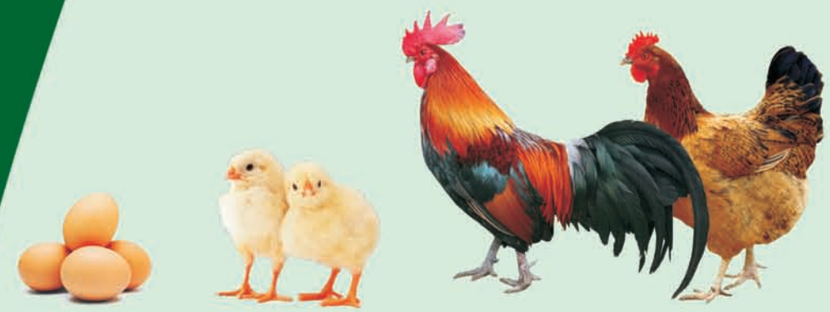

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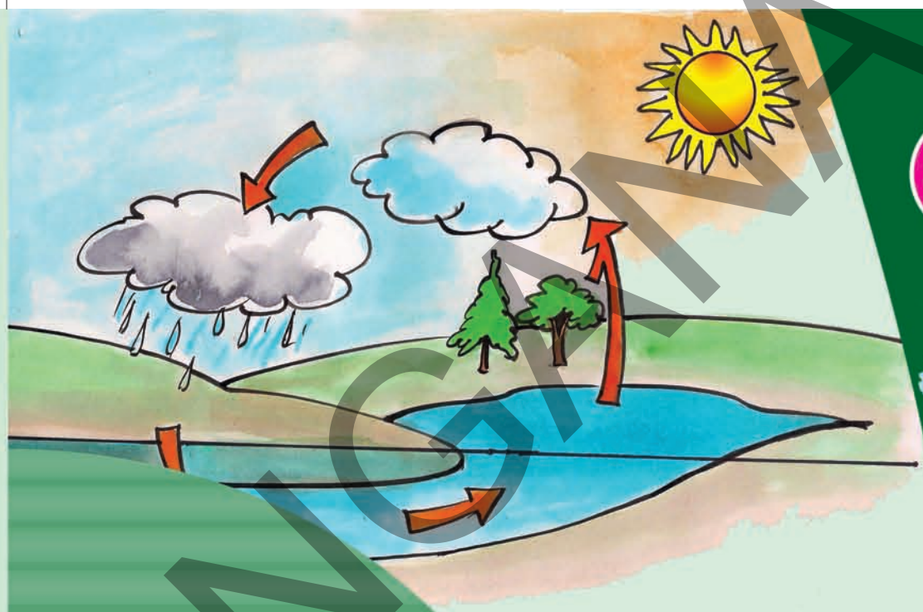

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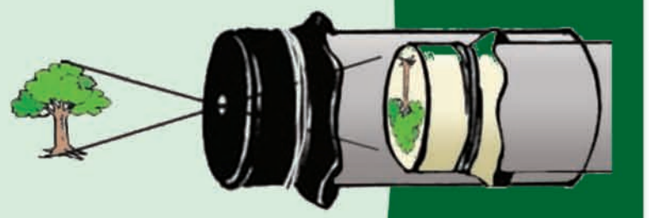
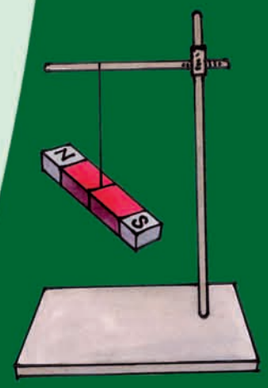
SCIENCE

CLASS-VI





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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'

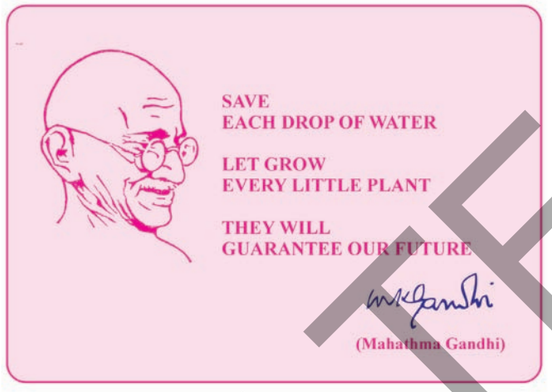
Using wisdom and saving mother earth is the 'Science'

So my dear little minds ...

The universe is yours

And you are the creators

Dr. A.P.J. Abdul Kalam



SCIENCE

CLASS VI

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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

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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 as questioning, and observing the nature and also trying 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.
- The information given in the bottom line boxes of every page is only for extensive reading.

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

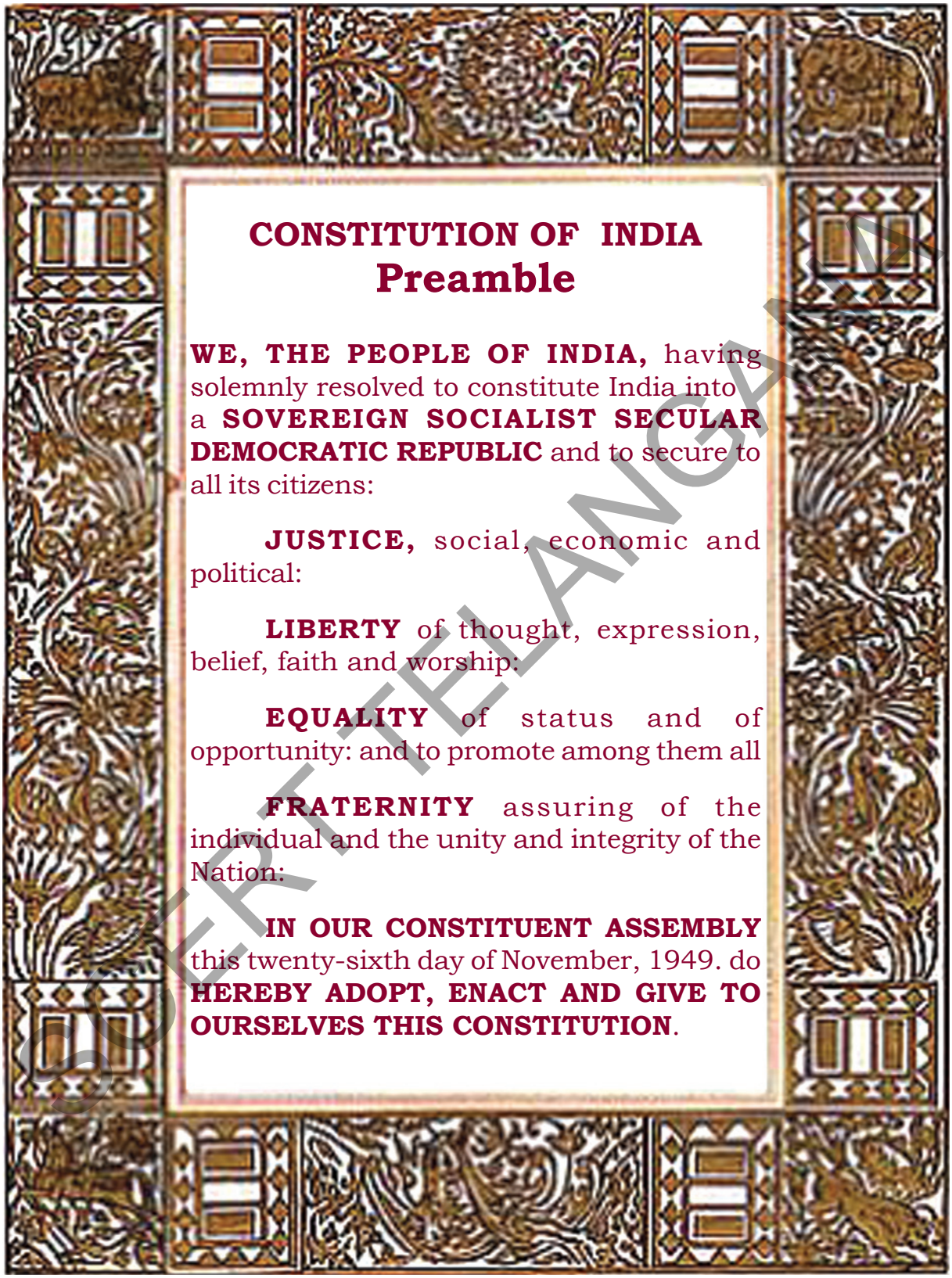
1922 - 2011
Genetic Engineering

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

VI Class

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 Our Food

If any one asks you about your favourite food item, what will you answer? The list may include several things like laddu, biryani, idly-sambar, pulihora, cheese, dal, brinjal curry and so on. But if you are asked about the components, their sources and how they have been cooked, then, it may be difficult for you to answer. Generally we take interest in eating food and don't bother about other things, like what material we need to prepare brinjal curry or biryani? How can idly be made soft? We take food for our health and energy, but we should also know the materials required for preparing the food we eat. This type of information is very important. So, we will discuss about the ingredients, processing and sources of food in detail in this chapter. Observe the following food items and name them.

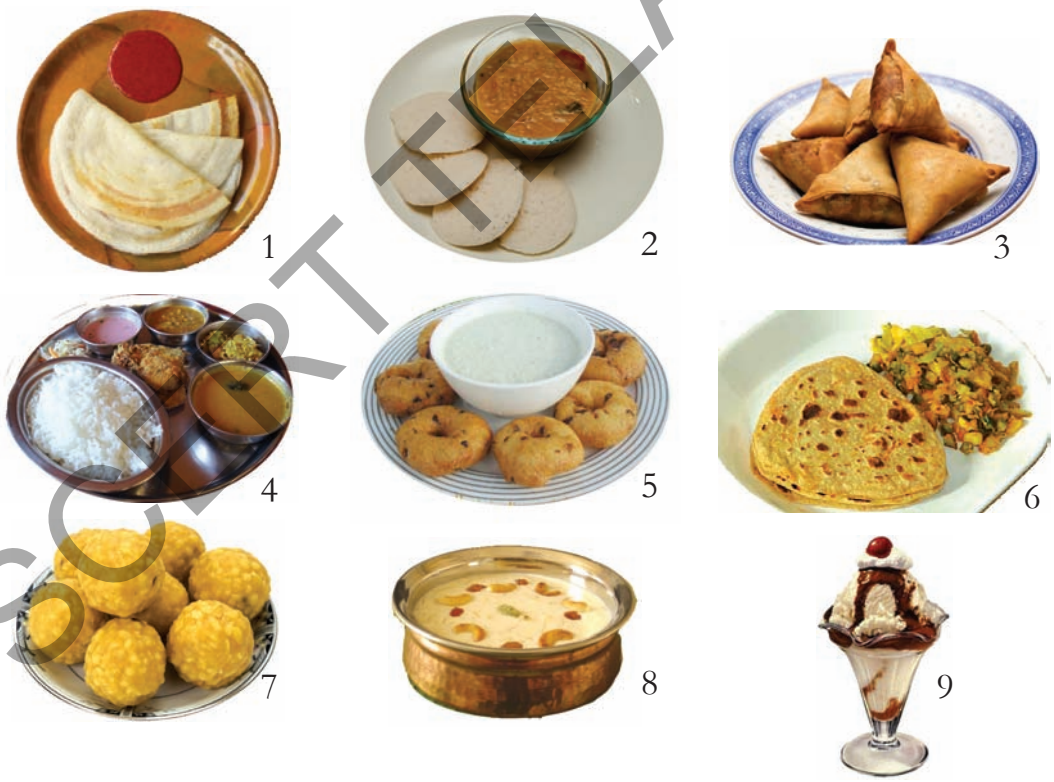


Fig. 1 : Variety of food

Banana contains potassium which is useful for us.

Activity-1: Finding variety in our food

Every day we eat different types of food from morning to night. What did you eat yesterday? Make a list. Also discuss with your friends and collect information about what food they had eaten yesterday.

Record the information in table 1.

Table 1 - What did I eat

Name of student	Food eaten
Ashok	Rice, Dal, Milk, Vegetables, Jam, Idly, Bread
Neelam	Biryani, Chilli Chatni, Roti

- Are there any common food items in the list of yours and your friends'?
- Count the number of food varieties you have listed in the table?
- Do all the students eat the same type of food items?
- What food is served in your school at midday meal?

We eat different types of food material daily but some food items like rice, dal and vegetables are common in the daily menu in large parts of Telangana. On special occasions we eat a larger variety of food.

Food ingredients

Activity-2: Many things are needed to prepare food

Srinivas wants to eat something special on Sunday. He asked his mother to make biryani. Srinivas wanted to help his mother. His mother asked him to prepare a list of materials which would be required to make biryani. Here is the list made by Srinivas - rice, salt, jeera, tomato, potato, onion, etc. Help Srinivas if he had missed any material and complete the list.

Srinivas was surprised that while cooking boiled rice we need only two materials,

Don't eat bananas on an empty stomach; combining them with a bit of protein will help to normalize the insulin response caused by the sugar in the banana.

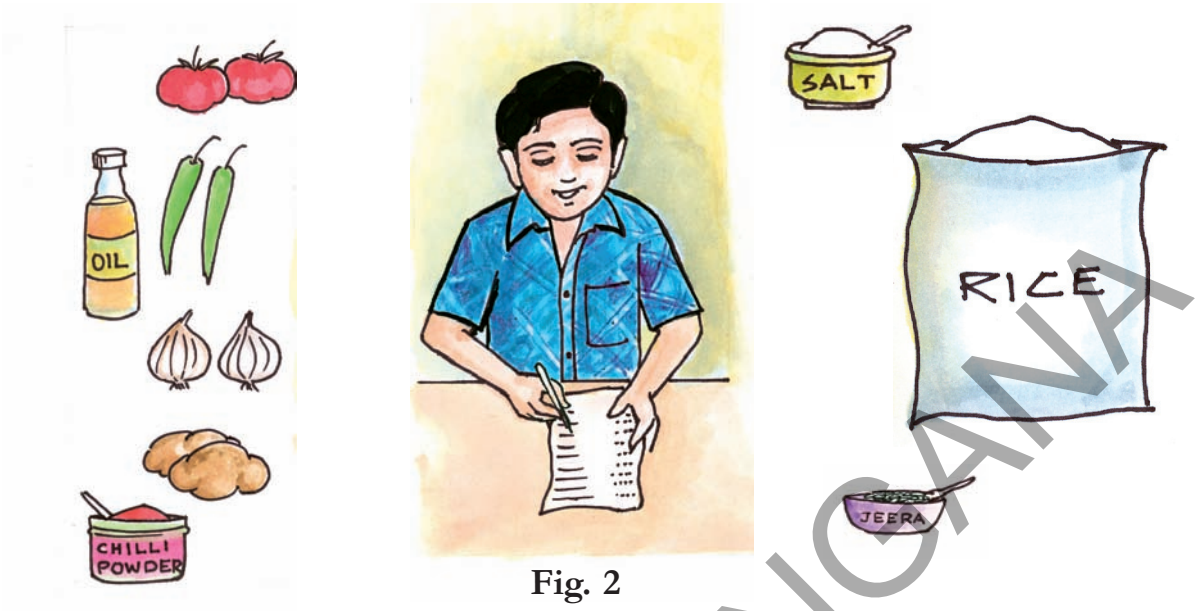


Fig. 2

raw rice and water. But for making biryani we need many materials.

To make different kinds of food we need different materials. These materials which are required to prepare food are known as ingredients.

List out some food items you like to eat and try to find out what ingredients are used to prepare them (Table-2).

Table 2 - Ingredients of some food items.

S.No.	Food items you like	Required ingredients
1.	Payasam	
2.	Chicken curry	
3.	Pallikaram	

When you purchase packed food, biscuits or any cool drink, you will find their ingredients written on their packets. Have you ever thought from where these ingredients come? Yes, it will be easy for you to say that we get vegetables and fruits from plants; eggs, milk, meat from animals. Is there any other source you can think of? Some ingredients have been listed below. Find out the source of each ingredient; if it is a plant mark (P) or an animal (A), or something else (O) (Table-3).

Chicory is beneficial for digestion, the circulatory system and the blood

Name the plant or animal also. You can take the help of your friends or elders.

Table 3 : Who gives us food

Ingredients	Plant/Animal/Others	Name of plant or animal
Cooking Oil		
Honey		
Chips		
Turmeric powder		
Salt		
Dough		
Meat		
Rice		
Eggs		
Sugar		
Peanuts		

Try to enrich this list as much as you can. You will find that from animals we get milk, eggs and meat. If you observe carefully you will notice that there are a number of animals from which we get different kinds of food. Goats and sheep give us meat. Hens and roosters are used as meat (chicken). Can you elaborate this list? In plants we eat different parts, like leaf of spinach and coriander plants, flower of cauliflower plant, fruit of tomato and drumstick plants. You may be having some doubt about the salt. It is a mineral and obtained from the sea. In later classes you will learn about the components of food. Can you identify which part of the plant is eaten by us in the given table? You can also discuss with your friends (Fig.-3).

* We get varieties of food material from plants
* In some plants we eat only some parts as food.
* We take entire plant as food.

Beet roots are high in carbohydrate levels and should therefore be used sparingly

Fig. 3

Do you know?

To make biryani or kheer, we use different types of ingredients such as ilaichi (cardamom), lavang (clove), dalchini (cinnamon), biryani leaves, pepper etc. They are called condiments (sugandha dravyalu / fragrant material). Cashew nuts, almonds, kismis (dried grapes) etc are also used. These are dry fruits. Condiments and dry fruits grow in particular places only. They are not available in large quantities. They are expensive.

Now look at table 4 and try to fill it as shown.

Table 4

Name of plant	Parts that we eat
Fenugreek (Menthulu)	Leaves, seeds
Mustard (Avalu)	
Sugarcane	
Carrot	
Onion	
Cabbage	
Asafoetida (Inguva)	

Peanuts contain beneficial protien, but many people are allergic to them and find them hard to digest.

- Which parts of the plants do we generally use?
- Do we also use flowers as food? Which plants are these?
- Is there any plant of which whole parts of it can be eaten?

We use various parts of plants for our food. Leaves, roots, seeds and fruits of plants are widely used whereas stems and flowers are not so widely used. We need several ingredients to cook different types of food. Whatever may be the source of ingredients - plants, animals or minerals, we use some in plenty but others are needed in only small quantities. Why is it so?

How people develop food habits?

People living in one region usually share common food habits. You might have seen paddy fields near your village. In our state geographical and climatic conditions are more suitable for growing paddy so we produce more rice. In which districts of our State is paddy grown widely? Even though farmers grow various types of food crops we generally use rice as staple food. A variety of food items are prepared using rice. A number of food items are made using rice in the form of Rava and flour. Make a list of those items. We eat more rice and rice products as compared to other cereals like wheat or maize. But in Rajasthan maize, bajra and wheat is produced more than rice. So the main food in Rajasthan is chapathi or roti.

Many times we hear people saying that "I like this curry ". "I don't like that". This is not a good food habit ,you should make a habit of eating all varieties of vegetable food items. This makes you strong and energetic.

Different methods of preparing food

Preparing food is an extremely important art and essential for life. There are many ways of preparing food. Rice is boiled but idly is not made in the same manner. (For making idly, rice and dal are fermented, followed by steaming.) Potato chips are fried in oil. Some processes have been mentioned in Table 5. Fill in the food items.

Table 5 - Processes involved in making food

Method of preparing food	Food items
Boiling	
Steaming	
Fermentation	
Roasting	Peanuts ...
Deep Frying	Pakodi, Puri ...

Onions are an excellent antioxidant, and they contain anti-allergic, antiviral and antihistamic properties

Method of preparing food	Food items
Shallow frying	Chicken, Fish...
Chopping and mixing	
Cutting and mixing	

In table 5, you can also add any other methods of cooking which you know. Don't forget to add the food items prepared by this method.

Tasty Food:-

We usually say food is tasty. But how does food get its taste? The taste of food depends on its ingredients, method of preparation and our cultural habits. Do you know the method of preparation of any food item?

Fig. 4

Joseph knows how to make tomato curry. Listen to him.

"I like tomato curry. I learnt how to make it from my father. To prepare it, we need two tomatoes, one onion, two green chillies, one red chilly, turmeric powder, salt, oil, mustard seeds, black gram and jeera.

First of all, clean all the vegetables in water, and chop them into pieces. place a pan on the flame. Pour three spoons of oil. When oil becomes hot, put one spoon-full of mustard, black gram and jeera. Then add green and red chilli pieces and put a pinch of turmeric powder. Half a minute later add pieces of onion and tomato. Then add some salt and close the lid. After five minutes the tasty curry is ready."

Activity-3: Let us cook

What is your favourite cooked food? Find out how it is prepared. Write the recipe in your note book.

Sweet potatoes are an excellent source of carotenoid antioxidants

Preservation of food

The discussion about food will be incomplete unless we talk about food preservation. How do farmers protect rice from pests and store it after it is harvested? How is rice stored in your home? Why does curry get spoiled when kept out for a couple of days but pickle stays fresh for so long? It is only because of preservation. For preserving certain food-items, they are salted and dried. In certain areas dried fish is commonly used. Vegetables and meat are dried and also pickled.

- Try to find out how vegetables are pickled at home.
- Find out the ingredients that help to preserve vegetables.

Salt and turmeric powder are used for preservation while making pickles. In coastal areas it's a common sight to see fish being smoked for preservation.

- Try to find out more about this process.
- What are the other food material preserved by this process?

Do you know?

Sugar syrup or honey is a good preservative. Fruits are often preserved in sugar syrup or honey. Jams and fruit juices are good examples of preservation with sugar.

Activity-4: Let us store food

Discuss in groups and identify examples of different preservatives. Ask your parents other ways of preservation that they follow. (Table-6)

Table 6 - How to preserve food

Types of preservatives	Examples
Adding salt, chilli powder and oil	pickles, ...
Adding only salt	
Drying	
Sugar syrup	

For preserving food we use different types of preservatives. But some food items which are available in the market have harmful preservatives. So we must

Tomatoes are an excellent source of vitamin C (the vitamin C is most concentrated in the jelly-like substance that surrounds the seeds. It helps to build up immunity)

be aware of the ingredients of packaged food. When you purchase any food item in the market, don't forget to read about its ingredients and manufacturing date. Eating out-dated food material may damage your health.

Joseph's father always observes the ingredients used and the date of manufacturing when he buys the readymade food items. Expired food items should not be consumed. They are harmful to our health.

Do you know?

Preparation of food using vegetables and fruits is an art. Some people make different types of designs and decorations with vegetables. This is called vegetable carving. Try to make your own carving (Fig. 5).

Fig. 5

Keywords

Ingredients, preservatives, fragrant materials, dry fruits

What we have learnt

- We get food from plants and animals.
- For cooking food, we need different types of ingredients.
- We use different parts of plants like stems, roots, leaves, fruits and flowers as food.
- The taste of food is based on its ingredients, method of preparation and cultural practices of the region.
- Boiling, steaming, fermentation are some methods of preparing food.
- We use preservatives to preserve food for some time.

Improve your learning

1. What are the common food items usually eaten by you?
2. Find out the ingredients of the given food items:

   Pachipulusu, coconut chutney, jilebi, onion pakodi
3. Write down the process of making upma or any other snack of your choice.

Tomatoes are rich in Carotenoid and Lycopene; eating foods containing Carotenoids can lower the risk of cancer.

4. Collect any wrapper of packaged food. Read the information details and answer the following questions.

   (a) Name of the food item

   (b) Price of the food item

   (c) When was it manufactured

   (d) How long can we use it?

   (e) What ingredients does it contain, name them?

5 Shahina's mother always cooks plain rice! If the same rice is used to make kichidi, payasam or biryani how would you feel eating those?

6 List out the names of some plants that grow in your village. Which parts of it are used as food?

7. Some food material is given below. What are the diffrent possible ways of cooking them? Find out and write them.

   Meat - Groundnuts - Potatoes - Spinach

8. With the help of your teacher form groups of 5 or 6 students of your class. Make a fruit chat or vegetable salad and eat it.

   How do you feel? Write few lines about your experience.

9. Ask your friend to think of the name of any food item. Now you have to guess its name. For this you can ask some questions. Your friend can only answer Yes or No. How many and what questions did you ask before you could guess the name?

10. List out the ingredients needed to make vada. Are they same for dosa? Identify the differences in your list.

11. Latha's mother has prepared the following statements for you. Find out the wrong ones among these, don't forget to give your reasons.

   (a) We can get food from plants and animals only.

   (b) Spices, oil, salt and meat are the ingredients of a chicken curry.

   (c) Plants are the source of honey.

12. Find out from your parents the various methods of preserving food and write a note on them.

13. Collect information about the main food habits of different states of India. Refer to the Atlas, library books and discuss with your teacher.

Cakes and cookies contain too much sugar and not enough vitamins and minerals

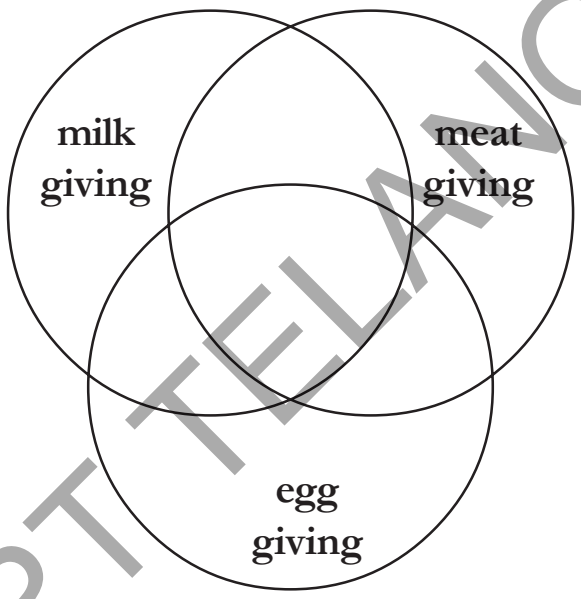
14. Suppose if fish / raw mango / lemons are given to you how would you preserve them?

15. Make a list of animals and insects from which we get food.

(a) Write the names of these animals on slips of paper. On the other side of the slip write the names of food we get from the animals - milk, eggs or meat.

(b) Sort the slips into groups. Write the names of the animals in the correct portions of the circles shown below.

(c) Are there any portions where none of the animals fit? Explain why?



* * * *

Oranges are more fibrous. So take oranges for the source of fibrefood.

2 Playing with Magnets

All of you would have seen a pin holder in your school office (see Fig. 1 (a)). You may have seen that in this pin holder, some pins are attached to the top or cap.

Fig. 1 (a)

- Why do the pins get attached to the cap of the pin holder?
- What could be there in that cap?
- Does it attract objects other than pins? What are they?

You might have seen some metal stickers stuck to the door of an iron almirah or a refrigerator (see Fig 1 (b)).

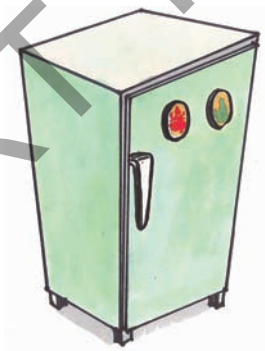


Fig. 1 (b)

- What is there in those stickers which makes them stick to the iron doors?
- Do they stick to wooden doors or plastic doors too?

Activity-1: Finding objects that get stuck to the cap of the pin holder.

Take a pin holder from your school office. Drop some pins, jump-clips, iron nails into it. What do you observe? Do the same with a piece of paper, a pencil and an eraser. What do you observe?

You would notice that some of these objects (pins, jump-clips, nails) get stuck to the top of the pin holder while the other objects (paper, pencil, eraser) fall into the pin holder.

Why does this happen so?

The cap of the pin holder contains a speical material which attracts substances like iron pins, iron nails etc.

Similarly, the metal stickers also have a speical material at the back so that they can stick to iron doors. That speical material is called **magnet.**

- What material is needed for making magnets?
- How were these magnets discovered?

Let us try to find the answers to these questions.

Right now, the Neodymium is the strongest magnet currently known

Story of Magnet

Around 2500 years ago, there lived an old shepherd named Magnus. He used to take his goats and sheep to the hills for grazing. He always carried a wooden stick which had an iron cap on its lower end. One day, while his goats were grazing, Magnus dipped his stick into a spring of water and poked at the pebbles and stones at the bottom with it. Suddenly he felt something pulling his stick. When he took it out of water, he saw a stone stuck to the iron cap. The stone which Magnus pulled out was called ***Lode stone.*** *It is a natural magnet and possesses the property of attracting iron.*

The magnets we discussed are not natural magnets. These magnets are man-made magnets.

Magnets of different shapes

The magnets we see and use in our daily life possess different shapes. Some of the usual shapes of magnets are shown in Fig. 2.

Bar Magnet

Horse Shoe Magnet

Ring Magnet

Disc Magnet

Fig. 2

Think: Can we make a magnet in a required shape?

Usually, magnets are made of steel or iron. However, special alloys of iron, nickel, copper, cobalt, and aluminum can be made into powerful magnets.

Activity-2: Finding materials attracted by magnets.

Take a bar magnet, nail, jump-clip, plastic scale, a piece of glass, brass key, paper, iron bolt, pen, blade, pencil, knife, stainless steel spoon, piece of chalk, wood and touch the magnet to each item. Does the magnet attract every object? Observe and record your observations duly mentioning the name of the material of which the object is made in table 1.

Table 1

Name of the object	Material of which the object is made (Iron/plastic/aluminum/ wood/glass/ any other)	Attracted By Magnet (Yes/No)
Jump Clip	Iron	Yes
Scale	Plastic	No

- Which materials are attracted by a magnet?
- Which materials are not attracted by a magnet?

The materials that are attracted by magnets are called **magnetic materials**. The materials that are not attracted by magnets are called **non-magnetic materials**.

- Give your own examples for magnetic materials.
- Give your own examples for non-magnetic materials.

Magnets have the property of attracting materials like Iron. Based on this property of magnets they can be used to separate some mixtures.

Activity-3: Can we separate iron filings from soil?

Take a bar magnet and roll it in the soil in your school ground for some time. Pull out the magnet. What do you find? Does anything get attached to the magnet?

You may find some dark particles of soil sticking to the magnet.

Now gently remove these dark particles from the magnet and collect them in a sheet of paper. These are iron filings.

Once the Greek scientist Archimedes of the "Eureka" used lodestone to win enemies in battles by using lodestone to get the nails from the ship. So the ship would sink.

(Keep these iron filings in a box to use in further activities.)

- Which part of magnet attracts more iron filings?
- From which part of the magnet do you feel more difficulty in removing iron filings ?

Poles of a Bar Magnet

Does the property of attracting iron filings remain same for all parts of a bar magnet?

Activity-4:

Spread some iron filings uniformly on a sheet of paper. Place a bar magnet below this sheet.

- What do you observe?
- Do you observe any change in the pattern of iron filings spread over the sheet?

You will observe that the uniformly spread iron filings concentrate at two points of the paper sheet. At some distance you will find some scattered iron filings between these two points. (see Fig. 3)

This change in the spread of iron filings on the sheet of paper is due to the magnet present below it. The iron filings move towards its ends because of this magnet. Thus the ends of the bar magnet attract more iron filings than the middle part of the magnet.

By this activity we can conclude that every bar magnet always has two ends whose attracting capacity is more than its other parts. These ends are called **poles** of the magnet .

Activity-5: Finding directions with a bar magnet.

Suspend the bar magnet freely with the help of a thread tied around its center as shown in Fig. 4. Does the magnet remain stationary? Wait for some time. What do you find now?

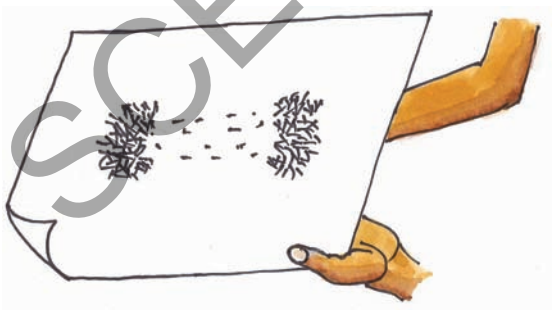


Fig. 3

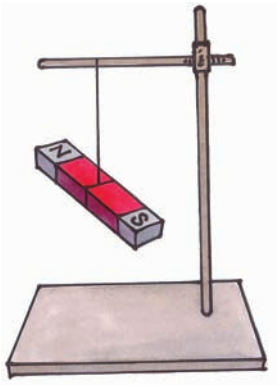


Fig. 4

Electromagnets are made up of an arrangement of wire coils; often, the wire is wound around a ferromagnetic substance such as steel.

You will notice that the magnet finally takes a position in the North-South direction. Mark the end that points towards the North with some colour. Now disturb the magnet and again wait for some time.

- Where does the coloured portion come to rest?
- Repeat this experiment at another place. What do you observe?

Magnets always come to rest in the North-South direction. In each case the marked end points towards North. This end is known as North pole of the magnet. The other end, which points towards the South is known as South pole of the magnet. This property of magnets is called **directional property**. It is exhibited only by magnets. We use this property to make the *magnetic compass*.

Magnetic Compass

A compass is usually a small box with a glass covering it. A magnetized needle is pivoted inside the box in such a way that it can rotate freely. The compass also has a dial with directions marked on it. The compass is kept at the place where we wish to know the direction. Its needle indicates the North-South direction when it comes to rest. The compass is then rotated until the north and south marked on the dial are exactly below the two ends of the needle. To identify the North pole of the magnetic needle, it is usually painted in a different colour (see Fig. 5). Then we identify north and south at that place. After that we can also identify the East and West between them.

Fig. 5

A compass is used to find directions. It is mostly used in ships and airplanes. Mountaineers and army people also carry a compass with them so that they do not lose their way in an unknown place.

Note: Don't place compass and magnets together.

Activity-6: Attraction and Repulsion Between Two Magnets

Take two similar magnets, place them in four different ways as shown in Fig. 6 and record your observations.

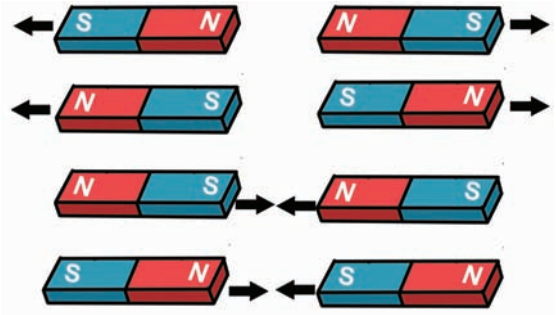


Fig. 6

Some vets use magnets to retrieve wire and metal from animals stomachs

- What do you observe?
- When do the magnets attract each other?
- When do the magnets repel each other?

You notice that **like poles (N-N, S-S) repel each other and unlike poles (N-S) attract each other.**

Earth as a Magnet:

We saw that a suspended bar magnet always comes to rest in the North-South direction.

- Why does it come to rest in that particular direction only?
- What force is acting on it?

Activity-7:

Place a bar magnet on a table in any direction. Suspend another bar magnet over it as shown in Fig. 7. The suspended bar magnet should be fairly close to the one kept on the table. Observe in which direction the suspended bar magnet comes to rest.

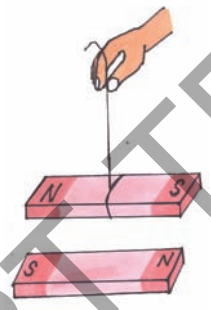


Fig. 7

Change the direction of the bar magnet placed on the table.

- Do you find any change in the direction of suspended bar magnet?
- Is there a change in the direction it comes to rest? What is that change?

The suspended bar magnet always comes to rest in the direction of the bar magnet placed on the table. But the north pole of the suspended bar magnet points towards the south pole of the bar magnet placed on the table and south pole of the suspended bar magnet points towards the north pole of the bar magnet placed on the table.

- What happens if you remove the bar magnet placed on the table?

In this case the suspended magnet comes to rest in the North-South direction. We can say that there is some magnet below the suspended bar magnet which compels it to come to rest in that particular direction (as in above two cases). Where does this invisible magnet come from? The earth possesses magnetic property which acts upon the suspended bar magnet (see Fig. 8).

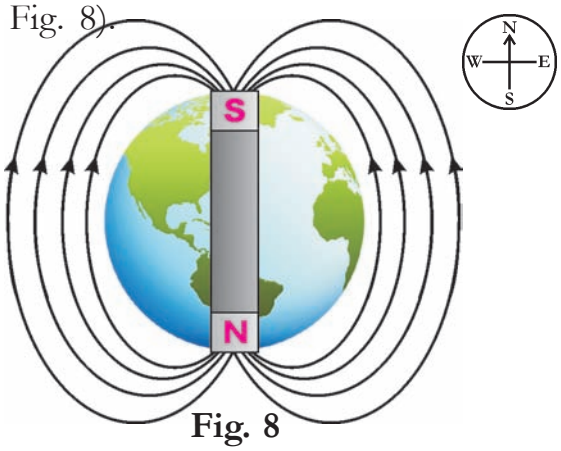


Fig. 8

Magnet attracts only magnetic objects

Activity-8: Finding out whether the given object is a magnet or not

You have been given three objects of same size, shape and colour and a bar magnet. You have to decide which one among them is a magnet, which is not a magnet but made up of a magnetic material or a non-magnetic material.

Bring three objects one after the other close to one pole of the bar magnet and observe whether they get attracted, repelled or not attracted. Record your observation in table 2. After that bring those objects close to the other pole of the bar magnet in the same way and record your observations.

Table 2

Observation	Object - 1 Attracted / Repelled / Not effected	Object - 2 Attracted / Repelled / Not effected	Object - 3 Attracted / Repelled / Not effected
Change observed when brought close to one pole of the bar magnet.			
Change observed when brought close to other pole of the bar magnet.			

What do you conclude by comparing the recorded observations?

By the above observations we conclude the following:

If an object is attracted by one pole of the bar magnet and repelled by the its other pole, then you can say that it is a magnet.

If an object is attracted by both the poles of a bar magnet and not repelled by any pole, then you can say that it is not a magnet but a magnetic substance.

If an object is neither attracted by magnet nor repelled by it, then you can say that it is neither a magnet nor a magnetic substance.

Activity-9: Make your own magnet

Take an iron nail and place it on a table. Make sure that the nail neither attracts nor repels iron pins or iron filings. Take a bar magnet and place one of its poles near one edge of the nail. Without lifting the bar magnet, move it along the length of the iron nail till you reach the other end. Then lift the bar magnet, bring it to the first end of the nail and move along the length again as shown in Fig. 9. Repeat this process 20-30 times. Always move the magnet in one direction, don't drag the magnet back and forth.

