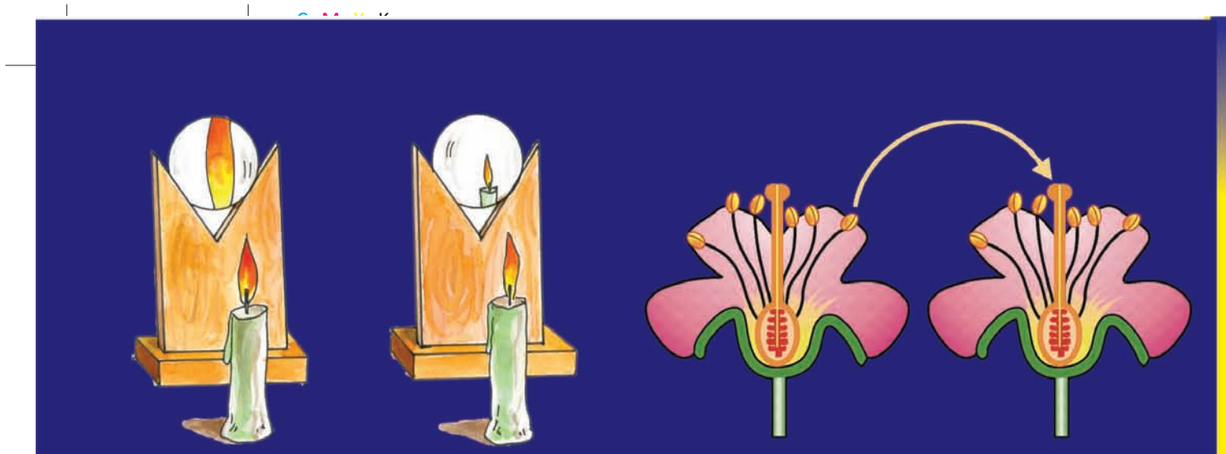

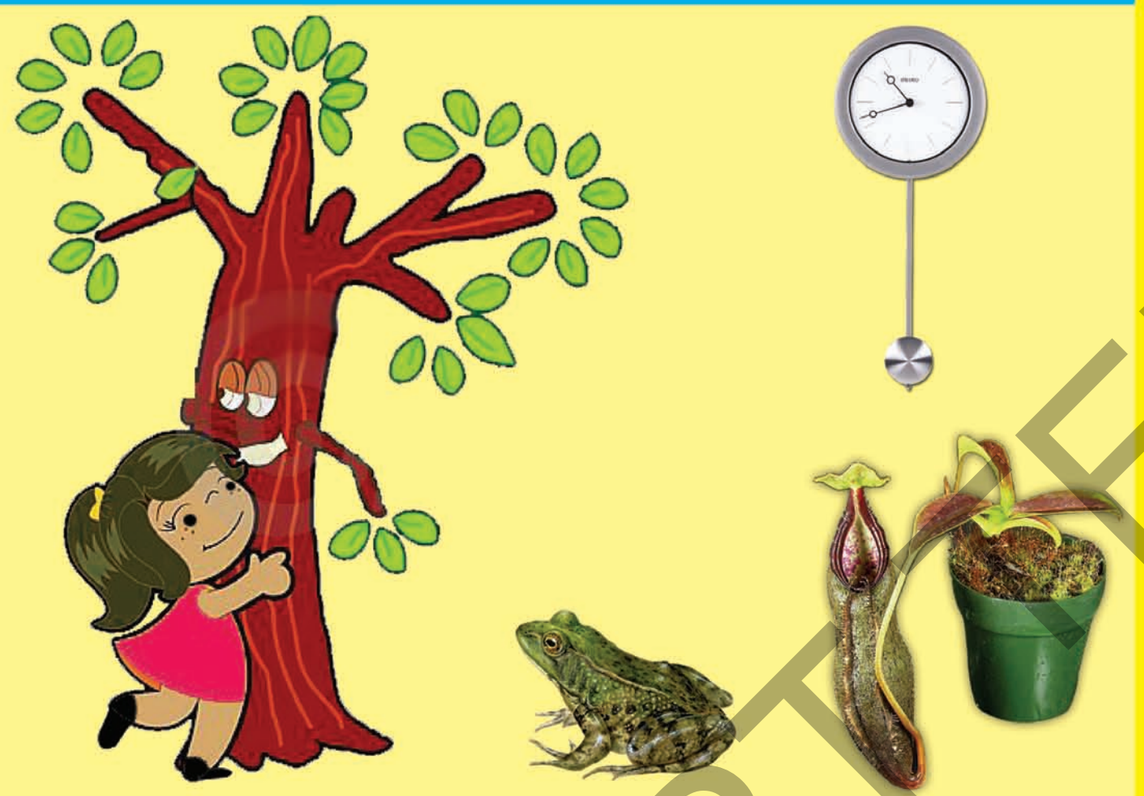

CLASS - VII SCIENCE

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SCIENCE

CLASS - VII

FREE

Published By
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I believe that Change Begins With Me!

1. *Always carry a cloth bag. Do not accept polythene covers from shops.*
2. *Never use water directly from tap. Use only little required amount. Fix leakages immediately.*
3. *Save Power and Pollute less. Reduce power bills.*
4. *Always have (indoor/) Plants in Home/ Apartment Never support tree felling.*
5. *Segregate dry and wet waste. Donate to rag pickers.*
6. *Buy and Sell Second hand goods.*
7. *Prefer sharing rides / Public transport / avoid junk trips.*
8. *Utilize more day light and reduce night time power consumption.*
9. *Use online tools / e-Seva / internet for payments and tickets. Avoid travel, pollution and traffic.*
10. *Share these Green living Tips regularly to people around. Share with at least with 3 friends.*

My Dear Young minds

When you open your senses

You feel .... Lots of doubts sprout in your mind

You may feel why? What? and How?

And wish to ask the same... don't you?

Don't hesitate to ask

You have a passion to explore, experiment and find reasons

Be ready to understand it by doing

Just this is the way of thinking scientifically

Grass to Galaxy will feast for your eyes.

Strolling ant ... running squirrel

Plunging leaf ... falling rain drop

Are to discover the core hidden principle is the 'Science'

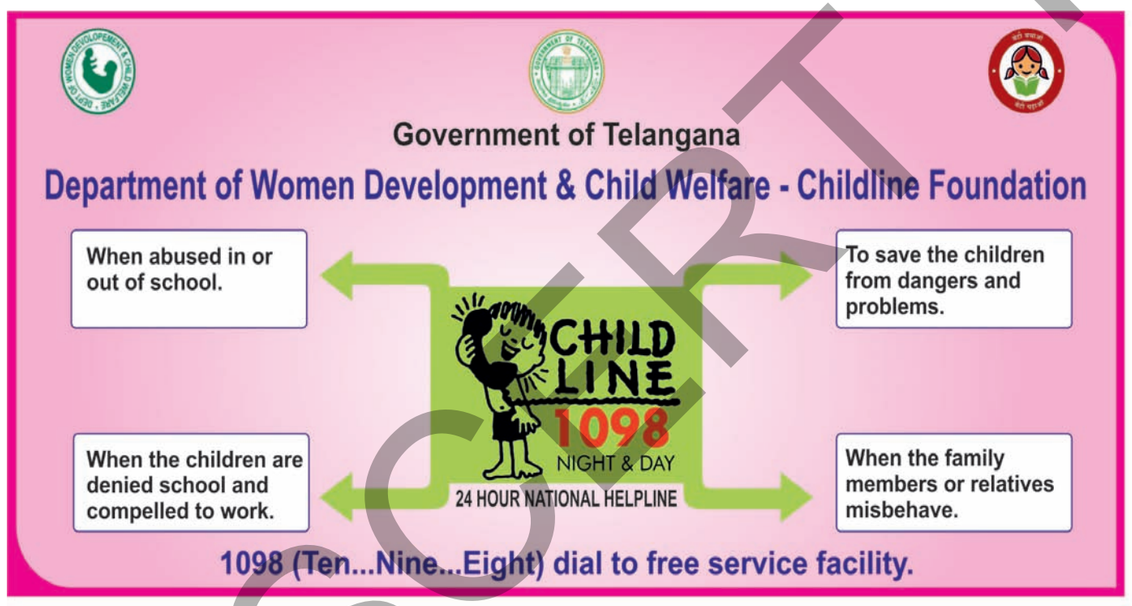
Using wisdom and saving mother earth is the 'Science'

So my dear little minds ...

The universe is yours

And you are the creators

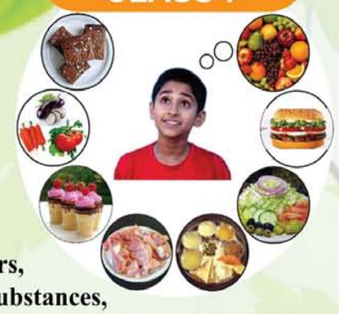
Dr. A.P.J. Abdul Kalam



Learning Outcomes

SCIENCE

CLASS 7



The learner....

- **Identifies materials and organisms, such as, animal fibres, types of teeth, mirrors & lenses, on the basis of observable features i.e., appearance, texture, functions etc.,**
- **Differentiate materials and organisms, such as, digestion in different organisms, unisexual and bisexual flowers, conductors and insulators of heat; acidic, basic and neutral substances, images formed by mirrors and lenses etc. on the basis of their properties; structure and function.**
- **Classifies materials and organisms based on properties/charecteristics, e.g. plant and animal fibres, physical and chemical changes.**
- **Conducts simple investigations to seek answers to quires, e.g., (i) Can extract of coloured floweres be used acids, base indicators? (ii) Do leaves other than green also carryout photosynthesis? (iii) Is white light composed of many colours?**
- **Relates process and phenomenon with causes, e.g. wind speed with air pressure,crops grown with types of soils, Depletion of water table with human activities etc.**
- **Explains processes and phenomenon, e.g. (i) Processing of animal fibres (ii) Modes of transfer of heat, (iii) Organs and systems in humans and plants, (iv) Heating and magnetic effects of electric current etc.**
- **Writes word equations for chemical reactions Eg. (i)Acid, base reaction (ii)Corrosion (iii)Photosynthesis (iv)Respiration (v)Time period of simple pendulum etc.**
- **Plots and Interprets Graphs Eg. (i) Distance time Graph**
- **Constructs modals using materials from surrounding and explains their working. Eg. (I)Stethoscope (ii)Anenometer (iii)Electro magnets (iv)Newtons colour disc etc.**
- **Discuss and appreciates stories of scientific discoveries.**
- **Applies learning scientific concepts in day to day life. Eg. (i)Dealing with acidity (ii)Taking measures to prevent corrosion (iii)Cultivation by vegetative propagation (iv)Connecting two or more electric cells in proper order in device. (v)Taking measures during and disasters polluted water for reuse etc.,**
- **Makes efforts to protect Enviornment Eg. (i)Following good practice for sanitation (ii)Minimising Generation of pollutants (iii)Planting trees (iv)Sensitising others with the consequences of excessive consumption of nature resoures.**

SCIENCE

CLASS VII

Published by Government of Telangana, Hyderabad.

The secret of Education is respecting the children

Ralph W. Emerson

Respect the Law
Get the Rights

Grow by Education
Behave Humbly

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What is done to children they will do to society

Dr. Karl Menninger

FOREWORD

Thought process is a unique boon given to human kind by Nature. Man creates and reconstructs knowledge through the process of thinking and analysis. Man generates knowledge by way of doing, imagining, redoing works in a different way. These may be called the processes of Science.

Science is a systematic logical thought oriented process and a path to truth. Science and Technology have improved human life by way of scientific inventions, discoveries and their applications in various fields.

Human beings understand Nature through Science and use Nature for their benefit while at the same time respecting and protecting Nature. However it is evident that we give importance to the first i.e., harnessing Nature and forgetting to protect and sustain Nature in its pristine form. As a result we experience several calamities leading to destruction of Nature, climate, Earth and finally life on Earth.

The future of the country is being shaped in the classrooms and science learning can never be limited to learning of principles, theories and introduction of experiments. Scientific attitude and thought shapes human beings in such a way so as to make them sensitive to Nature and strive to uphold and maintain bio-diversity. Science learning means commitment towards the good and welfare of society and all life forms including human kind.

Children should learn that science is not only in textbooks but also in the works of peasants, the artisanship of potters, food prepared by mother etc., The local knowledge should enter into science textbooks and must be discussed in the classrooms. Specific observations and logical thinking is required in order to inculcate values and develop life skills. This is possible through study of science. The inquisitiveness and creativity should be developed through science learning. The skill of asking questions, critical observations and developing the spirit of investigations and enquiry shall be facilitated through science teaching and learning.

Science teaching should promote the spirit of knowing and experimenting rather than keep these abilities dormant. The traditional attitude of treating science as a body of facts, theories, principles and information needs to be transformed. The re-learning of the true nature of science must happen as recommended by the National Curriculum Frame Work-2005.

The textbooks are developed based on State Curriculum Framework and its Position Paper on Science and also reflect the spirit of Right to Education Act. Science textbooks are developed to facilitate construction of knowledge jointly by the teacher and the pupil but never as merely an information provider.

The textbook facilitates learning through activities, discovery, exploration in a child centered manner. The activities i.e., group, individual and whole class, experiments, field investigations, information collection, questioning, analysis, synthesis, projects etc., must become a part of learning and as well as assessment in the context of science education. The pupil assessment procedures facilitate thinking in critical and multiple ways. Critical pedagogy and social construction become a part of classroom pedagogies in search of truth. The spirit of continuous and comprehensive evaluation is reflected in the assessment procedures. Certainly the revised textbooks facilitate the teachers in effective transaction of science duly reflecting the nature and spirit of science.

New textbooks are developed to achieve desired academic standards. So teachers should develop various teaching learning strategies to make their students to achieve class based academic standards. We should avoid rote learning methods for successful implementation of Continuous Comprehensive Evaluation (CCE). It is very impart to know more about different methods to assess student progress by summative and formative evaluation. New textbooks reflects Continuous Comprehensive Evaluation and teaching method with respect of discussed concepts. This is more useful to teachers and students.

We are very grateful for the kind of support from the National and State level experts in designing a textbook of science that transforms the very nature of science teaching learning in the state classrooms. We are also thankful to the Textbook Writers, Editors, Illustrators, Graphic Designers for their dedicated work for the cause of children's science education.

We humbly request the educationists, parents, NGOs and children for appropriate suggestions to improve the science textbooks. We also expect that the teachers and teacher educators will welcome the proposed reforms in science teaching learning process and implement them with appropriate professional preparation and referencing. It is also expected that a habit of scientific enquiry and nature of questioning would be developed among children within the contextual transaction set out in the revised science curriculum and textbooks.

Smt. B. Seshu Kumari
Director
S.C.E.R.T., Hyderabad.

BEFORE STEP INTO TEXTBOOK ....

The textbook is designed duly considering th e Inquiry Nature of childhood and their power of imagination. Children's world is creative and they are more inquisitive and want to find out everything they come across and ask several questions until they satisfy on any incomprehensive issue / objects. This nature of the child is the basis for an enquiry mind and for pursuing the scientific knowledge in a systematic way. Let us discuss some of the issues before preparing the children for the learning of science in a scientific way.

The National Curriculum Frame Work – 2005 and State Curriculum Frame Work – 2011 defined science is questioning, observing the nature and try to understand the nature. For this purpose one should question Why? What? How? When? on the observed phenomenon. The children imagine and expect what happens? and what will be the outcomes? Children must experiment and observe by utilizing the available resources in the local environment to find out answers to their questions.

It must be theorized and generalized based on repeated observations. The natural phenomenon and resources which influence our life viz., day and nights, water, air, earth, heat, light, food, flora and fauna must be understood primarily from our life experiences. For this purpose one should reflect on our daily experiences and impact of human interventions in various natural activities / processes. Children must be made to appreciate the applications of science for the betterment of human life, natural phenomenon such as rain, wind, day and nights and growth of life on the earth, bio diversity etc.,

Teachers must think and design strategies for appropriate science education and its classroom transaction to realize the constitutional values, goals and aims of science education and the philosophical perspectives of science education at school level. The transformation of young minds as potential scientists must be explored and afforded. This requires lot of planning on the part of teacher and professional preparation, referencing, collaborative work with the children and encourages bringing children's knowledge into the classrooms.

About Academic Standards....

The National and State Curriculum Frame Works, the Right to Education Act clearly envisaged on the role of the school in achieving the expected academic standards which are subject specific and grade specific. Learning of science does not include learning of information alone, but it includes doing projects to understand the science concepts, undertaking observations and experiments, collection of information, analysis of information and finally arriving to conclusions and generalizations.

Children must draw the illustrations on the observed things and appreciate the interdependence of the living beings in the nature. Appropriate attitudes on keeping the bio diversity and sustaining it is also one of the objectives of science learning in schools. Teachers must play a vital role and take the responsibility in developing such scientific spirit and academic standards.

Teaching Learning Strategies ....

Teaching does not mean transferring information from the textbooks. Teachers must understand the philosophical base of science i.e., why science is as a subject in school curriculum? And what are the expected goals and objectives of science teaching? What is the expected behavioral change in children through science teaching? How to motivate the children to peruse science with increased interest and dedication. The teacher shall plan strategies for science teaching. Following are the expected strategies of the science teaching.

- Textbooks must include various learning strategies to construct knowledge on various science concepts through observations, discussions, experimentation, collection of information.
- Using mind mapping as one of the initial whole class activity and develop debate and discussion on the given concepts.
- Prepare children for discussions by posing appropriate questions. The questions given in the textbook exercises make along with planning additional questions must be used.
- Textbook reading is a must to understand and to get an overall idea on the concepts introduced in the lessons.

- Textbook may be appropriately used while teaching the lesson both by children and as well as teachers.
- Teachers must prepare / collect appropriate equipment, plan and well in advance for a meaningful transaction of the science lessons and plan for children participation through group / individual / whole class work.
- Teacher preparation includes collection and reading of appropriate reference books, sources in the internet, library books, children exercises, appropriate questions to children to think on the given concepts and sharing the prior ideas of the children.
- Appropriate activities to appreciate the nature and natural phenomenon.
- Plan for discussions for improved understanding and appreciation of bio-diversity and efforts to environmental protection and specific roles of the children in doing so.
- Teaching learning strategies and the expected learning outcomes, have been developed class wise and subject-wise based on the syllabus and compiled in the form of a Hand book to guide the teachers and were supplied to all the schools. With the help of this Hand book the teachers are expected to conduct effective teaching learning processes and ensure that all the students attain the expected learning outcomes.

Conduct of Activities ….

The basic objectives of science teaching facilitate the learning of how to learn. Therefore, children must be facilitated to construct knowledge collaboratively through participating in whole class, group and individual activities.

- Provide advanced information and awareness on the experiments, observations to be done both in side and out side the classrooms along with study of reports.
- The exercises given in the textbooks must be performed during the classroom teaching learning processes without delay or skipping.
- The activities in the lesson shall be performed not only during its transaction but also during the entire academic year for specific units Eg: food for the animals and changes around etc.,
- The observations, information collection, field investigations etc., must be taken up under the teacher guidance / presence. Some of the work may be given as homework also.
- Local resources may be used as alternative equipment for designing and undertaking activities / experiments.
- Teacher must develop a year plan duly distributing the projects, assignments, field trips given in the textbooks so as to complete with in the available 180 working days.
- Teachers are advised to collect information about recent studies of the areas discussed in the textbook for every year.

About assessment ….

The present practice of testing children to what extent they learnt the information must be replaced by understanding how children are learning. What are the learning problems? What is difficult for children? etc., This may be possible by observing children notebooks, assignments and sitting besides them while doing the work / problem solving. Therefore, importance must be given for the Assessment For Learning than Assessment Of Learning. An effort was made to provide variety of assessment exercises in the textbooks, assess the different competencies to be developed as per the goals and objectives of science teaching in schools. Teachers must understand the continuity and appropriateness of varieties of assessment.

- It is expected that every child must understand the concept and try for his own answer rather than repeating the text given in the textbooks without any value addition.
- Teachers shall not try for uniformity in the answers across the students in the class but encourage them for a variety of responses.
- Some of the exercises for display in the wall magazine, bulletin board, school community meeting are not only for the sake of assessment but it reflects the nature of academic activities to be performed in the schools.

The revised science textbook is all together an improved design reflecting the nature and spirit of science learning and certainly make the children to think and contribute his / her ideas creatively and facilitate the construction of concepts based on the child's prior ideas / experiences. There is no doubt that children would develop creatively while following and performing the activities and exercises given in the science textbooks. It is a challenge for teachers to make children as constructors / creators of knowledge rather than receivers of information.

Salute our Great Scientists

Jagdish Chandra Bose

1858-1937
Creator of Crescograph

Acharya Prafulla Chandra Ray

1861-1944
Creator of Mercuric Nitrate

Srinivasa Ramanujan

1887 - 1920
Creator of Prime Numbers

Sir C.V. Raman

1888 - 1970
Creator of Raman Effect

Meghnadh Saha

1893 - 1956
Creator of Thermal Ionization

Saleem Ali

1896 - 1987
Encyclopedia of Birds

Homi Jahangir Baba

1909 - 1966
Nuclear Scientist

S. Chandrashekhar

1910 - 1995
Astrophysicist

Vikram Sarabhai

1919 - 1971
Father of Space Physics

Har Gobind Khorana

1922 - 2011
Genetic Engineering

Dr. M.S. Swaminathan

1925
Father of Green Revolution

Dr. APJ Abdul Kalam

1931
Father of Missiles Technology

CONSTITUTION OF INDIA
Preamble

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a **SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC** and to secure to all its citizens:

JUSTICE, social, economic and political:

LIBERTY of thought, expression, belief, faith and worship:

EQUALITY of status and of opportunity: and to promote among them all

FRATERNITY assuring of the individual and the unity and integrity of the Nation:

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949. do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

ACADEMIC STANDARDS

S.No.	Academic Standard	Explanation
1.	**Conceptual understanding**	Children are able to explain, cite examples, give reasons, and give comparison and differences, explain the process of given concepts in the textbook. Children are able to develop their own brain mappings.
2.	**Asking questions and making hypothesis**	Children are able to ask questions to understand concepts, to clarify doubts about the concepts and to participate in discussions. They are able to guess the results of on issue with proper reasoning, able to predict the results of experiments.
3.	**Experimentation and field investigation.**	Children are able to do the experiments given in the text book and developed on their own. Able to arrange the apparatus, record the observati onal findings, suggest alternative apparatus, takes necessary precautions while doing the experiments, able to do to alternate experiments by changing variables. They are able to participate in field investigation and prepare reports.
4.	**Information skills and Projects**	Children are able to collect information related to the concepts given in the text book by using various methods (interviews, checklist questionnaire) analyse the information and interpret it. Able to conduct project works.
5.	**Communication through drawing, model making**	Children are able to counicate their conceptual understanding by the way of drawing pictures labeling the parts of the diagram by drawing graphs, flow charts and making models.
6.	**Appreciation and aesthetic sense, values**	Children are able to appreciate the nature and efforts of scientists and human beings in the development of s ience and have aesthetic sense towards nature. They are also able to follow constitutional values
7.	**Application to daily life, concern to bio diversity.**	Children are able to apply the knowlegde of scientific concept they learned, to solve the problem faced in daily life situations. Recognise the importance of biodiversity and takes measures to protect the biodiversity.

INDEX

Class VII

OUR NATIONAL ANTHEM

- Rabindranath Tagore

Jana-gana-mana-adhinayaka, jaya he
Bharata-bhagya-vidhata.
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchhala-jaladhi-taranga.
Tava shubha name jage,
Tava shubha asisa mage,
Gahe tava jaya gatha,
Jana-gana-mangala-dayaka jaya he
Bharata-bhagya-vidhata.
Jaya he! jaya he! jaya he!
Jaya jaya jaya, jaya he!!

PLEDGE

- Pydimarri Venkata Subba Rao

"India is my country; all Indians are my brothers and sisters.
I love my country, and I am proud of its rich and varied heritage.
I shall always strive to be worthy of it.
I shall give my parents, teachers and all elders respect,
and treat everyone with courtesy. I shall be kind to animals.
To my country and my people, I pledge my devotion.
In their well-being and prosperity alone lies my happiness."

1 FOOD COMPONENTS

In the previous class we have learnt that we eat many kinds of foods like biryani, pulihora, idly, chapathi, dal etc. and you also learnt how to cook some kinds of food making them tasty and palatable by adding oil, sugandha dravyalu (condiments) etc.

Fig. 1

Every one have their own favourite food.

What is your favourite food/dish? Why do you like it?

Is only favourite food sufficient for you? Why?

What food do you eat every day?

Think ,why do you eat it?

Let us do – 1 :

We eat different types of food items. Make a group with five or six students and make a list of some day-to-day activities and food items we eat; display your group report. Discuss in groups with your teacher about the relationship between eating food and performing activities.

Food supplies the energy we need to do many tasks in our day to day activities.

- Do we need energy when we sleep? Why / why not?

Do you know that even while sleeping we breathe and circulation of blood in our body goes on; so do you agree that we need energy even while sleeping? Can you add some more activities performed by our body during sleep?

Read the following and discuss with your friends.

1. Suppose you don't get food for lunch how do you feel?
2. If you don't get anything for more than a day how will you feel?
3. If you don't get food for many days what will happen to you?
4. Why should we take food? What are the components in it?

Let us find out what components are present in our food.

Let us do – 2: Listing out food components

Observe the given packet (Fig. 2) and list out the food components present in it.

In Table 1, put a tick mark if you find the listed food components present in food items .

Collect some other food packets as well like those of chips, coffee, biscuit, etc. and identify the different components present in them and record them in the table given.

Table 1: Food items and components

Food Items	Carbohydrates	Protein	Fat (Lipids)	Vitamins & Minarals	Other if any
Milk Powder					

Fig. 2

1. What are the components found in biscuits?
2. What components are most common in your list?
3. Do you find any vitamins and minerals in them? What are they?
4. Where do you write salt and sugar? Why?
5. Are there any food items with similar components?

What are the essential components of food?

Our food consists of Carbohydrates, Proteins, Fats, Vitamins and Minerals. Besides these, water and fibres are also present. These are the essential components of our food and we call them nutrients. In activity 1, you prepared food items list. Which of them have carbohydrates? Which of them have proteins? Which of them have vitamins and minerals? The components present in food substances can be tested easily through simple experiments.

Let us do – 3: Confirmation of presence of food components

Collect different types of food materials like milk, a potato, little quantity oil / ghee. Test them according to the instructions given below. For this you will need test tubes, stand, plate and dropper. You would also need some chemicals as given in each section of testing.

Take a sample of each food item in a test tube or plate. Prepare the chemicals needed. Test the samples with them. Note down your observations in your notebook

Experiment – 1: Test for Starch:

Preparation of dilute iodine solution

Take a test tube or a cup and add few drops of Iodine crystals to it. Then dilute it with water till it becomes light yellow/brown.

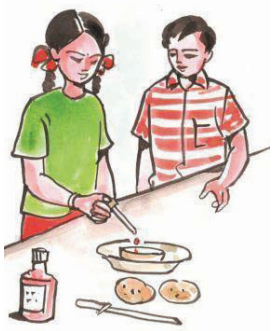


Fig. 3

Take a sample of food item in the test tube. Add a few drops of dilute Iodine solution to the sample.

Observe the change in colour. What do you find?

If the substance turns dark-blue or black it contains starch. Try with ripen banana and curry banana.

Experiment – 2: Test for fats

Take a small quantity of each sample. Rub it gently on a piece of paper.If the paper turns translucent the substance contains fats.

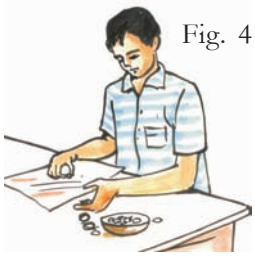


Fig. 4

Recall your past experience when you have eaten vada or any other food item on a paper plate; you might have noticed the paper plate turning translucent.

Why did the paper plate turn transluscent ?

The reason for this is presence of fats in food items.

Experiment – 3: Test for Proteins

Preparation of 2% copper sulphate solution and 10% sodium hydroxide solution:

To make 2% copper sulphate solution dissolve 2 gms of copper sulphate in 100 ml of water.

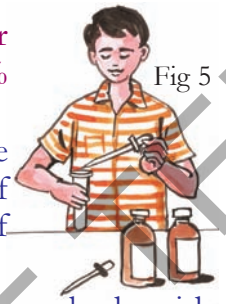


Fig 5

To make 10% of Sodium hydroxide solution dissolve 10 gms of sodium hydroxide in 100 ml of water.

1 gram of sodium hydroxide equals to 6 pellets of sodium hydroxide.

If the substance you wish to test is a solid, grind it into powder or paste. Take a little of it in the test tube and add 10 drops of water to the powder and stir well.

Take 10 drops of this solution in a clean test tube and 2 drops of copper sulphate solution and 10 drops of sodium hydroxide solution to the test tube and shake well. Change of colour to voilet or purple confirms presence of protein.

The above tests show the presence of components of food which are usually present in larger amounts as compared to others. All types of food that we eat contain all the above mentioned food components. The quantity of each component varies from type to type.

In Rice carbohydrates are more where as in oils, fats are present in more quantity.

Let us do – 4: Testing of food items

Test different food items as given in Table 2. You may add your own examples. Find out the different components in them and record the information on the basis of your observations in table 2.

You can enrich the table by adding more food substances.

Analyse the data in the table and think about the components presents in the food items.

Table 2: Testing of food items for Carbohydrates, Proteins, Fats

S.No.	FOOD	STARCH Present / Absent	PROTEINS Present / Absent	FATS Present / Absent
1	RICE			
2	POTATO			
3	MILK			
4	CURD			
5	EGG			

Discuss with your friends and answer the following questions.

1. Which foods show the presence of starch?

.....

2. What nutrients are present in milk?

.....

3. Which component of food could you identify in potatoes?

.....

4. Which food item contains more fat?

.....

5. Which food items contain more protein?

.....

Generally every food item contains all the components of food. But some components may be more while some may be less.

We require different quantities of Carbohydrates, Proteins and Fats according to age and need of individuals. Growing children need more protein-containing food like milk, meat, pulses etc. We also need minute quantities of some other components called Vitamins and Minerals to keep us healthy.

Think! Find out from your classmates whether all of their family members take sufficient food. If not,why ? Find reasons and solutions.

ROUGHAGES OR DIETARY FIBRES

There are some components of food that are necessary for our body called roughages or dietary fibres.

Let us do – 5: Roughages in some food items.

Collect some vegetables like ribbed gourd, bunch beans, lady's finger or some boiled sweet potato etc. break them or crush them into pieces and observe.

- Do you find some fine strands or thread like structures?
- What are these strands called?

Roughages are a kind of carbohydrates that our body fails to digest. They help in free bowel movement in the digestive tract and prevent constipation.

Discuss with your teacher how dietary fibres help in preventing constipation.

SOURCES OF ROUGHAGES

Bran, shredded wheat, cereals, fruits and vegetables, sweet and plain potato, peas and berries, pumpkins, palak, apples, banana, papaya and many kinds of beans are the sources of roughages.We must take care to include sufficient fibre foods in our daily diet.

Fig. 6

Generally we have a habit of eating some fruits with peels. We eat banana without peel but fruits like apples, grapes etc. are eaten along with peels. Most of the vegetables are also used along with peels, sometimes we make some special dishes like chutneys etc. with peels. So don't peel or discard outer layers of fruits or vegetables. They are rich in nutrients. Peel contains fibre which helps in digestion. But

now-a-days farmers use many pesticides in the fields They are very dangerous for our health so we must wash fruits and vegetables with salt water thoroughly.Then only it becomes safe to eat them along with peels.

Fig. 7

WATER

Water is also an essential component needed by our body. We should drink sufficient water. Do you know we get water from fruits and vegetables also? Most of the fruits and vegetables contain water.

Fig 8

Observe the above fruits and vegetables and cut them. Can you find water in them? Most vegetables like cucumber, beans, kheera, tomatoes, gourds and fruits like, papaya and melons etc. contain water.

Why does our body need water?

Let us do – 6: To know the use of water

Take a piece of sponge and try to move it in a pipe. It moves with some difficulty, Remove the sponge from the pipe, dip it in water and try to move it again in the pipe. It moves freely or smoothly (Fig 9).Why does it move freely? Water is food and it also helps the food to move easily in the digestive tract. Water helps in many other processes in our body as well. Hence, we must drink plenty of water.

Fig. 9

BALANCED DIET

Let us do – 7

Table - 3

Break fast	Lunch	Dinner

List the food items eaten by you yesterday from break-fast to dinner. Does your diet contain all the necessary components of food in it? Think and discuss with your friends.

Let us do – 8

Look at the food 'THALI' with many food items and list out the food items and food components in it.

Fig. 10

Table - 4

Food Items	Food Components
Rice	Starch

You need not eat all items as shown in the "THALI" rather you should ensure that your food contains all food components everyday in adequate quantity. For example, a diet containing food items having more of carbohydrates and protein along with a little fat, vitamins and minerals makes a balanced diet.

Make your diet a balanced one

Taking green salads and vegetables everyday.
Taking foods like cereals, pulses, milk etc. adequately

Taking a bit of fat (Oil, Ghee, Butter etc.)

Eat seasonable fruits.

Don't forget to supplement your daily diet with green salads and vegetables.

Do you know?

Dry fruits like dates, plums, raisins, Cashew nuts, pistachios, etc. also keep us healthy. Consumption of these in small quatities is good. Name some of the dry fruits you know.

Balanced diet is cheap indeed:

Scientists have found out that a balanced diet need not necessarily be costly. Everyone can afford it, even the poor. If a person eats dal, rice, rotis, green vegetables, little oil and jaggery all the food requirements of the body are fulfilled. Just balancing our diet with different kinds of foods is not enough. It should be cooked in a proper way.

Fig. 11

You know many nutrients are lost by over cooking, re-heating many times, washing the vegetables after cutting them into small pieces.

Think! Is your mid-day meal a balanced one? Write your observations and display them in bulletin board.

Do you know which foods are to be eaten moderately, adequately, plenty and sparingly?

- Foods like cereals, pulses, milk etc. should be taken adequately.
- Fruit, leafy vegetables and other vegetables should be used in plenty.
- Cooking oils and animal foods should be used moderately.
- Vanaspathi, Ghee, Butter, Cheese must be used sparingly.

Avoid junk foods:

If you are eating only pizzas and sandwiches daily, what will happen? Your body is being deprived of the other food substances. Junk food causes damages to our digestive system. It is better to avoid eating junk food.

Discuss in groups or collect information about junk food. In what way are they harmful to us?

Food habits of the people depends upon climatic conditions and cultural practices of the particular place. We eat rice in large quantities but people living in north India eat chapathies as a daily food. Why? Because wheat is grown widely in that region. The way of cooking and eating food also reflects the cultural practices of people.

History of food and Nutrition:

Until about 170 years ago there was little scientific knowledge in the West about nutrition. The founder of modern science of nutrition was Frenchman named Lavoisier (1743 to 1793) whose contribution paved new ways to nutrition research. In the year 1752 James Lind's discovered "Scurvy" which could be cured or prevented by eating fresh fruits and vegetables. In 1952 it was known that diseases could be cured by eating certain kinds of foods. In 19th century it was known that the body obtains three substances namely proteins, fats and carbohydrates from the food.

KEY WORDS:
Carbohydrates, Fibres, Balanced diet, Proteins, Fats, Constipation, Vitamins, Minerals.

What have we learnt?

- Food contains some components Carbohydrates, Proteins, Fats, Vitamins and Minerals
- Fibres are also a component of food that are present in different kinds of fruits and vegetables.
- All food items contain all the components of food. The amount of each component varies from one type of food to another.
- Roughages or Dietary fibres clean our food canal and prevent constipation.
- We must drink enough water so that our body functions properly.
- The food that contains all the nutrients like Carbohydrates, Proteins, Fats, Vitamins and Minerals in a proper proportions is called Balanced Diet.
- Every one requires a Balanced Diet.

Improve your learning:

1. Make a list of food items eaten during lunch by you. Try to mention the components in each food item.
2. Manjula eats only bread and omlette daily. Do you think it is a balanced diet? Why? Why not?
3. Make a list of food items that contain all components of food.
4. Who am I?

a. I am a component of food that makes paper translucent.

b. Put a drop of me on a cut potato. It turns dark blue. Who am I?

5. Explain what will happen if we don't include roughage in our food?
6. Test the given food items and record the type of component that are present in them. (Ground nut, Cooked dal, Pulusu)
7. Draw some food items of your diet and explain why you like them.

8. If you were invited to a party with many food items in the menu like Rice, Roti, Puri, Idly, Dosa, Samosa, Dal, Green salad, Vegetable curry, Fruit chat, Chicken curry, Eggs, Gulab Jamun

   a. What food items would come on to your plate to make your diet a balanced one?

   b. What food items would you take plenty, adequately?

9. How is water useful to our body?

10. Fill in the blanks.

    a. If our food is not balanced with proper nutrients we may _____ .

    b. Fibres in our diet prevent _____ .

    c. Our daily diet should include plenty of _____ .

    d. Oils and fats give us _____ .

11. Match the following and give the reasons.

1.	Fibre	( )	A) energy giving
2.	Protein	( )	B) body building
3.	Carbohydrates	( )	C) Bowel movement

12. Prepare a balanced diet chart with the help of your group and exhibit it in your class room science fair

13. Prepare 'kichidi' with your mother's help using all kinds of available vegetables, dals, nuts etc. Write a note on the process of making kichidi.

2 ACIDS AND BASES

In our daily life we use a lot of subatances. Even our food has a lot of variety. Different items also have different taste. In preparing and storing food we take a lot of care. In this chapter we would try to understand the reasons for some of them. Let us first think over the following questions related to what we eat.

- What sort of food do we eat?
- Are all the items alike? For example do they have the same colour, taste etc.
- In what ways are they different?
- What kind of tastes do food substances we eat have?

Fruits, vegetables and other food substances have different tastes.

Write the names of food substances that you know in the appropriate column, based on their taste:

TABLE - 1

S.No.	SWEET	SOUR	BITTER	SALTY	SPICY
1.	Sugar	Lemon Juice	Bitter Gourd	Common Salt	Red Mirchi
2.					
3.					
4.					
5.					
6.					

- Do you experience any other tastes in your daily life? Write them below.

  _____

  _____

  _____

  _____

- Do you find any difference in the taste of a raw and a ripe fruit?
- Do substances change their taste when cooked?
- Do substances change their taste when added to some other substances?
- Add salt to lemon juice. How do the two together taste now?
- Add sugar to lemon juice what change do you notice in the taste?
- Is there any difference in the taste in the above situations.

- Do substances change colour when added to other substances?
- Do you observed any change when lime water is added to turmeric?

Let us do - 1

Take some turmeric powder. Add a bit of water to it and prepare turmeric paste. Rub the turmeric paste on a white paper dry it for some time. Then draw a flower daigram on that paper with a pencil. Colour the flower with soap water using a brush.

Fig.1

- Does the colour of the flower remain the same when soap water is used?

Similarly take some lime water. Add a few drops of it on a piece of turmeric paper. Does the paper change its colour? Is the changed colour of turmeric paper the same in both the cases?

Rani and Sai dropped food they were eating on a white sheet. They washed the sheet with soap and found to their surprise a red spot appearing on the sheet.

- What is the reason for the red spot?

Colour Change:- We notice here that turmeric changes colour when soap water or lime water is added to it. Is it possible that some other substances also change their colour. Let us see.

Let us do - 2

Take a piece of turmeric paper. Find as many of the substances given in the table-2 as possible and put them on the turmeric paper one by one. You could try using other substances around you as well.

- What do you observe? Do you find any change in colour?
- We notice that the colour of turmeric paper changes with some substances when added to it.

  Record your observations in table-2

The substances which indicate a change in colour when some substances are added to them are known as indicators.

Turmeric paper is a natural indicator. We can also prepare other natural indicators mentioned in the table – 2 and carry out the tests.

Let us test some substances using these natural indicators. To the substances mentioned in the table – 2, add natural indicators and observe the change in colour. Write the changed colours in the table-2.

- What are the substances which can change the colour of the petals of hibiscus indicator?
- Are there any substances which can change the colour of more than two indicators?
- Is there any substance which cannot change the colour of the indicator?

TABLE - 2

Indicator		COLOUR CHANGE OBSERVED							
Filter paper indicators made using	Colour of the Indicator Paper	Vineger	Apple Juice	Banana	Lemon Juice	Soap	Lime Water	Glass Cleaner	Milk of Magnesia
Turmeric									
Petals of Hibiscus									
Mango Leaf									
Beetroot									
Oleander									

Try with some other substances and observe the changes.

Let us do - 3

Take solutions of some juices of fruits, vegetables, cool drinks and various solutions in beakers/test tubes and test them with blue and red litmus papers. List out results in the table (3), by marking (✓) in the relevant column if the colour changes, put (*x*) if the colour is unchanged.

TABLE 3

Substance	Red litmus turns blue	Blue litmus turns red	No Change in litmus
1. Orange			
2. Tomatoes			
3. Baking Soda			
4. Mineral Water			
5. Vinegar			
6. Salt Water			
7. Shampoo			
8. Washing Soda			
9. Spirit			
10 Saliva			
11. Cucumber			
12. Ridge gourd			
13 Kheera			
14. Butter Milk			
15. Milk			
16. Cooldrink			
17. Lemon Juice			
18. Grape Juice			
19. Bathing Soap			
20. Detergent Soap			
21. Lime Water			
22. Sugar Water			

Preparation of Lime water

Take half a beaker full of water. Add about 5 gm of lime that we apply to betel leaves. Stir the beaker well and let it stand overnight. Filter this solution the following day. Use this filtrate in all experiments you perform. This solution should be transparent.

- Which of the above substances changed red litmus to blue?
- Which of the above substances changed the blue litmus to red?

The substances that turn blue litmus to red are acidic in nature. The substances that are soapy to touch and turn red litmus to blue are basic in nature.

Some of the substances given in the list did not change the colour of either blue or red litmus. These are said to be neutral in nature.

Precautions

Don't taste any substance unless your teacher instructs you. Wash the testtube, stick or dropper you used for putting drops of substances on different paper strips for next use.

Let us do - 4:

Classify the above substances into the following categories from the above observations.

TABLE 4

Acidic Substance	Basic Substance	Neutral Substance

- Now take things which are sour in taste and used as food e.g. curd, lemon juice etc. Check with blue and red litmus, what happens?

Indicators:

The strips of litmus paper change the colour, based on the nature of the material put on them. These are all indicators. They tell us whether a substance is acidic or basic. They are used in studying acidic and basic properties of substances.

Acidic Nature:-

You may have experienced a burning sensation when bitten by an ant. The sensation is due to the presence of formic acid that the ant releases. The acids present in plants and animals are called as natural acids.

The substances that contain different acids. are given in the table 5.

TABLE - 5

ACID	SUBSTANCE
Acetic Acid	Vinegar
Citric Acid	Lemon, Orange
Butyric Acid	Stale cheese
Lactic Acid	Butter Milk, Curd
Oxalic Acid	Spinach, Tomato
Malic Acid	Apples
Tannic Acid	Tea
Oleic Acid	Olive Oil
Stearic Acid	Fats
Tartaric Acid	Grapes, Tamarind
Palmtic Acid	Palm Oil
Ascorbic Acid	Amla (emblica fruit)
Uric Acid	Urine

Apart from natural acids, there are certain acids like Hydrochloric acid, Sulphuric acid and Nitric acid etc. that are prepared from minerals.

Basic Nature:-

How do you feel when you touch a cake of soap? Take it between your fingers and gently rub your fingers on it? Do the same with the other material. What difference do you notice?

- You might have touched soap water or lime water. How do you feel?
- Can you list out some more substances that are soapy to touch?

The substances which are soapy to touch are basic in nature.

Some substances that we use in our daily life, contain different bases. For example soap, glass cleaners etc. Various substances containing bases are listed in the below table.

TABLE - 6

SUBSTANCE	BASE
Lime Water	Calcium Hydroxide
Glass Cleaners	Ammonium Hydroxide
Soaps	Sodium Hydroxide / Potassium Hydroxide
Milk of Magnesium	Magnesium Hydroxide

Let us do - 5

Burn a small piece of Magnesium ribbon by holding it with tongs. Collect the white ash and dissolve it in a little water. Touch the solutions formed and test this solution with blue litmus and red litmus.

- What do you observe?

Oxides of Magnesium when dissolved in water form Magnesium Hydroxide. Similarly oxides of Potassium and Sodium form Potassium Hydroxide and Sodium Hydroxide when dissolved in water. All these are basic in nature. They would be soapy when touched.

Chemical Indicators: Methyl orange and phenolphthalein used to test acids and bases are called chemical indicators.

Let us do - 6

Take the substances that are given in table (3) and test them with Phenolphthalein and Methyl orange solutions. Take a small amount of the substance in two test tubes. Add a few drops of phenolphthalein and methyl orange to each test tube separately. Note the effect. Repeat the process for all the substances one by one. Draw a table just like table (7) in your notebook. Record your observations in that table.

