain. Science education at School level in Rural Villages faces several problems. Mostly in rural villages teachers follow the traditional way of teaching using talk and chalk and using the text books for teaching, because of this methodology students can't be able to understand the concept clearly and it makes them no interest towards science. The teachers need to adapt new teaching methodologies to create interest among the students. The teachers need to upgrade skill themselves to innovate a method to teach through activity based i.e. through demonstration of the concepts. The most significant outcome of this programme may be that it will experiment away from classroom. Science learning process strongly feels that in any process of educational change, it is not enough to change the text books or the methodology of teaching but also to modify approach and systems and introduce a series of changes, which together constitute a complete package. We must bring to light all the factors which may enhance the efficiency of science teaching through this method.

2. Objectives

- i. To create a platform for knowledge exchange, capacity building and outreach activities in the field of knowledge products through Toys and Games.
- ii. To develop cutting-edge toys, games and knowledge products that enhance creativity learning outcomes and skill development among students.
- iii. To create group of resource trained teachers having ability to organize hand on activities in the schools existing in the district.
- iv. Constructing teaching aids and improving apparatus using low-cost house hold materials and discarded things
- v. To inculcate creativity and the technological learning needs of school students as per their needs

3. Inaugural Session

The inaugural session of the seminar on " Innovative Communication Tools for Secondary School Science Teachers using Low-Cost Teaching Aids -To improve Science Teaching in Aspirational District Gajapati of Odisha " began with lamp lighting, a welcome address, and a keynote speech on the use

of low-cost teaching aids as an alternative method of effective science learning and education for secondary school students.

Events followed

- Invocation and Lamp Lighting: The ceremony started with a prayer song followed by dignitaries lighting the traditional lamp to mark a bright beginning.
- Welcome Address: The Principal of school delivered the welcome speech, greeting the chief guest, speakers, Resource persons and attendees.
- Keynote Address: The Chairman of the Organizing Committee, Chief Guests, Chief speaker, District Education Officer, Gajapati District, Registrar, Centurion University, Dean, School of Agriculture, Centurion University, Gajapati and other dignitaries spoke about the rapid changes in tech-based learning and the importance of low-cost teaching aids for science education in secondary schools.
- Vote of Thanks: The programme coordinator thanked all guests, faculty members, and participants for making the opening session a grand success.

4. Plenary

The plenary session began with the following activities

Opening and Introduction

- Welcome note: District Education Officer, Gajapati District, chaired and opened the session.
- Core theme: Focused on use of low-cost materials to demonstrate the basic concepts of science among the participants.
- Key speakers: Introduced three main experts who demonstrated the small kits made from low-cost materials for the covering the basic concepts of science

Key Presentations

Resource Person one: Shared and demonstrated small kits made from low-cost materials covering basic concepts of Physics included in Secondary school

Resource Person two: Shared and demonstrated small kits made from low-cost materials covering basic concepts of Chemistry included in Secondary school

Resource Person three: Shared and demonstrated small kits made from low-cost materials covering basic concepts of Biology included in Secondary school

Discussion and Closing

Q&A round: Audience asked about reasons behind each demonstrated experiment

Main result: Group agreed on shared goals.

Final words: Chair thanked all the Resource Person

5. Technical

The technical session began with the power point presentation of resource persons covering the topics included in Physics, Chemistry and Biology as per NCERT school science course curriculum.

Technical Session-I

Power point presentation on the activities covering the topics of Physics as per NCERT school science course curriculum such as Forces and Motion, Energy and Sound, Light and Electricity, Motion (speed, velocity, acceleration), Force and Laws of Motion, Gravitation, Work and Energy, and Sound basics.

Technical Session-II

Power point presentation on the activities covering the topics of Chemistry as per NCERT school science course curriculum such as Basic introduction to materials, separation of substances, and changes around us, Acids, bases, salts, and physical/chemical changes, Chemical reactions and equations, acids, bases, salts, metals and non-metals, and carbon compounds.

Technical Session-III

Power point presentation on the activities covering the topics of Biology as per NCERT school science course curriculum such as Cell organelles, plant/animal tissues, Nutrition, respiration, transportation, and excretion, Asexual/sexual reproduction, genetics, and evolution

6. Summary of Discussion (Manuscript should be given in the Annexure)

Seminar Overview

- Topic: Innovative Communication Tools for Secondary School Science Teachers using Low-Cost Teaching Aids.
- Objective: Improve science teaching through affordable, accessible, and high-impact visual tools.
- Audience: Secondary school science teachers, science supervisors, and curriculum developers.

Key Discussion Points

The Need for Low-Cost Teaching Aids

- High-cost laboratory equipment is often unavailable in resource-constrained and rural based schools.
- Basic science concepts require physical, hands-on models for better student understanding.
- Affordable tools sensitize science education and boost student engagement.

Innovative Communication Tools and Techniques

- Recycled Material Models: Using plastic bottles, cardboard, and straws to teach anatomy, physics, and chemistry.
- Local Environment Labs: Utilizing backyard items like lemon juice, turmeric, and baking soda for chemistry indicators.
- Interactive Storytelling: Blending low-cost props with narrative techniques to explain complex scientific laws.

Overcoming Implementation Challenges

- Teachers often lack the training or time to design low cost teaching tools.

- The seminar highlighted the need for open-source digital repositories of low-cost blueprints.
- Peer-to-peer mentoring helps teachers share successful classroom experiments. Actionable Takeaways
- Simplification: Start with simple materials available in any household.
- Interactivity: Ensure the tool allows students to touch, test, and experiment.
- Scalability: Design aids that can be easily replicated for large classrooms.

7. Valedictory Session

Seminar Theme:

Innovative Communication Tools for Secondary School Science Teachers using Low-Cost Teaching aids

Objective: Improving science pedagogy through accessible, low-cost materials.

Opening and Synthesis

- Dignitary Welcome: The session began with the formal welcoming of the Chief Guest (Registrar, Centurion University, Dean, School of Agriculture, Centurion University, Gajapati, Odisha, District Science Supervisor, office of the District Education Officer, Gajapati and other dignitaries on the dais.
- Seminar Summary Report: The organizing coordinator presented a concise summary of the technical sessions, highlighting how daily household items can help demonstrating complex scientific principles.
- Key Indicators: Speakers emphasized that low-cost aids would help strengthening science education, bridging the resource gap between urban and rural secondary schools.

Valedictory Address and Participant Reflection

- Chief Guest Address: The Chief Guest delivered an inspiring speech on how innovative communication tools stimulate critical thinking and curiosity in young students.
- Call to Action: Teachers were encouraged to view low-cost aid generation not as a budgetary constraint, but as a creative opportunity to make science tactile and memorable.
- Participant Feedback: Some of the participating teachers shared their feedback, stating the practical activities gave them immediate, actionable ideas for their classrooms.

Recognition and Closure

- Certificate Distribution: Dignitaries awarded certificates of participation to all attending secondary school science teachers.
- Vote of Thanks: The convener expressed formal gratitude to the funding agencies, **GIAC**, **NIEPA**, school administrations, resource persons, and organizing committee.
- National Anthem: The seminar officially concluded with the singing of the National Anthem, followed by a high tea session.

8. Schedule of Seminar (to be given in the Annexure)

PROGRAMME SCHEDULE	
23.07.2026	Session - 1
9.00 - 9.30am	Registration of Teachers & Breakfast
9.30 - 10.15am	Inauguration & Lighting of Lamps and Guest Speech Sri Mayadhar Sahoo, DEO, Gajapati - Chief Guest Prof. Dr. Anita Patra, Registrar, CUTM- Guest of Honour Prof. Dr. S.P. Nanda, Dean, School of Agriculture, CUTM- Chief Speaker Sj. Banamali Sahoo, Chirman, SCDC, Guest of honour Smt. Sunita Panigrahee, Principal, Centurion Public School, Paralakhemundi give the Vote of Thanks.
10.15-10.30am	Tea break
10.30-12.30pm	Session-2 : Chaired by Mayadhar Sahoo, DEO, Gajapati Resource person- Sri Santosh Kar , Head Master, Jayadurga High School, Narla Road, Kalahandi, (2) Ajay Kumar Sahoo, Science Teacher, Govt. High School, Kesinga, Kalahandi to give hands on practical training (Demonstration of science activities using low-cost teaching aids)
12.30-1.45pm	Session-3 : Chaired by S.P. Nanda, Dean School of Agriculture, Centurion University Resource Person, Prof. Manoj Das, Former Principal, Jawahar Navodaya Vidyalaya, Konark, Dist-Puri (Power point presentation on the concepts of Physics & Chemistry)
1.45-2.30pm	Lunch Break
2.30-3.45pm	Session-4 : Chaired by Sunita Panigrahi, Principal, Centurion Public School, Paralakhemundi, Gajapati Resource Person, Prof. Manoj Kumar Ghosal, Former Professor & Dean, Department of Agricultural Engineering & Technology, OUAT, Bhubaneswar (Power point presentation on the concepts Biology) Group Discussion and Questionnaire by Science Teachers participants
3.45-4.00pm	Tea break
4.00-5.00pm	Valedictory function Concluding session, Chief Guest and Chief Speaker speech along with distribution of Participation certificates to Science teachers participants

- Seminar Summary Report: The organizing coordinator presented a concise summary of the technical sessions, highlighting how daily household items can help demonstrating complex scientific principles.

9. Recommendations

The seminar on "Innovative Communication Tools for Secondary School Science Teachers using Low-Cost Teaching Aids" highlights a critical need to make science education more accessible, engaging, and practical. Traditional, theory-heavy teaching methods often fail to inspire students or explain complex scientific concepts effectively.

Core Findings

- Expensive laboratory set up is not required to teach high-quality secondary school science.
- Household items and recycled materials can successfully demonstrate complex physics, chemistry, and biology concepts.
- Hands-on, low-cost tools bridge the gap between abstract textbook theories and real-world applications.
- Visual and tactile learning significantly boosts student engagement, retention, and exam performance.

Strategic Recommendations

- To successfully improve science teaching across secondary schools, the following actions are highly recommended:
- Mandate Toolkit Creation: Every secondary school science teacher should build a personal "Low-Cost Science Kit" using everyday items like plastic bottles, magnets, straws, and cardboard.
- Launch Peer-Sharing Networks: Schools must establish monthly cluster meetings where teachers share successful low-cost experiment designs and communication techniques.
- Revamp Lesson Plans: School administrations should require lesson plans to integrate at least one hands-on, low-cost demonstration per science chapter.
- Ditch Rote Memorisation: Internal school assessments should shift toward evaluating a student's ability to explain the science behind these low-cost models.
- Provide Continuous Training: **District science supervisors must host regular, practical workshops to train teachers on transforming waste materials into high-utility learning aids in all Aspirational District of Odisha.**

Seminar on "Innovative Communication Tools for Secondary School Science Teachers using Low Cost Teaching Aids -To improve Science Teaching in Aspirational District Gajapati of Odisha"

Organised by : Socio Cultural Development Centre, Odisha

Venue : Centurion Public School, Parakhemundi, Dist-Gajapati, Odisha

Date : 23 July 2026

Feed Back of the Programme

Name: Dr. Mayadhar Sahu

Designation: District Education Officer

Institution: Gajapati

Following item you have enjoyed

	Very Good	Good	Normal	Average
Interaction Programme	✓			
Knowledge of Resource person	✓			
Benefit of Subject	✓			
Seminar Activity	✓			
Overall Experience	✓			

Remarks: The Seminar is effective and Inspiring to all Science teachers of Gajapati District for effective transactions of Science Concepts

Signature

District Education Officer
Gajapati, Parakhemundi

Seminar on "Innovative Communication Tools for Secondary School Science Teachers using Low Cost Teaching Aids -To improve Science Teaching in Aspirational District Gajapati of Odisha"

Organised by : Socio Cultural Development Centre, Odisha

Venue : Centurion Public School, Parakhemundi, Dist-Gajapati, Odisha

Date : 23 July 2026

Feed Back of the Programme

Name:.....SUNITA PANIGRAHEE.....

Designation:.....PRINCIPAL.....

Institution:.....CENTURION PUBLIC SCHOOL,
PARAKHEMUNDI

Following item you have enjoyed

GAJAPATI
ODISHA

	Very Good	Good	Normal	Average
Interaction Programme	✓			
Knowledge of Resource person	✓			
Benefit of Subject	✓			
Seminar Activity	✓			
Overall Experience	✓			

Session was extremely beneficial. more than 80 Teachers of various schools from Gajapati District attended the seminar. Science teachers got an extremely extensive knowledge about the communication tools to make the science classes more attractive and there will be conceptual clarity. We are so very much grateful to SDC, Odisha for the extremely enriching seminar held in our school today (23.07.2026).

Signature

Principal

Centurion Public School
Parakhemundi, Gajapati
ODISHA

Seminar on "Innovative Communication Tools for Secondary School Science Teachers using Low Cost Teaching Aids -To improve Science Teaching in Aspirational District Gajapati of Odisha"

Organised by : Socio Cultural Development Centre, Odisha

Venue : Centurion Public School, Parakhemundi, Dist-Gajapati, Odisha

Date : 23 July 2026

Feed Back of the Programme

Name: Y. Krishna Rao

Designation: D.S.S. Gajapati

Institution: DEO. Office

Following item you have enjoyed

	Very Good	Good	Normal	Average
Interaction Programme	✓			
Knowledge of Resource person		✓		
Benefit of Subject	✓			
Seminar Activity	✓			
Overall Experience	✓			

Remarks: The programme is effective to develop Scientific skills in the class room transaction.

Signature
Y. Krishna Rao
District Science Supervisor
Gajapati, Parakhemundi

Seminar on "Innovative Communication Tools for Secondary School Science Teachers using Low Cost Teaching Aids -To improve Science Teaching in Aspirational District Gajapati of Odisha"

Organised by : Socio Cultural Development Centre, Odisha

Venue : Centurion Public School, Parakhemundi, Dist-Gajapati, Odisha

Date : 23 July 2026

Feed Back of the Programme

Name: Mohini Majhi

Designation: P.G.T Science (Biology)

Institution: Centurion Public School, Parakhemundi

Following item you have enjoyed

	Very Good	Good	Normal	Average
Interaction Programme	✓			
Knowledge of Resource person	✓			
Benefit of Subject	✓			
Seminar Activity	✓			
Overall Experience	✓			

Remarks: The seminar was highly informative, interactive, practical, engaging and directly applicable in classroom teaching. It was an excellent learning experience.

Mohini
Signature

Seminar on "Innovative Communication Tools for Secondary School Science Teachers using Low Cost Teaching Aids -To improve Science Teaching in Aspirational District Gajapati of Odisha"



Date : 23 July 2026

Organised by : Socio Cultural Development Centre, Odisha

**CENTURION
PUBLIC SCHOOL**

Venue : Centurion Public School, Paralakhemundi

Participation Certificate

This is to certify that Dr/ Mr/ Mrs/ Miss has participated in Seminar on "Innovative Communication Tools for Secondary School Science Teachers using Low Cost Teaching Aids -To improve Science Teaching in Aspirational District Gajapati of Odisha" Funded by National Institute of Educational Planning and Administration, New Delhi.

Banamali Satoh
Chairman
SCDC

Susanta Parigade
Principal
Centurion Public School

[Signature]
Chief Guest
District Education Officer, Gajapati

LOW COST TEACHING AIDS FOR SECONDARY SCHOOL SCIENCE TEACHING

**PRESENTED BY: DR. MANOJ KUMAR GHOSAL, FORMER
PROFESSOR & DEAN
ODISHA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY,
BHUBANESWAR, ODISHA**

THEME OF NATIONAL SCIENCE DAY 2026

- The theme of National Science Day 2026 was "Women in Science: Catalysing Viksit Bharat". This focus highlights the critical contribution of women in STEM (Science, Technology, Engineering, and Mathematics) fields toward realizing India's goal of becoming a **developed nation by 2047**.

C.V. RAMAN'S STATEMENT

- I am the master of my failures. If I never fail, how will I ever learn.

A. P. J. ABDUL KALAM'S STATEMENT

- Teaching is a very noble profession that shapes the character, calibre, and future of an individual. If students remember me as a good teacher, that will be the biggest honour for me.

PROBLEMS USUALLY PREVALING IN SCHOOLS

- No **specific room for science laboratory** and **electricity facility** in majority of schools in rural areas.
- Items such as maps, charts, posters, globe and atlases are only present in Headmaster/Headmistress's office room.
- Less time devoted to teaching by teacher (about 30 %) due to involvement in many **non-academic activities** like election duty, carrying out surveys, pulse polio campaigns and maintaining mid-day meal registers (NIEPA Report 2024, under MHRD, Govt. of India).
- Computer provided under **Computer Aided Learning (CAL) programme** in Government-run elementary schools of Odisha are almost in defunct condition or stolen.
- No teacher is **computer literate** due to lack of training.
- Less attraction to science subject by the students for lack of proper demonstrations and **teaching on theory based through text book only**.
- **Very less exposure visit of students to** science museums, planetariums, biological parks or places of scientific importance.
- **No low cost teaching aids found** in all schools of rural areas other than urban based schools due to constraints in adequate funds..

NEED OF LOW COST TEACHING AIDS

- Encouraging and stimulating **scientific and technological tempers** among students through trained teachers of schools by "**learning in doing**" approach
- Funds allocated to school education by state Govt. is meagre resulting into non-procurement of expensive science teaching materials causing the very need in use of low cost teaching aids from locally available cheap materials or through **modern audio-visual aids** like computers, internet surfing, LCD projectors, Power point presentation, educational CD and DVDs, you tubes use etc.
- **Maintaining equity in science education** among students of disadvantageous groups from rural areas, tribal and other socio-economically underprivileged section of urban areas
- **Bridging rural-urban divide** among the students mainly due to poor infrastructure, inadequate support systems, lack of access to information and other resources in rural areas
- Teaching science through **low cost teaching aids** by trained teachers would facilitate the proper understanding of scientific concept, idea convincingly which would discourage the act of cramming the subject by students
- **Upgrading the skills of teachers** to innovate a method to teach through activity based learning to cover curriculum i. e demonstration of concepts.
- **Creating an environment of interest and interactions** among students for science learning

EFFECTIVENESS IN SCIENCE TEACHING AND EDUCATION

- Today's age is the age of science and technology and revolutionary changes are being witnessed in science and technology
- Learning by doing is an effective approach in science education
- Cramming/memorizing mechanically a concept seven times is same as seeing and doing its demonstration once.