The compass was used hundreds of years ago by chinese sailors

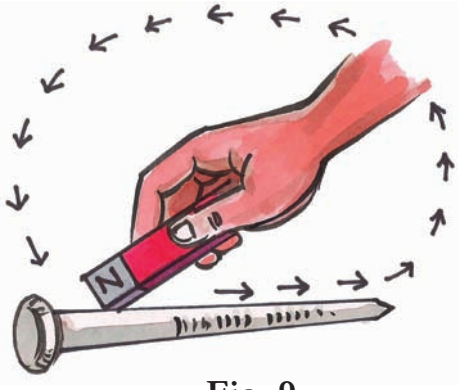


Fig. 9

Now remove the bar magnet and bring some iron filings or alpins close to the nail. What do you notice?

The iron filings or alpins get attracted by the nail. Thus you have succeeded in making your own magnet by magnetizing the nail. What will happen if the nail is now suspended freely?

Activity-10: Make your own magnetic compass

Take a magnetized needle. Tape the needle to a light cork. Float the cork in a glass of water as shown in Fig.10.

Add a little detergent to water to help the cork float freely. In what direction does your magnetized needle point?

It points in North-South direction. Thus it acts as a magnetic compass.

Fig. 10

Activity-11: Magnetic induction

Take a safety pin and bring it close to an alpin. Does it attract the alpin? Why?

Bring the safety pin close to one pole of a bar magnet and see how it gets attached to the magnet. Now bring an alpin and touch it to the safety pin as shown in Fig. 11 (a). Does safety pin attract the alpin? Why?

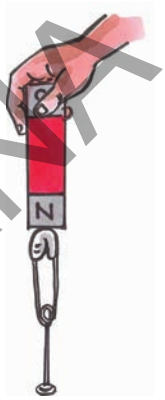


Fig. 11 (a)

In the above two cases, we notice that the safety pin acts as a magnet when it is in contact with another magnet. Magnetic property is induced in safety pin due to the bar magnet.

Magnetic property possessed by a magnetic substance due to the presence of a magnet near it, is called magnetic induction.

- If the safety pin is not in contact with the bar magnet, can it attract the alpin?
- What happens if we place the bar magnet very close to the safety pin but not touching it?

Let us find out.

The earth's magnetic field is like a bar magnet at the center

Take a bar magnet in one hand and a safety pin in the other hand, hold them in such a way that they are close to each other but not in contact as shown in Fig. 11 (b).

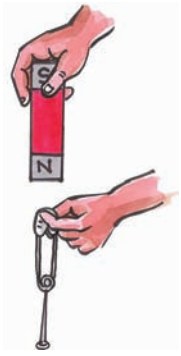


Fig. 11 (b)

Ask your friend to bring an alpin and touch the safety pin. You will notice that the alpin will stick to the safety pin. This shows that due to magnetic induction safety pin acts as a magnet.

Keywords

Magnet, magnetic material, non-magnetic material, North Pole, South Pole, Magnetic compass, like poles, unlike poles, attraction, repulsion, magnetic induction

What we have learnt

- Lode stone is a natural magnet.
- Magnets are of different shapes i.e. bar magnets, horse shoe magnets, ring type magnets, disc magnets, etc.
- The materials that are attracted by magnets are called magnetic materials. The materials that are not attracted by magnets are called non-magnetic materials.
- A bar magnet always has two ends whose attracting capacity is more than other parts of it. The poles of the magnet lie at these ends.
- Each magnet has two magnetic poles : North and South.
- A freely suspended magnet always aligns in the North-South direction.
- Unlike poles of two magnets attract each other; whereas like poles repel each other.
- Magnetic property possessed by a magnetic substance due to the presence of a magnet near to it, is called magnetic induction.

Improve your learning

1. Predict which of the following material are magnetic and non-magnetic material. Test with a bar magnet and check your predictions. What do you say after testing all materials?

   Plastic, Iron, Stainless steel, Wood, Aluminium, Gold, Silver, Copper, Paper, Cloth.

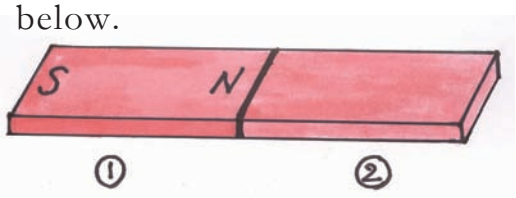
2. List out the magnetic and non magnetic materials in your class room.

Earth magnets can be 20 times more powerful than a fridge magnet

3. For which purposes do people use magnets in their daily life? Ask your family members and other elders and collect the information and prepare a list of uses of magnets.

4. Draw a bar magnet and locate the poles.

5. Observe and locate North and South poles for the second bar magnet shown in the figure given below.



6. Think and say, in which direction your house is facing?
   (a) Use the compass and findout the exact direction of your house and compare it with your prediction.
   (b) Similarly predict and findout in which direction you keep your head while sleeping at night,
   (c) The directions you face while you are reading, eating etc.

7. Prepare a toy using magnets and write the procedure of preparation briefly.

8. Think and say where the poles will be located in a ring magnet? Try to find out its poles using a bar magnet and check your prediction.

9. Magnetize a needle using a bar magnet. Make a compass with that needle by following the process explained in activity 10.

10. Sometimes people use magnets to keep the doors open and some times to close the doors firmly. Think and say how is it possible and how we should arrange the magnets in each case.

11. Does the Earth behave as a magnet? How do you prove it?

12. If you have two similar bars, one a magnet and another a piece of iron. can you findout which one of these is a magnet? Explain the process.

13. Teacher said that Earth is a magnet. But Sreevidya has some doubts and she asked her teacher some questions. What may be the questions?

14 (a) Surya was wonderstruck to know that Earth is a big magnet and appreciated efforts of scientistis to discover this.

14 (b) Do you notice any such things in magnets to appreciate? Explain.

15. Kiran wants to prepare a toy using some magnets to make people understand the slogan "Reject bad food and accept only good food". Can you help him to prepare the toy? If yes, how?

* * * *

It is believed that the earth's magnet power comes from a current in the liquid center of the Earth causing it to become a gigantic electromagnet!

3 Rain : Where Does It Come From?

Fig. 1

Ramya and Sowmya were getting ready to go to school. Their mother advised them to keep an umbrella with them. Ramya asked her mother why the umbrella was needed as it was not raining. After looking at the sky, mother told them that it was likely to rain as it was cloudy and windy weather. They started to school wondering about how their mother was able to predict when it could rain.

- Why do we get rains?
- Where do the rains come from?
- How did mother know that it was likely to rain?
- Do all the clouds formed in the sky cause rain?

Rain is a common phenomenon like air and sunlight in our daily life. We generally get more rains in rainy season. Our general observation is that if the sky is cloudy then there is a possibility of rain. But clouds do not lead to rains every time. Some times we witness sudden rains.

- Why do clouds cause rain?
- What is the relation between rains and clouds?
- Why don't all clouds cause rain?

To understand about clouds and rains we need to first know something about water.

Forms of Water

All of us know that water is available in nature in three forms.

Solid Form

We call soild form of water ice.

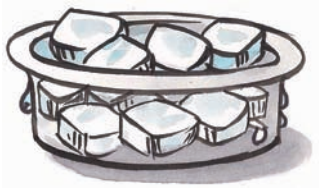


Fig. 2 : Ice

Snow occurs naturally.

Rain drops are not shaped like this , they are shaped like this as they fall. Raindrops vary in size from 0.02 inch to about .031 inch diameter.

Can we convert water into ice? Explain what we should do?

Liquid Form

What happens if ice is kept in the open air?

If we heat ice, it will change into water. Water in liquid form is present in oceans, seas, lakes, rivers and even underground.

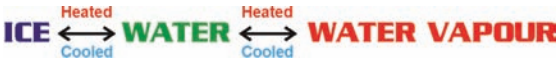
Fig. 3 : Water - Liquid form

Gaseous Form

What happens when water is heated? The gaseous form of water is water vapour which is present in the air around us.

We know that when ice is heated it converts into water and if water is heated it turns into water vapour. Similarly when water vapour is cooled we can get back water. If water is cooled further we will get ice.

Fig. 4 : Vapour - Gaseous form



So, we understand that these three forms of water are interchangeable.

Evaporation and formation of clouds

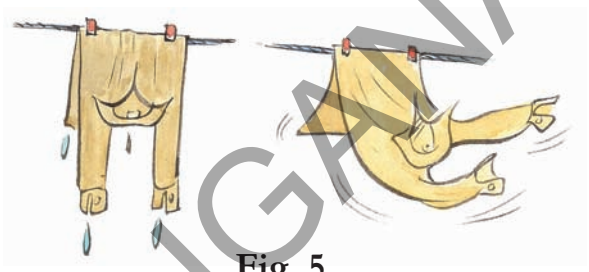


Fig. 5

What happens to the water in wet clothes when they are kept in sunlight? When we want to dry clothes quickly we wave them about or keep them under a fan.

- Does the water in wet cloths dry up only due to sunlight or due to other reasons?

You must have seen that water on wet roads, roof tops and some other places dries up after sometime.

- Where does this water go after drying up?

If you heat water kept in a bowl by using a stove, you may notice water vapour coming from the bowl. Thus, when water is heated, it gets converted to vapour and mixes with the air. This is

The umbrella was originally intended for shade from the hot Egyptian sun.

what happens to the water in wet clothes also.

The process of water changing into water vapour is called "evaporation"

If water is gently heated it will become warm. Some vapour is produced. If it is heated more, it starts boiling. If we heat it further , it evaporates and converts completely into water vapour.

We know that the amount of heat absorbed by water affects its evaporation. If water is heated more, it will evaporate faster.

- You might have observed evaporation in many situations in day-to-day life. Discuss them with your friends and prepare a list.

Evaporation is a natural process which takes place on the Earth. Water evaporates continuously from the surfaces of water bodies like seas, oceans, rivers, ponds etc. and changes into water vapour due to the heat supplied by sunlight.

- Where does this water vapour go after evaporation?

The water vapour formed due to evaporation becomes a part of air and cannot usually be seen. The water vapour which enters into air through the process of evaporation forms clouds in the sky.

- What is a cloud?
- How are clouds formed?

Condensation

It is our common experience that on cold winter mornings when we speak, we observe smoke-like vapour coming out of our mouths(Fig 6).

- Why does smoke-like vapour come out of our mouth in winter?
- Do we experience this in summer as well?

In winter, the air in our atmosphere is very cool as compared to the air coming out from our mouth. Water vapour present in the air coming out from our mouth gets cooled suddenly to form very tiny droplets. These tiny droplets concentrated in a limited area, appear like smoke or a small cloud near our mouth.

Fig. 6

You might have observed that during mornings in winter, some fog is formed and small dew drops appear on grass, leaves of plants (fig. 7).

- From where do these water drops come on the leaves and grass?

Fig. 7 : Dew on grass

Some monkeys are omnivores which eat other animals.

Activity-1: Condensation

Take some water in a glass. Add some pieces of ice to it. Observe for few minutes.

(Fig. 8)

- What changes do you observe on the outer surface of the glass?

You would observe formation of small drops of water on the outer surface of the glass.

- Why are these drops formed?
- Do drops form if there is no ice in the glass?

Ice-cold water in the glass cools its surface. Air around the glass contains water vapour which is warmer than the surface of the glass. Due to the cold glass, air close to its surface will also become cooler. This changes the water vapour in the air around the surface of the glass into water and forms small drops on the outer surface of glass.

Have you ever observed in your daily life where water vapour changes into water? List out them.

The process of conversion of water vapour into water is called "condensation".

Clouds and rain

On a warm day, the sun heats up the ground as well as the water in seas, oceans, rivers, ponds etc. This water converts into water vapour by the process of evaporation.

Fig. 9 : Water cycle

This water vapour rises up into the atmosphere. As it is lighter than air when we move away from the surface of the earth, the air becomes cooler. Hence, when water vapour reaches higher levels it condenses due to contact with cool air and forms small drops or water droplets. These tiny droplets remain floating in air at higher levels of the atmosphere and appear as clouds.

Activity-2: Clouds in kitchen

Take a vessel filled with water. Keep it on a stove and heat it slowly. Observe for some time. Now cover the vessel with a plate. Remove the plate

In some rainforests there are flying animals such as squirrels and snakes.

after a couple of minutes (Fig 10). Do you see any changes on the inner surface of the plate?

Fig. 10

Pour some cool water on the plate and observe what happens?

What similarities do you find between evaporation of water from surface of water bodies and evaporation of water from a bowl heated in the kitchen?

From both cases discussed above, we know that water vapour helps to form clouds.

Rain

The clouds formed on the surface of the different water bodies do not stay there. They start to move from one place to another in the direction of winds.

As more clouds come together they become laden with water vapour. Winds bring the clouds from the sea to the land. The colder air in the upper layers of the atmosphere cools the clouds.

- Have you observed the colour of a cloud before rain?
- How are clouds converted into rain?

We all know that without clouds, it will not be possible to get rains and that all clouds do not cause rains. Some changes take place in the clouds before they cause rain.

- What changes do you notice in the sky and in the atmosphere before it rains?
- What changes take place in clouds before raining?

Fig. 11

The clouds moving in air are generally at higher levels. Sometimes the cool breeze coming along with air makes the clouds cooler. This leads to water droplets present in the clouds to condense and form large water drops. Further cooling of clouds increases the size of their water drops and clouds become heavy and descend towards the earth. The colour of such clouds changes from white to gray giving us the feeling

Acid rain is the combination of sulphur dioxide and nitrogen dioxide from polluting clouds from industries and by burning fossil fuels.

of dark clouds gathering. When the size of the water drops increases further it becomes difficult for the cloud to hold them and water drops begin to fall. This is called **"rain"**.(Fig 11)

In our daily life, we observe that before raining, clouds descend towards the earth's surface and we experience a cool breeze before rainfall.

In very cold conditions, the drops of water turn into crystals of ice and fall as snow. Sometimes big drops of water solidify into ice and fall as pieces of ice known as **hailstones.**

Monsoons

Generally, we get rains in some particular months during the year. In our state, rains occur normally from June to September . During that season you might have observed in the sky that clouds are moving along with the winds blowing from western direction (South West side). These winds are called "South West monsoon". Similarly, we observe in the months of November and December rains occur due to movements of clouds in the direction of winds blowing from Eastern side (North East side). These winds are called **"North East Monsoon".** Now a days we are not getting timely rains and seasons are also changing slightly. Think, why is it happening so?

Water cycle

When it rains ponds, lakes etc are filled with water. Water from rainfall runs down as small streams. These small streams join together and make bigger streams. These bigger streams join the rivers. The rivers flow down to seas and oceans. Some of this rain water seeps into the ground and becomes ground water.

As it is very hot during summer, large quantity of water evaporates from seas, lakes, rivers etc. and converts into water vapour. This goes up into the air to form clouds. These clouds again cool and produce rain.

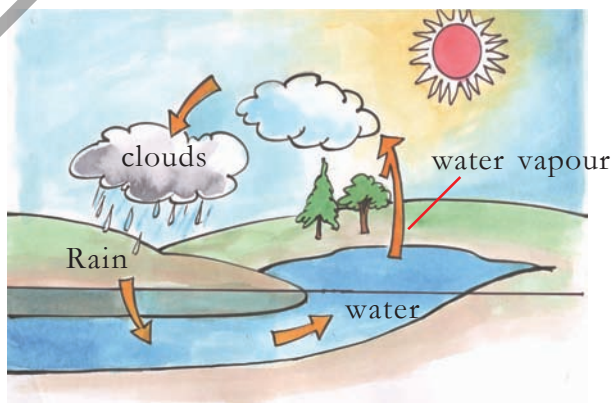


Fig. 12 : Water Cycle

The circulation of water into water vapour by evaporation, water vapour to clouds and clouds to rain by condensation is known as **"water cycle"**

If the rain drops are very small, they are collectively termed drizzle.

This cycle of evaporation and condensation takes place continuously in nature. (Fig 12)

Deforestation and pollution from factories are now causing global warming. So, the atmospheric conditions are not favourable for clouds to get cooled. Consequently, there is a decrease in rainfall. This disturbs the water cycle and causes either floods or droughts.

* * * *

Keywords

Evaporation, condensation, water cycle, cloud, water vapour, atmosphere, stream, droplets, dew, rain, hails, breeze, wind

What we have learnt?

- Water on the Earth can exist in three forms: ice (solid form), water (liquid form) and water vapour (gaseous form).
- The process of changing of water into water vapour is called evaporation.
- If water receives more heat, it evaporates faster.
- Clouds are formed from tiny droplets of water vapour.
- Evaporation of water from the surface of seas, lakes, ponds etc. is part of cloud formation.
- All clouds do not always cause rain.
- As we move up from the surface of the Earth, air becomes cooler.
- The process of conversion of water vapour into water is called condensation.
- The cycle of evaporation and condensation of water, present on the Earth's surface, causes rain.
- The conversion of water into water vapour, water vapour to clouds and clouds to rain is known as water cycle.

Improve your learning

1. How are clouds formed? Explain?
2. In which form does the water from clouds reach the earth?
3. When do clouds become cool?
4. Explain the relationship between the heat of sun and evaporation.
5. Why do we experience cloud like smoke near our mouth while we speak during the winter season?
6. Correct the given sentence if necessary.

Raindrops fall between 7 and 18 miles per hour (3 and 8 metres per second)

"If the size of water drops decreases in the clouds, they can no longer hold the water drops."

7. Which of the following days is more suitable for drying of washed clothes? Explain why.

(a)Windy day (b)Cloudy day

8. Which of the following statements are right or wrong ?

(a) evaporation takes place quickly when more heat is supplied.

(b) for condensation of water, it should be cooled.

(c) water vapour is obtained from water by evaporation.

9. Draw a diagram which explains the water cycle.

10. How do you feel when you see a Rainbow? Express your feelings in the form of a song or a poem.

11. Clouds once seen at a particular point, may not be there after sometime? Why?

12. Revanth blew air from his mouth onto the mirror while he was getting ready to go to school. He observed that the image in the mirror was not clear. Why do you think it has become so?

13. If it is raining in a village you don't find rain another village. Why do you think it is happening so?

14. If condensation fails to occur in nature what happens in water cycle?

15. Why does the driver of a vehicle wipe the glass inside, even if the wiper is working on the outer surface of the glass when he drives in rain?

* * * *

Dangerous Plastic

We use plastic bags, covers frequently. we use disposble plates and glases in functions. All food materials also packed with polythene paper in super markets. In this way we use polythiene covers and throw away. But it takes very long time to decompose and mix into soil. These layers of plastics prevent the sinking of rain water into the soil. It leads to decreasing of ground water and abstruct drain water and channels during rainy season. It results in floods.

A monsoon is a seasonal wind, found especially in Asia that reverses direction between summer and winter and often brings heavy rains.

4 What do Animals Eat ?

Kartik has a pet dog. He loves playing with it by tossing it a ball or biscuits or even sometimes some small leaves and twigs. He observes that the dog sniffs and catches the biscuit in mid air and eats it up very quickly, while it just holds the ball in its mouth and only sniffs the leaves. If the dog is given milk it first sniffs it and then licks it up quickly.

- Kartik often wonders what the dog is trying to find out by sniffing.
- Why do dogs first sniff food before they eat it?

In the previous chapter we talked about our own food and the different varieties eaten by us. There are a wide variety of animals in the living world and they too eat a wide variety of food items. Let's see how animals eat their food.

Fig. 1 (a)

Activity-1: Taking in food

You can see many animals in your surroundings. Discuss about them with your friends. Make a list of what they usually eat and what they usually do to find their food. Do not be in a hurry to complete this table. Keep adding to this list as you observe animals around you everyday. But don't forget to observe animals wherever you go.

Fig. 1 (b)

The first animals evolved about 600 million years ago during the late Precambrian.

Table 1

S. No.	Animal/Bird	What they eat/ drink	How they find food
1	Sparrow	Worms, grains, ...	Looking, seeing, ...
2	Dog	Bones, bread	Sniffing
3			
4			
5			
6			
7			
8			
9			
10			

- Which of the animals, listed by you, eat nearly the same type of food?
- What are the types of food that your pet animals eat?
- Write about any two animals in your list, describing the type of food they eat and how they get their food?
- Compare the types of food habits of two animals selected by you.
- Regarding the types of food eaten by animals, what major groups can be made? Discuss with your friends and write. You could write like this :

1. Some animals depend only on plants for food.
2. .....
3. .....
4. .....

Animals are divided into six basic groups which include invertebrates, fishes, amphibians, reptiles, birds and mammals.

We have seen that all animals depend on different types of food. Now let us do the above exercise in a slightly different manner. Add your own examples in the last column of table 2.

Table 2

S.No.	Food group	Examples
1.	Only plants	Cow, ...
2.	Only animals	Fox, ...
3.	Both	Human beings , ...

Look at table 2 and try to answer the following :

- Which group of members have an advantage in finding food? Why do you think so?
- Could the animals in food group 3 depend only on plants if animals were not available? Why?
- What will happen if all animals eat only plants?

Do you know?

Animals that depend only on plants for food are called **herbivores**. Animals that depend on other animals for food are called **carnivores**. Animals that take food from plants and animals are called **omnivores**.

- Suppose omnivorous animals start depending only on plants. Discuss and write how it could affect nature.

We know that animals have their own ways of gathering and taking in food. Let us see how they do this.

From finding food to eating it

Plants and animals are the main sources of food in our surroundings. Like us, animals also depend on these sources of food. Every animal has its own style of getting food. They track down, collect, grab or hunt and then use various tools to finally take food into the mouth.

Tracking down food

Most animals feed regularly but, first, they must locate food. To do this, they use a wide range of senses - smell, sight, hearing, taste and touch. Some animals rely more on one sense than the other and it can therefore be highly developed in them.

There are approximately 5,400 species of mammals alive today.

Let us consider some examples to understand this better.

- What do you think the dog does to find its food? Which sense of the dog, do you think, is more developed?
- What about the vultures that fly high above in the sky yet find their food on the ground? Which sense do they mainly use in finding their food?
- How do bats find their food at night?

Thus we have seen that animals use some senses more strongly than others to find their food. For example, dogs use the sense of smell while vultures use vision. Bats depend more on hearing while some reptiles, on taste.

If you ever go near a pond, observe the pond skaters there (Fig. 2). Observe how quickly they move from one side of the pond to another to catch an insect that falls in water.

Pond skaters (an insect which feeds on other insects) detect ripples produced in water by any other insect trapped on the water surface. They compare the ripples on the opposite side of the pond, caused by the legs of the insect struggling to move out, calculate the distance and set out to grab it!

Fig. 2

Collecting food

Finding food is one thing, but collecting or capturing it is quite another. Many animals have specialized body parts such as mouthparts, hands or feet that help them collect their food most efficiently.

Fig. 3

Most animals are motile (capable of movement). One exception is the sponges, which are considered to be sedentary for most of their life cycle.

Activity-2

In the list given in table 3, write the bodyparts of animals that are used to collect or capture food.

Table 3

S. No.	Animal	Bodypart used in taking food
1.	Hen	Beak, ...
2.	Cow	
3.	Dog	
4.	Frog	
5.	Snake	
6.	Man	
7.	Lizard	
8.	Vulture	
9.	Lion	Legs, claws, mouth, ...
10.	Humming bird	

Look at table 3 and answer :

- Which animals use similar parts in taking food?
- Compare the parts of dog to that of hen. Note down the similarities as well as differences observed by you.
- Compare the parts of hen and humming bird in taking in food. Note down the similarities as well as differences observed by you.
- What are the similarities between a dog and a lion in the parts involved in taking food?
- What are the similarities and differences between a vulture and a lion in their mode of taking in food?
- You may also add any other observations you may have made.

You will see that the same part may be used in different ways by different animals. For example, tongue may be

All animals are heterotrophs which means they cannot produce their own food.

used by dog in a different manner as compared to frog. The dog licks with it while frog captures and swallows food with it.

Also, different parts may be used to take in the same type of food, like, hens use their beaks to pick insects while frogs use their tongues for the same purpose.

The same part in a similar group of animals may be used in ways that can be largely different. For example, beaks of different birds are used to eat different types of food.

Let us take some specific examples to observe how animals eat their food. The type of food and the ways in which an animal collects it, form the food habit of the organism.

Let us study the food habits of birds in detail. How do birds eat their food?

Look at (Fig. 4) and choose the correct

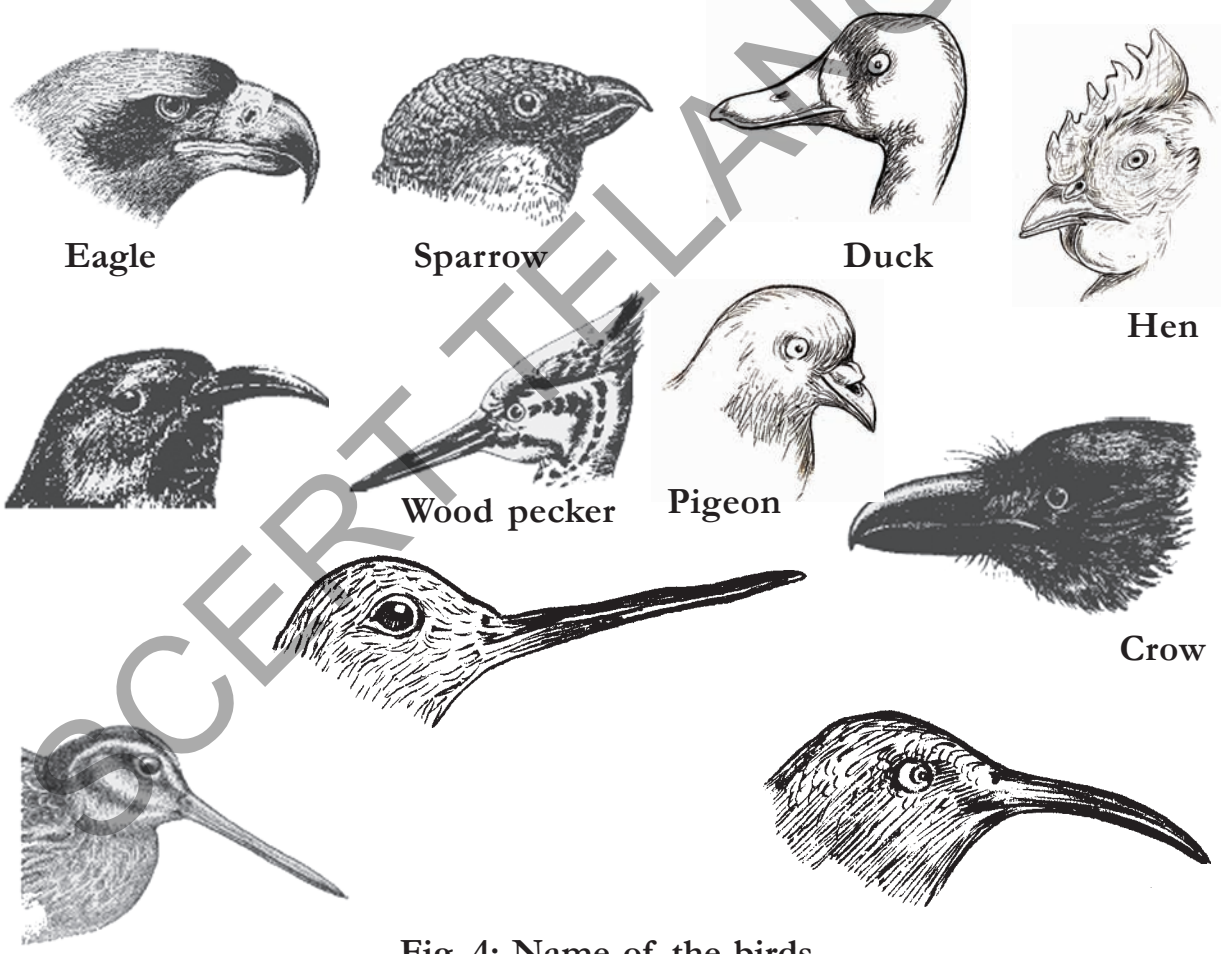


Fig. 4: Name of the birds

The largest animal alive today is the blue whale.

options from statements 1, 2 and 3 given below.

1. The reason for the beaks of different birds being different is to make it easy to recognize them.
2. There is no reason for the difference, it just happens.
3. The beaks are different because the birds eat different kinds of food.

Again look at Fig. 4 and try to answer :

- Which two of the given birds (sparrow, duck, eagle, dove) would eat the same kind of food according to you?
- Why do you think they might eat the same kind of food?

Activity-3: Picking food with beak

We see hens and crows in our surroundings searching for food.

Do you find any similarities, and dissimilarities in the way and type of food eaten by hen and crow? What are they? Write your observations in table 4.

Table 4

S.No.	Similarities	Dissimilarities
1.	use beak	*hens scratch the ground with feet and eat worms, crows don't*
2.		
3.		

Woodpeckers have a long and strong beak. By using this beak they remove layers of bark and eat ants and pests which lie under the bark. Crane has a long beak to catch fish in water. Have you ever seen vultures? They have strong hooked beaks to tear flesh off animals.

Parrot, which eats fruits and cracks nuts, has a hooked beak, while the crow doesn't have it. Not only the beak, there are other parts as well that are different to suit the type of food eaten by a bird.

Vultures would need sharp claws along with strong hooked beaks to tear flesh, while the humming bird that sucks nectar would need a long thin beak and does not need sharp claws.

Activity-4: Picture Collection

Prepare a booklet on birds and their food habits. Collect pictures of different birds. Write the way in which each bird gets its food.

Do you know?

Crows that live in our surroundings usually eat waste and rotten food material, dead animals etc. They keep our surroundings clean in this manner. So they are called natural scavengers. Vultures are also called so due to the type of food they eat.

Blue whale weighs in the range of 110 to 160 tonnes and grows to lengths of between 20 and 30 meters.

Activity-5: How does a frog get its food

It is very interesting to watch a frog get its food. A frog throws out its sticky tongue towards an insect. The insect gets stuck on the frog's tongue. Then the frog swallows it.

- Find out where a frog lives and how it feeds there.
- Observe how a lizard catches its food. Write down your observations.
- Find out the differences between a frog and a lizard's way of taking in food. How do these animals use their tongue?

Activity-6: How does a cow get its food

We know that many animals like the cow depend on plants for food. They are herbivores. Animals like cow, goat, buffalo, sheep, giraffe, camel, elephant, deer etc. eat different parts of plants like green/dry grass, leaves and branches.

Observe a cow or buffalo while it is eating its food. Write your observations in your note book.

- How does a cow take its food?

Note the parts of its body involved.

- How does the cow start eating?
- Which parts of the cows' mouth (jaws, teeth, tongue etc.) are involved in eating its food?
- Do cows have teeth? Do they have teeth on both jaws? (ask someone who tames a cow to find this).
- You may have observed cows and buffaloes sitting under the trees and moving their jaws. Do you know why they do that?

Do you know?

Animals like cow, buffalo, camel etc., chew food very quickly and swallow and store it in a part of their stomach. After sometime they take food material back from the stomach to the mouth and chew it again. This process is called **rumination**.

How much and how little!

Generally elephants eat leaves, branches of plants, fruits etc., which are available in the forest. Think how much of food an elephant needs to eat per day?

The larva of a crane fly eats a lot but after changing to adult, a crane fly doesn't need to eat at all !

Activity-7: How a dog gets its food

Observe a dog in your surroundings. How does it get its food? Write your

Birds evolved from reptiles during the Mesozoic Era about 150 million years ago.

observations in the space given below.

.....

.....

.....

- What does it do to find food?
- Which parts are involved in taking in food?
- How does a dog eat meat?
- How does a dog drink water?

Dogs eat food by using their sharp teeth and tongue. Wild animals like lion, fox, wolf, tiger and others also have sharp teeth. Can you say how they get their food?

Animals that hunt have strong legs to run, sharp claws to catch and sharp teeth to tear flesh.

Rabbits and squirrels also have teeth. They eat seeds, tubers, leaves etc. by using their teeth.

- Do you know how cats and dogs use their teeth?

We can see sharp teeth in a cat or dog's mouth. They tear flesh of animals by using these sharp teeth. Did you ever see how a cat hunts a rat? What do you feel about it's concentration and actions while hunting?

Activity-8: Using tongues

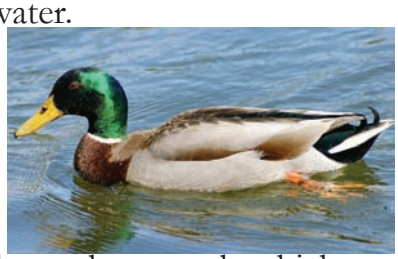
Compare how a frog, cow and dog use their tongues

Animal	Use of tongue
Frog	.....
Cow	.....
Dog	.....

Getting food without hunting:-

Some animals get their food by hunting and some others do not hunt. Write about the way in which at least two animals that do not hunt, get their food.

It is very interesting to watch how a duck catches its food. Ducks also have teeth, but they are not like the teeth of a cow or lion. They are not useful in grinding food. They act as filters to get food from water.



Similarly, fish too have teeth which are used for the same purpose as that of ducks.

How leeches get their food

When we walk on the banks of ponds,

Many desert animals are nocturnal. They burrow underground to escape the extremely high temperatures in the day and come out at night to feed.

canals etc. we can see different kinds of animals. We can see leeches, snails, earth worms etc.

People in rural areas are familiar with leeches. While rearing cattle near water they find leeches on the skin of animals. Leeches stick on the skin and suck the blood of cattle as well as humans. They have special structures called suckers in their mouth to do this.

Do snails and earthworms also suck something from the ground? Discuss this with your teacher and your friends.

Activity-9: Modes of getting food

Observe the following animals in your surroundings. Find out how they get their food. Observe them everyday for at least a week. Write whatever you observe in your notebook and display it on your wall magazine.

1. Lizard on the wall
2. Spider in a Web
3. Hen in the garden
4. Butterfly on a flower.

Do you know?

Some animals search for their food only at night. Cockroaches, desert lizards, rats, owls, bats, moths, crickets etc. get their food only at nights . During daytime they hide in dark places. These type of animals are called **nocturnals**.

Food Chain

There is a great balance in nature established among different plants and animals regarding their food habits. What will happen if all animals eat plants? To maintain a balance in nature animals follow different food habits. See Fig. 5. What do you find?

Fig. 5

In a pond, we can see that eggs and larvae are eaten by fish and frogs. Fish and frogs are food for a crane. Think, who can eat the crane?

Activity-10: Food Chains

Look at Fig. 5 and write your observations.

.....

.....

Now, try to draw a food chain that starts from grain and ends in a cat.

Food chains cannot always be represented by a straight line. They can be branched with several food chains

The leopard (*Panthera pardus*) is a member of the cat family (Felidae The lifespan of a leopard is between 12 and 17 years.

connected to each other in the form of a web. Look at the following. Draw connections to show which animal is eaten by whom. It will surprise you!

Rat	**Cat**	**Lion**
Grass	**Deer**	**Fox**
Dog	**Tiger**	**Hen**
Wolf	**Man**	**Worms**

Food chains form a web where one animal depends upon more than one source and type of food. Think, in which category do you belong? The following animals depend on others to show through lines.

Rat	**Cat**	**Lion**
Grass	**Deer**	**Fox**
Dog	**Tiger**	**Hen**
Wolf	**Man**	**Worms**

We use pesticides and insecticides to protect crops but every year a large number of frogs die by eating poisioned insects. What will happen to the food chain if all frogs die?

Animal colonies and food

There are many animals that live in colonies - from huge elephants to tiny ants.

The wonder world of ants : Ants do a lot of things. Their colony has large ant forces to do work. There are mainly workers, soldiers, female and male ants.

The workers collect and maintain food stock for others in the colony along with several other duties. Just as we keep cows for milk, some species of ants keep a type of insect called aphids for honeydew.

Like us ants are good farmers as well they cut leaves into pieces and create a bed to grow a type of fungus which they eat!

Think! What can we learn from ants? Write your opinion in your notebook.

Keywords

Food habit, food chain, sucking, picking, chewing, habitat, carnivore herbivore, omnivore, nocturnal, rumination

What we have learnt

- Different types of animals that live in our surroundings have their own food habits (way of taking in food and type of food taken).

Birds are vertebrate animals. They all have a backbone.

- Sucking, licking, picking, chewing, peeling, swallowing are all the ways by which animals take in their food .
- Beaks of birds differ from one another depending upon the type of food they eat.
- Most wild animals that eat other animals have sharp teeth.
- Animals are divided into three types on the basis of their food. They are carnivores, herbivores, omnivores.
- Food chain is the connection between animals on the basis of their food habits.
- Food chain explains the interdependence of diverse organisms in nature.

Improve your learning

1. Name some animals in your house which have the same kind of food habit.
2. Observe your surroundings or go to a nearby field and write about the following :

   (a) How does the cow eat grass?

   (b) What parts are used while doing so?

   (c) In what way can you justify it as a herbivore?
3. Compare the legs and nails of a dog and hen and say why they are different.
4. Go to a nearby pond where cranes are usually seen. Observe how they catch fish. Write about the process of catching fish. (Take care of yourself when you are near water places.)
5. Name some animals which use tongue as a tool for taking in food.
6. The butterfly uses.....to suck honey from flowers.
7. Do the following and record your observations :

   Collect one or two earthworms and put them in a bottle containing wet soil. Close it with a the lid which has holes. Observe how earthworms get their food.
8. Which animals in the forest depend only on plants or only on animals for food?
9. Fill up the following table

Bodypart used to collect food	Examples
Beak	Hens, ...
Tongue	
Teeth	
Sucker	
Strong legs with claws	

Birds have wings and they can fly. They have hollow bones to save weight. Some of them can't fly like penguins, ostrich, emu and rhea.

10. Why do most carnivores live in forests? Give reasons.

11. Make your own food chain and display it in your class room.

12. Prepare a scrap book of animals and separate them into carnivores, omnivores and herbivores.

13. Identify which of the following statements are wrong and give reasons.

(a) That which lives in water cannot eat animals.

(b) Elephants and deer are herbivores living in the forest.

(c) Birds' beaks are designed to suit their food habits.

(d) Sharp claws are useful for hunting.

(e) Most of the food chains end with herbivorous animals.

14. If you want to understand more about food chain what questions would you like to ask?

15. Write a play with dialogues between a parrot and a lion about their food habits and organs they use to get food. Act it with your friends. Send it to school/ district childrens magzine.

16. Identify the given animal :

- What does it eat?
- Which part of the body helps it in eating?

Every creature is better alive than dead, men and mouse and mango tree, and he who understands it alright will rather preserve it's life than destroy it.

..... Saleem Ali

A rat can last longer without water than a camel can.

5 Materials and Things

Mary was sitting in her room and studying. Suddenly she heard a loud sound from the kitchen. Mary went to the kitchen and saw a cat running away.

- Can you guess what could have happened? Write it down in your note book.