TABLE - 7

SUBSTANCES	CHANGE OBSERVED	
	Colourless Phenolphthalein	Methyl Orange

- What can you conclude from the above data? Keep in mind that some substances are acidic, some are basic and some are neutral.
- Compare the above observations with those in case of litmus test.
- Can you distinguish acids and bases using the indicators?
- What would be the criteria for deciding this?

Do you believe that blood comes out of a lemon? How is it possible?

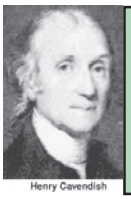
When a magician or a juggler cuts a lemon, blood flows out of it! Actually, he uses a knife dipped in methyl Orange or hibiscus solution to cut the lemon. When Methyl orange is mixed with citric acid (lemon juice) it turns red. But it is not blood. In many of our places we find people doing this and presenting it as magic. In our state some are performing above science tips as black magic (Mantralu, Chetabadi and Banamathi) and decieve the people. Now you can also do this!

Methyl orange gives red colour with acids and yellow colour with bases. Phenolphthalein remains colourless in acidic solution while it turns pink in basic solution.

Let us do some more experiments

Take a natural acid say lemon juice in six test tubes and add Copper, Zinc, Magnesium, Iron, Brass, Aluminium pieces to each one of the test tubes separately. Note your observations.

Light a matchstick and introduce it into the test tubes. What do you observe?



Henry Cavendish, an Italian Scientist discovered a colourless gas called Hydrogen Balloons are filled with this gas. The balloons are used for decorations.

It catches fire with a sound. Is it Hydrogen?

Do you know?

Why are the inner sides of vessels made up of brass and copper coated with tin?

When some substances are kept in a copper container for a long time then a blue - green layer is formed in the inner walls of the container. Copper reacts with the acids present in the substances and forms a blue - green compound these are harmful for our health. To avoid this reaction the inner walls of these vessels are coated with Tin.

- Why are pickles, jams, jellies preserved in glass, porcelain and plastic containers?

  If we preserve them in copper and brass vessels the acids in the above substances will react with copper and brass vessels, damage them.

Have you heard about Acid rains?

Do you know what acid rains are? Acid rains are the combination of Carbonic acid, Sulphuric acid and Nitric acid with rain water. Acid rains cause damage to buildings and monuments like Tajmahal and our skin. Industrial waste gases contain Sulphur dioxide, Nitrogen Oxide, Carbon dioxide. When they get mixed with moisture they change to Sulphuric acid, Nitric acid, Carbonic acid.

Acid rains are also witnessed in A.P State in Visakhapatnam district. Can you guess the reason for acid rain in Visakhapatnam?

Let us do - 7

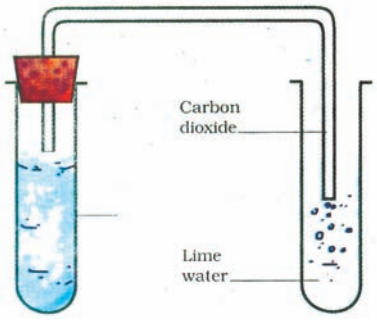
Take lemon juice in two test tubes and add some pieces of marble to one test tube and egg shells to another.

What do you observe?

Bring a burning match stick near the test tube.

What happens? The flame extinguishes.

Pass the gas into lime water. What happens? Can you see the formation of precipitation?



Lime water turned milky white. Is it Carbon dioxide?

Now try to write the properties of acids and bases from your observations in the above experiments.

We have seen that neutral solutions have no effect on indicators. We have also seen that acids and bases have different effects on indicators. When is the solution made by mixing of an acid and a base, be a neutral?

Let us do - 8

Take a clean test tube. Using a clean dropper put 10 drops of dilute Hydrochloric acid carefully in it and also add 2 drops of phenolphthalein indicator solution.

What is the colour of the resulting solution?

Now add Caustic soda solution (Whose concentration is equal to Hydrochloric acid) drop by drop to the test tube.

After each drop shake the test tube well and see if there is any change in the colour of the solution.

Keep adding the Caustic soda drop by drop until the colour turns pink. Now what kind of solution does the test tube have?

Add one drop of Hydrochloric acid and see if it changes back to its original (colourless) state. If not, then add one more drop of Hydrochloric acid. Keep doing this until the solution in the test tube becomes colourless again.

Now can you say what kind of solution this is? Check your claim with litmus paper.

On the basis of this experiment can you explain how would you convert an acidic solution into basic solution?

If you are given a basic solution how can you turn it into an acidic solution?

In the above experiment you might have noticed that if we add excess base (caustic soda) to acidic solution (Hydrochloric acid) it gets converted into a base; similarly we can change a base into an acid by adding the acid in excess.

If you are given a solution of Hydrochloric acid how can you make it into a solution which is neither acidic nor basic?

If you are given a caustic soda solution, how can you make it into a solution which is neither acidic nor basic?

When acids and bases are mixed in equal concentrations they give a neutral solution. We learn more about neutralization in higher classes.

Manures:-

In recent years the use of chemical fertilizers has increased. Though the use of chemical fertilizers increases the production of crops, it changes the nature of the soil. Some fertilizers increase the acidity of the soil and some changes its basicity. Thus use of natural organic manure is becoming more preferred these days.

Salts:-

We have seen in the process of neutralization, both the acidic and the basic qualities are changed. Actually when an acid and a base are mixed, a chemical reaction takes place and a salt is produced.

For example by neutralizing Hydrochloric acid solution with Caustic soda (Sodium Hydroxide) solution, a salt Sodium Chloride is formed. Formation of a salt depends on the type of an acid and a base and ratio of their mixture.

Remember:- All neutral solutions are not salt solutions. Sugar and Starches are neutral but they are not salts.

Let us do - 9

Test the following salt substances with red litmus and blue litmus papers. Record your observations in the table.

TABLE - 8

Salt Substance	Effect on Blue Litmus Paper	Effect on Red Litmus Paper
Copper Sulphate		
Common Salt		
Sodium Carbonate		

Salts which change blue litmus to red are acidic salts and salts which change red litmus to blue are basic salts. Some salts affect neither blue nor red litmus papers. These are called neutral salts.

Let us do - 10: Classifying salts

Collect some salt substances with the help of your teacher, make their salt solutions. Test the salt solutions with blue litmus and red litmus papers. Classify these salts as per your observations in the given table.

TABLE - 9

Acidic Salts	Basic Salts	Neutral Salts

Why is our sweat salty ?

Our body needs many types of salts. We lose some salts through excretion. So sweat is salty.

Do you know?

Uses of some acids, bases and salts

TABLE - 10

ACIDS	BASES	SALTS
Preparation of Pickles - Acetic Acid Preparation of Puli-hora - Citric Acid Cool Drinks - Carbonic Acid Removal of Ink stains - Oxalic Acid Manures, Batteries - Sulphuric Acid Medicine, Dyes - Hydro chloric Acid Explosives - Nitric Acid	Removing of grease Stain - Ammonium Hydroxide Soap contains Potassium Hydroxide & Sodium Hydroxide Bleaching Powder contains - Calcium Hydroxide Fire extinguisher contains - Aluminum Hydroxide	Food preservation - Common Salt Wash Clothes Washing Soda Cold Drinks Cake - Baking Soda

Keywords:-

Indicator, Acid, Base, Red litmus, Blue litmus, Acidic substance, Basic Substance, Neutral Substance, Salts, Neutralization, Acid rain.

What we have learnt

- Indicator helps us to find whether the solution is acidic or basic or neutral.
- Red litmus paper, blue litmus paper, phenolphthalein, methyl orange are indicators.
- Hibiscus, turmeric and rose petals are natural indicators.
- The substances that turn blue litmus to red are acidic in nature.
- The substances that are soapy to touch and turn red litmus to blue are basic in nature.
- Acid rains are the combination of Carbonic acid, sulphuric acid and Nitric acid with rain water.
- All substances whose solutions are neutral are not salts. For eg. sugar and starch solutions are neutral, but they are not salts.
- In the process of Neutralization, both the acidic and basic qualities are neutralised.
- Salts need not always be neutral, they can be acidic or basic.

Improve your learning

1. The sting of a wasp is basic. How can we treat the sting of a wasp?
2. Why are acids not stored in a metal container?
3. Acidic, basic and neutral solutions are given in three test tubes and you are given a strip of red litmus? How will you identify the three solutions?
4. When drops of lemon juice are put on blue litmus it turns red what will happen if you put some drops of soap solution on the same position on litmus paper?
5. What happens when Nitric acid is added to egg shell?
6. Turmeric stains on white clothes, when washed with soap, turn red. Why?
7. Ammonia is present in window cleaners. It turns red litmus blue. What is its nature?
8. What is the nature of urea? Is it acidic, basic / neutral? How can we verify it?
9. Red litmus paper is dipped in a solution. It remains red. What is nature of the solution? Explain your answer?
10. What is the effect of basic substances on turmeric paper?
11. Can flowers and turmeric papers also be called indicators? Why?
12. Correct the statement if it is wrong
    a) Indicators show different colours in acidic and basic solutions.
    b) Sodium Hydroxide turns blue litmus red.
    c) Tooth decay is caused by the presence of base in water.
13. Take vinegar, lemon juice, soapy water, baking soda in different vessels. Put beetroot pieces in the vessels. Predict what happens? Verify your prediction by observing the changes. After 10 minutes, 30 minutes, 60 minutes record your observations. What do you conclude?

14. Visit a doctor. Find out the medicines she prescribes to treat acidity. Ask her how acidity can be naturally prevented. Prepare a report.
15. Prepare violet cabbage juice by boiling a piece of cabbage in water. Use it as an indicator and test acidic and basic solutions with it. Present your observations in the form of a table.
16. Collect different flowers and prepare their natural indicators with the help of filter papers verify whether they act as indicators.
17. Test the nature of lemon juice and milk sample with help of natural indicators prepared from different flowers. Explain their nature.
18. How do you feel about nature? It is a big natural laboratory that contains innumerable indicators!
19. Choose the correct anser:

    a. To protect tooth decay we are advised to brush our teeth regularly. The nature of the tooth paste commonly used is

    (i) Acidic (ii) Neutral (iii) Basic (iv) Salt

    b. Which of the following is acidic in nature?

    (i) Lemon juice (ii) Baking Soda (iii) Lime Water (iv) Soap Water
20. Match the following

a) Lactic Acid	( )	(1) Tomato
b) Acetic Acid	( )	(2) Lemon
c) Citric Acid	( )	(3) Vinegar
d) Oxalic Acid	( )	(4) Curd

21. Why industrial wastes are neutralised before releasing into water?

3 SILK - WOOL

One day Neelima went to a flower garden to pluck flowers with her friend Reshma. Suddenly, while plucking flowers, Neelima shouted and started crying, by seeing a caterpiller had crawling on her dress! Reshma quickly threw it away. "Are caterpillars harmful?" Neelima asked. Reshma said, "All caterpillars are not harmful, some are useful too. Do you know your dress is made of something we get from caterpillars?" Neelima was surprised and started thinking about how dresses are made up of material obtained from caterpillers. She remembered studied about that in class VI, the fibres derived from plants like cotton & jute are made into fabric. So the animals also give us fibres!

What fibres do animals give us? Is the way of obtaining them similar to plants? Which part of animal is useful to make fabrics? Neelima asked question after question. She wanted to get answers to all her questions.

We get fibres from plants and animals. Cotton, Jute, Deccan hemp(Gongoora), Coconut plant fibres are useful to make different kinds of fabrics. In the same way we get fibres of silk and wool from animals like silk worms, sheep, goat, camel, yak etc. Let us find out about these animal fibres.

Story of silk:

Making of silk or silk fabrics is a very interesting story. This involves various persons and practices. To know about silk, Neelima visited a sericulture exhibition. People there, shared the following experiences with Neelima.

Stall-1 (Moth to egg)

This was the stall where eggs and different moths were displayed.

Fig. 1

Hello….! I am Prathima living in Palamakula of Ranga Reddy District. My father works in a seed growing centre.

Do you know we call the eggs of silk moth as 'seeds'?

Silk moth is like butterfly. We keep those moths in grill mesh boxes in separate rooms. My father takes care of those silk moths. We call them as 'Chilakalu', my father said scientific name of these moths is '*Bombyx mori*'.

At the time of laying eggs we arrange white cloth pieces or paper. Moths lay hundreds of eggs on them(a female moth lays around 500 eggs in one go and dies). Those eggs are very small in size.

Farmers from different places of our districts come and purchase these eggs. Most of the times my father allows these eggs to hatch in special chambers usually over mats, on beds of chopped mulberry leaves to get small worms. Farmers from different places of our State come and purchase these tiny worms.

Sometimes silk moths are also sold. People buy these silk moths to produce eggs. These centers are called 'Grinages'. "I saw a big seed growing centre at Horsely Hills in Chittoor district in AP" said Prathima.

Neelima walked on to the next stall .There she met Rehman.

Stall- 2 (Egg to cocoon)

Here, large trays with leaves and larva feeding on them could be seen. Some trays had white and yellowish egg like structures.

Fig. 2

Fig. 3

As-Salam-Alekum… ! I am Rehman from Karimnagar District. We grow silk worms to get cocoons. We get 5-6 harvest of worms in a year. My grandfather, father and my brother work on our farm. We have two acres of Mulberry plantation. My grandfather bought Mulberry twigs from Palamaneru of Chittoor district, where sericulture(the whole process of obtaining silk starting from silk moth) is carried out. We plant the twigs to get the mulberry crop.

My father purchased tiny white coloured silk worms (caterpillars) from seed growing centres at Horsely Hills. We place these worms in trays. We chop Mulberry leaves into small pieces to feed them.

These worms eat leaves day and night. They need good hygienic conditions and proper light to grow. When they grow bigger in size, we transfer the worms into big sized cane frames called "Cocoonage(Chandrikalu)"

After 30-35 days the caterpillar stops eating and settles at a particular place. It weaves a net to hold itself. Caterpillar moves its mouth from side to side and secretes a substance, when it is exposed to air and heat it becomes strong, this forms the silk fibre. The net is woven completely to cover the body of the

catterpillar. This seems to be a closed sack. This is called 'Cocoon (Pattukayalu)'.

My father said the larva of silk worm undergoes changes in the cocoon into a moth. After 2-3 weeks young moths come out from the cocoons and fly away. So we have to be very careful. Within 2-3 days of formation of cocoon, we start removing them from the tray.

We kill the larvae inside by a process called stiffling by putting a lot of these in a steam oven for 10 to 15 minutes. The cocoons have to be stiffled to kill the larva inside as otherwise, it will cut its way out after growing into a moth and spoil the cocoon. We will not be able to get a continuous thread of silk from such a cocoon. Thus we won't be able to obtain quality fibre for fabric!

Stiffling helps us to store the cocoons for a long time.(Fig 4)
This process is usually done in a reeling centres.

Fig. 4 Stiffling

These cocoons are kept in sealed bags and sold at the cocoon market. If not stiffled, we sell them off within a week. My father usually enquires about rates of cocoons in the market at Hindupur, Madanapally, Dharmavaram, Kadiri, Palamaneru, Raychoti and Hyderabad.

Do you Know?

Apart from Mulberry, Tasar silk (Desali Pattu) is produced in our State. Some species of silk moths that lay eggs on termanalia (oak) plantation produce tasar silk. Mostly tribal people rear these kind of cocoons. This silk plantation is mainly concentrated in Karimnagar, Adilabad, Warangal, Khammam.

Stall 3 (Cocoon to fibre –process of reeling; fibre to yarn)

Neelima observed that some people were to boiling and stirring something in large pots(Fig 5). She also observed removing a thin thread and reeling it on to the reels.

Fig. 5

Locating ends of thread of cocoon

Fig. 6

Located ends reeled onto reels

A person stood in the corner explaining about the process of obtaining fibre from cocoon. I am Prasanth from Shadnagar of

Ranga Reddy district. I am working in the reeling centre.

Neelima saw cocoons being boiled in water. She was shocked and uttered 'Hey … ! What are you doing?

We are boiling cocoons to get silk fibre. Caterpillar of silkworm spins fiber which is mainly made up of two types of protein (sirisine and fibroin) and it is very strong. The cocoons have to be boiled to loosen the fibre to be able to reel it

Obtaining silk fibre from cocoon is called reeling. It is done with special machines called reelers and twisters. The silk fibre is carefully collected from the cocoon and nearly 3 to 8 of such threads are wound together to make yarn from it which is reeled(Fig 6). This yarn is cleaned, bleached and coloured.

The yarn is ready to be woven into a variety of designed fabrics, on looms. You can see reeling centres at Nandikotkur, Hyderabad, Karimnagar etc.

Fig. 7 Warp of sari being prepared.

Stall 4 Weaving

Neelima saw a handloom at one corner of the exhibition and talked with the person displaying it.

Namasthe …! I am Bhupathi belonging to Pochampally - silk city of Telangana. We weave silk fabric by using silk yarn on handlooms. For us, weaving is a traditional occupation. We get silk yarn from reeling centres to weave a variety of sarees. Pochampally pattu and Dharmavaram are famous types produced by our state. Pochampally pattu is also called 'tie and die or Jamdani'. Dharmavaram is famous for its wide border and rich buta or dots.

Fig. 8 A Jamdani sari on loom. Weft being woven over warp.

Banaras, Kanchipuram, Dharmavaram, Narayanpet, Kothakota, Pochampally are all types of silk fabrics. They get their names from the places where they are made. You may have also heard the names of tasar silk, mooga silk, kosa silk, eri silk etc as you went through different stalls here. These are all several varieties of silk. Some chemicals add strength to silk fibres. Silk is used to make other products as well like satin and crepe. We have both handlooms and power looms to weave silk.

Neelima was filled with wonder and delight about the process involved in making of the fabric of her silk frock. She tried to make a flowchart showing the stages from silk worm to her frock. She also wanted to make a chart showing the life cycle of silk moth. Try to help her. (Fig 9)

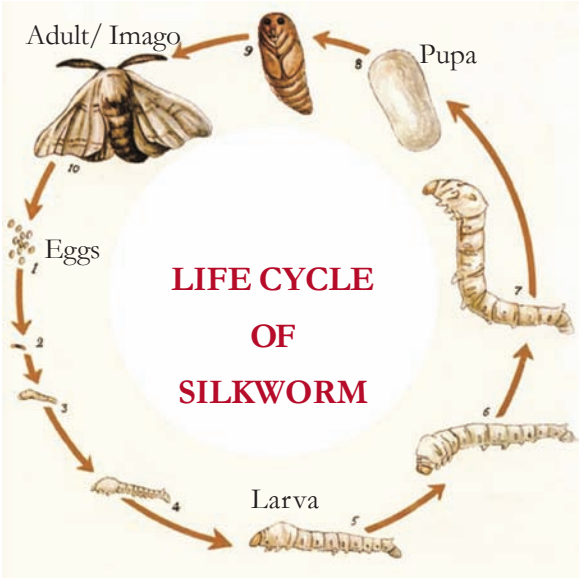


Fig. 9

Draw the flow chart of life cycle of silk worm in your notebook.

Do you know?

The thread you get from the average cocoon ranges from about 1,000 to 3,000 feet, and about 2,000 to 3,000 cocoons are required to make 500 gm of silk. That is about 5,000,000 feet or more than 1,000 miles!

That's not all. People involved in the process suffer from skin as well as respiratory problems due to continuous handling of the silk worm and the silk fibres.

Story of Wool:

Next day Neelima visited another part of the exhibition with her Grandpa. The entrance was shaped like a big sheep! She entered through the stomach of the sheep into the exhibition hall. She was surprised because the setting seemed to be a real Kashmiri village. There she saw different varieties of woolen clothes like sweaters, mufflers, hats, long coats, table covers etc. There were models of different types of animals like sheep, goat, yak, llama, camel, alpaca etc there. She knew sheep gives wool but why were the other animals displayed at the stalls?

Grandpa told Neelima that wool is obtained from hair of all the animals displayed. It is also called fleece or fur collectively. It is mainly a protein called **Keratin**. Good quality wool is obtained from Merino sheep. They are specially reared. The fleece is 3-5 inches long and very fine and most valuable. A merino sheep may yield about 5 to 18Kg of wool per year.

Grandpa do we find any difference among hair of different animals?

Certainly, hair of camel that lives in Rajasthan is not same as Angora goat that lives in Kashmir. Camels have rough and coarse hair. Under this rough hair some animals usually have soft hair as well. Angora goat and the Merino sheep have soft hair.

Grandpa where do we find sheep or goat that give us wool?

In Jammu & Kashmir, Himachal Pradesh, Uttaranchal, Arunachal Pradesh, Sikkim, Haryana, Punjab, Rajasthan and Gujarat. They are often reared on large farms.

Grandpa what are they doing with that scissor?

That is a shear to cut fleece from sheep. During spring season fleece of sheep is removed from its body using this type of razor.

Fig. 10

This process is called shearing(Fig 10). To prevent damage to skin, grease is used.

Well Neelima , why is shearing done during spring season?

Neelima replied:

(Guess what her answer is ? Write it down in your note book)

"Neelima come here. See this big water tank and spade". Sheared skin with hair is dipped in such tanks and stirred with a spade. Often it may be washed under a stream of water as well. This water contains some chemicals to remove grease, dirt and dust. This process is called washing or scouring.

After washing, cool air is passed over the wool which makes it softer.

"Grandpa, What are they doing? "Why are they keeping heaps of fleece at separate places?

Fig. 11

Well, they are sorting coarse and soft ones as well as broken and long ones and making separate piles of them. Unwanted materials like twigs or bits of leaves etc that may be present with the wool are also separated out. This process is called sorting or wool classing. Fleece is the soft mass of wool.

"Grandpa, how do these woolen fibres get different colours? What is there in the tubs?"

There are bleaches and dyes in the tubs. Woolen fibres are bleached and then dyed with different colours. The coloured fibres are used to make yarn. These fibres are then combed.

There is a machine for combing or carding wool. Wool is pulled through many teeth of the combing machine.(Fig 13)

From there, a machine rolls and pulls it out into a thick rope and another pulls twists it into a long thread. This is the process of spinning.

Fig. 13

Here you can see it being wound on whirling spools as well.

Fig. 13

Thus we get the yarn for weaving which may be dyed before.

"Grandpa how can I use those needles? What are they doing with the needles?"

"Neelima they are knitting woolen fabrics by using needles. Wool can be knit easily because it has a natural bend or crimp on it".

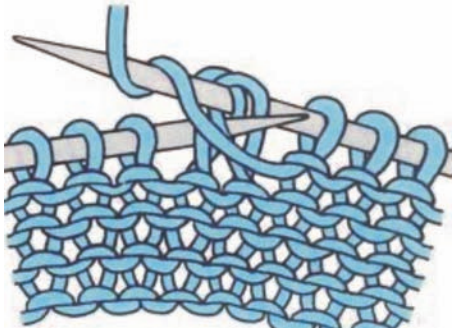


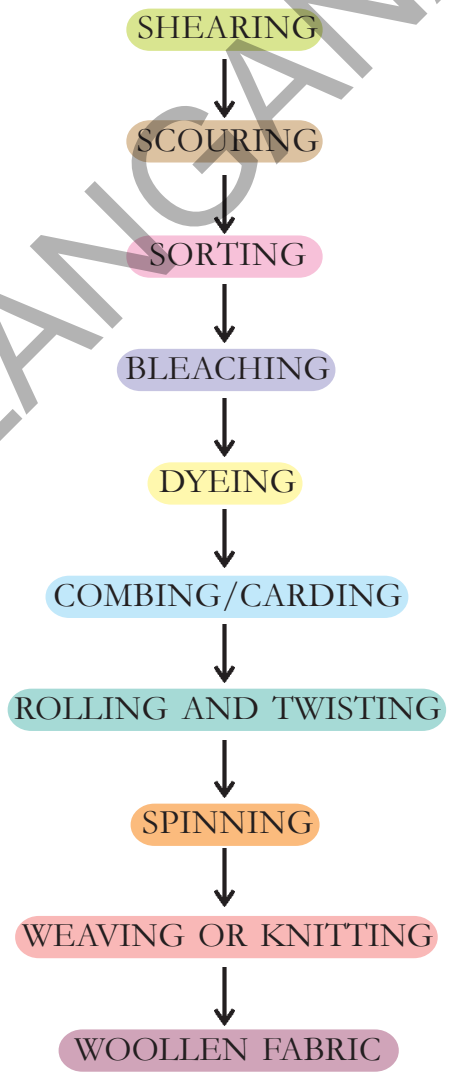
Fig. 14

By making knots with loops and rings of long threads of yarn, this process is called knitting woolen fabrics are knitted. In addition to handmade process of knitting, handlooms and power looms are also used on which woolen yarn is woven to fabric.(Fig 14)

Fig. 15

Woolen threads are stretched from the top of loom to the bottom. These are called warp threads. The threads that go side to side are weft threads. A shuttle like a big needle takes the weft threads over and under warp threads. One more important part of the loom is the harness. The harness lifts every other warp thread so that the weft threads go over one and under the next. All types of yarn whether cotton or silk or wool etc. are woven in this manner.(Fig 15)

Neelima was surprised to see how fast knitting was being carried out. She sat near a man to observe and learn how to knit. Neelima purchased a book about woolen fabrics and a sweater for her grandma and returned home.At home Neelima made a flow chart to show the processes involved from obtaining wool to producing fabric.



Grandpa asked Neelima to check and make corrections in the sequence. What corrections do you think Neelima needs to make?

Neelima thought that silk and wool are also natural fibres like cotton. She wanted to find out the difference between silk and cotton. Let us help her.

Silk	Cotton
1. Mainly protein	1. Mainly a carbohydrate called cellulose

Do you know?

Wool is a poor conductor of heat. Air trapped in between the woollen fibres and prevents the flow of heat from our body to our surroundings. So we feel hot and are protected from cold. Give reasons. Why? People in desert area also use woollen clothes. Woollen cloth also helps to douse fire.

Think why is it good to wrap a person, who are caught fire, with a blanket.

Key words

Animal fibre, Silkworm, Cocoon Mulberry, Sericulture , Bombyx mori, Reeling, Fleece, Shearing, Scouring, Knitting, Bleaching, Weaving , Dyeing, Warp, Woof

What we have learnt

- Animal fibres are natural fibres.
- Animal fibre is a protein while plant fibre is a carbohydrate.
- Rearing of silk worms for obtaining silk is called sericulture.
- Egg, Larva, Pupa, Adult moth are the stages in the life cycle of silk worm.
- Separation of silk fibre from cocoon is called reeling.
- Hair of animals like goat, sheep, camel etc., are used to obtain woollen fibre.
- Angora goat hair is soft to spin different types of fabrics like shawls and sweaters.
- Removing of hair or fleece from the skin of sheep is called shearing.
- Cleaning of fleece with a stream of water is called scouring.
- Knitting is the process of making fabric by using knitting needles to form interlocking loops and rings of woolen yarn.

Improve your learning

1. In sericulture industry do which stages of silkworm do weavers buy? Why do they do so?
2. Which place in our state is called silk city?
3. Prepare a chart showing life cycle of silkworm and display that in the classroom.
4. Why are cocoons stiffled?
5. What will happen if cocoon is not boiled?
6. What are the differences between fleece of angora goat and camel.
7. Make a flow chart showing various stages of production of woollen fabric.
8. In what way is knitting different from weaving?
9. Prepare a scrap book with pictures of different wool yielding animals.

10. Fill up the blank and give your reasons for the statement.

…….. fabric protect us from cold.

11. If you are going to visit Dal lake at Kashmir which type of clothes would you like to keep in your luggage ? Why?

12. Do you find any similarities between silk and wool weaving? What are they?

13. Write 5 differences between wool and silk manufacturing.

14. Observe designs on silk sarees, trace them in your notebook and make your own designs.

15. In East India silk is called pat. You may collect different pieces of silk fabric from a cloth store and write the names of the type of fabric and make a chart.

READ AND ENJOY

SILK- THAT'S HOW IT BEGAN:

Chinese traditions, along with the writings of Confucius tell the same 2700 BC tale. It states that the empress Leizu (Hsi- ling- shi) was having tea one day under a mulbery tree with her husband, emperor Huang-ti, when a silk worm's cocoon fell into her cup.

In an attempt to take it out, the thread of the cocoon began to unroll. So the Empress thought of weaving the thread. The Emperor, encouraged his wife to study the life of silk worm, and so she learned the art of raising silk worms or what is called sericulture. Her finding was taught as well and thus the advent of the silk industry.

However, archaeological evidences show that the origin of silk industry traces back to 3000 and 5000 BC. The sites of Yangshao culture in Xia Country, Shanxi reveal a cocoon of a bombyx mori or a domesticated silk worm along with silk weaving looms.

THE WORLD OF WOOL

Woolen fabrics are as ancient as human civilization. According to archeological evidences domestication of woolly sheep may have started around 6000 BC by early Iranians. Earliest woven wool garments are dated 2000-3000 years later.

In 15th century, British made laws to control wool smuggling and at one time they punished people by cutting off their hands! The industrial revolution introduced mass production of wool. Leaders of wool production are Australia and China.

4 MOTION & TIME

Motion is a common experience in our life. We observe birds flying in air, buses, autos, cars, bullock carts, moving on roads , trains on railway tracks and many other objects around us in motion. Apart from observing motion of objects around us, we ourselves experience motion while we are walking, running, playing, riding a bicycle etc., Similarly we observe many objects like trees, buildings, display boards, electric poles etc., at rest while we walk to school.

Other than running, playing and walking when do you experience motion? Prepare a list.

When we sit inside a moving bus or train we observe that the objects like trees, buildings, electric poles etc., appear to be moving.

Are these trees, buildings, electric poles etc., really in motion or at rest?

To understand this we should understand the meaning of motion and rest.

Motion and Rest:

Observe the following pictures

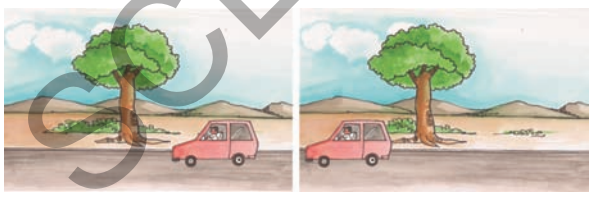


Fig. 1 Fig.2 (2 sec later)

- What difference do you notice in the position of the car?
- What difference do you notice in the position of the tree?
- Why has this difference occurred?
- Is it because the tree moved to the right of the car or the car moved to the left of the tree?

We know that the position of the car has changed with respect to the tree in '2' seconds. But there is no change in the position of the tree with respect to its surroundings.

An object is said to be in motion if it changes its position with respect to its surroundings in a given time.

An object is said to be at rest if there is no change in its position with respect to its surroundings in a given time.

Thus, we can say that the tree is at rest and the car is in motion while we observe them over a period of time (2 seconds in this case).

Can you give some more examples of objects which are at rest or in motion?

Let us do - 1:
Observing motion of the car.

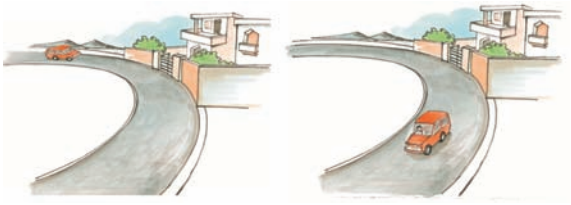


Fig .3 **Fig.4**

Look at the pictures. State which of the following statements are true.

i. The distance between the driver and the car changes. ( )

ii. The distance between the car and gate of the house is changed ( )

iii. There is no change in the position of gate of the house with respect to its surroundings ( )

iv. There is no change in the position of the car with respect to its surroundings ( )

Imagine that you sat in the above moving car beside the driver. Would you observe any change in the driver's position? Is there any change in the scene you view through the window (buildings, trees etc.)?

As the car moves, the distance between you and the landmarks like buildings, trees, poles etc., outside the car changes. This change in the scene you view through the window indicates that the car is moving. However your position with respect to the driver of the car remains the same.

That is, you and the driver of the car are at rest with respect to each other, but both of you are in motion with respect to the surroundings outside the car.

A body may be at rest with respect to one set of surroundings and at the same time be in motion with respect to another set of surroundings.

Thus motion is relative to the observer.

Let us do - 2:

Observing certain motions.

Observe the following pictures. Read the statement below the first picture and write similar statements about other pictures. Talk about them with your friends.

Fig. 5

The man in the boat is moving with respect to the bank of river. He is at rest with respect to the boat.

Fig. 6

The girl on the swing is ..... with respect to the seat of the swing.

She is ..... with respect to the garden.

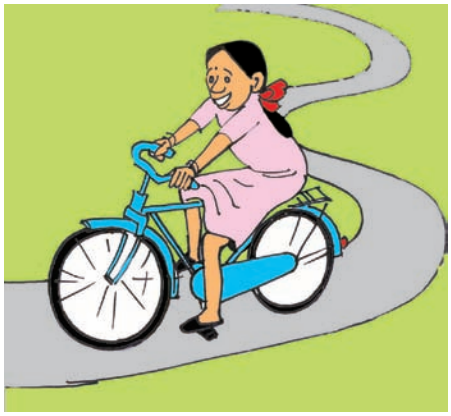


Fig. 7

The girl on the bicycle is .....with respect to the road.

She is ..... with respect to the bicycle.

Uniform and non uniform motion

A body is said to be in motion if its position keeps on changing with time (with respect to the observer). But in our daily life we experience certain motion in which, the change in position of objects remains the same for a time interval. In some other motion, the change in position of an object will not be the same for a given time interval.

Imagine the movement of hands in a wall clock and the movement of a butterfly in a garden. In these two cases; hands of wall clock and the butterfly are in motion. They change their positions with time.

Fig. 8

Fig. 9

What difference do you find in the movement of the hands of a clock and the body of a butterfly?

In which case is the change of position with time constant?

We observe that in case of the wall clock, change in position of minute hand is the same for every minute. How do we know this? Measuring the angle between two positions of the minute hand is the way. But in the case of the butterfly, the change in its position is not constant while it is flying from one flower to another in the garden.

Let us do - 3:

Observing time and distance values.

Observe the following tables, showing distances travelled by two different cars for different intervals of time.

Time in Seconds	Distance Traveled
0	0 m
10	150 m
20	300 m
30	450 m
40	600 m

Car A

Time in Seconds	Distance Traveled
0	0 m
10	50 m
20	90 m
30	180 m
40	230 m

Car B

1. Which car has travelled equal distances in equal intervals of time ?
2. Which car has travelled unequal distances in equal intervals of time?

Obviously we notice that for car - A, the change in position in every 10 seconds is 150m but for car-B, the change in position is not constant. For 1st 10 seconds, it is 50m, for 2nd 10 seconds, it is 40m, for 3rd 10 seconds it is 90m, and for 4th 10 seconds it is 50m.

Thus motion of car - A is uniform and motion of car - B is non-uniform.

If a body covers equal distances in equal intervals of time, it is said to be in uniform motion.

If a body covers unequal distances in equal intervals of time, it is said to be in non-uniform motion.

Let us do - 4

Identifying Uniform and Non-Uniform motion.

Identify uniform and non-uniform motion among the following examples and mark Uniform as (U) and non uniform as (NU).

1. Movement of hands of a clock. ( )
2. A boy cycling in a crowded place. ( )
3. Movement of a housefly. ( )
4. The fan in an air cooler running at fixed speed. ( )
5. A train entering into a railway station. ( )
6. Kite in the air. ( )
7. Rotation of Earth. ( )

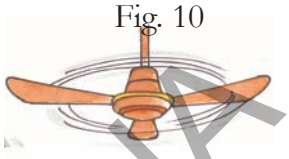
Types of Motion

When we discuss about motion, it is important to be aware that there exist different types of motion and each type is dependent on a particular situation.

Let us consider the following examples.

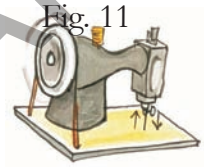
A car travelling along a straight road.

Fig. 10

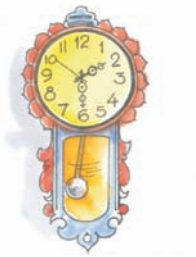


Motion of blades of a ceiling fan

Fig. 11



Motion of needle in a running sewing machine



Motion of pendulum in an old wall clock

Fig. 13

Considering the direction of motion what differences do you notice in the above examples?

The motion in the above examples are different in terms of direction of motion.

- Car is moving in same direction along a straight line.
- Blades of ceiling fan rotate about a fixed line in a circular path.
- Needle of sewing machine moves up and down about a fixed point.

- Pendulum of the wall clock oscillates 'to' and 'fro' about a fixed point.

Based on the path taken by the bodies in motion we classify motion of bodies as,

1. Translatory motion 2. Rotatory motion 3. Oscillatory motion

Translatory motion

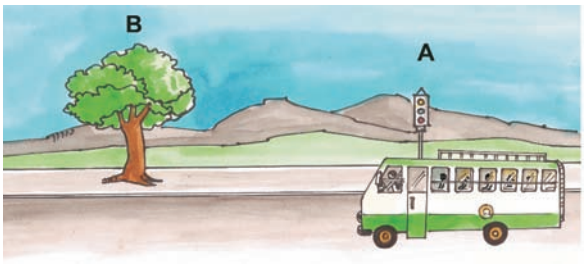


Fig. 14

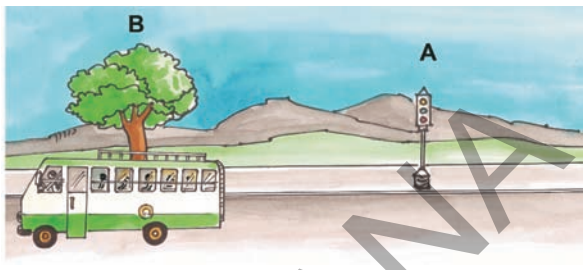


Fig. 15

The bus moved from point 'A' to 'B', in a certain interval of time.

Think and answer the following questions:

1. Do all the parts of bus (like wheels, head lights, windows etc.,move along from point 'A' to 'B'?
2. Is the direction of motion of bus along a straight line or a curved line?

Can you give some more examples of motion in which all points of moving body move in the same direction as that of the body?

Let us do - 5: Observing the path of the motion.

Observe the following table, and state the paths of motion for each case by putting (✓) mark in the relevant column .

Sl. No.	Movement of body	Path of motion	
		Straight line	Curved line
1	Soldiers marching in a parade		
2	Car taking a turn on road		
3	Stone dropped from a height		
4	Running race along a road		
5	Running race along a track on a ground		
6	Movement of bicycle on a road		

In all the above cases of motions, do all the points of moving objects move in same direction of motion?

If all parts of a moving body move in the direction of motion then the motion is said to translatory motion.

If a body in translatory motion moves along a straight line then motion is called rectilinear motion.

If a body in translatory motion moves along a curved path then motion is called curvilinear motion.

Let us do - 6: Identifying types of motion.

We notice everyday some motion which are rectilinear and curvilinear at a time. Some examples of motions are given below: Label them as rectilinear (R) or curvilinear (C) or Rectilinear and curvilinear (RC) motion.

1. Seconds hand of a watch. ( )
2. Movement of a train on tracks. ( )
3. Movement of a tape in a tape recorder. ( )
4. Movement of a needle in a speedometer of car. ( )
5. Movement of a bus on hill station road. ( )
6. Motion of coins on a carrom board. ( )
7. Motion of the ball in pin board. ( )
8. Motion of a mango falling from tree. ( )

Rotatory motion:

Let us do - 7:

Observe the following diagrams

Fig. 16

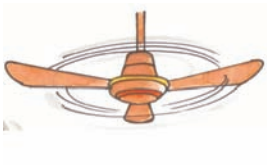


Fig. 17

Fig. 18

Fig. 19

Fig. 20

Fig. 21

1. What similarity do you find in all the motion?
2. What is the path of motion of each particle of the body that moves?
3. Is there any change in the position of a body while it is in motion?

Let us examine motion of blades of ceiling fan. Consider one blade of the rotating ceiling fan drawn below.

While the blade of a fan is moving, the points A, B, and C on the blade move to A_1, B_1, C_1 first and then move to A_2, B_2 and C_2 position. Thus when a fan is in motion, each point on the blade moves in a circular path around the centre of the fan which is fixed.

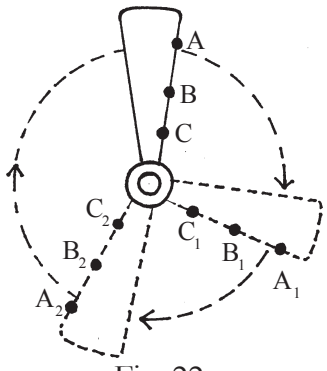


Fig. 22

Here, we observe that the position of a fan is not changing. Only the blades of fan are

changing their position continuously and moving in circular path around a fixed point. The imaginary line passing through this fixed point is called axis of rotation. This type of motion is called Rotatory Motion.

Rotatory motion means that, motion of all particles of a moving body follow a circular path with respect to a fixed centre or axis of rotation.

1. Are all the objects shown in activity - 7 in rotatory motion?
2. Can you give some more examples of rotatory motion?

Let us do - 8:

Observe the following motion of objects, State whether they are in rotatory motion? Draw a line showing axis of rotation by using a pencil.

1.  . . . . . .

Fig. 23

2.  . . . . . .

Fig. 24

3 . . . . . .

Fig. 25

 . . . . . .

Fig. 26

Let us do - 9:

Take a table tennis ball, and keep it on the surface of a table. Push the ball with your finger and observe its motion.

Fig. 27

Is it in Rotatory motion or in Translatory motion?

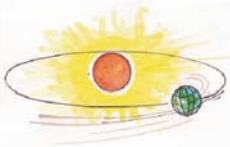
When you push the ball on the surface of a table, it moves from one end to the other end and all the particles of the ball also move along the direction of motion of the ball. Hence the ball is in translatory motion. Similarly, each particle of the ball moves in a circular path about a particular line, when the ball rolls on the surface. Therefore it is in rotatory motion.

Thus in the above example the ball possesses both translatory and rotatory motion.

Can you give some more examples of objects having both translatory and rotatory motion?

Let us do - 10:

Observe following motion of bodies and label them as Rotatory (R), Translatory (T), Translatory and Rotatory (TR)

1		Motion of blades of a ceiling fan	
2		Motion of an arrow from a bow	
3		Motion of the earth around the sun	
4		Motion of a drill bit	
5		Motion of wheels of an object	

Oscillatory motion:

Observe the following pictures and answer the following questions.

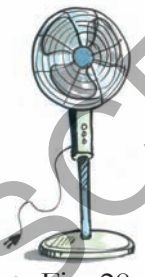


Fig. 28

Fig 29

Fig. 30

Fig. 31

- What similarity do you find in the motions of the above given situations?
- Are the objects in motion following the same path again and again?
- Is the direction of motion constant?

If we critically examine the above mentioned motion, we understand that in each case the objects move backwards and forwards or upward and downward, on the

either side of a fixed point or a line. For example, the girl on a swing moves backwards and forwards, on either side of the rest position of the swing.

Similarly in other cases also the body is in 'to' and 'fro' motion along the same path of motion. This type of motion is called oscillatory motion.

The 'to' and 'fro' motion of an object about a fixed point always following the same paths is called oscillatory motion.

Can you give some more examples of such type of motions?

Let us do - 11

Identify oscillatory motion among the following and put (✓) mark in the brackets given.

1. A spinning top ( )
2. Bullet fired from a gun ( )
3. Typewriter key ( )
4. Motion of a potter's wheel ( )
5. Motion of a vibrating sitar string ( )
6. Motion of a car taking a turn while moving ( )
7. Ringing of a bell ( )
8. A bouncing ball ( )

4.1 Slow and Fast Motion:

We observe many objects in motion in our daily life. In some cases objects move slowly and in other cases they move fast. How do we know whether the motion is slow or fast?

Let us assume that you started to school on a bicycle and your friend started in a bus at the same time from a place.

- Who reaches the school first? Why?
- Do you find any difference in the time taken by bicycle and bus to reach the school?

Let us do - 12: Comparing the motion of objects.

Observe following pairs of objects that are in motion. Compare their motions and decide which moves slower and which move faster. Mark (✓) in relevant box.

S.No.	Pairs of Objects in Motion	Slow	Fast
1	a. Aeroplane		
	b. Train		
2	a. Bus / Auto Rikshaw		
	b. Rikshaw		
3	a. Bicycle		
	b. Scooter		
4	a. Elephant		
	b. Cheetah		
5	a. Dog		
	b. Buffalo		
6	a. Man		
	b. Horse		

- How can you decide whether the motion of a body is slow or fast?

- Do we need to know about distance covered, time taken by the body in motion to decide whether the motion is slow or fast?

Let us look at details of a running race.

Priya, Karthik, Divya and Kiran participated in a 100 m. running race. They took 20 s, 22s, 25s and 28s respectively to reach the finishing line.