Mohith Agadi, an Indian Philosopher
- I hear and I forget
I see and I remember
I do I understand


Confucius, a Chinese Philosopher
- The mediocre teacher tells
The good teacher explains
The super teacher demonstrates
The great teacher inspires


William Arthur Ward, an American Philosopher

AWARENESS ON USE OF LOW COST TEACHING AIDS IN SCIENCE LEARNING

- To arouse interest among teachers regarding the technological learning needs of children for fulfilling their needs
- To create group of trained teachers in the subject of Science having ability to organize hand on activities in School and District level.
- To construct low cost teaching aids and to improve apparatus using locally available cheap resources from the near by surroundings
- To develop creativity, originality and conceptual thinking among the teachers
- To change in science teacher preparation programmes in the light of new role specifications and developing necessary teaching competencies
- To build-up educational foundation for education in life

BROAD AREAS OF ACTIVITIES TO BE FOLLOWED THROUGH AWARENESS PROGRAMME

➤ HARD SKILL DEVELOPMENT

- ❖ Preparation and demonstration of low cost teaching aids/tools based on science curriculum of school students using household wastes and discard materials

➤ SOFT SKILL DEVELOPMENT

- ❖ Teaching/Learning in use of computer, internet surfing, Power point presentation slides, LCD projector, Animated power point slides, YouTube video

➤ AWARENESS ON SECURED SOURCE OF POWER AVAILABILITY

- ❖ Awareness in use of solar photovoltaic panel for power generation to run IT devices

➤ AWARENESS ON WASTE UTILIZATION TO VALUABLE ITEMS

- ❖ With a bit of creativity and imagination, wastes such as scraps of metal, wood, plastic, rubber, paper, card board etc. can be converted into valuable items/module which can be used as effective teaching tools for science subject in school.

SCIENCE

Science has derived from the latin word “scientia” means knowledge, acquiring knowledge and collecting information

Science is the study of nature and behaviour of natural things and the knowledge we obtain about them.

ENGINEERING

Engineering is the creation of new things such as tools, devices, structures, machines, frame works, parts and processes based on *scientific* knowledge.

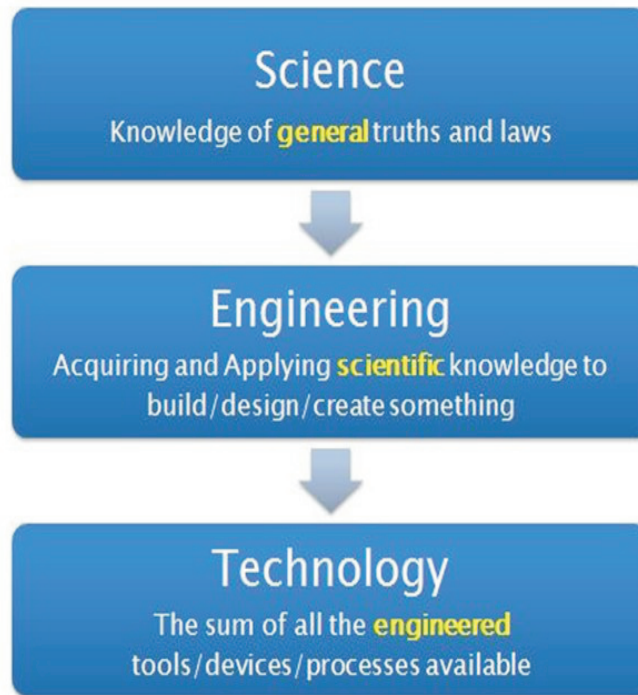
Engineering is creation based on the scientific knowledge put together. *engineered* tools, devices and processes available.”

TECHNOLOGY

Technology is the set of engineered creations put together for the need of mankind and society.

Technology is the sum total of all the *engineered* tools, devices and processes available.”

“Scientists study the world as it is; engineers create the world that has never been.” and technologist help the people of the world as per their needs.

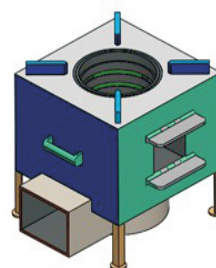


Science comes from **observation** of the world, Engineering comes from acquiring and **applying knowledge**, and Technology comes from repeated **application** and approval of the engineered tools.

EXPLAINING SCIENCE, ENGINEERING AND TECHNOLOGY

BURNING OF BIOMASS FOR THERMAL ENERGY GENERATION AND COOKING FOOD

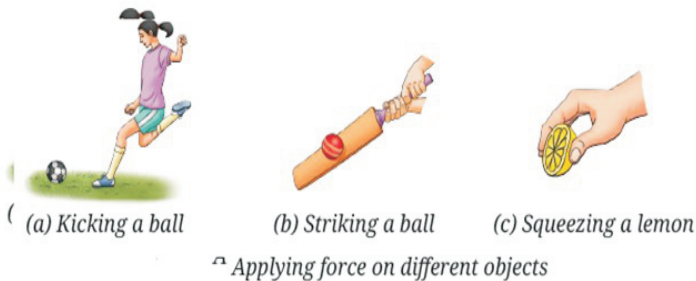
- The example of Science is burning wood that produces water, heat and carbon dioxide.
- The example of engineering is to build a chimney and fireplace makes it simpler to cook with flame without filling the smoke in room.
- The example of technology is that fire can be utilized to cook different types of food items



CHAPTER: HOW FORCES AFFECT MOTION

TOPIC: CONCEPT OF FORCE AND ACCELERATION

- Force is a push or pull on the object causing it to move from rest, change the speed, direction and can even change its shape
- To cause an object to change velocity (i.e. accelerate/decelerate) we need to apply force



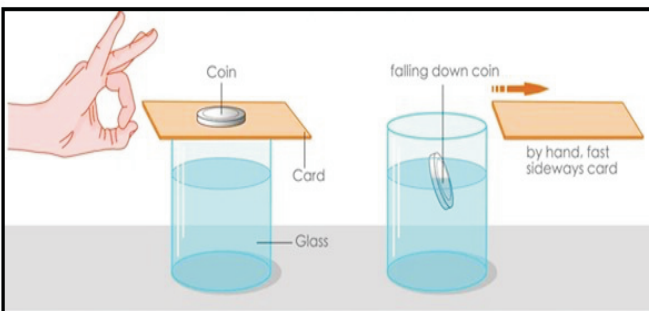
Small force = small acceleration



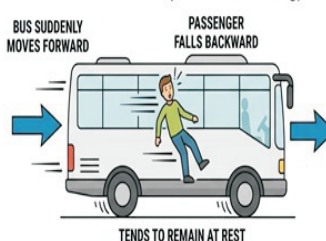
Double the force = double the acceleration

INERTIA

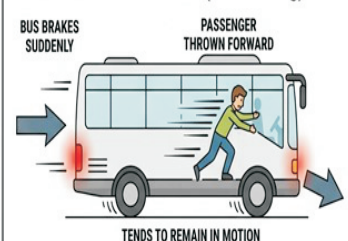
- Inertia is the natural property of matter that causes it to resist any change in its state of rest or motion. An object at rest stays at rest, and a moving object continues moving at a constant speed in a straight line, unless acted upon by an outside force.



1. INERTIA OF REST (Bus Accelerating)



2. INERTIA OF MOTION (Bus Braking)



Materials Needed:

A small, clear glass or cup, A smooth, stiff piece of playing card or cardboard, A coin (like a ₹5 or ₹10 coin)

- Place the cardboard flat over the mouth of the glass. Balance the coin right in the center of the cardboard, over the empty space in the glass. Using your index finger and thumb, **quickly flick the cardboard sideways** so that it flies off the glass.

What Happens & Why:

- When you flick the card, it moves away instantly due to the applied force. However, the coin stays completely still in mid-air for a split second because it wants to maintain its state of rest due to inertia. Once the support is gone, gravity pulls the coin straight down, causing it to drop safely into the glass

NEWTON'S LAWS OF MOTION

NEWTON'S THREE LAWS OF MOTION

1. FIRST LAW (LAW OF INERTIA)

An object at rest stays at rest, and an object in motion stays in motion at constant speed in a straight line unless acted upon by an external force.



A book on a table stays at rest until pushed

2. SECOND LAW (LAW OF FORCE AND ACCELERATION)

The acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass.



Pushing a lighter box is easier than pushing a heavier one

3. THIRD LAW (ACTION-REACTION LAW)

For every action, there is an equal and opposite reaction

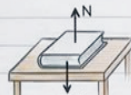


When you jump off a boat, the boat moves backward

NEWTON'S LAWS OF MOTION (REVISION)

① FIRST LAW (Law of Inertia)

An object remains at **REST** or in **UNIFORM MOTION** unless acted upon by an **external force**.



Book on table (rest)



Ball rolling



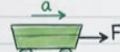
Passenger leaning forward in bus.

Inertia = resistance to change.

② SECOND LAW

Force = mass × acceleration.

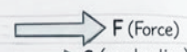
$$F = m \times a$$



Empty cart (moves easily)



Loaded cart (moves slowly)



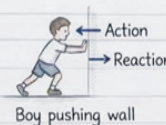
More force → more acceleration.

③ THIRD LAW

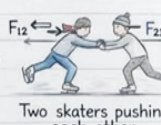
For every **action**, there is an **equal** and **opposite** reaction.



Rocket launch

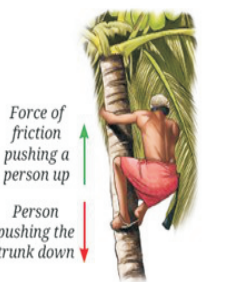


Boy pushing wall



Two skaters pushing each other

- 1st → Inertia
- 2nd → $F = ma$
- 3rd → Action = Reaction



A person climbing a coconut tree

CHAPTER (GRAVITATION): DIFFERENCE OF MASS AND WEIGHT OF BODY



MY WEIGHT ON EARTH IS AROUND
560N



MY WEIGHT ON THE MOON IS AROUND
90N



MY MASS IS ALWAYS
56KG

MASS

The quantity of matter in a body is known as the mass

Mass is a scalar quantity

The mass of a body is constant everywhere in the universe

The mass of a moving body is $m = F/a$

The unit of mass is kg

WEIGHT

Weight is the gravitational force with which the Earth attracts objects towards its centre

Weight is a vector quantity

The weight of the body is variable. The weight of a body depends on the location.

The weight of the body is given by $W = mg$

The unit of weight is N

➤ The relation between weight and mass of an object with 1kg mass will have a weight of 9.8N.

➤ Which is heavier, 1kg cotton or 1 kg sugar?

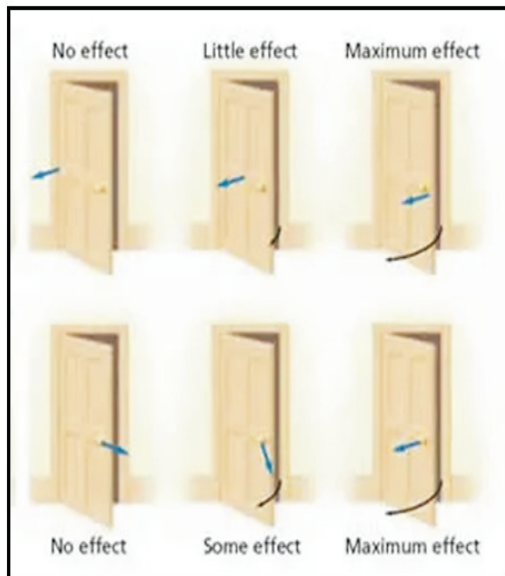
➤ Both have the same mass: 1 kg of cotton and 1 kg of sugar have the same mass. In air, however, 1 kg of cotton may appear a little lighter because of larger buoyant force (it displaces more air), so its apparent weight is slightly less.

➤ Is 1 kg cotton heavy or 1kg iron

➤ They both weigh exactly the same. Because both are 1 kg, their mass is identical.

(CHAPTER: DESCRIBING MOTION AROUND US) TORQUE (ROTATIONAL FORCE)

- In physics, torque (also known as the "moment of force") is the rotational equivalent of linear force. It measures a force's ability to twist or rotate an object around a specific axis or pivot point.

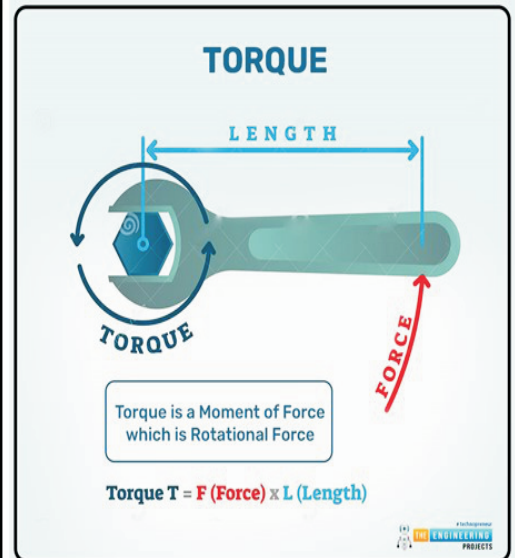


The amount of torque generated depends on three things:

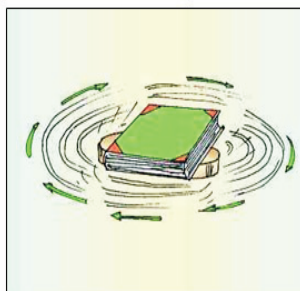
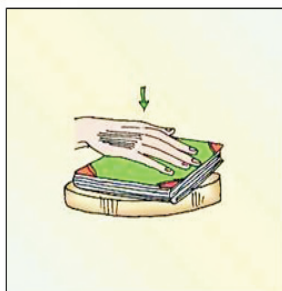
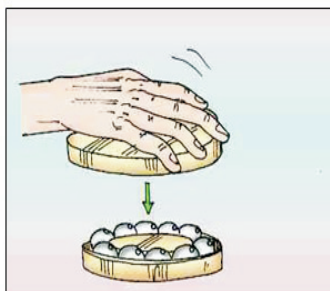
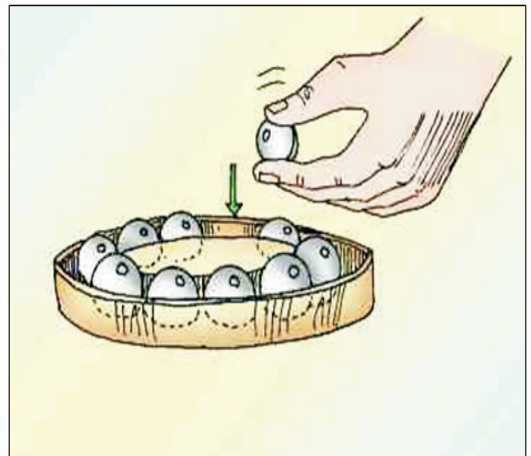
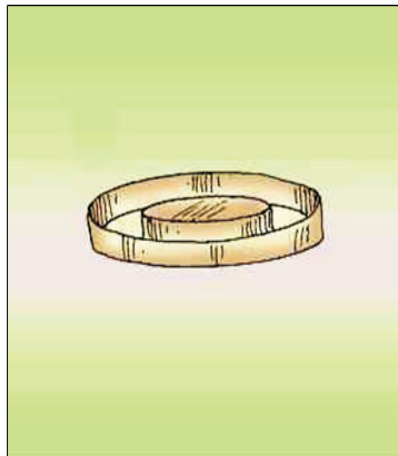
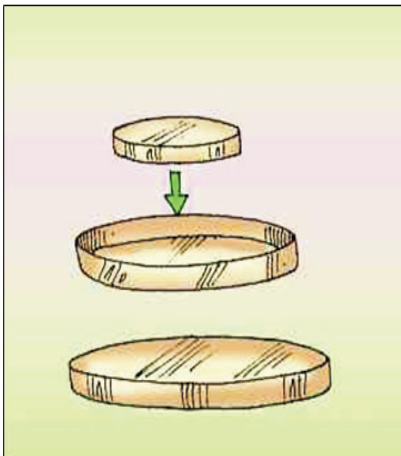
- (i) The magnitude of the force applied.
- (ii) The distance (or "lever arm") from the pivot point to where the force is applied.
- (iii) The angle at which the force is applied.