Mary saw that many objects had fallen on the floor. Some of them were broken and some were not. Can you guess which objects might have broken and which might not have broken? Fill in the table 1.

Fig. 1

Table 1

Objects that would have broken	Cup, ...
Objects that would not have broken	Stainless steel glass, ...

- Can you guess reasons why some objects broke and some did not?

In our day to day life, we use several things for different activities. These things are made of different materials.

For example body of your pen is made of plastic, where as its clip is made of Iron.

Activity-1: Finding the materials used to make different objects

A list of things in a house are given in table 2. Name the materials from which each object may possibly be made of :

(If you don't know which material the object is made of, discuss with your friends and find out.)

The color of a transparent object depends on the color of light it transmits.

Table 2

S.No	Object	Material
1	Door	Wood, metal, rubber.
2	Towel	
3	Bicycle	
4	Knife	
5	Mirror	
6	Shoes	
7	Water bottle	
8	Pot	

- Which objects are made of only one material?
- Which objects are made of more than one material?
- How many types of materials can be used for making chairs?

Fig. 2

List them in the space given below.

There are many objects in our surroundings such as chairs, tables, cycles, bullock carts, utensils, clothes, tyres, water, stones, etc.

We see that different objects are made of different materials. Some objects are made of more than one material. Think of some objects made of more than one material.

Activity -2: Finding the objects made from diffrent materials

Name as many things/objects as you can, made using the materials given in table 3.

When white light shines on an object it may be reflected, absorbed, or transmitted.

Table 3

S. No.	Material	Things/Objects
1	Metal	Utensils, ...
2	Plastic	Bag, ...
3	Glass	Mirror, ...
4	Wood	Table, ...
5	Cotton	Cloth, ...
6	Leather	Shoes, ...
7	Ceramic	Cup, ...
8	Rock	Idols, ...

We see that the same material can be used to make different objects (Fig. 3). Each object is used for a special purpose. So we need to know the properties of materials, as well as the properties of the objects to decide which material should be used for making an object. Some materials are soft and some are hard. Similarly some are shiny whereas some are non-shiny. Depending on these properties materials are used for different objects.

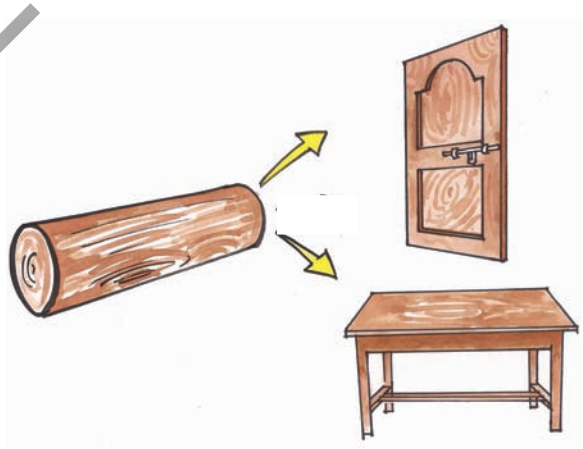


Fig. 3

Discuss the following:

- On what basis can we classify materials?
- How do we decide which material should be used for making an object?

We use different materials for different purposes based on their properties.

We do not actually see colors. What we see as color is the effect of light shining on an object.

Properties of Materials

- What type of material can you use to make a window when you don't want someone to see through it?
- What type of material can you use to make a window when you want to see through it?
- Can you make a cricket ball with mud or glass? Why?
- Can you make a chair with glass or mud? Why?

Let us examine the properties of materials and their usage. We begin with properties of material that we easily recognize.

Transparency

Why do shop keepers usually store eatables like sweets and biscuits in glass jars? The shopkeeper wants his customers to be able to see these items! We all know that we can easily see through glass. Such materials are said to be **transparent.**

Can you see through plastic? Can you see through wood?

We cannot see through some materials like wood, steel, card board. Such materials are said to be **opaque.**

Activity-3: **Identifying transparent and opaque objects from the table - 4.**

Table 4

Objects	Transparent or Opaque
Plastic	
Glass jar	
Steel plate	
Mirror	
Wooden door	
Polythene bag	
Paper	

Fig. 4

Actually, objects sink or float because their density is more or less than the density of whatever medium they are floating in.

Activity-4: Are we able to See through a paper

Take a sheet of white paper and try to see a lighted bulb through it (Fig. 5). Record your observation. Now put a few drops of oil on that sheet and again try to see the bulb through it (Fig. 6). What difference do you notice?

Fig. 5 **Fig. 6**

You notice that in the first case you can't see the bulb but in second case you are able to see the bulb.

The materials through which we can see objects, but not very clearly, are said to be **translucent**. Oily paper is an example of a translucent substance.

Some glass panes fixed to windows allow some light to come through but you can't see clearly through them; such type of glass is translucent glass.

Can you give some more examples of translucent objects?

Try This

- Take a torch, switch it on and see. Does the light pass through the torch glass?
- Now cover the torch glass with your palm. What do you observe?
- Now cover the torch glass with oily paper. What do you observe?

In the above activity, when do you observe transparent, translucent, and opaque property? Discuss.

State of the materials

In the chapter on rain you have studied the relationship between ice, water and water vapour, the three states of water. You would have noticed that when ice is added to a glass, the ice begins to melt and after some time all of it becomes water and the outer surface of the glass becomes wet.

If we heat the water in a vessel we notice that after some time water vapour is produced. If heating is continued, more and more vapour is produced in the form of steam and the quantity of water in the vessel keeps decreasing.

Some materials change their state from solid to liquid, liquid to gas on being heated and from gas to liquid, liquid to solid on being cooled. We sort materials as solids, liquids or gases based on their state at normal temperature.

Can you think of any material other than ice that goes from solid to liquid, liquid to gas (vapour)?

Activity-5: Light a candle

You might have lit a candle with a matchstick many times, holding the burning matchstick to touch the wick of the candle until the wick catches fire. Can you light the candle without

Water has a density of 1g/ml therefore if you had an object with a density less than 1g/ml it will float.

touching the wick with a burning matchstick?

Do you think this is impossible? Let us see how it can be done.

Place a candle in a safe place and light it. The first time, the candle cannot be lit without touching the wick with the burning matchstick. So do just that the first time. Let the candle burn for some time.

After about two minutes, hold a burning matchstick in one hand and blow the candle out. What did you notice? Did you see a column of white smoke rising from the wick as soon as you extinguish the flame?

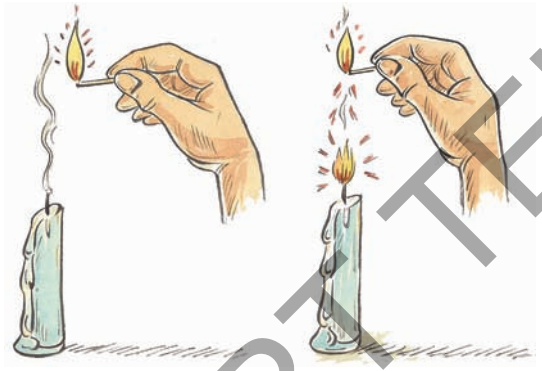


Fig. 7

Now quickly bring the burning matchstick close to this smoke, but do not touch the wick with it. What happens?

- Could the candle catch fire from a distance?

If you wish, you can make a game of this. What is the maximum distance from which candle can be lit?

Discuss with your friends how and why the candle got lit from a distance.

- Does the white smoke represent candle wax in the state of gas?

How can you know the diffrent states of materials?

We observe that certain materials can change their shape according to the shape of the containers they are put into, while some retain their shape. Those materials which change shape are mainly **liquids** such as water, rasam, milk, oil, kerosene, etc. Those materials which do not change shape are **solids** such as wood, rock, brick, plastic objects, and vegetables etc.

Activity-6: Classification of Materials

Think of different solids, liquids and gases around you and group them in table 5.

Table 5

Solids	Liquids	Gases
Stone	Milk	Smoke

Water is more dense than ice. It's the CRYSTALLINE STRUCTURE that makes ice less dense,

Discuss with your friends and find out who had the longest list. Now consider only one group, say liquids, from the observation of liquids can you list their properties? For example, liquids take the shape of the container they are put into. Write all possible properties of solids, liquids and gases in your notebook. Discuss about them with your friends and teachers.

A dilemma with sugar

While thinking about properties of solids, a group of students in class 6, put sugar in a glass, in a bowl and in a vessel. They observed that sugar takes the shape of the container. Since they know that liquids take the shape of the container, they concluded that sugar is a liquid.

The second group in the class disagreed with the first. What do you think? Is sugar a solid or a liquid? How will you decide? Razia, a student from the second group came up with an idea. She took a single crystal of sugar and one drop of water and declared that sugar is a solid while water is a liquid. The first group also had to agree with her argument.

- What must she have argued using only one crystal of sugar and one drop of water?

Discuss with your friends and find out why sugar is a solid although it takes the shape of the container.

- Is common salt a solid or a liquid?

Activity-7: Sinking or floating in water

Let us assume that a tomato, brinjal, potato, iron nail, sponge, wood, stone, leaf, piece of chalk and paper are given to you. Predict which of them sink or float in water. Record your predictions in table 6.

Table 6

Prediction	Object
Sinks	Stone ...
Floats	

Now try to test whether your predictions are correct or wrong by dropping the above objects in a beaker of water one by one. What do you find record your observations in the following table 7.

Table 7

Object	Prediction	Finding

Fig. 8

The word candle is derived from the Latin word candere, meaning to shine.

For which objects is your prediction wrong? Why?

Now, add a lot of salt to the water in the beaker. Try this same activity with water which is excessively salty.

- What do you observe?
- Do you get the same result? Discuss.

Activity 8: Do iron objects float?

Take some water in a wide mouthed bowl. Put an iron nail in it. What do you observe? Put an empty iron tin in that bowl. What do you observe?

Also try to observe whether a wooden piece floats on water. What happens when a wooden bowl is dipped in water?

What do you conclude from this activity?

Some materials in one shape will sink in water but float on water when they are in other shape. The materials that can sink can be made to float, but all the materials that float cannot be made to sink.

Activity-9: Soluble or insoluble in water

Take five beakers with water. Take small quantities of sugar, salt, chalk powder, sand and saw dust. Add each material to separate beakers and stir. Observe the changes and record your observations in table 8.

Table 8

S. No.	Material added	Dissolves (Yes/No)
1.	Sugar	
2.	Salt	
3.	Sand	
4.	Saw dust	
5.	Chalk powder	

We observe that certain materials dissolve when mixed with water. These substances are said to be **soluble** in water. The materials that do not dissolve are said to be **insoluble.** Repeat the activity with different liquids like vinegar, lemon juice, coconut oil and kerosene. What do you observe? Discuss with your friends.

Keywords

Material, object, metal, transparent, opaque, translucent, solid, liquid, gas, sink, float, soluble, insoluble

What we have learnt

- Objects around us are made of a large variety of materials.
- Based on their properties, we use different materials for different purposes.

Candles made of bee wax have sweet smell and give less smoke.

- Some materials such as glass are transparent, some materials such as wood are opaque and materials like oily paper are translucent.
- Materials can exist in three important states; as solids, liquids and gases.
- Some materials sink in water and some materials can float on water.
- Some materials are soluble in water and some materials are insoluble in water.
- Materials are grouped together on the basis of similarities and differences in their properties.

Improve your learning

1. Name any five objects which are made up of only one material?
2. Name any five objects which are made up of more than two materials?
3. List five things which we can make using each of the following materials :
   a. glass b. metal
   c. plastic d. wood
4. Mary saw a ship travelling on a sea. She knows that iron nail sinks in water. She has many doubts, what are her doubts? Write them.
5. Mary, while examining whether a boiled egg sinks or floats, found that it floats but Vakula made it sink, How is it possible? Guess and write it.
6. Drop an egg in a beaker of water. Now drop the same egg in another beaker of water in which excessive salt is added. Write your observation.
7. Do the following activities. Write down your observations. What do you conclude.
   a. Mix chalk powder in water.
   b. Place a piece of candle in water.
   c. Add some oil drops to a beaker of water.
8. Make a list of items from your kitchen like utensils, food ingredients etc. classify them as follows.

Item	Sink / Float in water	Soluble / Insoluble in water

9. Collect different plastic items from your surroundings. Classify them as transparent, opaque and translucent.

The word candle is derived from the Latin word candere, meaning to shine.

10. Draw different objects made up of wood which we use in our daily life.

11. Make a few models you like using clay.

12. We know that a ship, even though it is madeup of tonnes of iron, floats on water. How do you feel about the scientists who found the scientific principles and efforts in making a ship?

13. We use so many wooden items in our daily life. Is it good to use wood? What happens by excessive use of it? What is the reason? Is there any alternative for this?

The Sun, The Moon and The Stars would have disappeared long ago had they happend to be within the reach of predatory human hands.

..... Havelock Elllis

If green light passes through a transparent object, the emerging light is green; similarly if red light passes through a transparent object, the emerging light is red.

6 Habitat

Uma was swimming in the village pond with her elder brother. She enjoyed swimming there as she saw several things in the pond different from what she could see around her house. Her brother would show her eggs of all sorts of creatures. Right below the lotus leaf was the snail's egg, within leafy bushes at the side of the pond were eggs of a fish and so much more. There were several organisms vary - from very small to quite large ones like the fish that grandpa was rearing. Human beings would often hold their breath underwater for such explorations. But we would gasp for breath just after a short time and come to the surface.

Uma often wondered how the organisms underwater could live there easily while it was so difficult for her to breathe?

Do all organisms have different needs which are fulfilled by their surroundings?

We see organisms living everywhere around us. We see them living on the ground or under the ground, in the water or on its surface etc.

Let us explore all the places where organisms (plants and animals) live.

Fig. 1

(Note: Visit the pond/lake in the presence of a teacher or parents only)

Activity-1: Who lives where

Here is a list of some organisms. Ant, human beings, elephant, lotus, wall spider, oyster, fish, rabbit, bee, sparrow, dung beetle, earthworm, korameenu (murrel), squirrel, beetle, rat, crab, snail, bat, pistia, water hyacinth, monkey, prawn(royyalu), tiger prawn. You may add the names of even more animals and plants that you see around you or remove those from the given list which are unfamiliar to you.

Where is each organism found most often? In table 1 write the names of the organisms in the appropriate box

Our planet is an extraordinary mosaic of land, sea and life forms.

according to where they can be found. You could put the name of one organism in more than one column.

If you put the organism in the column 'some other place', try to mention the place where you could find it.

Some examples are filled in to help you. Copy the table 1 in your notebook. Try to enrich the list as much as you can.

How many organisms are present in more than one column? Why did you place them there?

Table 1

Under the ground	On the ground	In/on water	Some other place
snake	snake	snake	
earthworm			
	cat	lotus	
			Sparrow (in homes)

- In which column will you put a frog?

We have seen that different organisms live in different places but many of them live in the same place. Living organisms have different needs. They usually stay in the places where most of their needs are met, that is, they get sufficient food, shelter and other conditions necessary for life.

All organisms depend on their surrounding for their needs like food, water, air and shelter. The surrounding which meets the needs of a particular organism in the best manner is the **habitat** of that organism. For example, pond is the habitat of royyalu or the fresh water prawn. Fish lives in ponds so it is a habitat for fish as well.

Can you say what is the habitat for crow? A crow makes its nest on the tree. So tree is a habitat for the crow. We often find some insects on the skin of buffalo. So, buffalo skin is the habitat for that insect.

With such a lot of different types of organisms it is difficult to find areas with just one type of plant or animal. It is also difficult to study the needs of each organism separately, so usually we study them collectively according to the habitat.

Alpine or montane, habitats occur in highlands and mountain ranges around the world.

Now lets see what are the different habitats around us.

We find animals living on trees, in our houses, in different areas in the ponds, in a small pool of water after rains and several other places. As the area increases, the type and number of organisms living there usually increase.

You would find more types of organisms living in your house than your hair, and more in the pond than your house, more in the lake than your pond and so on. These larger areas are suitable for supporting the life of more organisms.

Now let us study some habitats more closely.

Pond as a habitat

There are several organisms in a pond. To study them more closely we need to see the different regions in the pond where communities of some organisms are present.

- Which animals and plants do you think would live on the surface of the pond?
- Which animals and plants do you think would live in mid-water?

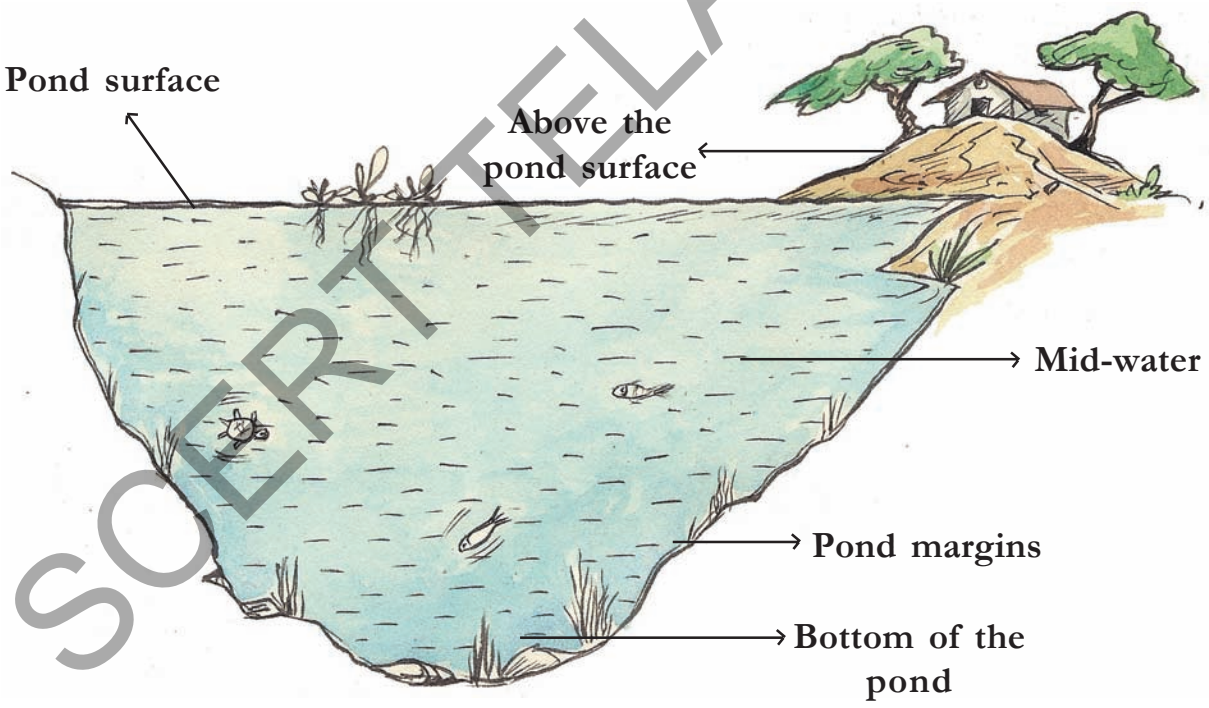


Fig. 2

Mountains provide habitat for a wide range of terrestrial animals including mammals, birds, reptiles, invertebrates and amphibians.

- Which animals and plants do you think would live in the pond margins?
- Which animals and plants do you think would live at the bottom of the pond?

In the pond, we find that different organisms live in different regions. This is due to some conditions like availability of different amounts of food, air, light etc.

We find organisms like dragonfly, mayfly and kingfisher living above the surface, that is, hovering above the pond and then resting over a bamboo pole or a stick jutting out of the surface of the pond. They get food from the surface of the pond.

Organisms like snail, whirling beetle and pond skater live on the surface. The larva of mayfly and dragonfly also live on the surface of the pond. Plants like pistia float on the surface completely while those like the lotus have roots going deep under. On the surface organisms are easily eaten up by others because there is little protection for them. However, there is plenty of food and air and this is why fish usually come to the surface to feed.

Great water boatman, leech and mosquito larva are found in midwater. Fish and crabs also swim around this region.

Pond margins have several grasses, frogs, cranes, crabs etc. Fish usually lay eggs here.

The bottom of the pond has plants like Hydrilla and animals like mussels, flatworms and some maggots (larva of some insects like fly). Light is minimum here, but food, in the form of dead and decaying matter is in plenty.

Activity-2: Organisms that live in different levels of a pond

Try to answer the following questions on the basis of what you have read so far :

- Name some organisms in the pond that can stay in different regions in the same pond? What makes them stay in different regions in the pond?
- Can different places in the pond also be called as habitat? Why or why not?
- Is there any animal with legs in the pond?
- Do all animals in the pond have tails?
- Do all animals in a pond swim?
- What are the animals that share the surface of the pond as habitat?
- Are leaves of all plants growing in the pond similar? What is the difference between the leaves of a plant growing at the bottom (hydrilla) and that floating on the surface (lotus)? Try to think and write why such difference may be there.

In all ponds we can see both plants

Coral reefs are among the world's most diverse habitats. Coral reefs are made up of millions of tiny coral polyps.

and animals. The plants that we see in water are called aquatic plants. Animals are called aquatic animals. This type of habitat is said to be an **aquatic habitat.** There are several aquatic habitats on earth, from very small ones like water tanks, ponds, different places in the water tank or pond, small garden pools, pools that form after rain to large ones like saltwater lakes, rivers, seas etc.

Tree as a habitat

Now, in the same way, let us study a plant or a tree as habitat.

Birds, monkeys, squirrels, snakes, ants, spiders, caterpillars, moths, bees, wasps, small plants (mosses), mosquito, are some organisms that you may find on a tree. Try to classify them in table 2 based on where you find them. Add some more examples that you know.

Table 2

At the base of the tree	ants, ...
On the trunk	
Between the branches	monkeys, ...
On or within leaves	

Fig. 3 has been drawn for your help.

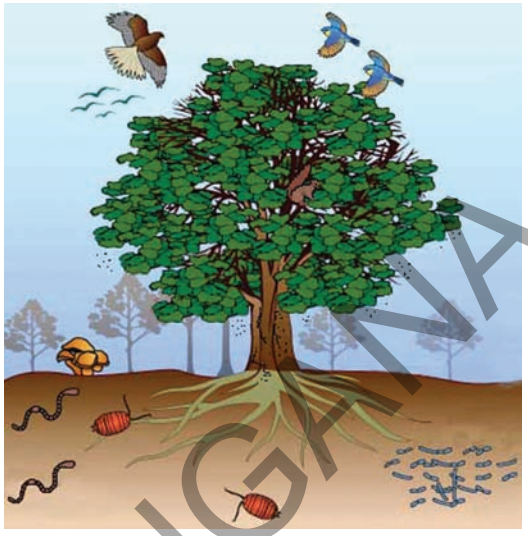


Fig. 3

Now try to explore the types of organisms that you may see living on a tree or even a medium sized plant found in your surroundings.

Activity-3:

- Select a tree/plant in your school (you may work in a group of 4-5 students of your class).
- Observe the tree that you have selected over a period of time, say a week, by visiting it at least at two different times a day. Do this everyday.
- Let each member of your group note the observations individually whenever they can.

Deserts and scrublands are landscapes that have scarce precipitation.

Note the following :

- Make a list of all the organisms seen by you on your first visit. Add the names of organisms that you may find in your next visits.
- Make a rough sketch of the tree in your note book and mark the places on the tree where you spot these organisms. Take the help of Fig. 3.

Carry out your exploration by trying to find out the following :

- Did you find some small plants growing on the tree? (You can touch the bark and look for a green velvety growth for this).
- Is the tree chosen by you a habitat for this plant?
- Did you find that some animals were always present on the tree? Name them.
- Did you find some animals coming to and going away from the tree? What were they?
- Did you spot the same animals everyday?
- Is the tree a habitat for the organisms that came on some days and could not be found on the other days?
- Based on your observations, for which organisms is the tree observed by you a habitat?

Discuss with the other groups what they observed and answer the following :

- Do all the trees observed have the same animals?
- Is there any tree without animals?
- What are the animals we frequently see on trees?

Try to observe more plants and trees in your surroundings as well.

There are different types of trees in our surroundings. Tree is a place where different types of animals live. Birds, squirrels, ants, spiders etc. Some very small plants also grow on the barks of trees (you may have seen certain areas of the barks having green velvety growth especially in the rainy season). Trees are thus habitat for different organisms. Birds and squirrels come and go from a tree yet the tree is a habitat for them.

Our house as a habitat

We live in houses that protect us from heat and cold, rain etc. and are a shelter for us. We keep some animals and birds as pets in our houses. We also grow some plants which give us fruits and vegetables.

Forests and woodlands are habitats dominated by trees. Forests extend over about one-third of the world's land surface and can be found in many regions around the globe.

Activity-4:

Discuss the different organisms living in your house. List them.

- Can animals that live in our houses as pets live in other places as well? Name the animals and also write the places where they can live.
- Animals not useful to us also live in our houses. Give examples of such animals.
- Why do only certain types of animals and plants live along with us?

We domesticate some types of animals and plants for our needs such as food.

- Think, why do we domesticate dogs and cats?

Thus we can say that our house is also a habitat, isn't it? Several animals like dogs, cats, goats, cows, birds (like hens, ducks, pigeons), spiders, ants, cockroaches live with us. Plants like the money plant and some crotons are also kept inside our houses.

We should take care of our pet animals. Most of the time, we concentrate on getting milk from cow/ buffalo but not on their needs. Keeping their sheds clean, supplying fodder and water to them is our responsibility. If we show concern for animals they become affectionate to us. You notice your pet dog licks your feet, wags its tail, sits near you and walks with you. Have you ever experienced the affection that a dog / cat shows towards you? Write your experience.

Do you know:

Animals are partners of our habitat. They also have a right to live. We people are encroaching their habitat. If we cut a tree, birds that live on it lose their nests and fall in danger. We often see dogs, cows, monkeys suffering from lack of food and shelter. Blue Cross is one of the voluntary organisation that works for animal rights and protection.

Orchard : A wonderful avenue

While travelling by bus or train, we can see different types of crop fields and orchards. Farmers grow mango, guava, sapota, banana, citrus(battai) trees in the villages. In orchards, farmers grow a single type of fruit plants; in a mango orchard there will only be mango trees. But we find several other small plants growing on the ground and also find different types of animals there.

- Are all plants that grow in an orchard the same as the plants in a forest? Why is it so?

Grasslands and savannas are habitats characterized by the predominance of grass vegetation and the absence of forests or thick tree stands

Tamarind, mango, amla are examples of plants that grow in forests or in the house-gardens or fields.

Plants and animals that live in different places on the land like those living on trees, in our houses, fields, forests etc are said to belong to terrestrial habitat. All habitats on land are collectively known as **terrestrial habitats.**

Now let us do a small activity to see the difference in the ways in which plants and animals adjust or adapt to their surroundings.

A study of the difference between aquatic and terrestrial plants will help us understand this better.

Activity-5: Compare water plants with land plants

Collect an aquatic plant say a hydrilla or vallesneria. Also collect any land plant. Now compare the two and write your observations in table 3.

Table 3

Parts	Terrestrial plant (tulsi)	Aquatic plant (valisneria /hydrilla)
Stem		
Leaf		
Root		
Others		

- On the basis of your observations write how is the aquatic plant suited to living in water?

Diversity of habitats in Telugu States

The plants that grow in coastal regions differ from those of Telangana or Rayalseema. We can see mangroves only in coastal districts. Grapes are grown in Telangana. Similarly, we can see same type of plants in all places of our state.

Do you know?

Cactus, *Acacia*, *Aloe vera* (Kalabanda) plants do not need water like chilly or jasmine plants. They are called desert plants. We can see camels frequently in the desert. Desert plants and animals are suited to dry conditions and vast temperature differences. Different characteristics in the desert make up desert habitats.

Aquatic habitats come in many forms: lakes, rivers, wetlands, marshes, lagoons, streams, rivers and swamps.

Discuss with your friends and write:

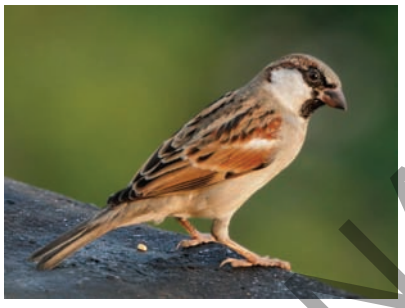
- Do animals change their habitats?
- What about our domestic animals, have their habitats changed?
- Have you seen some birds in your surroundings only during a particular season? Why do they come here?
- Can we see all types of birds throughout the year? We hear songs of cuckoo only in a particular season. We see cranes on trees in rainy season, where do they come from and where do they go at other times?

Good habitat, good life!

Suppose the doors of your house are destroyed somehow? How will you feel?

We fail to accept even little changes in our house or surroundings. We feel disturbed. Do we feel the same way for others? We are dumping wastes in nearby ponds, lakes, rivers and grounds and destroying forests on a large scale to set up industries. Think what will happen to all the organisms living in these areas. What will be the result of all this? Don't we depend on different organisms? You have already studied about the interdependence of different organisms. Try to give your answer on the basis of that. If we harm them wouldn't we be harmed as well?

Think how a good unharmed habitat leads to a better life for us.



Do you know?

Different kinds of birds come from long distances to Kolleru and Pullicat lakes of A.P state. During the months of October to March, pelicans appear near those lakes. In Kurnool district we can see a bird called battameka pitta which flies over long distances to come here.

Generally we can see birds flying over long distances to find suitable conditions to reproduce. Animals like turtles and fish also move from place to place. Some kinds of turtles move away from coasts of West Bengal and Orissa to the coasts of Vishakhapatnam.

Have you heard about the Pulasa fish? Gather information about them. How and why do they change their habitat in some seasons.

Keywords

Habitat, Terrestrial, Aquatic

Where freshwater mixes with saltwater you'll find mangroves, salt marshes, and mud flats.

What we have learnt

- Habitat is a dwelling place for plants and animals that gives them optimum conditions for life.
- Tree, pond, house are some examples of habitats.
- Temperature, moisture, air, water, food, shelter are the components of a habitat.
- All habitats may be broadly grouped into terrestrial (land) and aquatic (water).
- Several kinds of plants and animals share the same habitat.
- Habitats shows the diversity of nature.
- Habitats are specific to the particular organism living there.
- Birds often change habitat in search of better living conditions. For example, some birds change habitat before laying eggs.
- We must not destroy habitats of other organisms to satisfy our needs; rather we must try to protect them.

Improve your learning

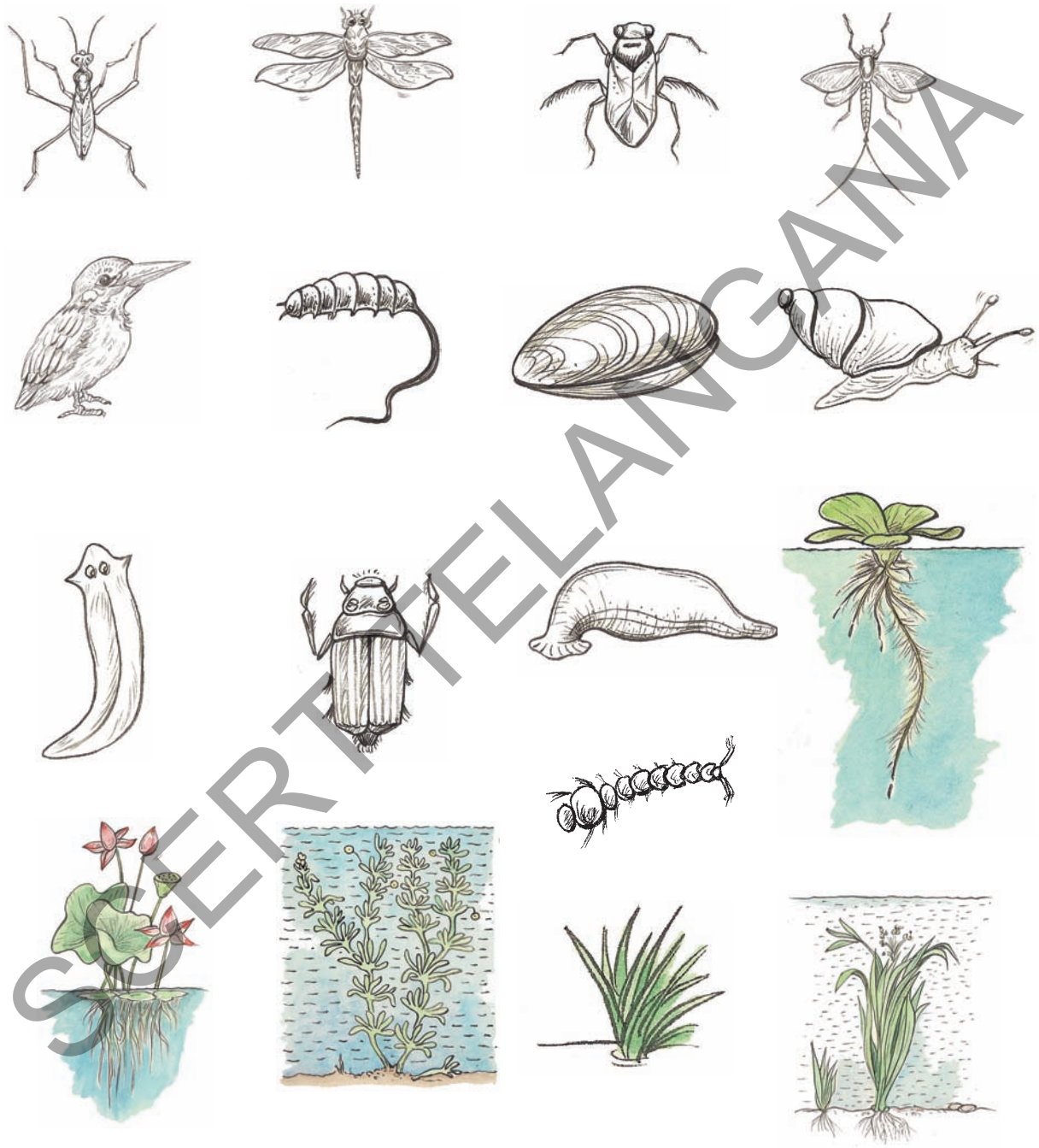
1. What is a habitat?
2. Name some plants and animals that live in terrestrial habitat.
3. Why can't fish live on land?
4. "Animal skin is a habitat for some organisms." What do you understand by this statement?
5. Identify the habitat in which the following live. More than one organism may be present in one habitat (use information given in the help box)

   Our intestine, pond margin, kitchen, garden, tree, underground, grass

6. What happens if a habitat is disturbed or destroyed?
7. Why do some animals change their habitat?
8. Observe a spider in its web and write how a spider shares its habitat.
9. Collect a hydrilla plant. Put it in a glass of water and observe for a week how it grows.
10. Take a map of Telangana and colour the areas where forests grow.
11. "I am a living being. I have four legs. I live in water and also on land." Who am I? And guess who are there in my habitat along with me.
12. Write your experiences with your pet dog / cat / cow etc. that shows its affection on you.
13. Raziya doesn't want to distrub squirrles that eat fruits on the guava tree at her house. Why does she do so?
14. Prepare a map that represents different habitats which exist in your school.
15. Prepare an article to deliver a speech in Literary Association meeting on "Animals also have right to live."

Seas and oceans stretch from pole to pole and reach around the globe. They cover more than 70 percent of the Earth's surface and hold in excess of 300 million cubic miles of water.

16. Pictures of diffrent kinds of plants and animals which live in plants and lakes in our surroundings are given below for you. Try to know their local names with the help of your teacher and write them in your note book.



Where water meets land, a diverse array of animals and wildlife gather to feed, reproduce, and seek out shelter.

7 Separation of Substances

Hemanth's mother sent him to a grocery store to buy grocery and vegetables. He purchased green chilli, coriander seeds tomato, red gram, wheat flour and kept them safely in a bag. While returning home he fell on the ground and all the items in the bag got mixed. How will he separate them now? Which material will he separate first? How would he separate tomato and chilli? How would he separate wheat flour? How would he separate coriander seeds?

Fig. 1

We separate components in mixtures for different purposes in our daily life. For example, we remove small stones from rice before cooking, remove worms and husk from flour by seiving before preparing roti. Similarly we separate impurities from water, tea leaves (tea powder) from tea etc. Can you mention some more?

Mixtures

Have you observed tea being prepared? What substances are used for preparing tea? List them in table 1. and also list out the different substances that are used to make the items given in table 1.

Fig. 2

Table 1

Item	Substances
Tea	Milk, ...
Laddu	
Lemon Juice	
Concrete	
Soil	

The above items are **mixtures** as they contain more than one substance. Combination of more than one

The natural variety, Japan camphor, is obtained by steam distillation of the wood of the camphor tree (Cinnamomum camphora)

substance forms a mixture. Some mixtures are natural like soil. Some mixtures are man-made like laddu, lemon juice etc.

Write in table 2 some mixtures that you know and their substances. Also mention whether they are natural or man-made.

Table 2

Mixture	Substances	Natural / Man made
Lemon water	Lemon juice, sugar, water	Man-made

- Identify the mixtures among the following : milk, tea, sand, turmeric powder, red chilly
- From which mixture in the examples mentioned above are you able to separate substances?

Fig. 3

Activity-1: Use of water in separation

Collect some solid materials such as ghee, wax, sand, sugar, salt, turmeric powder, dal, plastic, wood, iron nails. Take a bucketful of water and a beaker. Now try to discover the following.

- Which materials float on water?
- Which materials sink in water?
- Which materials are soluble in water?
- Which materials are not soluble in water?

You have studied about materials and their properties in a previous chapter. We make use of several properties of the materials for separating the desired items from the mixture.

You might come across some situations where you have to separate some components from a mixture. Write down two examples of such situations.

1. _____

2. _____

A vitamin is a substance that makes you ill if you don't eat it.

What do you do to separate the components?

- Were you able to separate each substances from the mixture?
- Are the methods used to separate the substances the same in all these instances?
- What are the properties of the substances that are used, in separating them?

Methods of Separation

We will discuss some simple methods of separating substances that are mixed together. You may come across some of these methods being used and seen in your day to day life.

Hand Picking

Fig. 4

- How stones were separated from pulses and rice?

Stones are separated by **hand picking** from rice and pulses (see fig. 4).

- Can you separate salt from sand in this manner? What differences in the properties of rice, pulses and stone help us in separating them by the above method?

Sonu gave following examples for hand picking method of separation.

1. Rotten fruits are removed from fresh fruits.
2. Separating oranges and apples.

Try to give some more examples where the hand-picking method is used.

1. .....
2. .....
3. .....

Winnowing

When farmers thresh their crops, they get a mixture of husk and grain. How do the farmers separate the husk from the grains?

On a windy day, a farmer stands on a high platform and allows the mixture of grain and husk to drop slowly from the flat pan. The wind carries the husk forward and the grains fall vertically downward. A separate heap of grain is formed (Fig. 5).