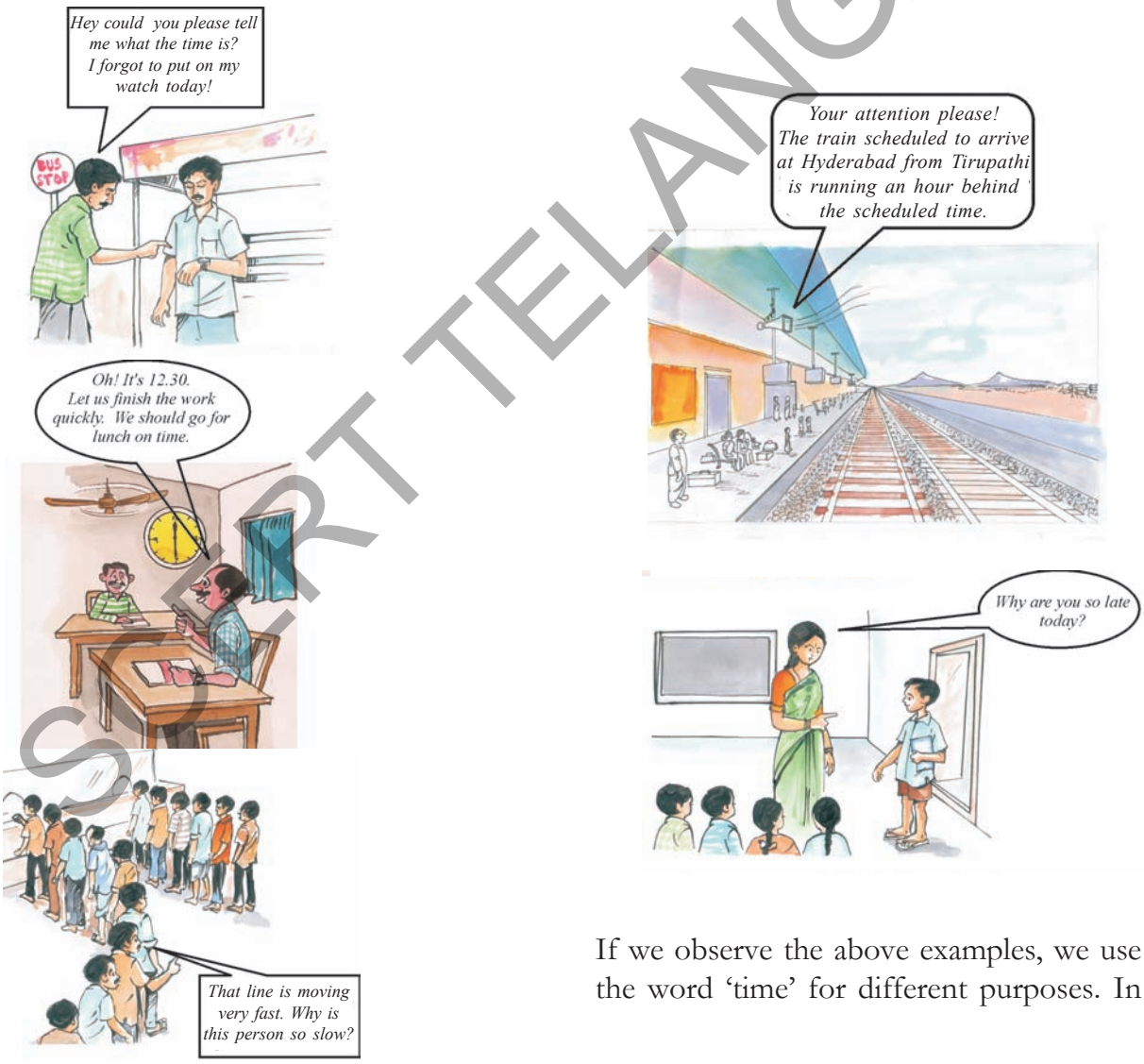
Who do you think ran the fastest and whose running is slowest? Why?

Obviously we can see that all of them ran the same distance of 100 m but time taken to cover the distance was different. Priya took the shortest time of 20 seconds which shows that she was the fastest.

Thus we understand that the distance travelled by an object in a given interval of time can help us decide which one is faster and which one is slower.

Time:

We use the word time very often in our daily life. Look at the following examples.



If we observe the above examples, we use the word 'time' for different purposes. In

some situations, without using the word 'time', we express the duration of time like 'so late', 'so early' etc.

How do we measure or estimate time?

Let us do - 13: Estimating time.

Ravi and Sathish started for school at 8.00 a.m. from their houses which are side by side. Ravi started on a bicycle and Sathish by walk.

- Who will reach the school first? How much earlier will he be compared to the other?
- How do you measure 'early' or 'late' arrival at school?

You can easily estimate that Ravi reaches the school earlier than Sathish. But to answer the question of how early Ravi reached, we need to measure the times taken by both Ravi and Sathish and find the difference of time between both the cases.

For this we need time measuring instruments like watches, clocks etc.

Try to give some more examples of how to measure time in addition to watches

Now-a-days, we use different instruments like electronic clocks, digital clocks, quartz clocks etc to measure time. A few decades ago people used pendulum clocks that have now become rare.

Fig. 32

Fig. 33

Do you know:

Like minutes and hours, week, fortnight, month, season, ayanam are also units for measuring time. Sand clock, water clock, sun dial etc. were used earlier instruments for estimating time.

Measurement of time using stop clock

Stop clocks are used to measure time interval between occurrence of events accurately. You might have seen stop clocks in the laboratory. We use stop clocks in the laboratory to measure short intervals of time like time taken for completion of chemical reaction, time taken by the pendulum for one oscillation etc.

Fig. 34

Fig. 35

Now-a-days we find stop clocks almost in all cell phones. In our daily life stop clocks help measure pulse rate etc. Apart from this, they also help us to accurately measure the times in running races , swimming races etc.

Let us try to measure time using a stop clock.

Let us do - 14:

Take a cell phone . Go to 'setting' and open 'stop clock' option. If you are not able to do this take help from your friend or teacher. Measure the time taken for the events mentioned in the table.

Event	Duration of Time
Ringing of long bell in the school.	
Completion of prayer song	
Running 200m by your friend in the school ground.	
Completion of pledge during school assembly	

Which event has taken more time to complete? Let us know, how much time does it take to sing the national anthem?

Units of time:

Depending on the context, we express time in seconds or minutes or hours to specify the occurrence of and time taken by an event.

The basic unit of time is a second (s). Larger units of time are minutes (min) and hours (h).

Table: Units of time

60 seconds	1 minute
60 minutes	1 hour
24 hours	1 day
365 days	1 year
10 years	1 decade
10 decades	1 century
10 centuries	1 millennium

Speed:

Many objects in the world around us are moving. To compare how fast they are moving, we need to know their speed.

You may have observed the speedometer in motor cars which tells us how fast the car is travelling.

Usually, the Odometer in a vehicle shows the distance travelled in kilometers and the Speedometer the speed of the journey in kilometres per hour.

Look at the speedometers of two vehicles shown here and decide which vehicle is slower.

Car - 1

Car - 2.

Have you seen any other vehicles having speedometers? Write their names?

.....

.....

.....

.....

Have you seen a bicycle with a speedometer?

Do the following activity:

Travel on a motor vehicle with your father to market or any other place and observe the changes in speedometer reading.

Note the exact time when you started from home and observe speedometer reading carefully and note it and the corresponding time in the table. Some examples are given in the table.

Speedo Meter Reading (Speed)	Corresponding Time (Time)
0	Started at home 9-10 a.m.
20	9.15 a.m.
30	9.20 a.m.

- Does the speed of the vehicle remain the same throughout the journey?
- If not, what can you say about the speed of the vehicle during the journey?

We experience in our everyday life that most of the objects in motion do not have the same speed throughout the journey. To express the speed of the object, we consider its average speed.

How to calculate the average speed?

Average speed = Total distance travelled / Total time taken to travel the distance

Thus we can define speed of an object as the distance travelled by it in a unit of time.

Units of speed

Depending on the need and context, speed is measured in different units.

Unit of speed in S.I. system is meter per second (m/s)

Another unit commonly used for speed is kilometer per hour (Km/h)

1 Km / h = 5/18 m/s

Do you know how we got this?

1 km = 1000 m

1 h = 3600s

1 km / h = 1000 m / 3600s

= 5/18 m/s

If we travel 1km in 1 hour it means we travelled 5 meters in 18 seconds.

Consider a car driven on a road. A person seated beside the driver recorded the distance travelled after every 10 minutes by noting the distance reading in the Odometer. The distance travelled by the car at different instances of time is as follow.

Time	Reading of Distance Covered
0 minute	0 km
10 minute	15 km
20 minute	25 km
30 minute	38 km
40 minute	60 km

- What is the total distance travelled by the car?
- What is the time taken to travel the distance?
- How do you find the speed of the car?
- Is the speed of the car uniform throughout the journey?

From the table, we notice that the car has covered unequal distances in equal intervals of time (10 min), which shows the speed of the car is not uniform. To find the speed of the car in the journey we should calculate total distance travelled by the car and the total time taken to cover that distance.

Total distance travelled by the car = 60 km

Time taken = 40 min.

The distance must be either in meters or kilometers and time in seconds or hours. We express the speed either in m/s or in km/h. In this example distance is 60 km and time is 40 min.

1 hour = 60 min

$$40 \text{ min} = \frac{40}{60} hour = \frac{2}{3} h$$

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$= \frac{60 \text{ km}}{\frac{2}{3} h} = 60 \times \frac{3}{2} km/h = 90 \text{ km/ h}$$

Thus, the car travelled with an average speed of 90 km/h.

Solve the following problem

The speed of a bus is 72 km/h, whereas the speed of a car is 12.5 m/s. Which vehicle moves faster?

To compare two speeds. They must be expressed in the same units. In the above example, speed of a bus is expressed in km/ h and the speed of a car in m/s, to compare these speeds, one of them must be converted to other.

Speed of a bus = 72 km/h

Speed of a car = 12.5 m/s

1 km/h = 5/18 m/s

1 m/s =18/5 km/s

Thus the speed of car is

12.5 x 18/5 km/h = 45 km/h

Hence, the bus moves faster than the car

Key words:-

Motion, Rest, Translatory motion, Rotatory Motion, Axis of Rotation, Oscillatory Motion, Speed, Average Speed.

What we have learnt:-

- Motion is a common experience in our life.
- An object is said to be in motion if it changes it's position. And it is said to be in rest if it does not changes it's position with respect to time.
- There are three types of motion namely translatory motion, rotatory motion and oscillatory motion.
- We measure time by using diffrent instruments like electronic clocks, digital clocks, etc.
- Speedometer helps us know the speed of a vehicle.
- Units of speed in SI system is meters per second. In another system it is kilo meter per hour

Improve your learning:-

1. State whether the following statements are True or False. Rewrite the wrong statements correctly.

   a) A body can be at rest and in motion at the same time in relation to the same set of surroundings.

   b) A passenger flying in an airplane is at rest with respect to the airport and moving with respect to other passengers.

   c) The wheels of a train are in rotatory motion as well as in translatory motion, when it moves.

2. John tied a stone to a string and whirled it around. What type of motion do you find there?

3. What is common to the following?
   Motion of the propeller of a flying helicopter, the minute hand of a watch, the tape of a cassette recorder.

   a) All are examples of translatory motion

   b) All are examples of oscillatory motion

   c) All are examples of rotatory motion

   d) All are examples of periodic motion

4. Which of the following is not an oscillatory motion?

   a) Motion of the hammer of an electric bell.

   b) Motion of your hands while running.

   c) Motion of a child on a see - saw.

   d) Motion of a horse pulling a cart.

5. Arun completed a 100 meter race in 16s., while Karthik finished it in 13s. Who ran faster?

6. **I.** A train runs from New Delhi to Hyderabad. It covers first distance of 420 km in 7 hrs. and next distance of 360 km in 6 hrs.

II. Gopi takes part in a car race. He drives a distance of 70 km each in the first, second and third hours.

Which of the following statements is true.

a) I, is an example uniform motion and II is an example of non-uniform motion.
b) I is an example of non-uniform motion and II is an example of uniform motion.
c) I and II are examples of uniform motion.
d) I and II are examples of non-uniform motion.

7. Write the motion of different parts of a bicycle while it is in motion.

a) the wheel
b) the cycle chain
c) the pedal with its arm
d) the movement of the feet pedaling
e) the movement of the rider along with the bicycle.

8. Which of the following statements is correct?

a) The basic unit of time is second.
b) Every object's motion is uniform.
c) Two cars move for 5 minutes and 2 minutes respectively. The second car is faster because it takes less time.
d) The speed of a car is expressed in km/h.

9. The basic unit of speed in SI system is

a) km / min b) m/min.
c) km/h d) m/s

10. The correct relation between speed, distance and time is.

a) Speed = distance x time
b) Speed = time / distance
c) Speed = distance / time
d) distance = speed / time

11. The distance between two stations is 240 km. A train takes 4 hrs to cover this distance. Calculate the speed of the train.

12. A train travels at a speed of 180 km/h. How far will it travel in 4 hours?

13. When do you say an object is in rotatory motion?

14. Can an object possess translatory and rotatory motion at the same time? Give an example.

15. Make a collection of action pictures showing living and non-living things in motion. Paste them neatly in a scrap book. Under each picture write the type of motion the picture shows.

16. In a sewing machine used by tailors, mention the type of motion of sewing machines parts when it runs.

a) the wheel
b) the needle
c) the cloth

5 HEAT - MEASUREMENT

In class VI we learned about different changes that take place in different seasons in the lesson 'Changes around us'. We wear different clothes in different seasons.

Fig. 1

We wear woollen and dark coloured clothes during winter when it is cold out side. Woolen and dark coloured clothes keep us warm. We prefer to wear light coloured cotton clothes when it is hot. They give us a feeling of coolness. You might have wondered why a particular type of cloth is suitable for a particular season.

In winter we feel cold inside the house. If we come out in the sun, we feel warm. In summer we feel hot even inside the house. How do we know whether something is hot or cold? We try to get answers to these questions in this chapter.

Fig. 2

Let us do this:

Some objects are given in the table. Mark these objects as hot or cold?

Table - 1

OBJECT	COLD	HOT
Ice Cream		
Fruit Juice		
Metal Chair Kept in the sun		
Spoon in cup of hot tea		

We see that some objects are cold and some are hot. We also know that some objects are hotter than others while some are colder than others. How do we decide which object is hotter than the other and which object is colder than the other? We need a reliable method to decide the hotness/coldness of an object, Generally hotness or coldness is expressed in terms of temperature. **Temperature is a measure of the degree of hotness or coldness of an object.**

By touching with our hands, we can guess whether a cup of milk is still worth sipping or has become too cold, whether milk is hot enough for making curds etc. But estimating temperature with our hands can, sometimes mislead or confuse us.

Let us do - 1:

Take some coldwater, normal water and hot water in three different vessels. Immerse your left hand finger in the cold water vessel and right hand finger in hot water vessel simultaneously. Wait for two or three minutes. Take off both your fingers and dip them in the normal water vessel.

Fig. 3

What do you feel about hotness of water now? Do both of your fingers feel the same hotness? Though both fingers are in the same glass of water, one finger we feel it cold and the other feel it hot! Look how our fingers are confused. Can we say hotness and coldness of the water?

Can we exactly decide hotness/coldness of a substance just by touching it? Why? It is not possible to guess the hotness of a substance only on the basis of feel/touch. It is certain that the water in different tubs has different degrees of hotness which cannot be exactly determined simply by touching.

Heat – A form of Energy

Fig. 4

We feel hot when we sit in sunlight or near fire. We feel cold when we put a piece of ice on our palm. Have you ever thought why it is so?

Think it over!

When rice is being cooked you observe the plate on the rice bowl jumps!

Why is it happening?

.....

.....

Fig . 5

Have you observed water boiling in a vessel with a lid on it? What do you notice?

Have you seen the lid moving up and down and listened to the sound coming out of it? Where does the sound come from? Why is the lid moving? Sometimes the lid might be thrown away too. What is the reason ?

We know that boiled water is being converted to water vapour. The volume of the water vapour increases. The increasing volume of vapour tries to go out. In this process it tries to lift the lid up. What makes the lid lift up? We need energy to lift any object. Where does this energy come from? It comes from the heated water. Where did this water get energy from? From the heat of the fire! Thus heat is a form of energy.

We know that heat is a form of energy that is transferred from an object at higher temperature to one at lower temperature. When we stand in the sun or near fire, heat energy enters our body and we feel hot. When ice is put on our palm, heat energy moves from our body to the piece of ice. That's why we feel cold.

"The energy which makes an object appear hot or cold is called heat."

Let us do - Conversion of Energy.

- Rub your palms together.

  How do you feel?
- Have you ever observed that iron becomes hot when it is beaten with a hammer?
- Take a soapnut seed. Rub it on a stone and touch it.

  How do you feel?

Fig . 6

In above cases mechanical energy is converted into heat energy.

- Did you ever bathe with cold water during winter? What happens?

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  .....

- What do you do to protect yourself from cold?

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  .....

- How do you get hot water in winter?

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- Generally we heat water to get hot water. How do you heat water? What sources do you use?

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If we use electric heater to heat water electrical energy is converted to heat. Likewise, if we use gas stove, chemical energy is converted to heat. In solar heaters, solar energy is converted to heat.

Fig. 7

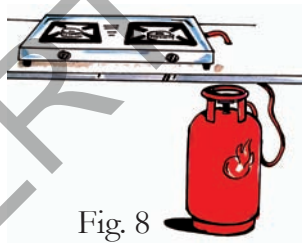


Fig. 8

In the above examples, different kinds of energies are being converted to heat. In the same way heat energy can be converted to other forms of energy. You may have heard that in a thermal power station, heat energy is converted to electrical energy. In a steam engine, heat energy is converted to mechanical energy which helps in moving the engine.

Give examples where heat energy gets converted into other forms of energy and vice versa.

Heat and Temperature:

If you stand close to fire, you feel warm. When a warm object is placed close to a cooler object, heat energy moves from the warmer object to the cooler one until both objects attain the same temperature. Often we think that heat and temperature are the same things; this is wrong. Temperature is a measure of the heat energy in a body and which indicates the ability of a body to give heat to another body or absorb heat from another body. We use thermometers to measure temperature.

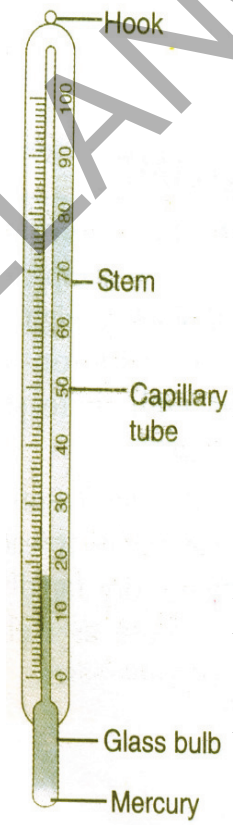


Fig. 9

Have you observed any thermometers in daily life?

Have you seen the thermometer used by doctor's in hospitals? What does it contain?

How does it help us to measure the temperature?

Let us observe a thermometer:

Hold the thermometer and observe it carefully. What is it made up of?

What do you find inside the thermometer?

What do you find at both ends of the tube?

How do they differ from each other?

At one end of the tube you observe a bulb. It is filled with Mercury. What do you observe at the other end of the tube?

The other end of the tube is sealed after removing air from it. Do you find any markings on the tube? We find a scale which is marked to express temperature in degree Celsius. We read the temperature with the help of these markings. Read the markings on the tube. Where does it start? Where does it end?

This arrangement of the marks is called scale of temperature.

All thermometers are based on the fact that matter expands on heating. To understand the working of a thermometer we need know how matter expands on heating.

Let us do: Expansion of liquid due to heat

Take a flat bottom flask and fill it with coloured water. Fix a cork, having a capillary tube, in the mouth of flask such that level of water is as shown (Fig 9). Place the flask in a metal trough. Pour boiling hot water into the trough and carefully observe the level of coloured water. What do you observe?

If you take the flask out of the trough and keep it out side for some time, what do you observe? In the above activity we see that water expands on heating and contracts on cooling.

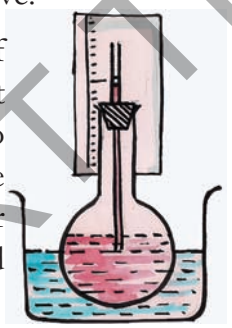


Fig. 10

So does Mercury. It is used as liquid for indicating temperature in thermometers. Apart from Mercury we also use alcohol as thermometer liquid.

Think:

Why do we use mercury or alcohol as thermometer liquids?

Properties of Mercury:-

- Its expansion is uniform. (For equal amounts of heat it expands by equal lengths.)
- It is opaque and shining.
- It does not stick to the sides of the glass tube.
- It is a good conductor of heat.
- It is easily available in pure state.

Properties of Alcohol

- It can record very low temperatures.
- Its expansion per degree Celsius rise in temperature is very large.

  It can be coloured brightly and hence is easily visible.

How to use a thermometer?

To find the temperature of an object, the bulb of the thermometer needs to be in close contact with that object. Watch the shiny line of Mercury in the tube. The highest point on the scale, at which the rise of Mercury stops , shows the temperature of the object.

Example: To find the temperature of your palm, place the bulb of a thermometer in contact with the palm for two minutes and see the Mercury rise. When Mercury stops rising and its level becomes steady, note the position of its upper end. This is the temperature of your palm. How much is it?

If markings on thermometer are wiped out, how do we create new markings?

Take some ice in a beaker. Immerse a thermometer in ice for two minutes. Mark the Mercury level. Now let the ice melt.

Can you observe any change in Mercury level?

The level of Mercury remains same while ice melts. This means that temperature is

constant. This constant temperature at which ice melts is called melting point of ice and mark it 0°C.

Take some water in a beaker. Immerse the thermometer in it and start heating the water. It will start boiling while getting converted into steam. Mercury level starts rising and reaches a point beyond which it doesn't rise. Mark the level of mercury at this point. Observe the constant level at which Mercury stays while water is boiling, this constant temperature is called boiling point of water. We mark the level of mercury at this point as 100°C.

Thus temperature at which ice melts or water boils is constant. These values are fixed as 0°C and 100°C respectively. Like water, all substances in pure form melt and boil at certain fixed temperatures.

To create a scale, we need two fixed points let us choose the melting point (0°C) and boiling point (100°C) as two fixed points for the scale of thermometer. Now divide the distance between these two points on the thermometer into 100 equal parts. Think about how we can achieve this.

Eachof the 100 equal parts represents 1°C. We further divide 1°C into 10 small divisions. It can be read as 1/10 = 0.1°C.

Now can you precisely determine which water is cooler and which is hotter than the other in the 3 beaker experiment? If the temperature of the beaker in which we immersed both the hands is 25°C, what can be said about the temperature of water in other beakers?

The beaker containing cooler water will record temperature less than 25°C.

The beaker containing hotter water will record temperature more than 25°C.

Do you know about the first thermometer?

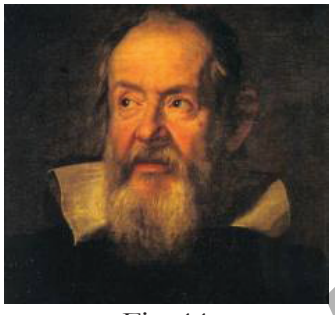


Fig. 11

First thermometer was invented by Galileo in 1593 AD. In this thermometer air was used as the thermometric substance as air rapidly expands on heating and contracts on cooling. Further, the substance that is used in thermometer has uniform expansion or contraction with the rise or fall in temperature.

Let us do this:

Do you find any difference in temperature of air in shadow and in the sun?

Fig. 12

Fig. 13

Measure temperature of air using a thermometer. What will you do to keep thermometer in close contact with air?

.....

Record your observations in the following table.

Table - 2

OBSERVATION	RECORDED TEMPERATURE
Air in the shade (at 12 noon)	
Air in the Sun (at 12 noon)	
Morning (at 8 am)	
Night (at 8 pm)	

- What did you observe? Is there any difference in temperature with variation of time or place?

  .....

  .....

- Why do you use an umbrella in the hot sun during summer?

Fig. 14

Do you know?

In Libya (Africa) on a particular day in the year 1922, it became so hot that the temperature of air even in shade was as high as 58°C. At some places (Kothagudem, Ramagundam) in Telangana, the maximum temperature of air sometimes reaches 48°C and more. When it is so hot we feel extremely uncomfortable as the normal temperature of the human body is 37°C. The lowest temperature in the world has been measured in Antarctica where it once went down to about -89°C. The minus sign is used for temperature which is less than 0°C. Water freezes at 0°C, just think how cold -89°C must be. In winter when the atmospheric temperature around us becomes 15°C - 20°C we begin to feel cold.

The maximum (highest) and minimum (lowest) temperatures of a day are measured by a thermometer called the Six's maximum - minimum thermo meter

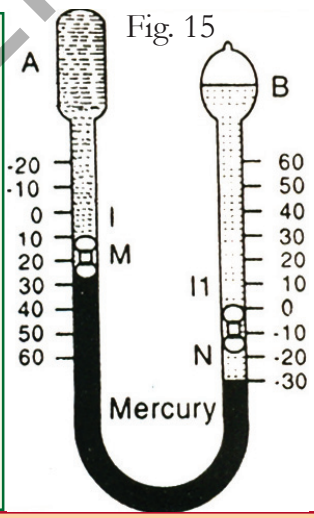


Fig. 15

Clinical Thermometer:

Generally when we are suffering from fever our body temperature increases.

Can you find how much the body temperature has increased?

Doctors use a thermometer to find out the temperature of our bodies. It is called Clinical Thermometer.

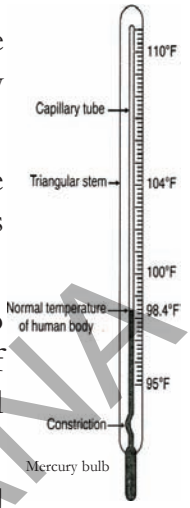


Fig. 16

Hold the Clinical Thermometer in your hand and observe it carefully.

Fig. 17

There are two types of scales marked on the clinical thermometer one that starts with 35 degrees and ends at 45 degrees is Celsius scale. While the other that starts with 95 degrees and ends at 110 degrees is the Fahrenheit scale.
Do you see a kink in the capillary near the bulb?
This kink prevents Mercury level from falling on its own.

Reading the Fahrenheit Scale on thermometer:

There are markings on it from 95°F to 110°F on fahrenheit scale. Note the temperature difference indicated between the two bigger marks. Also note down the number of divisions between these marks. Suppose two consecutive bigger marks differ by one degree and there are five divisions between them. Then one small division reads

$1/5 = 0.2$ °F

Fig. 18

How to use a clinical thermometer?

Wash the thermometer preferably with an antiseptic solution. Hold it firmly by the end and give it a few jerks. These jerks will bring the level of Mercury down. Ensure that it falls below 35°C (95°F). Now place the thermometer bulb under your tongue or arm pit. After one minute, take the thermometer out and note the reading. It tells your body temperature.

What did you record as your body temperature?

Fig. 19

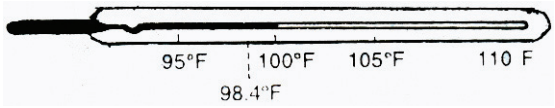


Fig. 20

In the picture first thermometer shows the body temperature of Srikar. Second thermometer shows the temperature of Srinath. Who is suffering from fever? How can you say that?

The normal temperature of human body is 37°C (98.4°F) which is measured by clinical thermometer.

Let us do this:

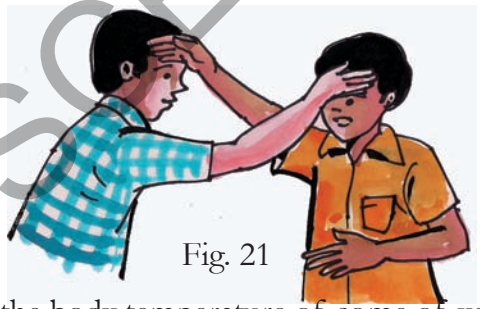


Fig. 21

Feel the body temperature of some of your friends by placing your hand on their forehead. Estimate the temperature and record it in the table.

Measure it now with clinical thermometer. Record your observations in table.

Fig. 22

Make sure that you have cleaned the thermometer before each measurement.

Table - 3

Name of the Student	Estimated Temperature by touching	Temperature measured with clinical thermometer

Compare the values in the table after completion of recording.

- What do you observe in the table?
- Are the estimated temperature and measured temperature same?
- Is the body temperature of every person 37°C (98.4°F)?
- What is the average body temperature of your friends?

The average body temperature of a large number of healthy persons is known as normal temperature(98.4°F).

Thermister thermometer:

It is available in market to measure the human body temperatures, particularly for infants and children.

Fig. 23

Can you guess why?

.....

.....

Digital thermometer:

There is a lot of concern over the use of Mercury in thermometer. Mercury is a toxic substance and is very difficult to dispose of if a thermometer breaks. These days digital thermometers are also available which do not use Mercury.

Fig. 24

Fig. 25

We are advised not to use a clinical thermometer for measuring the temperature of any object other than human body. Also we are advised to avoid keeping it in the sun or near a flame. Why?

Try this:

Measure the temperature of a person with clinical and digital thermometers. Are the temperature readings same or different? Explain your observations.

How to measure the temperature of other objects?

To measure the temperature of other objects there are other thermometers. One such thermometer is known as the laboratory thermometer.

Laboratory thermometer

Observe the thermometer in Fig 26. It is laboratory thermometer. Label the parts of it. Observe the markings of the laboratory thermometer. What is its range ?

What do you mean by minus degree Celsius?

Is it less than 0°C or greater than it?

How to use it

Take some tap water in a beaker. Dip the thermometer in water so that the bulb is immersed in water but does not touch the bottom or side of the beaker. Hold thermometer vertically, wait till the mercury thread becomes steady. Note the reading. That is the temperature of water at that time.

Fig. 26

Reading the Celsius scale on thermometer

Note the temperature difference indicated between two bigger marks(Fig 27). Also note down the number of divisions between those marks. Suppose two consecutive bigger marks differ by one degree and there are 10 divisions between them then one small division reads

$1/10 = 0.1°C$

Fig. 27

Let us do this:

Take some hot water in a beaker, dip thermometer in it for one minute. Record the temperature while the thermometer is in water.

Take out the thermometer from water. Observe the mercury thread carefully.

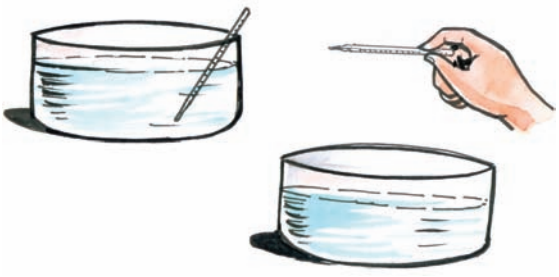


Fig. 28

What do you notice after some time? Why?

We are advised not to use the laboratory thermometer to measure our body temperature. Why?

Hint: (Think about the kink)

How does the laboratory thermometer differ from the clinical thermometer?

Key Words:

Heat energy, Temperature, Thermometer, Fahrenheit scale, Celsius scale, Clinical thermometer, Expansion

What we have learnt?

1. Temperature is the degree of hotness or coldness of an object.
2. Heat is a form of energy
3. Heat flows from an object at high temperature to another at lower temperature.
4. Mercury and alcohol are used as thermometer liquids in thermometer.
5. Doctors use a clinical thermometer to measure the human body temperature.
6. The normal temperature of human body is 37°C (98.4°F)
7. Laboratory thermometer is used to measure the temperature of objects.

Improve your learning

1. The body temperature of Srinath is 99°F. Is he suffering from fever? If so, why?
2. Why do we use Mercury in the thermometer? Can water be used instead of Mercury? What are the problems in using it?
3. Temperature of Srinagar (J & K) is -4°C and Hyderabad is 7°C . Which of them has greater temperature? What is the difference between the temperatures of these two places?
4. During winter mornings why do people stand in the Sun? Explain.
5. After walking some distance on a hot summer day, why do we prefer to go into the shade?
6. Srikanth takes a sip of cool drink and feels the chill. Guess what its temperature is? Try to measure it.
7. Gauthami was prepared to measure the temperature of hot water with a clinical thermometer. Is it right or wrong. Why?
8. Swathi kept a laboratory thermometer in hot water for some time and took it out to read the temperature. Rani said it was a wrong way of measuring temperature. Do you agree with Rani ? Explain your answer.
9. Why do we jerk a clinical thermometer before we measure body temperature?
10. Heat energy is converted into other forms of energy. Give some examples.
11. Prathima said 'Heat is a form of energy'. How do you support her?
12. Why is a clinical thermometer not used to measure the temperature of air?

13. Fill in the blanks

a. Doctor uses _____ thermometer to measure the human body temperature.

b. At room temperature Mercury is in _____ state.

c. Heat energy transfer from _____ to _____

d. -7°C temperature is _____ than 0°C temperature.

14. Match the following

i)	Clinical thermometer	( )	a)	A form of energy
ii)	Normal temperature of human body	( )	b)	100°C
iii)	Heat	( )	c)	37°C
iv)	Boiling point of water	( )	d)	0°C
v)	Melting point of water	( )	e)	Kink

15. Use the Thermometer and record the temperature in your school daily at mid day meals time in the following table. Record temperature for a month.

Fig. 29

Table - 4

Date	Temperature

- On which day was the temperature highest? What could be the reason?
- On which day was the temperature lowest? What could be the reason?
- What was the average temperature during the month?

16. Draw the diagram of a clinical thermometer and label its parts. What is the use of kink in clinical thermometer?

17. Draw the diagram of a laboratory thermometer and label its parts. How does it differ from a clinical thermometer?

18. Measure the body temperature between fingers, under the tongue, armpit,folded hands, folded legs etc., Is it the same? Does the body temperature remain the same after jumping ten times?. Why?

19. Collect information from hospital/ health centre about the precautions to be taken while reading temperature with a clinical thermometer.

Fig. 30

20. Measure the temperature of water in normal conditions. If you add the following substance to the water, do you find any difference in temperature? Predict and verify.

Table - 5

Water temperature in Celsius	Water(100ml each time) mixed with Two tablespoonful of each	Prediction	Temperature of the solution immediately after mixing the substance
	Glucose	**Decrease**	
	Washing powder		
	Baking soda		
	Sugar		
	Common salt		

Do you find any change in temperature before and immediately after mixing the above substances in water? If yes, what could be the reason?

6 WEATHER AND CLIMATE

Fig. 1

In class VI you had seen how Ramya and Sowmya's mother predicted that it was going to rain. She also advised them to take an umbrella.

- On what basis did Ramya and Sowmya's mother predict that it was going to rain?
- Does it happen that each time you think it would rain, it rains?

Generally our elders try to predict rain. Sometimes their expectations come true and sometimes not. They look for some indications to make such predictions.

- Do you know what they are ? Discuss in groups and make a list of those indications.

It is a common experience for everybody to hear elder people talking about the possible weather on a day before planning to celebrate a function of the family. They do it by observation of different seasons. Farmers listen to radio or watch T.V. for weather forecast. They depend on these weather predictions to plan their agricultural activities. These weather predictions effect our daily life.

- Where do these predictions come from?
- How does the meteorological department make these predictions?

The department collects data and uses it to make predictions.

Let us do-1: Observe the following table.

Table - 1

Weather aspects	Day - 1	Day - 2	Day - 3
Maximum Temperature	28°C	27°C	29°C
Minimum Temperature	21°C	17°C	21°C
Rainfall	None	Light Shower	None
Sky may be	Clear	Cloudy	Cloudy
Wind velocity	Very mild breeze	Mild breeze	Good breeze
Humidity	95%	90%	85%
Sun rise	6:25 a.m.	6:30 a.m.	6:31 a.m.
Sun set	5:40 p.m.	5:40 p.m.	5:41 p.m.

This is about weather of Hyderabad for three consecutive days.

- What aspects do you see in this weather record?
- On which day did it rain ?

We find that these aspects of weather keep changing. The humidity changes, the wind changes, the temperature changes the sunrise and sunset times change too.

We find that there are some changes in a day. But most of the day is normal. The weather is a complex phenomenon that it can vary over very short period of time. Sometimes it is sunny in the morning but clouds appear from somewhere and it starts raining. Within a matter of a few minutes this gives way to bright sunshine. You must have had several such experiences. The temperature, humidity, rain, wind speed change. All this effects the life of human beings and other living organisms. This constitutes weather.

Do you know?

Many people died during the tsunami in Andaman and Nicobar islands in 2004. But the tribals who observed the ocean moving back and birds making sounds moved away from danger. They could predict the danger and save their lives.

Let us do-2: Plotting Graph

- Take a newspaper or watch the TV news and record the maximum and minimum temperature, rainfall, humidity and wind pattern of any 3 cities or towns in a table. Do this over a week.
- Take the figures of the maximum temperature over a week and plot the data on a graph. For example one is given here.

Table - 2

Day	Date	Maximum temperature
1	10-12-2011	30°C
2	11-12-2011	31°C
3	12-12-2011	31°C
4	13-12-2011	30°C
5	14-12-2011	30°C

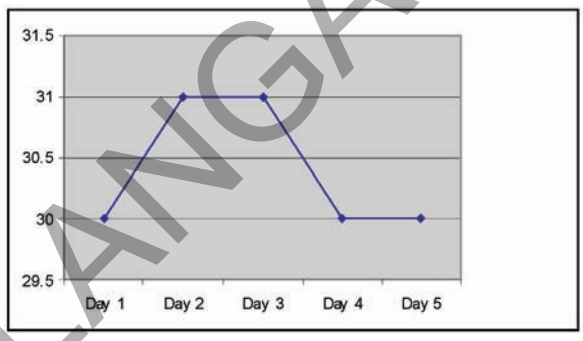


Fig. 1 Graph showing the variation of maximum temperature during 10-14 Dec. 2011 at Hyderabad.

- Draw graphs for the minimum temperature and humidity as well.
- Understanding weather reports-

Let us do-3: Understanding weather reports

Report 1:

Isolated rain or thunder showers are lightly to occur over Chittoor, Nellore, Prakasham and some parts of Kadapa districts. Mainly dry weather will prevail over southern Telangana districts and northern coastal districts of Andhra Pradesh. Sky may be cloudy for the next two days in Kurnool and Ananthapur districts.

Report 2:

According to meteorological department report 42°C

maximum temperature recorded at Ramagundam of Peddapally district and 29°C minimum temperature recorded at Aarogyavaram of Chittore district. Because of cumulonimbus clouds 2mm of rainfall was recorded in Hyderabad. Scattered rainfall recorded in some parts of interior Rayalaseema. Remaining part of Telangana and Andhra Pradesh States was dry.

- Which report explains what will happen?
- What aspects of the weather are discussed in both the reports?
- What are the differences in the weather situation given by the two reports?

The report that explains future conditions is a weather forecast. The report that explains about past conditions is a weather report. In common conversation we often refer to both as weather report.

Measuring components of weather

We have different types of measuring instruments to measure different weather components. Do you know how we measure them? Let us know how to measure weather components like temperature, rainfall, wind speed, humidity etc.

Measuring temperature of a place

The weather of a place can change every day. This is why we often say today's weather is very humid or it is too hot and so on. Generally mornings and evenings are pleasant during summers but we feel that it is very hot during noon.

- How do we compare a place which is hot with a place which is cool ?
- How do we determine the hottest part of the day?

We have already learnt that there are thermometers that help us measure the temperature. There is a special thermometer to measure highest and lowest temperatures of a day.

Activity 4:

Take a maximum minimum thermometer (MMT) from your school laboratory. Let us find out how to use it to measure the two temperatures.

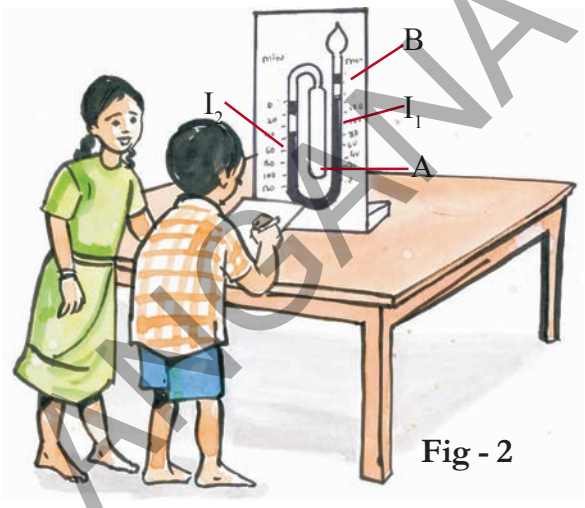


Fig - 2

Six invented the maximum minimum thermometer (MMT) thermometer to measure highest and lowest temperatures of a place. This consists of a cylindrical bulb A, connected through a U-shaped tube to spherical bulb B that contains alcohol.

When the temperature increases, the alcohol in the bulb A expands. The mercury in the U tube goes up to the bulb B side and the indicator(I_1)also moves up. This indicates maximum temperature of the day. If the temperature decreases,alcohol in the bulb A contracts then the mercury in the U-tube goes to the A bulb side and the indicator (I_2)also moves up. This indicates minimum temperature of the day. After taking readings the indicators I_2 and I_1 are brought to their original places by using a magnet.

Table - 3

Date	Temperature at your school observed by MMT				Temperature obtained based on Radio or TV forecast		Comparsion
	Minimum	*Time*	*Maximum*	*Time*	*Minimum*	*Maximum*	

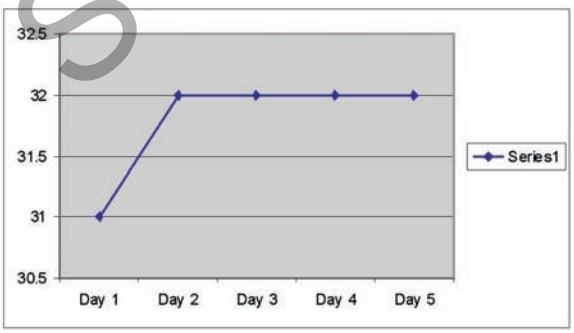
Collect weather reports of a nearby city from newspapers. Tabulate your observations for a week and compare them.

Write your observations in your notebook about the temperature that you have measured.

- When was the maximum temperature recorded?
- When was the minimum temperature recorded? Why?
- Is there any similarity in temperatures between your school and the nearest city?

Activity 5

Pravin has measured temperature of his village with the help of MMT. He expressed his observation through a graph. Observe the graph.



Graph showing the variation of maximum temperature during the period of 10 to 14 Dec. 2011.

Table - 4

Day	Date	Maximum temperature
1	10-12-2011	31°C
2	11-12-2011	32°C
3	12-12-2011	32°C
4	13-12-2011	32°C
5	14-12-2011	32°C

- For how many days did Pravin observe the temperature of his village?
- On which day was the highest temperature recorded?
- On which days did the lowest temperature recorded?
- Do you find any relation between 10th and 14th of December 2011? What is that?
- Make a graph with your observations of maximum and minimum temperatures.

Measuring rainfall

- How can we measure the amount of rainfall at a particular place?

Farmers estimate the rainfall based on the wetness of the soil after the rain. They call it as "PADUNU". This much of rainfall is sufficient to start agricultural activities like ploughing. This is an approximate measure.

Let us do - 6:

Take a 10cm wide beaker and insert a funnel of the same width. Keep the apparatus in an open place when it is raining. The rain water would be collected through the funnel into the beaker. After the rain is over, measure the amount of water collected in the beaker. If the depth of water is 1 cm then that the magnitude of rainfall is 1 cm.

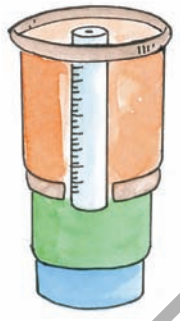


Fig - 3

Meteorologists measure the rain fall using a 'Rain gauge'. It is also called Udometer or Pulvinometer or Anthrometer. They can measure exact amount of rainfall. Rainfall is expressed in centimeters or millimeters.

In rural areas if there is rainfall at the right time farmers celebrate crop festivals.

- How do farmers celebrate the first showers?
- Try to find out about this.
- Discuss with your elders in your village/ town. You can also collect the songs they sing at that time. Display them on your school wall magazine.

Direction of the wind

We feel happy in the mornings and evenings in summer. At that time cool breeze blows. We know that there is air in our surroundings and also that moving air is wind.

- Can we guess what the direction of wind is?

Let us do-7:

Let us find the direction of wind by using card board pieces and a thin nail.

Take two cardboard pieces and cut them the shape of an arrow and paste them together. Insert a thin needle or iron wire (as shown the figure) in the middle of the arrow. The needle must be long enough to be fixed on a strong base and should allow the arrow to move along the direction of the wind.

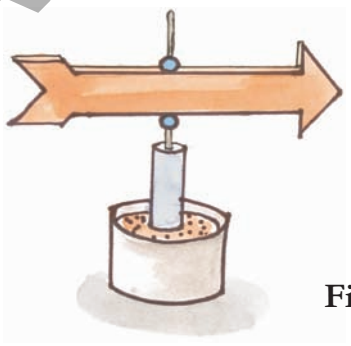


Fig - 4

We can also measure wind speed and direction with an Anemometer.

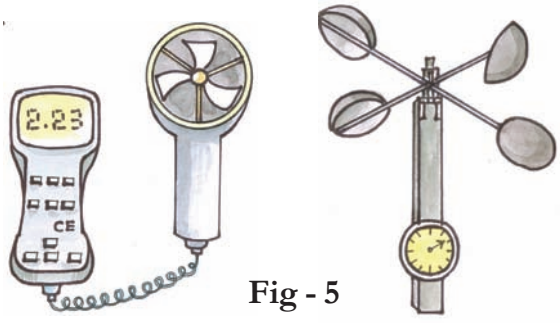


Fig - 5

Observe the direction of wind. In one day with the help of anemometer you made Tabulate your observation of wind direction.