The mathematical formula for torque is:

$T = r \times F \sin \theta$ maximum torque is achieved when you push or pull at a 90° angle (perpendicular) to the lever arm



BALL BEARING TO REDUCE FRICTION



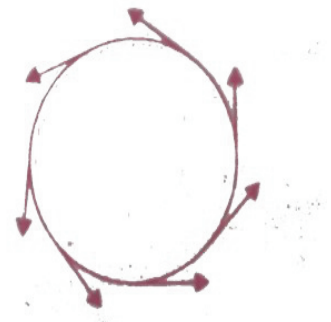
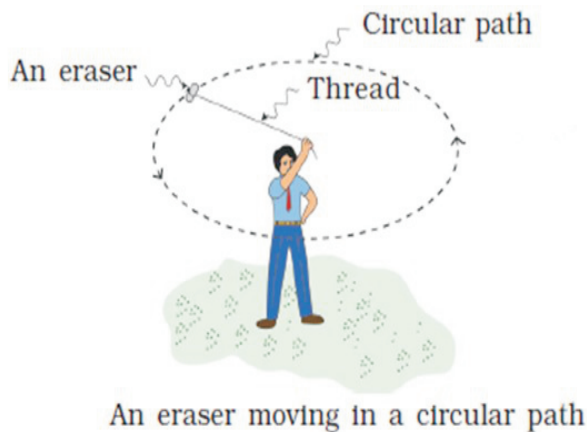
Materials Used

- Glass marbles
- Three bottle caps (like those on jam jars) of different sizes
- A book

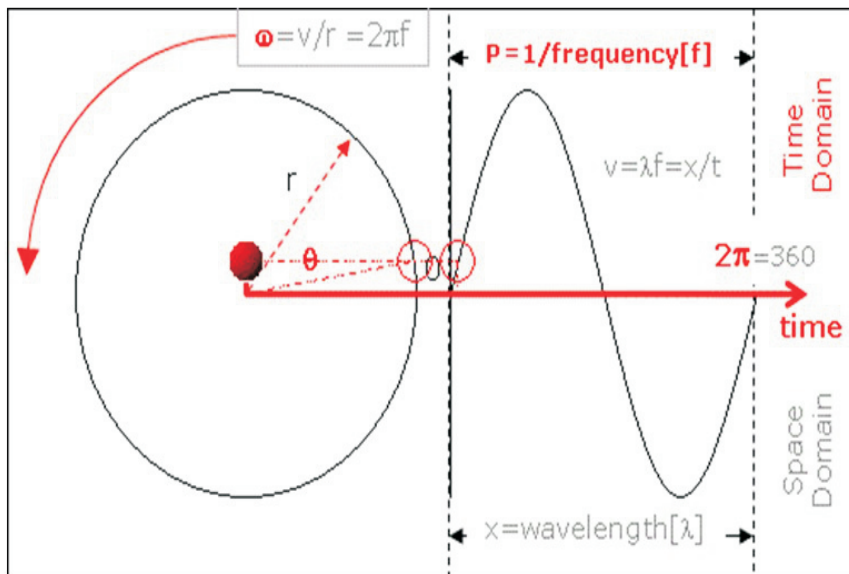
Direction of motion of a body moving in a circular path

Strong thread about 1 m and an eraser

At any point along its circular path, a body moves in a direction tangential to the circle. While the object travels in a circle, its continuous change in direction requires an inward force (centripetal force) pulling toward the center. If this inward force breaks, the body flies off in a straight line tangent to the last point of its path.

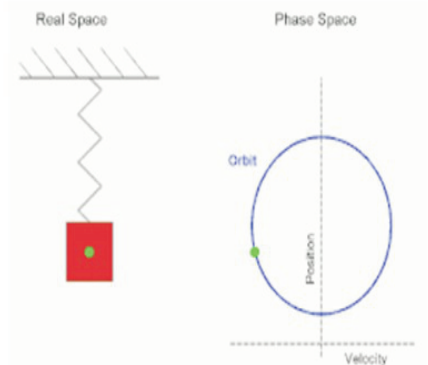


CHAPTER: (WORK, ENERGY AND SIMPLE MACHINES): SIMPLE HARMONIC MOTION

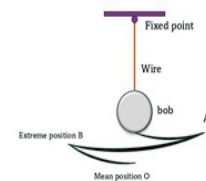


Harmonic motion is any motion, repetitive, or periodic, back-and-forth movement around an equilibrium position over **regular interval of time (periodic)**. (pendulum in wall clock) Most common type is simple harmonic motion (SHM), where restoring force driving object back to the center is directly proportional to its distance from that center point

Simple Harmonic Motion (SHM) is a special type of **periodic** motion where the **restoring force** on the moving object is directly **proportional** to the object's displacement magnitude and acts towards the object's equilibrium position.



The pendulum is said to have completed one oscillation when its bob, starting from its mean position O, moves from one extreme position A to the other extreme position B and comes back to O.



DIFFERENT TYPES OF MECHANICAL LEVERS AND MECHANICAL ADVANTAGES

Levers and Inclined Planes

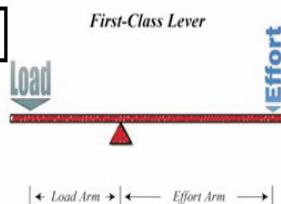
- ▣ **Lever:** A simple machine that changes the amount of force you need to put on an object to move that object.
- ▣ It consists of a bar that rotates around a fixed point, the **fulcrum**.
- ▣ **Effort force:** The force you exert on a lever to make it move.

Formula: $MA = \{\text{Length of Effort Arm}\} / \{\text{Length of Load Arm}\}$

Levers Continued...

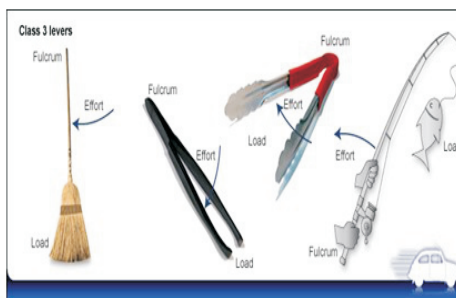
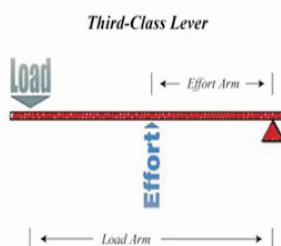
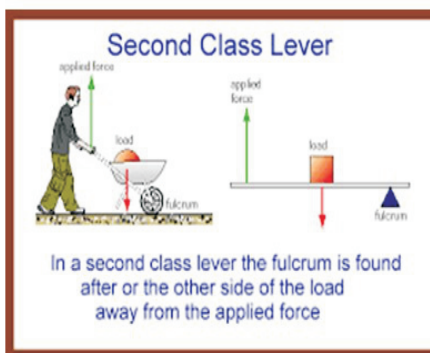
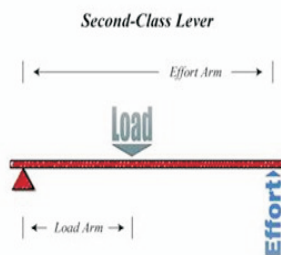
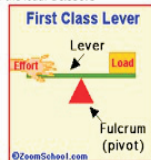
- ▣ **Load:** The mass of an object that is moved or lifted by a machine such as a lever.
- ▣ **Effort arm:** The distance between the fulcrum and the effort force.
- ▣ **Load arm:** The distance between the fulcrum and the load.

SIMPLE MACHINES

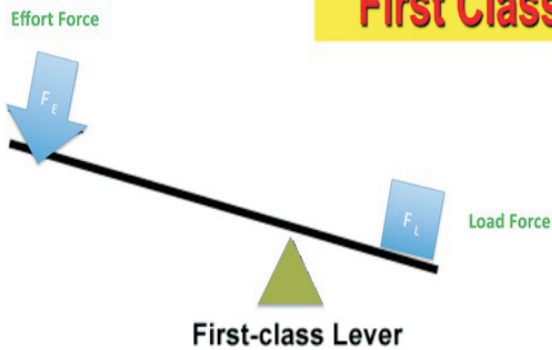


Classes of Levers

- ▣ **Class 1 Lever:** The fulcrum is between the effort and the load. **Scissors**



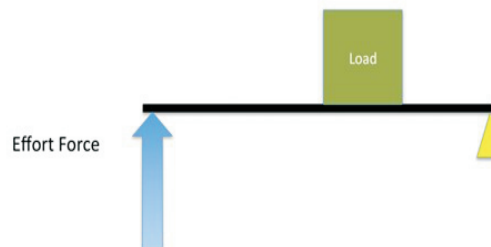
First Class Lever



Fulcrum is between F_E (effort force) and F_L (load force)
 When the **effort moves farther than load**, the Mechanical advantage > 1
 When the **effort moves less than the load**, the Mechanical Advantage < 1



Second Class Lever



Load is **between** fulcrum and Effort
Effort moves farther than Load.

Multiplies Effort Force, but does not change its direction

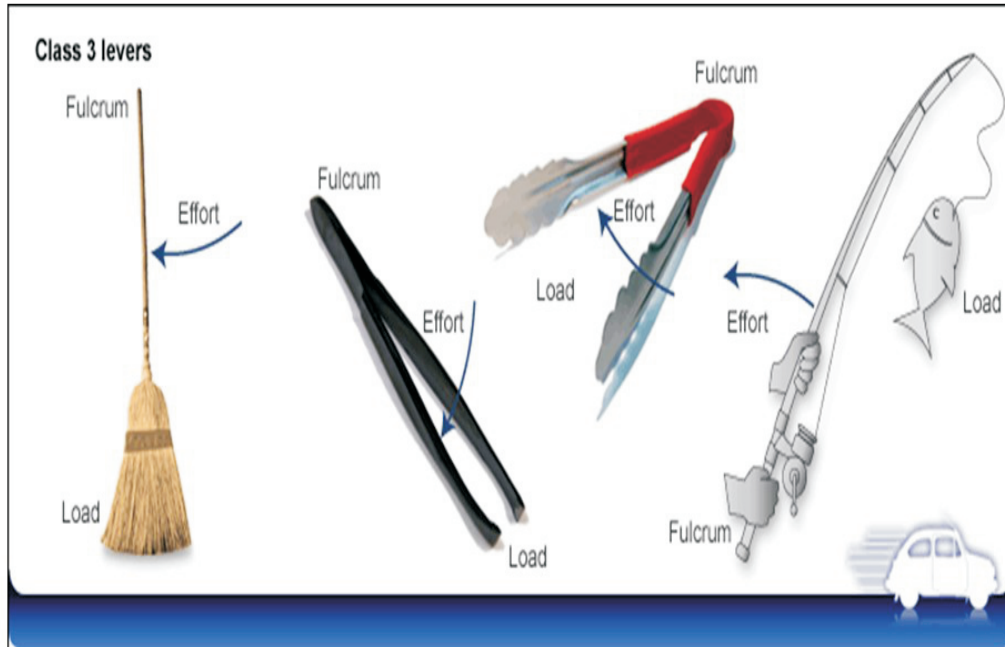
The **mechanical advantage** of a 2nd class lever is always greater than 1



THIRD CLASS LEVER

Third class lever

- Effort force located between the load and the fulcrum.
- Effort arm is always shorter than load arm
- MA is always less than one



Chapter: (Mechanical properties of fluid) Bernoulli's Principle

•Bernoulli's equation represents the conservation of energy in a moving fluid.

•Pressure energy (E) is the energy stored in a fluid due to its pressure. It is written as the product of pressure (P) and volume (V):

•Formula: $E = PV$

•Units: Joules (J)

•In fluid dynamics (like Bernoulli's equation), we often express energy relative to volume, which mathematically simplifies to just the pressure term

•Formula: $E/V = P$

•Units: Joules per cubic meter (J/m^3) or Pascals (Pa)

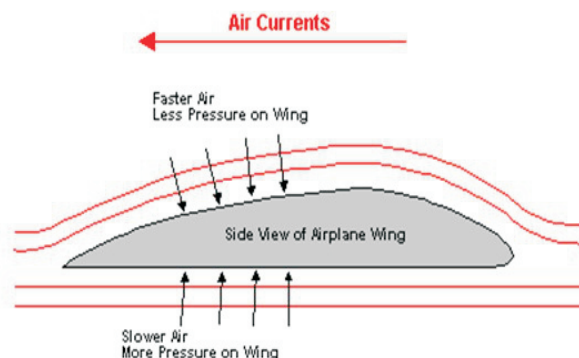
For a streamline fluid flow, the sum of the pressure energy, kinetic energy and potential energy per unit volume remain constant.

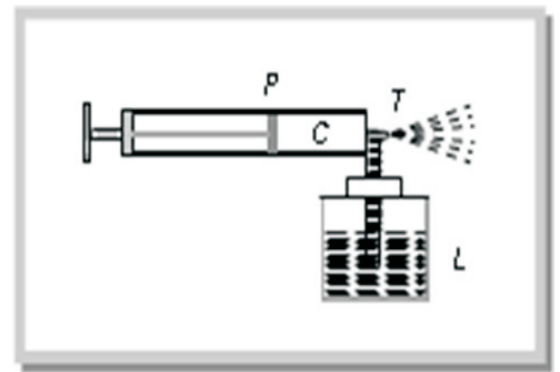
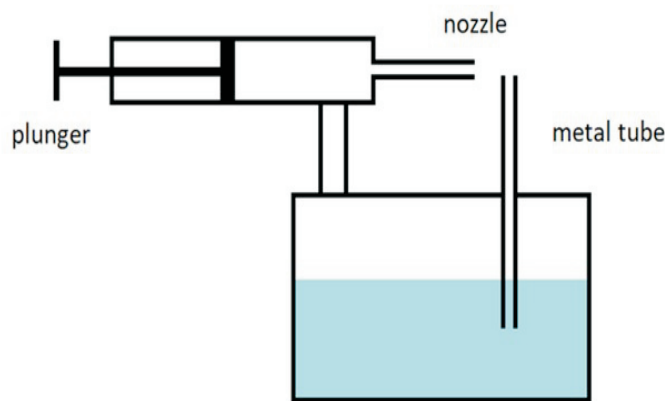
$P + \rho v^2/2 + \rho gh = \text{Constant}$

An increase in the velocity of a fluid that is accompanied by a decrease of pressure. Swiss scientist, Daniel Bernoulli (1700-1782), demonstrated that, in most cases, the pressure in a liquid or gas decreases as the liquid or gas moves faster. This explains in part why a wing lifts an airplane.

The Lift of a Wing

The curved top of a wing creates a longer distance from front to back than the straight bottom. This causes the air on top to travel farther, and thus faster, to reach the back than the air underneath. creating a difference in pressure between the two surfaces.



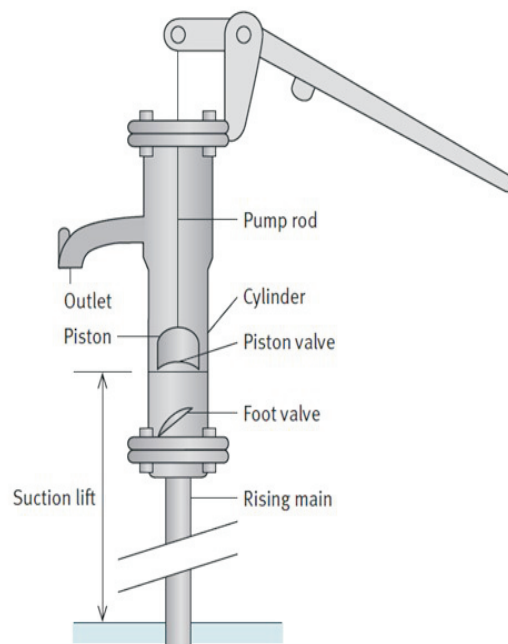


By means of motion of a piston P in a cylinder C, high speed air is passed over a tube T dipped in liquid L to be sprayed. High speed air creates low pressure over the tube due to which liquid (paint, scent, insecticide or petrol) rises in it and is then blown off in very small droplets with expelled air.

HAND WATER PUMP

Hand Pump Parts:

Handle
Pump rod
water outlet
Piston
Piston valve
Foot valve
Rising main
Suction lift



There are several types of water hand pumps. Most commonly used hand pumps are positive displacement pumps, positive displacement pumps have reciprocating plungers or pistons. In a piston pump, the piston is fitted with the piston valve (non-return valve) and slides vertically up and down within a cylinder which is fitted with a foot valve (non-return valve). Applying the force on the handle of the water pump causes vertical movement of pump rods that are connected to the piston.

When the piston of the pump moves upwards, the piston valve closes and a vacuum is created below the piston valve; Piston valve causes water to be drawn into the cylinder through the foot valve, which opens. Simultaneously, water above the piston, held up by the closed piston valve, is displaced upwards. In a suction hand pump water flows outward through the delivery outlet; in a hand pump with a submerged cylinder, it is forced up the rising main.

When the piston moves downwards in hand pump, the foot valve closes to prevent backflow of water, and the piston valve opens to allowing the piston to move down through the water in the cylinder.

Pascal's Law

The external static pressure applied on a confined liquid is distributed or transmitted evenly throughout the liquid in all directions.

Example of Pascal's Law

Let us understand the working principle of Pascal's law with an example.

A pressure of 2000 Pa is transmitted throughout a liquid column due a force being applied on a piston.

If the piston has an area of 0.1 m², what is the force applied?