Concrete is the combination of sand, stones, and cement, which is filled in Iron frames.

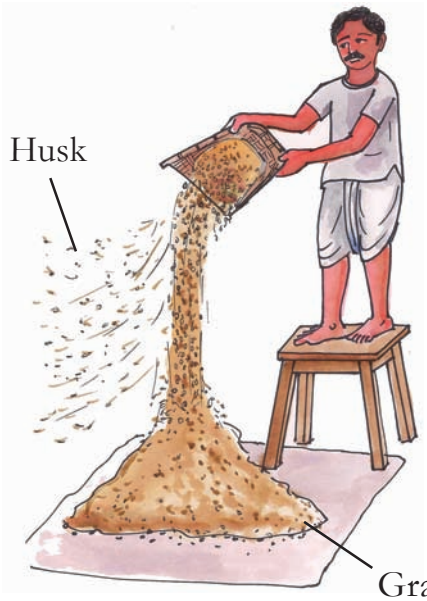


Fig. 5

- What property helped in separating the husk from grain?

Husk is very light as compared to the grains, and farmers use this property.

Activity-2: Sedimentation and decantation

Take a mixture of soil and water in a glass tumbler and keep it undisturbed for sometime. What do you observe?

You will find that the sand and the mud particles in the soil settle down at the bottom of the glass tumbler (Fig 6(a)). These are called sediments. This process of separation of mud and sand is called **sedimentation**.

After sedimentation, the tumbler is gently lifted. The tip of the tumbler is inclined on the edge of another tumbler without disturbing the sediments (Fig. 6 (b)). The water gets seperated from the sediment(mud). This process is called **decantation**.

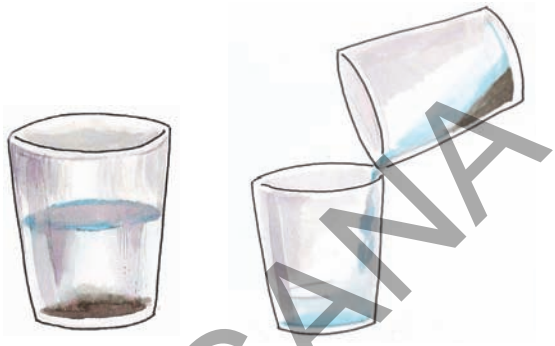


Fig. 6 (a) **Fig. 6 (b)**

- Why did mud particle settle at the bottom of the tumbler?

Laxmi says that sedimentation and decantation are used at home while cleaning rice and pulses for cooking. Describe the sediments in this process.

- Think of other examples where we use this method of separation and list them.

_____

_____

Sieving and filtration

- How will you separate the tea-leaves from tea?

Tea-leaves are separated from tea using a strainer. Which property helped in separation of tea-leaves (tea powder) from tea?

You must have seen flour being seived in the kitchen (Fig. 7). The flour particles are very fine and pass through the holes

You can walk on waters of Dead Sea it is a salt lake bordering Jordan to the east and Israel and the West Bank to the west.

of a sieve, but the husk particles being large are left on the sieve.

Fig. 7

We use sieves to separate tea leaves (tea powder) from tea and sand from gravel. What are the differences between the sieves used in the two instances?

Do you know?

Farmers separate grains which are bigger in size from the smaller ones by sieving. The bigger grains are then used as seeds or sold at higher price

Can you separate mud from muddy water using a sieve? How small should the pores of the sieve be to do this? Use a cloth as a sieve and try to do this.

- Is the water clear after sieving?
- Gowthami filtered mud water with a filter paper. Can you do it? (See Fig. 8)
- After using the filter paper to filter water what do you find? What do you see left behind on the paper? What is obtained in the beaker?

Fig. 8

Filter paper

Filter paper is a sieve made of paper which has very fine holes. We can filter very small particles using this type of sieve.

Activity-3: Why can't we filter salt from salt water

- Take water in a beaker. Dissolve some salt in it. Filter this mixture with a filter paper. Were you able to separate the salt from the salt water?
- Why could you not filter the salt from salt water?

Handpicking is an excellent method of controlling pests especially when only a few plants are infested.

The pores in a filter paper are so minute that we cannot see them with naked eyes. Think, how small should the particles of salt dissolved in water be if they are to pass through filter paper!

Activity-4: Crystallization

Heat some salt water in a beaker, over a flame. Stir the solution with a glass rod (Fig. 9). Continue heating till all the water in the beaker has evaporated. What is left behind in the dish? You will find salt crystals and powder in the dish.

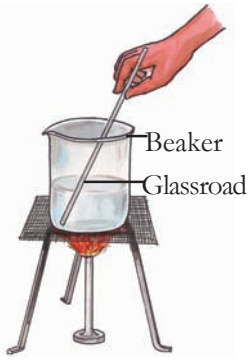


Fig. 9

Do you Know?

Water is generally evaporated in sunlight. We use this property while extracting salt from sea water. Sea water is captured in wide pans and is exposed to air and sunlight. Then water evaporates and the salt is left behind in the pans.

Fig. 10

Distillation

Before administering injections to patients, doctors mix injection powder with some liquid. What is it? Is it water or any other liquid?

This is water and it is known as distilled water. Where does this distilled water (pure water) come from?

- Do you know the process of distilling water?

Activity-5: Get your own distilled water

Fill a conical flask with water, close it with a cork having a hole. Insert a glass tube through the hole. Take an another conical flask with a cork having a hole and insert another glass tube through it. Connect both tubes with a rubber tube. Now heat the flask containing water using a Bunsen burner (Fig. 11).

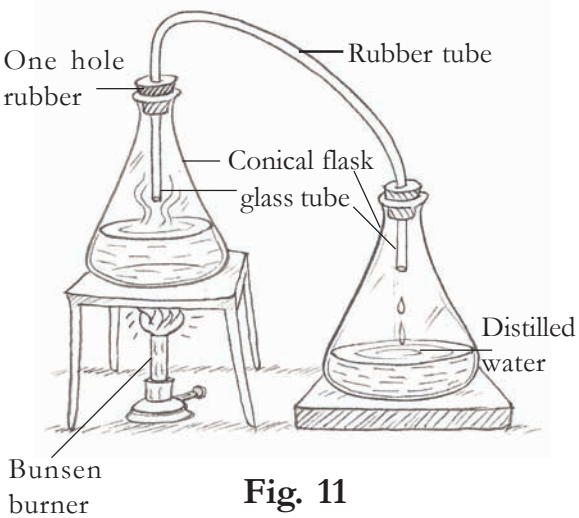


Fig. 11

Soil and rock layers naturally filter the ground water to a high degree of clarity.

After some time, water vapour goes into the second conical flask through the glass tube. The water vapour will slowly turn to water. The water in the second conical flask is called distilled water. It is free from impurities.

Sublimation

In order to separate the components of a mixture we make use of their difference in color, shape, size, weight, solubility.

- Can we use these features for separating mixtures of powdered salt and camphor?
- What other properties can we use?

Activity-9: Sublimation of camphor

Take a mixture of camphor and powdered salt in a china dish and cover it with a funnel. Close the tube of the funnel with cotton. Place the dish on a stand and heat it with a burner (Fig. 12).

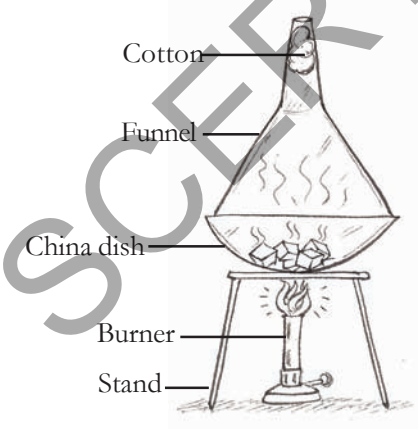


Fig. 12

- What do you observe in the dish?

When camphor is heated, is it transforms into liquid or directly change into gaseous form? Similarly, on cooling, the gaseous form of camphor changes directly into a solid without going to the liquid state. Guess. Is same change found on heating salt? The process in which a substance changes directly from solid to gaseous form and vice-versa is called **sublimation**.

Chromatography:

Can we separate colours from a mixture of colours? Let us do an interesting activity.

Activity-7: A chalk with diffrent colours

Take a whole stick of white chalk. Around the curved surface of the chalk put an ink mark with blue or black ink.

Now pour some water in a plate and keep the piece of chalk in the water (Fig. 13). Ensure that the water in the plate is very little and does not touch the ink mark.

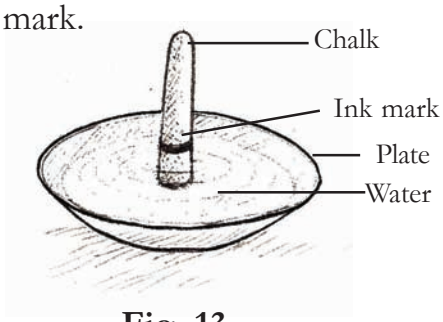


Fig. 13

Chilka lake is the India's largest salt water lake

Now observe the colour patterns that form on the piece of chalk after some time.

- Does chalk absorb water?
- What changes you observe?
- Can you find any change in ink mark on the chalk?
- Which colours are seen?

Remove the chalk before the water reaches its top. Which colours do you see on the chalk from the bottom to top? Draw a picture of the chalk in your notebook and the colours you have seen on the chalk. From where did these colours come?

The ink appears to be made of a single colour but it is actually a mixture of many colours hidden in it. This method is an example of chromotography. Try to do chromatography with different inks and find out which colours they contain.

- Where do we use the chromatography method?

We know that a leaf is green in colour. Try to find whether the leaf consists of only one colour or more than one colour?

Separation using more than one method

We have studied some methods for separation of substances from their mixtures. Often one method is not sufficient to separate the different substances present in the mixture. In such situations, we need to use more than one of these methods.

Activity-8: Separation of diffrent materials from the mixture

Take a mixture of sand, saw dust and salt in a beaker half-filled with water. Stir the mixture well. Allow to undisturb for 10 minutes. What do you observe?

- Which substance floats on the water?
- How can you collect it?
- Which substance settles at the bottom of the beaker?
- How can you collect it back?
- Which substance is dissolved in the water?
- How can you get it back?

Think about suitable methods to separate the substances that are floating (or) settled at the bottom of the beaker (or) dissolved in water and write them in your notebook.

Separation of substances is a very important scientific activity and is also important in our daily life.

We are using different types of separation techniques for various purposes to get desirable quantities of material.

Distilled water will hamper metabolic processes - if distilled water is consumed for longer period.

Keywords

Mixture, separation, handpicking, winnowing, sedimentation, decantation, sieving, filtration, crystallization, distillation, sublimation, chromatography

What we have learnt

- Substances can be separated from a mixture.
- Hand picking is used to separate substances when their sizes are sufficiently large.
- If mixtures have light and heavy substances, winnowing can be used for separation.
- An insoluble substance in a liquid can be separated by sedimentation and decantation.
- Sieving can be used for separating larger and smaller substances in a mixture.
- Crystallization is used for separation of dissolved substances from a liquid.
- Distillation is used to remove impurities from water.
- More than one method of separation can be used to separate the components of some mixtures.

Improve your learning

1. Is it possible to separate sugar mixed with wheat flour? If yes, how will you do it? If powdered sugar is mixed with wheat flour, how do you separate them?
2. Why is hand picking necessary after winnowing?
3. Srikar accidentally mixed mustard seeds with rice and salt. How can he separate them?
4. Which separation process is used when one component is in a mixture :
   a. Heavier than the other?
   b. Bigger than the other?
   c. Different shape and color from the other?
   d. One is soluble in water and the other is not?
   e. One floats and the other sinks in water?
5. Visit a nearby dairy and report about the processes used to separate cream from milk.
6. Divya suggested some methods to separate mixtures given below. Are they correct? Find whether they are possible or not. Give reasons.

Solid form of Corbondioxide is called Dry Ice

a. Pure water can be obtained from sea water by the process of filtration.

b. Cheese is removed from curdled milk by the process of decantation.

c. Separation of sugar from tea can be done by filteration.

7. Collect information from your parents regarding various methods used by us to clean food grains at home and prepare a chart to show them.

8. We observe that kerosene rises up in the wick of a lantern. Take a wick and put a spot of ink at one of its ends. Then dip the wick in kerosene just as you had dipped the chalk in water in the chromatography activity. Will your experiment be successful in seperating the colour ink spot. Try it.

* * * * *

In the Middle Ages, salt was so expensive it was sometimes referred to as "white gold".

8 Fibre to Fabric

Neelima lives in a town. Her father is a salesman at a cloth shop. One Sunday she went there along with him. She was amazed to see so many varieties of cloth (fabrics). Her father and other salesmen were showing different types of fabric to the customers. They were telling customers about their smoothness, thickness, colour and shrinking property. They were also telling them how to take care of the fabrics, whether they were washable or needed to be dry-cleaned. She also noticed that some materials cost less than the others. On the way back home she asked her father many questions. Why was there a difference in the price? How are these fabrics made? What materials are these fabrics made of? Is the process of making fabrics the same for all types? Let us try to find the answers to Neelima's questions.

Fig. 1

Types of Fabrics

List the types of clothes we wear in the following seasons:

Seasons	Cloths we wear
Summer	
Winter	
Rainy	

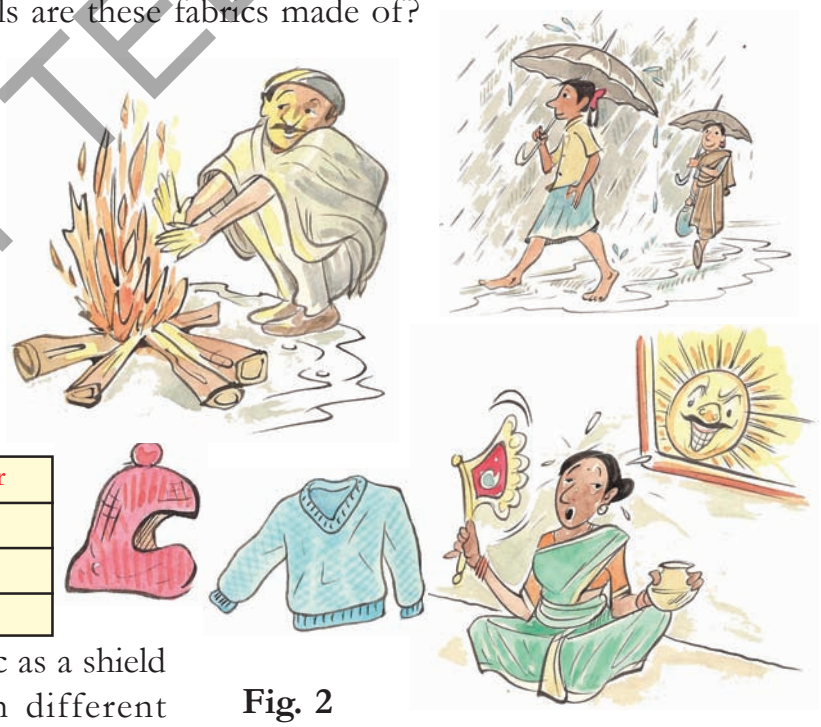


Fig. 2

We can say that we use fabric as a shield to protect ourselves from different

Corn fibre is a new innovation in the textile industry.

weather conditions. Along with protection, clothes can also be a symbol of beauty and status. Choice of fabric may vary from person to person. Somebody may like to wear clothes made up of light, thin, shiny fabrics. Another person may like to wear clothes that are bright coloured and made of coarse fabrics. Fabrics for casual and formal wear may be different. Personal choice, personality of the owner and the cost of fabric are all-important factors in the selection of the perfect fabric.

Our purpose and the properties of a fabric together determines which type of fabric can be used for each purpose. Coarse fabrics can be used for mopping and making gunny bags but not for making clothes. Some other properties will have to be considered for choosing curtain fabrics.

Do you know?

The material used for making school bags is also a kind of fabric. Fabrics are not only used for making clothes; they are also used in making banners, flags, shoes, curtains, in book binding etc. Calico is a type of fabric used in book binding.

Activity-1: Things made up of fabric

List things in your house made up of any type of fabric. Classify them into cotton, silk, wool, polyester, terylene, etc. Try to enrich the list as much as you can. For identifying the fabrics, you can take the help of your elders and teachers.

Table 1

Type of fabric	Things
Cotton	
Silk	Kurta, Sari, ...
Wool	
Polyester	
Linen	Shirts, ...

- Which kind of fabric is being used more in your house?
- How did you identify the type of fabric?

Cotton fabrics are somewhat thicker than polyester fabrics. Coarse cotton clothes are heavier. After washing, cotton clothes get wrinkled. Silk fabric is smooth to touch whereas woolens are somewhat heavier than silk fabrics.

- Try to find out the properties of each type of fabric (cotton, wool, polyester, etc.).
- Which properties were you able to generalize for a particular type?

What are fabrics made up of?

When you look at any fabric, it appears to be a single, continuous piece. Now look at it closely; what do you notice?

Silk is commonly obtained from silkworms. However, in recent times, scientists have come up with an innovation wherein silk is produced from spiders.

Activity-2: Threads in the fabric

Take a piece of fabric. With the help of a magnifying lens, observe how the fabric is. Pull out threads one by one from the fabric. Observe these threads. What did you observe?

Take one thread. Scratch its end. Observe it through a magnifying lens. Were you able to see the fine structure of thread?

Take a needle and try to insert this thread into the eye of the needle. Can you? Isn't it difficult? Have you ever seen what people do to overcome this problem? Generally when we are not able to put thread into the eye of the needle, either we twist the end of the thread or we wet the end using saliva.

Fig. 3

Types of fibres

We know that there are different kinds of fibers like cotton, wool, silk, polyester etc. The fibers of some fabrics such as cotton, jute are obtained from plants. Silk and wool are obtained from animals. The fibres that are derived from plants and animals are natural fibres. Nowadays, clothes are also made up of chemically developed yarn like polyester, terylene, nylon, acrylic etc. These are all called artificial fibres.

Do you know?

Human beings in ancient times used leaves and skins of animals as clothes. Clothes were also made from metal. Warriors used to wear metal jackets during wars. You can see clothes like these in historical museums or in television shows.

Activity-3: Characterstics of fabrics

Collect some natural and artificial fabrics and observe the following characterstics. Record your observations in table 2.

Coir fibre is thick and strong and is hence ideal for use in rugs, sacks and brushes.

Table 2

S. No.	Character	Natural fabric	Artificial fabric
1.	Water absorbing nature		
2.	Time taken to dry		
3.	Smell while burning		
4.	Result after burning		
5.	Stretching capacity of yarn		
6.	Smoothness		

- Which types of fabrics are smooth in nature?
- Which type of fabrics dry in a short time?
- Do you find any relation between smoothness and time to dry?
- Which fabrics gives ash when they are burnt?

Silk fabrics are slippery and shiny in nature, whereas cotton fabrics may be coarse as well as smooth. When we burn fabric made up of artificial fibres it gives a pungent smell.

Natural Fibres

Cotton, jute, wool and silk are some common examples of natural fibres. In this section, we will discuss cotton and jute in detail. Cotton is obtained from cotton balls or cotton fruits. Usually cotton plants are cultivated in black soil. In our State, cotton crop is widely grown in districts like Warangal, Adilabad and Nalgonda.

- Look at the Telangana State map and list out the places where cotton is grown.

Activity-4: Making cotton yarn.

Collect cotton balls from nearby houses or cotton growing fields (Fig. 4). Remove seeds from the cotton balls and separate cotton. Take a small piece of cotton; observe it using a magnifying lens or under a microscope. What do you observe?

You will see small hairy structures. These are the fibres of cotton. After maturing, cotton balls burst and open. Then we can see white coloured strands of cotton

Fig. 4

The hair of the yak is very useful in the production of warm clothes, mats and sacks.

fibre. Cotton is usually picked by hands. When cotton wool is separated from seeds, it is called ginning.

Making yarn from cotton fibre: Cotton fibre is collected after removing the seeds from the cotton ball. This cotton fibre is cleaned, washed and combed. This fine cotton fibre is used to make cotton yarn. Yarns are dyed and coated with chemicals.Then they become strong enough to make fabrics.

Activity-5: Spinning yarn

Take cotton ball and remove seeds from it. Take some of it in one hand and gently start pulling out cotton by using thumb and forefinger (Fig. 5(a)). Continuous twisting of the fiber will make yarn. Is it strong or not?

Fig. 5 (a)

The yarn that we make from cotton wool is not strong enough to be used for weaving. To get strong yarn from fibre, Takli (Fig. 5 (b)) an instrument for spinning has been used since olden days. Charka (Fig. 6) is also used to make yarn. The process of making yarn from fibers is called spinning.

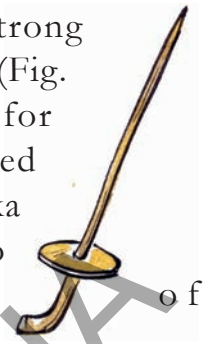


Fig. 5 (b)

Do you know?
In our State, Nalgonda district, cotton is widely grown. To pick up maturing cotton balls from cotton plants, children works in field as child labour. Many voluntary organizations along with government are working to eradicate child labour. Think, why are children forced into labour? Give your own solutions to this problem.

Fig. 6

Charles Macintosh was a Scottish chemist who invented (1823) a method for making waterproof garments.

Do you know?

During the freedom struggle, Mahatma Gandhi encouraged people to wear clothes made of homespun (khadi)yarn. People burnt imported clothes during Swadesi movement.

Jute yarn

Have you seen gunny bags? Where do you see them? Paddy, chilli and other commercial crops are packed in gunny bags. All bags of these types are made up of coarse jute fabric.

Fig. 7

These bags are suitable for carrying heavy material. Do you know how jute yarn is made? Is this process same as that for cotton or is there any difference?

Like cotton, jute yarn is also useful in making fabric. It is also called golden fibre. Jute fabric is not the same as cotton fabric. It is harder, stronger and more rough.

Making of Jute Yarn

Jute fibre is obtained from stem of jute plant. The stem of the harvested plant is cut and immersed in water for some days. When the stem is soaked in water it becomes rotten and easy to peel. Then the fibres are separated from the stem to make jute yarn. This is thoroughly combed and cleaned. Gunny bags are made using this cleaned jute.

Activity-6: How is jute yarn?

Collect gunny bags. Pull out the threads from the bag and observe under magnifying lens. You will see strands of yarn. Observe how the fibre looks like? compare these fibers with cotton fibers.

Do you know?

We all use polythene bags for different purposes. Polythene is very difficult to decompose. To protect our environment, we should use cloth bags instead of polythene bags.

In the same way fibre is made from Red sorrel (Gongura) and Bamboo. Hemp and flax are also plant fibres which are used in making clothes but in smaller quantities as compared to cotton.

Yarn to fabric

The yarn that is prepared from fibre is used to make fabric.

Fig. 8

Waldo L. Semon invented a way to make polyvinyl chloride (PVC) useful. He created vinyl.

Strands of yarn are arranged in vertical (*padugu*) and horizontal (*peka*)rows in a loom to weave fabric.

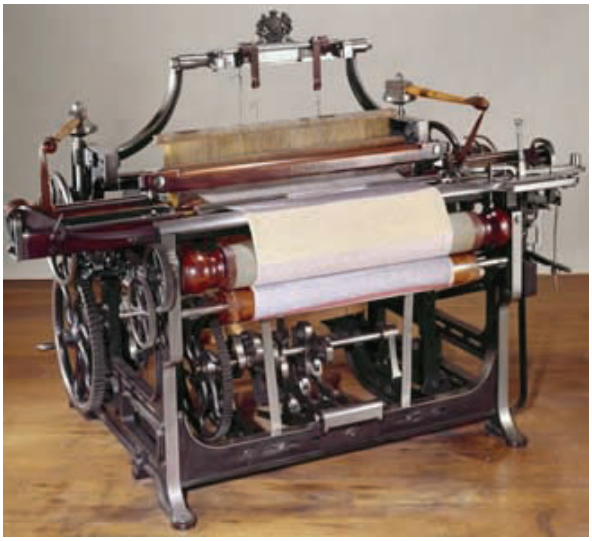


Fig. 9

Spinning of yarn on large scale is now done by using machines. Two sets of yarn arranged together to make fabric is called weaving. Weaving is done on looms. The looms that are worked by man power are called handlooms (Fig. 7). Power looms are run by machines. (Fig.8)

Activity-7: Mat making

Take coconut leaves or two different colour paper strips. Cut and remove middle vein of the leaf to get two halves. Now put these strips parallel to each other (Fig. 9). Take one more strip and insert horizontally and alternately between the vertical strips. Finally you will get a sheet like structure. This is

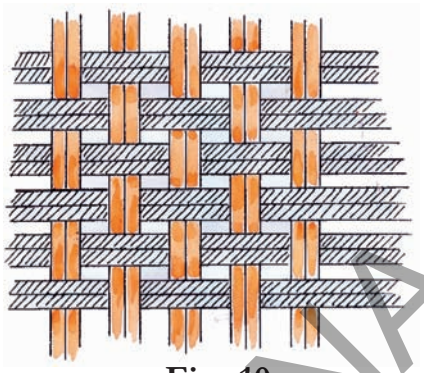


Fig. 10

the way a mat is prepared. In the same manner, weave a paper sheet by using paper strips.

The handloom industry is well developed in our State. Places like Gadwal, Venkatagiri, Siricilla, Narayanpet, Pochampalli and Kothakota are famous for handloom industry. Warangal is famous for carpet industry.

Keywords

Fabrics, fibres, yarn, natural fibres, artificial fibres, ginning, spinning, weaving, looms

What we have learnt

- Cotton, wool, silk, jute are all derived from plants and animals. They are called natural fibres.
- Fibres made of chemicals are called artificial or synthetic fibres.

In 1970, Toray Industries scientist Dr. Miyoshi Okamoto invented the world's first microfiber.

- Tiny strands like structures are called fibres. These fibres are converted into yarn. Yarns are woven together to make a fabric.
- Cotton fibres are made from cotton ball.
- Jute fibre is obtained from the stem of a jute plant.
- The process of removing seeds from cotton wool is called ginning.
- Making yarn from fibre is called spinning.
- Handlooms or power looms are used in weaving fabrics.

Improve your learning

1. What will happen if a rain coat is made from cotton fabric? Why?
2. Make a flow chart showing the process of getting a fabric (clothes) from cotton plant.
3. Coconut is also a fibre. Make a list of some articles made of coconut fibre.
4. Classify the fabric of following items as natural or artificial- Dhothi, Venkatagiri saree, jeans, umbrella cloth, bed-sheets, your shirt or skirt, rain-coat, gunny-bags.
5. Explain the process of making yarn from cotton wool?
6. Small strand like structures are called
   a. fabric b. fibre
   c. loom d. cocoon
7. Making fabric from cotton yarn is called.....
8. What would you do to remove wrinkles from your shirt or skirt?
9. Prepare a bag using cloth. Collect pieces of fabric and make designs on your bag by using them. Display it on school display day.
10. Make a scrap book containing pictures of different types of fabric and name them.
11. Discuss with your teacher and prepare an information chart about spinning mills in our state.
12. Collect news items about handloom workers and cotton growers. Analyze one news item in your own way.
13. While purchasing your dress what doubts would you want to clarify from the shop keeper?
14. What did you do to know whether artificial fibers give pungent smell while burning. Write the steps of your experiment.

Polyester, the most commonly used manufactured fiber, is made from petroleum.

15. The clothes that we wear have a great background. Track the stages (from seed to dress) and write your feelings about the people working at different levels of the track.

16. Observe these logos.

What does this means? Collect information about this from your school library.

Who Said:

THE STORY OF JUTE

In Andhra Pradesh State in the districts of Visakhapatnam, Srikakulam and Vijayanagaram jute is widely grown. There is an interesting story about jute.

Long long ago a man was grazing his cattle in the forest near his village. Suddenly it started raining. It did not stop for days. He saved himself by climbing on to a tree. Almost all the forest got submerged in floods. After a couple of weeks he got down from the tree and walked through soaked plants in the mud. He observed that peels of plants stuck to his legs. He went home and removed those peelings from his body. One day his wife saw the dried peels and noticed that they were so strong and spun a thread. Haven't you understood what the plant is?

Rayon, derived from wood pulp.

9 Plants : Parts and Functions

What kind of plants have you seen at home and outside? You must have observed a variety of plants; some are big and some are small. We can find plants near our home, in the school campus, on the way to school, in the parks and almost everywhere.

- Are all plants similar?
- What are the similarities among them?

Let us get to know more about plants, especially about their parts and functions.

Parts of plants

We know that we have different parts in our body. In the same way plants also have different parts. Do you know them? Here is a plant . Try to name its parts. Which plant is this?

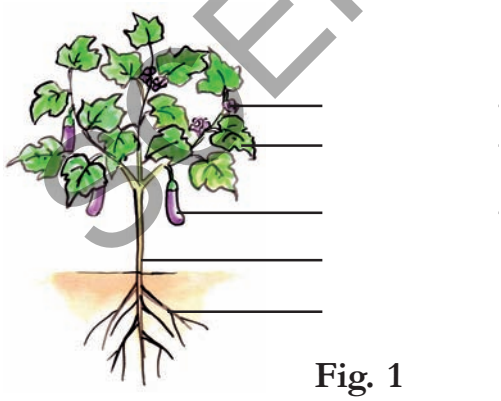


Fig. 1

In this chapter, Let us try to understand about different parts of plants through activities. For this, make groups of 4-5 students. Each group will collect 5 to 6 different types of plants along with their roots. You can collect different small plants from your garden or surroundings but be careful not to damage too many plants.

Activity-1: Identification of plant parts

Observe the collected plants and try to identify their parts. Take the help of Fig. 1 and write your observations in Table 1 given on the next page.
If you don't know the name of any of the plants you can give them a number. You can take the help of your teacher, a gardener or some one else to find the name of the plant. Based on the observations in the Table 1, let us discuss the following questions.
Did you find any plant which does not have roots?
Are the leaves of all the plants similar in size?
Is there any plant without flowers?
What are the common parts that you observe in all plants?

A notch in a tree will remain the same distance from the ground as the tree grows.

Table 1

S.No.	Name of the plant	Root Yes/No	Stem Yes/No	Leaves Yes/No	Flower Yes/No
1.	Tridax plant	Yes	Yes	Yes	Yes
2.	Plant No. 2				
3.					
4.					
5.					

There are variations in the size and shape of plants but generally all plants have roots, stems and leaves. Have you ever thought about the importance of leaf, stem and roots in plants? What is the role of plant parts? Let us try to understand these things.

Roots: Different types of roots

Observe the roots of the plants you collected. How are they?

Do all plants have similar types of roots?

Is there any difference?

Compare the roots of your sample plants with Fig. 2(a) and Fig. 2(b). Write 2(a) or 2(b), in the column 'roots are similar to', according to your observations.

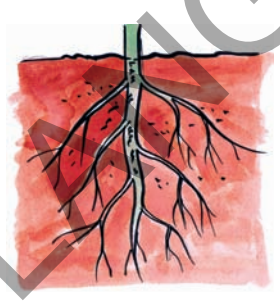


Fig. 2(a)

Fig. 2(b)

Table-2

S. No.	Name of the plant	Roots are similar to Fig.
1.	Tridax plant	2a
2.	Plant No. 2	
3.		
4.		
5.		

Banana oil is made from petroleum.

- In Fig. 2(a), how does the middle root look like?
- Compare this middle root with the remaining roots of the plant shown in Fig. 2(a).
- Do you find any such main root in plant shown in Fig. 2(b)? How are the roots of this plant?
- Do you find any other differences between Fig. 2(a) and Fig. 2(b)

In some plants, the main root becomes thick and has thin rootlets. This main root is known as **tap root** (Fig. 2(a)) and the rootlets are called lateral roots.

In some plants we find small hair-like roots arising from the base of the stem. This type of root system is known as **fibrous root**. Here all roots are similar (Fig. 2(b)) and there is no main root.

Function of the roots

- In activity-1, could you pull out the plants easily from the soil? Or was it difficult? Think why?

Observe the roots of the plants; soil is attached to the roots. Roots help to fix the plant tightly to the soil, so we cannot easily uproot the plant.

Do you know why the roots penetrate deep into the soil?

Activity-2: Absorption of Water

Take two glass tumblers filled with water. Collect two plants having soft stems, along with their roots.

Plants in water without ink

Plants in water with red ink

Fig. 3

84% of a raw apple and 96% of a raw cucumber is water.

Add colour (red ink) in one of the tumblers. Place the plants in each of the tumbler (Fig. 3). Let them be for 2–3 hours and then record your observations.

- Why do you think we added red ink in one tumbler?
- Did you see any red spots in the stem or other parts of any of the plants?
- Why did red spots appear on the stem or flower?

We can conclude that roots help in taking up of water from the soil. They do this by absorption. Minerals present in the soil are also absorbed along with the water.

Do you know?

Some plants store food in roots and stems. Some plants like radish, carrot, beetroot store food materials in their roots. These roots bulge out and called tuberous roots. Can you give some more examples. Carrot, sweet potato are eaten even when raw!

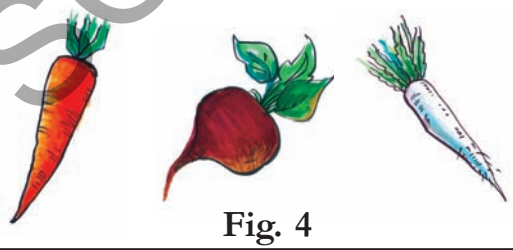


Fig. 4

Parts of a leaf

Leaves are another important part of plants. Most plants that we see in our surroundings have different types of leaves.

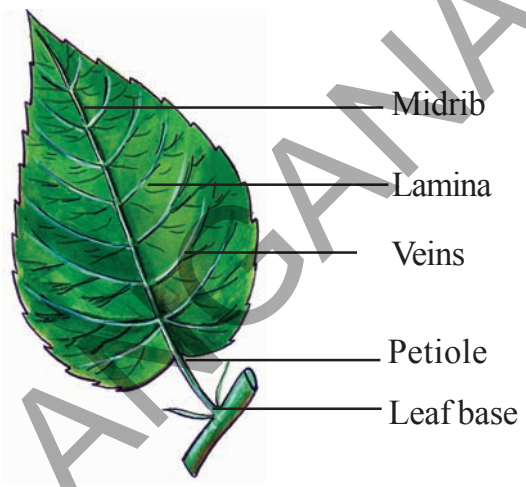


Fig. 5

Observe the given picture of a leaf and its parts (Fig. 5).

- Where is the leaf attached to the stem?
- What is the flat portion of the leaf called?
- What do you call the small line like structure in the flat portion of the leaf?
- Which part connects leaf lamina with stem?

A leaf contains leaf base, a stalk like structure called petiole and lamina.

Pistils have three parts – the stigma, the style, and the ovary.

Activity-3: Are all leaves same?

Observe the leaves of the plants that you collected in activity 1. How are they? Are all the leaves of the same size and shape? See Fig. 5 showing a leaf and its parts.

Compare the leaves of the plants, collected in activity 1, with Fig. 5. Write your observations in table 3. You can also draw what you see in the 'shape' and 'edge' columns if describing is difficult.

Table 3

S. No.	Name of the Plant	Leaf base Yes/No	Petiole Yes/No	Lamina Yes/No	Shape of the leaf	Edges of the leaf
1.	Tridax plant					
2.						
3.						
4.						
5.						

- What are the common parts that you observe in all leaves?
- Do all the leaves have the same shape?

Venation

Observe the leaf lamina carefully. What do you see? You may see some thin line-like structures spread over the leaf.

Activity-4: Venation

The leaf lamina usually consists of a midrib, veins and veinlets arranged in the form of a network. To understand this venation let us do an activity.

Put a leaf under a white sheet of paper or a sheet in your notebook. Hold the tip of a pencil flat and rub it on the paper. Did you get any impression? Is this pattern similar to that on the leaf?

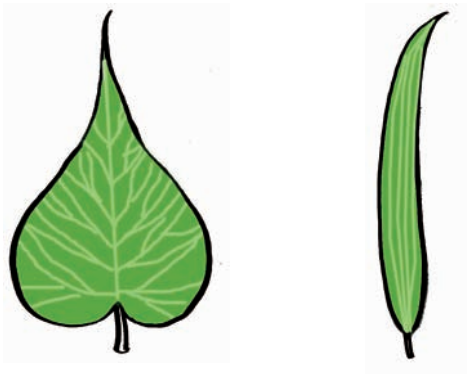
These lines on the leaf are called veins. The long vein present in the middle of the lamina is called midrib. The branches arising from the midrib are called veins and the even finer divisions are veinlets. The arrangement of veins in the lamina is called **venation**. Venation acts as a skeleton of the leaf and give it a shape and support. Think what would happen if there are no veins in the leaf !

Petals are usually colorful, and they attract insects and birds that help with pollination.

Activity-5: Types of Venation

Observe the venation of the leaves that you collected in activity 1. Now compare them with the venations of the leaves shown in Fig. 6.

Record your observations in table 4.



Reticulate (web-like) venation **Parallel venation**

Fig. 6

Table 4

S. No.	Plant	Venation (Reticulate/ Parallel)
1.		
2.		
3.		
4.		
5.		

Now compare the results obtained in table 2 with table 4.

- What type of roots are there in plants having parallel venation in their leaves?
- What type of roots are there in plants having web-like venation in their leaves?
- Is there any relation between venation and root system?

You will see that the plants with tap root system have leaves with web-like or reticulate venation and plants with fibrous roots have parallel venation.

Functions of a leaf

Leaves play an important role in the life of plants. Plants also breathe like us. Do you know which part of the plant acts as their nose?

Activity-6: Stomata Observation

Take a fleshy leaf. Peel the outer layer of the leaf and place it on a slide. Put a drop of water on it and observe it under a microscope. Try to find some bean shaped parts.

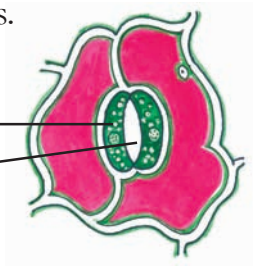


Fig. 7

Pistils have three parts – the stigma, the style, and the ovary.

Compare what you see under the microscope with Fig. 7.

The bean shaped (guard cell) part that you see in the leaf acts like our nose. These are called **stomata.** It is useful in the exchange of gases between the plant and atmosphere.

Do you know?

In Warangal district, there is a traditional cottage industry where pictures of various traditional and mythological figures are drawn with bright colours on dried leaves. This artwork is famous throughout the world.

Activity-7: Transpiration

Do you know that excess water is removed in the form of vapours from the leaf surface. To understand this let us do the following activity. Choose a bright, summer day to do the activity.