Table - 5

Time	East	North East	North	North West	West	South West	South	South East
Early Morning								
Noon								
After Noon								
Evening								
Night								

- Does the wind move in the same direction the whole day?
- In which direction does it move in the morning?

Humidity:

Why is it sweaty in Vijayawada and relatively less in Hyderabad in summer? Even though it is hotter, we do not sweat as much in Hyderabad. In places near a river or in coastal regions the weather in summer is humid.

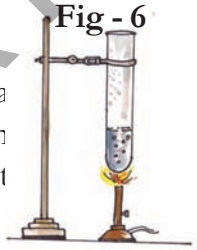
In summer season if you are in coastal region you would feel very sweaty in addition to feeling hot winds.Vijaywada is more humid than Hyderabad.

- Why is Vijaywada generally more humid?

Let us do - 8:

Take about 10 ml water in a test tube. Heat it on a Bunsen burner or a candle. What happens? Think about it.

Fig - 6



- Why do bubbles appear in water?
- Why is the water level reducing?
- Where did the water go?

When water is heated, it changes into water vapour. The vapour enters into the air. In the same way sea water changes into vapour due to heating by the sun.

The quantity of moisture in the air is the 'humidity' of the place. If the humidity is high when it is hot, we feel sweaty. We will learn more about humidity in subsequent classes.

Think and discuss:

- Why do people living in hot and humid region wear cotton clothes?
- In which season is the quantity of moisture in the air high?

Are weather conditions cyclic during the years?

We know that in the equatorial region it is very hot and in the polar region it is very cold. How can we say a particular place is cold or hot?

Let us do - 9:

Observe the weather report (temperature and rain fall) of two places in Telangana state. The average temperature and rain fall for the last 25 years of the particular month is given in the table. (See the table in next page)

- In which month was maximum temperature recorded? Why?
- Comparatively which place is hot? Why?
- How can you say Hyderabad is cooler than Ramagundam in summer?

If the same weather recurs periodically at a place it is considered as climate of that place.

Table - 6

Month	Ramagundam		Arogyavaram	
	Average temperature in Celsius degrees	Average Rainfall in millimeters	Average temperature in Celsius degrees	Average Rainfall in millimeters
January	30	1	28	6
February	32	-	28	2
March	34	-	29	-
April	38	-	30	1
May	41	1	33	3
June	39	4	31	3
July	36	2	30	8
August	38	10	30	16
September	35	11	29	9
October	36	11	29	18
November	31	11	28	23
December	32	9	28	14

What is Climate?

The average weather pattern taken over a long time, say 25 years, is called climate of that place.

Broadly, the same patterns of temperature, rainfall, humidity wind speed that have been generally continuing for a long time, say the last 25 years, at a place gives the climate of that place.

If we find that temperature at a place is generally high for large part of the year, we say the climate of that place is hot.

- When would you say that the climate of a place is rainy or cold?

Let us do-10

Observe features of the following states, and specific places in India from an ATLAS. Try to write down something about the climate in these areas.

Table - 7

S.No.	State	Climatic Condition
1	Kerala	
2	Andhra Pradesh	
3	Rajasthan	
4	Jammu & Kashmir	
5	West Bengal	

The Indian Meteorological Department (IMD) studies climate of our country.

Climate describes the weather condition occurring over a relatively longer period of time in a given place. For example in the month of June. We expect the weather to be dry in Bangalore, humid in Kolkata, hot and dry in parts of Rajasthan, cold in Kashmir and rainy in Coastal Kerala. What does this tell us? Think about it. For example does it mean that in coastal Kerala it is always rainy in the month of June or and it would be always humid in Kolkata?

Do you know?

The people living in an area adjust to the conditions of climate. For example the rain fall has being relatively less for the past two decades. Even in Rayalseema during rainy season the tanks and canals remain dry. The dried canals and tanks are now used for other purposes. The less rainfall has also led to developing ways to use less water. The change in rainfall pattern shows there may be shifts in climate over long periods of time. In areas which do not have a climate of rain when it rains heavily there is no way to drain out the water. As a result many areas were flooded and submerged in Kurnool in 2010 and also in other parts of Rayalaseema.

Now-a- days there is a complaint that climate is not as ordered as it was . Seasonal climatic condition do not appear as predictable and known. Give examples of such changes in your area after discussing to elders.

Climate and life style

Climate mostly effects on our daily life. We change our life style to suit that climate. We wear cotton clothes in summer. We want to drink cool water also. What do we like to do in winter? We take care to protect ourselves from rain. Imagine the precautions you would need to take if you were going to visit Kashmir or Ooty during winter. Discuss with your friend and write a note on these precautions.

Keywords

Weather, forecast, temperature, climate, humidity

What we have learnt

- Weather affects our life.
- The factors hot, cold, winds, rain etc describe the weather of a place.
- We can measure temperature of a place with maximum and minimum thermometer.
- The quantity of water vapour (moisture) in air is humidity.
- Humidity is measured by a hydrometer.
- Rainfall of a particular place is expressed in **millimetre (m.m.), centimetre (c.m.)** and measured with a rain gauge.
- Anemometer is used to measure wind speed.
- Climate of a place can be defined after 25 years of weather observations.
- We adjust to the climate to live comfortably.

Improving your learning

1. What aspects should you observe to know and predict the weather of your village?
2. Read a newspaper, collect the weather reports in it. Write about the various elements of the weather mentioned in the report.
3. Where is the meteorological department in your area? How is it useful to you?
4. If it is hot and sweaty at a place. What could be the possible reasons for that?
5. Write true or false. Give reasons.

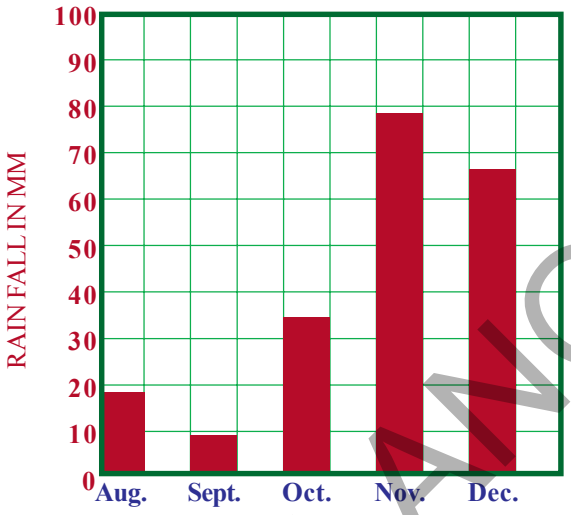
a. Minimum temperature is recorded in early morning. ( )

b. The direction and speed of wind is found by an Anemometer. ( )

c. In summer the winds blow towards the earth from the seas/ocean in the afternoon ( )

d. In our state the maximum temperature is recorded in the month of July. ( )

6. Observe the graph showing rainfall (in mm) of a place from August to December. Write down the observations from it and what inference you can draw.



7. Why do people need and observe weather?

8. Explain these symbols used in a weather forecast report.

9. Collect the weather reports from the news papers and make a profile of the weather in a city.

10. Every year we have floods in the rainy season. Why?

11. Observe your surroundings and try to predict how tomorrow would be?

12. Priya's mother said "It is very hard to stay at Vizag during summer" Why did she say so?

13. Collect different news papers and compare the weather reports. Are they same or not? Why?

14. Observe your surrounding immediately after rain. Express your feelings in the form of a song.

15. Prepare some questions to conduct a quiz programme in your class on this chapter.

7 ELECTRICITY
CURRENT AND IT'S EFFECT

Rajesh and Pavani are studying at night (fig. 1)and the power goes off. (fig.2) Rajesh searches the table desk for the torch and the batteries.

Fig. 1

Pavani tries to insert the batteries in the torch, she tries for a few minutes and the torch lights up.

You must be familiar with such a situation.

Fig. 2

Think:

1. Do you know how to insert batteries in a torch?
2. Can you make out whether the switch of the torch is working properly?
3. Can you determine whether the bulb in the torch is fused?

In class 6 you have learnt about the torch and how it works. Now let us see what a cell or battery contains.

MAKE YOUR OWN CELL

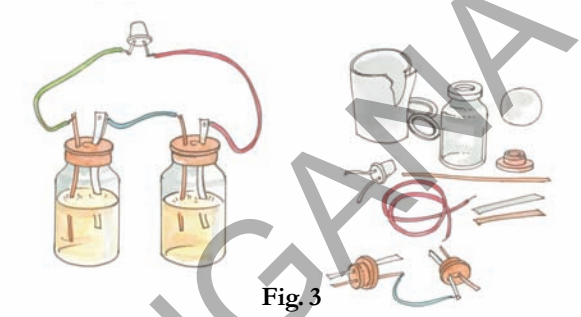


Fig. 3

You will need a few things to make a cell. First get two injection bottles. Then cut two 3cm long bits of thick copper wire. Use sandpaper to scrape about 1cm of the coating off both ends of the wires. Break and open a discharged dry cell and remove its outer metal covering (made of Zinc). Cut 2mm wide and 3cm long zinc strip from zinc plate and a copper strip from a copper plate. Insert the copper strip and zinc strip separately into the rubber caps of the injection bottles as shown in Fig 3. Ensure that the copper strip and zinc strip do not touch each other.

Now take a wire and connect the zinc strip of one bottle with the copper strip of the other bottle. Fill both bottles with sulphuric acid (ask your teacher to help you). Carefully close the bottles with the caps in which the copper wires and zinc strips are inserted.

Your cell is ready. How will you test it? Take an LED (Light Emitting Diode). Attach two wires to its two terminals. Touch the wire from one terminal to the copper wire of the first bottle and the wire from the other terminal to the zinc plate of the second bottle.

Did the LED light up? In case you have any problem, consult your teacher.

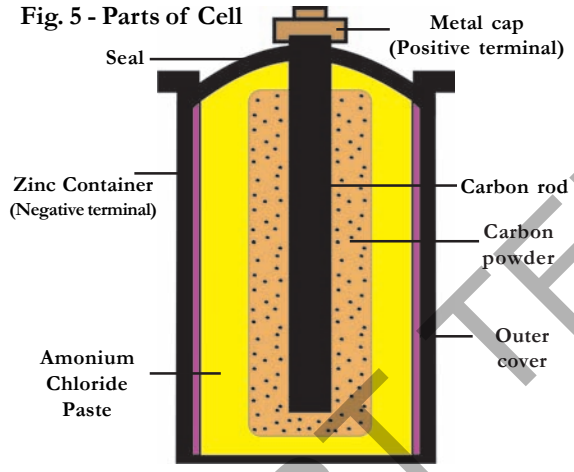
Do all the cells contain liquid in them? Let us find out what the batteries in our torches contain.

Activity - 1 :

Take the help of your teacher to cut open a dry cell. What can you see inside it? Observe the chemical components in the dry cell. Inside a dry cell there are certain chemicals which react with one another to produce electric energy.

Fig. 4
Dry Cell

Fig. 5 - Parts of Cell



A dry cell consists of a container made up of zinc metal. The container also serves as the negative terminal in the centre. A carbon (graphite) rod with a metal cap serves as a positive terminal.

The carbon rod is surrounded by a mixture of carbon particles and a chemical called ammonium chloride. The cell is sealed from the top.

The dry cell can supply electric current in a circuit for a certain time. After that, its chemicals get exhausted and it cannot be used any more.

Dry cell converts chemical energy into electrical energy

Symbols of electric Components

Do you know about symbols? How do you indicate to your teacher that you wish to go out to drink water? You know the signs for addition, subtraction, multiplication and division. You might have used the symbols for 'greater than',' less than' , 'equal to' etc.

Symbols play an important role in our life. They convey precise meaning with few descriptions. Some common electric components can be represented by standard symbols as shown in the following page.

Activity - 2 : Write the symbols for given electric components in the table.

S.No.	Electric Components	Symbol
1	Cell	
2	Electric Bulb	
3	Electric Switch	
4	Battery	

Activity - 3 : Drawing a circuit diagram

In the previous class you have learnt about some simple circuits. Let us learn a little more about them by performing a few experiments.

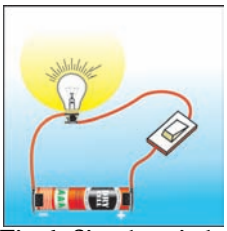
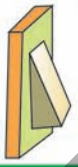
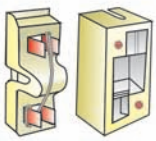


Fig. 6 - Simple switch to close the circuit

Look at figure 6. A bulb, battery and switch are connected as shown. Can we make this drawing simpler using symbols? The picture of circuit using symbols is called a circuit diagram.

Figure 7 shows a circuit diagram of the circuit shown in figure 6.

ELECTRIC SYMBOLS AND THEIR USES

Sl. No.	Electric Component	Symbol	Description / use
1.	Cell 		The longer vertical line denotes the positive terminal and the thicker smaller line denotes the negative terminal
2.	Electric Bulb 		Electric bulb is in OFF position
3.	Switch in ON position 		Switch is a device used to close or open an electric circuit
4.	Switch in OFF position 		Switch is also called as key Switch is open.
5.	Electric Bulb ON 		Electric bulb is in ON position.
6.	Battery 		Two or more cells joined together form a battery
7.	Fuse 		Fuse Safety device used in electric circuit

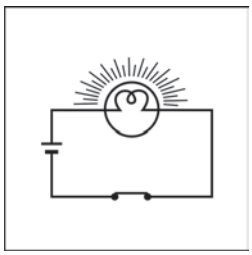


Fig. 7 - Circuit daigram

Circuit Diagram

There should be a source, which is one or more electric cells(battery). The switch can be placed anywhere in the circuit. If the switch is in the ON position, the circuit is complete from the positive terminal of the battery to its negative terminal. The circuit is then said to be closed and the current flows throughout the circuit constantly. The wires should not have any discontinuity (gaps). When the switch is in the OFF position, the circuit is incomplete. It is said to be open. No current flows through any part of the circuit.

Observe the sequence in which the cell, bulb and switch are connected in the circuit.

The sequence of components is as follows:

Positive terminal of the cell → Wire → Switch → Wire → Bulb → Wire → Negative terminal of the cell

Is it compulsory to follow the above sequence? Can you change the sequence and still make the circuit work. Try this experiment and write other possible sequences.

……

……

……

Series and Parallel circuits:

In a series circuit, electricity has only one path to flow through. All the electrical components are connected in this path. If any one of them is removed or is not functioning properly, the circuit will be incomplete.

A parallel circuit has more than one path for the flow of electricity. Each bulb in the circuit is connected in a separate path through which electricity can flow. If any one of the bulbs removed the current flows continuesly in parallel circuit.

Connecting Electrical cells in series:

Activity - 4:

Take a dry cell and torch bulb. Connect the bulb to a cell using copper wires shown in figure-8. Observe the intensity of light.

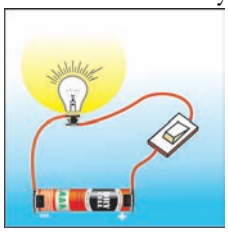


Fig. 8 - Dry cell to make a bulb glow

Now take one more dry cell and connect two cells as shown in figure-9. In this method the positive terminal of the first cell and the negative terminal of the second cell are connected to the bulb.

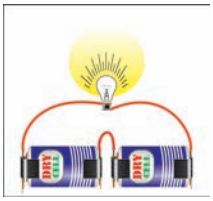


Fig. 9 - Connecting dry cells in series

Is there a difference in the intensities of the bulb in the above case? When does the bulb glow brighter?

……

……

You may use three or four cells in the same manner. The bulb glows brighter and brighter.

Thus by connecting cells in series, we get a battery. The battery cells in the torch are in series.

Think:

Can we connect as many cells as we want for making a bulb glow brighter and brighter? Is there any restriction on the how many cells can be/should be used for a given bulb?

Connecting Electric cells in Parallel:

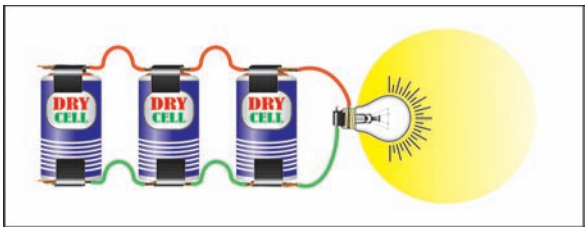


Fig. 10 - Connecting cells in parallel

Activity - 5 :

Take three dry cells and connect them as shown in figure-10. That is, all the positive terminals of the three cells are connected together and all the three negative terminals are connected together. These three positive and three negative terminals are connected to a bulb.

Is there any difference in the intensity of bulb glow compared to that in the case of only one cell?

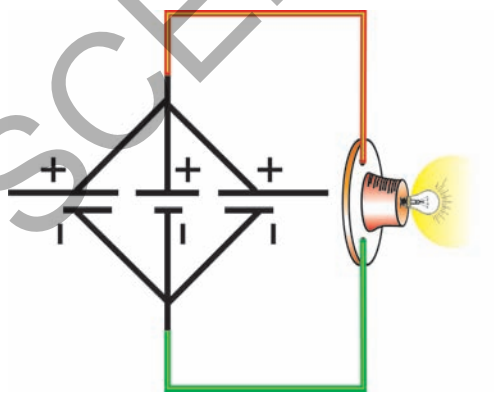


Fig. 11 - Parallel Circuit

Connecting Electric Bulbs in Series:

Fig. 12 - Bulbs connected in series

Connect three torch bulbs in series as shown in figure-12.

Connect this to a dry cell. Observe the brightness of each of the three bulbs. Now connect one more dry cell in series with the first cell. Observe the brightness of each of the bulb. Then connect one more dry cell in series with the first two cells. Again observe the bulbs.

Disconnect one of the three bulbs from circuit. What do you observe? In series connection of bulbs, if one bulb gets fused, all the other bulbs in the series will stop glowing. It means that if one bulb is disconnected the other bulbs do not glow. This can be observed in serial bulbs used in decorative items at the time of marriages and other festivals.

Connecting bulbs in parallel:

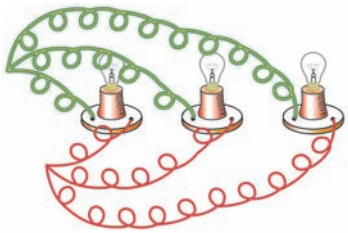


Fig. 13 - bulbs connected in parallel

Activity - 6 :

Connect three bulbs in parallel as shown in figure 13. That is, one end of each of the three bulbs are connected to one wire. The other ends of the three bulbs are connected to another wire. These two wires are connected to a cell. All the three bulbs glow

dimly. Now disconnect one of the bulbs. What would happen? Can you predict? It means that if one bulb is disconnected the other bulbs continue to glow. This can be observed in our household electric circuit. All components in our houses are connected in parallel.

Think!

1. Why does the bulb glow brighter and brighter when electric cells are connected in series?
2. Do the electric bulbs used in your house glow with a dry cell? Why?
3. Are the cells used in torch light and wrist watch the same?
4. What is the reason for connecting electric bulbs in parallel in a household electric circuit?

Heating effects of Electric Current

The bulb becomes hot when you put it on for some time. Why do you think this happens? It is the filament of the bulb that heats up due to current flowing through it.

Fig. 14
Electric Bulb

You might have seen an electric iron, electric cooker and electric heater. All these contain a coil of wire made up of Nichrome. This coil is called filament of the appliance.

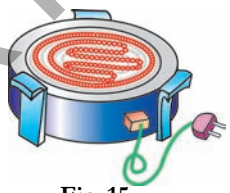


Fig. 15
Electric Heater

You might have noticed that when these appliances are switched on, their filaments become red hot and give out heat.

The amount of heat produced in a wire depends on its material, length and thickness. Thus, for different requirements, the wires of different materials, lengths and thicknesses are used.

The wires used for making electric circuits do not normally become hot. On the other hand, the elements of some electric appliances become so hot that they are easily visible. The filament of an electric bulb gets heated to such a high temperature that it starts glowing and giving out light.

When an electric current passes through a wire, the wire gets heated. Can you think of some electric appliances that get heated up just like a bulb when electric current passes through them? .....

.....

.....

Activity - 7 :

Think of the main use of electrical appliances and write their names in the correct column. One example is given for you

An Electric kettle, a lift in a building, a street lamp, a tube light, an exhaust fan, a rice cooker, a cassette player, an electric mixer, an electric oven, a water pump.

Table - 1

Used for Light	Used for Heat	Used for a Movement
E.g. Table Lamp		

Tube Lights and Compact Fluorescent Lamps (CFLs)

Wastage of electricity can be reduced by using fluorescent tube lights (figure-16 a) in place of bulbs.

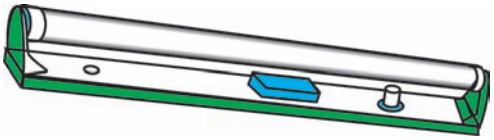


Fig. 16 a – Tube light

Compact Fluorescent Lamps (CFLs) (shown in figure 16 b) also reduce wastage and can be fixed in ordinary bulb holders. The ISI mark of a lamp ensures that the appliance is safe.

Fig. 16 b C.F.L.

Electric Fuses

When excessive electric current flows through a circuit the wires or the appliances may get heated and can catch fire. To avoid fire, a safety device known as a fuse is connected in series in the circuit.

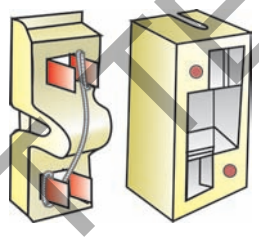


Fig. 17
Electric fuse

A fuse is a small, thin piece of wire as shown in figure 17. It is made of a special alloy that gets heated quickly and melts. If the current in the circuit is too high, the fuse wire gets hot and melts. This leaves a gap in the circuit. Automatically the circuit is broken and flow of electricity is stopped. This protects appliances from getting burnt due to the passage of too large a current through them.

Miniature Circuit Breaker (MCB):

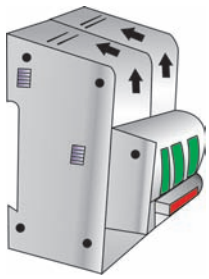


Fig. 18 - Miniature Circuit Breaker

These days Miniature Circuit Breaker (MCB) is increasingly being used in place of fuses. These are switches which automatically turn off when current in a circuit exceeds the safe limit. It has a switch which goes OFF automatically if there is overheating. This breaks the circuit. If we turn them on, the circuit is once again complete

The advantage miniature circuit breakers have over fuses is that they can be reset (manually or automatically) to restore normal operation, whereas fuses need to be replaced after every single operation. The MCB can be reset by hand and the circuit becomes complete once again . Look for ISI mark on MCBs also.

What can be a disadvantage of MCB?

Electricity in our home:

Fig. 19 - Electric & Digital Meter

Most of the electricity that we use at home and at school is alternating current. The mains electricity that is supplied to our houses comes from power stations. Sub-stations distribute electricity. Electricity is not free of cost. We have to pay for it according to how much we consume.

You may have noticed that a person belonging to the electricity department, the meter reader, visits houses every month and takes the meter readings. If you look at the meter in your house you will notice a wheel that goes around and the numbers in the window keep changing. Modern meters have digital displays.

What does the term 'one unit' mean? How is the usage of electricity measured? If you look at the bulbs used in your home, you will notice that they are marked in watts 25W, 40 W, 60W, 100W. The wattage measures how 'powerful' the bulb is. The brighter the bulb, the higher its wattage and the more the electricity used by it.

1 Kilowatt (KW) is 1000 Watts (W). When any appliance of 1 Kilowatt is used for one hour, it uses up one kilowatt - hour (KWH) or 'one unit' of electricity. If it runs for two hours it will use up two units of electricity.

You can learn how to calculate the amount you have to pay in the electricity bill through the following exercise table.

Exercise:

1) The meter reading in Ayub's house in January is 400 units, February 580 units. Calculate how much his parents would have to pay towards electricity bill of February? The unit cost is Rs. 3.05.

Table - 2

Reading in January 1st	400 Units
Reading in February 1st	580 Units
Number of units Electricity Used	180 Units
Cost per unit	Rs. 3.05/-
Total Amount to be paid	180 x 3.05 = 549/-

Note: Unit cost differs in different areas and also on the slabs. Electricity provided for domestic purpose is cheaper compared to that for commercial or industrial purposes.

2) Suppose in a house there are four bulbs of 100 W each, six of 60 W each and six of 40 W each. All of them are used for two hours a day. How many units of electricity will be used up in 30 days? How much will they have to pay at Rs. 2.80 /- per unit.

Total power used

= (4 x 100W) + (6 x 60 W) + (6 x 40 W)

= 1000 W = 1 KW.

Total power used every day

= 2 hrs x 1Kw = 2 KWH

In 30 days, power used

= 2 x 30KWH = 60 KWH

The cost of the power is

=Rs. 2.80 x 60 = Rs. 168/-

Think!

Are there households in Telangana who do not have electricity ? Which areas of Telangana are they found in large numbers? What may be the reasons for those people having to live without electricity?

Think! Our country faces shortage of electricity. So wasting electricity means you are depriving someone else of electricity. Your bill also goes up. So use electricity carefully and only when it is needed. Think of the ways of saving electricity.

Do you Know!

Michael Faraday (1791-1867)

Michael Faraday observed that by moving a magnet in and out of a coil. we can make electric current flow through the coil. Using this he built the first electric generator or dynamo in 1831. He also invented the transformer.

New words:

Cell, Battery, Fuse, Series Circuit, Parallel Circuit, Bulbs in Series, Bulbs in Parallel, Tube light, Compact Fluorescent Lamps, Miniature Circuit Breaker, Watt, Circuit Diagram, Heating effect of Current, Switch,

What we have learnt:

- Electric cell is a source of electric energy.
- The two terminals of an electric cell are called positive (+ve) and negative (-ve).
- Dry cell converts chemical energy into a electrical energy.
- Two or more cells joined together form a battery.
- The battery cells in the torchlight are kept in series.
- An electric bulb has a filament that is connected to its terminals.
- An electric bulb glows when electric current passes through it.
- In a closed electric circuit, the electric current passes from one terminal of the electric cell to the other terminal.
- Switch is a single device that is used either break the electric circuit or to complete it.
- If one bulb is disconnected in a series connection, all the other bulbs also get disconnected.
- Wastage of electricity can be reduced by using fluorescent tube lights in place of bulbs.
- Safety device used in electric circuit is fuse.
- 1 Kilowatt (KW) equal to 1000 watts.

Improve your learning:

I. Answer the following Questions

1) Draw the symbols of the following electric components

   a) Cell b) Battery
   c) Switch d) Electric bulb

2) Draw an electric circuit diagram consisting of a cell, a bulb and an electric switch.

3) In a series connection of bulbs, if one bulb fails, why do all other bulbs go OFF?

4) Write the difference between series connection and parallel connection.

5) What is the advantage of Miniature Circuit Breaker?

6. Fill in the blanks

a. Longer line in the symbol for a cell represents its _____ terminal.

b. Smaller line in the symbol for a cell represents its _____ terminal.

c. The combination of two or more cells is called a _____

d. Safety device used in electric circuit is _____

e. The device used to close or open an electric circuit is _____

7. Mark **'T'** of the statement is true and **'F'** if it is false. Give reasons for choice of answer.

a. In series circuit the electricity has only one path (T/F).

b. In parallel circuit the electricity has more than one path (T/F).

c. To make a battery of two cells, the negative terminal of one cell is connected to the negative terminal of the other cell (T/F).

d. When the electric current through the fuse exceeds a certain limit, the fuse wire melts and breaks (T/F).

e. The switch is used to close or open an electric circuit (T/F).

8. Choose correct answer.

i. Arun buys four bulbs of 15W, 40W, 60W and 100W respectively, Which one should be use in his room as a night bulb.

a) 15 W b) 40W ( )

c) 60W d) 100W

ii. Device used to close or open an electric circuit is ( )

a) Electric bulb b) Battery

c) Switch d) Fuse

iii. Which one of the following is used as a for light source. ( )

a) Cassette player b) Electric mixer

c) Rice Cocker d) Table lamp

iv. Safety device used in electric circuit is

a) Electric bulb b) Battery ( )
c) Switch d) Fuse

9. Visit your classmates houses. Find out the meter readings of three months. Record your observations. Ask your parents about how electricity bill is paid?

10. Draw the circuit daigram for the following series connection.

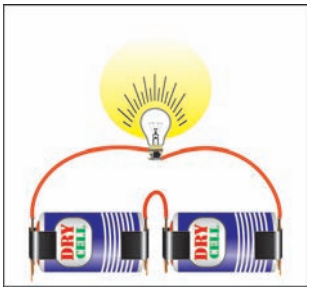


Fig. - 20

11. Match the following

1.	Cell	( )	a)	Used to open or close a circuit
2.	Switch	( )	b)	Safety device used in electric circuit.
3.	Circuit	( )	c)	A complete path for the flow of an electric current
4.	Miniature Circuit Breaker	( )	d)	Reset by hand, circuit becomes complete once again.
5.	Fuse	( )	e)	A device which converts chemical energy into electrical energy

8 AIR, WINDS AND CYCLONES

We know that when we ride on a bicycle in the direction of the wind, it is easy to ride the bicycle, but when we go opposite to the direction of the wind, it is very hard and we may tire easily.

- Try to guess the reason.
- How else does wind effect and influence our lives?

Sometimes the wind is cold and sometimes it is pleasant and nice. It can blow clouds and sometimes raises dust. It is sometimes gentle but can be really strong too and blow away things. You have read in Class 6th that clothes dry faster on a windy day.

- Write five examples from your daily life that you feel are influenced by wind.

Since wind has so much effect on our lives we have to find out what winds are? How do they arise?

The air around us is rarely still. It moves continuously from one direction to another. The movement is in many directions. This is what we call winds. So we know that wind is moving air.

Let us try to understand something more about air and winds.

Let us do–1: Where do we find air?

Take a bucket full of water and a transparent glass. Take a paper, crumple it into a ball and push it to the bottom of the glass. Invert this glass and immerse it in to the bucket of water

Fig.1

Keep the glass straight and press it so that the glass is completely under water. Take it out and observe what happens.

- Did the paper in the glass get wet or not?
- What would happen if you tilt the glass while immersing it in water? Try it.

Let us do - 2

Fill a bucket with water. Take a bottle with a narrow mouth and immerse it in the bucket till it fills with water (Fig. 2).

- Did something come out of the bottle when water entered it?
- How do you know whether something came out or not?

Would it be correct to say that a glass or bottle that we think is empty is actually full of air?

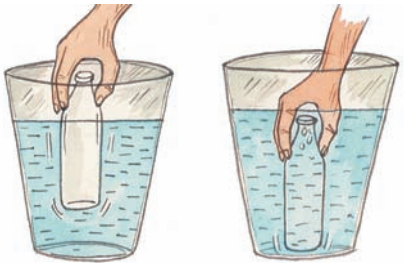


Fig. 2a Fig. 2b

After doing activity 1 and activity 2, Rani said that air is everywhere. Any bottle, glass or any other container that appears empty is actually full of air. Nothing can be added to it unless the air inside is removed. It is only when some air is removed that something else can enter. Air occupies the space around us.

- Do you agree with Rani? Discus with your friends and write the reasons for your answer.
- Give a few more illustrations showing that air needs to be removed from a container before something else can enter it.

What are the steps needed to use a dropper? Explain its functioning.

Fig. 3a Fig. 3b Fig. 3c

Does Air exerts pressure?

You know that a bicycle tube or tube of any other vehicle can burst when it is over filled with air. How does this happen? What does the excess air do to the tube? Discuss with your friends on how the air in the vehicle's tubes keeps them in shape.

Take a balloon and fill it with air. Keep blowing more and more air into it. What would eventually happen? The balloon expands and after a point bursts.

- Why does it burst?
- Can we say that this activity also shows that air exerts pressure?
- Give reasons for your answer.
- List other experiences of situations where air exerts pressure. For example these may include a balloon being filled with air, the air filled football that becomes hard, water rising through a hand pump, the tubes of cycle, scooter or car. Think of other examples where we can see that the air exerts pressure.

Let us do - 3:

Take a syringe and draw out its plunger to the limit. Close the nozzle of the syringe with a finger and press the piston.

Fig. 4

Were you able to press the piston?

- Did you feel pressure on your finger while doing so?
- What do you think exerted pressure on your finger?

Air Expands on Heating

Let us do - 4

Take an empty injection bottle and one empty ball point refill. Remove the pin of the refill and insert one of its ends in the cork of the injection bottle as shown in Fig. 5.

Put a water drop on the upper end of the refill. Rub your hands together so that they become warm. Carefully pick up the bottle and hold it in both your hands for some time

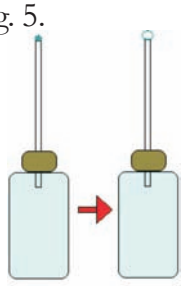


Fig 5

so that the bottle also becomes warm.

What happens to the water drop?

How does it behave?

Now keep this bottle in a saucer of cold water and observe what happens to the drop. Why does this happen?

- What makes the water drop inflate when the injection bottle is held in cupped hands? What happens to it in cold water?
- Can we infer from the first observation that air expands on heating?
- Can you state what happens to the air in the bottle when it is cooled by keeping the bottle in water?

Let us do-5: Hot air is lighter than cold air

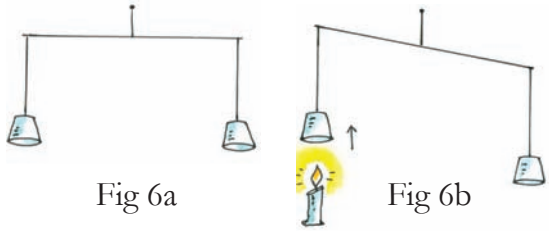


Fig 6a Fig 6b

Take two paper bags or empty paper cups of the same size. Take a broomstick. Hang the two bags in the inverted position on the two ends of the broom stick. Tie a piece of thread in the middle of the stick. Hold the stick by the thread, like a weighing balance. Put a burning candle below one of the bags as shown in the figure 6 (b) and observe what happens.

Note that we have used paper bags or cups as they are of light weight and it would be easier to see the results of this experiment if we take any such light objects to hang on the thread.

- Why is the balance of the bags disturbed?

Handle the burning candle carefully.

Let us do -6

Take a balloon and fill it with air. Heat it slowly. What happens?

The balloon expands and the air inside exerts more pressure on the walls.

- If the tied end is opened now, what would happen?

The air from the balloon would slowly escape.

- Why does that happen?

Let us do - 7

Take a balloon. Blow air into it. As we fill it up, it expands and it becomes harder to press the walls of the balloon. The inside air exerts pressure on the walls of the balloon.

Open the mouth of the balloon slightly. What happens?

Air from the balloon comes out. You can open the mouth less or more and control the flow of air. The air in the balloon is at high pressure and it goes towards low pressure area.

You already know that when air moves, it is called wind. Air moves from the region where the air pressure is high to the region where the pressure is low.

The greater the difference in pressure, the faster the air moves. We still have to think why winds occur in nature. How is the pressure difference that causes winds created in nature? Is there a difference in temperature involved? The following activities will help you to understand this.

Let us do – 8

Take an incense stick(agarbati) and light it. Observe the smoke of the incense stick?

- Where does it go?

Observations from above activities indicate that warm air rises up. Also, it is important to remember that on heating the air expands and occupies more space. When something occupies more space, it becomes less dense and lighter. The warm air is therefore less dense and lighter than cold air. Thus smoke and hot air go up.

Similar to observations of activities done so far, numerous factors contribute to heat air.

When the air rises up, air pressure at the place becomes low and we have many kinds of winds as air comes in to occupy areas of lower pressure. The differential heating of land and water by the sun leads to land and sea breeze.

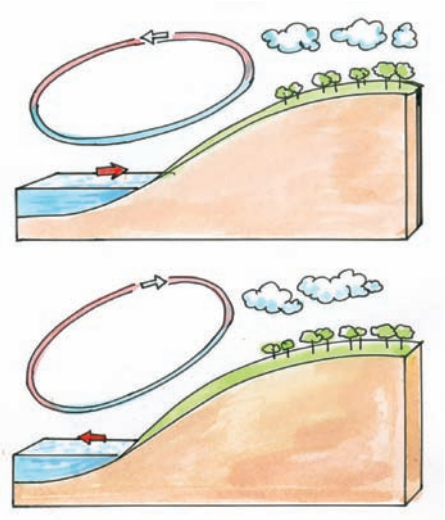


Fig. 7 Land and sea breeze

The land heats up faster than the sea, so warm air rises over the land during the day as it is warmed by the Sun. At certain times of a year, this can create a sea breeze which is a gentle breeze blowing into the land. At night, the land cools faster than the sea, reversing the air flow. This creates a land breeze that blows out to sea.

Let us do – 9

Effects of Moving air

a. Take a glass and a postcard. Keep the glass on a table and the postcard on the glass. Wave your hand or note book above the post card to displace the air just above the postcard.

What do you observe?

Why did postcard lift up?

Figure – 8(a)

b. Now wet the edges of glass with water. Stick the post card to it, and hold it inverted with your left hand as shown in figure (8 b) and move your right hand or note book to move the air form under the paper.

Figure – 8(b)

Can you imagine what would happen? Have you ever seen high speed winds blowing over the roofs of houses? If roofs were weak they could be lifted and blown away.

- If you have heard or seen any such experiences share it with your friends.

In the activity (9), when we move our hand there is movement of air caused. The moving air creates low pressure. Hence the paper lifts up due to the higher pressure on the paper from air in the glass. When on the other hand we hold the glass facing down, the same thing happens and the air inside the glass pushes the paper out and makes the paper fall down.

WIND - UNEVEN HEATING ON THE EARTH

We have discussed the cause of winds in areas near large water bodies including seas and oceans, What about wind on the other parts of the earth. What are the reasons that different areas have different temperature? Let us try to find more about all these.

Uneven heating takes place on the surface of the earth. There are a number of reasons for this.

A. Uneven heating between the equator and the poles.

You might have learnt in geography that the region close to the equator gets more heat from the sun. This is because of the direction of the sunlight being straighter close to the equator. The air in these regions gets warmer. The warm air rises, and the cooler air from the regions in the 0-30^0 latitude belt on either side of the equator moves in. This movement of air sets forth winds that move over the earth.

We have also seen that the increased wind speed is accompanied by a reduced air pressure and this aids rains.

Let us try to understand how winds are produced, how they bring rain and how they can be destructive sometimes.

B. Uneven heating of land and water

You have read about the sea breeze and the land breezes. In summer, near the equator the land heats up faster and during the day the temperature of the land is higher than the water in the ocean. The air over the land gets heated and rises. This causes the winds to flow from the oceans towards the land. These are monsoon winds. This is usual during the months of June to September.

The direction of the wind flow gets usually reversed in the months from December to early March. The wind flows from the land to ocean as the sea cools more slowly..

The winds from the oceans carry water and bring rains. Farmers in our country depend mainly on rains for their harvests. We can also generate energy from high speed wind. Thus we can see the usefulness of winds in our life.

- *Write other uses of wind you can think of*

Do winds also cause harm? Let's see how? You may be familiar with the word cyclone. During the months of May-June or October-November reports about them can be seen in the news papers/ T.V.

CYCLONES

Cyclones are a form of violent storms on Earth. People call these storms by names such as typhoons, hurricanes etc. depending on where they occur. Let us try to understand the phenomenon of cyclone through the following activity. Ex: Lyla, Bulbul cyclones.

Let us do - 10:

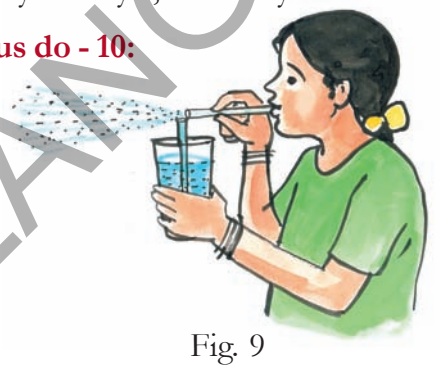


Fig. 9

Take a glass containing water and two straws. Keep one straw in the water and another in horizontal direction as shown in figure 9 and blow through the horizontal straw.

- Can you say what happens to water?
- What do you observe?
- Why is the water spray coming out from the straw? Discuss with your friends.

When you blow over the straw the water comes out due to low pressure which forms inside the straw. So the water from the glass reaches up in the straw due to high pressure.

We see that the increased wind speed is accompanied by a reduced air pressure.

How Cyclones are Formed

Tropical cyclones are like giant engines that use warm moist air as fuel. The warm moist air rises upward from near the surface. The warm air rises causing an area of lower air pressure below. Air from surrounding areas of high air pressure pushes into the low pressure area. Then this "new" air becomes warm and rises too. As the warm air continues to rise, the surrounding air swirls-in to take its place and the water from the sea surface also comes up with the air as you have seen in activity 10. As the warmed moist air rises and cools off, the water in the air forms clouds.

The whole system of clouds and winds spins and grows, fed by the ocean's heat and water evaporating from the surface. See the figure (10)

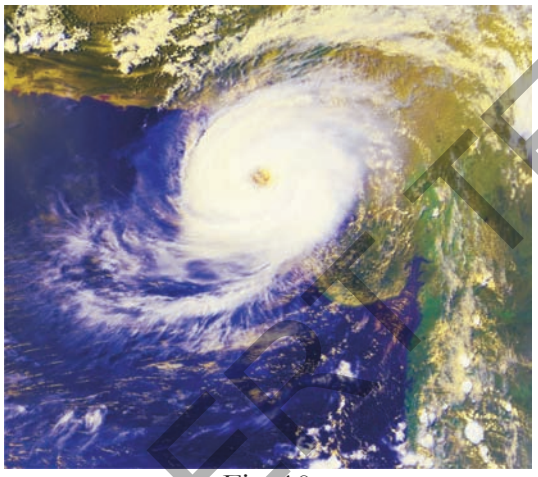


Fig. 10

These kinds of satellite images help us to predict the path of the cyclones to some extent.

DESTRUCTION BY CYCLONES:

Cyclones can be very destructive. The main effects of cyclones include heavy rain and, strong wind. The destruction of a cyclone depends mainly on its intensity, its size and its location.

Fig. 11

- Have you heard or seen any experiences of cyclones? Write about these in your notebook.
- Collect information regarding cyclones from news papers. Prepare a scrap book with news paper cuttings followed by small report prepared by you.

CYCLONES – Do's and Don'ts:-

- We should not ignore the warnings issued by the meteorological department through T.V., Radio or news papers. Pass on the information to others and ignore rumors.
- When a cyclone alert is on for your area, continue normal working but stay alert to the radio warnings.
- We should make necessary arrangements to shift essential household goods, domestic animals and vehicles, etc. to safer places.
- Switch off electrical mains in your house.
- Keep ready the phone numbers of all emergency services like police, fire brigade, and medical centers.
- Pack essentials for yourself and your family to last a few days, including medicines, special food for those who

would need it. This may include babies and elders.

Post cyclone measures

If you are staying in a cyclone hit area-

- Strictly avoid any loose and dangling wires.
- Do not drink water that could be contaminated. Always store drinking water for emergencies.
- Do not go out for the sake of fun.
- Cooperate and help your neighbours and friends.

Advanced Technology has helped and these days we are better protected. In the early part of last century, coastal residents may have had less than a day to prepare or evacuate their homes from an oncoming cyclone. The world today is very different. Thanks to satellites and radars, a cyclone alert or cyclone watch is issued 48 hours in advance of any expected storm and a cyclone warning is issued 24 hours in advance. The message is broadcast every hour or half an hour when a cyclone is near the coast. Information about cyclones will be given by the Indian Meteorological Department (I M D).

We have learnt that all storms are low pressure systems. Wind speed plays an important role in the formation of storms. It is, therefore, important to measure the wind speed, The instrument that measures the wind speed is called anemometer. (See extended activities to make your own anemometer)

KEY WORDS:

Wind, Expansion, Anemometer, Cyclone, Low pressure, High pressure

What we have learnt:

- Air is everywhere.
- The moving air is called wind.
- Air around us exerts pressure.
- Air expands on heating and contracts on cooling.
- Warm air rises up whereas comparatively cooler air tends to sink towards the earth's surface.
- As warm air rises air pressure at the place is reduced and the cooler air moves into that place.
- Uneven heating on the earth causes wind movements.
- Cyclones may be caused due to wind traveling at high speed due to difference in air pressure.
- It has become easier to study cyclones with the help of advanced technology like satellites and radars.

Improve your learning

1. Fill the missing words in the blank spaces in the following statements.

   a. Wind is ———— air.

   b. Winds are generated due to ———— ———— heating on the earth.

   c. Near the earth's surface ———— ———— air rises up whereas ———— — air comes down.

   d. Air moves from a region of ———— ———— pressure to a region of ———— ———— pressure.

2. Suggest two methods to find out wind direction at a given place.
3. State two experiences that make you think that air exerts pressure. (Other than those given in the text).