This can be calculated using Pascal's Law formula.

$$F = PA$$

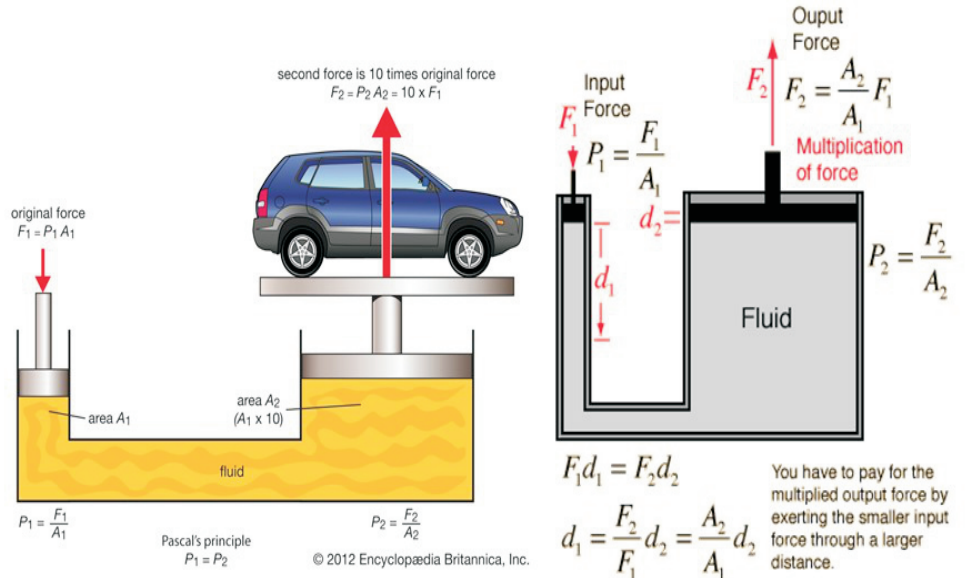
Here,

$$P = 2000 \text{ Pa} = \text{N/m}^2$$

$$A = 0.1 \text{ m}^2$$

Substituting values,

$$\text{we arrive at } F = 200 \text{ N}$$



Hydraulic Press

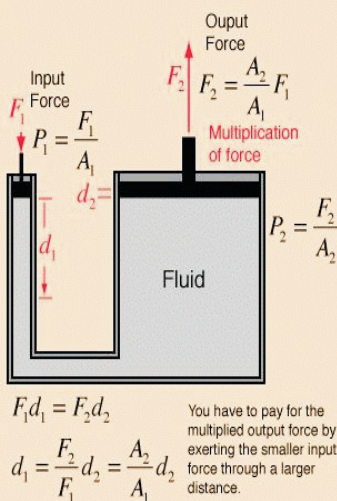
A multiplication of force can be achieved by the application of fluid pressure according to Pascal's principle, which for the two pistons implies

$$P_1 = P_2$$

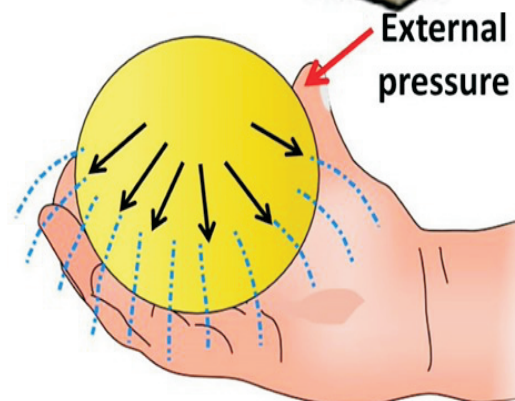
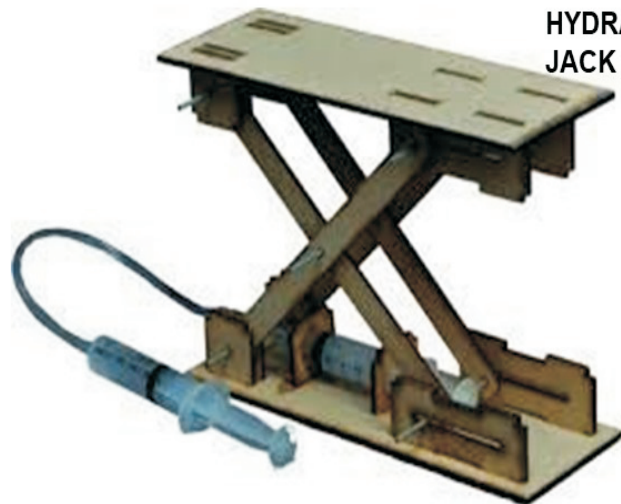
This allows the lifting of a heavy load with a small force, as in an auto hydraulic lift, but of course there can be no multiplication of work, so in an ideal case with no frictional loss:

$$W_{\text{input}} = W_{\text{output}}$$

Calculation



HYDRAULIC JACK



Think of a balloon filled with water and poked with a few tiny holes. If you squeeze the balloon, the water doesn't just shoot out of the side you are pushing; it shoots out of *all* the holes with the exact same strength. Because liquids (and gases) can be squeezed but don't easily compress, they act like a hidden messenger carrying your push evenly to every corner of the container

Driving a Car (Hydraulic Brakes): When you step lightly on the brake pedal, you apply force to a small master cylinder. The hydraulic brake fluid transmits this pressure equally to all four wheels, multiplying the force to clamp the brake pads against the rotors and safely stop the vehicle

Pressure applied on one point of liquid

CHAPTER: GRAVITATION

BUOYANT FORCE



Arrangement to show the existence of buoyant force

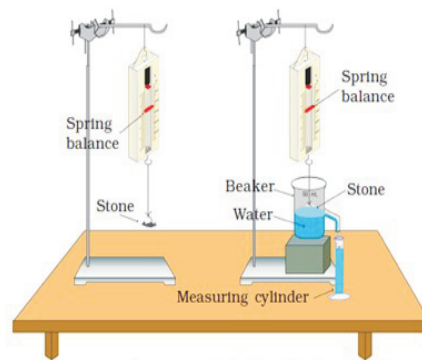
An upward force is exerted when a solid is immersed in a liquid. It is known as buoyant force. The buoyant force becomes constant when the body is fully immersed.

What is required?

Plastic bottle, a bucket and water

How will you proceed?

1. Take an empty plastic bottle.
2. Close its mouth with an airtight stopper and push it vertically downwards into a bucket filled with water.
3. Do you feel an upward push? Why is there difficulty when you are pushing the bottle into the water?
4. Push the bottle deeper and deeper into the bucket. Why is there more difficulty when the bottle is pushed deeper into the water?
5. Now you push the bottle still deeper into water till it is fully immersed. If you push it further deep into water, do you still feel more difficulty? If not, why?
6. Now release the bottle, what do you observe? Why does the bottle bounce back to the surface of water?



Arrangement to show the buoyant force

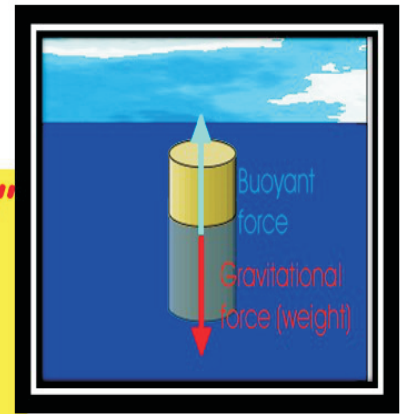
EUREKA AND ARCHIMEDES' PRINCIPLE

- **Archimedes' Principle**, law of physics that states that when an object is totally or partially immersed in a fluid, it experiences an upthrust equal to the weight of the fluid displaced.
- The principle is most frequently applied to the behaviour of objects in water, and helps to explain floating and sinking, and why objects seem lighter in water. It also applies to balloons in the air.

"Eureka" comes from the Ancient Greek word εὕρηκα *he úrēka*, meaning "I have found (it)", Eureka is an interjection used to celebrate a discovery or invention.



UPTHRUST AND BUOYANT FORCE



The key word in the principle is “upthrust” (or buoyant force), which refers to the force acting upward to reduce the actual weight of the object when it is under water.

for example, a metal block with a volume of 100 cm^3 is dipped in water, it displaces an equal volume of water, which has a weight of approximately 1 N. The block therefore seems to weigh about 1 N less.

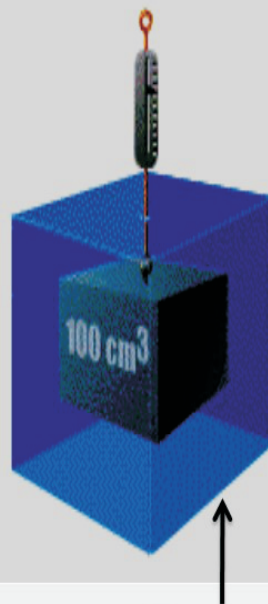
SINKING AND FLOATING OBJECTS

1

Volume of aluminium = 100 cm^3
Density of aluminium = 2.7 g/cm^3
Mass of aluminium = 270 g
Weight of aluminium = 2.7 N



The reading of spring balance is 2.7 N



Volume of water displaced = 100 cm^3
Density of water = 1.0 g/cm^3
Mass of water displaced = 100 g
Weight of water displaced = 1.0 N

The reading of spring balance is 1.7 N

2

Volume of wood = 100 cm^3
Density of wood = 0.6 g/cm^3
Mass of wood = 60 g
Weight of wood = 0.6 N



Volume of water displaced = 60 cm^3
Density of water = 1.0 g/cm^3
Mass of water displaced = 60 g
Weight of water displaced = 0.6 N

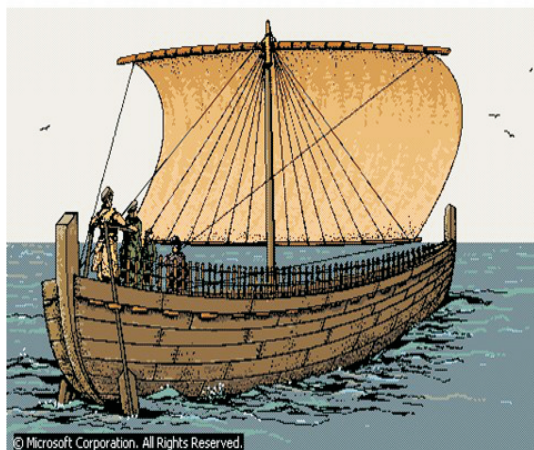
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*What is the reading of spring balance
if the wood is attached to it ?*

ZERO

The Law of Floatation

*A floating object displaces its own weight of fluid
in which it floats.*

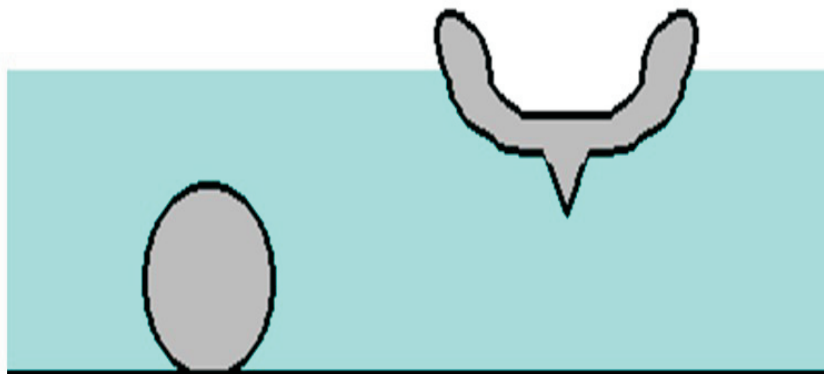


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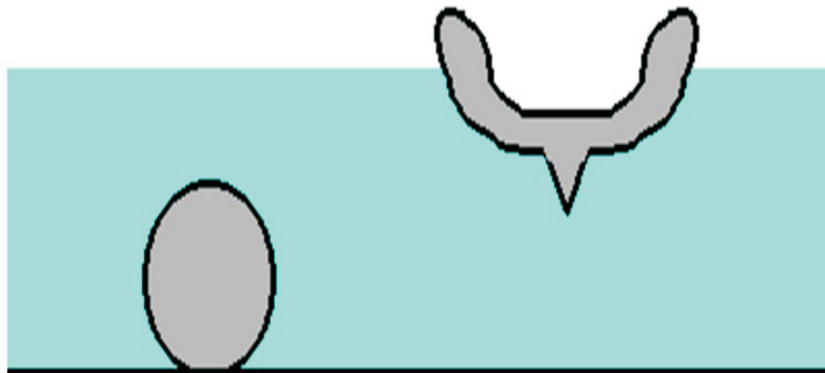
Fresh water less dense than sea water and warm water less dense than coldwater so warm fresh water need to be displaced more to keep the uptrust force equal with weight of the boat so it still can float.

2. If the plasticine is formed into a ball, it will sink. But when it is formed into a hull it will float. Why?



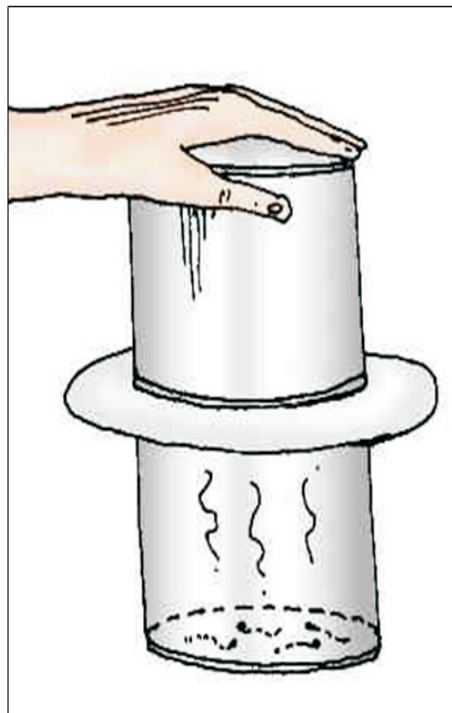
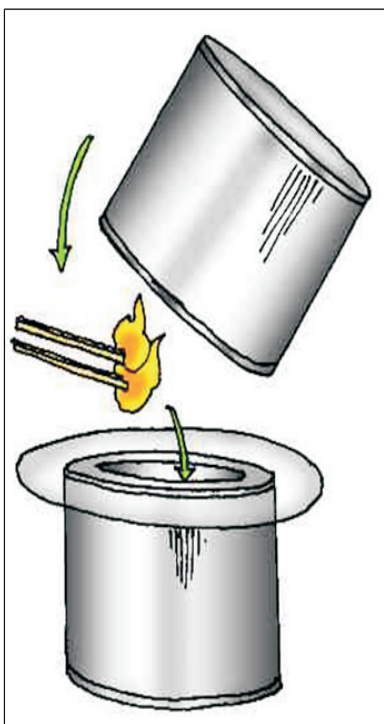
BECAUSE....

ball: displaced water weighs less than ball
hull: displaced water weight = hull weight



EXPERIMENT SHOWING AIR EXERTS PRESSURE

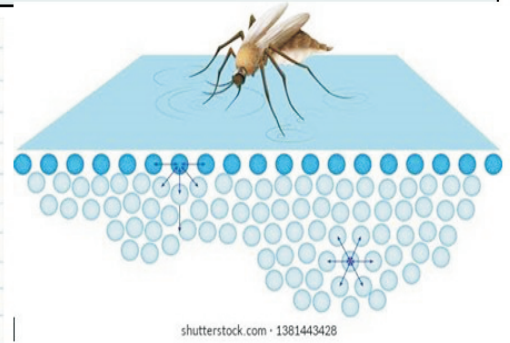
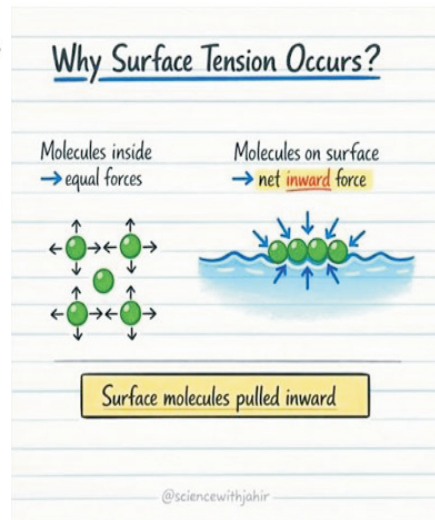
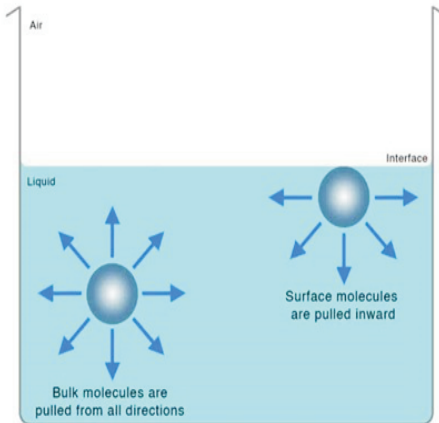
MATERIALS USED 1. Tin container of same size 2. Filter paper 3. Few strips of paper 4. Match box & sticks 5. scissors, 6. water



CHAPTER: (MECHANICAL PROPERTIES OF FLUID)

SURFACE TENSION OF WATER

- Surface tension is the tendency of liquid surfaces to shrink into the minimum surface area possible, causing it to behave like a stretched elastic skin.
- In the bulk of a liquid, every water molecule is pulled in all directions by surrounding molecules (cohesion), resulting in balanced forces. However, water molecules at the surface do not have neighbouring molecules above them, resulting in an unbalanced net inward pull. This inward pull creates a tight, resilient "skin" at the surface.



In surface tension. Cohesive forces between liquid molecules pull inward at the surface, causing liquids (like water droplets or soap bubbles) to behave as if they are wrapped in an invisible, elastic membrane.

THE SCIENCE OF SOAP REMOVING GREASE

WATER AND OIL DON'T MIX
Grease and oil are hydrophobic (they repel water). That's why plain water can't remove oily dirt effectively.

SOAP MOLECULES ARE SPECIAL
Each soap molecule has TWO ends:
• Hydrophilic end (loves water)
• Hydrophobic end (loves oil/grease)

HOW SOAP REMOVES GREASE - STEP BY STEP

- The oil-loving ends (hydrophobic) stick to grease.
- The water-loving ends (hydrophilic) stay in water.
- Soap surrounds the grease droplets and breaks them into tiny particles called MICELLES.
- Water rinses away the micelles with the trapped grease, leaving the surface clean.

This process is called **EMULSIFICATION**.
Grease + Soap + Water → Micelles → Clean Surface

WHY SOAP IS GOOD FOR HYGIENE
Soap can break down oily layers on dirt and many microbes, helping lift and remove them from your skin.

REAL-LIFE EXAMPLE

WITH ONLY WATER
Grease stays because oil and water don't mix.

VS

WITH SOAP + WATER
Soap breaks grease into micelles and washes it away.

FUN FACTS

- Warm water helps dissolve grease faster.
- Dishwashing soaps are designed especially for oily substances.
- Hard water can reduce soap effectiveness.
- Too much grease can use up soap quickly.
- Many soaps use ingredients that are biodegradable and eco-friendly.

Tiny molecules, big cleaning power! SCIENCE makes life CLEAN and EASY!

Cleaning with Soap and Detergents

Activity: Using laundry detergent or dish soap to wash clothes or greasy dishes.

The Science: Soap acts as a surfactant, wedging between water molecules to weaken their strong cohesive bonds. This lowers the surface tension, allowing water to spread out, penetrate fabrics, and lift away dirt and grease.

A surfactant (short for "**surface-active agent**") is a chemical compound that lowers the surface tension between two substances, such as a liquid and a solid, or two liquids. Because they bridge the gap between substances that normally do not mix, they are the active ingredients in soaps, detergents, and emulsions

How Surfactants Work

Surfactant molecules are unique because they possess a dual structure: **Hydrophilic Head:** A "water-loving" end that binds with water **Hydrophobic Tail:** A "water-repelling" (oil-loving) end that binds with fats, oils, and dirt.

When added to water, surfactants gather at the surface and form **micelles**. The hydrophobic tails cluster around dirt or grease, trapping it in the center, while the hydrophilic heads face outward, making the entire cluster water-soluble and easily rinsed away.