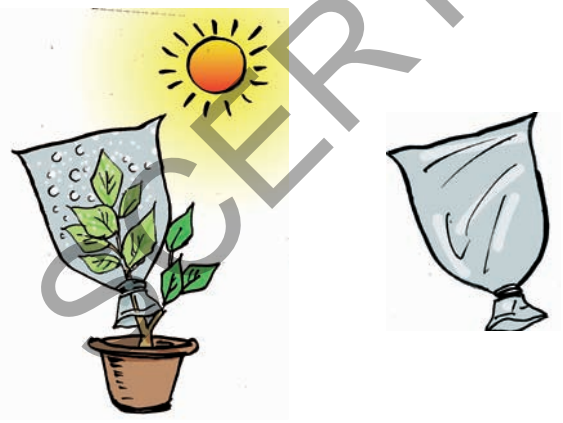


Fig. 8

Select a well watered plant that has been growing in the sun. Enclose a leafy branch of the plant in a polythene bag (Fig. 8) and tie up its mouth. Take another polythene bag of same size and tie up its mouth without keeping any plant. Keep both the polythene bags in the sun. After a few hours observe the inner surface of the bags. What do you see?

Are there any droplets of water in any of the bags? Which bag has droplets? How do you think they are formed there?

Plants release excess water in their body through stomata and some other parts as well. The water is released in the form of vapour and this process is called **transpiration**. These vapours condense and are seen as droplets in the polythene bag. Think, what will happen if transpiration does not take place in plants.

Another leaf function is the preparation of food for the plant by the process of **photosynthesis**. We will discuss more about this in the next classes.

Stem provides support to the plant

Observe the stem portion of some plants that you collected for Activity 1 Record your observations in table 5.

Petals are usually colorful, and they attract insects and birds that help with pollination.

Table 5

S. No.	Name of the plant	Stem grows Vertically/Horizontally	Branches are Present/Absent
1.			
2.			
3.			
4.			
5.			

- Do all plants have stems.
- Are the stems of all plants similar?
- How is the stem of the plant that grows horizontally?

Leaves and flowers grow from the stem. If you observe carefully, you will see a scar on the stem where the leaf arises. The stem branches into sub-branches and bears leaves, flowers and fruits.

Activity-8: Carrying food material

Take two small cuttings from a soft stemmed plant. Set them up like you did in activity 2 (Fig. 9). Wait for 2-3 hours and record your observations.

- What differences did you find between the stem of both the plants?
- Do red spots appear on the leaves or flowers of any of the plants?

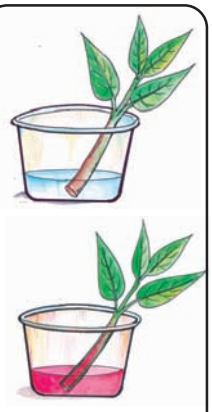


Fig. 9

Take the stem of a plant which was kept in water with red ink and cut a small section transversely with a sharp blade. Take the help of your teacher for this. Put it on a slide. Observe it under a microscope. Do you observe any coloured portion? Now, cut the stem into two halves vertically, from top to bottom Observe it. Do you see any coloured portion?

The coloured ring like structure that you see act as a tube that carries water and food material throughout the plant. The water absorbed by the root is carried through the stem to all parts of the plant.

Fruit is really the part of a flower in which seeds grow. Cherries, apples, and even milkweed pods are fruit.

Do you know?

Some plants like potato, turmeric, garlic, ginger and sugarcane store food material in the stem due to which the stem bulges in size. Generally we think that these are all tubers or roots. Actually they are modified stems.

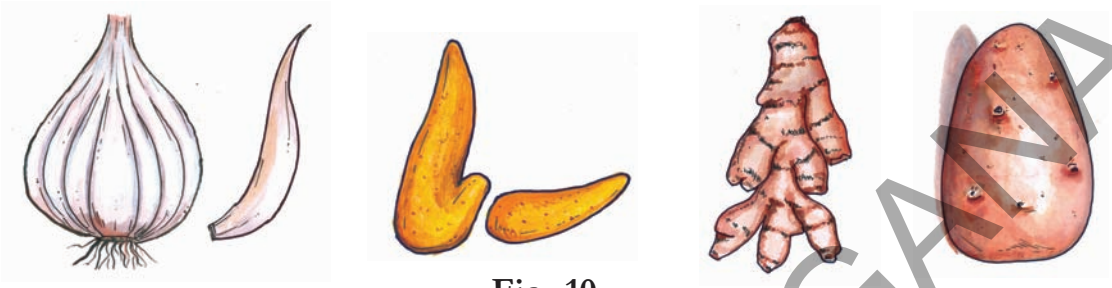


Fig. 10

How can you say that a potato is stem although it grows under the ground? Think it over.

Most plants around us have roots, leaves, stems and flowers. All parts of the plants carry out some functions, essential for the whole plant. There are diverse forms of plants in nature and plants adapt themselves to the different conditions in nature in different ways. For example, while stems usually support the plant body, in some plants they adapt and start storing food.

Flower is another important part in the plant. Flower has different colourful structures called petals. They attract insects for pollination and produce fruits.We grow plants for colourful flowers which gives beauty to nature. We will learn more about flower in the next classes.

Keywords:

Tap root, fibrous roots, petiole, lamina, stomata, reticulate venation, parallel venation, transpiration

What we have learnt

- The important parts of a plant are roots, stem and leaves.
- Tap root system and fibrous root system are two types of root systems seen in plants.
- Roots absorb water and minerals from the soil and also help in anchoring the plant body to the soil.
- The stem bears branches, leaves, flowers and fruits.
- The stem carries the water absorbed by the roots to different parts of the plant.

Buds are small swellings on a plant from which a shoot, leaf, or flower usually develops.

- Leaves are involved in preparing food. They also help in exchange of gases and transpiration.
- Leaf base, petiole and lamina are all parts of a leaf.
- Reticulate and parallel venation are found in leaves.

Improve your learning

1. What are the important parts of a plant?
2. How will you tell which part of a plant is the stem and which is the root?
3. Collect any plant from your surroundings. Draw its root structure. What can you say about its root system?
4. John has no place in his house but he wants to plant vegetables like tomato in his house. Suggest him different ways to do so.
5. What will happen if a plant doesn't have any leaves?
6. How does the stem help the plant?
7. What type of venation is found in the leaves of plants with fibrous roots?
8. If the leaves have reticulate venation what would be the type of root?
9. Explain the various parts of a plant with the help of a diagram.
10. Explain the parts of a leaf with the help of a diagram.
11. How can you show that plants absorb water through their roots?
12. Rajani said "Respiration takes place in leaves", is she correct? How can you support this statment.
13. Collect the leaves of various plants. prepare a herbarium. Write a brief report on their shapes, size and venation.
14. Prepare a greeting card with dry leaves.
15. Observe a plant which has healthy green leaves and beautiful flowers. Write your feelings about the plant in your notebook.

Bonsai

Usually rose and chrysanthemum plants are grown pots. Can we grow a big tree in a pot in a similar way? You may wonder how a big tree can be grown in a pot! There is a method that would make any tree fit in a pot. This method is known as Bonsai. The word Bonsai means dwarf tree. These are also known as Liliput Trees. Bonsai is Japanese art. They grow trees in wide pots for years. Time to time the roots and branches of the trees are trimmed. You too may try it out.

Grapes and clematis have stems that climb with tendrils, which hold onto a surface, as the stems get longer.

10 Changes Around Us

Fig. 1

Priya wants to write an article on colours. She started observing her mother while preparing tea. Suddenly her brother Teja rushed into the kitchen shouting "See my white shirt is spoilt. It has colour stains. Yesterday it was fine. Why has it become like this? Who spoilt my shirt?"

Mother saw the shirt and said that it might have got this red stain when it was soaked in soap water along with a new red shirt.

Priya who was listening to all this began thinking about all the changes she had seen. She had noticed the change in the colour of the tea after milk was added to it. There was a change in the colour of the shirt. She started wondering.

- Why does the colour of the tea change?
- How did the red stain get on her brother's shirt?
- How do colours change?
- Can you find answers to these questions? Discuss with your friends and think of the answers.

The change of state from liquid to gas is called evaporation.

In our daily life we notice many changes around us. These include the changes from time to time, in the crops growing in the fields fall of leaves, the growth of fresh leaves on trees, change in the colour of the sky, change in colour of leaves of trees etc. Flowers bloom and then wither away. Apart from this we notice some changes in our body like increase in length of nails and hair, increase or decrease in weight, and increase in height etc.

Of all the changes we observe in our daily life, we are able to find out reasons for some of them. For other changes, we are not able to find reasons. To explain any change we need to ask the following questions :

- What has changed?
- How do we know that it has changed?
- What are the possible reasons for that change?
- Which seems to be the most appropriate reason?
- How would we check if the reason is correct?

Let us discuss certain changes in detail.

Changing of milk into curd

We know that curd is prepared from milk. Making curd is our common experience. Curd is prepared in almost every house.

- Do you know how milk can be converted into curd?

Generally curd is prepared by adding a very small quantity of curd (sample curd) to the bowl containing luke warm milk. Then the bowl containing milk with the sample curd is covered by a lid and kept still and undisturbed for few hours to get curd.

- What changes do you see when milk is converted into curd?
- How do you know that milk is changed into curd?
- Is there any change in its state?
- Is there any change in its volume?
- Is there any change in the weight?

Activity-1: Comparing milk and curd

Take some milk in a bowl and some curd in another bowl, compare the colour of the milk and curd carefully.

What do you notice? You may notice that there is slight difference in colour from milk to curd.

Now take some milk and curd in separate tea spoons and taste them. Do you find any difference in the taste of milk and curd? You may notice that milk is somewhat sweet and curd can be slightly or highly sour in taste.

The change of state from gas to liquid is called condensation.

Touch the milk and the curd with your finger to know their state. You will notice that milk is in liquid form. Guess the state of curd. Observe. Curd is neither in solid state nor in liquid state. What you call this State of material? The curd is in semi-solid form. Now measure the level of milk in a bowl and its weight. Then measure the level of the curd and its weight in the bowl.

Write the values of measurement in table-1

Precautions

Do not try to taste any substance until you know what it is and its properties. Tasting of some substances can be hazardous to health. The test for taste is to be done only under the guidance of teacher and for substances we know are safe.

Table 1

S.No.	Substance	Level in bowl	Weight
1	Milk		
2	Curd		

Compare the measurements, what do you notice?

From this activity, we find that there are changes in milk when it becomes curd. These include change in the colour, taste and in the state. These indicators of change explain that a change has taken place from milk to curd.

- What can be the reasons for this change?

Activity-2: Finding the conditions for making curd

Take three equal volumes of empty bowls with lids as shown in Fig. 2

Bowl-1 *Bowl-2* *Bowl-3*

Fig. 2

Add some ice-cold milk to bowl 1 and same quantity of some warm milk to the bowls- 2 and 3. Then add small quantity of curd to the bowls 1 and 2. Stir them well. The curd must mix in the milk. Cover all the bowls with lids and keep them in your classroom. Leave them and ensure they are not touched even after you have left for home. Observe the changes in the

The change of state from liquid to solid is called solidification.

three bowls when you come back to the school next day.

What do you notice about the milk in the three bowls?

Has the milk in all the three bowls changed into curd? If not, which has not changed into curd?

Compare bowls 1 and 2, and bowls 2 and 3 separately and try to answer the following questions :

- Why do we notice change only in bowl 2, though we added curd to the milk of bowl 1 as well.
- Why do we notice change in bowl-2 though we took warm milk in both bowls 2 and 3?

When we compare the bowls 1 and 2 though the sample curd is added in both bowls, the bowl having warm milk is converted into curd. The cold milk does not change into curd.

Similarly if we compare bowls 2 and 3, though we have taken warm milk in both bowls, only the milk in the bowl 2 to which sample curd has been added changes into curd. We may note that the warm milk in the other bowl does not change into curd.

These two observations explain that the reason for change of milk into curd is due to addition of sample curd to warm milk.

The adding of sample curd to the milk helps to grow some kind of bacteria in it and enables conversion of the milk into curd. You will learn more about this type of bacteria in the lesson "living things under microscope".

Let us discuss one more change

Changing seasons

Every year we observe that seasons changes. We go from rains to winter and winter to summer and so on.

- What changes do you observe from winter season to summer season?
- Is there any change in the clothes we wear?
- Is there any change in coldness and hotness of the air around us?
- Is there any change in duration of day and duration of night?
- Is there any change in the food that we eat or drink?

If the winter season changes into summer, we observe change in our clothes. For example, wearing of woolen clothes in winter changes to wearing of cotton clothes in summer. Similarly we observe that the winter season is cool and summer season is hot. In winter, duration of night is longer than in summer. We take cool drinks in summer

Due to heat, a place gets heated and pressure gets lowered.

but prefer hot tea, coffee or milk in winter. These changes that we observe, show the change of seasons.

- Which of the above changes are because of changes in seasons?
- Which changes could possibly be the causes for the change in seasons?

List the changes that you think are caused by the change of seasons.

We also need to think about what are the reasons for changing seasons?

Activity-3: Comparing duration of day in December and May.

See table 2. shows time of sunrise and sunset at a particular place in the month of December, and shows the same information in the month of May. Is there any changes observed in day time of everyday.

- What is the duration of the longest day in December?
- What is the duration of the longest day in May?
- Do December and May belong to the same season? If not, to which seasons do they belong?

By looking at the data regarding the times of sunrise and sunset on a particular day in December and May, we see that days are shorter in December and longer in May. Thus there are short duration days in winter and long duration days in summer.

Table-2

	December (1)		May (2)	
Day	Sunrise	Sunset	Sunrise	Sunset
1	06:29	17:40	05:51	18:36
2	06:30	17:40	05:50	18:36
3	06:31	17:41	05:50	18:37
4	06:31	17:41	05:49	18:37
5	06:32	17:41	05:49	18:37
6	06:32	17:41	05:48	18:38
7	06:33	17:41	05:48	18:38
8	06:34	17:42	05:47	18:38
9	06:34	17:42	05:47	18:38
10	06:35	17:42	05:46	18:39
11	06:35	17:43	05:46	18:39
12	06:36	17:43	05:46	18:39
13	06:37	17:43	05:45	18:40
14	06:37	17:44	05:45	18:40
15	06:38	17:44	05:45	18:41
16	06:38	17:45	05:44	18:41
17	06:39	17:45	05:44	18:41
18	06:39	17:45	05:44	18:42
19	06:40	17:46	05:43	18:42
20	06:40	17:46	05:43	18:42
21	06:41	17:47	05:43	18:43
22	06:41	17:47	05:43	18:43
23	06:42	17:48	05:42	18:43
24	06:42	17:48	05:42	18:44
25	06:43	17:49	05:42	18:44
26	06:43	17:49	05:42	18:45
27	06:44	17:50	05:42	18:45
28	06:44	17:50	05:42	18:45
29	06:45	17:51	05:41	18:46
30	06:45	17:52	05:41	18:46
31	06:46	17:52	05:41	18:46

The seasons and changes in weather occur because earth rotates on its tilted axis.

Actvity-4: Does the sun rise exactly in the east in all seasons?

In the chapter "playing with magnets" we learnt about the magnetic compass. This helps us to find the North-South direction. Take a magnetic compass find the North-South directions with its help. We know that the East-West direction is exactly perpendicular to North-South direction. Mark East-West direction with the help of magnetic compass and compare it with the direction in which the sun rises during the winter season.

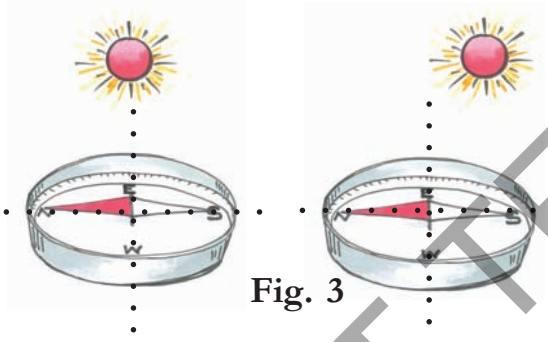


Fig. 3

Observe the direction of sunrise three to four times in winter and in summer. Compare it with the exact east direction marked with the help of the compass.

- Do you find any change in direction of sunrise between winter and summer season?
- What difference do we notice?

Try to find the direction in which the sun rises even if it is not winter at the time of reading the chapter.

- Did the sun rise exactly in the east?

Observing the changes in shadow during winter and summer seasions

Teja likes photographs very much. His father took photos in the months of December and May and are given below. Observe Fig. 4(a) and 4(b):

Fig. 4(a)

Fig. 4(a) shows the shadow of a boy, standing on the doorstep of an east facing house, at the time of sunrise. This is on a day in the month of December.

Fig. 4(b)

Digestion is the mechanical and chemical breakdown of food into smaller components.

Fig. 4(b) shows the shadow formed at the time of sunrise on a day in the month of May.

- What difference do you notice in length and direction of the two shadows?
- What does it say about the change in the direction of sunrise in December and in May?

You may also ask some elders about the change in the direction of the sun rays coming through windows or doors facing east during winter and summer. You can also observe shadows formed by the sun rays through windows and doors in your house or in a neighbour's house.

You will notice that the sun does not exactly rise in the east. In our State around 20th December, the direction of sunrise is a little south of east. Around 15th May, the direction of sunrise is very close to the east. Because of this, we find that the shadow of the boy is right behind him in May and shifts towards his left in December.

This slight change in the direction of the sunrise is one of the reasons for changes in seasons. we will learn about the exact reasons for the changes in higher classes.

In the two changes discussed above, we notice that for every change there are indicators to confirm that a change has taken place and there is a cause (reason) of the change.

Activity-5: Indicators and causes for change.

The changes observed, indicators of the changes, and possible causes for the changes discussed above are shown in table 3.

Table 3

S. No.	Change	Indicators of change	Causes of the change
1.	Change from milk to curd	Change in : State, taste, smell	The small quantity of curd added to warm milk makes certain bacteria to grow in the milk and it converts to curd.
2.	Changes in seasons	Change in dress we wear, coldness or hotness of air, food/drinks we take, usage of water, fruits and flowers available duration of a day.	The slight change in the direction of sun rise

We have used running water as an energy source for thousands of years.

Compare the change of milk to curd with change of seasons.

- Which change is slow and which is fast? Why?
- Which change takes place naturally?
- Which change needs initiation/ intervention of human beings to occur?
- Which is a temporary change and which is permanent?

If we compare the two changes i.e. the "change from milk to curd" and "change of seasons", we notice that the change of seasons is slow when compared to change of milk to curd.

But if we compare change of milk to curd and change in electric bulb due to the switch being on or off, the change of milk to curd is a slow change.

Thus the change of milk to curd is a fast change when compared with change of season but it is a slow change when compared with change in electric bulb being put on or off.

Therefore, whether a change is slow or fast is relative.

Similarly, the comparison of above two changes explains that change of seasons takes place naturally, but to change milk into curd we need to add some curd to the warm milk and keep it in such a way that it is not shaken and remains warm. Thus we need some initiation and intervention from human beings to bring a change in the milk.

Also, seasonal changes are temporary as these changes from winter to summer and summer to rains then rains to winter are continuous. Thus we get winter again. Change of milk into curd is permanent because we cannot get back milk from curd.

The comparision shows that it is possible to classify certain changes as slow or fast, natural or man-made and temporary or permanent.

- Can you think of any other basis for categorization of changes?

Write the indicators and causes for the other changes given below. You may not be able to write the causes of all changes. Try to discuss with your friends and elders to know the causes.

Are you able to categorize these changes as slow or fast, natural or manmade temporary or permanent?

Curds are a dairy product obtained by curdling (coagulating) milk with rennet.

Activity-6: Categorizing changes

Table 4 describes some changes. Study the changes, discuss in groups with your friends and state the category of each change by writing yes or no in relevant columns.

Table 4

S. No.	Change	Type of change					
		Natural	Man made	Temporary	Permanent	Changes the state	Changes the shape
1	Change from milk to curd						
2	Change in seasons						
3	Change of ice into water and water into ice						
4	Rusting of iron						
5	Growth in plants						
6	Rice to cooked rice						
7	Melting of ice-cream						
8	Egg to boiled egg						
9	Electric bulb on and off						
10	Changes in 'Touch me not'						

- How many changes are natural?
- How many are man-made?
- How many changes are temporary?
- How many are permanent?
- How many changes are slow?
- How many are fast?

List them in tables 5, 6 & 7

Coal, oil and gas are called "fossil fuels" because they have been formed from the organic remains of prehistoric plants and animals.

Table 5

S. No.	Slow Change	Fast Change
1.		
2.		
3.		

Table 6

S. No.	Permanent Change	Temporary Change
1.		
2.		
3.		

Table 7

S. No.	Natural Change	Man made Change
1.		
2.		
3.		

In this activity we have categorized ten changes in three ways - slow/ fast, permanent/temporary and natural/ man-made.

- Are there any other properties by which you can categorize the above changes?

Discuss with your friends and list properties other than those mentioned above for categorization. Prepare a new table for grouping.

Keywords

Changes, change in state, duration of day, indicators of change, slow/fast change, temporary/permanent change, natural/man-made change.

What we have learnt

- Many changes are taking place around us.
- Some changes take place naturally and some changes are initiated by human beings.
- There will be many indicators of changes to show that a change took place.
- There exists a cause for every change.
- We can classify changes around us in many ways; slow-fast, permanent-temporary, natural - man-made etc.
- Classification of changes is also made based on various indicators of change like the change in state, change in colour, change in size, change in taste etc.

Fuel is any material that stores energy that can later be extracted to perform mechanical work in a controlled manner.

Improve your learning

1. Is the change of ice into water a temporary or permanent change? Explain.
2. How do you know that rusting of iron is a change?
3. If a raw egg is boiled in water, what changes do you notice in it?

   If you are given two eggs, can you determine which one is boiled and which one is not? Explain.
4. Name five changes you notice in your surroundings. Classify them as natural or man-made changes.
5. Choose incorrect statements from the following and rewrite them correctly :

   a) The coldness in air during winter is a permanent change

   b) Boiled egg is a temporary change.

   c) There is a cause for every change.

   d) An electric bulb going on and off is a permanent change.

   e) There is a change in state when ice-cream melts.
6. Some changes are listed below, classify them as temporary and permanent.

   a) Souring of curd
   b) Ripening of oranges
   c) The sawing of a piece of wood into two
   d) Cooking of food
   e) Heating of milk.
7. We use clay to make idols. Can we get back clay from the idol? What type of change is it? Explain.
8. Carpenter made a chair using wood, what type of change is it?
9. Rafi said that "Flour from Rice / Wheat is a man-made change." He wants to make a list of examples of this kind of change, help him expand his list.
10. Select a plant in your house / school observe and record changes keeping in view height of plant, number and size of leaves and flowers etc. over a period of 2 months. Display your observations.
11. What will happen if a decorative colour paper is dipped in water? Predict the possible changes. Verify your predictions by doing experiments and write down the steps of the process.

The explosion of fireworks is an example of chemical change.

12. Write various processes involved in making ghee from milk, what changes do you find, during this process.

13. Observe the following table and answer the questions give below.

Place	Month	Temperature		Rainfall	Sunrise	Sunset
		Min.	Max.			
Rentachintala	January	21°C	27°C	2.41mm	6.50	17.12
	April	39°C	47°C	0.01mm	6.11	17.47
	August	24°C	34°C	39.12mm	6.37	17.31

i) Which month had maximum rainfall?

ii) Which season occurs in the month of August? How can you support your answer.

iii) In which month is the duration of day minimum? What could be the reason for this?

iv) Do you find any relation between sunrise and seasons?

v) What changes can you identify from January to August?

14. Farha wondered "How it could be possible for Nature to bring changes in seasons periodically". Can you add some changes like this.How will you explain them?

15. Sita wondered and felt very happy to see the beauty of the fields and insects like twinkling beetle *(Arudra)* during rainy season in their village. Can you list some such changes which make you wonder and feel happy?

★ ★ ★ ★ ★

A common physical change occurs when matter changes from one phase to another.

11 Water in Our Life

During the festival of Holi, Arvind was playing with his friends. They had gone to the market and bought different colours. They mixed each colour in a bucket of water and poured mugs full of water on each other. They sprayed colours on each other as well. Arvind and all his friends were completely drenched and enjoyed themselves a lot. Then they decided to go and have a wash.

Fig. 1

They went to a well and took bath with several buckets of water. They washed their clothes as well.

- If there was no water, what would happen to Arvind and his friends?
- For what purposes do we need water in our life?
- Do plants and animals also require water like us?

We need water to perform several day to day activities like cooking food, washing clothes, cleaning utensils etc. We can't survive without water for even a single day.

Activity-1: **Water and its uses**

Make a group of five students and discuss the uses of water in their daily life. Write down the uses.

Classify the above uses of water in three groups, uses in a house or family, for agricultural purposes and others.

Over 1 billion people use less than 6 litres of water per day.

Fig. 2 : Uses of water in our daily life

Measuring the volume of water

Aravind used buckets of water to clean the colours from his body and his clothes. He said he used seven buckets of water. Is bucket a measure of the volume of water used? How do we measure the volume of water?

We can keep water in different vessels. Often, we say, a glass of water, bucketful of water, bottle of water etc. Do you know any specific unit of measurement of volume?

Almost 4 million people die each year from water related diseases.

Activity-2: Quantity of water

Collect different used water bottles or water pouches from nearby shops. Observe their labels. What quantity of water is mentioned on the label? Record your observations in your notebook.

- Do all the bottles and pouches have the same quantity of water?

You can also ask the water-vendor how much water there is in a water can or bottle.

Do you know?

Volume of water and other liquids is measured in litres and millilitres. The water tanks in some villages and most towns and cities have the capacity to store gallons of water. Gallon is also a measure of volume of liquids.

Water level in the reserviors is measured in feet. Water released from dams and projects during floods is measured in cusecs (cubic centimeters/sec).

- **Think:** Air and water are freely available in nature but now people have to pay for water along with other commodities. Find out from your parents and grandparents whether they also paid for water.

Activity-3: How much water do we use daily?

We use water for different purposes. Can you estimate how much water your family uses in a day? Can you guess?

Record your estimates in table 1. Also think how you could reduce the amount of water used and write how much water you can save.

Table 1

Work	Water used (In liters)	How much can you save? (In liters)
Drinking		
Toilets		
Bathing		
Washing clothes		
Other		
Total		

To estimate in litres the amount of water used, take any 1 litre bottle and find out how many bottles of water are needed to fill a bucket, a glass, a mug etc. Now, find out how much water is used in a whole day by you

43% of water related deaths are due to diarrhoea.

and your family. Also, calculate the amount of water you and your family were able to save.

You have a rough idea of how much water your family uses in a day. With this information you may be able to calculate the approximate quantity of water required for your colony/ village/ town/city. For this, you will need to know the population as well. Ask your teacher about population.

Approximate quantity of water used per day by a person .....

Number of people in the colony/ village etc. .....

Approximate quantity of water used per day in the colony/village etc.

.....

Approximate quantity of water used per month in the colony/village

.....

Approximate quantity of water per year in the colony/village etc.

.....

Imagine how much water is needed across the world!

Where do we get water from?

We get water from different water sources in our surroundings. In most villages wells, canals, tanks, ponds, rivers, etc are the main water sources.

- List out the sources from where you get water in your village/town.
- Are the sources from where you get water for your daily needs and crops the same or not? Give your reasons.

Do you know?

Water is not only available from sources such as the rivers, lakes and ponds but also present in certain fruits and vegetables. Fruits like watermelon and vegetables like cucumber contain a lot of water. Can you suggest some other examples? Our body also contains 70% of water by weight. Think, why we take juicy fruits in summer.

Water on the earth

There are different sources of water on the earth. We know that nearly $3/4^{th}$ of the surface of the earth is occupied by water. Is this water useful for us?

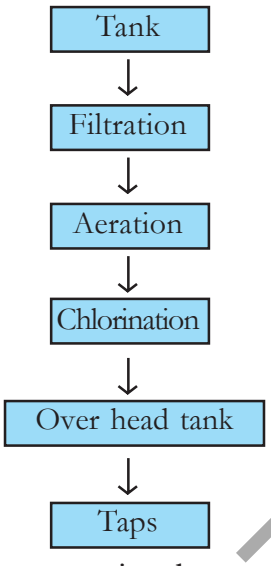
- Can we drink the water available in the sea?

Sea-water is salty but water used by us in our daily purposes is not salty. It is known as fresh water. Water in ponds, puddles, river, from tube-wells and our taps at home is usually fresh water.

98% of water related deaths occur in the developing world.

Activity-4: Safe drinking water stages

Meet your panchayat officer and collect information about safe drinking water scheme in your village. Don't forget to prepare questionnaire for interview. Display your observations in your wall magazine.



Observe the stages in the supply of protected drinking water as shown in the flow chart. Based on your observation, write the steps followed in supplying the water to households from water resources. Compare these steps to the method of water supply in your village. Discuss your observations.

Activity-5: How the well was dug

Go to nearby village and look at a well from where people get drinking water. Can you estimate the approximate volume of water in the well? Collect information from elders in the village about the level of water in the well over the years.

- Is the water level constant or has it changed?
- How was the well dug?
- Have you seen a borewell being dug? Write the process in your notebook.

Tapping of ground water by digging a well or borewell is a tough job. Many people put in a lot of hard work in this process. We need to appreciate this and preserve water.

Do you know?

Even though the river Krishna flows through Nalgonda district, it suffers from severe water scarcity.

You have read about the different types of water sources in our surroundings. The water level in them depends upon rainfall. Generally, we observe that the water levels in wells or other water sources go up in rainy season and down during the summer season.

What happens if there is less rain fall or too much rain fall?

Unsafe water is the biggest killer of children under five; around 90% of all diarrhoeal deaths are in this age group.

Activity-6: Droughts - water scarcity

Form groups of 4 to 5 students and discuss the following topics in each group. Prepare and submit a group report. The topics to be discussed are:

Group-1 : What will happen if rainfall is less this year than the last year?

Group-2 : What would happen if there is no rainfall for five years?

Group-3 : What could be the possible reasons for water scarcity in a particular place?

Group-4 : What problems can arise due to water scarcity in a particular place?

Fig. 3

In our region, if there is no rain for a long period (4 to 5 years), it may cause droughts. During this period, it is very difficult to get food and fodder; drinking water is scarce. People need to travel long distances to collect water. Soil becomes dry agriculture and cultivation is difficult. Many people who depend on farming for their livelihood, migrate to other places in search of jobs. In our state, Mahabubnagar districts are treated as drought prone areas.

Activity-7: Drought affects our life

Here is a Ramana's letter for you try to understand how drought affects our lives.

Kosgi

Dear Firoz,

I hope you are fine there. Nowadays, we are facing severe problems due to drought. For the last five years we have had no rains. All our fields have dried and there are cracks on them. We fail to grow any crop. My father invested money on bore wells with no results. Now we get water, after a great struggle from the bore-well which is five kilometers from our village. The days have become very bad. Several people have sold their cattle and migrated to Hyderabad and Bengaluru. My family also wants to do so. I request you to ask your parents to search for a job for my father at your place. My father may have been a well-known, rich farmer here but he is willing to do any kind of job there.

Yours loving friend

Ramana

The recommended daily water requirement for sanitation, bathing, cooking and consumption is approximately 50 litres per person per day.

- What problems were faced by Ramana?
- How can Firoz help him?

Water scarcity is a problem in some districts of our state, as mentioned earlier. Here rainfall is less and farmers are largely dependent on irrigation using underground water to raise crops.

- What will happen if farmer grow crops that require more water in these districts?
- If several bore wells are dug and underground water is tapped constantly, what will happen to the source of ground water?

Discuss with your friends and teachers about the reasons that can cause reduction of ground water.

Activity-8: How much water do we waste?

After playing in the ground you may wash your hands and legs under the tap in your school. Measure the time the tap is on open for you to complete your wash. Then take a bucket put it under the tap open the tap for the same time that you measured with the same flow of water. How many students of your class can wash thier hands and feet with the bucket of water that you collect from the tap?

List out those situations in our life where we waste water unwisely and make suggestions to avoid this.

Activity-9: Floods a natural hazard

Usually, during the rainy season, you may have come across pictures of this type in newspapers (Fig. 4). Discuss the following.

Fig. 4

- What does the picture tell us?
- Does excessive rainfall in certain areas of our country lead to such a condition?
- Are there other reasons as well that can lead to this situation?
- Did you ever face or hear about flood?
- On the basis of the newspaper cutting or your own experience in this matter if any, write down a few lines on floods.
- We can't live single day without water. It is unwise pumping of water that leads to drought. Arvind decided that water is precious.

Agriculture is responsible for about 70% of the world's water usage. Industry uses a further 22%.

Don't waste even a single drop of water. We must preserve water not only for us but also for future generations.

Keywords

Water sources, drought, floods, migration

What we have learnt

- We need water for domestic use, agriculture, industries etc.
- We get water from sources like ponds, lakes, rivers etc.
- Of the water available on the earth, only 1% is fresh water.
- We depend on rains for water.
- Long periods of less rainfall usually causes condition of droughts.
- Floods are natural disasters that affect human life.

Improve your learning

1. How can you say water is necessary for us?
2. Ravi wants to know the measuring units of water. What will you tell him?
3. Why do people need protected drinking water scheme?
4. List out the activities that we perform in our daily life that consume water.
5. In --------- season we face severe water scarcity. Give your reason.
6. The nature of sea water is -------

   a) Salty b) Tasteless
   c) Odourless d) Sweet
7. If we use water unwisely what will happen in future. Write your suggestions to prevent water wastage.
8. Prepare a map of your village showing different water sources.
9. Make a pamphlet on "Don't waste water". Display it on wall magazine.
10. Collect information about water related games and make a scrap book.
11. Find out the relationship between water shortage and drought?
12. Justify the statement "droughts and floods are a result of actions made by man". Investigate your reasons.
13. Aravind never forget to switch off water pumping motor in time. Do you support him? Why?
14. If people are suffering due to severe floods, what would you do to help them?

* * * * *

It takes up to 5000 litres of water to produce 1kg of rice.

12 Simple Electric Circuits

Niharika's father Ranganna had to go to the fields after dinner. Watering the field in the night had become a usual practice due to power cuts throughout the day. Ranganna walked out of the house and called Niharika asking for a torch-light. She took the torch and cells out from the cupboard and handed over the torch-light to her father after inserting the cells. He switched on the torch but it did not light up.

Fig. 1

- What could be the problem?

Was there something wrong with the torch-light? Niharika took back the torch and opened it and realised her mistake. She had inserted the cells in a wrong way. She changed the position of the cells and handed over the working torch-light to her father.

Why does the position of cells affect the working of a torch-light?

What does a cell contain?

Fig. 2

Activity-1: Observe the cell

Let us take a torch cell (Fig. 2) and observe it. Can you describe it?

The cell consists of a cylindrical metal can. Its heaviness suggests that it is filled with some chemicals. The protrusion on one end is due to a carbon rod in the centre. At the top of the cell a metal cap is fixed. The entire can is sealed.

Greek philosopher Thales of Miletus (c.624–546 BCE) discovered static electricity.

Have you seen (+) and (-) signs on a cell? These signs indicate the two terminals of a cell.

Note:
Do not connect the two terminals of a cell with a single wire.

Bulb

Observe a torch-bulb or an electric bulb carefully (Fig. 3). What does it contain.

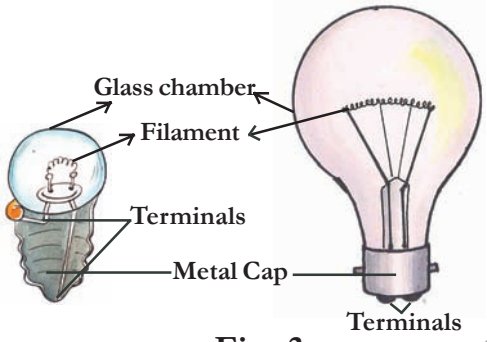


Fig. 3

A torch bulb consists of a glass chamber fixed on a metal cap (metal base). Two metal wires are firmly fixed. One wire is attached to the metal cap and the other is attached to the base at the centre of the metal cap. The arrangment in an electric bulb is different. In an electric bulb, two metallic wires are attached to the two terminals at the bottom of the metal cap. These wires act as two terminals. The two terminals do not touch each other.

The part of the bulb that glows is the **filament**, which is a thin spring like wire attached to the two metal wires inside the glass bulb.

- Why do bulbs and cells have two terminals?
- How does a bulb glow with the help of a cell?

Activity-2: Simple electric circuits

Take four wires of different colours, say blue, green, red and yellow, each about 15 cm long. Electric wires are often covered with plastic. First, remove about two centimeters of the plastic covering from both ends of each wire. Now attach two wires (Blue and Green) to a bulb and two wires (Red and Yellow) to a cell with a cello tape or cell holder as shown in Fig. 4(a). We can use a cell holder to hold the cells and wires together tightly.

[Take an old tube of a bicycle and cut it into narrow bands. Each band should be wide enough to cover the knob of the cell. This is your cell holder.]

Now connect the wires in different forms as shown in Fig. 4(b) to 4(g). In each case, check whether the bulb glows or not. Record your observations in table1.

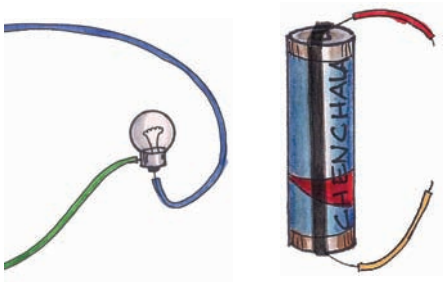


Fig. 4 (a)

English scientist William Gilbert (1544–1603) was the first person to use the word "electricity." He believed electricity was caused by a moving fluid called humor.