4. While constructing a house, where do we construct ventilators; why?

5. Explain why holes are made in banners and hoardings hanging in the open.

6. How will you help your neighbours in case cyclone approaches your village/ town?

7. In the day time, when we go to the sea the air blows towards us and does not go towards the sea. Explain.

8. Which of the statements given below is correct?

a) In winter the winds flow from the land to the ocean.

b) In summer the winds flow from the land towards the ocean.

c) A cyclone is formed by a very high pressure system with very high speed winds revolving around it.

d) The coastline of India is not vulnerable to cyclones.

9. Read the following procedure and make your own anemometer.

Collect the following items

(a) 4 small paper cups (b) Two strips of the cardboard 20 cm long, 2 cm width (c) Gum (d) Stapler (e) Sketch pen (f)sharpened pencil

Take a scale draw crosses under the card board strips as shown in figure 12.

Fix the strips at the centre, putting one over the other they make a '+' sign. Now fix the cups at the ends of the strips. Colour one cup with sketch pen. All four cups should face in the same direction.

Push a pin through the centre of the strips and attach the strips to the sharpened pencil.

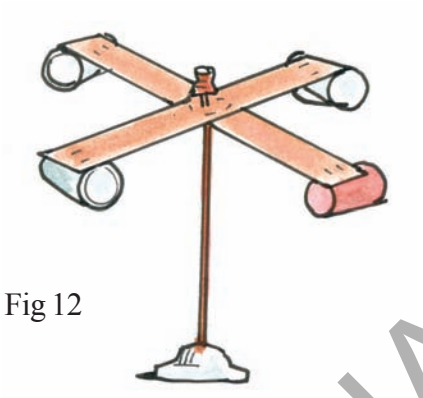


Fig 12

Check that the strips rotate freely and when you blow on the cups.

Your anemometer is ready. Counting the number of rotations for a minute will give you an estimate the speed of the wind.

10. Collect some articles and photographs from news papers and magazines about storms and cyclones. Make a story on the basis of what you learnt in this chapter.

11. Interview eye witnesses to collect the actual experiences of people affected by a cyclone.

12. More fun with air

A. do the following activities and write your findings

Fig 13

Take an empty bottle and place it on the table as shown in figure 13. Place a cotton ball just inside its mouth. Now try to blow air on the ball to send it into the bottle, and then try the activity with bottles of different sizes. Throw

a challenge to your friends whether they can send the cotton ball inside the bottle by blowing air. Are you surprised? Why did this happen? Think about it and discuss with your friends.

B. Can you blow out the ball from funnel?

Fig 14

Take a funnel and ball, keep the funnel in your mouth as shown in figure 14. Keep the ball in the funnel. Blow air through the funnel and try to send out the ball from funnel. What happens? Have you succeeded in sending the ball out?

Fig. 15

And then place the ball on your hand and put the funnel over the ball as shown in figure 15 Now blow air forcefully through funnel and try to blow out the ball from the funnel (while blowing air, remove hand).

- What did you observe?
- What did you expect?
- What happens?

Try to answer and discuss with your friends.

C. Flow of air

Fig 16

Take a large plastic bottle and a two holed rubber cork that fits firmly into its mouth. Also take two glass tubes. Tie a coloured balloon to the lower end of one of the glass tubes. Insert the glass tubes into the two holes of the cork. The glass tubes should fit tightly in the holes.

Close the mouth of the bottle with the cork and seal it with sealing wax to make the bottle airtight. The balloon should be inside the bottle as shown in Fig. 16.

Now suck air out of the bottle through the tube that doesn't have a balloon attached to it.

- What happens to the balloon?
- Why do you think this happened?

9 REFLECTION OF LIGHT

In Class VI you saw how shadows are formed. You observed that the shape of the shadow changes according to the position of source of light and the position of object . You drew shadows of some objects and you noticed that the rays of light travel in a straight line, by the observation of shapes of the shadows.

You came to know that when light falls on an object it will be reflected by the surface of that object and if that reflected light reaches our eyes we can see that object.

In this class we try to learn more about reflection of light.

When will you be able to see clear images of yourself in a plane mirror?

Will you be able to see your image in a mirror if the mirror is in front of you in a dark room?

Let us do this (1)

Point a torch towards the mirror so that it's light falls on the mirror which you hold up as shown in figure 1(a), and try to see your image in the mirror.

fig. 1(a)

Then turn the torch towards your face as shown in figure 1(b), and see your image in the mirror.

fig. 1(b)

In which case is your image clear?

You will find that when light is focused on your face you can see your image clearly in the mirror.You also notice that when light is focused on the mirror you find a dim image of your face in the mirror. Why does it happen so?

Think:

We already know that, to see any object, light should fall on it. In daytime we are able to see all objects which are in our room even though sunlight does not fall directly on those objects. How is it possible?

The multiple reflection of sunlight from surfaces like wall, floor, ceiling etc. finally falls on the object and gets reflected by it and reaches us. This enables us to see the object.

Imagine that your friend sat in the middle of the room. Estimate how many times, reflection of sunlight should take place to finally fall on your friend. Identify the places from where light reflects.

How light reflects after striking an object?

We need to understand about light rays to know how light is reflected after striking an object.

Rays of light

Let us do this (2)

Take a mirror strip and a black paper as shown in figure 2a. Cover the mirror strip with black paper and cut a 1 mm wide slit in the black paper, as shown in figure 2b.

fig. 2(a)

fig. 2(b)

Hold the mirror strip with the slit facing the sun as shown in figure 2c. You will see some light coming through the slit. Let this light fall on a sheet of paper spread on the ground.

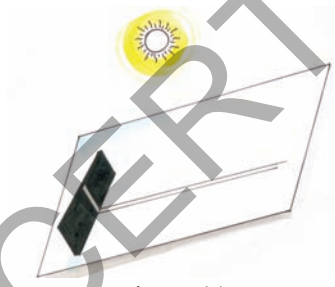


Fig. 2 (c)

Light coming from such a slit or any other small hole looks like a ray of light.

We shall use this mirror strip covered with the slit of black paper in the following experiments.

Let us observe how light (ray of light) reflects.

Let us do this (3)

Place a blank sheet of paper on the ground such that part of it is in the sunlight and other part of it is in the shadow. Hold the mirror strip with the slit facing the sun. Let a ray of light from the slit fall on the paper. Now take another mirror strip and place it in the path of this light ray such that the ray coming from first mirror falls on the second mirror as shown in fig 3.

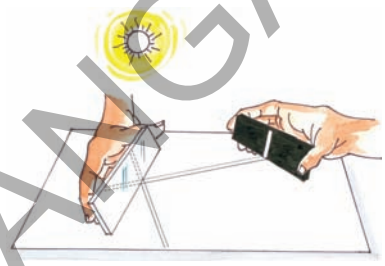


Fig. 3

What do you observe?

Did you see any other ray of light, apart from the one from the mirror slit, on the paper?

This effect of the mirror strip on the ray of light is called reflection. The ray of light falling on the mirror is called the ***incident ray*** and the ray returning from it is called the ***reflected ray***.

Laws of reflection:

Is there any relationship between the direction of the incident ray and the direction of the reflected ray.

Let us do this (4)

Take a sheet of blank paper. Draw a line segment AC. Draw another straight line

at right angles (90 degrees) to segment AC. The second line should intersect segment AC at point B. We shall call this line as **Normal.** See in figure 4a.

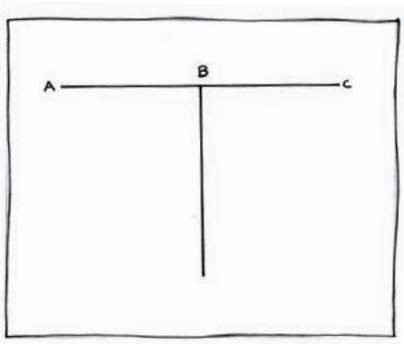


Fig. 4(a)

Draw two lines from point B on the left side of the normal and two on the right side. The lines should be at angles of 30° and 60° respectively from the normal. Number these lines 1, 2, 3, 4 as shown in figure 4b.

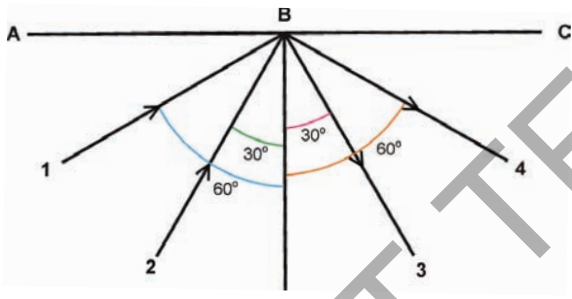


Fig. 4(b)

Place a mirror strip vertically on segment AC with its reflecting surface facing the normal. See that the back of the mirror coincides with segment AC. Take the mirror strip with a slit and let its light ray fall along line 4, as you did in the earlier experiment. Now this ray is the incident ray for the mirror . The angle between the normal and the incident ray is called the **Angle of Incidence (∠i).**

Did the reflected ray fall on any of the lines you have drawn? If yes, on which line did it fall?

The angle between normal and the reflected ray is called the **Angle of Reflection (∠r).**

Adjust the mirror strip with the slit so that its light ray falls along line 3 and observe on which line the reflected ray falls?

Adjust the mirror strip with the slit so that its light ray falls along normal, then the angle of incidence is 0^o (the angle between normal and incident ray "that is also normal here", is 0^o)

What happens? Where did you find the reflected ray?

Record your observations in the table - 1.

TABLE - 1

S.No.	Incident ray	Angle of Incidence	Reflected Ray	Angle of Reflection
1.	On line - 4		On	
2.	On line - 3		On	
3.	On normal		On	

Do you see any relationship between the angle of incidence and the angle of reflection? State this relationship in the form of a rule and write the rule here.

.....

Let us verify this rule.

If the two incident rays form angles of 20° and 45° respectively with the normal, what will be the angles formed by the reflected rays with the normal?

Verify your answer by conducting the experiment.

Note: observe this diagram carefully (figure 5). The ray of light from the candle is reflected at the mirror, and bounces off at the same angle as it come to the mirror. Our eye does not know that the light has been reflected. Our eye sees the object (the candle) in the mirror, and feels that light is coming from that candle which seems to be behind the mirror. In this way we see an image of the candle.

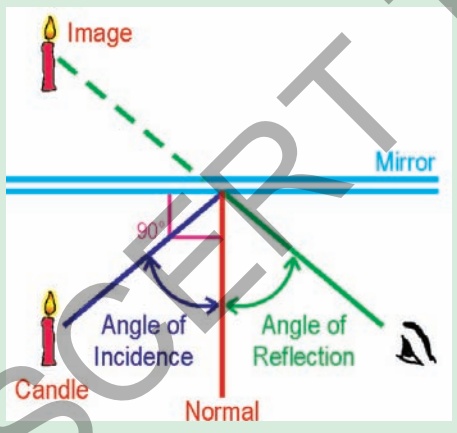


Fig. 5

We are able to see a person who is walking on the road through a window or a door. At the same time that person can also see us. Is it possible to see that person while hiding oneself?

Make your own periscope

Let us do this (5)

Collect the following materials to make your periscope:

Empty agarbatti box, two mirror strips, scale, pencil, blade, match box, candle, glue.

Close both ends of the agarbatti box. Draw squares at both ends. Draw the diagonal to these squares as shown in figure 6(a). Slit the diagonals with a blade. The slits should be equal to the length of the mirror strips.

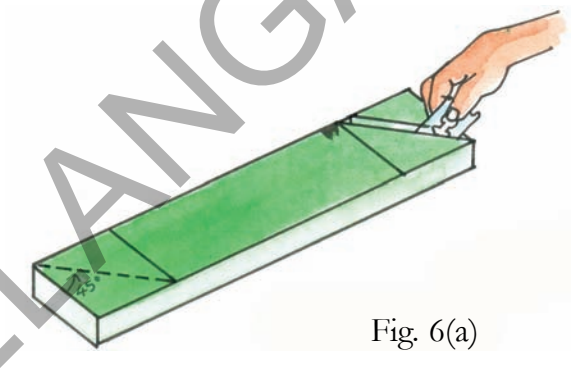


Fig. 6(a)

Fix the mirror strips in these slits as shown in figure 6(b). Take care to see that these mirror strips lie parallel to each other, with their reflecting surfaces facing each other. Fix the mirror strips firmly to the box with a few drops of molten wax from a burning candle. You can also use glue or fevicol instead of wax.

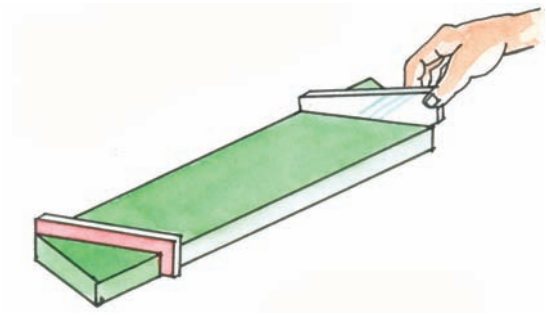


Fig. 6(b)

Cut out two windows on the narrow sides of the box as shown in figure 6(c). The windows should open directly on the reflecting surfaces of the mirror strips. Now your periscope is ready.

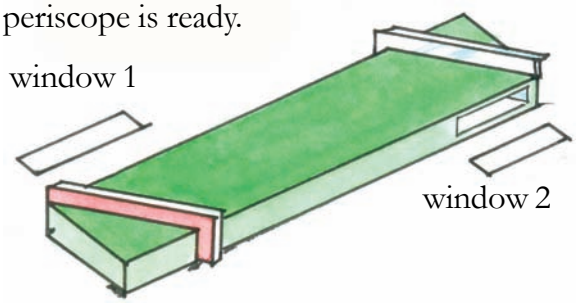


Fig. 6(c)

When you look through window 2, you will be able to see things lying in front of window 1. If you hide behind a tree, you can easily see what is happening on the other side of the tree with your periscope. Observe in figure 6(d), the girl is viewing objects outside the room through the window while hiding herself in the room,with the help of a periscope.

Fig. 6(d)

Think: why should we keep mirror strips parallel to each other in periscope?

What happens if they are not parallel?

Let us do this (6)

Place a mirror (1ft. × 1ft.) on the floor. You and your friends A, B, C stand on four sides of the mirror as shown in figure 7. Adjust your places of standing, in such a way that each one of you can see the image of the person opposite to you in the mirror kept on the floor.

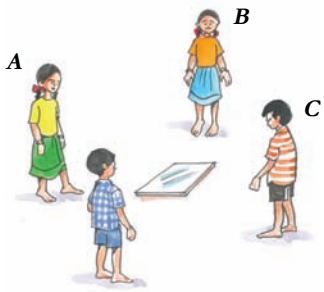


Fig. 7

Your friends A, C are able to see images of each other in the mirror. Why can't you see their images?

Ask your friend – B, who is in front of you to move a feet aside from his place. What happens? Did you see his image in the mirror? If not, why?

Imagine a normal to the mirror. It would be perpendicular to the mirror as well as to the floor. Imagine an incident ray coming from your friend B, falls on the mirror then the reflected ray from mirror and reaches you. Observe that the incident ray, reflected ray and normal lie in the same plane.

Now think why the image of your friend B is not visible to you when he moves aside. Where should you stand to see his image? Once again imagine the incident, reflected rays and normal and assumed plane. What do you understand?

The incident ray, reflected ray and normal should be in same plane, only then can you see your friend.

Are the incident ray coming from your friend A, reflected ray going towards your friend C and normal in the same plane?

Now let us try to answer why the mirrors in periscope are kept parallel to each other: In a periscope the incident ray for the second mirror is the reflected ray of the first mirror. When these two mirrors are parallel to each

other, only then the rays lie in the same plane and can pass through the windows of the periscope. If these mirrors make some angle with each other, then the reflected ray of the first mirror may not reach the second mirror or the reflected ray of second mirror may not pass through the window of periscope. In both cases we can't see the object with the periscope.

How do we get an image in a mirror?

You would have seen your image in a mirror many times. Do you know how it is formed? During day time the light which falls on you gets reflected and a number of reflected light rays from you that fall on the mirror also get reflected back. These reflected rays reach your eye and make you see your image. See figure 8. Thus formation of image in mirrors is due to reflection of light rays from the mirror.

Fig. 8

See the figure 9 and observe the lines. They will explain how the image of a candle is formed in the mirror and how you are able to see the image of the candle in the mirror

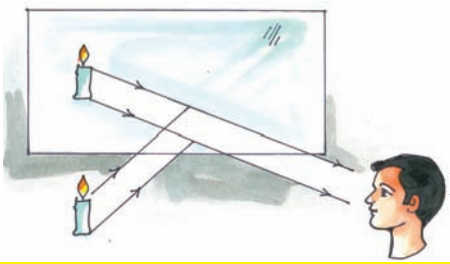


Fig. 9

Can you see the image in the mirror though the object is not seen by you? Look at figure 10.

Take a mirror and an object and try.

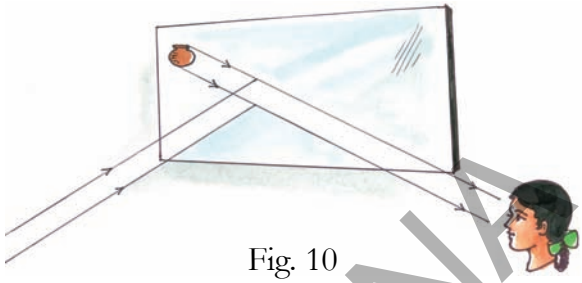


Fig. 10

Think: All of you are sitting in your classroom, where and how would you place a mirror to see a tree which is outside the class?

Can all of you see that tree at a time?

If not, what will you do so that each one of you can see the tree without changing your seat?

Take a mirror and try.

Is there any difference between you and your image?

Stand in front of a mirror as shown in figure 11 and observe on which side of you does the pocket on your shirt appear, when you look into the mirror.

Fig. 11

Fig. 12

Raise your right hand in front of a mirror as shown in figure 12. Which hand of your image appears raised?

To make your image to comb hair with its right hand, what will you have to do?

What do these observations suggest?

In a mirror, right of an object appears ..... and left of the object appears .....

Note that only sides are interchanged. This is called ***lateral inversion.***

Let us do this (7)

Take a drawing sheet and cut it into a few pieces. Write an English letter in capitals on each piece of drawing sheet. Observe the images of the letters formed in the mirror as shown in figure 13.

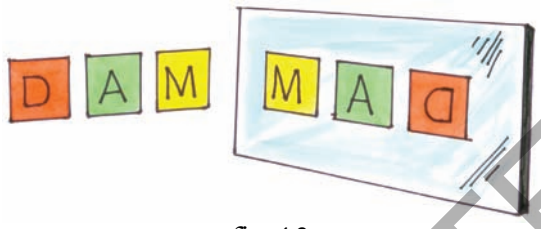


fig. 13

i) Which of the images appear same as the original letter?

ii) Which of them appear reversed? Why?

Repeat above activity with **Telugu/Hindi/ Urdu** letters and also with numbers 1 to 9 then try to answer the above questions.

Can you spell your name as it appears in a mirror?

Spelling of my name is .....
It appears in the mirror as.....

Think: On the front side of ambulances, Why the word **AMBULANCE** is written like ƎɔИAꞀUꓭMA

Is the size of an object and its image same?

Let us do this (8)

Stand in front of a big mirror. Observe your image. Step back two feet and step forward one foot. Observe your image while you move to and fro. What do you notice? Did your image also move? Estimate the distance from you to the mirror and the distance from the mirror to the image. Is the size of your image equal to your size? Place an object in front of the mirror. Compare the size of the object with its image. Is the size of the object and its image the same?

What can you say about the size of your image when you stand in front of a small mirror and a big mirror? Do you find any difference in the sizes of those images?

You may notice that irrespective of the size of mirrors, the size of image and the size of object are equal.

Think:
Anuvugani chota adhikulamanaradu
Konchamundutella koduva kadu
Konda addamandu konchamai undada
Viswadabhi rama vinuravema
Have you heard of this poem?
Why does a mountain look tiny in the mirror?

Images are many . . . Object is one. .

- Have you gone to a hair cutting saloon?
- How many mirrors does the barber generally use in a saloon?

You may notice there is one mirror in the front and another at back of the sitting place. Sometimes barber places a mirror behind your head, as shown in figure 14.

Fig. 14

- Why do they use more mirrors?
- How many images do you see when you sit in the chair? Why?

How to form multiple images?

Let us do this (9)

Take two plain mirrors of same size and join them with a cellophane tape as shown in figure 15. Fold the mirrors through certain angle and place an object between them. How many images can you see?

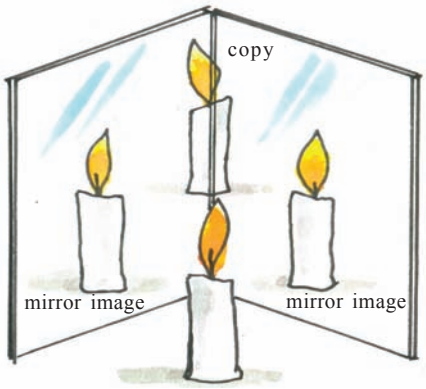


Fig. 15

Count the number of images after changing the angle between the mirrors.

What should we do to get more images?

Observe:

Keep the mirrors in such a way that the angle between the mirrors is 90 degrees and observe the images and compare them with the object. What do you notice? Is there any difference between those images?

Imagine the reason for that.

- How can we use the property of reflection in daily life?
- Have you seen any instrument (or) toy which works, based on reflection?

Let us do this (10): A Garden in box

Take an empty shoe box. Place two plane mirrors along the edges. See that the pair of mirrors are parallel to each other and their reflecting surfaces face each other as shown in figure 16.

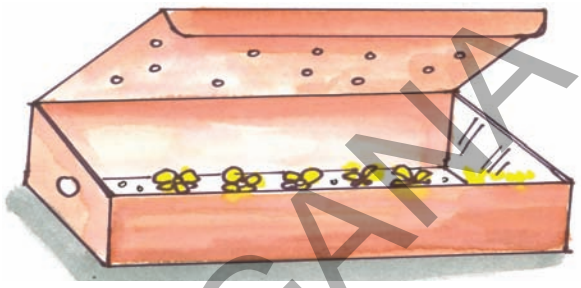


fig. 16

Scratch the centre part of a mirror at its back and make a hole to the wall of the box such that it coincides with the scratched portion of the mirror. Put some flowers in the box. Make a few holes in the lid before closing the box so that light enters into the box. Now look through the hole. You can see a wonderful and beautiful vast garden.

Why does the small area look like a vast garden?

The light which enters the box falls on the flowers, gets reflected and travels in all directions. The rays which fall on the mirrors reflect back to the opposite mirror. This process happens again and again. Due to this multiple reflection we can see that small area as a big garden.

Make your own Kaleidoscope

Let us do this (11)

Take three mirror strips of the same size. Tie these strips with rubber bands to form a triangular tube as shown in figure 17(a).

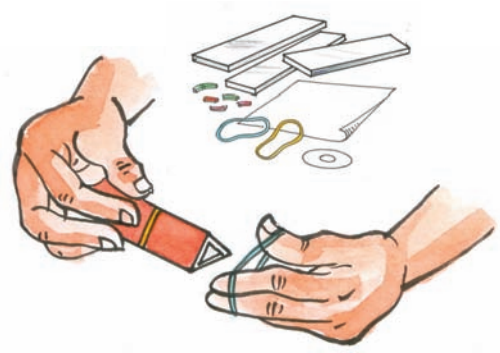


fig. 17(a)

While tying the strips together, remember to keep their reflecting surfaces facing each other inside the tube. Cover one end of the tube with translucent paper using a rubber band. Cover the second end with card board sheet and make a hole in it. So that you can look inside it. Your kaleidoscope is ready.Now put few small pieces of coloured glass bangles inside the triangular tube as shown in figure 17(b).

fig. 17(b)

Look at the bangle pieces through the hole as shown in figure 17(c).

fig. 17(c)

What do you see?

Shake the kaleidoscope and try to see through the hole slowly rotating it. What happens?

Can you explain why this happens?

Think: Have you seen these types of patterns (those observed in kaleidoscope) in your daily life?

Have you ever observed your image in a rearview mirror?

Have you observed the mirrors at both the sides of driver in motor vehicles like bus, car or motorcycle? See figure 18.

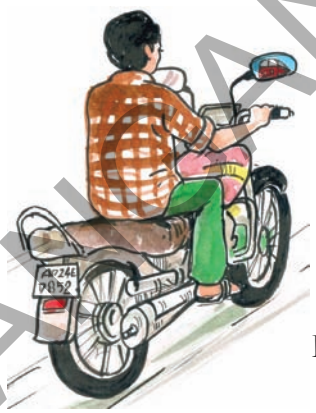


Fig. 18

These are rearview mirrors. These are used by drivers to see vehicles which are moving behind or beside of the vehicle without turning their heads.

Have you ever observed your image in that mirror? How is your image in that mirror?

Let us do this (12)

Take a plane mirror. Go to a vehicle. Observe your image in the rearview mirror and as well as in the plane mirror. What difference do you find?

You might have noticed that the image formed by a rearview mirror is smaller than the image in a plane mirror. Why it is like that?

What is the difference between these two mirrors? Observe their shapes and find the difference.

Have you observed reverse image of yourself in any mirror?

Let us do this (13)

Try to observe your image in a stainless steel spoon. The curved shining surfaces on either side of a spoon acts as a mirror as shown in figure 19.

Fig. 19

How is the image on the outer portion of the spoon?

How is the image on the inner portion of the spoon?

When you look at the inner portion of the spoon you find a reversed image. The inner portion of spoon acts as concave mirror. When you look at the outer portion of the spoon you find small size image of you. Outer portion of spoon acts as a convex mirror.

Have you seen the mirrors whose reflecting surfaces look like the head of a steel spoon? (See figure 20) The mirrors which contain curved reflecting surface are called **spherical mirrors.** They are two types.

1) Concave mirror 2) Convex mirror

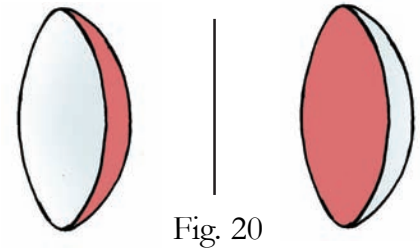


Fig. 20

Why do we call concave and convex mirrors as spherical mirrors?

Let us do this (14)

Take a rubber ball and cut a portion of it with knife as shown in figure 21. (Be careful. Ask your teacher to help you in cutting the ball).

Fig. 21

The inner surface of the cut piece of ball is called concave surface and the outer surface of it is called convex surface.

If the reflecting surface of a mirror is concave, it is called a concave mirror see figure 22(a).

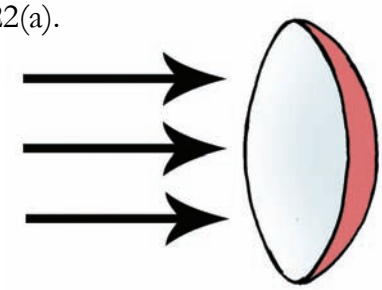


Fig. 22(a)

If the reflecting surface is convex, then it is called as convex mirror. See figure 22(b).

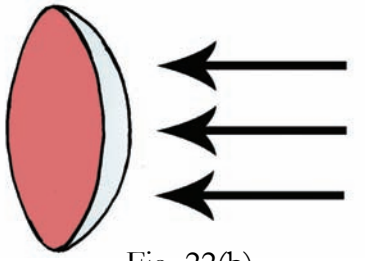


Fig. 22(b)

Any convex or concave mirror is a part of a sphere. Hence these mirrors are called spherical mirrors.

Let us form images with Spherical mirrors

Let us do this (15)

Place the concave and convex mirrors on two different V- stands. Put two candles of same size in front of them as shown in figure 23.

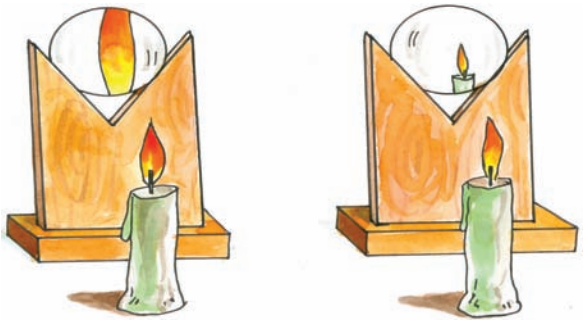


fig. 23

Adjust the position of candles, to form clear images in the mirrors. Observe the sizes of images and compare them with candle sizes.

- What difference do you notice between the image and object in a convex mirror?
- What difference do you notice between the image and object in a concave mirror?

Can we obtain the images formed by mirrors on the screen?

Let us do this (16) (try this in a dark room)

Place a concave mirror on a V-stand. Place a lighted candle in front of it. Place a thick white paper or white drawing sheet behind the candle. This acts as a screen. See figure 24.

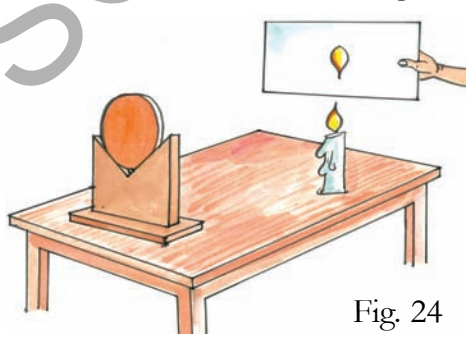


Fig. 24

Adjust distances between candle and mirror, screen and mirror by moving them either forward or backward till a clear image appear on the screen.

Repeat the activity using a convex mirror and plane mirror in place of concave mirror.

Images of which mirror are formed on the screen?

The image that can be obtained on a screen is called a ***Real Image.*** We can see this image in the mirror too.

The image that can't be obtained on a screen but can be seen only in the mirror is called a ***Virtual Image.***

Think: Every day we see our image in a plane mirror. Is it a real or virtual image? How can you decide?

Have you noticed the surface of reflection in a torch light? Or in a head light of a vehicle?

Observe the torch light or headlight of a vehicle. You notice a concave mirror behind the bulb (See figure 25). Due to this concave surface the brightness of a small bulb is increased.

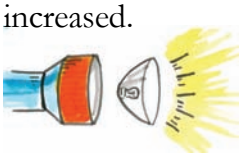
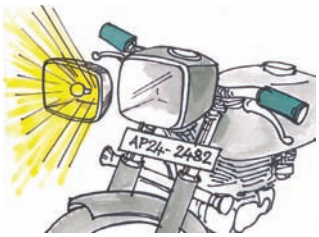


Fig. 25



Imagine: What happens if the surface of reflection in the torch or in a head light of a vehicle is convex like in figure 26?

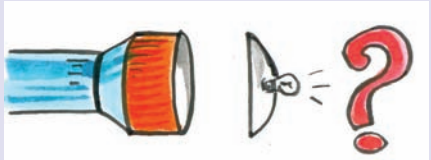


Fig. 26

Dentists use mirrors to examine our teeth (See figure 27).

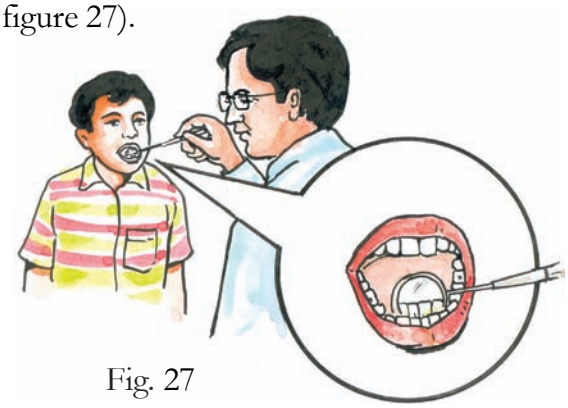


Fig. 27

These mirrors used by doctor help to see a bigger image of teeth. What type of mirrors are they?

In our daily life while we stand in front of windows we observe our images on the glass of some windows but don't find images on the glass of some other windows. Why?

Our image is clear when we stand in front of certain types of glass as shown in figure 28(a). Our image is not clear when we stand in front of some other types of glass as shown in figure 28b.

Fig. 28(a) Fig. 28(b)

- Why do certain glasses form clear images?
- Why are images in some other glasses not clear?

Reflection from a smooth surface like that of a mirror is called **regular reflection (**see figure 29). Clear images are formed in case of regular reflection.

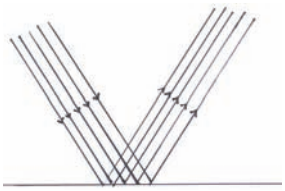


Fig. 29

Reflection from a rough or irregular surface is called **irregular reflection** or diffused reflection (see figure 30). Images are not clear in case of irregular reflection. In some cases we can't find the image at all.

Fig. 30

If the surface of the window glass is smooth, due to the regular reflection we are able to see our image in that glass. But if the surface of the window glass is rough, due to the irregular reflection we can't find our image or we find unclear images in that glass.

Let us try this

Observe the image of the sun or a tree in still water. Later, disturb the water by throwing a pebble. How does the image of the Sun or the tree appear now? Why?

Let us try this

Keep a mirror close your face and look into it. Move the mirror backward and observe the image. What change do you observe? Try this activity using Convex, Concave mirrors. In which mirror do you get an inverted image? At what distance does it happen?

Key words:

Incident Ray, Reflected Ray, Normal, Angle of Incidence (∠ i), Angle of Reflection (∠ r), Periscope, Lateral Inversion, Kaleidoscope, Rear view mirror, Spherical mirror, Convex Mirror, Concave mirror, Real Image, Virtual Image, Regular Reflection, Irregular Reflection.

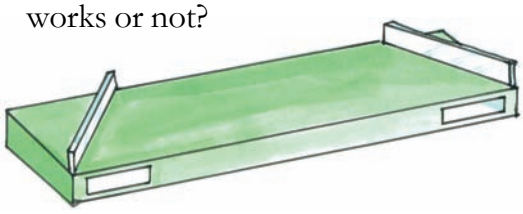
What we have learnt

1. Light changes its direction when it is obstructed by any object. This phenomenon is called reflection.
2. Angle of incidence is equal to an angle of reflection. We denote angle of incidence with **∠i** and the angle of reflection with **∠r**.

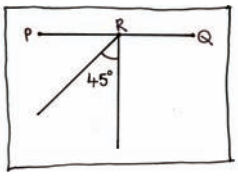
   Measure of **∠i** = measure of **∠r**.
3. In the image formed by a mirror, right of the object appears as left and left of the object appears as right. This is called Lateral Inversion.
4. The distance from the object to a plane mirror is equal to the distance of the image from the mirror .
5. Irrespective of size of the plane mirror, the size of the image in the mirror is equal to the size of the object.
6. Any object which is far away from us looks smaller in size. In the same way its image in the plane mirror will also look smaller.
7. Plane mirror forms single image. If we want to form multiple images two plane mirrors need to be kept at an angle.
8. The number of images increases when we reduce the angle between two mirrors.
9. In a rearview mirror (convex mirror) we get diminished image of the object.
10. In a mirror which is used by Dentist (concave mirror) we get enlarged image of the object.
11. The image that can be obtained on a screen is called a Real Image.
12. The image that can't be obtained on a screen but can be viewed in the mirror is called a Virtual Image.
13. Torches, headlights of vehicle have concave mirrors behind the bulb for reflection.
14. Reflection from a smooth surface is called regular reflection.
15. Reflection from a rough surface is called irregular reflection.

Improve your learning

1. Vidya made a Periscope making slits like this as shown in the figure. Will it work or not? Explain your answer. Try to make a periscope like this and see whether it works or not?



2. (i) Draw reflected ray in the figure given here.



(ii) Mark the position of the image in the figure given here by dotted lines.

3. How do you relate angle of reflection and angle of incidence?

   What will be the angle of reflection when angle of incidence is

   i) 60° ii) 0°

4. Imagine that your sister is viewing a cricket match on a TV and you are viewing the same cricket match in a mirror which is opposite to the TV. What difference do you notice in the match?

5. Write the mirror image of your name?

   ..... (in English)

   ..... (in Telugu)

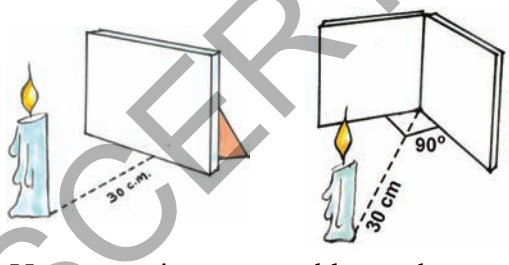
6. You are given the mirror image of a name. Can you find out the actual name?

   SURYA

   Place a mirror in front of this figure and check your answer.

7. Get three mirror strips, two rubber bands, card board sheet, translucent paper, and broken bangle pieces and make a Kaleidoscope.

8. Observe the following figures.



   How many images would you observe in the mirrors in the above cases? Write your guesses.

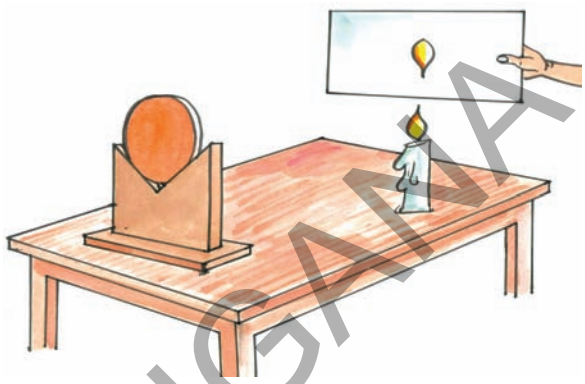
Fig – 1.....

Fig. – 2 .....

   Do experiments and check whether your guesses are correct or not? Give reasons.

9. Write examples of multiple images formed in your daily life?

10. Observe the figure and identify which type of mirror is used? How do you justify it?



11. Sai lighted a candle in his house when power went off. His mother placed it in front of a mirror. Sai observed something that excited him. What change would have excited Sai? Some questions came to his mind. Can you guess the questions? Write a few such questions.

12. Unexpectedly some water sprinkled on a mirror while Madhu was shaving his face. Did he observe any difference in his image? If yes, explain why?

13. Imagine that all the houses in your street have elevation with mirrors. Suppose you and your friends are walking in the street. Would you experience any difficulties when you walk through that street? Predict and explain. Is it difficult for birds to live or fly in that street? Why?

14. Take an empty tooth paste box and two mirror strips of required size and make a periscope.

15. What is the angle between two plane mirrors when there are five images?

16. What is the difference between convex and concave mirrors? Draw the diagrams of concave and convex mirrors.

17. Where do you find irregular reflection in daily life? Give some examples.

18. Mirrors help us to see all the objects around us without turning our heads. Write about the role of mirrors in our life.

19. Army people can see their enemies while hiding themselves with the help of periscopes. Write about the use of periscope for their security.

20. Imagine what would happen if there are no rearview mirrors attached to vehicles and there are no concave mirrors in head lights of the vehicles. Write about the role of convex and concave mirrors in safe driving.

21. While constructing a new house, Kishan's uncle rejected his wife's request of glass elevation to the building, saying that "It is harmful to the birds and also our selves". Why would you support the decision of Kishan's uncle?

22. Collect information from your elders and shopkeepers about where we use more mirrors and why?

23. Collect information about which objects of your school and home work like a mirror and why? Identify the similarities among those objects.

24. Can we use a plain mirror in place of rear view mirror Yes/No give the reason.

25. A mirror is hanging in your room. Your friend is sitting in the same room in a chair. If your friend wants to see you in a mirror, how will you adjust your position? Explain.

10 NUTRITION IN PLANTS

Fig.1

How do plants produce so much that they are able to feed other organisms dependent on them?

For ages people have been pondering over this and till three hundred and fifty years ago we believed what Aristotle had said over two thousand years ago. According to him plants could produce everything from what they took from the soil.

In the year 1648 a Belgian scientist Jan Baptista Von Helmont conducted an experiment that continued for five years. He took a small willow tree and planted it in a large pot of soil. Before he did this he carefully measured the mass of the dry soil and the mass of the tree.

I grew from a mango seed. How large am I ? So much I produce, plenty for me and plenty for all.

He covered the soil with a lid so that nothing could fall onto the surface of the soil and add to its mass.

Fig 2
Von Helmont

There were holes in the lid so that the tree could grow out of the soil and so that air and water could reach the roots.

Van Helmont left the tree for five years, giving it only rain water to drink. At the end of the five years he measured the mass of the tree and the mass of the dry soil for a second time. The results of this experiment are shown in table:

Fig. 3

This experiment changed the belief of hundreds of years! This was because Von Helmont arrived at a result that –

Mass (kg)			
	At start	After five years	Change in mass (kg)
Tree	2.27	76.74	74.47
Dry soil	90.72	90.66	0.06

1. The substances needed for the growth of a plant do not come from the soil only.
2. The plant grows because of the water it gets.

Do you think Von Helmont's conclusions were correct?

Fig 4
Stephen Hales

People tried to check this and thus experiment after experiment followed. Stephan Hales described the leaves as organs of transpiration (loss of excess water from plant body) and he said that plants exchange gases with their surrounding air. Furthermore, he was the first to point out a possible role of light in plant nutrition.

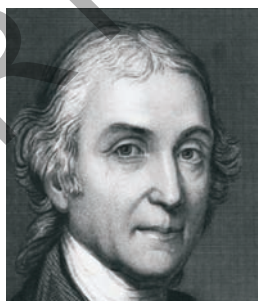


Fig 5
Priestley

It was Priestley who carried out a sequence of experiments. He could demonstrate that what animals were doing to the air was being reversed by plants. That is, according to him, if animals were making the air impure, plants were making it pure.

Ingenhouz tried to repeat Priestley's experiments under different conditions and found that only the green parts of plants when exposed to sunlight could do that. Several scientists started working on what green plants were doing with water and air and sunlight and till date we know that-

Fig 6
Ingenhouz

Green parts of plants use carbon dioxide in the presence of sunlight (as well as other sources of light) along with water to make glucose, starch and other food materials. This process of making food materials is called as photosynthesis and such plants are called Autotrophs.

List the four major things needed by plants to carry out the process of photosynthesis.

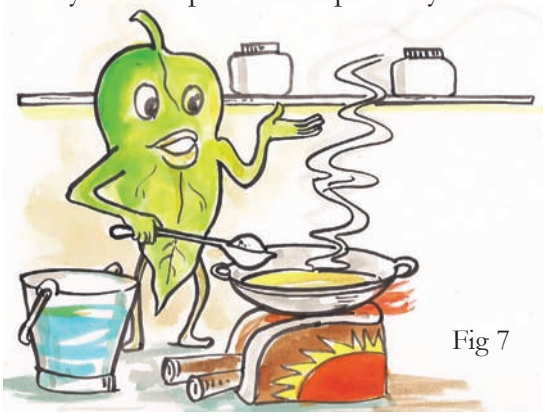


Fig 7

In nature, the presence of the green substance in leaves is essential for photosynthesis to take place. This green substance is called chlorophyll.

Carbon dioxide + Water $\xrightarrow[\text{Chlorophyll}]{\text{In the presence of sun light}}$ Glucose + Oxyzen + Water

Where does water come from?

We have learnt that plants absorb food from water from Vanhelmont experment. But later we come to know that plants absorb food from air as well as water. Plants get water from the soil through their roots while the process of photosynthesis takes place in the leaves. So how does the water reach the leaves from the roots? What path does it follow?

Let us recall the experiment done in the chapter " Plants: Parts and Function" of class VI, which showed how water is transported in the plant body.

Fig 8

- On the basis of this experiment, what conclusion can you draw about the functions of the root and stem in the nutrition of plants?

  Farmers sprinkle urea in rice or wheat fields whenever the leaves turn yellow. The leaves soon become green again.
- Why is it necessary to irrigate the fields after sprinkling urea? Think it over and answer with reasons.
- The farmer sprinkles urea in the soil of his field. How does the urea affect the leaves of the crop?

This experiment and the information about urea tell us how and from where plants get water and other nutrients dissolved in it.

Exchange of air

Plants get water from the soil through their roots. They use carbon dioxide of air. This job is done by the leaves. The leaves have tiny holes through which the exchange of air takes place. These holes are so minute you can only see them with the help of a microscope. They are called stomata. It is through the stomata that the exchange of air in leaves takes place continuously. You have seen the picture of stomata in your Class VI science textbook.

Fig 9 - Stomata

We know that plants take water through their roots and air through the stomata of their leaves (there are some other parts like loose tissues and lenticels present on the bark of plant through which exchange of air takes place). We also know that leaves contain the green substance, chlorophyll. What else is needed for photosynthesis?

The next question is whether the process of forming starch by combining carbon dioxide and water requires light. Let us try to find out.

If light is absent

A description of an experiment is given here. Read it, try and find out what effect light has on the formation of starch in leaves. The experiment was done with a plant called Chaina rose (Mandara), but it can be performed with any plant.

You need to find out if starch is present in

leaves. You already know how to test for starch, but a problem arises if you try this test with leaves. Leaves are green in colour. When iodine solution is put on a leaf, it should turn blue if starch is present. However, the green colour of the leaf disguises the blue colour. So you must first remove the green colour of the leaves if you want to test whether they contain starch. The way to do this is to first put the leaves in a test tube and boil them in alcohol or hot water. This is a bit difficult. You need to be careful while boiling leaves in alcohol.