CHAPTER (HEAT): MODES OF HEAT TRANSFER

Heat naturally moves from hotter to colder objects through three distinct modes. In daily life, these occur together when cooking: conduction (touching a hot pan handle), convection (boiling water), and radiation (the warmth from a stovetop burner)

Conduction (Heat by "Touching")

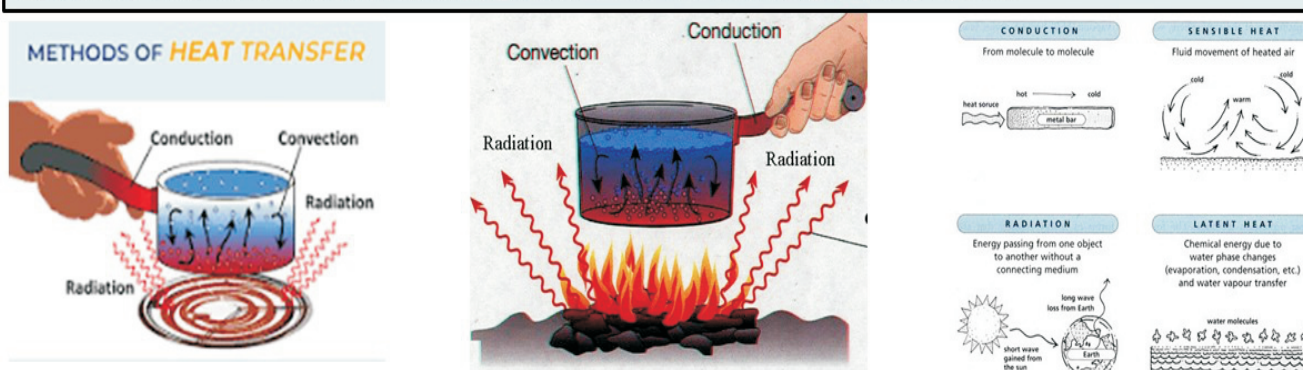
What it is: The transfer of thermal energy through direct physical contact, where vibrating molecules pass their energy to neighboring cooler molecules

Convection (Heat by "Flowing")

What it is: The transfer of heat in fluids (liquids and gases) through the actual movement of hotter, less dense molecules rising and cooler, denser molecules sinking

Radiation (Heat by "Rays")

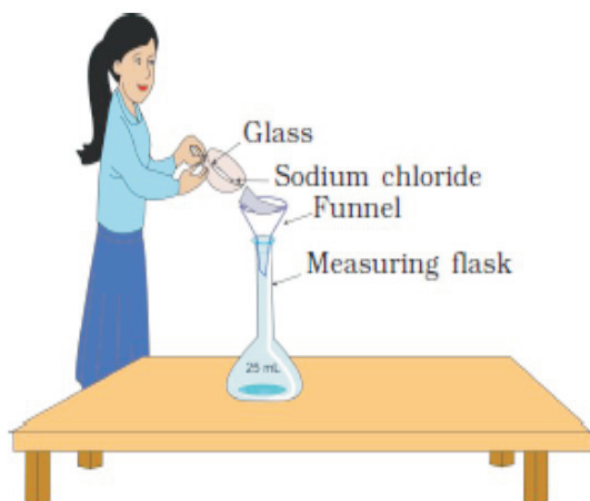
What it is: The transfer of heat energy through electromagnetic waves. It does not require any physical contact or a material medium, meaning it can even travel through empty space.



CHAPTER-----EXPLORING MIXTURE AND THEIR SOLUTION

TOPIC-----CONCENTRATION OF SOLUTION

How to prepare a solution of common salt of 10 per cent composition by volume



1. Take 2.5 g sodium chloride.
2. Transfer it to 25 mL measuring flask.
3. Add some water and shake it well to completely dissolve the sodium chloride in water.
4. Add water to the flask up to the mark of flask. This is 10% concentration by volume of a solution.

In 10% solution of sodium chloride in water by volume, the solute is 10 g and the solvent is 100 mL.

A. Mass by mass percentage (% m/m or % w/w)

This method is commonly used to express the concentration of homogeneous mixtures. It tells us how many grams of solute are present in 100 grams of the total solution.

This can be expressed mathematically as,

$$\text{Mass by mass percentage} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100 \quad (5.1)$$

Example 5.1: If 10 g of salt is dissolved in 90 g of water, calculate the mass by mass percentage of the solution formed.

Answer: Mass of salt (solute) = 10 g

Mass of water (solvent) = 90 g

Total mass of solution = Mass of solute + Mass of solvent
= 10 g + 90 g = 100 g

$$\text{Mass by mass percentage} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

$$= \frac{10 \text{ g}}{100 \text{ g}} \times 100 = 10 \% \text{ m/m}$$

2 Preparation of solution of common salt of 10% composition by volume

B. Mass by volume percentage (% m/v or % w/v)

This method is used where measuring the volume of a liquid is easier than weighing it, for example, in medicines and laboratories. A common example is 5% glucose solution (Fig. 5.4b). It tells us how many grams of the solute is present in 100 millilitres of the solution.

Mathematically,

$$\text{Mass by volume percentage} = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100 \quad (5.2)$$

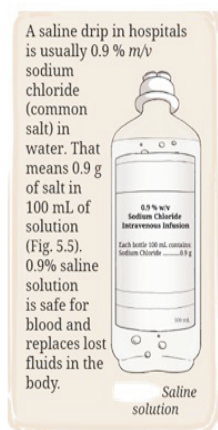
Example 5.2: If 5 g of glucose is dissolved in water to make 100 mL of solution, calculate its concentration in mass by volume percentage.

Answer: Mass of glucose (solute) = 5 g

Volume of solution = 100 mL

$$\text{Mass by volume percentage} = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

$$= \frac{5 \text{ g}}{100 \text{ mL}} \times 100 = 5 \% \text{ m/v}$$



C. Volume by volume percentage (% v/v)

This method is used when two miscible liquids are mixed, for example, in perfumes, cosmetics and vinegar (Fig. 5.4c). The volume by volume percentage (% v/v) tells us how many millilitres of the solute is present in 100 millilitres of the solution.

Mathematically,

$$\text{Volume by volume percentage} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100 \quad (5.3)$$

Example 5.3: If 1 mL of a liquid pesticide is mixed with a sufficient amount of water to form 100 mL of a pesticide spray for rice crop, calculate its volume by volume percentage.

Answer: Volume of pesticide (solute) = 1 mL

Total volume of solution = 100 mL

Volume by volume percentage

$$\begin{aligned} &= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{1 \text{ mL}}{100 \text{ mL}} \times 100 = 1 \% \text{ v/v} \end{aligned}$$

CHAPTER: MAGNETIC EFFECTS OF ELECTRIC CURRENT

CURRENT CARRYING COIL PRODUCING MAGNETIC FIELD

What is required?

A circular coil (having about 500 turns and internal diameter about 10 cm) fitted with a board in a horizontal plane through its centre, a plug key, iron dust and about 12 V DC obtained by 8 cells in 4 holders each containing 2 cells

How will you proceed?

1. Connect the ends of the circular coil in series with the four 2-cell holders, plug key as shown in [Fig 10.11.4].
2. Sprinkle iron dust particles on the board as uniformly as possible.
3. Complete the circuit by closing the key K.
4. Tap the cardboard gently a few times and observe the pattern in which the iron dust settles on the board.
5. How does this pattern look like?
6. What does it indicate about the nature of magnetic field produced by the current carrying circular coil?

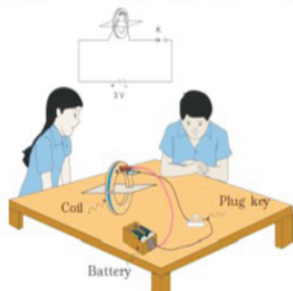


Fig. 10.11.4 Pattern of magnetic field lines produced by a current carrying circular coil

What have you learnt?

The pattern of the magnetic field lines near the wires of the coil are concentric circles. The diameter of these circles goes on

increasing as we move away from the points where coil enters the board.

Extension

Change the direction of current by altering the connections of the battery. Repeat Step 4 and observe if there is any change in the pattern.

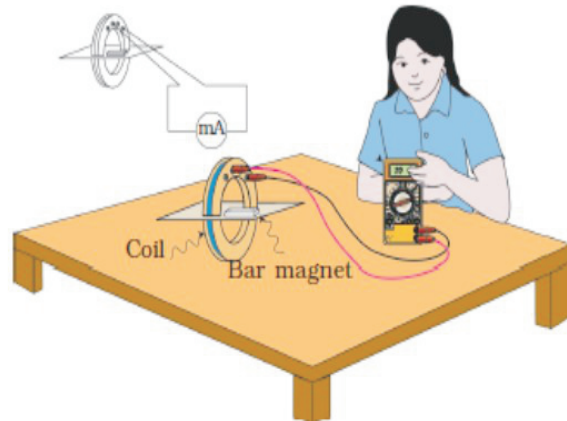
A magnet is moved near a coil of wire

What is required?

A bar magnet, circular coil having about 500 turns of insulated copper wire and 10 cm internal diameter fitted on a board, a multimeter (used as micro-ammeter), a plug key and connecting wires.

How will you proceed?

1. Place the coil on the table and connect a micro-ammeter to its two ends. Is there any reading in the micro-ammeter?
2. Keep a bar magnet on the board fixed with the coil. Do you see any reading in the micro-ammeter? Repeat your observation by placing the bar magnet at different positions in the board.
3. Hold the bar magnet in the board such that it can be moved along the axis of the coil easily.
4. Move the bar magnet towards the coil. Do you see any deflection in the micro-ammeter needle? If yes, what does it indicate?
5. Move the bar magnet away from the coil. Is there any change in the direction of the deflection of the micro-ammeter needle? What does that show?
6. Repeat Steps 4 and 5 by reversing the poles of the bar magnet.
7. Now conclude your observations.

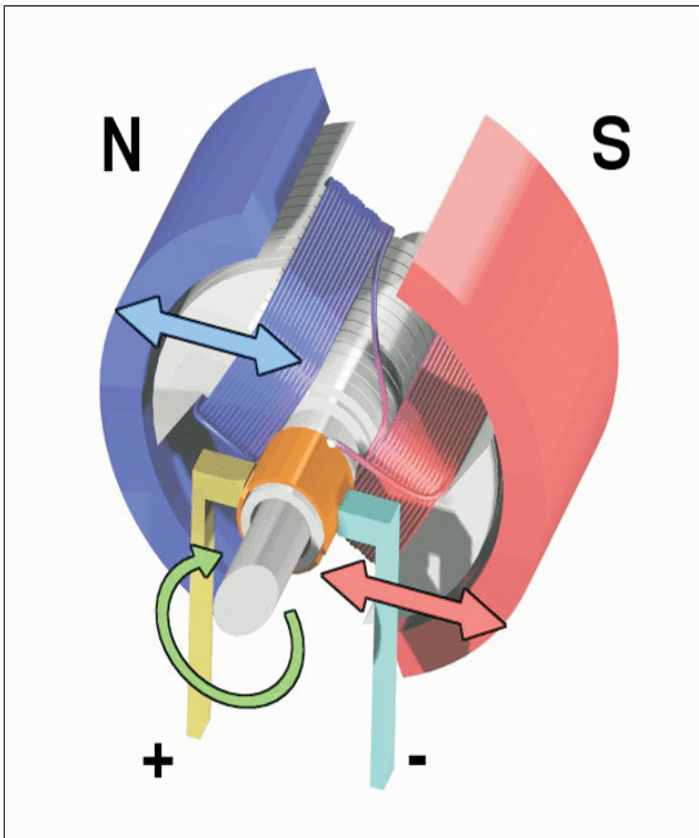


1.6 Electric current is generated in a circular coil due to the motion of a bar magnet in the coil

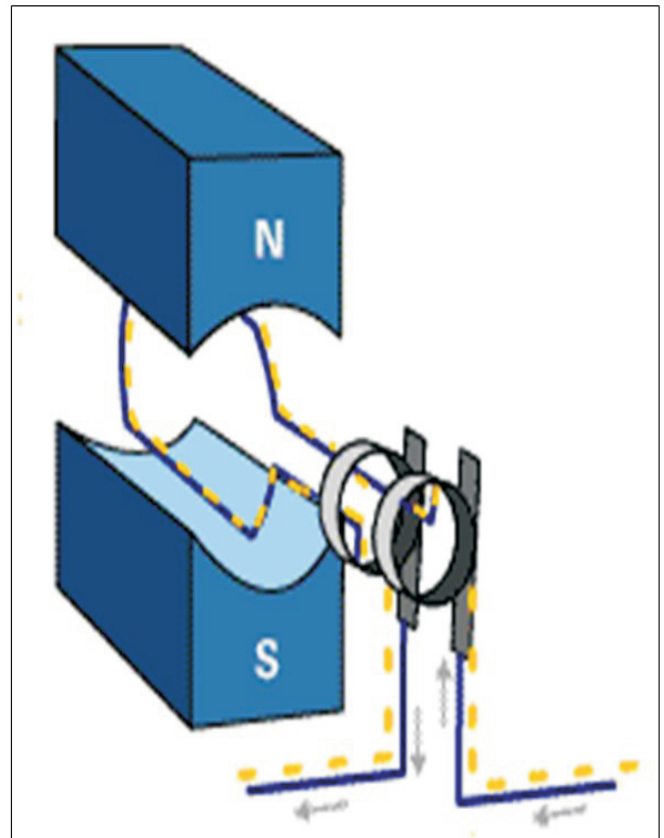
What have you learnt?

1. As the reading of the micro-ammeter needle indicates the flow of current in the coil. Current is generated when the coil and the magnet are stationary relative to each other.
2. A current is generated in the coil whenever there is a relative motion between the coil and the magnet.
3. The direction of current changes when the direction of motion of the magnet changes or the polarity of the magnet is changed.

ELECTRIC MOTOR

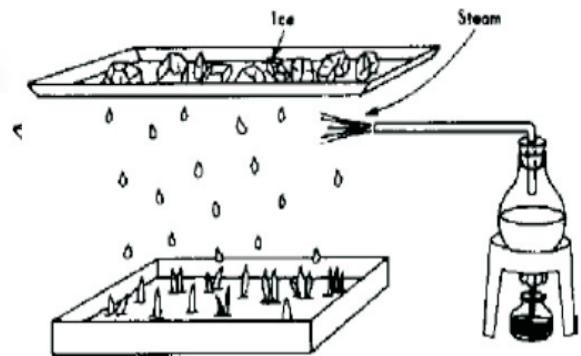


ELECTRIC GENERATOR



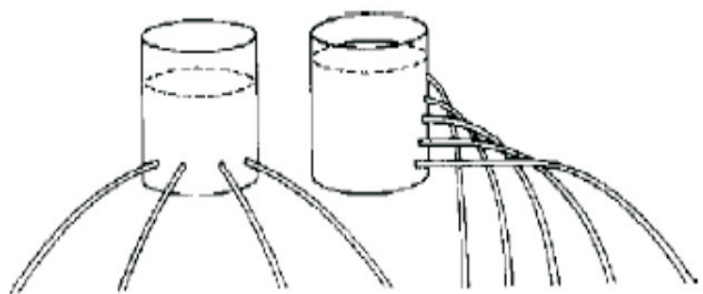
The rain cycle

You can reproduce the rain cycle in miniature in your classroom. Place a box of plant seedlings on the table. Place a metal tray about 35 to 40 cm above the box of seedlings and support it. Strew the top of the tray with pieces of cracked ice. Place a tea kettle or flask containing water over a source of heat so that steam will issue between the seedlings and the tray. You are now ready to study the rain cycle. The tea kettle or flask serves as the earth source of water. This evaporates and rises up to the cool tray which represents the upper layers of air above the earth which have been cooled by expansion. Here the moisture condenses on the tray and drips back on to the seedlings as rain.



Water pressure is the same in all directions

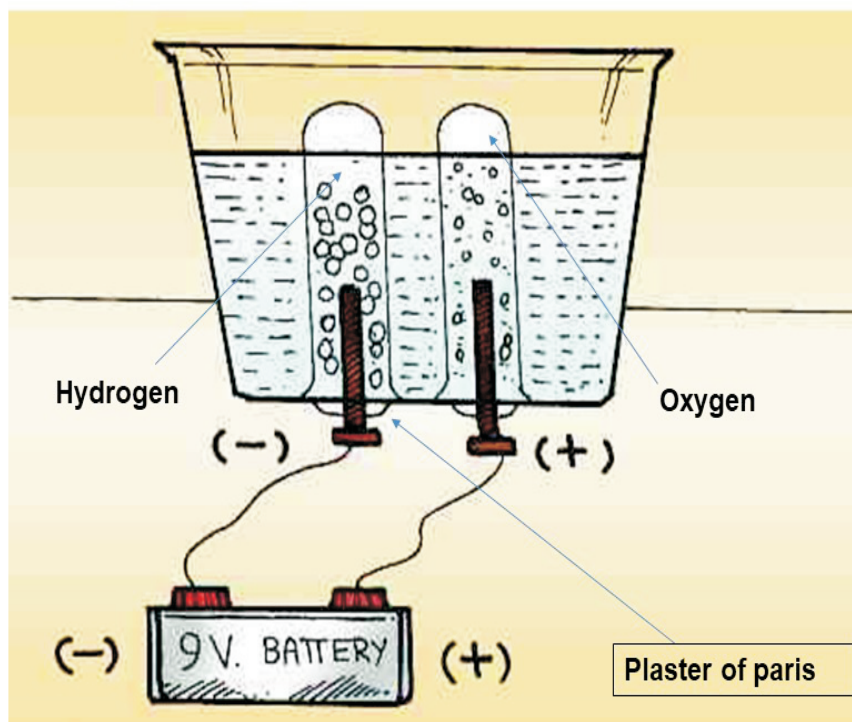
Punch holes around the base of a tall tin can with a nail. Cover the holes as above with a strip of tape. Fill the can with water and strip off the tape while holding it over a sink. Observe and compare the distance the streams shoot out from the holes all around the can.



