

Science

Standard Six

Term III

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Note to the teacher...

As we present this revised edition of the Science Textbook, we would like to express our deepest gratitude to the learners and the teaching community for their enthusiastic responses.

In science some concepts could be subject to change from time to time as new theories and principles are constantly being evolved.

We have tried to present facts and concepts of science (both concrete and abstract) in a visually appealing manner without detracting from the content.

Activity based learning is now accepted as the basis of science education. These activities should be regarded as a means for open-ended investigation rather than for verification of principles/content given in the textbook are has been designed to facilitate low cost activities and experiments using locally available materials. With a view to streamlining the activities, we have now segregated them into three groups:

- **I Do** - activities to be done by an individual learner.
- **We Do** - activities to be done by a group of learners. and
- **We Observe** - activities to be demonstrated by the teacher.

The third group of activities have a higher degree of difficulty or require careful handling as it may involve dealing with chemicals, electricity etc.,

The “More to know” snippets in the text represents some unusual and interesting facts or information in which the students need not be examined.

The evaluation section is nothing but another space for learning in a different manner. As the focus is on understanding, rote learning is to be discouraged thoroughly. Application of learnt ideas, problem solving skills and critical thinking is to be encouraged. There could be scope for more than one answer to a question, which should be acknowledged always.

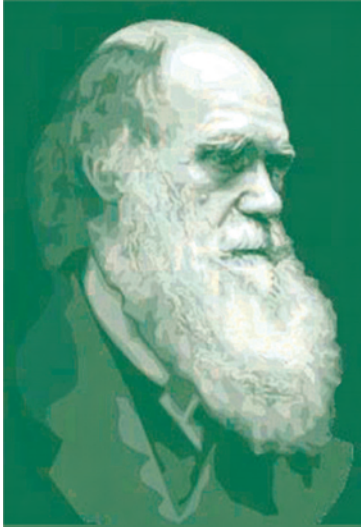
To facilitate further reference, books and websites have been suggested at the end of each lesson. Suggestions and constructive criticism are most welcome. Valuable suggestions will be duly incorporated.

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Diversity of Organisms

1



Do you know which book was sold in large number and paved way for the maximum criticism? It was the book titled '[Origin of Species](#)' published in the year 1859. It was written by a scientist [Charles Darwin](#). Why did it raise criticism?

Darwin sailed to several important islands of the world in the ship [H.M.S. Beagle](#), for more than 10 years and gathered information. He said that living organisms on the earth have evolved gradually from one form to another over a million years. He was the first person to explain why ape and man, cat and tiger share common characters.

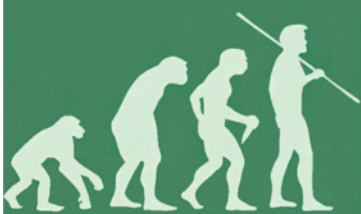
Mushrooms grow in our garden when it rains. Why? Frogs croak when water stagnates. Why? Dragonflies fly before it rains. Why? Fire flies glow during night time. Why? Are you not curious to know about the various features of living organisms on the earth? Darwin too was interested.

When he was young, he collected one hundred and seventeen types of beetle. We too grow peacock feather in our book. Can we rear golden beetle? There are many such forms on this earth.

When did life originate on this earth? How was the first formed organism? How did organisms procure food? How did they grow? How do we resemble our parents? How can the body be healthy? How can food be produced? [Biology](#), a branch of science, answers these questions.

[Biology](#) is the science that deals with the study of living organisms.

[Botany](#) and [Zoology](#) are the branches of Biology.



Organisms differ in their character, habit, size, structure, nutrition and habitat. This is known as **Bio-diversity**. Organisms exist in different forms such as micro-organisms, plants, animals, worms, insects and birds. Shall we learn about micro-organisms?

unicellular micro-organisms. Most of the fungi and algae are multicellular micro-organisms.

1.1 Micro-organisms

1.1.1 Virus

Activity 1

WE OBSERVE

Aim:

To observe micro-organisms.

Things we need :

Compound Microscope, water, buttermilk, slide.

Procedure:

- ▶ Let us add 5 drops of water to a drop of buttermilk.
- ▶ Place a drop of this mixture on the slide.
- ▶ Observe it under a compound microscope.
- ▶ Draw the diagram we have observed.

We know many people suffering from diseases like swine flu, bird flu, chikungunya, jaundice, polio, chicken pox, rabies and AIDS.

How are these diseases caused?

These are caused by viruses. We cannot see virus with our naked eyes. It can be seen only through electron microscope. Viruses cause variety of diseases in plants and animals. They infect us if we are not aware of them. The branch of science that deals with viruses is called **Virology**.