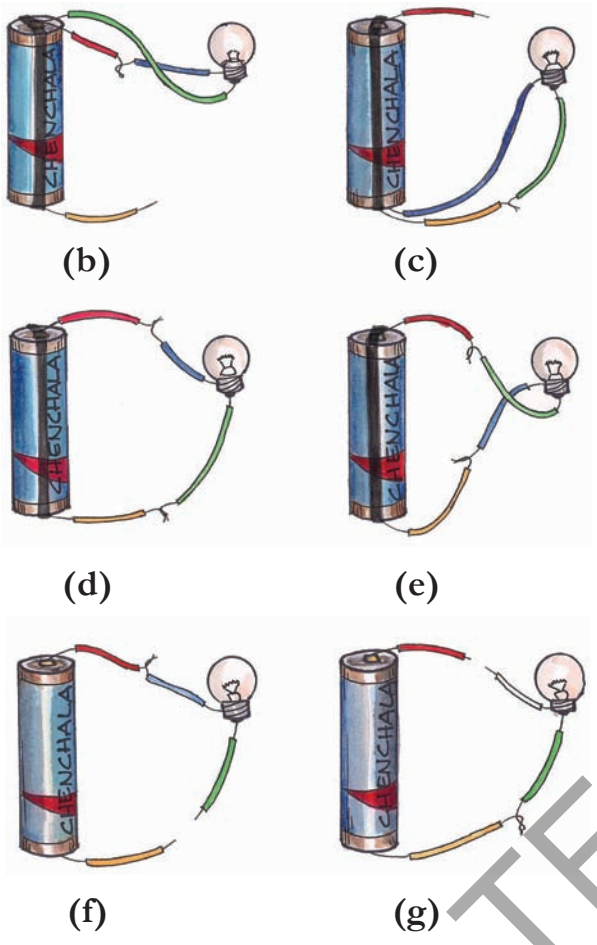


Fig. 4(b) to 4(g)

Table 1

Connection	Does the bulb glow (Yes/No)
Fig 4(b)	
Fig 4(c)	
Fig 4(d)	
Fig 4(e)	
Fig 4(f)	
Fig 4(g)	

In which case does the bulb glow? Why?

In which case the bulb does not glow? why?

You may observe that the bulb glows in connections shown in Fig. 4(d) and Fig. 4(e), but not in other cases?

We observe that in Fig. 4(d) and Fig. 4(e) the connections form a closed path while in the remaining cases we find some gap in the path.

What is a circuit?

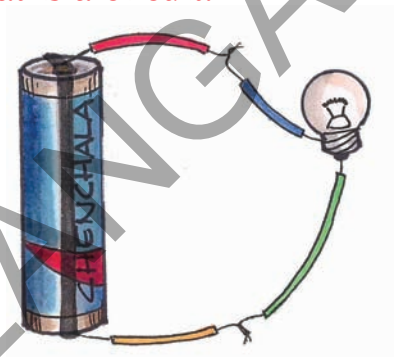


Fig. 5 : A simple electric circuit

Fig. 5 shows a closed circuit. It consists of a cell (power source), a bulb, and connecting wires. In a electric circuit, the electric current flows from positive terminal to negative terminal.

An electric circuit provides a complete path for electricity to flow between cell and the bulb.

A similar circuit exists for an electric bulb which we use in our houses. The two electric supply wires are connected to the two terminals of the bulb through a switch. When the switch is closed (put on) the circuit provides complete path for electricity.

American printer, journalist, scientist, and statesman Benjamin Franklin (1706–1790) carried out further experiments and named the two kinds of electric charge "positive" and "negative."

Many times in our houses we observe that though electricity is available some bulbs glow and some don't glow.

What could be the reason for that?

Observe a bulb which is not glowing. Do you find any difference in the filament of glowing bulb and the bulb that is not glowing ?

The bulbs which don't glow are said to be fused . If we connect a fused bulb in a circuit the ciruit remains open and there is no closed path for the flow of electricity. Hence the bulb doesn't glow.

Switch

We use switches to put ON or put OFF the torch light. Similarly we use various switches in our house to put ON or put OFF the electric bulbs, tubes, fans etc.

What is a switch? How does it work?

Let us observe

Activity-3: Electric Switch

Connect a circuit on a wooden plank or on a thermocol sheet as shown in Fig. 6.

Insert two drawing pins at A and B. Insert a safety pin in between A and B, such that one end of the pin is completely in contact with B and the other end is left free. Now observe the bulb. What do you notice? Now touch the safety-pin to pin A and observe the bulb again. What happens? Why doesn't the bulb glow when the safety pin is left free at one end?

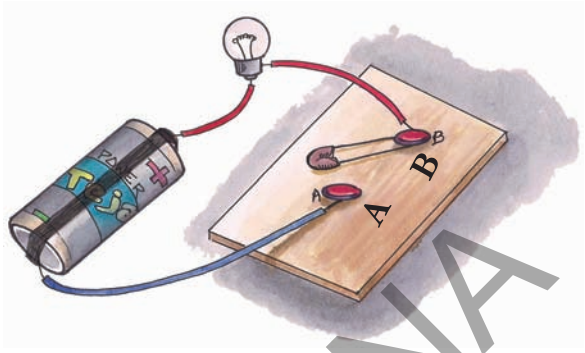


Fig. 6 : Circuit with a switch

In the above activity, the safety pin is used to close / open the circuit. Electric switch is an arrangement to close or open (break) a circuit.

The switch allows the flow of electricity when it is ON and cuts off the flow of electricity when it is OFF. In this way, the switch is used to allow / stop the flow of electricity to the bulb or any other electrical device.

The flow of electricity in a circuit is called **current**.

Torch-light

- What does a torch consist of?
- What makes the torch bulb glow?

Take a torch and observe its internal parts (Fig. 7).

Italian biologist Luigi Galvani (1737–1798) touched two pieces of metal to a dead frog's leg and made it jump. This led him to believe electricity is made inside animals' bodies.

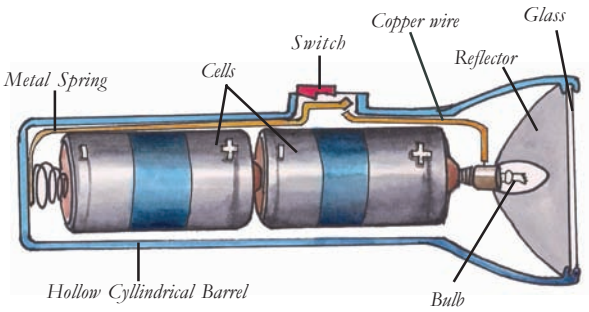


Fig. 7 : Inside view of a torch-light

Torch-light is used as a source of light. The parts of a torch-light are hollow cylindrical barrel, cells, bulb, switch, glass cover and metal spring.

Torch consists a hollow cylindrical barrel in which cells are fitted. At one end of it there is a lid with screw which can be opened and closed. When the lid is closed and switch is ON, the circuit is completed and current flows in the circuit which makes the bulb glow.

In Niharika's case, it was just the position of cells that made the bulb to glow. Can you predict other reasons for the torch not working ?

Activity-4: Let us do

Take a torch which has two cells. Arrange the cells in the torch in as many ways as you can. In which cases does the bulb glow and in which cases it doesn't? Draw pictures showing different positions of cells and glowing of bulb. Can you find out why the bulb glows only when cells are placed in a particular position?

Conductors and insulators

In activity-2, we used wires after removing the plastic covering at both the ends. Why don't we use the wires without removing the plastic covering?

What material do you find in electric wires?

Why are we advised to wear rubber chappals while working with electricity?

Let us find out

Activity-5: Identifying conductors and insulators

Take the circuit which we used in activity-3, as shown in Fig. 8. Remove the safety-pin from the drawing pins so that you have two open terminals A and B. Insert different objects like a hair pin, safety pin, eraser, plastic scale, match stick, piece of a metal bangle, piece of a glass bangle, paper clip etc. in the gap between A and B. With each insertion, check whether the bulb glows or not. Record your observations in table 2 for each case.

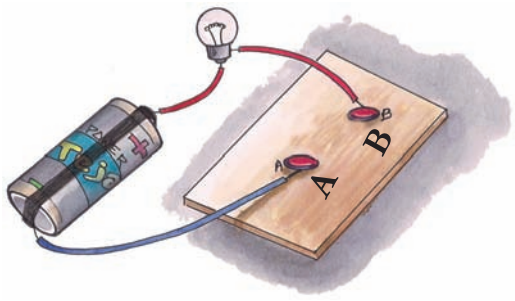


Fig. 8 : An open electric circuit

Danish physicist Hans Christian Oersted (1777–1851) put a compass near an electric cable and discovered that electricity can make magnetism.

Table 2

S.No.	Object	Name of the Material	Does the bulb glow (Yes/No)
1.	Hair pin	Metal	Yes
2.	Pencil lead		
3.	Eraser	Rubber	
4.	Plastic scale	Plastic	
5.	Match stick		
6.	Divider from geometry box		
7.	Piece of paper		
8.	Iron nail		
9.	Piece of Metal bangle		
10.	Piece of Glass bangle		
11.	Paper clip		
12.	Piece of chalk		
13.	Safety pin		

If you look at table 2, after recording your observations you will find that the bulb glows in some cases and does not glow in other cases. Can you guess the reason?

- Substances which allow electric current to flow through them are known as **conductors** of electricity.
- Substances which do not allow electric current to flow through them are known as **insulators**.

Using the above definitions, can you group the objects you observed in your daily life as conductors and insulators? Make a list

Michael Faraday (1791–1867), an English chemist and physicist, developed the first, primitive electric motor.

of objects and group them as conductors and insulators and write in table 3?

Table 3

Conductors	Insulators

The story of bulb

The story of invention of bulb is very interesting. We may think that a bulb is a very simple gadget, just press a switch and it lights up. But do you know that many scientists worked hard for many years before the first successful bulb was made? One of them was Thomas Alva Edison who ultimately succeeded in making the first bulb.

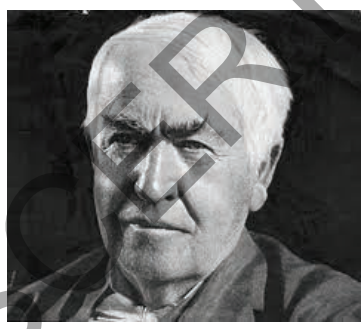


Fig. 9 : Thomas Alva Edison

From childhood, Edison was of an inquisitive nature and he learned science by performing experiments himself. You will be amazed to know that in his lifetime he invented more than one thousand inventions.

Even an intelligent scientist like Edison had to work hard for many years before he could make a bulb that worked. First of all, he passed electricity through a thin, thread-like platinum wire. He noticed that the wire did give out light after being heated, but it burned out after only a few seconds. Edison then thought that if the air surrounding the wire coil was removed then, perhaps, the wire would not burn out so quickly.

Edison's first bulb

He made a glass casing and fitted a filament of platinum wire in it. He then removed all the air from within the glass casing. He passed an electric current through the wire and, to his delight, the bulb lit up and did not burn out for eight long minutes.

He began experimenting with different materials while searching for a better choice of filament. He tried cotton thread coated with soot. This filament burned continuously for 45 hours. He tried different kinds of thread. One summer day he saw a man fanning himself with a

Building on his earlier discoveries, Michael Faraday invented the electric generator.

bamboo fan. An idea striked his curious mind - "Well, why not try bamboo fiber as a filament?" He executed his idea and amazingly the bamboo filament burned continuously for a number of days. Finally he succeeded in making a cotton filament that was even better than the bamboo one.

Today we use the same kind of bulbs as were first made by Edison. The only difference is that our bulbs have a filament made of a metal called Tungsten.

Keywords

Electricity, cell, bulb, fused bulb, terminals, filament, switch, circuit, conductor, insulator, tungsten

What we have learnt

- Cell is the source of electrical energy in a torch-light.
- Cell has two terminals, (+) and (-).
- Bulb consists of two terminals and filament which emits light.
- Electricity requires a closed path for it to flow.
- A switch helps us to allow or break the flow of electricity in a circuit.
- Torch-light consists of cell, bulb and switch.
- Substances which allow the flow of electricity through them are known as conductors of electricity.
- Substances which do not allow the flow of electricity through them are known as insulators of electricity.
- The electric bulb was invented by Thomas Alva Edison.

Improve your learning

1. What is an electric circuit? Explain with a diagram.
2. What are the parts of a torch-light?
3. In a bulb the part which gives us light is :

   a) Metal base

   b) Glass chamber

   c) Filament d) Terminals.
4. Classify the following into conductors and insulators :

   a) Water
   b) Plastic pen
   c) Pencil lead
   d) Dry cotton cloth
   e) Wet cotton cloth
   f) Dry wood
   g) Wet wood

The world's first experimental electric power plant opened in Godalming, England.

5. Niharika observed an electrician repairing a street light wearing gloves on his hand. She asked him some questions. What would be those questions?

6. In activity 4 we obsereved some situations where the torch bulb glows. Niharika challenged her friends that she could make the bulb not glow even with the cells kept in proper position. What would she have done?

7. Connect a circuit as shown in the following diagram.

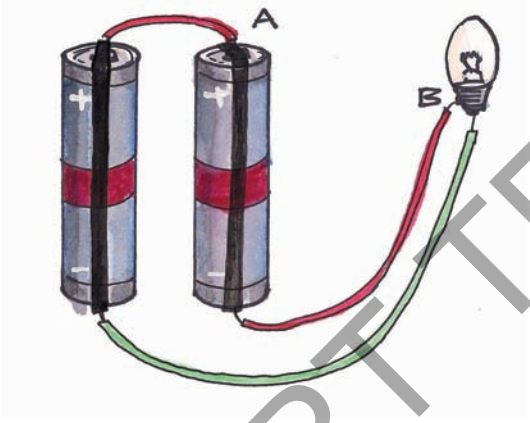


Fig. 10

a) Does the bulb glow? Why?

b) Draw the circuit so that the bulb glows.

c) Verify it by connecting cells and bulb as per the circuit drawn.

8. What will happen if the cells in a torch are arranged as shown in the following figure? Why?

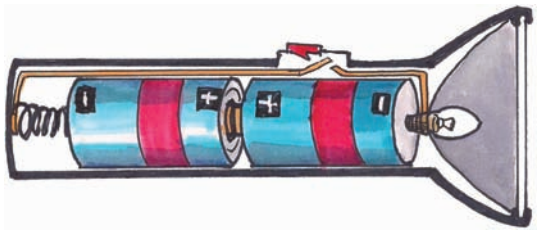


Fig. 11

9. Draw a circuit diagram showing a cell, switch and a bulb.

10. A circuit is connected with a cell, bulb and a switch, but the bulb is not glowing. Write all possible reasons for this.

11. You have studied the story of Thomas Alva Edison. Write a note appreciating his efforts in inventing the bulb.

12. List the daily activities in which we use electricity.

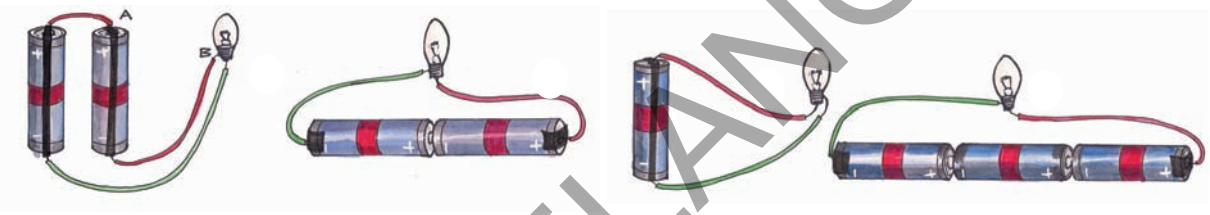
13. If you put the switch on, a light will glow, a fan will rotate, an iron box heats up etc. All these different functions will be performed by electricity. How do you feel about the comforts given by this great invention to human beings?

14. Write a list of electrical appliances in your house. Classify them as follows.

Thomas Edison (1846–1931) built the first large-scale electric power plants in the USA.

Works with cell as a source	Works with electric current as a source	Works with both cell and electric current as a source

15. Connect circuits as shown in the following figure. Write your observation in each case.



16. Match the following :

1)	Cell	A) Conductor	( )
2)	Switch	B) Source of electricity	( )
3)	Safety pin	C) Filament	( )
4)	Eraser	D) To close or open a circuit	( )
5)	Glowing of bulb	E) Insulator	( )

* * * * *

Don't play with household power sockets or push things into them. Don't take apart electrical appliances, because dangerous voltages can linger inside for a long time after they are switched off.

13 Learning How to Measure

Rasheed went to a cloth shop with his mother to buy clothes. The cloth merchant used a metal rod to measure the length of cloth. Rasheed asked his mother what that metal rod was and why did the merchant use it? Mother told him that the metal rod was a metre scale that was used to measure lengths. Later, both of them went to a flower market and purchased a string of jasmine flowers. While cutting the jasmine flower string, the woman selling the flowers measured its length with her cubit.

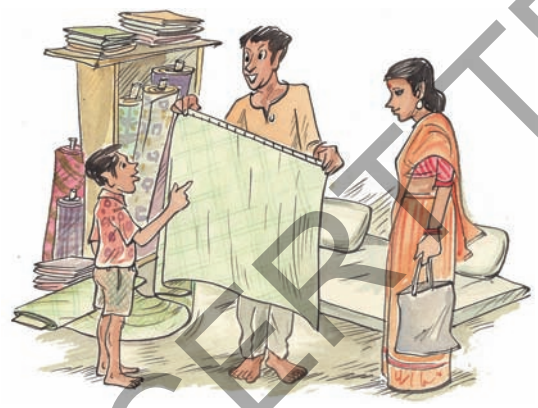


Fig. 1

Rasheed was confused and started thinking :

- Why was a metre scale used to measure the length of cloth?
- Why did the woman use her hand to measure the length of the jasmine flowers' string?
- Which method is correct?
- How can we decide the correct method of measurement?

You might have observed many situations of measurement of length as in the above examples, where sometimes we use instruments and sometimes hands, foot, palms etc.

Write some more examples where we use instruments to measure the lengths and some examples where we don't use any instruments, but use foot, hand-span, palm etc. to measure the length.

Discuss which method is correct with your friends and why you think that a particular method is correct.

Fig. 2

We use metre as a unit of length and subsequently, centimetres and millimetres as smaller units of length.

Activity-1: **Measuring Lengths**

Measure the length of one side of a table using your hand-span (Fig. 3). Ask your classmates to do the same. Record the length of the table in terms of number of hand-spans in table 1 :

Fig. 3

Table 1

S. No.	Name of the student	Number of hand-spans
1.		
2.		
3.		
4.		
5.		

Do all of you get the same number of hand-spans for the length of the table?

- Who got more number of hand-spans?
- Why is there a difference in number of hand spans though you measured the same table?

Now find the length of your classroom using your foot-span. Enter your observations in terms of number of foot-spans in table 2 :

Table 2

S. No.	Name of the student	Number of foot-spans
1.		
2.		
3.		
4.		
5.		

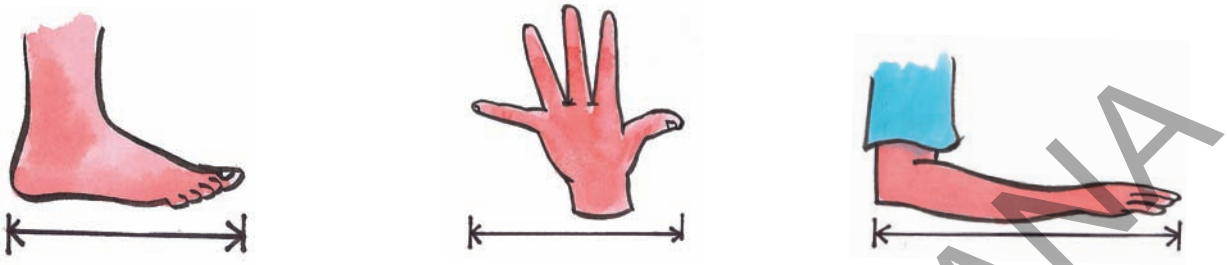
- Is the number of foot-spans same when different students measure the length of class room?
- Who got more number of foot-spans? Why?
- Who got least number of foot-spans? Why?

We do not get the same measurements in two cases mentioned above because the hand-spans / foot-spans are not same for each one of us.

We often use these type of conventional methods to measure certain lengths. For example, cubits for the length of a string of flowers and length and breadth of a

The Danyang–Kunshan Grand Bridge is the world's longest bridge. It is a 164.8 kilometres (102.4 mi) long

playground using strides. Similarly, we use this system of measurement while playing 'sirra gona', (gilli danda), where the length of the stick is used as the unit to measure the desired distance.



Foot-span Hand-span Cubit

Fig. 4

The story of the scale

Many hundred years ago, people used to measure distances with their hand-spans, strides or foot-spans. One day a very tall man went to a shop to buy some cloth. He asked for three-and-a-half cubit length of cloth. The shopkeeper measured three cubit lengths of cloth and then added approximately another half-cubit length.

The man felt that the shopkeeper had cheated him. So he measured the cloth with his cubit and found that the cloth was not even three cubit lengths. He told the shopkeeper that the length of the cloth was less than three-and-a-half cubit when he measured with his own cubit. The shop keeper replied that his own arm was the standard for measuring. They both argued about whose cubit was to be taken as standard measure.

In those days, people measuring the length of fields with ropes, it creates arguments and hundreds of other things must have been a familiar fight. How should one measure a half or a quarter cubit length?

Finally, some sensible people got together and decided to have a scale of a fixed length. In order to measure subunits, they marked this scale with several smaller but equal divisions. They then decided that everyone would measure lengths with this scale. They used wood and metal to make scales of the same length.

At one place, people decided to use the distance between the nose and the tip of the middle finger of their king as a measure (Fig. 5). They called this distance **one yard**. They used wood and metal to make scales of this length

In 1590 Zaccharias Janssen and his son Hans invented micro scope.

and called this distance one **yard**. This yard was divided into three equal parts and each part was called a foot. They then divided each foot into twelve equal parts called inches. They even divided each inch into smaller segments!

Fig. 5

Other countries in the world also made their own scales. Because each country had its own scale which differed from others, it led to a lot of problems in trade and commerce. There was always a chance of quarrels breaking out.

Finally in France, it was decided that a certain length of rod made of a special material (Platinum-Iridium) would be called a metre. The metre was divided into 100 equal parts and these parts were called centimetre. Each centimeter was further divided into ten equal parts called millimetre. Now we are using this as a standard measurement for length throughout the world. This original scale is preserved in a museum in France.

The story explains the need of standard instruments to measure lengths. The meter scale is internationally accepted instrument for measuring lengths.

One metre is a standard unit of length.

We use metre as a unit of length and subsequently, centimeters and millimeters as smaller units of length.

Fig. 6

1 metre = 100 centimetres

1 centimetre = 10 millimetres

or

1 m = 100 cm

1 cm = 10 mm

In our daily life, we use different instruments like plain tape, rolled tape, centimetre scale of different sizes, made up of wood, metal or plastic.

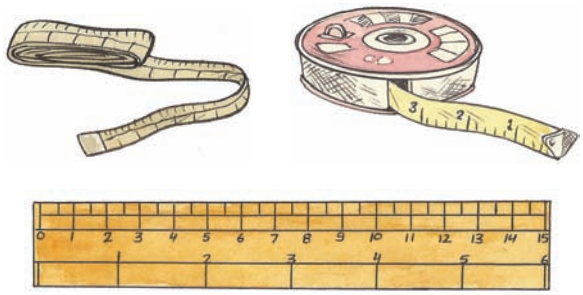


Fig. 7

- How do you select a suitable instrument to measure length?

The Danyang–Kunshan Grand Bridge is the world's longest bridge. It is a 164.8 kilometres (102.4 mi) long

If you want to measure the thickness of an eraser, which of the instruments shown in Fig. 7 is more suitable and why?

Sometimes we may need to measure long distances like length and breadth of school play ground or agricultural fields or distance between our house to school, distance between one town to another town, and even longer distances such as those between one country and another country.

- Can we measure these lengths using the instruments shown in Fig. 7?
- If not, how are these distances measured?
- What instruments are used?
- Is there any other way to measure very large distances?

Discuss with your friends, parents, and teachers to know the answer.

Metre is not a convenient unit for measuring large distances. We need to define a larger unit to measure larger distances. We use kilometre as a larger unit of length. One kilometre is 1000 times longer than a metre.

1 kilometre	=	1000 metres
1 Km	=	1000 m

Activity-2: How do we measure?

- How do you measure the height of your classmate using a meter scale?

Ask your classmate to stand with his/her back against a wall. Make a mark on the wall exactly above his/her head.

Now measure the distance, from the floor to this mark on the wall, with a scale. Let all other students measure this length in a similar way. Record your observations in your notebook.

Study carefully the measurements reported by different students.

Do you all have the same readings of measurements? If not, what could be the reason for the differences?

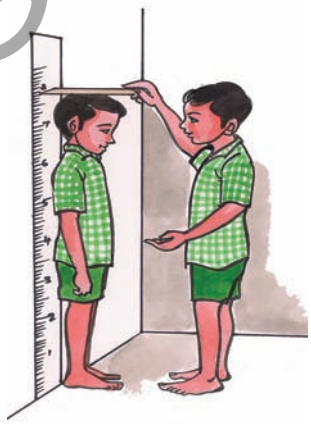


Fig. 8

In the above activity, though the measurement was done using a standard scale, results may be close to each other but not exactly equal.

The difference in reading is due to some errors in measurement. For example :

- Not marking the point exactly at the top of the head.
- Not using the metre scale in a proper manner.

The simple protractor in your compass box looks like a semicircular disk marked with degrees, from 0° to 180°.

To measure the lengths accurately using the standard measuring instruments like meter scale, centimeter scale and tape etc., we should take some precautions.

How to measure length accurately with a meter scale

In our day to day work, we use a wooden/plastic scale to measure lengths. It is marked or graduated in centimeters and millimetres. Suppose we are asked to measure the length of a table. We will take a metre scale. The zero mark on the scale is made to coincide with one end of the table and the reading at the point which is coinciding with the other end of the table is taken. Since a metre scale has some thickness, we may make an error if the eye is not correctly positioned. The correct position of the eye is "B" (Fig. 9) which is vertically above the end where the reading is to be taken.

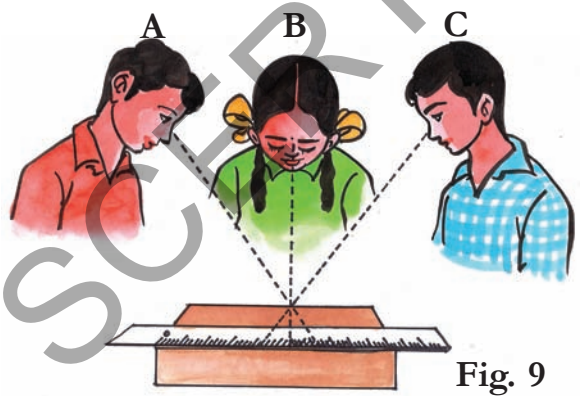


Fig. 9

- Does we get proper measure by viewing A and C places? Why?

Precautions while using a meter scale

We must take the following precautions while using a metre scale for measuring length :

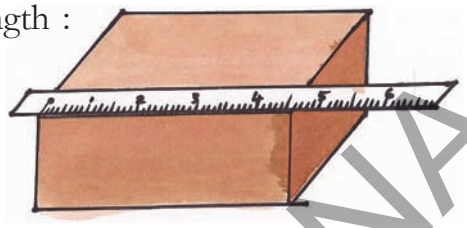


Fig. 10

1. The scale should be placed exactly along the length to be measured.
2. Zero point on the scale should coincide with the starting point of the length to be measured.
3. Our eye must be vertically above the point of coincidence of scale where the measurement is to be taken.
4. Ensure that the ends of the scale are not worn out.
5. Measure the length of an object more than two times and then take the average of these measurements for accuracy.

Think! What can you do to know a scale is accurate or not

How can we measure a small thickness?

Can you accurately measure the thickness of the cover page of your text book or a coin using the scale? If we want to

The foot is divided into 12 inches

measure the thickness of a page of notebook or a coin it is not possible to directly use a scale. Let us look at the method to measure the thickness of a coin.

Activity-3: Measuring thickness of a coin

Take about 10 one rupee coins of same size and place them one upon the other as shown in Fig. 11. Measure the total thickness with a scale and then divide it by the number of coins to get the thickness of one coin.

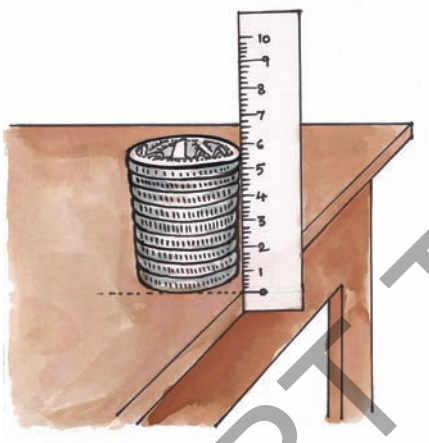


Fig. 11

In the same way, try to measure the thickness of a page of your text book.

We generally use a scale to measure the lengths which are in a straight line like the length of a room, length of a table etc. There are certain situations where the lengths are in curved line like the perimetre of bucket, perimetre of a tava or kadai etc.

Can we measure these curved lengths with a meter scale? If not why?

Activity-4: Measuring the length of a curved path

Fix alpins at the ends of the curved line to be measured as shown in the Fig. 12. Now tie a knot with cotton thread at the first point of the alpin A and move the cotton thread along points B, C, D, E etc.

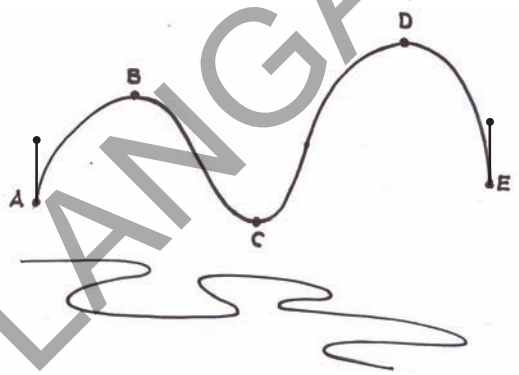


Fig. 12

Care should be taken that the thread is neither too tight nor too loose and see that the thread coincides with the curve at each point while moving along the path. When the thread reaches the extreme end of the curved path, cut it at that point.

Remove the thread from A and then place it straight along the length of a meter scale, and measure its length.

The length of the thread is the measure of the length of the curved path.

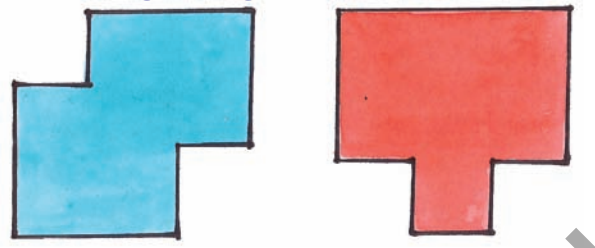
The initial metric unit of mass, the "gram," was defined as the mass of one cubic centimeter (a cube that is 0.01 metre on each side) of water at its temperature of maximum density.

Measurement of area

Ramu and Ravi's father brought two drawing sheets for them. After taking these sheets from their father, Ramu and Ravi started quarrelling with each other, each one claiming that his sheet was shorter than the others.

Which sheet is smaller? Which sheet is bigger? How can we decide?

Activity-5: Observe the drawing chart figures given below



Sheet A Sheet B

Fig. 13

See Fig. 13. Can y.ou decide which is the bigger and which is the smaller sheet by observing them? If not, what method do you adopt to decide the bigger one or smaller one?

Let us do:

Take two sheets of A4 paper and cut them in the shapes of shown in Fig. 13. Now take some empty matchboxes of equal size and keep them on the sheet. Starting from one corner of the sheet, count how many matchboxes are needed to cover the entire surface of the sheet. Similarly repeat the process for the second sheet also and record the findings in your notebook.

- Which sheet needs more number of matchboxes? Which is bigger in size?

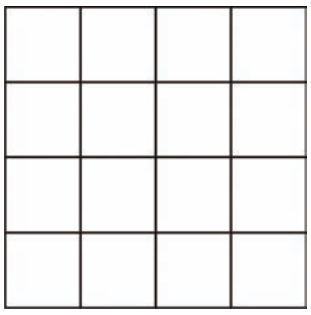
You may find that one of the sheets needs more number of matchboxes which shows that one sheet is bigger in size than the other. Thus, we need to measure the surface of an object to decide whether it is bigger or smaller.

Area is the measure of the extent of plane surface occupied by an object.

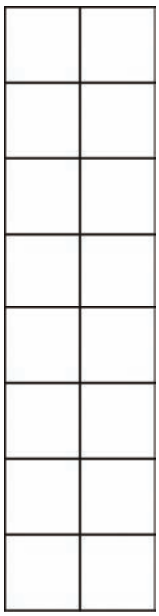
In the above activity, a matchbox is taken as a unit to measure area but it is not a standard unit. We need a standard unit to measure the area.

What is the standard unit to measure area?

Observe Fig. 14. In each figure, vertical and horizontal lines divide the surface into certain number of parts.



(a)



(b)

Fig. 14

The Arthashastra offers a wealth of evidence for the wide varieties of standardized weights and measures of the time.

- Which figure has more area and why?
- Are all the parts in both figures equal?
- What is the shape of the smaller part in each diagram?
- Is the length and breadth of each smaller part equal?
- Measure the length and breadth of any one part of each diagram. What do you notice?

You may notice that the small parts in each diagram have equal lengths and breadth, one centimeter each. Area of each part is equal to one square centimetre and it is written as cm^2.

- Since Fig. 14 (a) and 14 (b) have same number of squares, of area 1 cm^2 each, both the figures have a total area of 16 cm^2 each. Thus, these figures have different shapes but equal areas.

Square centimetre (cm^2) is a standard unit to measure the area of a surface.

We use m^2 (square metre), mm^2 (square millimetre), $foot^2$ (square foot), etc., also to measure the areas according to need and requirement of the situation.

Table 3 : Units of measurement

S.No.	Units of Length	Symbol	Units of Area	Symbol
1	Meter	m	Square metre	m^2
2	Centimetre	cm	Square Centimetre	cm^2
3	Millimetre	mm	Square millimetre	mm^2
4	Feet	ft	Square feet	ft^2

Activity-6: Measuring the area of a regular surface

Cut a cardboard into a shape of rectangle having length 4 cm and breadth 2 cm as shown in Fig. 15. Let us measure its area.

The convenient unit to measure the area of given cardboard would be cm^2.

Take a centimetre graph paper. Each small square on this graph paper has a

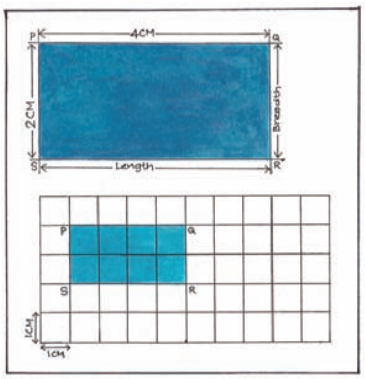


Fig. 15

The Mughal measurement system measured land in terms of "gaz" and "bigha".

side equal to 1 cm. The area of each small square on this graph paper is 1 cm^2.
Place the cardboard on the centimetre graph paper (Fig. 15) and draw its outline with the help of a sharp pencil. Now remove the cardboard and mark the shape as PQRS. Count the number of squares inside the outline. The number of squares is 8.

Area of the cardboard is equal to the area covered by PQRS on the graph paper.

Area of PQRS = Total area of unit squares inside the PQRS
= 8 × area of 1 unit square
= 8 × 1cm^2
= 8 cm^2

In this case, the cardboard we used has a regular shape - rectangle.

- Can you relate the measured area to some formula of finding area?

Activity-6: Measurement of areas irregular plane surface

Let us find out the area of an irregular surface, take a leaf, which has irregular shape. Place the leaf on a graph paper as shown in Fig. 16. Mark the boundary of the leaf on the graph paper with a pencil. Now remove the leaf to find the outline or boundary of the leaf on graph paper.

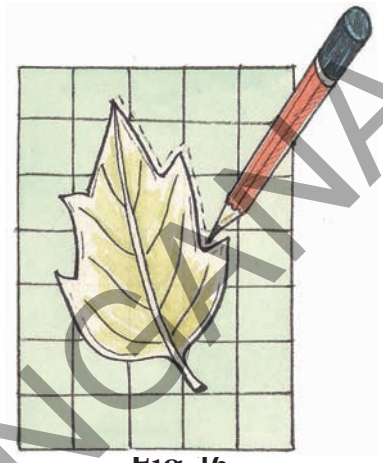


Fig. 16

Count the number of complete squares (each of 1 cm^2 area) inside the boundary. Also count those squares, inside the boundary, which are half or greater than half. Add this to the number of complete squares.

This total number of squares inside the boundary gives the area of the leaf. If there are 'n' squares inside the boundary, the area of the leaf becomes n cm^2.

Neglect those squares, inside the boundary, which are less than half.

This process will gives us the value of area which is close to the actual area.

- How can you use the graph paper to get a more accurate answer?

The Republic of India adopted the metric system on April 1, 1957.

Measurement of volume

- How do you find the volume of a solid?

Mrs. John is constructing a house. She needs sand and enquired about prices. The supplier informed her that two tractor loads of sand costs Rs. 4000/- and one lorry load of sand costs about Rs. 4000/-.

- Which deal is cheaper for Mrs.John? A lorry load or too tractor loads of sand?
- How can you decide which load has more quantity of sand?

To decide the quantity contained either in a lorry or tractor, we need to know the volume of the body of lorry as well as that of the body of tractor.

Volume is a measure of the extent of space occupied by a body.

Measurement of volume of liquids

- How can you measure the volume of kerosene?
- How do you decide the volume of milk?

We use some measuring cylinders to measure the volumes of liquids such as kerosene, milk, oils, water, etc. The volume of liquids is expressed in liters (l) or millilitres (ml).

Measuring cylinder

It is cylindrical in shape, with graduations marked on its body. Measuring cylinders are available in different sizes. They are used in laboratories to measure a certain volume of a liquid and to measure milk, oils, etc by shop keepers. We can fill it with the liquid to be measured and then read the marking at the lowest point of the concave surface of liquid. We must bring our eyes in line with this level of liquid and then read it.

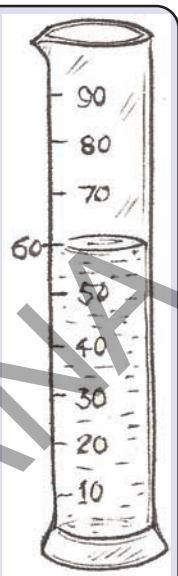


Fig. 17

Apart from measuring the volumes of liquids, we also measure the volumes of solids, for example, loose solids like sand, clay, and ready mix of cement.

- What is the standard unit of measuring the volume of solids?
- Are you able to measure the volume of loose solids?
- How can you decide a standard unit of volume of a solid?

Look at Fig. 18. There are certain number of identical cubes of length, breadth and height 1 cm each, and a cardboard box of length 3 cm, breadth 2 cm, and height 2 cm.

The distance travelled by Aeroplane or Ship per hour is measured by knots or nautical miles. 1 Knot is equal to 1.852 Km/h.

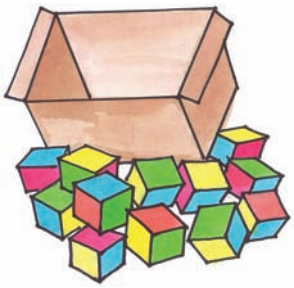


Fig. 18

Place three cubes in a line so as to cover the entire length. Along the side of this line, place another line of three cubes so as to completely cover the base of the box (Fig. 19). How many cubes have you used so far?