TIN CANS

CHAPTER: CHEMICAL REACTIONS AND EQUATION

ELECTROLYSIS OF WATER



MATERIALS

- Two used cells of torch
- Two meter copper wire
- Plastic container
- Hammer
- Plaster of paris
- Two empty test tubes of equal size
- Two Carbon rods (old used pencil)

$2H_2O + 2e^- \rightarrow H_2(g) + 2OH^-$ (At cathode),
electron added

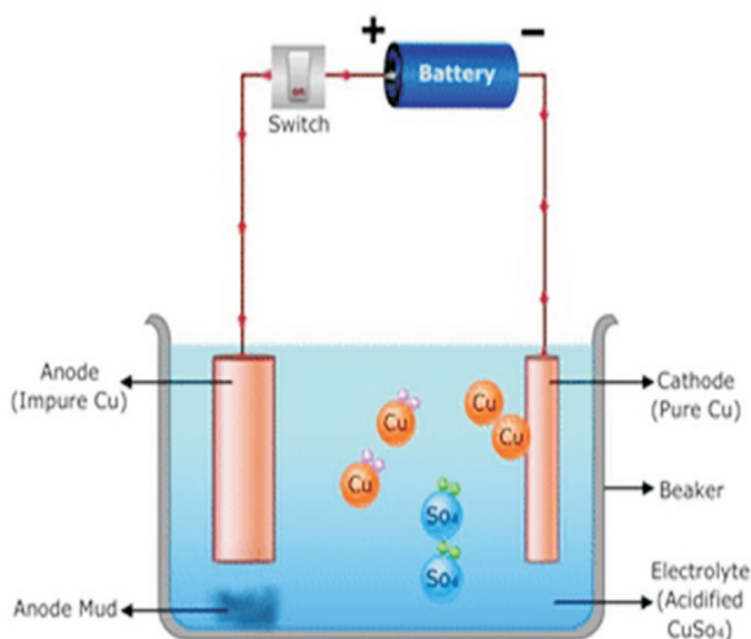
$H_2O \rightarrow \frac{1}{2} 2O_2(g) + 2H^+ + 2e^-$ (At anode),
electron removed

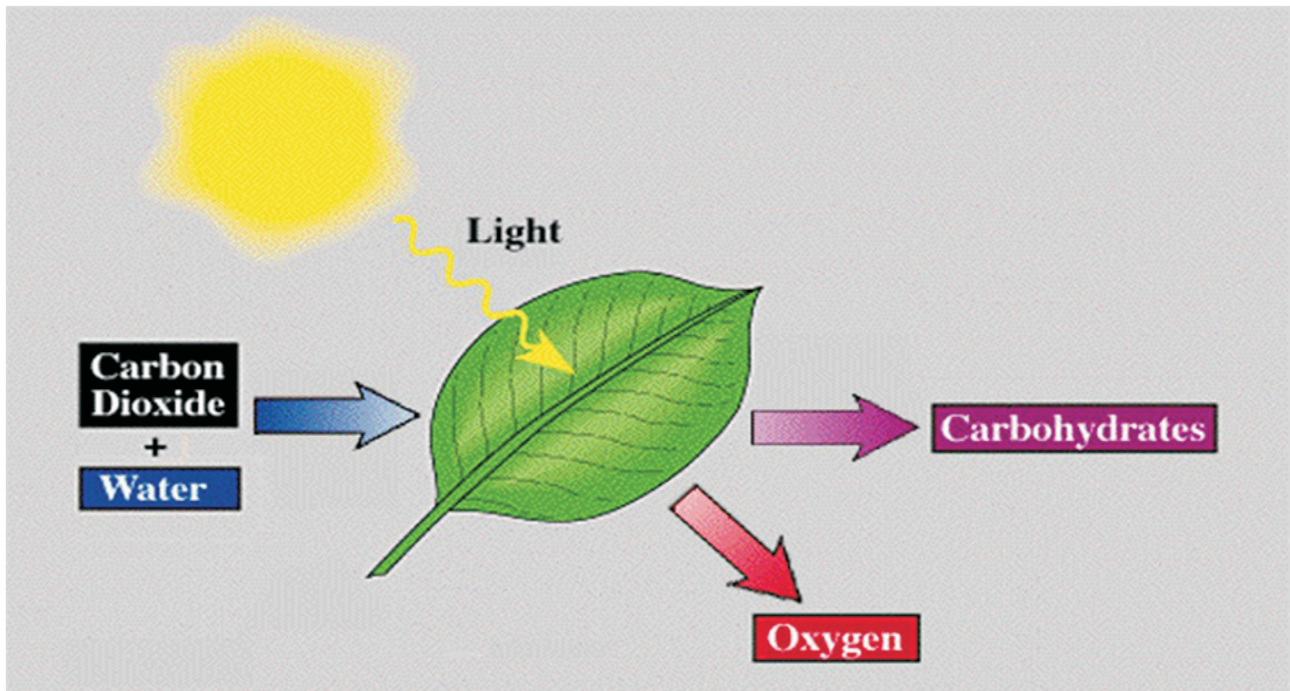
If we add $H_2O = H_2(g) + \frac{1}{2} 2O_2(g)$

Electrolysis of water is breaking down of water into its constituents that are hydrogen and oxygen by the action of electrical current.

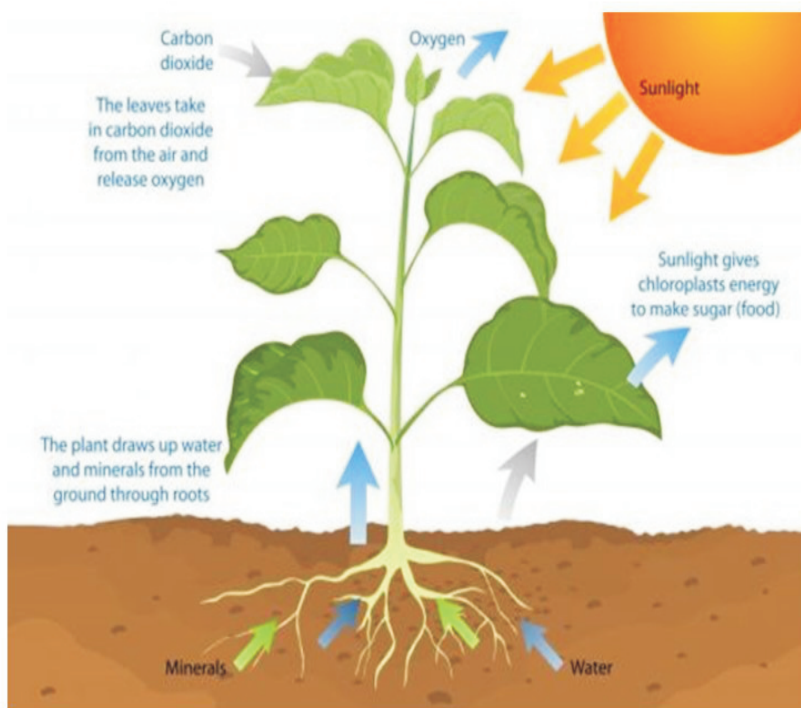
EXAMPLES OF SOME ANIMATED EXPERIMENTS THROUGH AUDIO-VISUAL AIDS

ELECTROLYSIS OF WATER

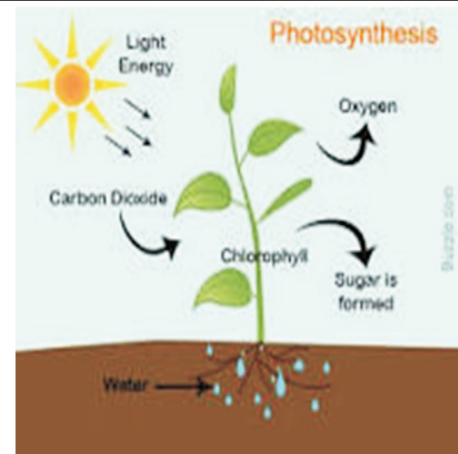




ACTIVITY OF PHOTOSYNTHESIS IN PLANT LEAVES



We can easily demonstrate photosynthesis by watching oxygen bubbles form on a submerged leaf. Place a fresh, healthy leaf in a glass, submerge it in water, and leave it in direct sunlight for 10 hours. You will see oxygen gas bubbles forming on the leaf's surface



Green leaves give off oxygen in sunlight

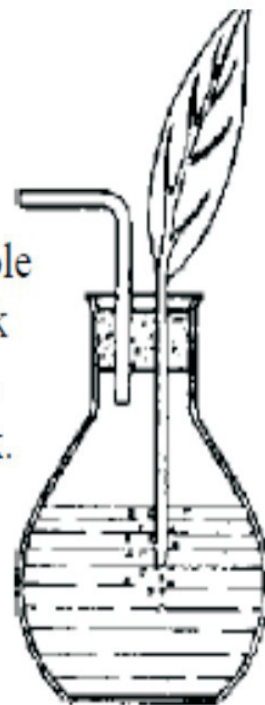
Place some water weed under a funnel in a beaker of water. Invert a test tube full of water over the tube of the funnel.

Leave the apparatus in strong sunlight. Bubbles of gas will be liberated from the weed and rise to the top of the test tube. In a short time the tube can be removed and the gas tested with a glowing splint.



Air can enter a plant through the leaf

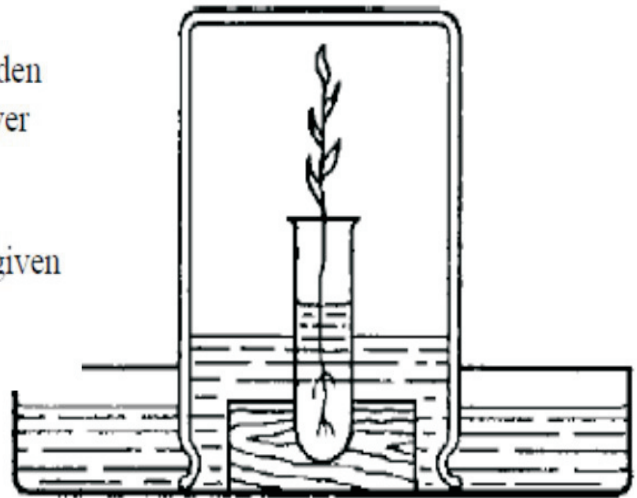
Procure a leaf with a long stalk to it and seal it into a hole through a cork. Fit this with a side tube, and seal the cork into a flask containing water. Suck air from the side tube. Air bubbles will be seen to issue from the end of the stalk.



To show the respiration of a plant

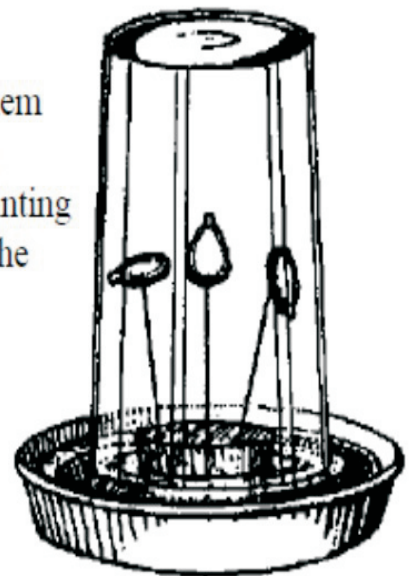
Place the plant in a test tube held in a weighted wooden block. Put this in a bowl containing lime water and cover the plant with a jar. Keep the plant in a dark place for several hours, or examine next day.

The lime water will be milky showing that CO_2 was given off, and the rise in the level shows that a considerable amount of oxygen was taken in.



To show the direction of sprout growth in seeds

Soak pumpkin or other large seeds overnight and fasten three of them on needles as shown in the diagram. Fasten one with the tip pointing upward, one with the tip toward the side and the third with the tip pointing downward. Keep them in moist air and note the directions in which the sprouts grow.



Release of Carbon Dioxide during Respiration

What is required?

Test tube, straw, freshly prepared lime water

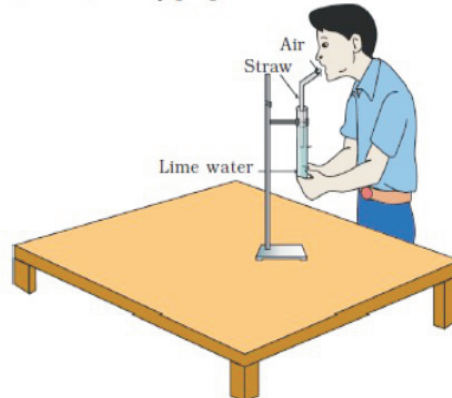


Fig.10.5.4(a) Demonstration to show liberation of CO_2 gas during respiration in human beings

How to proceed?

1. Take a test tube which is half filled with freshly prepared lime water.
2. With the help of a straw, blow air into the lime water.
3. Observe the colour change.

What have you learnt?

The lime water turns milky due to CO_2 .

GEO-TROPISM IN PLANTS

What is required?

Small disposable plastic cups, garden soil, seeds of *gram* or *moong* and two pieces of wooden stand and black paper

How to proceed?

1. Soak some seeds of *gram* or *moong* in water for one day.
2. Pierce slightly big holes (2 mm diameter) at the bottom of the cup.
3. Fill it with 1 cm thick layer of garden soil.
4. Sprinkle soaked seeds (*moong/gram*) over the soil. Water the seeds.
5. Put the cup on 2 pieces of wooden or stone slabs so that there is a little gap between the top of the table and bottom of the cup.
6. Cover the lower part of the setup with black paper.
7. Water the seeds regularly with little water.
8. Observe the bottom of the cup after 10 days.



Fig.10.6.1 (b)
Demonstration showing the geotropism in plants



Geo-tropism (also known as gravitropism) is the directional growth of a plant in response to gravity. Roots show positive geotropism by growing downward to anchor the plant and find water, while stems show negative geotropism by growing upward against gravity to reach sunlight

What have you learnt?

The roots come out from the holes and grow towards the earth showing positive geotropism.

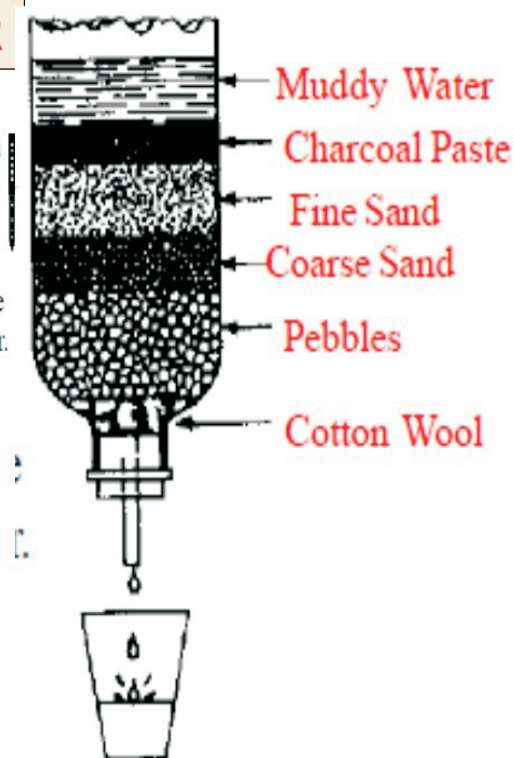
Extension

Make a transparent cup by cutting the lower half of a mineral water bottle. Fill it half with soil. Place some soaked seeds towards the wall of the cup, water the seeds. When the seeds germinate, observe the direction of the root and shoot of the seedlings. The roots grow downwards and shoots grow upwards. Now keep the cup in horizontal position for a few days. You will see that the roots bend downwards and the shoots bend upwards.

CHAPTER: SEPARATION OF SUBSTANCES

HOME MADE DRINKING WATER FILTER

Fit a one-hole stopper carrying a short length of glass tube into the small end of a lamp chimney. Put a little cotton wool in the bottom and then a layer of small clean pebbles. Wash some coarse sand well and place a layer above the pebbles. Next wash some fine sand and make a thicker layer in the filter. Grind up some wood charcoal and make into a paste with water. Pour the charcoal paste evenly over the surface of the sand. Secure some very muddy water and pour in the top of the filter. Collect the filtrate in a clean glass placed below the filter.



CHAPTER: LIFE PROCESSES (OSMOSIS)

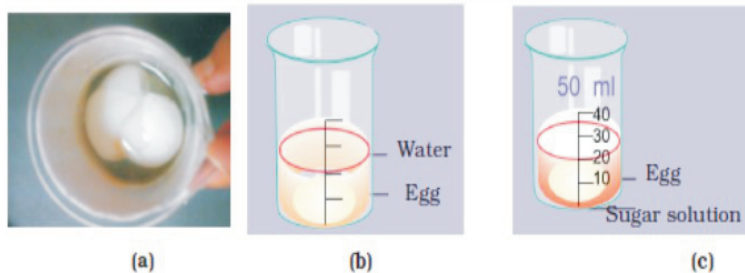
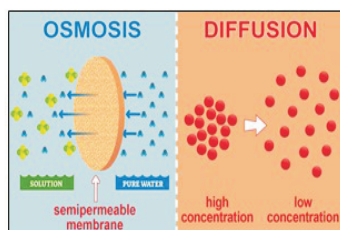
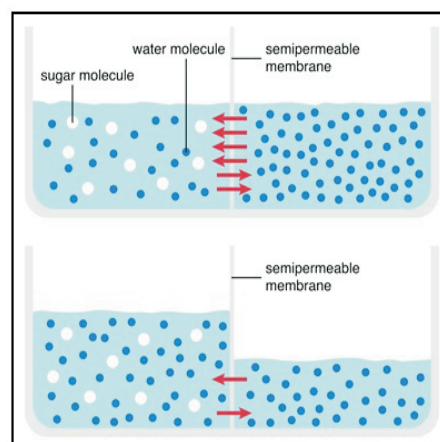


Fig. 9.5.3 (a) De-shelled eggs
(b) Kept in water
(c) Kept in sugar solution

1. Keep two eggs in dil. HCl for about one hour to dissolve the shell of the eggs.
2. Wash the de-shelled eggs with water thoroughly.
3. Take two beakers-one half filled with water, and the other with saturated sugar/ salt solution.
4. Put one egg in each of the beakers.
5. After about four hours, observe the two de-shelled eggs.