In the experiment described here, 4 to 5 leaves of a Chaina rose plant were plucked in the afternoon. After removing their green colour in the way described above, they were put in diluted iodine solution. The leaves turned bluish-black. Why did this happen?

In the second part of the experiment, 4 to 5 leaves of the same plant were covered with black paper without removing them from the plant. The way the black paper was cut and fixed to the leaves is shown in the figure 8.

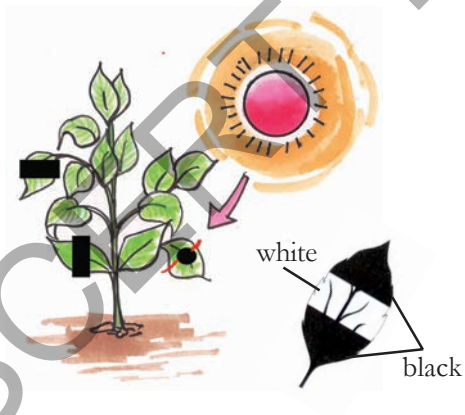


Fig. 10

These leaves were plucked two days later. Their black paper was removed and they were dipped in iodine solution. The leaves turned black in the pattern shown in the figure.

Do You Know?

Preservation of plant parts like leaves, flowers or whole plant is a traditional designery art. If the plants are not available in a particular place then the plant physiologists collect those plants where they are available and make them in the preservative form. This is commonly known as herberium They study those plants, and these preserved plants are also helpful for the future studies.

Can you tell by looking at the figure where starch is present and where it is not?

Did the entire leaf get light after it was covered with black paper? If this was not the case, which parts of the leaf did not get light?

Did starch form only in those parts that were exposed to light?

On the basis of this experiment, what connection do you notice between light and starch formation?

Do plants produce only starch?

In the chapter 'Our food', you read that starch, fats and proteins are present in food. They are also present in plants. Where do these substances come from? Plants produce sugar first, which is converted to starch and then other compound as well. But plants need other nutrient elements to do this.

The main nutrients needed are nitrogen, potassium and phosphorus in large quantity are called macronutrients. Plants require many other nutrient elements as well, but these are needed only in minute quantities. Hence, they are called micronutrients. Plants absorb these nutrient elements from the soil through their roots. The experiments related to this aspect will be learnt in higher classes.

Other types of the nutrition in plants

Plants that grow on other plants

Have you seen yellow thread-like structures twining around the stem, branches and leaves of some trees? Fig -9 shows such a plant.

Fig. 11: Cuscuta

This thread-like plant is Cuscuta. It neither has leaves nor chlorophyll. How do they survive? From where do they get nutrition? Cuscuta takes food from the plant on which it is climbing.Like humans and animals such plants depend on the food produced by other plants.

This mode of nutrition is called heterotrophic nutrition.

Parasitic plants like cuscuta develop special roots called haustoria, which penetrate into the tissues of the host plant and absorb food materials from them.

Plants that grow on dead and decaying matter

Often after rains, we find umbrella like structures growing on dead and decaying matter. Such plants are called Saprophytes.

You might have seen black and white spots appearing on bread pieces, pickles, when kept in moist places. These spots develop due to the growth of fungi, which is a type of plant.

Fig. 12 : Fungus

All these types of plants do not contain chlorophyll so they simply absorb organic material usually from decaying matter.

- Try to find out the different types of saprophytes that you may find growing around you? If they are too small try to observe them with a hand lens.
- Draw the pictures of the saprophytes and write the places where you found them.

Special mode of obtaining nutrition in insectivorous plants:

A few plants manufacture their own food but also obtain a part of their nutrition from insects. Leaves of these plants are specially modified to trap insects. These plants grow in areas deficient in nitrogen. Hence they meet their nitrogen requirements from insects. Being green in colour, they can manufacture their own food. Droseras, Utricularia, Nepheenthies, Venusflytrap are examples of some such insectivorous plants. These are also called as carnivorous plants.

Fig. 13 : Nepanthis

Some plants like those of the Dal family have a type of bacteria growing in their root nodules. The bacteria fixes nitrogen for the plant while it gets shelter in the roots of these plants. Such an association is beneficial to both groups and called **symbiosis**.

Fig. 14 : Root nodules

Do you know?

There are colonies of algae and fungi living together in a symbiotic relationship! These colonies are known as Lichens. This relationship starts with the attack of algal colony by a type of fungus. It is an example of balanced parasitism then. Later as algae survive, they are given protection from intense light and conditions of drying up due to the presence of fungus colony. The fungus gets food from its partner.

Fig. 15 : Lichens

Let us green our environment so that we will never worry about oxygen and food!

Key words:

Nutrition, Autotroph, Chlorophyll, Photosynthesis, Stomata, Saprophyte, Insectivorous, carnivorous, Symbiosis, Fungi

What we have learnt

- Green parts of plants use carbon dioxide in the presence of sunlight (as well as other sources of light) along with water to make glucose, starch and other food materials. This process of making food materials is called photosynthesis.
- Plants that do not photosynthesize depend on other means of getting their nutrition.
- Saprophytes live on decaying organic matter.
- Insectivorous plants fulfill their nitrogen deficiency by trapping insects.
- In symbiosis, organisms share their food and shelter.

Improve your learning

1. A potted plant is kept in light for a day and one of its leaves is tested for starch. The same plant is kept in the dark for two days and another leaf is tested for starch. Will there be a difference in the results of the two experiments? Give reasons for your answer.
2. What happens if leaves of a green plant are coated with oil?

   (Hint: What will be the effect on stomata?)

3. Do you think saprophytes help us in keeping the environment clean?

(Hint: What do saprophytes feed on?)

4. Differentiate between following with some examples.

(i) Parasite and saprophyte

(ii) Host and parasite.

5. Fill in the blanks and give reasons.

(i) Lenticels are present on …… in plants.

(ii) The food synthesized by the plants is stored as ……

(iii) Saprophytes depend on …….. for food.

6. Name the following:

(i) Pores through which leaves exchange gases.

(ii) Plants that act as scavenger of nature.

(iii) Those plants that share food and shelter.

(iv) Plants which cannot make their own food and obtain it from host.

7. Tick the correct answer

(i) Cuscuta is an example of

a). Autotroph b). Parasite
c). Saprophyte d). Symbiont

(ii) Haustoria are

a). Roots b). Stems
c). Leaves d). All of them

(iii) Raw materials involved in the process of photosynthesis

a). Carbon dioxide b). Water
c). Sun light d). All of them

8. Circle the insectivorous plant among the plants given below.

(a) Hibiscus (b) Teak

(c) Nepanthis (d) Aloevera

9. Collect information about experiments of Joseph Priestly and Ingen Houz from Internet and make a brief note on them.

10. Do you agree with von Helmont? If nutrients absorbed by plants from soil is equal to the mass of plant / tree what will happen? Think and write your hypothesis.

11. Why are some plants called insectivorous plants? Give reasons.

12. Designery leaves - select any broad leaved potted plant. Cut a card board with a design of your choice and seal the selected leaf with the card board. Let the plant stand under the sun for a week then remove the card board you will get designery leaves plant. Try to make more leaves with designs and display your plant but don't forget to present your writeup.

13. Collect a leaf. Take peels from both sides of the leaf and observe stomata size, shape and number under microscope with the help of your class teacher. Write your findings.

14. Prathima said "Mushroom is also a plant" is she correct? How would you support her?

15. Photosynthesis is the way plants make food in every leaf by using different items. Write your feelings on this.

11 RESPIRATION IN ORGANISMS

We know that people may survive without food for several days. They go on a fast or hunger strike but during time that they drink some water or other liquids at least once a day. But what about air? Don't we feel suffocated if we don't get air even for a short while!

The process by which air goes in and out of our body is called breathing. In this lesson we will study about what happens when we as well as other organisms breathe? How does this process help in respiration?

Let us do - 1: Respiration in Human Beings

Let's first find out how long a person can hold her/his breath. Use a watch with a seconds' needle to time your breathing. If you don't have a watch, then practice counting at a uniform rate. You can measure the time by counting. Close your mouth and close your nose with your fingers so that air cannot pass through it.

Fig.1

- How long could you keep your mouth and nose closed?
- What did you feel after keeping your mouth and nose closed for so long?

Let us do-2: How many Breaths in a Minute?

Hold a finger under the nose of one of your friends. The side with the fingernail should face the nostrils. Ask your friend to breathe in and out normally.

Fig. 2

- What did you feel on your finger when your friend exhaled?
- Use this method to find out how many times your friend inhales and exhales in a minute.
- Did your friend inhale as many times as (s)he exhaled in a minute?

The process of breathing in air is called inspiration and that of breathing out air is called expiration. The number of times we breathe in and breathe out air in a minute is called the respiration rate.

Exercise and breathing:

You may have seen that we begin to pant after running or exercising. So do exercise and running affect the rate at which we breathe in and out?

- In your opinion does the expiration rate increase or decrease after exercising?

The air we breathe in fills our lungs that are located in our chest. In the following experiment we shall see what happens to our chest when we inhale or exhale air.

Let us do - 3: Expansion of chest with each breath

Take a length of twine or a measuring tape. Wrap the tape around the chest of one of your friends and measure the width of her/his chest. Hold the tape lightly and ask your friend to breathe in and out deeply a few seconds.

Fig. 3

- Do you find any difference between measurements?
- How does the width of the chest change when air is inspired or exhaled?

Let us do - 4: How much air in your breath?

Make a measuring cylinder with a two-litre plastic bottle and 100 ml injection bottle. To do this, pour 100 ml of water at a time in the bottle and mark the water level after each addition.

Now fill the bottle to the brim and invert it in a bucket or a large container of water. But remember, no air bubbles should remain in the bottle after you invert it. Insert one end of a rubber tube into the mouth of the bottle under water. Hold the other end of the tube in your hand. Inhale as much air as you can and blow the air into the measuring cylinder through the rubber tube. Don't breathe in while blowing the air out. Blow out as much air as you can in a single breath. This air will collect in the measuring cylinder. As a result, the water level in the cylinder will fall. The reduction in water level is equal to the air you breath.

Fig. 4

- How much air were you able to exhale in a single breath?
- Find the amount of air the others in your group breathe out in a single breath and compare these amounts.
- Was the amount of air the same for all your friends?

Let us do - 5: Difference between inhaled and exhaled air

Exhale air from your nose on the back of your index finger.

- Is this air warm?

Now use a syringe to pump some air on your finger.

- Is the air from the syringe also warm?

Let us day - 6: Moisture in our breath

On cold winter mornings you may have noticed that the air you breathe out is misty.

- Why does this happen?
- We shall do an experiment to find out.

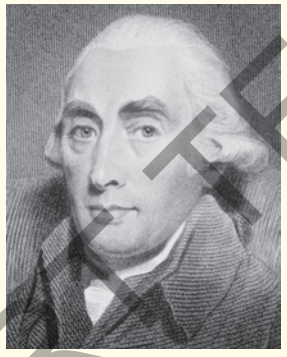
Take a mirror. Wipe it clean with a cloth. Blow air from your mouth on the surface of the mirror.

- Look at the surface of the mirror carefully. What did you see?
- Clean the mirror again and blow air on it with a syringe.
- Did you see the same effect on the mirror this time?
- On the basis of this experiment would it be correct to say that exhaled air is more moist than air from a syringe?

Discovery of Carbon dioxide

The first step towards trying to find out what air contained was carried out by Von Helmont. He conducted an experiment of burning charcoal which leads to the formation of ash. He found the weight of ash to be much less as compared to charcoal. On the basis of this, he concluded that the decrease in mass was due to formation of an invisible substance which he named "gas".

Von Helmont

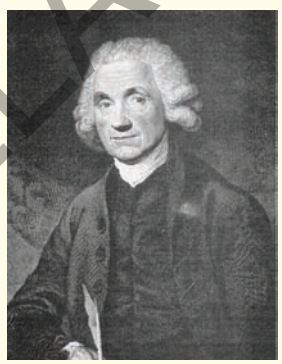


Joseph Black

In the year 1756, Joseph Black studied this gas in more detail. He found that when limestone is heated or reacted with acids, it gives rise to a gas which he called "fixed air". He studied several properties of this gas. One of the properties was, lime water turned milky when this gas was passed through it. Now we know this gas as carbon dioxide.

Discovery of Oxygen

After nearly two decades of discovery of carbon dioxide, oxygen was discovered. Joseph Priestley, published his "Experiments and observations on different kinds of air" and was the first to prove the different qualities of the gases released by plants and the one's exhaled by animals (mice). He discovered that, although a candle burned out in a closed container, when he added a living sprig of mint to the container, the candle would continue to burn.



Joseph Priestley

Lavoiser

At the time, Priestley did not know of Oxygen, but he correctly concluded that the mint sprig "restored" the air that the burning candle (or mice which he used in a similar set of experiments) had spoiled.

Priestley shared his observations with Lavoiser. Lavoiser had also conducted several experiments on atmospheric air and knew that it contained many gases, and he identified Priestley's discovery as the active component of air for which he had been searching. He called it oxygen (Greek: acid former), in the belief that all acids contained it.

- Why did we use a syringe in Experiments 5 and 6?

You must have understood from these experiments that there are differences between the air we breathe out and the air from a syringe.

What does our breath contain?

We know that we inhale and exhale air. The exhaled air is warm and has moisture in it. What we do not know is about the gases our body takes from the inhaled air and throws out in exhaled air. For this we would have to know about the gases present in air. Also, how we came to know about them.

We know that air is a mixture of several gases not only Oxygen and Carbon dioxide, there are others as well. Air also contains several suspended particles.

Let's do some experiments to find more about gases present in inhaled and exhaled air. For this we shall refer to the discoveries of the gases mentioned in the previous section.

We would have to prepare some solutions to test the gases. These are phenolphthalein solution and lime water. Prepare them in the same manner as you had done in the chapter on acids and bases.

Let us do - 7: Gases in our breath

Set up the apparatus shown in Figure 5 for this experiment. Be careful while inserting the glass tube in the cork. It could break. So take the help of your teacher to do this.

Fig. 5

Fill both test tubes one fourth with phenolphthalein solution. Mark them A and B. Now repeatedly blow in and suck out air in this apparatus as shown in Figure 6.

Find the answers to the following questions while doing the experiment:

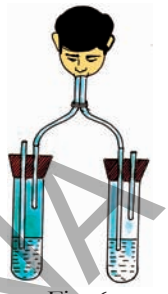


Fig. 6

- When you suck in air, through which boiling tube does the air flow into the apparatus? How can you find out?
- When you blow air out, through which boiling tube does the air flow out of the apparatus? Can you say why the air does not go out through the other boiling tube as well?
- In which boiling tube did the colour of the indicator solution change?
- Are the inspired air and expired air similar? If they are not, what are the differences between them?

Wash and clean the two boiling tubes and fill both of them with one fourth lime water.

Repeat the experiment of repeatedly blowing in and sucking out air.

Answer the following questions on the basis of this experiment:

- What was the colour of lime water in boiling tubes A and B before you began the experiment?
- In which boiling tube did the lime water turn milky after you blew in and sucked out air?
- What difference between inspired and expired air did you find out in this experiment?

You have studied the test of carbon dioxide with lime water in the section of "discovery of carbon dioxide"

- On the basis of what you learned can you say which gas is present in exhaled air?
- Can you explain how and from where this gas came into the exhaled air?

S.No.	Gases	Inhaled Air (ml.)	Exhaled Air (ml.)
1	Oxygen	210	165
2	Carbon Dioxide	0.4	40
3	Nitrogen and Other Gases	790	795
4			
5			
6			
7			

The air we breathe in does not contain only oxygen. It is a mixture of many gases. Similarly, the air we breathe out is not only carbon dioxide, but a mixture of several gases. The quantity of gases in every 1,000 ml of inhaled and exhaled air is given below:

- Try to state the difference between inhaled and exhaled air on the basis of Activity 5, 6, 7 and the table given above?

This kind of change that we see through the experiments done so far and the table , we come to know of a process that occurs beyond breathing, known as respiration.

Think ...! Think ...!
What happens to air after it reaches our lungs? Try to find out about this from your school library or your teacher.

Breathing in other Animals:

Let us study some organisms and find out how they breathe.

Fish:

Observe fishes in an aquarium. Fishes continuously open and close their mouth in water. Why do the flaps on both sides of the head alternately open and close?

Fig. 7

If you look below the flaps, you will see red colored gills. These are the respiratory organs of the fish. The water that enters the mouth flows through both the gills as it comes out of the flaps. The gills absorb the oxygen that is dissolved in the water. This oxygen is carried to different parts of the body.

Frog:

Fig. 8

In class 6 we have studied that frog is able to stay on land, in water and even underground.

How does it manage to do so? To breathe on land it has lungs while it goes deep underground and sleeps twice every year, its moist skin takes over the function of its lungs. In baby frogs or tadpoles there are special organs like that of fishes called gills. These gills help them to breathe in water by taking in the air dissolved in water.

Fig. 9

Tadpoles of the frog live only in water but the frog lives either on land or in water. Sometimes you may see frogs under the soil also.

Think! How does the frog respire under the soil?

Cockroach

A cockroach has small openings on the sides of its body. Other insects have similar openings. On the underside of the cockroach in each segment, there are small holes which are connected through respiratory tubes in a network. These help the cockroach to breathe. These holes are called spiracles. The network of respiratory tubes called trachea take air from these spiracles, circulate it throughout the body, collect it back and send it out through these spiracles.

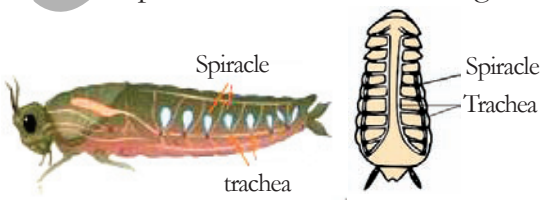


Fig. 10

To know more about this process you may observe a live cockroach by keeping it covered by a transparent bottle or glass. See the movements that occur in its body. What do you observe? Write your observation in a few lines.

Earthworm

Earthworms breathe through their skin. It is thin and moist with minute holes. Through the skin, air passes in and out. The earthworm thus breathes through its whole body surface. Name some other animals that breathe through their skin.

Fig. 11

Respiration in plants

Do plants respire in the way humans do? In human beings gaseous exchange with the surroundings takes place through nose and mouth. We have studied in class 6 about the parts in plants that help in gaseous exchange. They are stomata present on surface of leaves and lenticels present on the surface of stems.

Let's do an experiment to find out

Take a conical flask. Fit a two-holed rubber cork tightly into its mouth and insert glass tubes into the two holes. Fit a rubber tube on one of the glass tubes and a funnel on the other.

If the funnel does not sit tightly on the glass tube, make a funnel with an ink dropper. Fill a test tube about one fourth with lime water and dip the rubber tube into it.

Now add water to the funnel drop by drop. Keep adding water till the conical flask is filled one fourth with water. Observe the test tube carefully while you add water.

- Did the lime water change colour?

Now remove the water from the conical flask and put some flowers and buds in it. Fit a cork on the flask and let it stand for half an hour.

Now add water drop by drop to the conical flask through the funnel as you did in the previous experiment. Look carefully at the test tube while doing so.

- Did the lime water change colour this time?

After completion of your experiment try to draw a figure of your apparatus arrangement in your note book.

You can do the above experiment by taking a small rooted plant with moist soil at its root instead of flowers and buds. But you would have to keep the set up in a dark place.

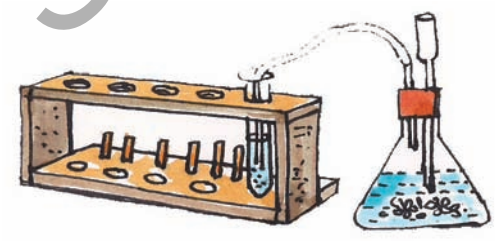


Fig. 12

Let us do - 8: Respiration in Sprouted seeds

Repeat Experiment 8, using sprouted seeds (moong, gram etc) instead of flowers and buds.

- What effect did the experiment with sprouted seeds have on the lime water?
- On the basis of your observations in these experiments can you say that flowers, buds and sprouted seeds respire? Give reasons for your answer.

Plants respire like us. But it is difficult to observe this through experiments. Both plants and animals use oxygen during respiration.

You may have heard of big hospitals keeping cylinders filled with oxygen. When a person has breathing problems he is given oxygen. An oxygen mask is fitted to the nose and mouth of the person and a rubber tube connects the mask to the oxygen cylinder. Sometimes a patient is given oxygen during an operation.

Key words

Spiracle, Gills, Carbon dioxide, Oxygen, Inhale, Exhale, Inspiration, Expiration, Trachea

What we have learnt

- Respiration occurs in all organisms. In this process, oxygen is taken in while carbon dioxide and water vapour are released.
- Skin, Gills, tracheae and lungs are respiratory organs.
- Stomata and lenticels helps in exchange of gases in plants.

Improve your learning

1. Fill in the blanks and give reasons.
   (i) ……. are the respiratory organs of fish.
   (ii) In a cockroach, a network of …….. is found.
   (iii) …….. are found on leaves for the exchange of gases.
2. Identify the correct one, give reasons.
   i. The process of gaseous exchange is
   a) respiration b) circulation c) digestion d) inhalation
   ii. Plants respire through
   a) spiracles b) lenticels c) stomata d) alveole
   iii. Which of the following animals respire through skin and lungs?
   a) fish b) frog c) snake d) earthworm
   iv) What will happen when you blow air into the test containing lime water?
   a) remains same b) turns to blue colour
   c) turns to milky white d) becomes colourless
   v. Respiratory organs of cockroach
   a) lungs b) gills c) lenticels d) trachea
3. What is respiration? How is it different from breathing?
4. Frogs breathe through their skin as well as their lungs. Explain.
5. If you want to know about 'Actions of gases in lungs'. What questions you would like to ask?
6. If you did this experiment of respiration with fruits ard dry leaves, what would the result be? Explain.
7. It is very interesting to watch fishes in an acquarium. Make your own bottle acquarium.
8. Do you find any relation between plants and animals by their respiration and photosynthesis?
9. Asif wondered how plants and animals which live under water also respire. Do you know how?
10. Imagine the lungs and size of elephant. Is there any relation between body size and lung size? Collect information from School Library or Internet.

12 REPRODUCTION IN PLANTS

During spring season our surroundings are filled with the fragrance of flowers. Almost every plant around has flowers on it! We see a wide variety of flowers then.

We have already studied the different parts of plants in class VI.

- Let us write down names of the parts of plants that we have studied so far.
- Is there any part that you haven't studied about earlier?
- Do you know which part of the plant gives rise to fruit?

Flowers are usually the most attractive part of any plant. Why do you think flowers are so attractive and colourful?

Fig. 1

What role do flowers play in a plant's life?

Let us study some flowers around us to answer these questions.

Let us do - 1

Collect flowers of, say, Datura, Chinarose (Hibiscus), Cucumber, Bottle gourd, Tridax, Sun flower, Ipomea etc. Observe these flowers. Are they of the same size and shape? Try to draw the flowers collected and write their names if you know them. We shall now study the Datura flower to know more about the parts present in a flower (floral parts). Try to draw it's shape in your note book.

Thalamus

Let us hold a Datura flower by its stalk. This stalk is green in colour and has a slightly swollen head. This is called **thalamus.** It is the seat on which the parts of a flower are present.

Calyx:

Now let us observe the part that comes just above the thalamus. There is a green tube like structure called **calyx.** The edges on the part towards the petals have thin leaf like structures called **sepals**. The lower ends of sepals are fused to form the tube like structure. Remove the tube of fused sepals carefully. What do you see after removing the sepals?

Fig. 2

Corolla:

There is a funnel shaped corolla. This is formed of fused petals. Count the free edges of these. How many are there? What is the colour of the petals? Remove this funnel shaped corolla as well. Observe and draw the same in your note book.

Androecium:

After removing the petals you can see soft elongated structures attached to these petals.

They are called stamens. How many stamens do you see?

There is a bulb like structure at the top of each stamen that is called pollen sac or anther. Just below it a fine whitish thread like structure called filament attaches the anther to the petal (in Dhatura). So stamen has an elongated filament and a bulb like pollen sac. How many stamens are there? Stamens of the flowers are together called the male part or androecium. Draw the picture of stamen as seen by you.

Gynoecium:

As we remove petals, right on the thalamus is seated a bulb like structure called ovary. Just above it a fine tube like structure called style goes up ending in a somewhat flat bead like structure called stigma. This whole structure from ovary to stigma is the pistil or female reproductive part. All the parts present on the pistil together called as gynoecium.

Draw the picture of pistil which you observe. How many pistils are there in Dhatura?

We observe that flower parts are arranged in definite circles or whorls. Note your observations regarding the different types of flowers collected by you.

Write your observation in the given table.

Circle No.	Name of the Circle	Parts you observed in the circle

Let us observe male parts (Androecium)and female parts (Gynoecium) of different flowers that you have collected.

Observe stamen and pollen sac or anther of the flowers. Are they of the same size and shape? Observe various types of stamens of different flowers.

Fig. 3. Types of stamens

Let us observe female parts like ovary, style, stigma of different flowers that you have collected. How are they? Like male parts, female parts also differ from flower to flower. Observe various types of pistils of different flowers. (Fig. 4)

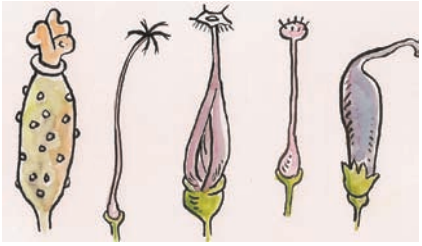


Fig. 4. Types of Pistil

Draw the diagram of flower you have dissected compare it with the diagram given below:

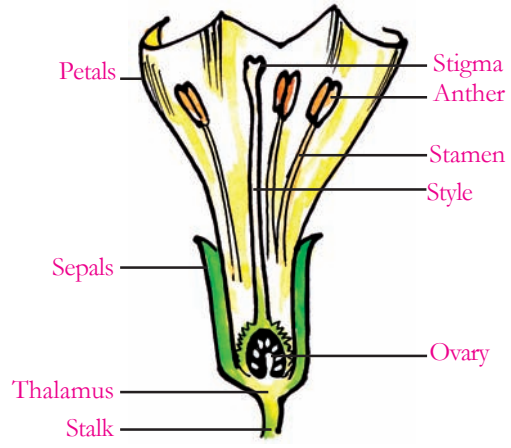


Fig. 5. Floral Parts

Do all flowers have four parts?

Let us do - 2

Collect as many flowers from your surroundings as you can. See that you have at least a type of melon or gourd flower as well. Now observe different parts in each flower. Record your observations in the table given below. (You may also record your observation regarding the flowers already collected by you earlier in this chapter).

S.No.	Name of the Flower	No. of Sepals (Calyx)	No. of Petals (Corolla)	No. of Stamens (Androecium)	No. of Pistil (Gynoecium)

- In the case of cucumber or bottle gourd, do they have all four parts in each flower?

In Cucumber and Bottle gourd you will probably find two types of flowers on each. Examine them carefully. Take the help of the figure given below and find out the difference between the two.

Fig. 6

Do you know any other plants which have separate male and female flowers? Give examples.

What do you see in sunflower? It looks like a single flower. But is actually a bunch of flowers. The small flowers in the bunch are called 'florets'. The florets in the centre are called disc florets. The florets along the rim are called ray flowers. You will learn more about such special flowers in higher classes.

Flowers may be classified on the basis of number of parts present in them as-

Complete flower:

A flower that has four or more whorls – at least one each of calyx (sepals), Corolla (petals), Androecium (stamens) and Gynoecium (pistil) is called a Complete flower. Eg: datura, ipomoea, hibiscus.

Incomplete flower:

A flower in which any of these four whorls is missing is an Incomplete flower. Eg: cucumber, bottle gourd, papaya. In lilly flowers not sepals and petals are not diffrent. They are one that means they have three whorls. Can we call this as complete flower?

Unisexual flower:

A flower which has either stamens (androecium) or pistil (gynoecium) is called unisexual flower. Eg:- cucumber, bottle gourd, bitter gourd etc.,). Are both unisexual flowers found always on the same plant? Try to find out about

Is an unisexual flower a complete flower? Why not?

Bisexual flower:

A flower that has both stamens and pistil (androecium and gynoecium). Eg:- Datura, hibiscus, Ipomea, is called bisexual. bottle gourd, watermelon and papaya or any other plant bearing unisexual flower, whether the male and female flowers are born on the same plant or on separate plants?

Collect hibiscus, cucumber, bitter gourd, datura, ipomea, bottle gourd flowers etc. Observe the different parts in them. Record your observations in the table-3 (see if you can collect all these, in case you can't, take the help of books present in your school library or elsewhere.

Table-3

S.No.	Name of the Flower	Complete/ In Complete Flower	Unsexual / Bisexual Flower	Male / Female Both
1	Hibiscus			
2	Datura			
3	Ipomea			
4	Cucumber			
5	Bottle Gourd			
6	Bitter Gourd			

Sexual parts of flower:

Now take a stamen (androecium) from the china rose flower, tap the stamen gently on a slide. You can see some grains fallen on the slide. Put a drop of water and observe these grains under the microscope.

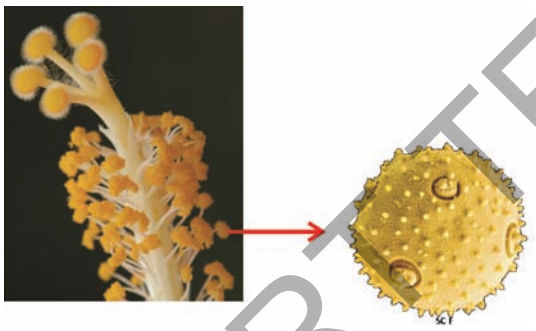


Fig. 7

These grains are called pollen grains. Collect pollen grains from other flowers and observe under the microscope as well. Are all these of same shape and colour? Draw the different pollen grains as you see them under the microscope.

Take the pistil of a datura flower as it is big enough to observe the internal parts.

Cut the sections of the ovary of pistil as shown in figures 8 a and 8 b.

Fig. 8a. T.S of ovary Fig. 8b L.S of ovary

With the help of hand lens study the internal parts. What do you see? Some small ball like structures called "ovules" can be seen arranged in different chambers.

Now take pistils of other flowers as well one by one, and cut the ovary of them and observe. Draw the diagram of the section of ovary that you have observed.

Flower part to Fruit

Let us do - 3

Collect a pistil and fruit from datura plant. Cut the transverse section of both ovary of pistil and fruit. Observe the internal structure of both the section cuttings with the help of a hand lens. Are there any similarities between these two?

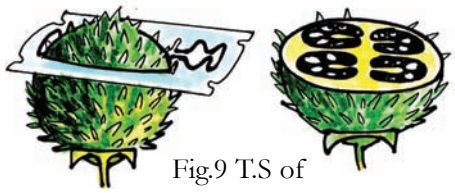


Fig.9 T.S of Fruit of Datura

Collect pistil and fruit of cucumber, bhendi (Ladies finger), cotton and beans and do the above activity. Write your observations. What similarities do you see between the ovary and fruit of the same species?

It is reasonable to conclude that an ovary develops into a fruit while the ovules develop into seeds. The seeds further produce new plants.

Agents that help ovary of flower to develop into fruit

Let us do - 4

Observe a bottle gourd plant in a garden. It has unisexual flowers i.e. male and female flowers separately. Select 10 female buds of bottle guard, cover with a polythene bag loosely tying the bag on a stalk. Make some tiny holes in the bag with the help of a pin.

Two days later observe the buds blooming. (Now collect the pollen grains from a male flower of the Bottle gourd plant). Pluck the stamens of male flower and shake to collect pollen grain in a sheet of paper. Twisting cotton wool over the tip of a match stick prepares a brush. Now uncover five of the ten female flowers. Apply the pollen grains on to the stigma of these flowers with the brush. The pollen grains stick to the stigma. Cover the flowers again with polythene bag. Remove all male flowers from the plant. So that no pollen grain reaches the remaining female flowers.

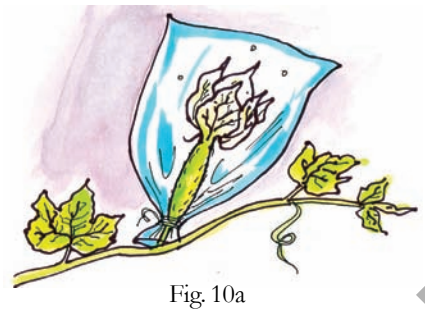


Fig. 10a

Fig. 10b

Fig. 10c

The transfer of pollen grains from another to stigma known as **pollination**.

After one week observe both pollinated and non-pollinated flowers. Pollinated flowers develop into fruits where as non-pollinated flowers do not.

- Why is it necessary to begin this experiment with buds in which sepals are closed?
- Why are the buds enclosed in polythene bags?
- Why are the non-pollinated flowers also covered with polythene bags?

By this experiment we come to know that significant role is played by male flower in the formation of fruit.

If transfer of pollen grains take place within the flower it is known as Self Pollination. Transfer of pollen grain from one flower to stigma of another flower of same species in called **Cross Pollination**.

Agents of Pollination:

How do these pollen grains fall on the stigma? Air, water, animals, insects, humans act as agents of pollination. They carry pollen grains from anther to the stigma. Insects like butterflies suck nectar from flowers. At that time pollen grains of that flower stick to the legs of the butterfly. When the butterfly goes to another flower for nectar, the pollen grain that have stuck to it's legs fall on that flower.

Do you know?

Birds and insects are the natural agents for pollination. Now-a-days farmers use pesticides to control pests on crops. The enormous use of pesticides kills insects also. It effects pollination. Crop yield become reduced particularly in sun flower crop. The rate of pollination is reduced because of lack of insects in the fields.. Think! How we destroy our beautiful nature.

What happens to the pollen grain after Pollination?

Let us do - 5

Take two slides. Put 2-3 drops of sugar solution on one slide and two drops of water on another side. Add some sugar grains to water on one slide. Now put some pollen grains of Hibiscus flower on both the slides. After one hour observe under microscope.

In which slide do pollen grains germinate and why?

There are some substances present on the stigma which promote the germination of the pollen grains. During germination a tube grows from the pollen grain. This tube ultimately reaches the ovary through the style with the male part. This male part fuses with the female part in the ovule of the ovary. Fusion of units of male and female parts to form a structure called as zygote is called **Fertilization.**

After fertilization seed develops from the ovule and the ovary usually develops into a fruit. The entire process of fertilization and formation of zygote is known as Sexual reproduction. For the formation of a seed sexual reproduction is essential. The seed thus formed are dispersed to different places by agents like air, water, birds and animals and by human beings as well. These seeds grow into new plants under favourable conditions.

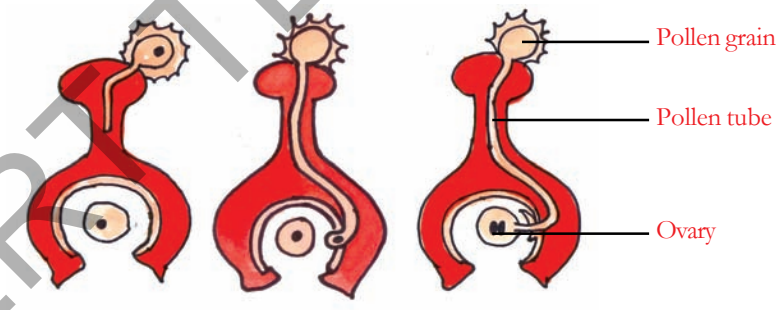


Fig. 11 Fertilization

Production of baby plants or offsprings from the zygote is called sexual reproduction. We often find that some plants produce new plants from their vegitative parts. Can you name some such plants?

S.No.	Name of the Plant	Plant part from which new plant produced
1	Rose	Twig
2		
3		
4		

Reproduction in plants when occurs using plant (vegitative part) other than the flower is asexual reproduction.

Asexual reproduction:

The most interesting thing in plants is baby plants can grow even without formation of seeds that is without sexual reproduction. Let us study some such processes.

a. Vegetative reproduction

Production of new plants from vegetative parts of a plant i.e. root, stem and leaf is known as vegetative reproduction.

Let us do - 6

Do you know how farmers produce potatoes in their fields?

Fig. 12

Take potato and observe it. It has a number of small depressions on its surface. These are known as eyes. Cut the potato into pieces such that there is an eye in each piece. Remove the eyes from some of these pieces. Fill two cups with soil. Plant the piece with eyes in one cup and label the cup as "with eyes" and those without eyes in another cup named as "without eyes". Water both cups daily and observe what happens. In which cup do potato plants sprout?

Here is a picture of a plant called Bryophyllum.

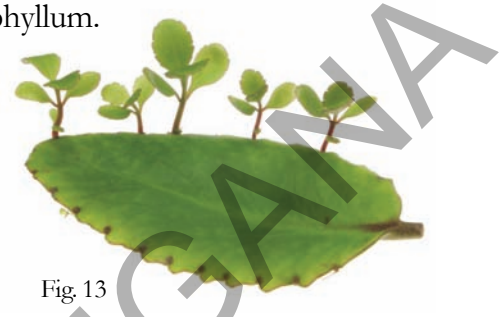


Fig. 13

You can see baby plants on the edge of the leaves. Can we say that the Bryophyllum plant reproduces through its leaves?

In our garden we grow plants like rose, hibiscus, and jasmine by cutting a small branch and planting them in the soil.

Which other plants can be grown from its cutting? (Name a few such plants)

Vegetative reproduction in some plants

S.No.	Plant	Part of the plant
1.	Sweet potato, dahlia, carrot, turnip, radish	New plants grow from the modified root.
2.	Potato	New plants grow from eyes in the tuber which is a modified stem
3.	Onion, garlic, tuberose, lilies, gladioli	New plants grow from bulbs, or corms (gladioli), which are modified stems.
4.	Bryophyllum (sprout leaf plant), begonia	New plants grow from buds on the leaf
5.	Sugarcane	Stem grows roots at the nodes
6.	Mint, strawberry, chrysanthemum, raspberry	Stem creeps along the ground and strikes roots at the nodes.

b. Budding:

The jilebi maker adds something to the jilebi mix and leaves it for sometime. It helps him to make good jilebes. What he mixes is a type of plant called yeast. Yeasts grow with the help of a small bulb like outgrowth which increases in size and breaks off from the parent plant to live independently. This process of reproduction is called budding.

Fig. 14

Let us do - 7:

Take some water in a glass tumbler. Mix a tablespoon of sugar and half spoon of yeast powder you get in the market, in the glass tumbler. Cover the glass and leave it undisturbed for a day. On the next day place a drop of the solution on a slide and cover it with a cover slip and examine it under a microscope. You will be able to see budding yeast cells as shown in the figure 14 (they look like water bubbles growing new ones on them).

c. Spore formation:

Let us do - 8

Take a slice of bread cover it with a vessel and leave it undisturbed for two or three days. Thereafter you will find the slice covered with grey coloured fungus called bread mould. Let it stand for three or four days. The whole growth appears like a black powder like matter. Transfer this powder with a thin stick on a fresh slice of moist bread. Observe what happens after every day and note your observation.(Fig 15)

The black powdery portion of bread mould contains several spores.

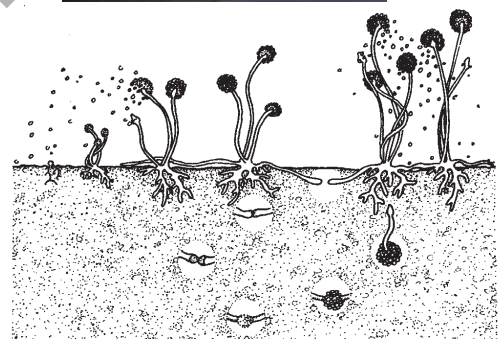
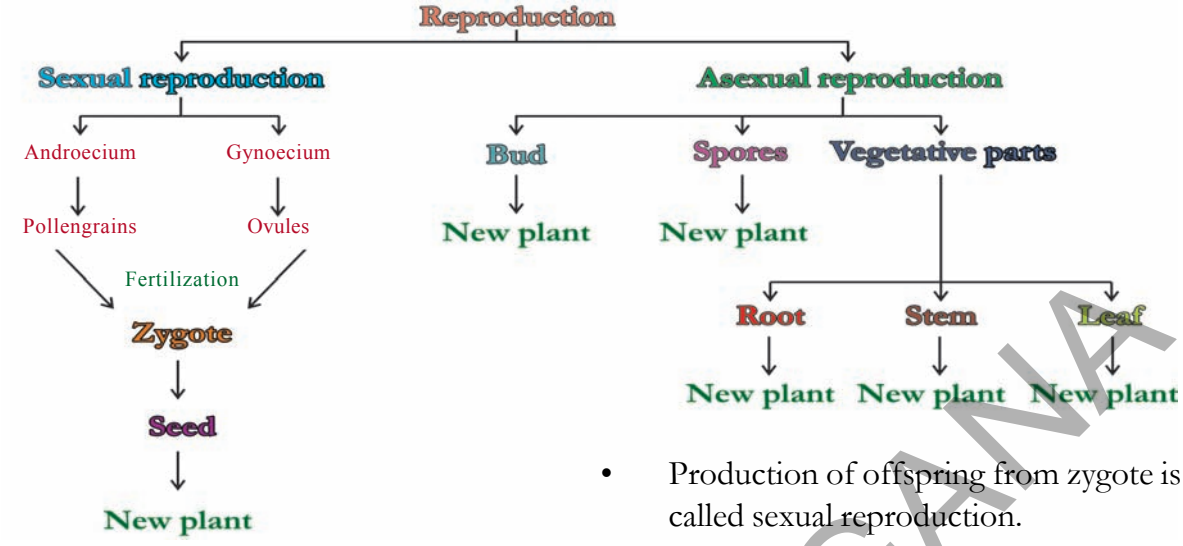


Fig 15

Do you know!

Alexander Fleming a Scottish scientist, discovered that a certain kind of mould (Penicillium) produces a substance, called **Penicillin**, whichcan destroy many kinds of disease causing bacteria. Penicillin came to be know as an antibiotic and saved the lives of many solidiers in World War-II.

Sir Alexander Fleming



Key Words:

Cutting, Androecium, Gynoecium, Thalamus, Corolla, Calyx, Stamen, Pistil, Anther, Filament, Budding, Zygote, Vegetative Propagation, Spore, Pollination, Fertilization

What we have learnt

- Flower consists of four parts. Sepal, Petal, Stamen and Pistil.
- Based on presence and absence of floral parts flower are two types. Complete flower and Incomplete flower.
- Based on presence of both or single sexual parts flowers are of two types. Bisexual flowers and Unisexual flowers.
- Transfer of pollen grains from anther to stigma is known as pollination. Flowers can be self pollinated or cross pollinated.
- Fusion of male and female parts to form zygote is called Fertilization.
- On the basis of parts involved, reproduction in plants is of two types, sexual reproduction and asexual reproduction.
- Production of offspring from zygote is called sexual reproduction.
- Formation of new plants without sexual reproduction is Asexual reproduction.

Improve your learning

1. Do all flowers have same parts? Classify the flowers according to the parts of flower present in them and give examples.

2. Differentiate between

a. Bisexual flowers, Unisexual flowers
b. Complete flower, incomplete flower
c. Male flower, female flower
d. Sexual reproduction, Asexual Reproduction
e. Self pollination, Cross pollination

3. What happens when a pollen grain falls on a stigma?

4. What helps to bring pollen grains to the stigma?

5. Explain the method of sexual reproduction in plants.

6. Can plants produce new plants even without seeds? Explain the methods with examples.

7. Draw the diagram of any flower showing its parts.

8. Write the differences between sexual and asexual reproduction.

9. Do all plants reproduce in the same way? Explain with examples.

10. Karthik saw a cucumber plant in the kitchen garden. He identified two types of flowers-some flowers had a small swollen structure behind them while some did not. He removed all the flowers which did not have the swollen structure behind them thinking that they were of no use.

    - Which flowers did he remove?
    - What are the flowers which had a small fruit behind them?

11. What are the agents of pollination?

12. Differentiate between self pollination and cross pollination.

13. Name the parts of the following plants from which they propagate vegetatively.

    a) Potato b) Byrophyllum

14. What am I?

    a) I am formed by the fusion of male and female parts.

    b) I am a part of the plant that can travel a long distance and grow to a baby plant.

15. Fill in the blanks

    a) Flowers containing both male and female parts are called .....

    b) Pollen grain from anther of one flower that reaches the stigma of another flower is called .....

    c) From ..... part of Bryophyllum new plants are produced

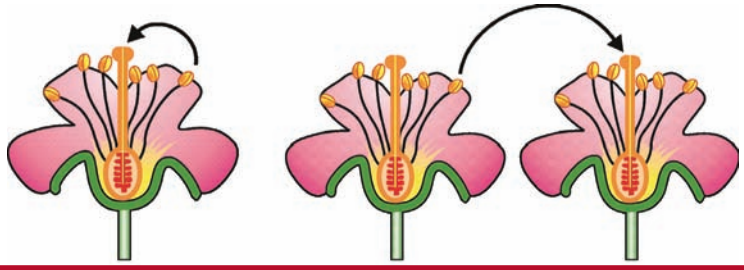
    d) Agents of pollination are .....

    e) Transfer of pollen grain from anther to stigma is called .....