- How many cubes do you need to cover the entire empty space in the box?

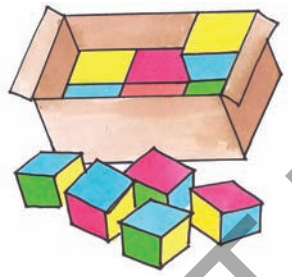


Fig. 19

Place more cubes over this set of blocks; so that the total space is occupied by the blocks. Calculate the number of cubes occupying the rectangular box.

- How many cubes occupy the rectangular box?
- Can you guess volume of rectangluar box.

Since each cube has measurement of 1 cm length, 1 cm breadth, and 1 cm height, the volume of one cube is equal to 1cm x 1cm x 1cm = $1cm^3$ which is known as 1 cubic centimetre and written as 1 cm^3.

Cubic centimetre is a standard unit for measurement of volume of solids.

Therefore the volume of the rectangular cardboard box is equal to the total number of cubes occupying it.

Therefore volume of rectangular cardboard box = 12 × 1 cm^3 = 12 cm^3.

However, if we multiply length, breadth and height, it would be

3 cm × 2 cm × 2 cm = 12 cm^3

Therefore, we can say volume of a box = length × breadth × height

Do you know?

You must have noticed that the volumes of liquids are written in ml while those of solids are written in cm^3. Do you know the relation between these two units. The two units are related as follows :

1 ml = 1 cm^3

Measurement of volume of irregular solids using a measuring cylinder

Take a measuring cylinder and fill almost half of it with water. Record the volume of water (Fig. 20). Let us assume it is "a" cm^3 (or "a" ml).

1 mile is equal to 1.61 kms

Now tie a small irregular solid (stone) with a fine cotton thread. Put the solid gently into the water in the cylinder so that it is completely immersed in water.

What changes do you notice in the water level of the cylinder?

You may notice that the level of water in the measuring cylinder rises as the stone displaces water equal to its own volume. Record the new volume of water. Let us assume that it is "b" ml.

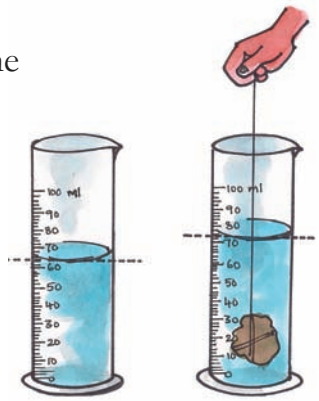


Fig. 20

Now the volume of stone will be the difference between the second volume and the first volume i.e volume of the stone = (b - a) cm^3.

Keywords

Measure, standard unit area, volume, regular surface, irregular surface, rectangular body, measuring cylinder, graph paper

What we have learnt

- We use some conventional ways like hand-span, foot - span, cubit, etc. for rough measurements in our daily life.
- We need standard instruments to measure lengths accurately.
- Meter scale is a standard instrument to measure length.
- Meter is the standard unit for measuring length. Larger distances can be measured in kilometers.
- Area is a measure of the extent of the plane surface occupied by an object.
- Generally we measure area in square metres or square centimetres etc.
- Volume is a measure of the extent of space occupied by a body.
- Volume of solids is measured in cubic metres, cubic centimetres, etc.
- Volume of liquids is measured in litres or millilitres.

$1cm^3 = 1ml$

Improve your learning

1. What is the smallest distance that you can measure with a centimetre scale?
2. Are we able to measure the thickness of a metal wire using a scale? Explain.

Astronomers use a method called parallax to measure the distance to some stars

3. A school hall measures 20 m in length and 15 m in breadth. Find its area.

4. Ramu's father had a rectangular plot of length 60 ft. and breadth 50 ft. He built a house occupying length 40 ft. of the plot and breadth 40 ft. and in the remaining area he planned a garden.

   Can you help Ramu to find out the area of his garden?

5. Match the following :

	A		B
a)	A litre	i)	10000 m^2
b)	A metre	ii)	1000 ml
c)	A Kilometre	iii)	100 cm
d)	A Centimetre	iv)	1000 m
e)	1 hectare	v)	10 mm

6. Millilitre is a unit for measuring _____

7. For measuring long distances we can use _____ as a unit.

8. What method will you adopt to measure the volume of a banana? Explain?

9. Identify incorrect statements among the following and rewrite them with necessary corrections :

a) One square metre is equal to 10,000 square centimetres.

b) The appropriate unit for reporting the volume of a cylindrical rod is cm^2.

c) The appropriate instrument to measure the thickness of a 25 paisa coin is a tailor's tape.

d) A measuring cylinder can directly measure the volume of solids.

11. How will you measure the area of your palm using graph paper? Explain.

12. Measure the volume of "Kalakanda" (sugar crystal) and piece of "Patika" (alum). Record your measurements in table 4.

    Ask your friends to measure volumes of the same pieces of Kalakanda and Patika and record the values.

Nanometre - A metric unit which equals to a 1/1,000,000,000 of a meter

Table 4

S. No.	Name of the student	Volume of Kalakanda	Volume of Patika
1			
2			
3			
4			

- Are all the values of volumes of Kalakanda equal?
- Are all the values of volumes of Patika equal?
- If not, state the possible reasons.

13. A carpenter who makes wooden furniture, needs accuracy in measurments. Do you ever notice how he measures? How would you appreciate him?

14. Make a visit to panchayat office collect information how VRO measure areas of agricultural lands in your village. Prepare a questionaire for this.

15. Collect any invitation card with envelope. Find out the difference between the measurments of card and cover. Write down the process that you follow.

16. The distance between numbers in a clock is accurately same. List out the things that you observe in your surroundings with accurate distance between them.

17. Try to imagine the area of CD, sim card, mobile phone then find out the area of the above by using graph paper. Compare the values of your guess with graph paper measurment. Which thing is closely related to your guess?

* * * * *

Computer memory is measured by Bites, Kilobyte (KB), Megabyte (MB), Gigabyte (GB) and Terabyte (TB)

14 Movements in Animals

While doing physical exercise we move our body parts in different ways. We lift and bend our legs, hands and other body parts. We can also rotate some parts of our body Have you ever noticed how we are able to move this way? What parts of our body are responsible for these movements?

Usually, when we have to go a short distance from one place to another, we walk or run. But how do animals like fish, snails, snakes etc. move their body or move from one place to another? Can all animal move their body parts like us?

Let us look closely at some of our own movements.

Activity-1: Human body and its movement

Do the following actions :

Bowl an imaginary ball at an imaginary wicket. Lie down and try to rotate your leg at the hip. Bend your arm at the elbow and your leg at the knee. Stretch your arms sideways, chew some food, bend your arm to touch your shoulder with your finger and try to move other body parts as well. Record your observations in table 1.

Table 1

S. No.	Body Part	Rotates Partially/Completely	Bends (Yes/No)	Lifts (Yes/No)	Moves (Yes/No)
1	Neck				
2	Wrist				
3	Fingers				
4	Knee				
5	Ankle				
6	Toes				

The cheetah (Acinonyx jubatus) is one of the fastest mammals found in the animal kingdom today. (97 km/hr)

S. No.	Body Part	Rotates Partially/Completely	Bends (Yes/No)	Lifts (Yes/No)	Moves (Yes/No)
7	Back				
8	Head				
9	Elbow				
10	Arm				
11	Upper jaw				

All these movement are done with the help of certain parts of our body that lie beneath our skin. We cannot see these parts directly but we can get a sense of their movement under our skin. Can you guess the names of these bodyparts?

Do you know?

We can perform different types of movements with the help of muscles and bones. They are situated inside the body. We can't see and study them like we can see our hair, skin, eyes, nose, ears etc.

Let us study how muscles and bones help in movement. For this, we will try to observe our body carefully so that we can sense these internal parts from outside. We will also take the help of their pictures.

Muscles

If you observe a cow, bull or horse, walking or running, you can see some fleshy structures moving beneath their skin, usually around the shoulders and hips. These tender fleshy structures are called **muscles**.

We shall perform a few experiments to find out how these muscles help the various parts of the body to move. We shall also see some of the activities that these muscles perform in the body.

Activity-2 : Touch your sholder

Make a fist with one hand, bend your arm at the elbow and touch your shoulder with the fist. Also touch your upper arm with the other hand, as shown in Fig. 1. Can you feel a swollen region inside your upper arm?

Snails and slugs travel at speeds that vary from slow (0.013 m/s) to very slow (0.0028 m/s).

Fig. 1

This is muscle. The muscle bulges due to contraction. When contracted, muscle becomes shorter, stiffer and thicker.

Activity-3: Fold and un-fold

Hold one of your hands in front of you, in the manner shown in Fig. 2(b), with the palm facing downwards. Fold and unfold the fingers of this hand one by one. Observe the back of your palm between the fingers and the wrist and study the movement of the muscles.

- Could you identify the different muscles that move as you open and close each finger?

Now hold your hand with the palm facing upwards, in the manner shown in Fig. 2(a), and fold and unfold your fingers one by one. Study the moving muscles between the wrist and elbow.

- Could you identify the movements in different muscles?

Try to open and fold your fingers without moving these muscles. Is it possible to do so?

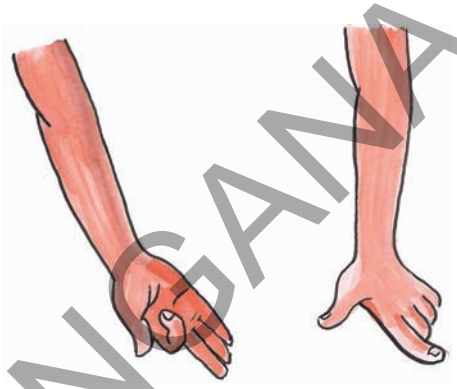


Fig. 2(a) **Fig. 2(b)**

In a similar manner, try to feel movements of muscles in your legs and toes as well.

After doing all these activities try to find out the relation between moving body parts and muscles?

Perform the following actions and say whether you were able to feel the movement of muscle here as well:

- Fluttering your eyelashes.
- Chewing.
- Breathing in and out.
- Lifting a weight.
- Moving your toes.

There are more than 2,700 species of snakes in the world

How do Muscles work?

Muscles work in pairs. When one of them contracts, the bone is pulled in that direction and the other muscle of the pair relaxes. To move the bone in the opposite direction, the relaxed muscle contracts and the first one relaxes. Thus two muscles have to work together to move a bone. Are the muscles attached to bones? Some muscles are connected directly to bones.

Some muscles have round, white, rope-like fibres at their ends that connect them to the bone (Fig. 3). These fibrous structures are called **tendons**.

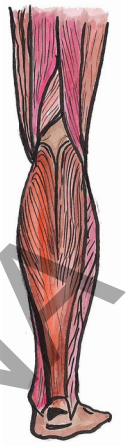


Fig. 3

You can feel the tendons in several parts of your body like; for example, above the elbow, beneath the knee, near the ankle (Fig. 4 (a,b,c)) . Try to find out if you can feel them in other parts of your body.

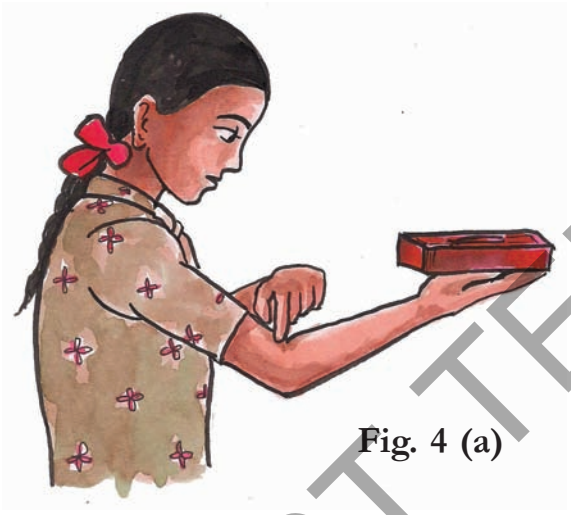


Fig. 4 (a)

Fig. 4 (b)

Fig. 4 (c)

Do you know?

Almost all our body movements depend on muscles, bones and joints. Expansion and contraction of muscle makes the bone move.Muscles always work in pairs.

The smallest bird is the Bee Hummingbird at 2.24 in (5.7cm)

Bones

The different bones of different body parts combine together to form a single structure or system. This structure is called the **skeleton**. It is very interesting to study the skeletal system, and it is funny to think, how we are with our skeleton.

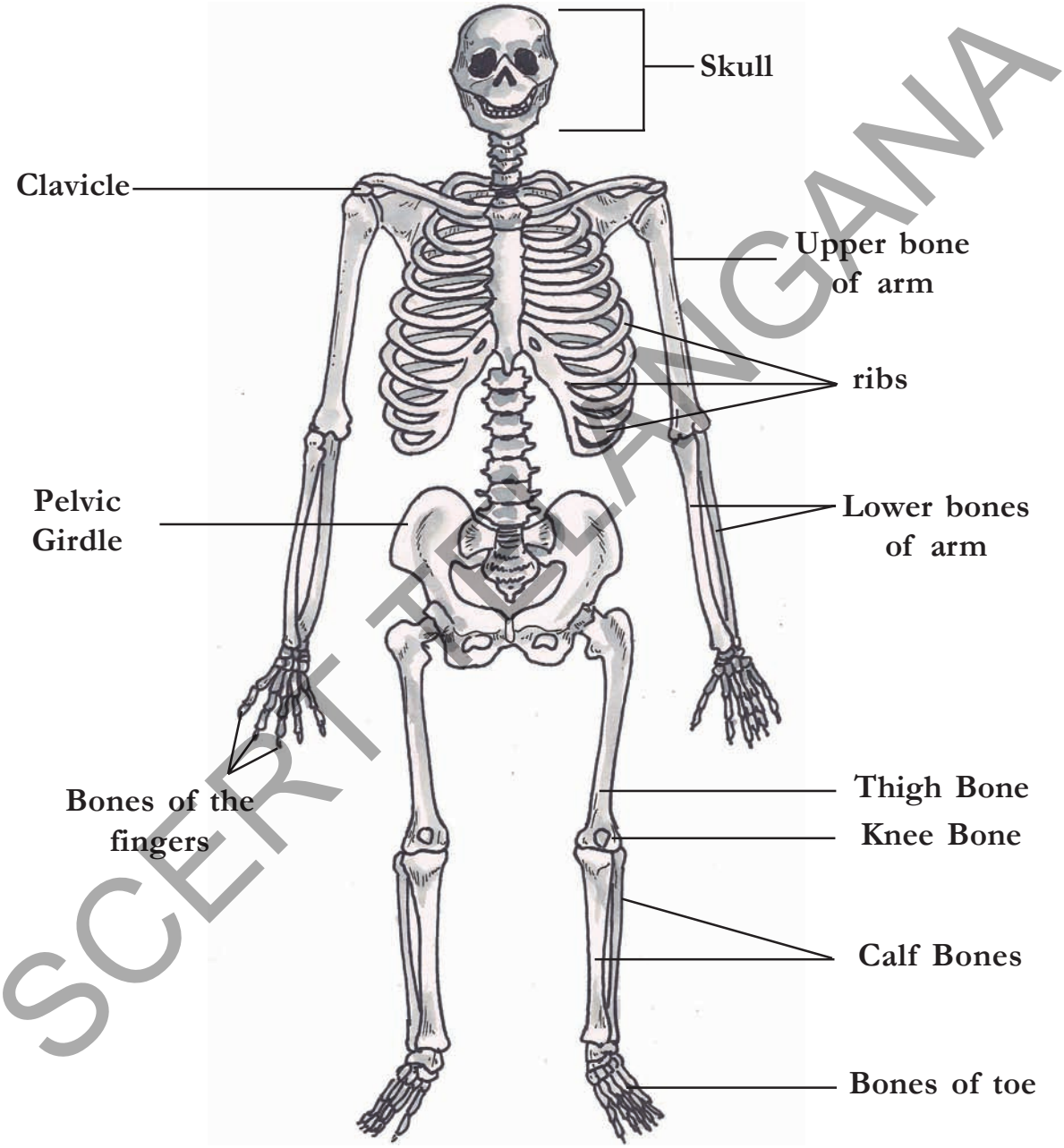


Fig. 5 : Skeleton

The average adult male ostrich, the world's largest living bird, weighs up to 345 kgs.

You saw earlier that muscles are joined to the bones to help them move. In the same way, two bones are joined together in a special way by fibres. These fibres are called **ligaments** (Fig. 6).

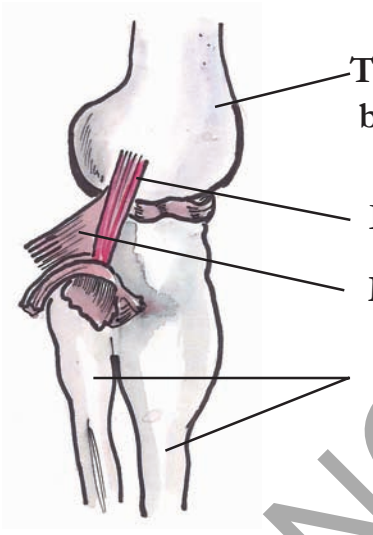


Fig. 6

Activity-4: **Jaw bone**

Fig. 7

Ask your friend to open his mouth and move his lower jaw up and down as well as sideways. Observe his face carefully.

- Did you notice any joint in the bones near his ear?

This is the place where the lower jaw bone is joined to the skull. Press your finger on both sides of your face and spot where you have these joints. These are fixed joints.

Activity-5: **The clavicle**

Fold one arm and rest it on your waist. Now slowly lift your arm and shoulder together (Fig. 8).

Fig. 8

Run a finger of your other hand from just below your neck towards your shoulder. Try and locate a raised bone

The femur is the longest and strongest bone in the body. It is located in your thigh.

there and the one behind it. The raised bone is called clavicle and the bone behind it is the shoulder blade.

There are two bones protruding from the shoulder called shoulder bones.

Fig. 9

Look at Fig. 9 showing where the clavicle joins the shoulder blade. Now try to locate the joint between the clavicle and shoulder blade.

Activity-6: The ribs

Take a deep breath and hold it for a little while.

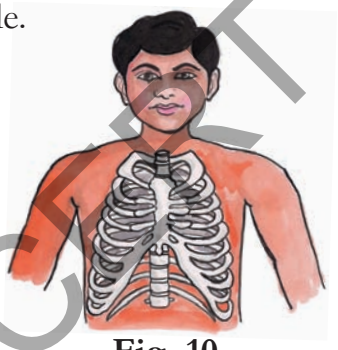


Fig. 10

Feel your chest bones by gently pressing the middle of the chest. Count as many ribs as possible. (Fig-10)

Ribs are curiously bent and join the chest bone and the back bone together to form a box. This is called the rib cage. Some important internal parts of our body lie protected inside this cage. Try to guess what those important parts are.

Activity-7: Backbone

Ask your friend to stand up, bend forward at the waist and try to touch his toes with his palms. Run a finger along the centre of his back from below the neck.

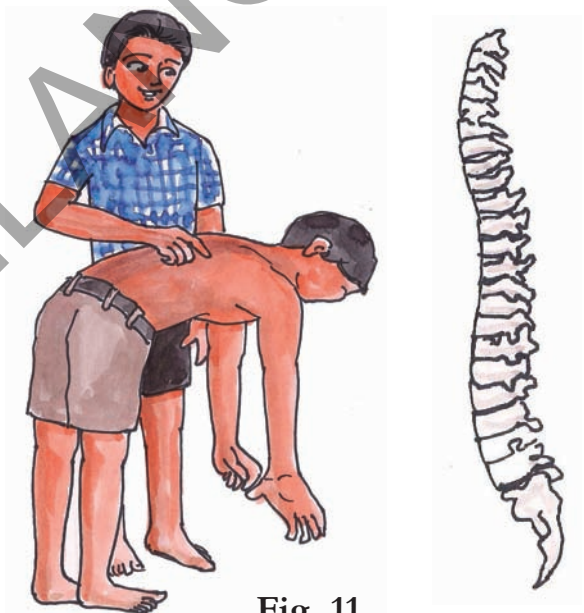


Fig. 11

A long structure running down the middle of his back is called the backbone (spinal cord). The small bones that make up this backbone are called vertebrae. The spinal cord passes through the vertebrae of the backbone. (Fig-11)

The average adult heart beats 72 times a minute; 100,000 times a day; 3,600,000 times a year; and 2.5 billion times during a lifetime.

Do you know?

There are 33 separate vertebrae in the backbone of an infant. Later out of the last 9 vertebrae, 5 vertebrae merge to form a single bone and last 4 merge to form another single bone. Can you say how many vertebrae you now have?

Activity-8: Pelvic girdle

Press the area just below your waist with the fingers of both hands as shown in Fig. 12. Can you feel similarly shaped bones on both sides of your body. This is called pelvic girdle

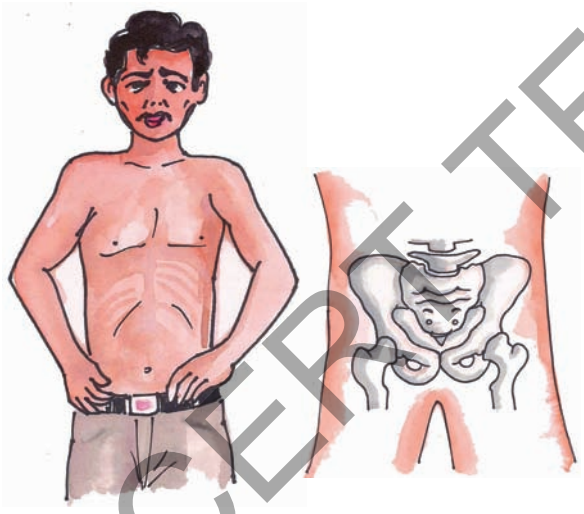


Fig. 12

This structure is made of pelvis bones. They enclose the portion of your body below stomach. This is also the part you sit on.

Skull

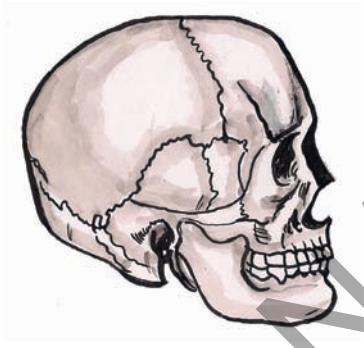


Fig. 13

The skull is made up of many bones joined together. It encloses and protects the brain. The joints between the skull bones are fused. They are also called fixed joints. (Fig-13)

Activity-9: Flexible bones-cartilage

Hold your ear with your fingers, press it and bend it as shown in the Fig. 14. Also touch and feel the tip of your nose.

Fig. 14

Some parts of the ear and nose are soft and others are hard. The hard parts are made up of a structure called cartilage. This is also a bone but it is flexible. Do you find these flexible bones in any other part of your body? Cartilage is present

The volume of blood pumped by the heart can vary over a wide range, from five to 30 liters per minute.

in other parts of the skeleton as well, like, between the rib and sternum, between the vertebrae of the backbone (spinal cord) etc.

Activity-10: Different types of joints

We knew that muscles help move a bone. How does one bone help the other to move? Is there any arrangement between bones? Are ligaments of bones sufficient for body movement? Let us understand different types of joints in our body. Put a meter scale under your arm so that your elbow is in the centre. Ask your friend to tie the scale and your arm together as shown in Fig. 15. Now try to bend your elbow. Is it possible?

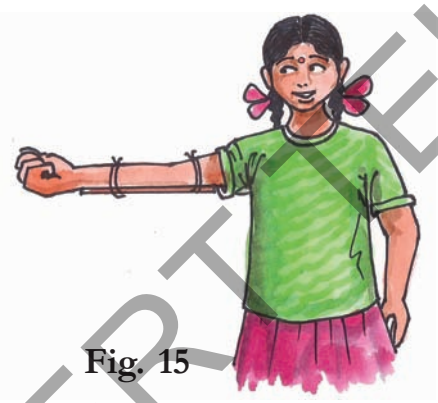


Fig. 15

Bones can't bend. You have seen that the human skeleton is made up of many bones. What will happen if bones can't move? Bones of our body move in their own way, How is it possible? These bones have joints between them. We can move various parts of our body because of these joints.

There are different types of joints in our body to help us carry out different movements and activities. Let us learn about them.

Ball and socket joint

You will have to make a model to understand how the joint between the shoulder blades and the bones of your arm works. Place a fused bulb inside the half shell of a coconut and rotate it in the way shown in Fig. 16(a).

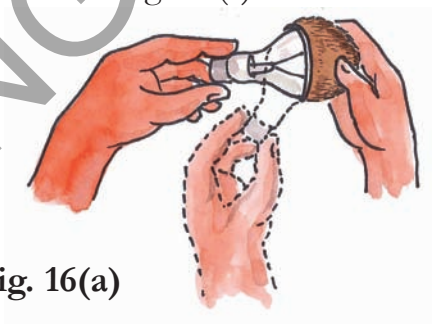


Fig. 16(a)

A joint made by fitting a ball into a socket is called a ball and socket joint. In this joint, a bone can rotate easily in all directions. (Fig-16-b)

Fig. 16(b)

Hinge joint

Straighten your arm and hold your elbow in the palm of your other hand.

According to the Science Museum of Minnesota (SMM), the lungs are the only organ in the body that can float.

Try and rotate your forearm in all directions at the elbow joint. Is it possible at the elbow as well? No. Why?

Try one more thing; bend your arm towards your shoulder in the opposite direction. Repeat this exercise two to three times. Were you able to bend your arm downward after a limit?

Could you move your hand from your elbow in all the directions? Why?

Fig. 17 shows a hinge. Where do you find such hinges in your house? Observe how objects attached by these hinges move. Compare these things with that of your elbow and knee.

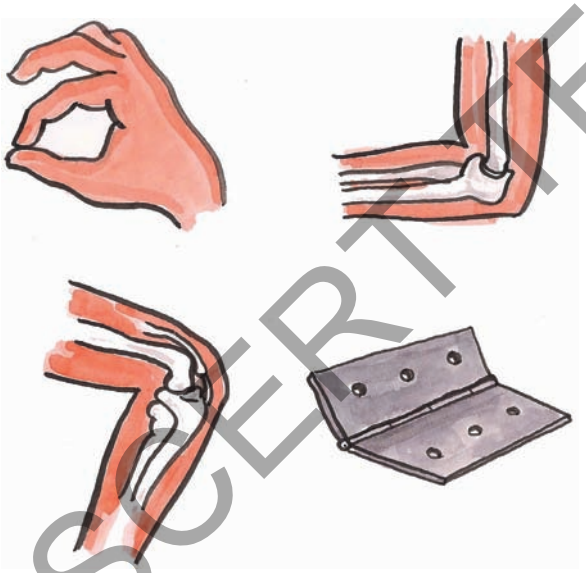


Fig. 17

Identify and list the hinge joints in your body by taking help of Fig. 17.

Your backbone is a spring

You may have often done the exercise in which you stand straight up and touch the floor with your palms by bending your body but without bending your knees. You may have also done the exercise in which you have bent your body to the left and right at the waist.

- Could you explain what property of the spinal cord enabled you to perform both these exercises?

There is tender and flexible cartilage between the vertebrae of the backbone. This cartilage between the vertebrae helps in rotating the backbone in different directions. (Fig-18)

Fig. 18

Neck joint

Neck joint is different from both the hinge joint and the ball and the socket joint. This joint helps us to move our head up-down and side to side.

The small intestine in adults is a long and narrow tube about 7 meters (23 feet) long.

But we cannot rotate our head totally. Neck joint is a type of joint called **pivotal** joint.

Fixed joints

Some joints between bones in our head can't move; such joints are called fixed joints. These joints are fused and seem to be a single bone in the skull. When you open your mouth, you can move your lower jaw. Can you move the upper jaw as well?

There is a joint between the upper jaw and the rest of the head. It is a fixed joint. So you cannot move the upper jaw. (Fig-19)

Fig. 19

Movements in other animals

We can move our body parts with the help of muscle bones and joints. Do all animals have these parts like us? Let us study how animals move.

Activity-11: Locomotion

Lets us see how animals move from one place to another. Fill your observations in table 2.

Table 2

Animal	Body part used for moving	How does the animal move
Cow	Legs	
Human		walks, jumps, ...
Snake		
Bird		hops, flies, ...
Insect		
Fish		

By analyzing table 2 you will see that different animals use different body parts for moving from one place to another (locomotion).

The skull is really 22 bones, not one single bone. The skull is also called a cranium.

Locomotion in fish

Fish swim in water. Do they swim the same way as humans? What is the difference? What features help fish in swimming and how?

Activity-12

Make a paper boat. Put it in water and push it with narrow end pointing forward (fig. 20.a). Now hold the boat sideways and push it into water from the broad side (fig. 20.b). What did you observe? In which process was it easy to move the boat?

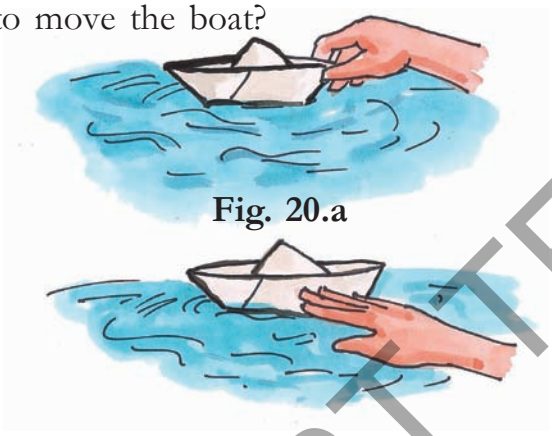


Fig. 20.a

Fig. 20.b

The body of the fish is streamlined. The shape is such that it allows the fish to move in water easily. The skeleton of the fish is covered with strong muscles. While swimming, muscles make the front part of the body swing towards one side while the tail swings its body towards the opposite side (fig. 21).

This creates a jerk and pushes the body forward. A series of such jerks help the fish swim forward. The tail fins also aid in this movement (Fig. 21).

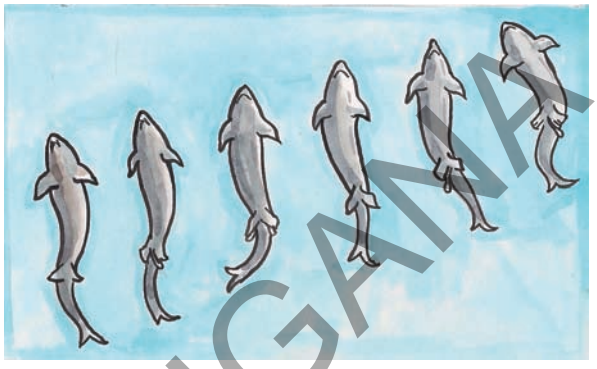


Fig. 21

Locomotion in birds

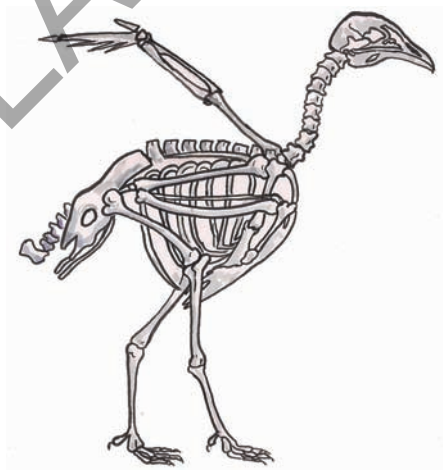


Fig. 22

Birds fly in the air and walk on the ground. Birds can fly because their bodies are well suited for flying. Their bones are hollow and light. The bones of the hind limbs are typical for walking and perching. Bony parts of the fore limbs are modified to hold muscle of

Most amphibian species have a life cycle that involves three stages, egg, larva, and adult.

flight which is used to move the wings up and down. (Fig-22)

Activity 13: Observe Hen and Sparrow How do they move? Write your findings about similarity and dissimilarities in your note book.

Locomotion in snake

Fig. 23

Snakes have a long back bone and several muscles. Usually the snake's body curves into many loops. Each loop of the snake gives it a forward push by pressing against the ground. This helps the snake move forward very fast. There are other ways in which snakes move. try to find out about them. Collect those pictures, information and display them on wall magazine

Activity-14: **Locomotion in snail**

Collect a snail from a garden. Have you seen the rounded structure it carries on it back? Place the snail on a glass plate and watch it, when it starts moving Fig. 24 (a). A thick structure may come out of an opening in the shell. the thick structure is its foot, made of strong muscle. The wavy motions of its foot is the reason why a snail moves slowly.

Fig. 24 (a)

Fig. 24 (b)

Don't forget to put back the snail from where you collected it. If you let it go away it will die. You are a student with concern towards bio diversity.

Movement or locomotion is an important function in every living organism. It is very interesting to watch ants running hurriedly in a line, squirrels and monkeys jumping on trees. Try to enjoy watching various locomotions in the animal kingdom.

Keywords

Bones, muscles, ligament, tendon, clavicle, pelvic girdle, hinge joint, locomotion, cartilage, ball and socket joint.

What we have learnt

- The different bones of differents body parts combine together to form a single structure called, skeleton.
- There are different kinds of joints in our body like ball and

We have 208 bones and over 230 moveable and semi-moveable joints in our body.

socket, hinge, pivotal etc. to help us in performing several activities.

- Bones and muscles help us perform different movements and activities.
- Muscles work in pairs.
- Tendons join muscles to bones.
- Ligaments join one bone to other bone.
- Our backbone works like a spring.
- The joint between upper jaw and skull is fixed joint.

Improve your learning

1. Imagine a situation where you have no bone in your body. Describe with reasons, what would happen.
2. Try and identify the joints in the body of a goat or a cow. Make a list of these joints.
3. What difficulties would you face if your fingers had only a single bone?
4. What is a ball and socket joint? How it is different from hinge joint?
5. **Fill in the blanks and give reasons:**

1) Joints of the bone help in the _____

2) The contraction of the ____ pulls the bones during movement.

3) The bones at the elbow are joined by a _____ joint.

6. **Guess who I am**

i) I am a joint that works like joint of doors and window.

ii)I help to join two bones.

iii) Joint between upper jaw and skull.

iv) I am a chain of small-small bones

v) I join bone and muscle

7. Collect X-Ray films and identify which body parts they represent. Write a note on them.
8. Prepare a questionaire to take interview of a yoga teacher or PET sir about asanas and exercises.
9. Crawling snake, jumping frog, flying bird are they amazing to you? Why you think so?
10. List out the activities that you performed at your home before coming to school. Which joints are involved in each activity.
11. "Which joints involved in plucking flowers, making garlands", Ravi's mother asked. What is his answer?
12. What is this instrument? How you use this?

Did you know that humans and giraffes have the same number of bones in their necks i.e. 8?

15 Light, Shadows and Images

One day Raju started for his home from school, late in the evening. When he started, he was able to see trees, buildings, animals, buses etc. on the road and on either side of the road. As he kept walking, it started growing dark and soon he was not able to see objects either on the road or on the sides as clearly as earlier. When he reached home, it was already dark. He started doing his homework. Suddenly the power went off. He was not able to see any objects in the room.

Raju started wondering.

- Why am I not able to see the objects clearly when it gets dark?
- Why am I not able to see the objects when power went off?
- How are we able to see the objects in the presence of light?
- Why are we not able to see the objects in the absence of light?

Activity-1: How can we see objects?

Make your room dark by shutting the door and windows; put on the light. Look at any one of the objects in the room. After that, hold a plank or a writing pad in front of your face. Is the object visible to you? Why is it not visible though there is light? What happens when you hold a plank between the object and you?

The object is visible when there is no obstruction between your eyes and the object. If we keep obstructions like plank or writing pad, they do not allow some thing that is coming from the object to reach us. What is that some thing coming from the object?

When we put on the bulb, light falls on the object, bounces from the object and reaches us. We can see an object only when light falls on it and bounces back to our eyes. See Fig. 1 and observe the direction of the arrowheads.

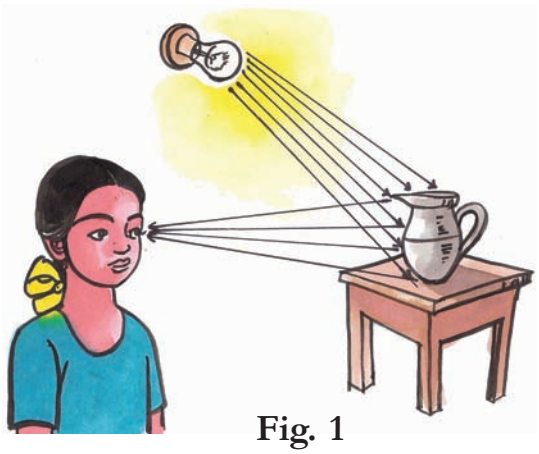


Fig. 1

It takes 8 minutes 17 seconds for light to travel from the Sun's surface to the Earth.

- Where does light come from? Which objects give us light? Think and write below :

....., ...

....., ...

A substance which gives light is known as a light source. Sun, a glowing bulb, lighted candle etc. are some sources of light. Any object which burns or glows acts as a source of light.

- Is Moon a source of light?
- Can you give some more examples for source of light?

You might have seen your shadow many times.

- When did you see it? Is it during day time or at night?

It is our common experience that we see shadows in daytime. Are shadows formed at night?

Try to see your shadow in moonlight on a full moon day. It is also possible to get your shadow at night, in your house, when the electric bulb is on. Is it possible to form shadows when there is no sunlight, bulb or any other light?

- What do we need to form a shadow?

We need light to get the shadow of any object.

Activity-2: Do all objects form shadows?

Try to form shadows of a book, a pen, a duster, a polythene cover, and a glass plate on the wall of your classroom with the help of a torch.

Do you find any differences in the shadows of the above objects? Do all objects form shadow?

- Which objects form the shadows?

....., ...

....., ...

- Which objects do not form shadows?

....., ...

....., ...

- Think and write why some objects form shadows? And others do not?

.....

.....

The substances like paper, plank, wood, iron etc. don't allow light to pass through them. These objects form shadow. These are called **opaque substances.**

The substances like glass and air allow light to pass through them and hence we don't get their shadows. Such substances are called **transparent.**

The substances such as polythene cover and oily paper partially allows the light to pass through them. Their shadows

Red, green and blue are the primary colours of light. Mixing them in various ways will make all other colours, including white.

are unclear. These are called **translucent** substances. You have also come across these terms in the chapter on materials.

Observe Fig. 2. Write whether the sheet held by the boy is transparent, translucent or opaque below each of the pictures.

. . . .

Fig. 2

Think, guess and write in table 1 which objects in your classroom and at home form shadows, which do not form shadows and which form an unclear shadow.

Table 1

Objects which form shadows.	
Objects which form unclear shadows.	
Objects which don't form shadows.	