Diffusion is the free movement of any particles (solute or gas) from an area of high to low concentration. **Osmosis is a specialized type of diffusion involving strictly water (solvent) molecules moving across a semi-permeable membrane.** Both are passive processes requiring no cellular energy, aiming to balance concentrations

Osmosis

A spontaneous movement of solvent molecule through semi permeable membrane into a region of higher solute concentration (lower concentration of solvent, in direction to equalize the solute concentration on the two sides. **Semi permeable membrane is a thin biological barrier that allows certain small molecules or ions to pass through while blocking larger particles**

1. The de-shelled egg kept in water looks swollen with increased volume.
2. The other de-shelled egg kept in the sugar solution has shrunk in size.

CHAPTER----- EXPLORING MIXTURE AND THEIR SOLUTION

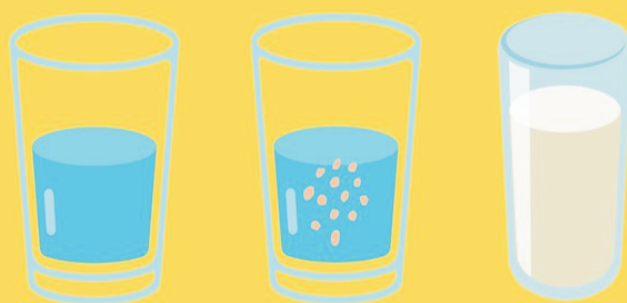
TOPIC-----SOLUTION, SUSPENSION AND COLLOIDS (TYNDALL EFFECT)

A **solution** is a clear, **homogeneous** mixture where tiny particles fully dissolve. A **suspension** is a cloudy, **heterogeneous** mixture whose large particles eventually settle. A **colloid** sits between them; it **looks homogeneous but is heterogeneous**, with medium particles that never settle.

Core

Property	Suspension	Colloid	True Solution or Crystalloidal
(i) Particle size	$>10^{-5}$ cm or $10^3\text{\AA}$ or 100 μm	10^{-7} to 10^{-5} cm or $10\text{\AA}$ to $10^3\text{\AA}$ or 1 μm to 100 nm	$<10^{-7}$ cm or $10\text{\AA}$ or 1 μm
(ii) Visibility	Visible with naked eye	Visible with ultramicroscope	Not visible with any of the optical means
(iii) Separation (a) with filter paper (b) with membranes	Possible Possible	Not possible possible	Not possible Not possible
(iv) Diffusion	Does not diffuse	Diffuse very slowly	Diffuses rapidly
(v) Settling	Settles under gravity	Does not settle but it may settle under Centrifuge	Does not settle
(vi) Nature	Heterogeneous	Heterogeneous	Homogeneous
(vii) Tyndall effect Brownian movement	May or may not show	Clear shows	not show

Solution Suspension Colloid



TYNDALL EFFECTS scientist John Tyndall, who studied the scattering of light by particles

The Tyndall effect is the scattering of a beam of light by particles in a mixture, which illuminates the path of the light. It occurs because colloidal and suspension particles are large enough to bounce light waves in all directions. Solutions have particles so small that light passes right through them without scattering

Daily Activity Examples

Solutions: Salt dissolving in a glass of water, or a fresh cup of black coffee.

Colloids: A glass of milk, fog, or the dust you see floating when a beam of sunlight enters a dark room.

Suspensions: Muddy water, chalk powder mixed with water, or a liquid medicine bottle that instructs you to "Shake well before use"

- The effect can also be observed when a fine beam of light enters a dark room through small hole. This happens because light gets scattered by the dust and smoke particles in the air.
- Also flood lights in a sports stadium

Tyndall Effect

LIGHT SOURCE			
	SOLUTION	COLLOID	SUSPENSION
LIGHT BEAM:	NOT VISIBLE	VISIBLE	VISIBLE
EXAMPLE:	WATER	MILK	FLOUR AND WATER

THE TYNDALL EFFECT

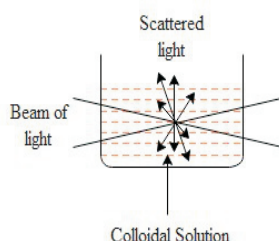
THE TYNDALL EFFECT IS THE SCATTERING OF LIGHT BY PARTICLES IN A COLLOID OR SUSPENSION.



Demonstration of Tyndall effect in a sports stadium

PRACTICAL APPLICATIONS OF TYNDALL EFFECTS IN DAILY LIFE

- **Sunbeams in a room:** When a ray of sunlight enters a dark, dusty room through a tiny window gap or door, the path of the light becomes distinctly visible because the floating dust particles scatter the light
- **Fog and mist:** Driving at night in foggy weather makes car headlight beams clearly visible. Tiny water droplets suspended in the air act as colloidal particles, scattering the light and illuminating the path ahead
- **Sunlight through the canopy:**
 - Beams of light are visible in a forest when sunlight strikes tiny suspended water droplets (mist) or dust in the air
- **Headlights in fog:** Car headlights are clearly visible in foggy or smoggy weather because the water droplets in the air scatter the light.
- **Dust in a dark room:** When a beam of sunlight enters a dark, dusty room through a small hole or ventilation, the path of the light becomes distinctly visible as it bounces off the suspended dust particles

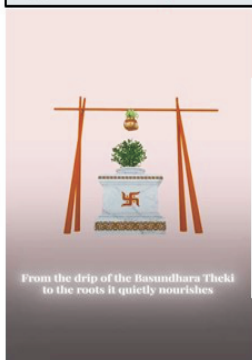


CHAPTER----- CROP PRODUCTION AND MANAGEMENT

TOPIC-----MODERN METHODS OF IRRIGATION (MICRO-IRRIGATION)

- **Irrigation** is an artificial application of water to crops or plants, especially when an agricultural field does not get enough water through rains.
- Irrigation is the controlled application of water through man-made systems to meet the water requirements of agriculture.
- **Micro-irrigation** refers to low-pressure irrigation systems that spray, mist, sprinkle or drip.
- **Micro-irrigation** system is effective in saving water and increasing water use efficiency as compared to the conventional surface irrigation method.

The term “micro-irrigation” describes a family of irrigation systems that apply water through small devices. These devices deliver water onto the soil surface very near the plant or below the soil surface directly into the plant root zone. Growers, producers and landscapers have adapted micro-irrigation systems to suit their needs for precision water application. **(DRIP AND SPRINKLER IRRIGATION)**





**DIY PLASTIC BOTTLE
DRIP IRRIGATION
FOR VEGETABLES**
SIMPLE, CHEAP & EFFECTIVE

CHAPTER----- MANAGEMENT OF NATURAL RESOURCES

TOPIC-----COAL AND PETROLEUM (FOSSIL FUELS)

- Fossil fuels are natural, carbon-rich energy sources formed over millions of years from the buried remains of prehistoric plants and microorganisms. Subjected to intense heat and pressure beneath the Earth's crust, these organic materials transformed into three primary forms: coal, oil (petroleum), and natural gas

Formation of Coal (Carbonization)

Coal was formed from the remains of plants and trees that lived in swampy forests millions of years ago.

Burial: As these plants died, they sank to the bottom of the swamps and were **covered by layers of mud, water, and sand, which blocked oxygen and prevented decay.**

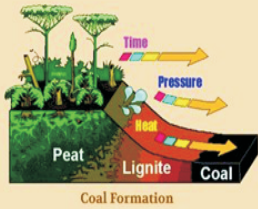
Heat and Pressure: Over millions of years, as more sediment piled on top, immense geological heat and pressure were applied to the buried plant matter.

Transformation: This slow process of converting dead plant matter into high-carbon coal is called **carbonization**. The matter gradually turned into peat, then lignite, and finally different types of coal (like bituminous and anthracite)

Formation of Petroleum (Crude Oil)

Petroleum was formed from the remains of tiny marine plants and animals (such as plankton and algae) that lived in the sea. **Burial:** When these marine organisms died, their bodies settled at the bottom of the ocean and were covered by layers of sand, silt, and mud. **Decomposition:** In the absence of oxygen, these remains were not fully decomposed by bacteria. **Heat and Pressure:** As more sediment accumulated, millions of years of intense heat and pressure transformed the trapped organic matter into a waxy substance called kerogen. With continued heat and pressure, this kerogen broke down into liquid hydrocarbons—creating petroleum.

Coal and Petroleum



About 300 million years ago forests got buried under the soil due to natural phenomena. Soil deposited over them and, under high pressure and high temperature, dead plants got slowly converted to coal.

Coke

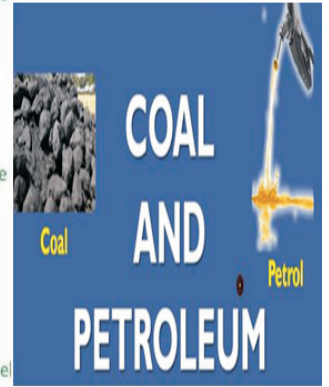
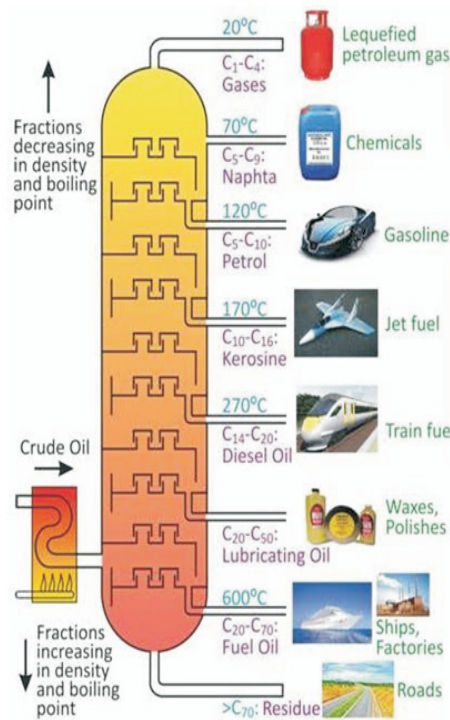
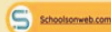
It is a tough, porous and black substance. It is an almost pure form of carbon.

Coal Tar

It is a black, thick liquid with an unpleasant smell. It is used in industry, like synthetic dyes, drugs, explosives, perfumes, plastics,

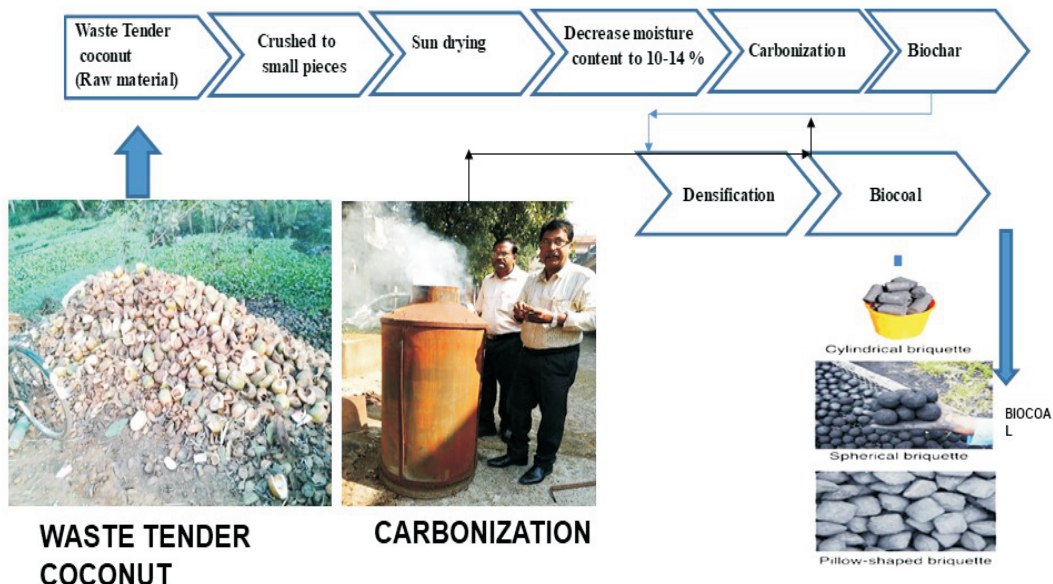
Coal Gas

Coal gas is obtained during the processing of coal to get coke. It is used as a fuel in many industries situated near the coal processing plants.



Distillation: A process used to separate a pure liquid from a solution or a mixture of two **miscible liquids** whose boiling points differ by more than 25°C. **Fractional Distillation:** An advanced process used to separate a mixture of two or more **miscible liquids** whose boiling points differ by less than 25°C. Used when boiling points are very close. It features a fractionating column that allows for multiple cycles of **evaporation and condensation**, ensuring cleaner separation (e.g., refining crude oil into gasoline and kerosene).

BIO COAL



- Bio coal is a briquetted char produced artificially from agricultural residues
- Bio coal is a good substitute of fossil coal (available naturally)
- Physical and chemical properties of bio coal are very much close to fossil coal
- Bio coal is a concentrated energy-rich clean solid bio fuel



OTHER AGRO-RESIDUES



GROUNDNUT SHELL



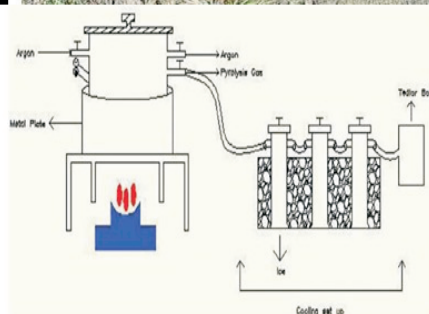
JUTE STICK



SUGARCANE BAGASSE



PULSES STALK



Plastic pyrolysis using metal container

PREPARATION OF PETROLEUM ARTIFICIALLY (PYROLYSIS)

We cannot make true, raw petroleum from scratch at home because it takes millions of years of geological pressure and heat acting on organic matter. However, you can make **synthetic petroleum by recycling waste plastics** using a process called pyrolysis. Alternatively, if you are trying to make **petroleum jelly (Vaseline)**, you can mix cosmetic ingredients.

1. Making Petroleum (Fuel) from Plastic Waste

Since plastics are chemically derived from petroleum, you can reverse the process using heat to turn shredded plastic back into liquid hydrocarbons.

The Process (Pyrolysis): This involves heating plastic waste in a closed, oxygen-free container to high temperatures (usually 400°C - 500°C). The plastic melts and vaporizes into gas, which is then passed through a cooled pipe (condenser) where it turns back into a liquid similar to crude oil.

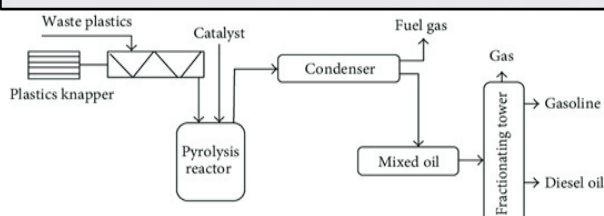
Why Pyrolysis Works (The Science)

Thermal Cracking: High heat breaks long plastic polymer chains into shorter hydrocarbon chains.

Anaerobic Environment: The process requires a strict absence of oxygen to prevent immediate combustion.

Output: The condensed vapors yield a mixture of liquid hydrocarbons chemically similar to crude oil, diesel, and gasoline.

Suitable Plastics: HDPE (milk jugs), LDPE (squeeze bottles), and PP (bottle caps) work best.



Pyrolysis is a thermochemical process that decomposes organic materials by heating them to high temperatures (typically 300°C to 900°C) in the complete absence of oxygen. Because no oxygen is present, the material does not burn (combust); instead, its molecules break down into three usable by-products: combustible gases, oils (bio-oil), and a solid carbon residue (char or biochar).

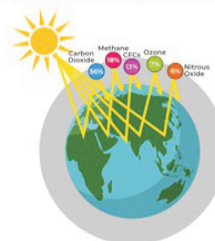
CHAPTER----- OUR ENVIRONMENT

TOPIC-----GREENHOUSE EFFECT, GLOBAL WARMING, CLIMATE CHANGE

Greenhouse: A greenhouse is literally a house designed for growing green plants. It gets its name because the glass walls and roof trap the sun's heat, creating a warm, protected environment to cultivate plants—especially out-of-season vegetation and tropical flowers—even when it is cold outside



Greenhouse Gases



Greenhouse gases (GHGs) are atmospheric gases that trap heat from the sun through a process called the greenhouse effect. They keep the Earth warm enough to support life, but excess emissions from human activities—like burning fossil fuels and deforestation—are driving rapid global warming and climate change

Greenhouse effects: The greenhouse effect is the fundamental physical process where atmospheric gases trap the Earth's outgoing heat. This drives global warming—the long-term rise in global temperatures. Climate change refers to the resulting broad shifts in weather patterns, sea levels, and ecosystems caused by this warming.

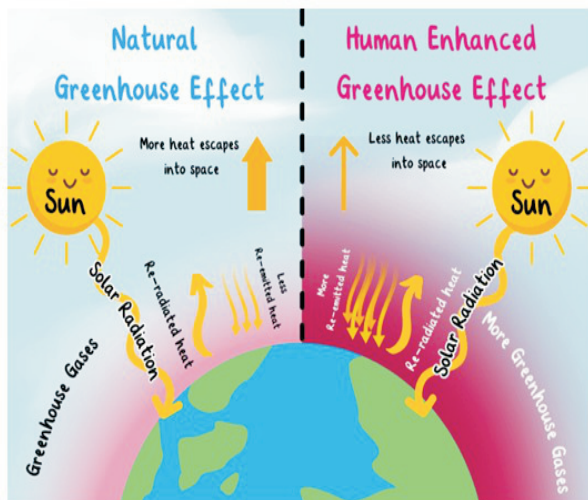
ATMOSPHERE AND GREENHOUSE EFFECTS

Formation of atmosphere:

The basic concepts of greenhouse can be very well understood from the **origin of the earth**. Before survival of any living organism on the earth, the temperature of the earth was around -18°C due to the absence of atmosphere between the earth and the sun. Various gases namely nitrogen, carbon dioxide, ozone, carbon monoxide, oxygen, nitrous oxide, water vapor etc. available inside the earth's crust came out through space between the tectonic plates of earth and formed a porous layer between earth and sun with unique properties. **This is known as atmosphere**. The newly formed atmosphere between earth and sun absorbed ultraviolet and far-infrared radiation coming from the sun and allowed only short wave length radiation emitted by the sun to the earth. Further the atmosphere did not allow long wavelength radiation emitted by earth to escape. Hence, the thermal energy trapped by the atmosphere became responsible to raise the temperature of earth as well as air between earth and atmosphere. The rise of temperature of air is known as greenhouse effect. Some of the atmospheric trace gases like carbon dioxide, water vapor, nitrous oxide and methane etc., responsible for greenhouse effect in solar system, permit incoming short wavelength ($0.3\mu\text{m}$ - $3\mu\text{m}$) solar radiation to reach the surface of the earth unhindered but restrict the outward flow of long wavelength ($> 3.0\mu\text{m}$) thermal radiation from earth surface. These atmospheric trace gases are referred as **greenhouse gases**. They absorb as well as reradiate this outgoing radiation after storing some of the heat in the atmosphere, and thus producing a net warming of the earth surface through greenhouse effect. This greenhouse effect in solar system helped in maintaining a **life-sustaining environment** on the earth. Due to this effect, **evolution of living organism** became possible on the earth.