16. Match the following

(1) Pollen grain	( )	(a) Ovary
(2) Ovule	( )	(b) Bryophyllum
(3) Reproduction through eyes	( )	(c) Anther
(4) Reproduction through leaves	( )	(d) Potato

17. Observe the following figures. What difference do you observe. Write in your note book.



Teophrastus, a Greek philosopher and the pupil of Aristotle, is known as the father of Botany. Reproduction in plants was first studied in detail by Theophrastus.

13 SEED DISPERSAL

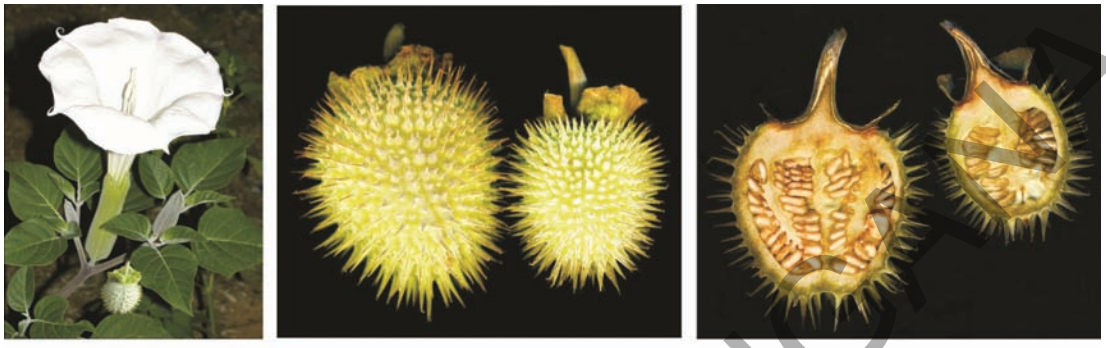


Fig. 1

In the previous chapter "Reproduction in Plants" you have learnt about the parts of the flower. Do you know which part of the flower turns into fruit? What does the fruit contain? You have also seen the section on the Ovary. What develops from the Ovule? You know that after fertilization ovary develops as fruit and ovules develop into seeds. When the seeds germinate they give birth to new plants.

You may have observed some fruits or vegetables growing in a garden or your back yard. Some fruits may be seen growing singly while some are in bunches. Some of them contain one seed, whereas some others contain many seeds.

One day Ravali saw that a tomato plant was growing on the roof top. No one can sow seeds on the house top.How did they reach there?

Fig. 2

How did they grow into plants? She was surprised. We often see plants that grow on cracked walls and on stones. How do seeds reach there?

Generally we sow seeds in our house gardens and in fields, but different kinds of plants grow in our surroundings. Who sows these seeds? How do seeds travel from one place to another? Ravali has so many doubts .

Why are seeds dispersed?

Most of the seeds fall in the soil and get buried in the ground. After some time they germinate and grow into small plants.

What will happen if all the seeds fall in the same place and germinate producing plants?

Will they have sufficient place to grow?

Will they get sufficient sun light and water?

Can they survive in the absence of light and water?

When we discuss these questions we will know that seed dispersal is necessary to

grow tiny plants of the same species. To avoid competition with the mother plant for air, water and minerals plants disperse their seeds to different distances. But the process of dispersal varies from plant to plant. Plants have special mechanism for seed dispersal. Do seeds travel to find suitable places to germinate? Do the dispersed seeds have any special characteristics? Does the travelling mechanism affect seed dispersal? Let us study these aspects..

How are seeds dispersed?

Do you know the factors that affect seed dispersal? Are the characteristics of seeds decided on the way they are dispersed? Let us find out.

Let us do – 2: Observe different seeds

Collect some seeds like grass, poppy, bhendi, coconut etc. Try to collect different types of seeds like seeds with hair, thorns, big, small, light, heavy etc., and record the information in the table.

S.No.	Name of the Seed	Nature of Seed						
		Light	Heavy	Round	Flat	Hairy	Thorny	Fibrous
	Bhendi	✓		✓				

- Which seeds can be carried by air?
- Name the seeds that are round and heavy?
- Which seeds can float on water?
- Which seeds contain hooks/horns? Why?
- Are the hairy seeds light and flat? Why?
- How are fibrous seeds? Are they light or heavy?
- Are there Tadi seeds in your list? Which characteristics do you find in them?

There are different seeds with different structures which are useful for their dispersal.

Do you know how these seeds are dispersed from one place to another?

Different agents of the seed dispersal

1. Dispersal through wind

Have you seen white hairy balls or parachute like structure moving in air? Children try to catch them. Have you ever tried to do so too? They are the seeds of caltropis. These seeds have light and hairy structure at one end. They travel with wind and settle at a suitable place to germinate. Seeds that are dispersed through air are usually light and are either very small or are light with wings on them or some hairy

structures on them. The seeds get adapted in such a way that they get carried away easily by wind. Some seeds float in air, some propel to travel short distances.

Milkweed Dandelion Tridax

Fig. 3

In some plants like orchids seeds are minute with inflated covering. In plants like maple, seeds have wing like outgrowths. Cotton seeds have hairy structures. These types of specialized structures, present in the seeds, will be helpful for dispersal by air.

Try to find out names of seeds which float in air in your surroundings and make a list.

2. Dispersal by water

Fig. 4

How do seeds float on water?

The seeds adapted to float on water are usually light. The outer covering of the seed has empty spaces filled with air and some are fibrous with air spaces that encloses the whole seed or fruit. Eg: Coconut. The entire Coconut fruit floats on water and moves from one place to another. When it reaches the ground it germinates. That's why we usually find coconut trees growing near sea shores. Seeds that are heavy usually fall to the bottom of water sources and get carried by the flow of water. Ex: Seeds of Lotus.

Give examples of some other plants whose seeds are dispersed by water? (Hint: Think about water plants)

3. Dispersal of seeds by birds and other animals

Discuss with your friends and list out the seeds which are dispersed by birds and animals.

Seeds are dispersed by animals in many ways. In case of fleshy fruits, the fruit is eaten by animals while some dry fruits, with specialized structures like hooks, thorns, hairy parts, get stuck to the bodies of animals and get carried to distant places. We find such seeds in some kind of grass plants.

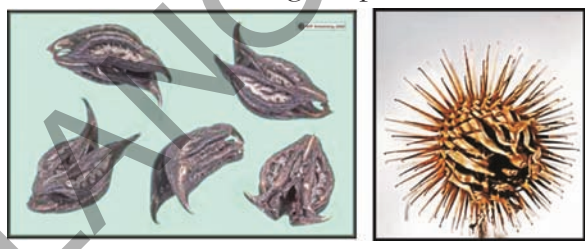


Fig. 5

Did you notice some kinds of fruits or seeds getting stuck to your clothes when you walk through fields and bushes? They have hooks or thorns on them. Find out which fruits or seeds these are?

Some seeds are sticky and get stuck to the beaks of birds and in course of flight they fall down at distant places. Often some birds carry seeds with their beaks. Some of them fall before they reach their nesting places.

Do you know some seeds have to pass through the guts of some birds before they germinate?

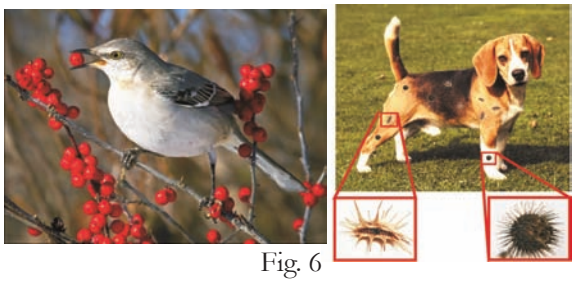


Fig. 6

The forgetful squirrel.
It collects a lot of nuts and hides them underground before onset of winter. It can hardly eat all of them and even forget where it has hidden its nuts! Thus we have several nut trees at different places.

Birds like Bulbuls, Mynahs, Crows eat some fruits (Eg: Neem fruit) the outer fleshly part gets digested in the food canal and the seed coats of them become tender.They are then dispersed to other places as bird droppings.

Many fleshy fruits are meant to be eaten by animals. The fleshy part of the fruit is eaten leaving the seeds uninjured. Some seeds get dispersed through animal excretions.

Let us do:

Observe the animals in your surroundings. Fill in the following table.

S.No.	Name of the Animal	Fruits eaten / Seed dispersed

4. Dispersal by bursting of fruits that throw the seed out:

Many fruits enclose the seed in a capsule or pod. Upon drying the pod explodes releasing the seeds with great force in the surroundings. We find such type of seeds in Bhendi, Mustard and seeds of Pea family. Some seeds grow in capsules which when touched burst and uncoil with a force in such a way that they scatter the seeds all around.

The seeds of Balsam are dispersed in this manner. You may have also noticed that some fruits explode when we sprinkle water on them and the seeds get dispersed.

Try to list out such types of seeds that you see in your surroundings

Let us do: Observation of scattering of the seeds

Collect fruits of Crossandra (Kankambaram) from your or your friends houses, sprinkle water on them. Write your observations. Collect some dry pods of pea, gingelly (Til), bhendi from a nearby field or from a shop and try to open them. What happens to the seeds in the pod? How far are they scattered? Note the distance.

- In which weather conditions do seeds scatter?

- Do you think that these seeds would scatter in this way during rainy season?

5. Dispersal of seeds through human beings

Generally we sow seeds of flowers, fruits and vegetables in our home garden . Everyone is aware of Tomatoes. It is a common vegetable cooked in every home. In tomato pickles, tomato curry etc. we find Tomatoes. Do you know from where this fruit has come from and that it is not native to India? When European travellers came to trade in India, they left the seeds of vegetables like tomato, cauliflower, guava, pear on their return. Similarly sugar cane which is native to India and is used worldwide for production of sugar, is a good example of how people transfer seeds/fruits from one place to another.

Now-a-days we see different kinds of fruits and vegetables around us. Import and export of grains like wheat pulses, maize, paddy is a common practice through which many seeds get dispersed all over the world. It is funny to think that seeds also travel by aeroplanes and ships!

Let us do:

Form group of four or five students and try to collect information about other seeds dispersed by man.

Why plants produced a large number of seeds:

You observed that fruits and vegetable plants that grow in our home garden produce a large number of seeds. Some fruits grow in singly whereas some are in bunches. Some fruits have a single seed in them and some have a large number of seeds.

Let us do: Seeds in fruits

Collect different kinds of fruit which are available in your surroundings. Open them and count how many seeds they have. Try to collect information about seeds and enrich the following table.

S.No.	Name of the Fruit	Number of Seeds

- Which fruits have a large number of seeds?
- Which fruits have a single seed?
- Do all the seeds germinate to grow into plants?

All the seeds of a fruit should be able to germinate to produce new plants. Actually this does not happen. If this happens we will see only same type of plants in large number in our surroundings. All seeds don't germinate. Some seeds never germinate to produce new plants. Some seeds germinate but plants die before maturation. To overcome these problems plants produce a large number of seeds.

Do you know:

A mustard plant produces more than 10,000 seeds in its lifetime. If all the seeds germinate to grow into adult plants, think how many seeds would be produced. If this happens for a period of six years the entire globe will be covered with mustard plants!

What we have learnt:

- Seeds are carried from one place to another so that they get suitable conditions to grow, this is called dispersal of seeds.
- Seed dispersal is essential for survival of plants.
- Seeds of different shapes, sizes and structures on them help in dispersal.
- Seeds are dispersed by wind, water, birds and animals.

Key words:

Dispersal, Bursting Mechanism, Fleshy Fruit

Improve Your learning:

1. What happens if seeds are not dispersed?
2. How are the seeds dispersed in caltropis?
3. Why do most of the coconut trees grow along the sea shores?
4. Do you find any relationship between the weight of the seeds and the dispersal mechanism? Discuss with suitable examples.
5. Ravali said "dispersal of seed is very important in nature" Is she correct? Why do you support her?
6. Collect the information in the following table and discuss the reasons?

Agents of dispersal	Name of the seed / Fruit
By wind	
By water	
By animal	
By bird	
By man	
By any other	

7. Some seeds like soap nuts have very hard shell. Why it is so?
8. Now- a-days people want to eat sprouts. List out the reasons why they take sprouts as food?
9. Collect some seeds sow them in a particular place in your school garden. Observe how many days each type of seed takes to germinate. Tabulate your observations.
10. Collect Toddy Palm seeds and make a model. Display them in your School.

14 WATER
TOO LITTLE TO WASTE

In class VI, we had studied about the uses of water, about floods, droughts etc. So little is the quantity of water available for our use that we have to use it very carefully. We know that water is a precious resource. We cannot live without water. Not only we, plants and animals also depend on water for their survival. Recollect the water sources on the Earth. We can see huge amounts of water in seas and oceans. Is it useful for us? We do not use sea water for drinking. Why? Sea water is also not useful for crops . We use only fresh water.

Do you know what is fresh water? Where is it available? Fresh water is available in ponds, lakes, rivers and streams. Do you know how much fresh water is available on the Earth? If 10 liters of water is the total water on the surface of earth then out of this only 1ml is available as fresh water for our use as well as for several plants and animals.

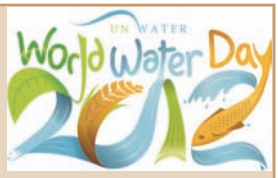
If the total water on earth be 100%, let's see what percent would be available of fresh water.

Source of Water	Percentage
Ocean(sea water)	97%
Glaciers & Poles as ice (fresh water)	2%
Ground Water, Water in Ponds, Lakes and Rivers (available fresh water)	1%

Source of Water on Earth

- Could we say fresh water is a precious resource? Discuss.
- How are we presently using this resource?
- What will happen if we continue to do so?

Do you know?



On World Water Day, that is 22 March 2005, the period 2005-2015 was declared as the International Decade for action on "Water for Life".

Did you notice that a very small amount of fresh water is available on earth? Most of the times we do not think of the importance of fresh water. We are not aware of the need to preserve fresh water.

Let us do-1:

List out the daily life situations where we waste water usually. Discuss in groups why we do so. Write reasons in your note book.

Neeraja collected a news letter for you. Try to analyse issues discussed in the newsletter.

SORROW OF EARTH:

My dear young minds, I am your living home I am called as the Planet Earth. I always try to make you happy by supplying various resources to meet your needs. But now I am in danger ,please listen to me.

Fresh water has been the constant and essential companion of human beings throughout history water is used in great quantities in agriculture and industries.

But your planet is poorly endowed with fresh water. Most water is rendered useless to humans by dissoloved salts in the oceans. Only 3 percent is available as fresh water of which 2/3 is locked up in Ice and snow. Nature is unkind in depositing almost eighty percent of rain over the sea. The rain that falls over the land has a great potential value.

Unsustainable extraction of fresh water causes water scarcity. Due to over extraction of fresh water underground reserves are falling rapidly. In India, the water table has fallen more than 300 meters. Human interventions which degrades the quality and quantity of natural supply of fresh water occur, in 3 principle ways .

Firstly dams alter the natural flow of rivers often leading to water scarcity. Secondly, soil moisture is lost by land degradation due to poor farming practices and deforestation. Thirdly, surface water is polluted by run off chemicals used in industries and house holds.

World population is projected to grow 9.3 Billion by 2050. In addition to safe drinking water and sanitation the rising pressure on fresh water will be felt most severely in the energy and food sectors. Two out of three people will be living with water shortage by 2025. The growth of demand the decline in fresh water availability ,the adverse health effects from poor water quality and scarcity will result in violence and water wars. The next World War could be over water.

Neeraja said that it is a sad story and she was afraid of our future also. Why did she think so? What do you find in the newsletter? Write your opinion about this in your note book.

What would you do for the cause "Water for life"?

Day-by-day our needs are increasing rapidly. We use water for agriculture, industries, power generation etc. Water resources are not being increased along with population and their needs. We must be aware of the need to protect water resources.

Neeraja decided she would conserve water at home as an action towards the cause "Water for life".

Devi observed that a lot of water flows out of the kitchen as well as bathrooms at her house. She could not see water being wasted in this manner so she made a channel for water to flow from kitchen to the garden around. She could not use water from bathroom in a similar manner. Her mother told her that it could be used after purification. Seeing her interest in this, they decided to visit a water treatment unit during the weekend.

At the water treatment unit, they came to know about many things.

All the wastewater released by home, industries, hospitals, offices and other users are collectively called Sewage. Sewage is a liquid waste. Most of it is water, which has dissolved and suspended impurities, disease causing bacteria and other microbes. These impurities are called contaminants. These are :

Organic impurities - Human faeces, animal

waste, oil, urea, pesticides, herbicides, fruit and vegetable waste etc.

Fig 1

Inorganic impurities- Nitrates, Phosphates, metals etc.

Bacteria & other microbes- Such as those which cause cholera, typhoid, dysentery etc.

Processes at the waste water treatment plant

Treatment of waste water involves physical, chemical and biological processes, which remove chemical and biological matter that contaminates water.

Stage - 1

Wastewater is passed through bar screens. Large objects like rags, sticks, cans, plastic packets, etc are removed by this.

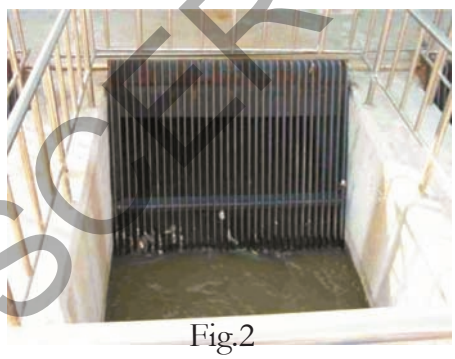


Fig.2

Stage - 2

Water then goes to a grit and sand removal tank. The speed of the incoming waste water is decreased to allow sand, grit and pebbles to settle down.

Fig.3

Stage - 3

The water is then allowed to settle in a large tank which is sloped towards the middle. Solids like faeces settle at the bottom and are removed with a scraper. This is the sludge. A skimmer removes the floatable solids like oil and grease. Water so cleared is called clarified water.

Fig.4

Stage - 4

The sludge is transferred to a separate tank where it is decomposed by anaerobic bacteria. The biogas produced in the process can be used as fuel or can be used to produce electricity.

Stage - 5

Air is pumped into the clarified water to help aerobic bacteria to grow. Bacteria consume human waste, food waste, soaps and

other unwanted matter still remaining in clarified water.

Stage - 6

After several hours, the suspended microbes settle at the bottom of the tank as activated sludge. The water is then removed from the top.

Fig.5

Stage - 7

The activated sludge is about 97% water. The water is removed by sand drying beds or machines. Dried sludge is used as manure, returning organic matter and nutrients to the soil.

The treated water has a very low level of organic material and suspended matter. It is discharged into the sea, a river or into the ground. Nature cleans it up further. Sometimes it may be necessary to disinfect water with chemicals like chlorine and ozone before releasing it into the distribution system i.e. river, groundwater etc..

Let us do: Study the sewage route in your home/school/any other place.

- Walk down the street or survey the campus to find the number of manholes.
- Follow an open drain and find out where it ends.
- Make a line diagram of the sewage route by following manholes and drains that appear to connect them.
- In case you do not find such a system in your locality, find out how sewage is being disposed off. Also find out whether it is sent to treatment plants or not.
- Is it being dumped into water bodies without being treated?
- Prepare a short report on your findings.

Let us do: Finding out what really happens to wastewater at treatment plants

You can do this individually or in groups at school or home. Record observations at each stage:

- Fill a large glass jar ¾ full of water. Add some dirty organic matter such as grass pieces or orange peels, a small amount of detergent, and a few drops of an ink or any colour.

Fig. 6

- Cap the jar, shake it well and let the mixture stand in the sun for two days.
- After two days, shake the mixture and pour a small sample into test tube. Label this test tube "Before treatment; Sample 1". How does it smell?
- Use an aerator from an aquarium to bubble air through the sample in the glass jar. Allow several hours for aeration; leave the aerator attached overnight. If you do not have an aerator, use a mechanical stirrer or a mixer. You may have to stir it several times. This actually works like a skimmer of waste water treatment plant.

- Aeration helps organisms to grow and break down waste material faster thus it leads to what is called as "Biological Process".
- The next day when aeration is complete, pour another sample into a second test tube. Label it "After aeration; Sample 2".
- Fold a piece of filter paper to form a cone. Wet the paper with tap water and then insert the cone in a funnel. Mount the funnel on a support (as you have learnt in Class VI).
- Place layers of sand, fine gravel and finally medium gravel in the funnel. (An actual filtration plant does not use filter paper, but the sand filter is several meters deep).
- Pour the remaining aerated liquid through the filter into the beakers. Do not allow the liquid to spill over the filter. If the filtered liquid is not clear, filter it a few times till you get clear water. This is "physical process".
- Pour a sample of the filtered water into a third test tube labeled "Filtered; Sample 3".
- Pour another sample of the filtered water into a fourth test tube. Add a small piece of a chlorine tablet. Mix well until the water is clear. Label the test tube "Chlorinated; Sample 4".
- This is a "Chemical Process" of treatment.
- Observe carefully the samples in all the test tubes. Do not taste! Just smell them!
- What changes did you observe in the appearance of water after aeration?
- Did aeration change the odour?
- What was removed by the sand filter?
- By adding chlorine what changes do you observe in sample 3 and 4?
- Did chlorine has an odour? Was it worse than that of the wastewater?
- Write two points each of similarities and differences between the processes involved at the treatment plant and this experiment.
- What is the use of bar screen at sewage treatment plant? Was anything like that present in this experiment? Why?

Diseases caused by untreated water

If waste water is not treated and allowed to pass as such into our resources, it becomes a cause for a large number of diseases.

This is what happens at Ramu's village.

All residences there release waste water from kitchen, bathrooms and toilets outside their houses, which gets stagnated and causes diseases like diarrhoea, malaria, typhoid and cholera.

- Suggest what Ramu could do to stop the stagnation of water.

Other ways of Disposing Sewage:

We dispose waste water in our daily life in different ways and means. We often see water stagnated near bore wells or beside houses. Sometimes human and animal excretions also mix with this water. We get a foul smell when we walk near those areas. To prevent this we need a proper drainage system.

In some villages and towns we can see drainage canals on both sides of the streets to maintain flow of waste water.

- Is there any drainage system in your village?

Types of Drainage Systems:

Generally we make some arrangements in our areas to carry waste water and other materials released by domestic activities. In some places people construct a ditch to settle drainage water. In some places they make the waste water flow in canals to their fields or to the waste lands around.

- Is it right to leave untreated waste water in this manner?

Let us do: Finding out types of drainage system in a locality

Make a list of drainage systems that you may have heard about (You may also ask your teacher):

_____

_____

_____

_____

- Which among the above is the most common type of drainage system that you see?
- How is the flow of water blocked sometimes in drainage canals?
- What can be done to reduce such blocks?
- How can a closed drainage system be useful for us?
- Discuss with your friends/teacher and write which type of drainage system (either open, closed or underground) is useful for us and why?

Some homes do not have drains running to a common treatment plant. They usually have a septic tank instead. These are units of waste disposal used at homes usually in villages/ towns and in some individual houses in cities.

Fig 7

Do you know? Our state government provides septic tank facility for each home in the village.

- Collect information about how many families have septic tanks and toilets

in their houses in your village/town/ nearby village. Ask the families who do not have one to construct the same.

- How are the wastes from toilets disposed of in your school? Write a few lines about the process.

Conservation of Water:

We perform many activities in our daily life using water. We can conserve water by adopting certain good practices. Let us read about the practices performed at Mary's house.

I am Mary. There are six persons in my family. My grandfather says water is precious so don't waste it. My mother collects water in a bucket after cleaning rice, dal and vegetables in the kitchen which contains peels of vegetables and we use this water for our cattle. We do not throw solid food remains, tea leaves and oily wastes down the drain. My father made a channel so that the kitchen and bathroom water flows to the coconut and banana plants in our garden. We always use mild soaps and detergents so that this water may not harm our plants. One day my grandmother asked me to measure drops of water which leaked from a tap in the bathroom. I noticed that three mugs full of water leaked from that tap in a day. Then she asked me to calculate how many mugs of water was wasted in a year. We immediately got our tap repaired.

- What are the ways in which Mary's' family conserves water at home?
- How can you conserve water in your home?
- Do people in your area conserve water? How?
- If they don't, think and write some suggestions that you would like to give them.

Another step towards conservation:

Nallavally is the oldest Vana Samrakshana Samithi (VSS) of Medak district, which was formed in 1993 with 600 members. An area of 310.40 Hectares has been allotted from Nallavally forest block to the VSS members.

Prior to formation of Vana Samrakshana Samithi, the Socio-Economic condition of the villagers was bad. Many of them used to migrate to other places as their lands were not suitable for cultivation due to lack of enough ground water. They could only raise rain fed crops like Jowar, Red gram, Horse gram, Maize etc., Availability of water even for drinking purpose was also difficult as all open wells and bore wells used to dry up in summer season.

The VSS members have constructed several Percolation Tanks, Contour Trenches to harvest the rainwater. Check Dams and Rock Fill Dams have also been constructed to conserve water to revive the forest area.

Key words

Sewage, Wastewater, Contaminants, Septic tank, Drainage system, Percolation tank, Contour trenches, Bar screen, Grit, Check dam, Rock fill dam, Activated sludge.

What we have learnt

- Only one percent of all water resources is available as freshwater.
- The available resource of fresh water is getting depleted at a very fast pace due to different human activities.
- Wastewater is generated at homes, industries, etc. by different human activities.
- All the wastewater released by home, industries, hospitals, offices and other users are collectively called Sewage.
- Sewage is a liquid waste. Most of it is water, which has dissolved and suspended impurities, disease causing bacteria and other microbes.
- Sewage water contains inorganic, organic and bacterial as well as other microbial contaminants.
- Wastewater is treated in treatment plants
- Physical, chemical and biological processes are involved in treatment of wastewater at the treatment plants.
- Chlorine kills harmful disease causing organisms present in wastewater.
- Aeration allows growth of microbes that break down wastes.
- Different types of drainage systems are open, closed and underground ones.
- Septic tanks also help in wastewater disposal.
- Water should be treated before being released to water bodies.
- Water must be conserved by individual efforts as well as through efforts made by the community.

Improve your learning

1. Fill in the blanks and give reasons.

   (a) Cleaning of water is a process of removing _____.

   (b) Wastewater released by houses is called _____.

   (c) Dried _____ is used as manure.

   (d) Drains get blocked by _____ and _____.

2. What is sewage? Explain why it is harmful to discharge untreated sewage into rivers or seas?
3. Why should oils and fats not be released in the drain? Explain.
4. Describe the steps involved in getting clarified water from wastewater.
5. What is sludge? Explain how it is treated.
6. Untreated human excreta is a health hazard. Explain.
7. Name two chemicals used to disinfect the water.
8. Explain the function of bar screens in a wastewater treatment plant.
9. Explain the relationship between sanitation and disease.
10. Outline your role as an active citizen in relation to sanitation.
11. What would you do to motivate people in your street to utilise toilets?

12. What would happen if there were no microbes that break down wastes in sewage?
13. What point would you like to address in the letter for your panchayat officer about drainage system in your village / town?
14. Go to a nearby railway station / bus station / hospital / industry. What type of sewage is released? List out where and how.
15. Fresh water is scarce. What is your contribution to make your family members aware of the need to save water?
16. Prepare atleast 5 slogans on "Don't waste water".
17. Make a writeup for your project on preservation of rain water.
18. Is there a check dam or any other water conservation unit in your village? Write a note on it.
19. Have you got any doubt about diseases caused by un treated water? List them out.
20. If you see water running off from a public tap what would you do about it?
21. Prepare a logo for International Water Day?

15 SOIL - OUR LIFE

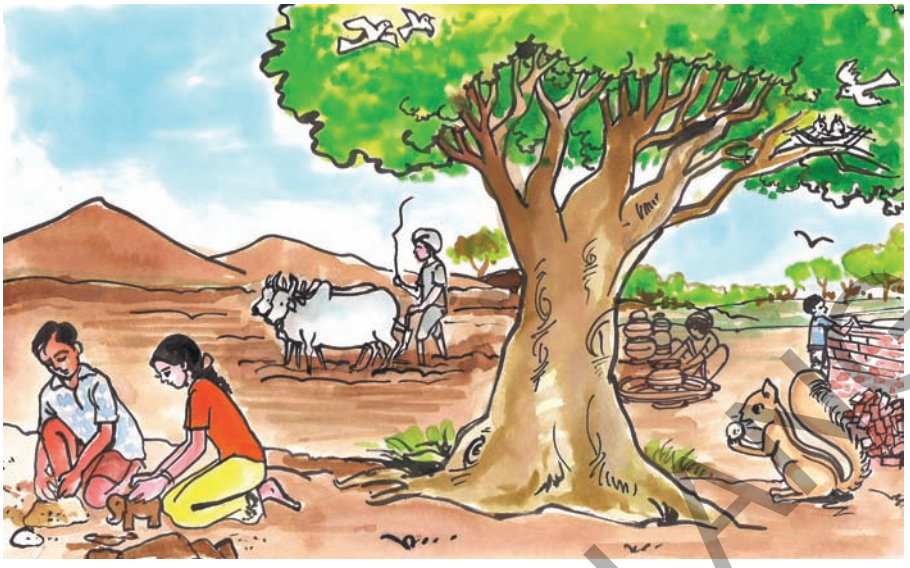


Figure 1

Rafi and Vasanthi were asked by their teacher to make models of some vegetables. They collected some soil from their garden, mixed the soil with water and made some models. They were not satisfied, as sometimes, their models would break when they tried to shape them. The surface of the models was rough and not smooth. Rafi's grandma saw them doing this and said, "To make models, you have to collect soil from the bank of our village pond which is sticky".

- Guess why soil of the garden was not suitable to make models?
- Why was grandma's suggestion useful?
- Are soils different from place to place?
- How is soil useful for us?
- Guess what soil is made up of?

Let us try to find out the answers to some of these questions. For this lets do some activities.

Let us do-1 : Usefulness of soil

Work in groups of 3 to 4 students. Discuss and list out the ways in which soil is useful for us. Compare the list with that of other groups and add any point that you may have missed.

- Can we say soil is one of the most important resources like water and air? Why?

Soil is the uppermost layer of earth's crust. It is formed of rock particles and organic matter called humus. It is one of the most important natural resources. It supports the existence of living organisms. We can use soil for different purposes in our daily life. Almost all things in our surroundings directly or indirectly depend on soil.

Can we say soil is one of the most important resources like water and air?

The soil supports all plants, animals and micro organisms. Almost all the things in our surroundings directly or indirectly depend on

soil. For example a pot may be directly made from soil. But a wooden chair is derived from tree which depends on soil.

Let us do-2: Soil in our life

Rafi and Vasu want to make a list of things that are directly or indirectly related to soil. Help them with their list.

S.No.	Things directly related to soil	Things indirectly related to soil
1	Pot	Wooden chair
2		
3		
4		
5		

What do you observe in your findings? This tells that our daily life activities are closely related to soil. In addition to agriculture we depend on soil for construction of house, making utensils, toys etc.

Human beings can't live without air and water. In the same way soil is also an essential component in our lives. Most of our daily life activities are closlely related to soil. We use soil for various purposes.

During festivals like Vinayaka Chavithi people use idols of Ganesh made of plaster of paris and chemical colours which causes severe damage to our environment. Instead of these chemical idols we should use clay idols and celebrate festivals in an ecofriendly way..

Let us do-3: Soil and Life

Go to any area to study about organisms in soil (The suggested sites are: lawn of the school, public parks, near pond, river bank, bank of a canal, a badly eroded field, a good agricultural field). Select any three such site and work in groups. It would be better to visit the place after rain.

Don't forget to carry a hand lens, any hand tool to dig soil, your notebook, pencil, rubber, scale, news paper, soil life chart and any bag.

Soil Life Chart

(Put a tick mark on the options given if you find them in your site, add to the list wherever needed.)

Name of Site:_____

Section 1: Plants

1. In the soil, there are-No roots, few roots, many roots _____

2. Presence of small plants like _____

3. Other signs of plants include: _____

Section 2: Animals

I observed-different kinds of worms. (e.g. earthworms which have no legs,……
……..)

different kinds of larvae of insects. (e.g. thick worm-like creatures,… ……
……)

different kinds of snails and slugs. (e.g. soft-bodied animals; snails have shells, slugs do not have shells,……)

different kinds of insects. (e.g. animals with 3 pairs of jointed legs,……...)

different kinds of spiders, mites, ticks.

(e.g. animals with 4 pairs of legs,……
……)

different kinds of animals with more than 4 pairs of legs. (e.g. centipedes, millipedes, ……)

Other creatures I found are…… ……..) After examining and counting, return the living things to the soil.

This is what you need to do at the site:

1. Measure and mark off an area of land approx. 30 cm x 30 cm.
2. Gently sort through the leaf litter, and collect any creatures you find there. Record your findings in the chart given.
3. Dig the soil to a depth of 4-6 cm. observe and record the presence of roots. Are there any?
4. Take out the soil and spread the soil onto a sheet of newspaper.
5. Carefully sort the soil, watch closely for small living things with a hand lens. Watch for worms and other animals. You may also find other signs of animal life such as burrows or eggs of insects which may be single or in masses. Count the different kinds (write in section: other creatures I found)

You may take the help of the given picture for your study.

Fig. 2

- Which area has a maximum of animal life?
- Does the amount of animal life and the burrows the animals make have any relation to the condition of the soil?
- "Soil is a good habitat". Explain the statement.

Soil is a good habitat. We depend on it for agricultural and construction purposes, making utensils, toys etc. We have already learnt that plants depend on soil for nutrients like mineral salts and water from the soil in the chapter "Nutrition in Plants."

Do you know?

Making pots by using soil is called pottery. This is an ancient creative occupation. During Harappan civilization, different varieties of designer pots and clay utensils were used. Pottery is a cottage industry in our country. Potters make pots by using clay soil on a pottery wheel.

Fig. 3

Know more about your soil

Now we have come to know that soil is a good habitat of organisms. We have also studied its different uses. Now let us study some other properties of soil.

Let us do-4: Is the soil from different places same?

For our study, we require soils collected from different places. Examples of some of these locations are given below:

fields, lakeside, open meadows, river banks, gardens, forests, roadside, fallow land

You can change the list, adding or subtracting names, to suit your convenience. But you should make sure that you get different types of soil from different places. It would be even better if the soils are of different colours.

Collect the soil samples while you are on your way to school from home. But, first, let your teacher distribute the work of collecting different soil samples among the different groups in the class. The class can decide which group should visit which location and bring back which type of soil samples to school. This work distribution should be done a day before the chapter is begun in the class.

Leave home a little early on that day, go to the location allotted to you, collect about 250 gm of soil for your sample, and bring it to school. You can carry the soil in a bag. Remember to collect the soil only on the day you begin the experiments in class. Don't forget to put a label on your soil sample, stating where you got it from and the date on which you collected it.

First copy the following Table in your Note book and note all your observations in this table. Instructions given after the table will help you to fill it.

S.No.	Activity No.	Properties	Observation
1	4	Shape of particle	
2	4	Colour	
3	4	How it feels	
4	4	Smell	
5	4	How it looks under a microscope	
6	4	Organisms presents	
7	4	Remains of organisms	
8	6	Type of soil	
9	7	Moisture content %	
10	8	Water retention (ml) Percolation rate (ml per minute)	
11	7	Acidic/alkaline	

Let us do-5: Examining The Soil After Returning To School

Examine the different soil samples brought to class and see whether you can identify various properties of soil as given in the table. Some points to study the properties are given below.

1. How does the soil look? Is it like fine powder or granular?

2. What is its colour? Is it black, brown or any other colour?
3. How does it feel when you touch or press it? Hard, soft, elastic, dry, sticky etc?
4. How does it smell? Is it aromatic, foul smelling or without a scent?
5. Can you find anything new when you examine the soil under a microscope?
6. Can you see any living creatures or plants in the soil?
7. Can you see any remains of dead creatures or plants?
8. Are all the particles in the same sample of soil similar?

If you have a problem in answering these questions, do the following activities and then try to answer them.

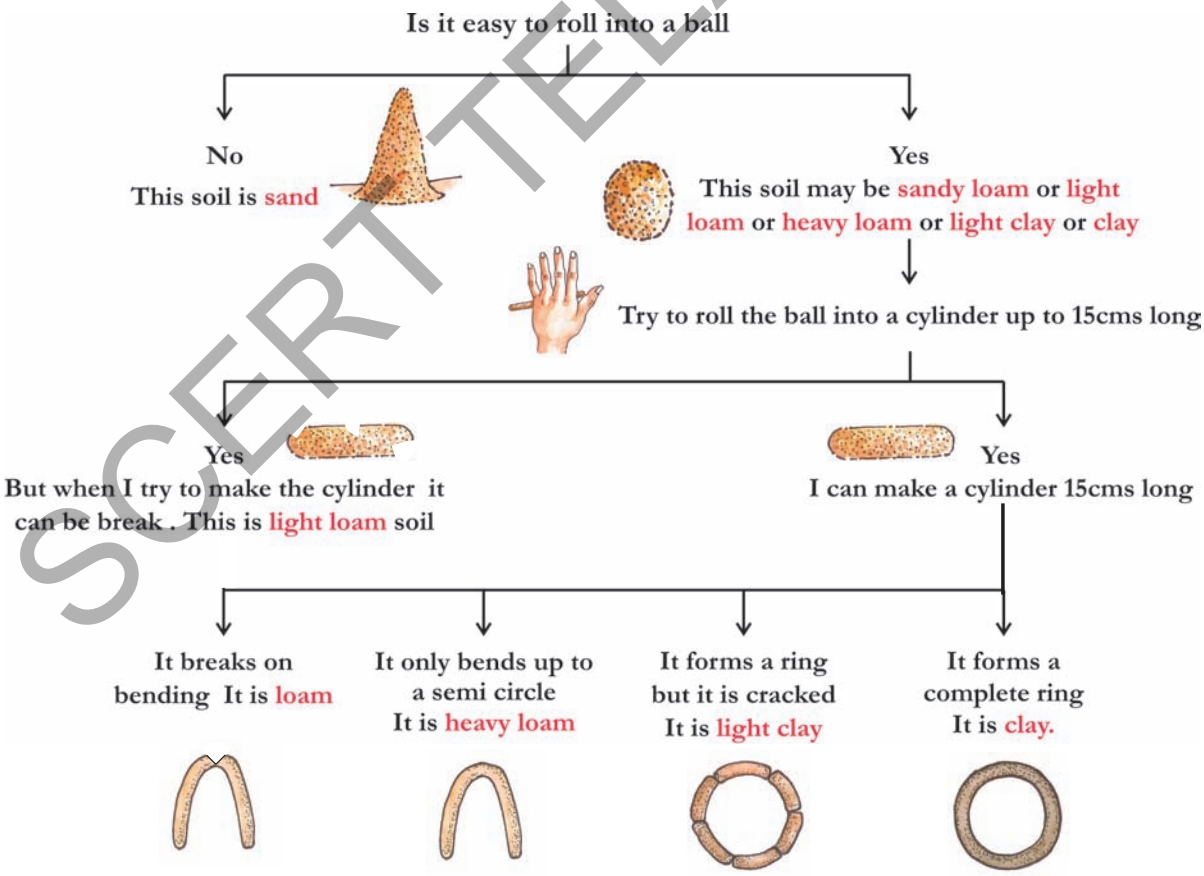
(To observe properties No 6 and 7, you will have to grind the soil to a fine powder, Spread it out and examine the particles through a hand lens.)

Let us do-6: What type of soil is it?

Take 20 gm to 25 gm of soil from your soil sample. Remove the pebbles, grass and other organic matter from it. Add water to the soil, drop by drop, kneading the soil while doing so. Pour enough water so you can make small balls of soil, without the soil sticking to your palms. Make a 2.5 cm diameter ball of soil. Put this ball on a flat surface and try and roll it into a 15-cm-long rod. If you can bend the rod without breaking it, then bend it into a ring.

You can identify a soil type by the extent to which you can mould it.

Identify the different types of soils in the line diagram given below. Determine the soil on the basis of following chart.



If the proportion of larger sized particles is more, we call the soil sandy. If the proportion of fine particles is more, the soil is clay. If large and fine particles are present in equal proportions, the soil is called loam.

Let us do-7: The Moisture Content of Soil

There are many ways of finding out the moisture content of different soils. We shall use a simple method. Grind the soil you wish to find the moisture content of, into a fine powder. Weigh 100 gm of soil from this pile.

Spread it on a newspaper and dry it for about two hours in the sun. While drying the soil, the sky must be clear and the heat of the sun intense. Keep turning the soil over while you are drying it. Be careful that the soil does not spill out of the newspaper. Weigh the soil again after it has completely dried. The difference in the two weights will tell you how much water 100 gm of the soil contained. This quantity is known as the percent moisture content of the soil.

Let all the groups do the experiment with different soil samples.

- Write the percent moisture content of the soil samples in the table.
- Are the figures of the percent moisture content of all the soil samples the same?
- Compare your findings with those of the other groups.

Let us do-8: The Percolatio

Take soil samples which were collected for the previous activity. Take a plastic funnel and place a filter paper in it as shown in figure. Weigh 50 gm of dry soil and pour it into the funnel. Take 100ml of water in a measuring cylinder. Then pour the water on the soil drop by drop.

Fig 4

Do not let all the water fall at one spot. Pour water all over the surface of the soil until it starts dripping out of the funnel. Observe how fast water passes down the soil. Measure the amount of water collected in the beaker.

Calculate the difference between amounts of water. Record the time taken for water to pass through the sample. Fill the following table.

S.No.	Type of Soil	Initial amount of water taken	Final amount of water in the beaker	Difference D in ml.	Time taken for water to pass down (T in sec)	Percolation rate D/T
1						
2						
3						
4						
5						

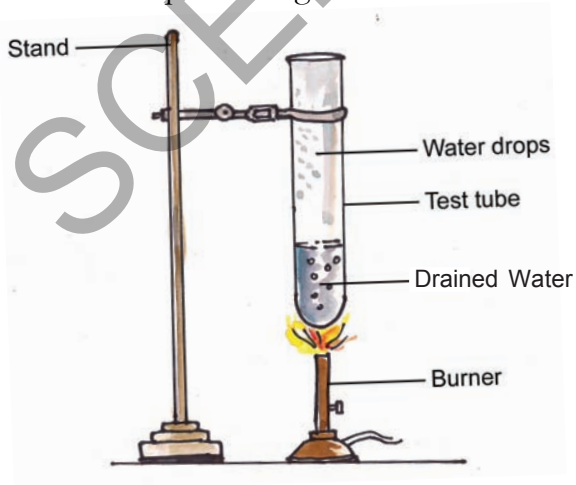
- Which type of soil retains the highest amount of water?
- Which type of soil took least time to pass down water?
- Which type of soil took maximum time to pass down water?
- Which type of soil retains least amount of water?

Water passing down through the soil particles is called percolation.

- Why does sand soil not retain water for a long time?
- Is there any relation between percolation rate and water holding capacity of soil? Write your observations?

Activity 9: Substances present in Soil

Fill a beaker half full with soil. Pour some rainwater or distilled water over the soil. You should pour enough water to fill the beaker three-fourths. Stir the soil and water with a twig. Then let the solution stand for some time. Once the soil settles down, drain out the water carefully. Fill a boiling tube half full with this drained water. Heat the boiling tube over a candle flame. Continue heating till only a fourth of the water remains. Then answer the questions given below:



- What is the colour of the water?
- Use blue and red litmus to test whether the water is acidic or basic. Note the result in the table.

Soils contain minerals. Most of the minerals found in the soils are salts of sodium, calcium, magnesium and potassium chlorides, sulphates and carbonates. Highly acidic soil retards plant growth by affecting the efficiency with which the plant absorbs nutrients from the soil.

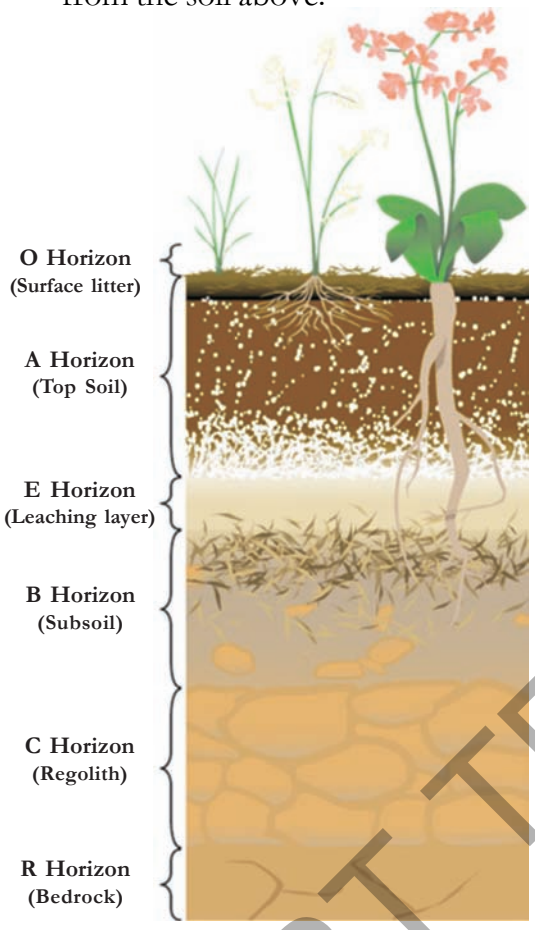
- Can you find out ways to decrease acidity?