Check the above objects in sunlight to verify your guess and make corrections in table 1 if needed. After checking, give your own examples for transparent, translucent and opaque substances.

Transparent Substances : ....

....

Translucent Substances : ....

....

Opaque Substances : ....

....

Thus we see that all objects do not form shadows. Only opaque objects form shadows. We need a source of light and an opaque object to get a shadow.

Are sources of light and an opaque object enough to get shadows? Do we need something more?

When sunlight is intercepted by a drop of water in the atmosphere it gives RAINBOW

Activity-3

Do this activity in a dark room with a torch and a book. Focus the light on the book with a torch as shown in Fig. 3 (keep the distance about 30 cm between the book and the torch).

- Where do you find the shadow of the book in the room?

Fig. 3

Now put the torch under the book at a distance of about 30 cm (Fig. 4).

- Where do you find the shadow of the book this time?

Fig. 4

Do the same activity, in open air (outside) at night. Where are the shadows formed in this situation? Do you see a shadow in open air when the torch is under the book? If not, why?

Place a drawing sheet or a plank (Fig. 5) at a distance of 1 m. above the book and try to find the shadow of the book.

Fig. 5

- Do you find the shadow of the book if you remove the sheet?
- What do you understand from the above activity?

We understand that only light and opaque object are not enough to form the shadow of an object. In addition to these, we need a screen. In the above activity, we used a drawing sheet or plank to get the shadow.

When you turn on a light bulb only 10 per cent of the electricity used is turned into light, the other 90 per cent is wasted as heat.

In our day-to-day life, we observe many shadows on the surface of the Earth. In all these cases, the earth is the screen.

Do you know?

Shadow puppetry is one of our traditional recreational activities. In this, some puppets are used to form shadows on a screen and a story is narrated with the help of these shadows. Observe Fig. 6. Try to make puppets and do a shadow puppet show in your school.

Fig. 6

Can we guess the object by observing its shadow?

Observe the shadows given in Fig. 7(a). Guess and write the names of the objects which form the shadows.

....

Fig. 7(a)

See the objects in Fig. 7(b) and compare them with the names guessed by you.

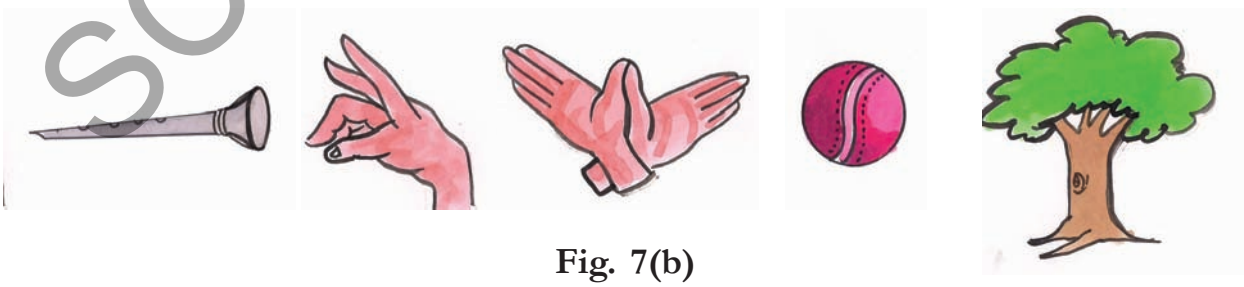


Fig. 7(b)

The speed of light is the speed at which light travels. It is about 300,000 kilometres per second. Nothing travels faster than light.

- What do you find?
- Were you able to guess the object correctly in all cases?

You must have wondered when you compared your guesses and the actual objects of which shadows are formed. You may notice that the shadows that look like bird and animal are actually formed by hands. (Try to form similar shadows with your hands.)

- What can you conclude from the above activity?
- Can we guess the object by observing its shadow?

Activity-4: Colour of a shadow

Take four balls of equal size but different colours. Try to form shadow of each ball as shown in Fig. 8. Ask your friend who is facing the screen and not able to see the balls to guess the colour of each ball.

Fig. 8

- Is your friend able to guess the colour of the ball correctly?
- Is it possible to guess the colour of the object by observing it's shadow? If not why?

Shadow is an area where light is absent. Hence, the shadow is colourless irrespective of colour of the object.

We have seen that we can't guess the object by observing it's shadow.

- Can we guess the shape of the shadow that would be formed by an object?

Let us find.

Activity-5: Shape of shadow

Observe the shadows of a book, a pen a duster, a ball and a round plate, one by one, in sunlight. While doing this, rotate the objects to change their positions and observe the changes in shadows. Try to answer the following questions on the basis of your observations :

- Is there any similarity between the shadows of ball and a plate? If yes, what?
- What change do you observe in the shadows formed when you hold the pen horizontally and then vertically?
- What differences do you observe in the shadows when the duster is kept in different positions by rotating it?

Scientists study the properties and behaviors of light in a branch of physics known as optics.

- Why are the shapes of the shadows of the same object different when you change the position of the object?

Observe the objects, formation of shadows and the path of light in Fig. 9(a) and 9(b). Similarly, draw the shadows for the objects given in Fig. 9(c, d). Extend the path of light and draw shadow on given screen.

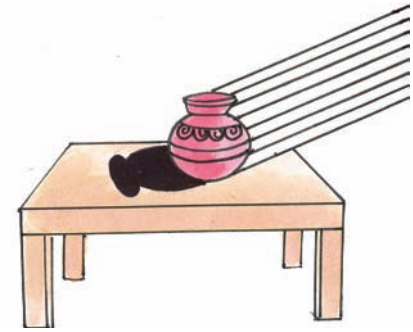


Fig. 9(a)

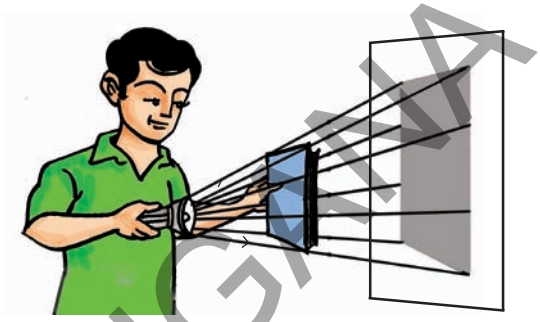


Fig. 9(b)

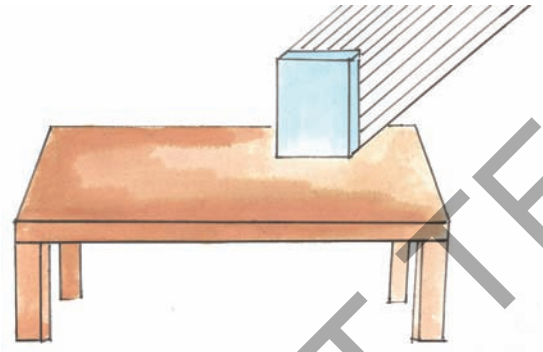


Fig. 9(c)

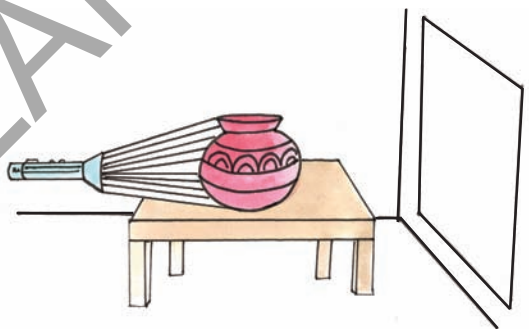


Fig. 9(d)

We have drawn arrows in the above figures assuming that light travels like rays that are straight. We can predict the shapes of the shadows only when we consider that light travel as rays along a straight path. In ancient days people by observing the shapes of shadows came to an understanding that light travels in a straight line.

Activity-6: Getting different shapes of shadows of a single object:

Take a rectangular piece of cardboard. Try to form shadows of different shapes by using it. You can do this in the sunlight or with the light from torch. Now, answer the following questions :

Light takes 1.255 seconds to get from the Earth to the Moon.

- Were you able to make a square shaped shadow?
- Were you able to make a triangular shadow?
- Were you able to make a circular shadow?
- What are the other possible shapes?
- Why are we getting different shapes of shadows when the object is same?

Because of the straight line path followed by light rays, we can get different shaped shadows for a single object by changing its position. The nature of straight line motion of light can also be understood by pinhole camera.

- Have you ever heard of a pinhole camera?

With this camera we can observe a big object through a pinhole. Isn't it interesting? Lets make a pinhole camera.

Activity-7: Making a pinhole camera

You will need :

A pvc pipe, about 8 cm in diameter and of length 30 cm.

A pvc pipe, about 7 cm in diameter and of length 20 cm.

One black drawing sheet.

oil - 1 ml, two rubber bands, a pin, and A4 sheet.

(If you cannot get pvc pipes, take a thick sheet of paper and roll it to form tubes. The diameter and length of the tubes should be the same as that given for the pipes.)

Cut a piece of black paper and put it like a cap at one end of the big pvc pipe and fix it with a rubber band as shown in Fig. 10(a). Put the white paper like a cap at one end of the thinner pvc pipe. Fix it with a rubber band as shown in Fig. 10(a). Now make a hole in the middle of black paper cap with the help of a pin. Put 2 to 3 drops of oil on the white paper cap so that it becomes translucent.

Fig. 10(a)

Insert the thin pipe into the big pipe. Your pinhole camera is ready.

Arrange a lighted candle in front of the pinhole of the camera. Move the thinner pipe forward and backward to get a clear picture of the candle on the screen of the thin pipe.

Fig. 10(b)

Sunlight can reach a depth of around 80 metres (262 feet) in the ocean.

This picture is to be observed from the back of the thin pipe (see figure 10b).

What do you see? The flame of the candle appears inverted on the screen. Why is it like that? This is not the shadow of the candle. It is its image.

By observing Fig. 11(a), try to understand how light enters into the pinhole camera. This will explain the reason for inversion of image.

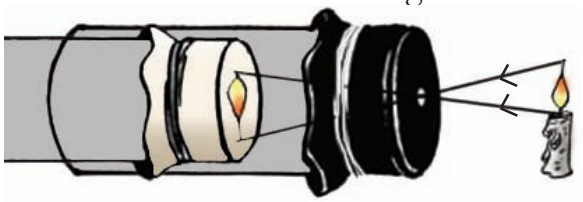


Fig. 11(a)

The light from the candle travels straight in all directions from each point of the flame of the candle. But only the light coming in some particular directions can enter into the camera through its pinhole.

Light which comes from the point at the top of the flame goes straight towards the bottom of the screen and light which comes from the point at the bottom of the flame goes straight towards the top of the screen, as shown in Fig. 11(a). In this way, the light coming in a particular direction from each point of the flame, will be able to enter into the pinhole, and light going in other directions is blocked by the black sheet. This leads to the formation of an inverted image.

The formation of inverted image on the screen of the pinhole camera explains that light travels in a straight line.

Now look at a tree through the pinhole camera as shown in figure 11(b).

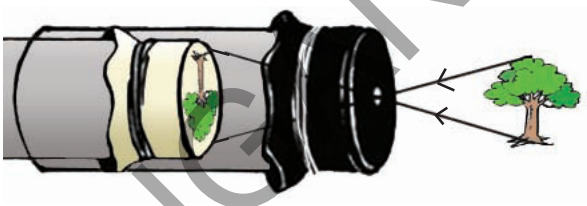


Fig. 11(b)

What do you see?

We get the full image of the tree in the pinhole camera. But when we put a candle in front of the pinhole camera, we get the image of the flame only. Why is it so?

- Predict what would happen if we make two pin holes in the camera? Try it and write down your observations in your notebook.
- Did your predictions match with your observations?

Activity-8: Image with a magnifying lens

Take a magnifying lens and try to form an image of a tree on a white drawing sheet.

The white light from the sun is a mixture of all colours of the rainbow.

- What do you observe in the image formed on the sheet?

The image on the white drawing sheet is inverted. Isn't it? What difference do you notice between the images formed through the pinhole camera and through the magnifying glass?

You may notice that the image formed through the magnifying lens is clearer than that formed with a pinhole camera.

Differences between Image and Shadow:

We see our face in the mirror everyday. Is this picture in mirror a shadow or an image? How did you decide that?

We know that shadows are not coloured but an image has colours that are same as that of the object. Also, a shadow shows only the outline of the object but an image shows the complete object as it is, just like a photograph.

- Can you find any other differences or similarities between shadows and images? Write in your note book.

Can you show the difference of a shadow and an image through a drawing?

Draw the shadow and image of the object shown in Fig. 12

Fig. 12

Activity-9: Observe the Reflection

Make your calss room dark by closing doors and windows. Ask one of your friends to hold a mirror in his hand. Take a torch and cover its glass with a black paper leaving only slit in the middle. Now switch on the torch and adjust it so that light falls on the mirror in your friend's hand. Ask your friend to adjust the mirror so that the patch of light falls on another friend standing in front of him at some distance. (see Fig. 13).

Fig. 13

- What do you observe from the above activity?

When light falls on any object, it rebounds back. This is called **reflection**.

Ask your friend to cover the mirror with

Laser is also a kind of light. Lasers are used to destroy and kill tumours and many other purposes.

a book. Now switch on the torch and focus it on the book. Can you see the patch of light on your friend? Why? Did the light that fell on the book not get reflected? We know that we can see the objects only after light is reflected from them, as mentioned in activity 1.

If light falls on any object, it is reflected back . But we see reflected light, as if from a source, only when it falls on the objects like mirror.

Precaution: You can reflect sunlight using mirrors and play with it. But make sure that the reflected light does not enter your eyes.

Keywords

Light, sources of light, shadow, transparent substances, translucent substances, opaque substances, pinhole camera, image, reflection

What we have learnt

- We need light to see objects.
- A substance which gives light is known as a source of light.
- Shadows are formed when opaque objects obstruct the path of light.
- In addition to light and object we also need a screen to obtain the shadow of an opaque object.
- Colour of objects cannot be determined by looking at their shadows.
- Light travels in a straight line.
- Light gets reflected when it falls on any object.
- People came to an understanding that light travels in a straight line by observing the shapes of shadows.
- An image and shadow are not same.

Improve your learning

1. Classify the following objects into transparent, translucent, and opaque :
   Cardboard, duster, polythene cover, oily paper, glass, spectacle lens, piece of chalk, ball, table, book, window glass, palm, school bag, mirror, air, water.
   Which type of materials do you find more in your surroundings?
2. Hold a glass slab at one end with your hand and stand in sunlight. See the shadows of your hand and glass slab. Explain what you observed.
3. We can't identify the presence of completly transparent objects even in light. Is it correct or not? Support your answer.
4. Why can't we see objects which are behind us?
5. If we focus a coloured light on an opaque object, does the shadow of the object posses colour or not? Predict and do the experiment to verfiy your predictions. (Coloured light can be obtained by covering torch

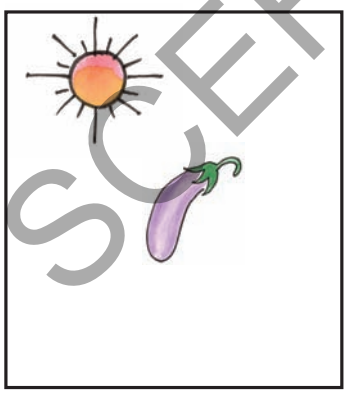
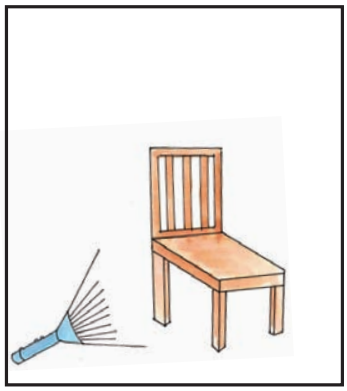
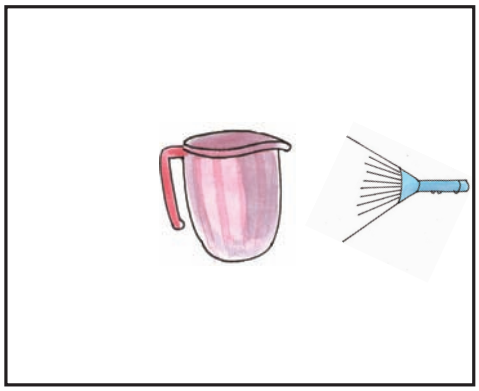
Sundials use shadows to tell the time.

glass with transparent coloured paper)

6. Between an electric bulb and a tube light, which forms sharp shadows of objects? Do experiment to find and give the reason.
7. What is required to get a shadow of a opaque body?
8. How can you explain that light travels in a straight line?
9. Explain what happens if the size of the hole in a pinhole camera is as big as the size of a green gram? Increase the size of the hole in pin hole camera and look at any object with that camera. What do you find? Write reasons for that.
10. Draw the shadows in your note book for the objects given below assuming that the light source is exactly above these objects.



11. Where do you find reflection of light in your daily life? Write few examples.
12. We would not be able to see any object around us if light does not get reflected. How do you appreciate this property of objects?
13. Can we use a plain mirror as a rear view mirror? If not why?
14. A mirror is kept on the wall of your room. Your friend is sitting on a chair in that room. You are not visible to him in the mirror. How do you adjust your place so that you are visible to your friend in the mirror? Explain.
15. Why do we get shadows of different shapes for the same object?
16. What are the differences between a shadow and an image?
17. Malati noticed changes in lengths of her shadows during the day time. She got some doubts about this. What could be those doubts?
18. Observe the light source and mark the place where the screens should be kept to get the shadows of the objects given below.

Light travels slower through different mediums such as glass, water and air.

16 Living and Non-Living

Venkatesh likes his blue shirt which he bought in the previous year. Now it does not fit him. He wants to alter it. He went to a nearby tailor shop along with his friend Tanvir. The tailor refused to alter the shirt because he said that it is not possible to increase the size of a shirt. On the way back, the friends saw a dog lying on the roadside as if it was fast asleep. Venkatesh wondered whether the dog was alive or not. "It is quite obvious that the dog is alive, its stomach is telling us that it is alive. Look at it carefully." said Tanvir.

Fig 1

- Venkatesh's favourite blue shirt does not fit him now? Think why?
- How will you decide whether the dog is alive or not?
- Can you decide whether a plant is alive or not by using the same reason?

There are many things around us; different types of plants, table, chair, soil, rock, clothes, animals, insects, birds. We can categorize them in various groups. Members of a common group share some common characteristics. In the previous chapter, we categorized materials as solids, liquids and gases. Another type of category is that of living things and non living things.

- Do all living things share some common characteristics?
- What are these characteristics?
- To be a part of living group is it necessary to bear all the characteristics of living things?

The seeds of an Indian Lotus plant remain viable for 300 to 400 years.

Activity-1: Living things - Non living things.

List out as many living things as you can. Don't forget to give reasons for why you think something is living.

Chair and tables also have four legs like buffalo. But they can't move, why? Trees cannot move but they can produce seeds which give birth to new plants. How do we know whether some things are living and some others are non-living? You will notice that there are many characteristics of living things. Do all living things have common characteristics that make them different from nonliving things?

- Do you know you are a living being? How can you say that?

Activity-2: Compare the characteristics

Some characteristics that are listed in Table-1 tells you that you are a living being. Compare these characteristics with plants, animals and rocks.

Table 1

S. No.	Characteristics	In you	In plants	In animals	In rocks
1	Growth	✓	✓	✓	×
2	Movement				
3	Taking Food				
4	Breathing				
5	Getting rid of waste				
6	Respond to Heat				
7	Respond to touch				
8	Respond to light				
9	Giving birth to young ones				

A new born blue whale measures 20-26 feet (6.0 - 7.9 meters) long and weighs up to 6,614 pounds (3003 kg).

- Do plants and animals possess the same characteristics as you do?
- In which way do the characteristics of plants differ from you or from other animals?
- What characteristics are same in plants and animals?
- Do you agree that you are the same as other animals?
- What characteristics do you observe in rocks?

The things around us that possess the characteristics listed above are known as living things. Those which do not possess these characteristics are known as non-living things.

Some of the characteristics are common in all living things. Can we say all characteristics listed in activity 2 apply to all living beings?

You know that plants are also living beings like us. Plants grow like we do but do they move like us?

Is it essential for a living thing to have all of these properties or could a thing be considered living if it has some of these properties? Let's take a closer look at the characteristics of living things.

Movement in living beings

- How do the following living beings go from one place to another? Observe the following table discuss in groups and write the way the organisms move.

Table 2

Living organism	Means of motion
Myself	walk, run, ...
Housefly	
Grasshopper	
Frog	
Snake	crawls, ...
Birds	
Fish	
Plant	

Do you have more examples of different kinds of movements in animals? List them in your notebook.

- We see that plants don't move like us. Should we consider them as living beings?

There are some movements in plants for example, closing and opening of flowers. Discuss in groups. List out the movements in plants. Track your discussions in your notebook.

- We say that plants don't move but we find plants of the same types in different locations. How is this possible?
- Other than plantation by human beings there are many natural ways of seed dispersion. The seeds grow into plants and we feel that

The longest living cells in the body are brain cells which can live an entire lifetime.

plants have moved from one place to another. Can you list these natural ways of seed dispersal? We will learn more about this in the next class.

Food and living beings

We have seen in the chapters on food that we as well as all other animals need food for smooth functioning of different activities.

- Do plants also need food?

In the chapter "plants parts and functions", we have seen that some parts of plants like root, stem and fruits store food.

- What are the sources of their food?

Most of the plants absorb water and minerals from the soil and prepare their food in the presence of sunlight. The leaf is the place where the food is prepared. This is called photosynthesis.

Do you know?

Some plants cannot prepare their own food. They depends on the other platns for their nutrition. These plants are called 'Parasitic Plants'. eg. *Cuscuta*. We also prepare food. Is our food preparation process is same as that of plants?

Growth in living beings

You notice that kittens, pups and chicks grow into adults. You become taller every year. Similarly, a seed germinates into a plant. Some plants grow day by day into trees. A human child grows into man/woman. Plants also produce branches that show their growth. They grow throughout their life but we don't grow like that. We will grow upto certain age and height. But some parts of the body grow throughout our life. Think what are those parts? (Fig. 2(a) and 2(b)).

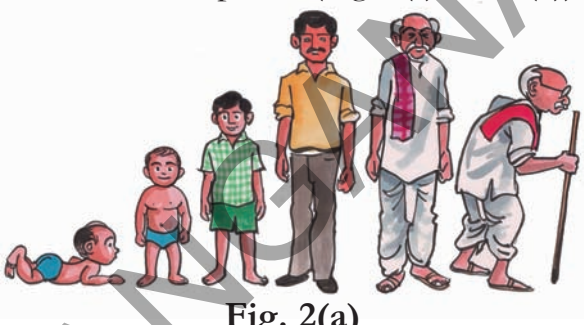


Fig. 2(a)

Activity-3: **Grow - Doesn't Grow**

You listed several living things in activity 1. How do they grow? Analyze your observations. Also add some things that don't grow. Record in table3.

Fig. 2(b)

Table 3

Grows for a certain period	hen, ...
Grows throughout its life	
Doesn't Grow	rock, ...

The average cough comes out of your mouth at 60 miles (96.5 km) per hour.

- Do all living things grow throughout life?
- Pick up any item from the column 'doesn't grow' in the above. Does it need food?
- Do you grow for entire life time or why not?

If we grew like trees, how would we look like? It's funny to think. Have you read stories of Lilliputs, David and Goliath?

Non-living things cannot grow. Growth is also a characteristic feature of living things. Is it common to all living things?

Do all living things breath

Observe the abdomen of a cow when it is in rest position. How is it? It moves slowly. This shows that the cow is breathing. If you keep a finger in front of your nose, you feel air coming out of your nostrils. When we breathe in or inhale, air moves from outside to inside our body. When we breathe out or exhale the air inside comes out.

- Do all birds have noses? How do they breathe?
- Fish can't remain alive in air. How might they breathe while remaining in water?

Do all living things breathe? Do plants breathe like us? We know that they don't have a nose. How would they breathe? Let us try to understand.

Activity-4: Plant has nose

Take any fleshy leaf like, alovera. Peel the upper layer from it and put it on a slide. Observe this under a microscope. You will see the structures as shown in Fig. 3. They are called stomata. These are useful for exchange of gases.

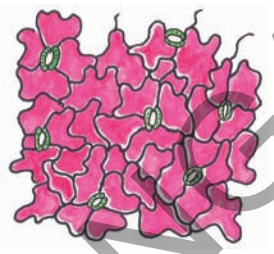


Fig 3 (a)

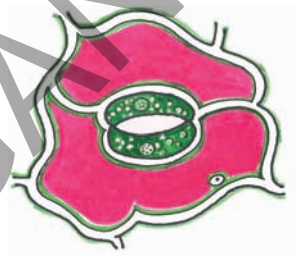


Fig 3 (b) stomata

Do all living things get rid of their waste?

We know that all living things take in food. After digestion, wastes have to be removed from the body. Our body produces different types of waste materials during different life processes. When we work hard our body becomes wet with sweat. This is a waste material.

The process of getting rid of wastes is called **excretion**. In what forms do animals excrete?

Animals excrete wastes in different forms - dung, urine, sweat etc. Plants also excrete their wastes but this is not in the same way as animals. Have you ever observed sticky substance on the stems of trees?

An egg white is made mainly of a protein called albumen

Fig 4(a)

Actually this gummy substance are the excretions of Acasia, Neem and Drumstick. Generally we feel that excretions are useless and foul smelling material. But excretory products of animals are used as manure. Secretions of plants like, gums and resins, are also useful for us.

Living things give birth to young ones

Activity-5: Egg or Baby

Make a group with 4 or 5 students. List out birds and animals from your surrounding. How do they produce their young ones? Write in table-4 whether they lay eggs or they give birth to young ones. Write the table in your note book and Extend the list.

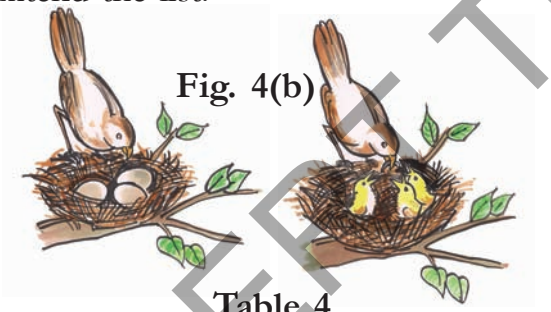


Fig. 4(b)

Table 4

Animals/ birds that lay eggs	Those which give birth to young ones

Fig 4(c)

Birds and animals that lay eggs for giving birth to young one are known as **oviparous**. (Fig-4(b)) Those which give birth to young ones without laying eggs are known as **viviparous**. (Fig-4(c))

- Can plants be classified as Oviparous or Viviparous?

Do you know?

Gums that are excreted from plants are not actually excreta. Speical parts known as excreding cells excrede oils, honey, gum, resins etc. Waste material formed in plants will be stored in crystal forms. They are not exreded.

The leg muscles of a locust are about 1000 times more powerful than an equal weight of human muscle.

We know that seed germinates into plants. This means that plants also produce their young ones. Seed germination is one of the ways of doing this.

- Are there any other ways in which plants produce their young ones?

Response to stimulus

Activity-6 : What will happen

When you step on a sharp object what would you do? You will take back your feet. Isn't it? Discuss with your friend how would we respond in the conditions given in table-5.

Table 5

Stimulus	Response
When you step on a sharp object	
Touch a flame or fire	
Touch ice-cream	
See a bright light	Blink, ...
Get bitten by an ant or mosquito	
When you hear the word 'tamarind'	Mouth waters, ...

All living beings possess the characteristic feature of response to stimulus.

- Do other animals also respond to stimuli like us?
- Do plants respond to stimuli like animals?

A famous Indian scientist Jagadeesh Chandrabose proved that plants have life and they respond to stimulus. We can understand the responses of plants through the following observations. Some flowers bloom in day times whereas some others bloom at nights. They respond to light. Many trees shed leaves in autumn. They respond to temperature.

Activity-7 : Atti-Patti

It is very interesting to observe a touch me not (Atti-patti or mimosa)plant. Touch it. Record your observations. How does this plant respond when you touch it? How much time does it take to return to its previous position?

The Atlantic Giant Squid's eye can be as large as 15.75 inches (40 centimeters) wide.

Fig 5

This observation explains that plants also respond to stimulus. Some plants bloom in the morning and some at night. These respond to sunlight. When winter comes many trees shed their leaves. They respond to change in temperature.

Activity-8: Response to light by earthworms

Get an earthworm from nearby moist soil. Take a glass jar. Cover half of the glass jar with black paper as shown in Fig. 6. Put some soil in the jar and put the earthworm in the jar. Close the jar with a lid that contains small holes, to allow air into the jar. When earthworm crawls out of the covered portion, shed some light on the jar. What happens?

Fig. 6

When we shed light on the earthworm, it moves to the dark portion. It seems that earthworms show response to stimulus, in this case light.

Seeds - Living or not

Seeds are produced from plants. We know that plant is a living being. Can we say that seeds are also living? Let us discuss what characteristics of living beings that seeds have?

- Does a seed take in food? From where?
- Will it die if stored for a long time?
- What happens when a seed is sown in soil?

Seeds germinate and turn into a whole plant. So we can say that seed is a living thing. Can you think of any way of deciding whether dry seeds are living? (Fig-(6a))

Fig. 6(a)

Venkatesh noticed that growth, breathing, excretion, taking food, giving birth to young ones, response to stimulus, movement are some of the characteristics of living beings. He also observed that these are not common among all living organisms.

But, non-living things do not possess these characters. He observed that

The average human brain has about 10 billion nerve cells

Fig. 7

people depend upon both living and non-living things. Generally we are told that the plant is dead when it has dry leaves and stem. If an animal doesn't show living characteristics, we can say that the animal is dead. Is a dead plant or a dead animal non-living?

Dead plants, animals or any other living beings decompose to form non-living constituents. So we can't say dead things are non-living things. They are intermediate things between living and non-living things.

Living things under a microscope

The letters in a book are quiet small. What do old people do to read books? Children frequently play with magnifying lens. When we see objects through magnifying lens they seem to be bigger than their actual size.

Activity-9 : Prepare your own magnifier

Collect an used electric bulb. Remove its filament. Fill water in half of the bulb. See a book through this bulb. Do the letters in the book seem bigger?

Are all things around us visible to us? Name some small animals that you see. Can we see mouth and antenna of ants and small insects with our naked eye? When you touch flowers, a yellow colour powder sticks your fingers. If you want to know what it is, what can you do?

We cannot see all things around us with our naked eye. Because those things like antenna of ants, yellow powder of flowers are very small. In the living world there are some things that are not visible. We cannot see them. We can see those small organisms under a microscope. Living beings that we can see only under the microscope are called micro-organisms. Let us try to understand about a microscope and then use it for observing some micro-organisms.

What is a microscope?

Microscope is an instrument with the help of which we are able to see minute

The human heart creates enough pressure to squirt blood 30 feet (9 m).

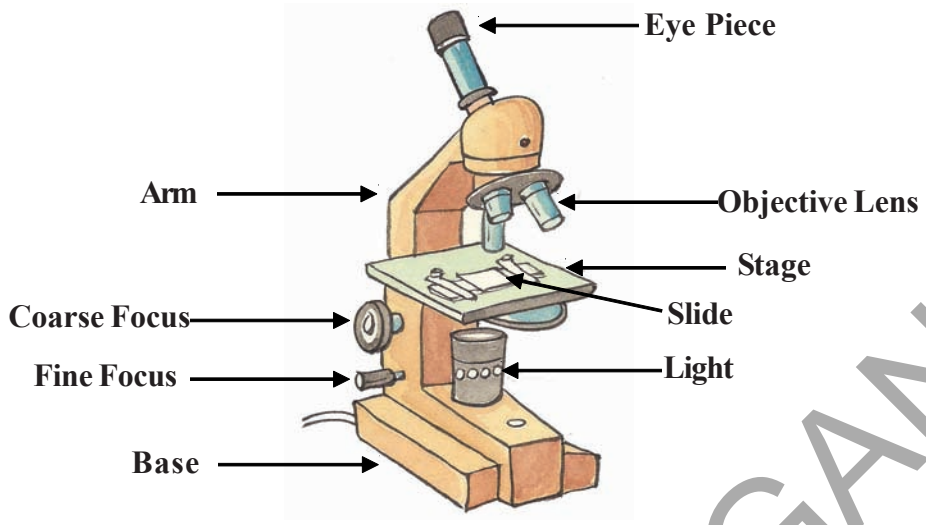


Fig 8

things that we cannot see with our naked eyes. It works like a hand or magnifying lens but it is much more powerful.

Basically, there are two components in a microscope - the structural component and the visual components

Structural components are the head/ body, base and arm. Visual components are eyepiece, objective, nosepiece, coarse and fine adjustment knobs, stage, aperture etc.

Fig. 8 shows a labeled diagram of a compound microscope. Taking its help identify different parts of microscope in your school.

Now we want to see some micro-organism. Where can we find them?

Activity-10: Bread Mould

Generally our elder say that we should not put wet spoons in pickle jars. Why do they say this? When you put wet spoons in a pickle jar, the pickle will spoil. What happens when you pack bread or vegetable and keep for a couple of days? You observe that they become rotten and they emit a foul smell. We can see thin, thread like grey colour substance. After some days this grey colour substance turns black. If you touch this material black colour substance sticks to your fingers.

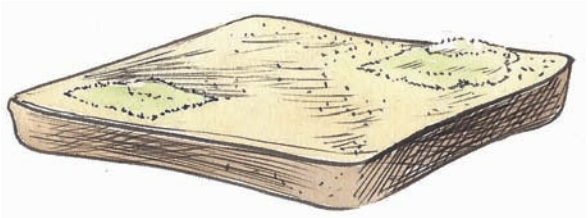


Fig. 9

Bacteria are found everywhere - in air, water, soil, animals, people and food.

Collect this rotten material and observe it under a microscope. Note your observation and discuss with your friends. Draw the structures seen by you under the microscope.

These tiny thread like structure are commonly called mould. Can we say that mould is also living?

The mould that develops on spoiled material is able to produce new mould. It grows. So we can say the mould is also living.

We all know that cows gives us milk. So they are useful. Do micro-organisms help us in any way?

- Why is idly mixture prepared the day before?
- Why do we add little amount of butter milk to milk to get curd?

Activity-11: Let us see bacteria

Take the watery substance in curd. Put a drop of this substance on a glass slide. Cover it gently with another slide. Observe this under a microscope. Note your observations. Draw a picture of what you see under the microscope.

The micro-organisms that you see under the microscope are called bacteria. Bacteria are in different shapes. The bacterium that you see in curd is helpful. This bacteria named lactobacillus helps to convert milk into curd.

Are bacteria harmful?

Discuss with your teacher how bacteria are harmful. Some bacteria cause diseases in human beings as well as animals and birds. These bacteria spread from one person to the other and cause various types of diseases. They spread all over the world. There is no place in the world without bacteria.

Fig. 10

When you suffer from a disease, the doctor advises you to take boiled water. Are there micro-organisms in water? Is the water that you drink regularly, pure?

Activity-12: Micro organisms in water

Collect water samples from a pond, well and borewell. Keep them separately. Put a drop of water on a slide. Keep another slide on it. Observe under microscope. What type of micro-organisms do you see in water samples? Do all water samples have the same type of micro-organisms? Is there any water without micro-organisms? Which water contains larger number of micro-organisms? Draw what you have observed. Describe the shapes of the micro-organisms.

- Which water contains larger number of micro-organisms? Why?

Some moulds are used in food production such as cheese manufacture

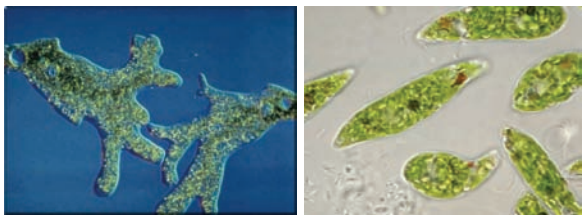


Fig. 11

- What difference do you find in the appearance of micro-organisms in pond water and bore well water?

Thus we see that micro-organisms are present everywhere, although they are not visible to naked eyes. From our activities, we could see only a few of them. But there is a vast world of micro-organisms and they are all part of the living world.

Keywords

Living things, non-living things, growth, breathing, excretion, response, stimulus, movement, micro-organisms, microscope

What we have learnt

- There are living and non-living things around us.
- When living things lose their life they become dead.
- Dead is an intermediate stage between living and non-living things.
- Dead material decomposes to form non-living things.
- Living things possess characteristics like growth, breathing, excretion, movement, response to stimulus and giving birth to young ones.
- Among living things, plants and trees can't move like animals.
- Seed is also a living thing but it doesn't have all characteristics of the living world.
- We can see minute things under a microscope.

Improve your learning

1. List out common characteristics of living things.
2. Why do cockroaches come out of their places when lights are put out?
3. Which characteristics are same in both living and non-living things?
4. Which of the following are derived from living things : sugar, coconut oil, pen, rice, fan, omelet, bus, wooden chair, garland, mango, clothes, fruit juice.
5. How can you say that a tree is living even though it doesn't move?
6. What is the use of microscope?

In humans the compound used to transport of oxygen in respiration is known by the name haemoglobin.

7. Thread like structure developed in bread are ----------

8. Which of the following is not a response to stimulus :

   a) Feeling cold by touching ice.

   b) Feeling the weight of carrying a bag of books.

   c) Scratching the skin at the place of ant bite.

   d) Closing eyes immediately after seeing bright light.

9. Collect sweet potato, bottle, salt, and water. Take a bottle full of water and add salt, then put the sweet potato inside the bottle. Observe for a few days. What happens? Note your observations. How can you prove that sweet potato is also a living thing?

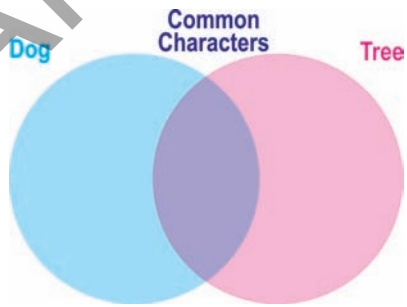
10. Venkatesh argues with his friend Tanveer about "seed is living" Think. What questions does Tanveer ask?

11. What will happen if there is no stomata in leaves? Write your predictions.

12. Write down the steps of the experiment that you did in the lab to observe micro-organisms in pond water.

13. How do you feel when you touch 'Touch me not' plant? Write your feelings.

14. Prepare Venn diagram to represent living and non living characteristics of dog and tree.



15. Do you think both living and non living things are necessary for our environment. Why?

16. Collect information from your school library / internet about Sir J.C. Bose who invented response to stimulus in plants.

The brain operates on the same amount of power as 10-watt light bulb.