One example of Greenhouse effect in daily life:

The interior of a car becomes too hot when parked in the sun as compared to the temperature outside



THE GREENHOUSE EFFECT & GLOBAL WARMING		
1. DEFINITION & BASIC CONCEPT: - Greenhouse Effect: A natural process where specific gases trap heat, keeping Earth warm. - Without it: Earth's temp would be -18°C (too cold for life). - Global Warming: The unnatural increase in temp due to an enhanced greenhouse effect.	4. KEY CAUSES OF ENHANCED EFFECT: - Burning Fossil Fuels (Coal, Petroleum). - Deforestation (Loss of Carbon Sink). - Industrialization (releases CFCs, etc.).	7. KEY OBSERVATIONS/IMPORTANT POINTS: - Effect essential for life, human-accelerated is the problem. - Methane (CH_4) is $\sim 25\times$ more potent than CO_2. - Planting trees is an immediate Carbon Sink.
2. THE MECHANISM (HOW IT WORKS): - Step 1: Solar radiation (short-wave) hits Earth. - Step 2: Earth absorbs energy, emits Infrared Radiation (long-wave heat). - Step 3: Greenhouse gases absorb this outgoing IR radiation, re-radiating it. - Result: Heat trapped, planetary warming.	5. ENVIRONMENTAL IMPACTS: - Melting Ice Caps, Sea Level Rise. - Climate Change & Extreme Weather. - Ocean Acidification (CO_2 forms H_2CO_3).	8. REAL-LIFE APPLICATIONS & ANALOGIES: - The Glass Greenhouse: Lets light in, traps heat. - The Locked Car: Sun heats inside, glass traps IR.
3. MAJOR GREENHOUSE GASES (GHGs): - Carbon Dioxide (CO_2): Primary contributor; from fuels & deforestation. - Methane (CH_4): From rice fields, cattle, landfills.	6. MITIGATION STRATEGIES: - Use Renewable Energy (Solar, Wind). - Large-scale Afforestation. - Improve Energy Efficiency.	9. IMPORTANT TERMS: - Carbon Sink: Natural system (forests/oceans) absorbing CO_2. - Albedo Effect: Reflection of solar radiation by white surfaces (ice).
(DIAGRAM: THE HEAT TRAP)	10. EXAM POINTS (VERY IMPORTANT FACTS): - Diff: Ozone Depletion (UV entry) vs. Greenhouse Effect (IR trapping). - Kyoto Protocol: Treaty for emission reduction. - Rice fields are major sources of CH_4.	

The Cause (Greenhouse Effect): the greenhouse effect is a natural and necessary process. Solar radiation passes through the atmosphere and warms the Earth, which then radiates this energy back outward as heat. Certain atmospheric gases—such as carbon dioxide (CO_2), methane (CH_4), and water vapor—act like a thermal blanket, trapping and re-radiating this heat. Without it, Earth would be freezing. **The Effect (Global Warming):** Human activities (Anthropogenic activities)—primarily burning fossil fuels, deforestation, and industrial agriculture—have drastically increased the concentration of these heat-trapping gases. This enhances the natural greenhouse effect, causing the planet to absorb more energy than it releases, which directly results in global warming (the gradual increase in the average global temperature). **The Consequence (Climate Change):** Global warming is primary driver of climate change. As global temperatures rise, it disrupts Earth's climate system, altered precipitation patterns, melting polar ice, rising sea levels, and frequent or intense extreme weather events like droughts, floods, and heatwaves.

Thanks to

National Institute of Educational Planning and Administration,

Govt. of India, New Delhi

INNOVATIVE SCIENCE TEACHING AIDS FOR SECONDARY SCHOOLS

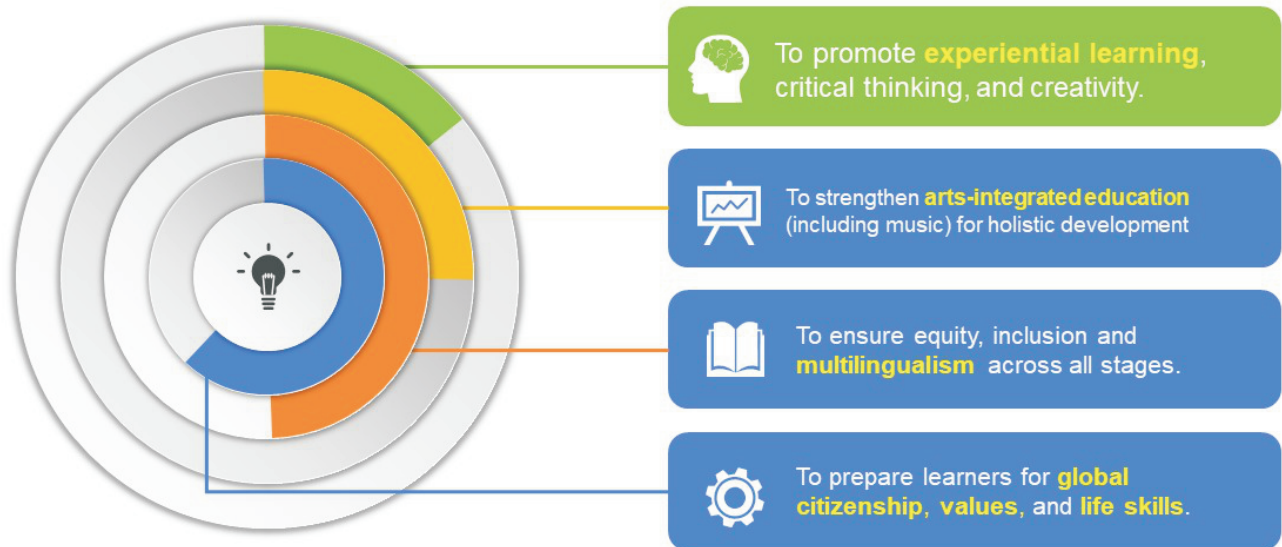
DR MANOJ KUMAR DAS

THE VISION OF NEP - 2020

To instill a deep-rooted **pride in being Indian**, not only in **thought**, but also in **spirit, intellect, and deeds**, as well as to **develop knowledge, skills, values, and dispositions** that support responsible **commitment to human rights, sustainable development and living, and global wellbeing**, thereby reflecting **a truly global citizen**.



MISSION OF NEP-2020



“E N G A G E” model

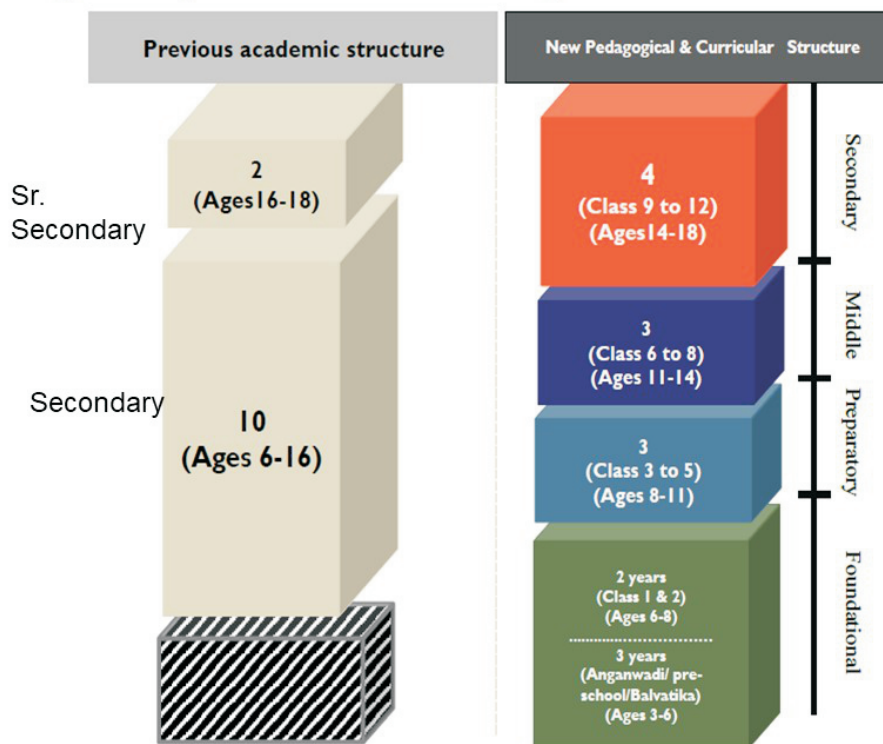
- **ENERGIZE LEARNERS** - Introduction through joyful environment
- **NAVIGATE CONTENT** - teaching and review through TLM
- **GENERATE MEANING** - focus on important concept through asking questions
- **APPLY TO REAL LIFE** - Demonstrate skills , experiment
- **GUARD THE LEARNING** - Evaluation, assesment
- **EXTEND** - Extended activities,pod cast, linked to learning outcome

Competency Based Education(CBE), Pedagogy & Lesson Plan

- The fundamental principles of NEP 2020 is to **recognize, identify and foster the unique capabilities of each student**, by sensitizing teachers to promote each student's **holistic development** in both academic and co-curricular spheres.
- Any **change in education system** is only possible through **classroom transaction** and the

teacher is the only agent

- who can make it happen by adopting **student centric creative pedagogy** through competency based education to achieve the objectives of NEP-2020.



NEP 2020, NCF 2023

- Make teaching enjoyable
- Activity based teaching
- Child centred class room teaching
- Art integrated / Sports integrated learning
- Targetted to reach Curricular Goal
- Interactive mode of teaching
- Go beyond the class room

PRESERVATION OF PLANTS

A : DRY PRESERVATION

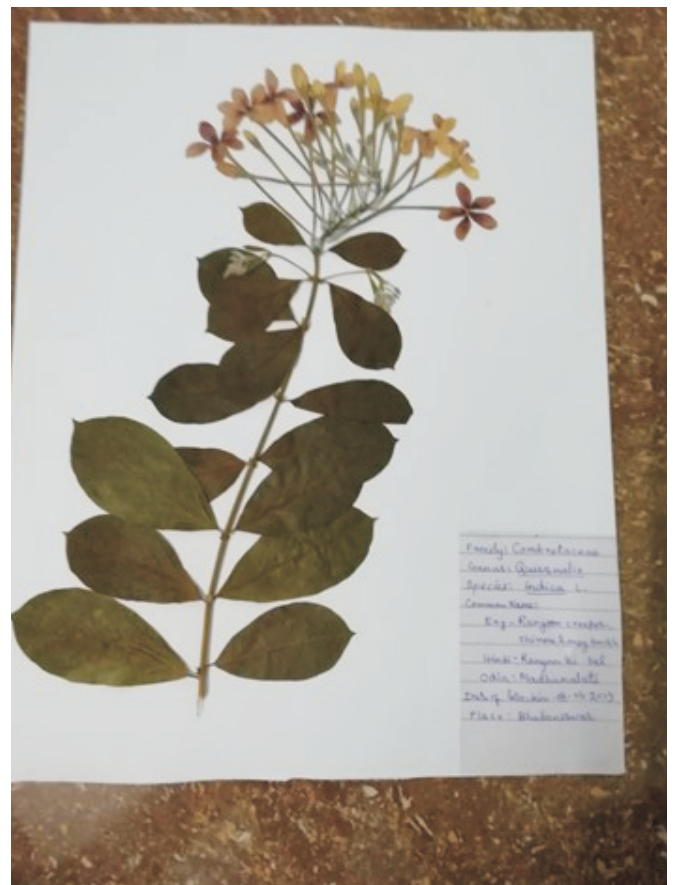
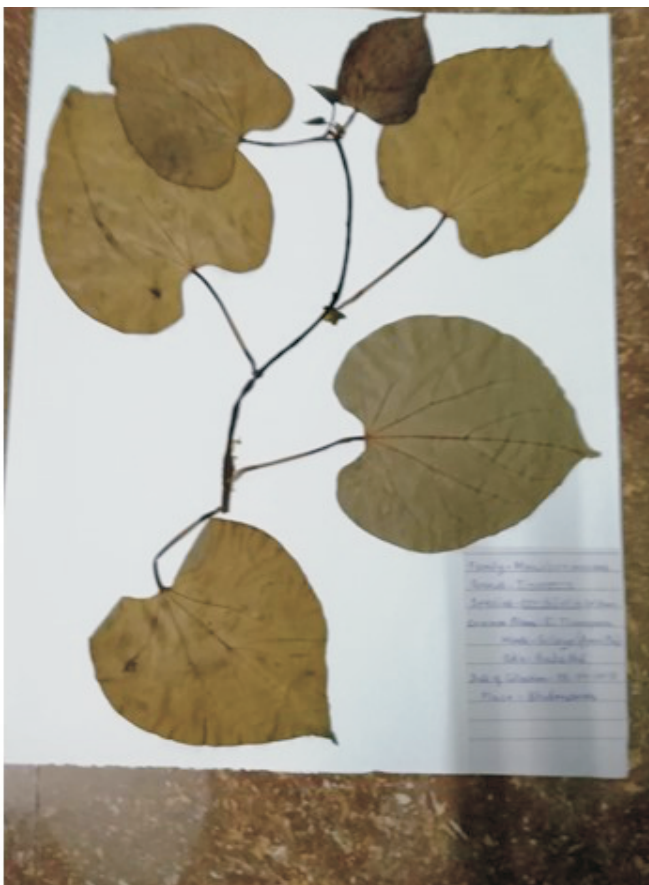
PREPARATION OF HERBARIUM :

- a** - Select a soft branch of a plant and wash it with water.
- b** - Arrange properly in plant press or in planks with the help of news paper.
- c** - Change the news paper in 2 – 3 days.
- d** - Continue pressing up to full dry of plant parts (10 – 15 days).

PRESERVATION OF PLANTS cont..

e - Select the white art sheet (28 x 43 cm) and paste the dried pressed plant on it and paste a small labelling paper having Family , Genus , Species , common name in English , Hindi and local language **f** - Use Dil. Mercuric Chloride (2%) or any other fungicide to protect the material from infections.

B : WET PRESERVATION : The plants like xerophytes and fruits or thick juicy parts are preserved in 2 – 3 % Formalin solution and kept air-tight .



PROJECT ON MEDICINAL PLANTS

Important medicinal plants can be collected and planted in an area in small plots (4' X 4' appx) and labelled with Family , Botanical name , common names in English , Hindi , local language and some of its medicinal uses.



Rouwolfia tetraphylla

- Common name : E : Wild snake root , Devil pepper ; H : Bada chandrika ; O : Bana patala Garuda.
- Some medicinal use : Root – snake bite , tranquilizer , insect bite , anti-microbial

Cheilocostus speciosus

- Common name ; E : Crepe ginger, Insulin plant; H : Keu ; O : Kustha / Keu.
- Some common medicinal use : Rhizome – fever , asthma , bronchitis , intestinal worm , Leaf : diabetes , inflammation of liver , anti-oxidant , fight stress.



Andrographis puniculata

- Common name ; E : Andrographis , Chirata ; H : Chiraita , Kirayat ; O : Bhuin nimba , Chiraita.
- Some medicinal use : Whole plant with leaf - Skin disease , blood purifier , de-worming , antimicrobial , rheumatoid arthaitis , respiratory tract infection , fever.



Ocimum tenuiflorum

- Common name : O : Dayana Tulasi
- Some medicinal use : herbal tea , essential oil , leaf juice – cough and cold , throat infection , insect repellent

Aloe vera



Aloe vera

- Common name : E : Indian aloe ; H ; Ghee kunar ,Gwar patha, Ghritkumari ; O ; Ghee kuanri
- Some Medicinal use : Leaf pulp - Antiseptic , stomach disorder , Skin healer , burns , injury, insect bite , diabetes , arthritis.

PRESERVATION OF ANIMALS

A : Formaldehyde preservation : Prepare 10 % , 5% and 3% Formalin from Formaldehyde solution. (i) All vertebrates are to be preserved in 10% formalin. The specimen should be well injected with formalin and fully dipped in it. (ii) All invertebrates are to be preserved in 3 – 5% formalin. (iii) Specimens should be well displayed with the help of glass rods , plates and threads. (iv) Formalin is corrosive , use gloves during the preservation.

BONES COLLECTED BY STUDENTS - 1993



DOUBLE HEADED BABY WITH TAIL



COLLECTED FROM A HOSPITAL BY
A PARENT-1992



Python molarus molarus
(Indian Python)

Collected by teacher and students - 1999

DIFFERENT PRESERVED ANIMAL SPECIES



Seminar on Innovative Communication Tools For Secondary School Science Teachers Using Low Cost Teaching Aids -to Improve Science Teaching In Aspirational District Gajapati Of Odisha



Inauguration by District Education Officer, Gajapati





Inauguration by Chairman, Socio Cultural Development Centre, Odisha





Addressing By Principal Centurion Public School, Paralakhemundi





Addressing by Chairman, Socio Cultural Development Centre, Odisha





Addressing By Dean, School of Agriculture, Centurion University, Paralakhemundi





Addressing by District Education Officer, Gajapati





Practical Demonstration of Low Cost Experiment by Resource person





Practical Demonstration of Low Cost Experiment by Resource person





Power Point Presentation by Experts





Power Point Presentation by Experts





Science Teachers receiving the Participation Certificate from the Dignitaries





Science Teachers receiving the Participation Certificate from the Dignitaries





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