HORIZONS OF SOIL

Soil is made up of distinct horizontal layers; these layers are called horizons. They range from rich, organic upper layers (humus and topsoil) to underlying rocky layers (subsoil, regolith and bedrock).

- **O Horizon -** The top, organic layer of soil, made up mostly of leaf litter and humus (decomposed organic matter).
- **A Horizon -** The layer called topsoil; it is found below the O horizon and above the E horizon. Seeds germinate and plant roots grow in this dark-coloured layer. It is made up of humus (decomposed organic matter) mixed with mineral particles.
- **E Horizon -** This eluviation (leaching) layer is light in colour; this layer is beneath the A Horizon and above the B Horizon. It is made up mostly of sand and silt, having lost most of its minerals and clay as water drips through the soil (in the process of eluviation).
- **B Horizon -** Also called the subsoil - this layer is beneath the E Horizon and above the C Horizon. It contains

clay and mineral deposits (like iron, aluminum oxides, and calcium carbonate) that it receives from layers above it when mineralized water drips from the soil above.



- **C Horizon -** Also called regolith: the layer beneath the B Horizon and above the R Horizon. It consists of slightly broken-up bedrock. Plant roots do not penetrate into this layer; very little organic material is found in this layer.
- **R Horizon -** The un weathered rock (bedrock) layer that is beneath all the other layers.
- These different layers of soil are called soil profile.

Do you know?

Soil Formation: Soil is formed slowly as rock (the parent material) erodes into tiny pieces near the Earth's surface. Organic matter decays and mixes with inorganic material (rock particles, minerals and water) to form soil. These days farmers test the soil in the field using soil technologies in order to grow suitable crops in the fields. Engineers also test the soil profile before constructing multi-storied buildings, bridges and dams.

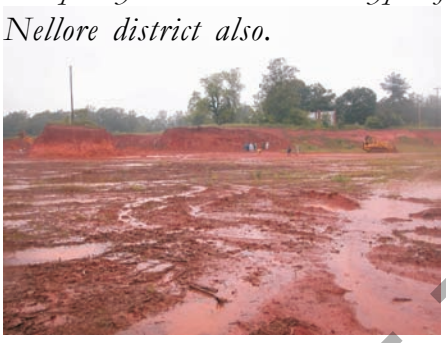
Soils in our village:

We will see different types of soils in different parts of our state. Most of the places in a district generally have same type of soil. In some cases we can see different types of soil in a district or same type of soil in different areas also. Lets us observe experiences of students from different parts of our state.

I am Madhu. I am living in Dondapadu village of Mellacherucu mandal in Nalgonda district. We have black soil in our village. We can make a ball by using this soil. But we can make cracked ring only. So it is light clay soil. Farmers grow cotton and Mirchi. If you dig two or three feet we will get lime stone in the soil. We use those stones for different purposes like construction of compound walls etc.

I am Kalesha. I am living in Padakal of Talakondapalli mandal in Mahaboobnagar district. We have red soil in our village. We can make a ball by using this soil. But we can't make a ring by using this soil, because this contains sand too. Farmers grow ground nut and castor and in some places cotton is also grown. Our people said that this is red sand soil.

I am Sujatha. I am living in Dantaguntla of Kanumolu mandal in Krishna district. We have black soil in our village. We can make any type of model by using this soil. It is sticky in nature. We call it black soil. This soil retains water for a long time. Farmers grow cotton, sugar cane and paddy. I saw the same type of soil in Indukurupeta of Nellore district also.



I am David. I am living in Kanala of Sanjamala mandal in Kurnool district. We can only make cracked rings using the soil in our village. My father said that this soil contains sand also. We grow Jowar, Bengal Gram and Paddy .

I am Ramadevi. I am living in Ramapuram of Vetapalem mandal in Prakasham district. In my village we can see sandy soil. We can't make even a ball by using this soil. Most of the farmers practise Aqua culture. Paddy is not grown in my village. Farmers grow Jasmine, Kanakambaram like flowers only. Like this Farmers grow flowers like Jasmine and Kanakambram only.

What do you observe in the information given by these children. Write information about soil and crops that are grown in your village in the same way.

I am .....

.....

.....

Soil and crops:

The crops commonly grown in any area depend on many factors. One major factor is the kind of soil available in that area and its properties.

We can understand the relation between soil and crop production by taking paddy as an example. A paddy crop grows best in a field that retains water for a long time.

- Which type of soil is better suited for growing paddy - one with a high percolation rate or with a low one?

Farmers decide the type of crop according to the nature of soil. Clay soil have high capacity to retain water, so sugarcane and paddy are grown in this type of soil. Red soil retains less water. So pulses, oil seeds and paddy variety that need less water are grown in this type of soil.

Let us do-10: Connection between crop and soil

Can you identify any connection between crops and soil? Make group with four or five students study the Atlas and other books in your school library. Make list of soils and crops growing in those soils in our State.

- Which type of soil is generally seen in our State?
- Which type of crops are grown in our state?
- The districts that cultivate paddy in large areas have which type of soil?

Along with seasonal rainfall fertility of soil also influence crop production. Do you know why farmers dump cattle dung in the fields? Farmers always take care of the soil in their fields.

Soil Conservation:

During heavy winds we observe that the surface soil particles are carried away by air. Sometimes during heavy rains, rain water carries away top layers of soil. This is called soil erosion. As a result of storms and floods fertile soil layers are removed and the soil become barren. Our farmers grow big trees around the fields to stop winds. They don't keep the lands vacant. Farmers generally use vacant lands to grow grass and other plants. These grass plant roots hold the soil particles and prevent soil erosion during heavy rains. You will learn more about this in the chapter on Forest.

It is very important to preserve the fertility of soil. Do you know why farmers can't continue the same type of crops in their fields? Continuous cultivation of same agriculture crops reduce the soil fertility.

S.No.	Name of the District	Types of Soil	Crops grown
1			
2			
3			
4			
5			

Let us do-11:

Make a group with four to five students and collect information about crops that grow in a year in your village. Why do they change crops after a period of time? Write your observations in your note book.

- Which crops are grown one after another in your village?
- Why are pulses grown every time?
- Is there any crop that grows continuously in a same field?

Generally, farmers cultivate pulses after completion of paddy. This kind of rotation of crops retains soil fertility and productivity. Conservation of soil is important factor in agriculture.

Key words

Clay, Humus, Loamy, Sandy, Percolation, Water retention, Soil profile, Soil fertility, Soil erosion, Crop rotation

What we have learnt

- Soil is a mixture of rock particles and humus.
- Clay, loam and sand are types of soil.
- Amount of water that passes through gives us percolation rate. It is highest in the sandy soil and least in the clayey soil.
- Water holding capacity of soil depends on soil type.
- Clay and loam are suitable for growing wheat, gram and paddy. Cotton is grown in sandy loam or black soil.
- Soil profile is a section through different layers of the soil.
- Removal of top soil by wind, water or any other means is known as soil erosion.

Improve your learning:

1. How can you say soil is a precious resource? Give reasons.
2. Which type of soil is suitable for growing cotton?
3. Give reasons for low percolation rate in clay soil when compared to sandy soil.
4. Why is top soil more useful for us?
5. What types of soils are there in your village? Make a list of crops grown on these soils.
6. If a farmer wants to improve water holding capacity of his sandy soil field what would you suggest him?
7. Do you think rotting vegetation and animal remains are important for the soil? In what way?
8. Roots of grasses hold soil particles. This conserves the .....
9. Which of the following statement is correct? Correct the wrong one.

- Soil form from sand.
- Crop rotation protects soil fertility.
- Clay soil can't hold water for a long time.
- Upper layers of soil are made of rocks.

10. Collect soil from your school ground. Try to make a ring with that soil. Write down your observations. What type of soil is it?

11. Take a boiling tube. Put two spoons of soil in it. Heat it on a spirit lamp and cover it.

    (a) Do this experiment and write your findings.

    (b) Do you find any moisture in the soil?

    (c) How can you say that?

12. Nazmal's grand mother said "Human beings always depends on soil" is she correct? How do you support her statement?

13. "If you sow a seed in the soil it will give birth to a tiny plant which grows bigger and bigger. "It is the wonder of soil" Swetha said. How you express your appreciation of soil like Swetha?

14. Write a dialogue between seed and soil and perform a small play using your own script.

15. If you have a chance to talk with a soil scientist, what questions would you like to ask him about soil?

16. Do you find any relationship between the chapters "Soil" and "Nutrition in plants". What are they?

SOIL SCIENCE

Soil science is the study of soil as a natural resource on the surface of the Earth. This includes Soil formation, Clssification and mapping, physical-chemical-biological and fertility properties of soil.

Some times terms which refer to branches of soil science such as pedology and edaphology are used as if synonymous with soil science. Study of formation, chemistry, morphology and classification of soil is called pedology. Study of influence of soil on organisms, especially on plants is called edaphology. Diversed disciplines are related to the soil science, the various associates concerned are engineers, agronomists, chemists, geologists, physical geographers, ecologists, biologists, microbiologists, sylviculturists, archaeologists all contribute to further knowledge of soil and the advancement of soil science.

16 FOREST : OUR LIFE

Pushpa stays at Adilabad. Her grandfather stays at a village near Utnoor.

- Try to locate these places in a map of Telangana State given in your atlas.

Pushpa always visits her grandpa's place during the summer vacation as grandpa owns a large mango orchard. She could feast on the juicy mangoes and feel the cool air at the orchard there. On the way to grandpa's village the beautiful view of thick forests always attracted her. She would ask her parents to stop the car on the roadside have a look at the forests along the hillside. There were different types of trees; several small and big plants growing close to each other and some climbers growing up to the tall tree tops!

Fig. 1

At the village, grandpa would take her into the orchard which looked like a forest with so many mango trees and the small plants growing under them. The difference was, all trees here grew in lines and were of the same kind!

Every morning after breakfast, grandma would pack a knapsack with some snacks, a bottle of cold water and a flask full of coffee. Pushpa was so fond of the orchard that she would love to spend the whole day under the shade of the trees. She could hear birds chirping, watch squirrels running about, people moving around, grandmas' goats wandering to feed on small plants, some insects flying about (grandpa always used the right insecticide – a chemical to kill insects to keep the orchard free from them yet some were always left!). It was indeed such a wonderful place!

Fig. 2

Pushpa had just passed her class sixth exam and had been pondering over a question in the question paper which was, "What do trees give us?"

In the answer she had written about several things as well as shade and cool air. Was she correct?

Do we feel cool under the shade of the trees in an orchard?

- Make a list of things that you know are obtained from trees.

Grandpa's orchard:

Pushpa always wondered how these mango trees had grown in grandpa's orchard.

Grandpa explained that it was great grandpa who was given a piece of land in the forest. The forest area had to be cleared to grow the mango saplings (baby plants) and develop it into the orchard it was today.

"There must have been wild animals then in those days?", enquired Pushpa.

"Yes of course, great grandpa along with his brothers and other villagers had to beat drums and use lighted fire torches at night to drive away the wild animals".

Where did the wild animals go? Where do they live now? What happened to the trees that were already present there? Do we always destroy forests to grow orchards or crops? Questions after questions poured out and grandpa had to think a lot to answer them.

- Why do we need forests at all? We could have only these orchards with so much of fruits to eat and, due to the absence of wild animals, safe to roam around too! Do you support this statement? Why?

What Forests are?

Pushpa asked her friends and relatives to find answers to her questions.

These are some information given to her.

- In ancient times the country was famous for its dense and continuous forests like Dandakaranya,Panchavati, Nallamala etc. But with the advance of civilization through ages, most parts of these forests are gone now.
- Forests have been cut down at a very fast rate in the past hundred years and replaced by industries, orchards (plantations of fruit bearing plants) or those needed for timber or other economic needs, croplands etc.
- The natural habitat of a forest is lost when forests are cut down. Several types of organisms disappear (either die out or leave the place).
- There are forests only on 19.3% of the geographical area of our country now (some reports say it's much less than this).
- A forest is a community of trees, shrubs, herbs and other plants and organisms that cover a large area using carbon dioxide, water, soil nutrients etc.
- Forests take up a large amount of Carbon dioxide and some other harmful particles and gases and keep the air clean. They serve as lungs of our earth.
- Forests are renewable natural resources, which play an important role in the maintenance of ecological balance.
- They are an important source of timber, fuel wood, cane, resins, lac, oils, fruits, nuts, firewood, fodder for animals, honey etc.
- The forests also have wild varieties of the cultivable crops and medicinal plants.
- If affected by a disease, the whole forest area is not destroyed.
- They provide habitat to wildlife.
- Forests help to control soil erosion.
- They help in causing rain.
- They keep the surrounding cool.

Pushpa was quite confused. There were so many things written about forests! She could not understand some parts such as how forests maintained ecological balance, how they could be lungs of the earth etc. She could only make out some common things about forests which were-

Forest is a place where there are many different trees. It is a home for wild animals. It also decorates the world. It is a very airy and shadowy place. We should not cut them to build factories, buildings etc or to grow crops, orchards etc.

- What is your opinion about forests?
- Why do you think forests are called lungs of the whole earth?
- In what way is an orchard different from a forest?
- Can large areas of plantations of same type of trees like eucalyptus be called forests? Why?
- Draw the picture of a forest in your notebook on the basis of what you have learnt so far.
- Do all forests have the same type of animals and plants? Why or why not?

Diversity in forests:

A. Forests of Telangana.

Let us find out about the types of plants and animals in the forests of our state.

In the forests of Telangana State we can see different types of trees like Teak, Sal etc., as well, that grow very tall. Neem, Tamarind, Amla, Soapnuts, Red sandalwood grows quite tall. There are bushes, creepers, kamba, cassia (tangedu), goat's horn mangroove (guggilam), rosewood, yegisa, bamboo, reodar etc as well.

Forest area	Animals that live in the forest	Types of Trees
Eturi Nagaram Bhoopalpally Dist.	Tiger, Chinkara, Antelope, Sloth bear	Teak, Sal, Tamarind, Amla, Neem
Bhadradri	Tigers, Panther, Hyena, Deer	Tamarind, Amla, Neem, Cassia (Tangedu), Teak, Rosewood
Mahabubnagar	Tigers, Deers, Chimpanzees, Pythan, Baboons, Snakes, Fox	Tamarind, Amla, Neem, Tangedu, Bamboo
Adilabad	Elephants, Tigers, Monkeys	Tamarind, Amla, Neem, Tangedu, Addaku

Let us do-1: Studying diverse animals and plants

Form groups and discuss about animals and plants found in the forests of our state.

Take the help of the above table, add some more names (refer to books in your library and also ask your teacher) and make a list of them.

Discuss and write why there could be variation in the type of animals and trees found in forests.

B. Forests of other regions

Let us do-2: Comparing forests

1. Forest of Hot and Humid areas

2. Forest of cold areas

Fig. 3(a)
Forest of hot and humid areas (Equatorial)

Fig. 3(b)
Forest of cold areas (Alpine)

Find the similarities and differences between the two types of forests as given in the pictures?

- We have studied about habitats in class VI, on the basis of that, can you say why forests are good habitats?
- Do you think forest is a habitat for human beings as well? How?

Besides animals and plants, forests have been a home of people as well, from ancient times. In various forest areas of our state we find some people still living there and making it their home. They usually live in places in the forest where water is available .

To know more about them let us read this.

These people never harm the forest in any manner. Chenchus, aadivasis never cut green trees for fuel wood and for domestic purposes. They collect only dry wood. They also hunt only small animals like monitor lizard and rabbits for their food. While collecting tubers that they eat, they leave a part of them in the soil for the plant to grow again. They have very little needs and happily go about their daily lives.

These people are being forced to leave their forest dwellings and start other professions. aadivasis are the only people living in the company of tigers and wild animals. If they withdraw from the core areas, their rich knowledge of wild animals, medicinal plants and tree species will vanish.

- What are the problems that these people will face if shifted from the forests?

Let us do-3: Preparing case study on tribals

Collect information about other tribal people living in forests and prepare case studies. You can take help from one given on "Chenchu's".

The Chenchus–Handling forests with care!

Nayudu cheruvu thanda is a small village near Papinenipally in the dense Nallamala forest of Prakasham District. This village is surrounded by the highest hill ranges of Andhra Pradesh and there are thick forests as well with several wild animals.

Fig 4

People living in this village belong to "Chenchu" tribe (these people are found in other villages and districts of the state as well). A Chenchu walks through forests for nearly 30 km every day and has thorough knowledge of forest, its flora, fauna and birds within a radius of around 15 km. They collect various food products like soapnuts, honey, tamarind, bamboo etc and sell them in the 'Santha' (a weekend market) and purchase materials like clothes etc. They also collect medicinal plants from the forest for which they are well known throughout the state.

Destruction of forests- An alarming pace!

Read the following news.

తమిళనాడు - ఆంధ్ర సరిహద్దుల్లో

ఏనుగుల బీభత్సం

దాడిలో ఇద్దరి మృతి ● ప్రాణభయంతో గ్రామస్థుల పరుగులు

ఏనుగుల దాడిలో మృతిచెందిన చిన్నారి దానమ్

Fig 5

- Discuss and write reasons.

Usually people destroy the forest for their own economic purposes for example, earning by selling trees and thus, excessive cutting down of trees or deforestation takes place. Deforestation also takes place when forests are cleared to construct buildings, roads, industries etc. Now-a-days thermal, nuclear power plants. mining industries led by multinational companies are a major threat to forests throughout the globe. Often large parts of forests are also lost due to forest fires.

- Does deforestation affect animals living in a forest? How?
- Think and write other reasons for the loss of forests.
- Why do wild animals enter villages near forests?
- What will happen if forests are completely destroyed?
- Can we have only agricultural lands and orchards instead of forests? Why?
- Can growing various types of trees in your locality help to revive forests? Why?

Let us do-4:

Go around your locality and note the number of trees. Also note the different types.

- Write down their names (If you know).
- Are these trees also present in forests of our state?

STEP TOWARDS CONSERVATION

Kondamallipudi Vana Samraksha Samiti, is located at the foot hills of Ananthagiri forest alongside the Srungavarapukota. It is in an area inhabited by members of

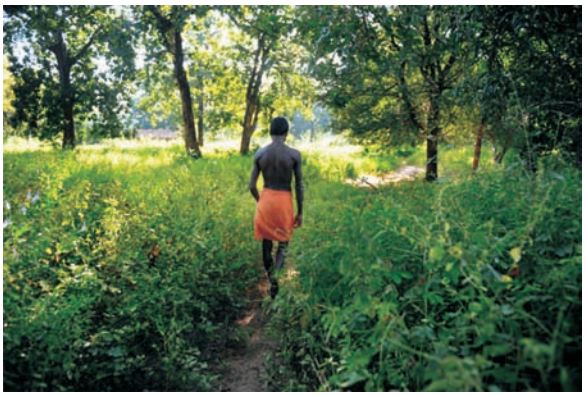


Fig. 6

"Koya" tribe who are known for getting into forest areas and cutting down trees to grow crops.

These people along with forest officials have now made great efforts to save forests by planting bamboo and other plants like Karaka, Rosewood, Nallamadi, Tamarind, Usiri, Jafra etc. They also took steps to conserve soil moisture by making bunds along edges of plantation areas, digging trenches etc. They see to it that no one harms trees in their area. Thus forests that were degrading started growing once again.

Let us take a step: We know that every bit of effort towards conservation helps. If we take care of plants growing around us we may not be adding a forest but adding to greenery around us which is essential for our own existence.

Do you know?

In 1730 AD about 350 Bishonois led by Amrita Devi sacrificed their lives to protect sacred green Kejari trees by hugging them when a king wanted to cut those trees later this was led to chipko movement in the history. There after this practice has been carry forward by people like Sunder Lal Bahuguna.

Read the following story and write your opinion in your notebook.

Save a Tree, Save Other Lives Too!

There is a school in a village. The school has no boundary wall. The Headmaster arranged for the construction of a boundary wall with the help of higher authorities. They were measuring the boundaries. There was a mango tree in the school. The tree was on the boundary line. A person staying next to the school argued that the tree belonged to him. The children studying in the school had been playing, reading, having lunch etc for years under the tree.

The children came to know that the person sold the tree. It was going to be cut very soon. They tried to convince that person not to remove the tree, but he adamantly denied the children's request.

Neelima who was studying class VII was worried about it.

Fig 7

Fig. 7

She thought throughout the night and got an idea. The next morning she told the idea to her friends. They collected money from their savings.

All the children went into the village and collected some more money. They went to that person and gave him all the money they collected.

Seeing the concern of the children, the person agreed that the tree would not be cut.

(This is adapted from an award winning story written by R. Ramya, Class – VIII of ZPH School, Navalaku Gardens of Nellore.)

In our state efforts have been made by communities along with Government officials to grow trees in areas allotted near villages/towns as social forestry, that is, peoples' own efforts to revive forests, which are well known as "Karthik Vanam".

Keywords

Orchard, Plantation, Timber, Firewood, Soil Erosion, Bunds, Deforestation, Tribe

What we have learnt

- We obtain various things and materials from the forest.
- A forest is a good habitat for many plants and animals
- Forest helps in binding of soil and protecting it from erosion.
- People living in forests depend on its products for their livelihood.
- Social forestry could help overcome deforestation.
- Forests are lungs of our earth.
- Destroying forests poses threat to life of animals and plants living there as well our own survival.

Improve your learning

1. How can you say forest is a habitat for people?
2. What variations do we see in forest types?
3. How do we depend on forests?
4. How can you say forests are lungs of our earth?
5. List the things that we use in our daily life which are made from wood.
6. What is deforestation? How can it be stopped?
7. This is not a forest product -

   a. Soap nut b. Plywood
   c. Matchstick d. Kerosene
8. If you want to develop social forestry in your village which type of plants would you like to grow. Why?
9. Collect the pictures of forest products and stick them in your scrap book.
10. Write a note on livelihood of forest tribes of our state.
11. Collect some songs / stories/poems about conservation of trees.
12. We can see animals not only in the forests but also in the Zoo. Write some similarities and differences between the conditions in which animals are found in the zoo and the forest.
13. Charita said "forest is good habitat" How can you support her?
14. How do we depend on forests?
15. Draw or collect pictures of forests. Discuss with your friends. Write about fate of forests in your state and what steps would you take to conserve them.
16. Find out about state of forests in India and write a brief report on it.
17. Plant a tree on your birthday or during any celebration in the family.

17 CHANGES AROUND US

In Class VI, we learnt that many changes are taking place around us. There are certain factors that influence these changes and there are reasons for every change. Among the changes we observe in our daily life some changes are slow and some fast. There are some changes that are temporary and some are permanent. There are many changes which take place naturally but for some we need to initiate or intervene in some way for the change to occur. In this lesson we try to learn about some more changes.

We know that there are certain changes that repeat after roughly a fixed period of time. For example we observe the repetition of sunrise and sunset every day. Similarly we notice changes in seasons after every few months every year.

Can you think of such other changes from your daily life?

Make a list of changes you observe in your daily life that are repeated after some period of time.

Let us do-1: Finding the period of repetition for changes.

Some changes are given in the following table-1. Observe the changes and write the approximate period of time after which they are repeated, for each change. If we observe the above table, we notice that every change mentioned in the table repeats after some period of time. Such changes are known as periodical changes.

Table-1

S.No.	Name of the Change	Approximate period of time of repetition
1	Change of day and night	12 Hours
2	Withering of leaves	1 Year
3	Rising of the pole star	
4	Change of Seasons	
5	Change of Greenery in the fields of cultivation	
6	Changes in lengths of shadows	
7	Appearance of Full Moon	

The events which repeat at regular intervals of time are called Periodical Events

Physical Change:

In our daily life we observe many changes. In the changes like melting of ice, solidification of ghee or coconut oil in winter etc., there is a change in state of the substance. In certain processes like filling balloons with air and pumping of cycle tubes etc., we notice change in shape. In some other changes like burning of wood and rusting of iron we find that new substances are formed. Are all these changes the same?

Let us do- 2: Find the change

Some changes are given in the table.Write possible changes you notice for each case and put (✓) in the appropriate column.

Table - 2

S.No.	Name of Change	Change in State	Change in Colour	Change in Shape	Change in Size	Formation of New Substance
1	Heating of coloured Candle					
2	Heating ice					
3	Heating Water					
4	Melting of Gold Ornaments					
5	Burning of Newspaper					
6	Filling air into Balloons					
7	Cutting a piece of wood					
8	Burning of Crackers					
9	Drying of Clothes in Sunlight					
10	Drying of wet Coconut					
11	Change of milk to curd					
12	Boiling Egg					
13	Change in cut apple/brinjal pieces					
14	Change in mouth due to Pan Chewing					

In how many changes do you notice change in the state/colour/size/shape? Count each separately

In which cases are new substances formed?

In the above activity we notice that only in some examples like burning of news paper, burning of crackers, change of milk to curd, boiling of egg, etc., a new substance is formed. But in other examples of changes we notice a change in state or colour or size or shape etc but the substance remains same and no new substance is formed. Let us observe the following change.

Let us do-3: Observe the changes in ice

Take few pieces of ice in a beaker and heat them as shown in the following figure.

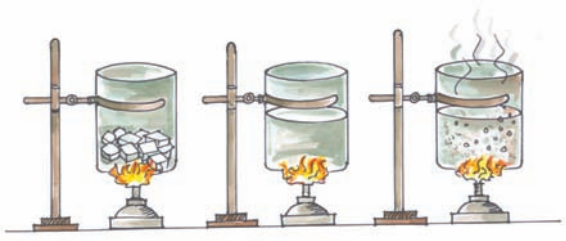


Fig. 1

What do you observe?

We notice that ice slowly melts and becomes water and on further heating it changes to steam. If we reduce the temperature, the water vapour changes back to water and when temperature is further reduced it changes to ice.

What changes do you notice in this experiment?

Is there any change in state?

Is there any change in shape and volume?

Is there any new substance formed?

Repeat the experiment using candle wax. What do you observe?

In the above activity we notice the change of the state of ice to water and to vapour but the substance, water, remains the same. Changes of this type where no new substance is formed are known as physical changes.

When a material undergoes a change in shape, size, color or state it is called a Physical Change.

Generally, no new substance is formed in a physical change

Make a list of some physical changes you observe in your daily life.

Chemical Changes:

Let us do-4: Observing the changes when burning some materials

Take a piece of wood, a piece of paper and a ball of cotton. Burn them and observe the changes.

Fig. 2

Record your observations in the following Table.

Table - 3

NAME OF THE MATERIAL	CHANGES OBSERVED WHEN BURNT		
A Piece of Wood	1.	2.	3.
A Piece of Paper	1.	2.	3.
A Piece of Cotton	1.	2.	3.

Is there any change in colour?

Is there any change in the state of material?

Do you find any new material after burning?

Are the materials present before and after burning the same?

In the above activity we notice that when a piece of wood, paper, and cotton are burnt a new material is formed . This is black in colour and in powder form which is different from the original material. We

also notice the change in shape and size of new material. This type of change which leads to form a new substance is known as Chemical Change.

Have you observed such changes in your daily life?

Can you name some changes which form new substances?

Rusting of Iron:

Fig. 3

Have you ever observed iron nails, iron gates, iron benches or pieces of iron left in the open ground for a long time?

What did you notice?

You observe a brown layer on the surface of the iron articles. This is called 'rust' and the process of forming of this layer is called 'rusting'.

Observe the iron tawa in your kitchen. You find a brown layer on it if it is unused for a long time. This is nothing but rusting of iron.

Similarly try to observe some other iron articles which are exposed to air like iron gates, iron caps on manholes , iron benches in lawns etc.

Do you find rust on these articles?

Why do iron articles get rust when they are exposed to air for a long time ?

When iron is exposed to air for a long time , the Oxygen present in air reacts with it in the presence of moist air and forms a new substance called iron oxide as rust on iron articles. This process is known as rusting.

Iron + Oxygen (from air) + Water $\longrightarrow$ rust (Iron oxide)

Similarly when Copper utensils are exposed to air we find a greenish coat on them. This greenish coat is formed when Copper reacts with Oxygen and Carbon dioxide present in the air. This coat also protects Copper from getting further corroded. It is an example of corrosion.

In all these cases, the metal is changed to its oxide, forming a new substance. Hence rusting or corrosion is a Chemical Change. The speed of rusting depends on the amount of moisture available to it for a long time That is more the humidity in air, faster is the rusting of iron.

The problem of rusting of iron and corrosion of other metal articles are the common experience in almost every home. It spoils beautiful articles and makes them look ugly. The following are some of the ways to prevent the rusting of iron.

1. Do not allow the iron articles to come in direct contact with Oxygen in the air, water or both.
2. Apply a coat of paint or grease on an iron article.

   Are there any other ways by which rusting of iron can be prevented?

Do all the materials react with oxygen in the air?

Observe Gold and Silver. You wear them in the form of ornaments. Even if they get exposed to air for a long time, they do not change colour or corroded. It means that they are resistant to corrosion which is the reason why we use them in making ornaments.

List metals which corroded and which don't corroded when exposed to air.

Galvanisation:

You might have observed handles of bicycle, metal rims of bicycles and motor cycles , white coated metal railings fixed to steps in cinema halls and shopping malls etc.

Do these articles rust? If not why?

Are all the above mentioned articles made of iron ?

How can we know that a given article is made up of iron or not ?

You learnt about magnets in the lesson 'Playing with magnets' in class VI.

Do magnets help us find iron articles? Try to find out whether your bicycle handle is made of iron or not. You notice that all the above mentioned articles are made up of iron.

Some articles made up of iron, don't rust even if they are exposed to air. To prevent iron articles from coming in contact with oxygen in air or water or both, a layer of another metal like chromium or zinc is coated on them. This process of coating a layer of metal on iron is called Galvanisation.

Have you ever observed in your house that water pipe lines don't rust on them ? Have you noticed any coating over these pipelines?

If we observe carefully, we notice that there is some metallic coating on these pipes to prevent rusting. They do not get rusted even after a long time because they are galvanized.

The process of depositing zinc metal on iron is called galvanisation

Let us do-5: Observing colour layer on cut fruits and vegetables

Take an apple, a brinjal, a potato, a tomato, a cucumber, a banana; cut each into small pieces; place them in separate plates and expose them to open air for sometime.

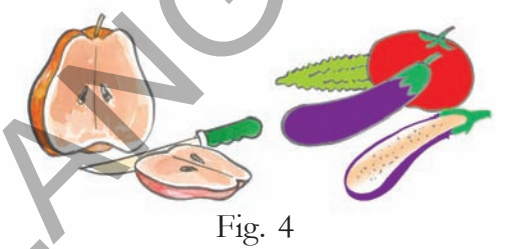


Fig. 4

What changes do you notice?

Table - 4

S.No.	Name of the fruit/ vegetable	Whether turned brown or not?	
		Yes	No
1	Apple		
2	Brinjal		
3	Potato		
4	Tomato		
5	Cucumber		
6	Banana		

Record your observation in the above table.

In which fruit or vegetable do you notice change in colour?

Why does this change occur?

Can you prevent the browning of cut vegetables and fruits?

Some fruits and vegetables, when cut , react with Oxygen in the air. This makes them to get a brown layer on the surface.

How to prevent browning of cut vegetables and fruits:

Have you observed your mother any time in the kitchen keeping cut potatoes or brinjals in salt water?

Fig. 5

Why does she put them in salt water?

Salt water prevents the outer surface of the potato and brinjal from colouring. Small quantities of acids like vinegar or lemon juice in water will also prevent browning of vegetables.

You can also rub the surface of the cut fruits with juices of citrus fruits like lemon to avoid from browning. The layer of lemon juice reduces the reaction on the surface of the fruit. Ascorbic acid (vitamin C) can also be used to prevent browning.

Let us do-6: Observe the changes in Magnesium ribbon

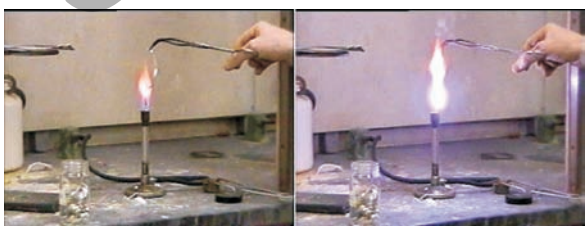


Fig. 6

Take a small piece of Magnesium ribbon. Burn it on a flame of candle. You will find brilliant white dazzling light leaving a powdery substance behind.

- Does the ash formed look like Magnesium ribbon?
- Do you think the Magnesium ribbon and the ash have the same composition?

When Magnesium burns in the presence of Oxygen, it forms Magnesium Oxide in the form of powder ash, which is a new substance. Thus there is a change in the composition.

Magnesium + Oxygen $\longrightarrow$ Magnesium Oxide

Collect the ash and mix it with a small quantity of water and dissolve it. Another new substance is formed.

Magnesium Oxide + Water $\longrightarrow$ Magnesium Hydroxide

What do you observe ?

Do you observe any change in the state of the substance?

Is it an acid or base?

Test the dissolved mixture with blue and red litmus papers to decide whether it is a acid or a base.

Let us do-7: Observe some chemical changes

Take a glass tumbler half-filled with water and add a teaspoonful of Copper Sulphate to it. Now add a few drops of Sulphuric Acid to the Copper Sulphate solution. Do you observe any change in colour ? Take some sample solution of it in another beaker and keep it aside. Add an Iron nail to the solution in the first beaker and keep it undisturbed for

half an hour. Compare the colour of the solution in which iron nail is dropped to that of sample solution kept aside.

Now remove the nail from the beaker and observe.

1. Is there any change in the colour of the solution that had iron nail in it?
2. Is there any change in the nail?

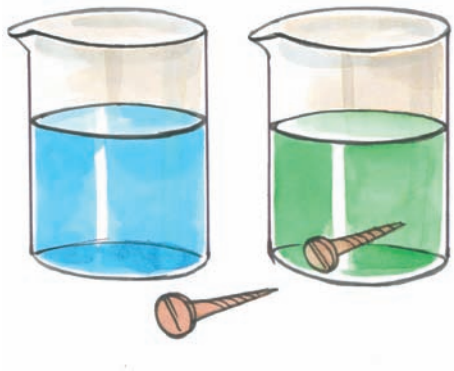


Fig. 7

We notice that the blue coloured solution changes into green colour and a brown colour deposit is seen on the iron nail.

Why did these changes take place?

The change in colour of the solution is due to the formation of Iron Sulphate, a new substance. The brown deposit on the Iron nail is Copper, another new substance.

Cooper Sulphate (Blue) + Iron ⟶ Iron Sulphate (green) + Cooper (brown deposit)

Let us do-8: Observe reaction of Vinegar with Baking soda

First set up the apparatus has shown in Fig-8. Take a teaspoon of vinegar (acetic acid) in a test tube and add a pinch of baking soda (Sodium bi Carbonate) to it. If you do not have vinegar, lemon juice can also be used. You observe bubbles coming out with a hissing sound. Pass this gas through freshly prepared Limewater (Calcium Hydroxide)

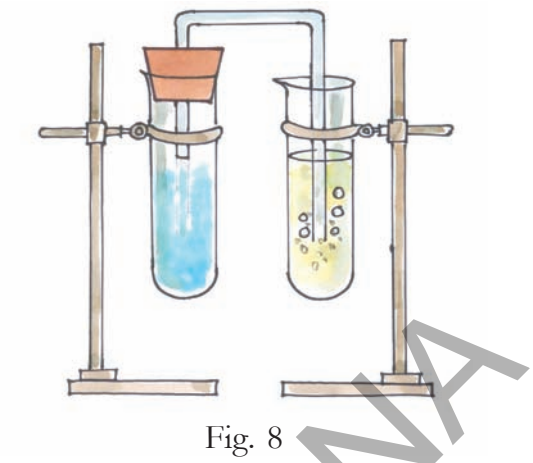


Fig. 8

What is the change you observe? Limewater changes to milky white showing that the gas sent into the test tube is Carbon dioxide.

Vinegar + Baking Soda ⟶ Carbon dioxide + other substance

Carbon dioxide + Lime Water ⟶ Calcium Carbonate + Water

In these reactions the new substances like Carbon dioxide and Calcium Carbonate are formed. Hence it is a chemical change.

When a material undergoes a change in its composition it is called a chemical change

Let us do-9: Burning of Camphor

Have you ever seen "harathi" ?

Have you ever thought of the material used in harathi?

It is "Camphor", we burn it to get flame (harathi). Observe what happens when you burn Camphor? Initially it changes into liquid and then burns. It is also considered to be a chemical change.

Take a small quantity of Camphor in a dish and place it in the open air. Observe it after some time. What happens? Its quantity reduces and you sense the smell of it. It happens because camphor evaporates. Since

it has strong smell, it is used to keep insects and flies away. It is also used in medicines.

From the activities discussed above we conclude that, in a chemical change, material undergoes a change in its composition and a new substance is formed.

In addition to new products the following may also occur in a chemical change.

1. Heat, light or any other radiation may be given out or absorbed.
2. Loud sound may be produced.
3. A change in smell may take place or a new smell may be produced.
4. A colour change may take place.
5. A change in the state may occur.

All chemical changes do not have the 5 traits mentioned above.

Chemical changes are very important in our lives. Mostly, new substances are formed as a result of chemical changes.

Think about some of the chemical changes you observe around in your daily life.

Can you list them?

Crystallisation :

Have you seen large crystals of sugar (Missri) or crystal salt?

Do you know how we get these crystals?

Have you ever observed the formation of small sugar crystals on sweets like Jilebi and badushah, which are kept aside for a long period?

What is the reason for this?

Let us find out.

Let us do-10: Observe crystallisation of Sugar.

Fig. 9

Take a big size test tube . Fill half of it with water. Add some sugar to it and stir it. Keep adding sugar and stirring until saturation is attained. Then heat this sugar solution and add some more sugar to it while stirring continuously. Continue adding sugar till no more sugar can be dissolved in it. Now filter the solution and allow it cool for half an hour.

What changes do you notice at the end?

We notice formation of large size crystals of sugar at the bottom of the beaker. Thus sugar the small granules of sugar added changed into large size sugar crystals.

What type of change is it ?

Let us do-11: Observe Crystallisation of Urea

Take some water in a test tube and add urea to it. Heat the test tube till all the urea dissolves. Add more urea to it. Keep on adding to it until no more urea can be dissolved in it. Let the solution cool down for sometime. Observe the test tube after about half an hour.

Do you find any crystals in the solution?

What is the shape of the crystals?

Repeat the experiment with Alum. Compare the type of crystals formed by urea and Alum.

Let us do-12: Observing Crystallisation of Copper Sulphate.

Take some hot, saturated solution of Copper sulphate in a test tube. Pour some of it in an evaporating dish. Allow the solution to cool quickly.

Observe with a magnifying glass, the size, colour and shape of the crystals formed.

From the above three activities we notice that we can separate dissolved substances in the form of crystals.

The process of separating a soluble solid from the solution by heating or evaporating the solvent is called crystallization.

What type of change is this? In crystallization no new substance is formed. Hence it is physical change.

Till now we have discussed about some physical and chemical changes. In physical changes no new substance is formed whereas in chemical change we have seen that one or more new substances are formed.

Identifying physical and chemical change

Have you ever thought of the process behind setting milk into curd? Is it a physical change or chemical change ?

What type of change is the boiling of an egg? Is it a chemical change or a physical change?

Think about the following changes and decide whether they are physical or chemical changes. Write the type of change and reasons for that in the table.

Table - 5

Sl. No.	Item	Physical / Chemical Change	Reasons
1.	Preparation of Idly Mix		
2.	Making dough for roti		
3.	Preparation of Tea		
4.	Ripening of fruits		
5.	Applying pain balm for different kinds of pain.		
6.	Applying cosmetic creams, antiseptic creams and lotions to skin		
7.	Taking tablets, capsules and syrups		
8.	Tearing of paper		
9.	Change in skin colour in hot summer		
10.	Growing of plant		

Everyday we use many types of batteries and many of these batteries are recharged regularly. Can you identify the types of change taking place in this process?

We use Turmeric with Limewater (Calcium Hydroxide) to decorate the feet (Parani) during some occasions at our homes. What type of change is this? Think about the reasons why chewing of Pan (Killi) turns our mouth red.

Look at the picture and circle all the Physical and Chemical changes. Write them in the table given below:

Fig. 10

Table - 6

S.No.	Item	Physical / Chemical Change	Reason
1.	Burning of Chichubuddi	Chemical	Forms powder, gives light & sound.
2.			
3.			
4.			

What we learnt:

- Changes mainly are of two types. Physical and Chemical.
- When a substance undergoes a change in shape, size, colour or state without the formation of a new substance, then it is called a physical change.
- In a physical change generally no new substance is formed.
- When a substance undergoes a change in its composition, it is called a chemical change.
- In a chemical change new substance is formed.
- A chemical change is also called chemical reaction.
- In any change heat, light, radiation or sounds may also be produced.
- In a change new colour or smell may appear.
- The process of separating a soluble solid from the solution on heating is called Crystallization.
- The process of depositing zinc on any metal is called Galvanisation

Key Words:

Chemical Change, Reversible, Irreversible, Rust, Physical Change, Composition, Vinegar, Baking Soda, Lime Water, Galvanisation, Crystallization, Corrossion.

Improve your learning:

1. Why do we paint wooden doors and windows?
2. Some deposits were observed in water preserved in Aluminum containers after two to three days. What could the deposit be? What is the reason for the formation of these deposits?

3. When a candle is burnt, what type of changes take place? Give another example of a similar process.
4. How is an iron gate prevented from rusting?
5. Between coastal and dry land areas, where is rusting of iron objects faster? Give reasons.
6. Classify the changes involved in the following processes as Physical, Chemical or both.

a) Burning of Coal
b) Melting of Wax
c) Beating Aluminum to make Aluminum foil
d) Digestion of food
e) Boiling of Egg
f) Photosynthesis
g) Cutting of Wood

7. Which of the following processes are chemical changes? Give reasons.

a) Making a Salt Solution.
b) Adding Hydrochloric Acid to Marble stone.
c) Evaporation of water.
d) Adding phenolphthalein indicator to acid solution.
e) Respiration
f) Ripening of a Mango.
g) Breaking of Glass.

8. Fill in the blanks in the following statements

a) The chemical name of vinegar is _____.
b) Changes in which only _____ properties of a substance change are called physical changes.
c) Changes in which new substances are formed are called _____ changes.
d) Magnesium+Oxygen→ _____
e) Copper Sulphate+Iron→ _____

9. Identify the incorrect statement.

I) The gas we use in kitchen is in the form of liquid in the cylinder. When it comes out from the cylinder it becomes a gas (step – I), then it burns (step – II). Choose the correct statement from the following.

a. Only step – I is a chemical change.
b. Only step – II is a chemical change.
c. Both steps – I & II are chemical changes.
d. Both steps – I & II are physical changes.

10. Identify the incorrect statements among the following and rewrite them correctly.

a) Formation of manure from leaves is a physical change.
b) Iron pipes coated with Zinc don't get rust.
c) Setting of curd is a physical change.
d) Condensation of steam is not a chemical change.
e) Burning of Magnesium in air is a chemical change.

II) Bacteria digest animal waste and produce biogas (step – I). The Biogas is then burnt as fuel (step – II). Choose the correct statement from the following.

a. Only step – I is a chemical change.

b. Only step – II is a chemical change.

c. Both steps – I & II are chemical changes.

d. Both steps – I & II are physical changes.

e. Step– I physical, step-II chemical change.

III) A piece of paper was cut into four pieces. What type of change occurred in the property of the paper?

a. Physical change b. Chemical change

c. Both changes d. No change

IV) Kishan stretched a rubber band. What does it represent? _____

a. Chemical change b. Physical change

c. Both changes d. No change

10) Sudheer wants to make his vessels ,which are made of Brass and copper, clean and shiny. What suggestions you would like to give him?

11) Anurag appreciates the changes in ripe mango as "How nice its colour and taste are"? Give some examples of changes that make you feel happy, or wonder. Appreciate them in your own words.

12) The changes like, chicks came out of eggs, blossoming flowers etc. are very pretty to see. List out such changes around you which make you feel happy on observation.

13) Collect information on the changes taking place in the food during the process of digestion. (From the school library / internet and display your observations on the bulletin board).

14) Collect information on the process of artificial ripening of fruits in fruit markets and discuss whether it is useful or harmful.

15) Ravi prepared carbon-dioxide using baking soda and vinegar. Carbon-dioxide changed lime water into milky white. Represent this experiment in a diagram with labelling

16) When you burn a piece of wood different changes take place. Analyse the following.

(a) Predict possible changes and list them all.

(b) Are there any physical changes among them?

(c) How many forms of energy are released in the change?

(d) What chemical changes do you notice? Explain briefly why these occur.

17. Match the following:

1) Growing hair	(	)	a) due to chemical change
2) Breaking Mirror	(	)	b) acetic acid
3) Galvanisation	(	)	c) slow change
4) Vinegar	(	)	d) physical change
5) Atmospheric pollution	(	)	e) the process of depositing metal on iron