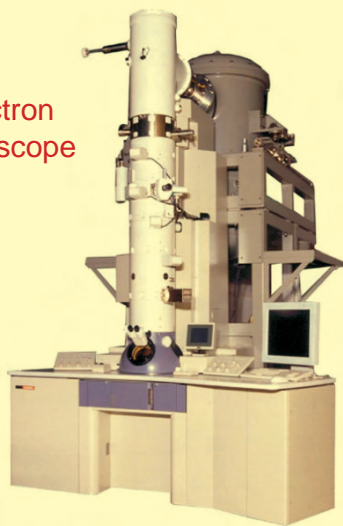


Organisms that can be seen only under microscope are called **micro-organisms**. They can be either unicellular or multicellular. They occur in air, water, land, food and even in other living organisms. The study of micro-organisms is called **Microbiology**.

Bacterium, virus, fungus, alga, protozoan etc. are micro-organisms. Bacterium and protozoan are

Disease	Name of the Virus
Common Cold	Rhino Virus
Polio	Polio Virus
Chicken pox	Herpes Virus
Tobacco Mosaic Disease	Tobacco Mosaic Virus (TMV)
AIDS	HIV
Rabies	Rabdo Virus

Electron microscope



Electron microscope was invented by Ernst Ruska and Max Knoll in 1931.

Some viruses are also useful. They are used in genetic researches.

Eg: Bacteriophage.

1.1.2. Bacteria

How are we affected with diphtheria (a type of throat infection) and pyorrhea (dental disorder)?

How does milk get converted into curd?

How does garbage become manure?

These are caused by **bacteria**, a micro-organism, which was discovered by **Anton Van Leeuwenhoek in 1675**.

The branch of science that deals with bacteria is called **Bacteriology**.

Beneficial activities of bacteria:

- ▶ curdling of milk
- ▶ decomposition of organic wastes into manure.
- ▶ fermentation of idly and dosa flour
- ▶ act as bio-fertilizer increasing the yield.



Robert Gallo

In 1984, Robert Gallo discovered HIV which causes AIDS.

Diseases caused by bacteria

- Plants – citrus canker, blight disease of tomato
- Animals – anthrax, tuberculosis
- Man – pneumonia, tetanus, tuberculosis

Activity 2

WE OBSERVE

Aim: To identify the micro-organisms.

Things we need:

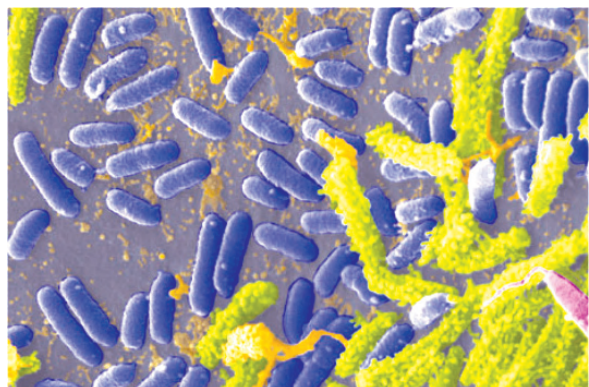
Compound Microscope, waste water, slide, ink filler.

Procedure:

- ▶ Let us place a drop of waste water on the slide by using an ink filler.
- ▶ Observe it under a compound microscope and draw the diagram.

Note: During activity, avoid contact with the waste water.

It is surprising to know that there are organisms made up of single cell. All activities like ingestion, digestion, respiration, excretion and

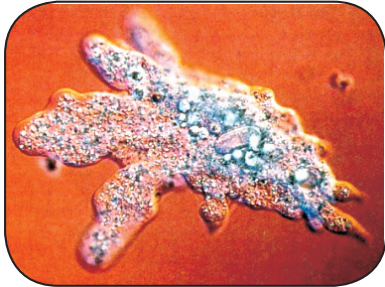


Bacteria

reproduction are carried out by the same cell.

Unicellular plants and animals belong to the kingdom **Protista**.

Example: *Chlamydomonas*, *Amoeba*, *Euglena*, *Plasmodium*.



Unicellular animalcule – Amoeba

1.1.3 Fungi

Most of the fungi are multicellular organisms. **Penicillin** is extracted from the fungus *Penicillium notatum*. It was discovered by **Sir Alexander Flemming** in 1928. Certain fungi cause diseases like dandruff formation on our scalp.



Mushroom

We see small umbrella-like structures growing on the bark of trees, soil and wood during rainy season. These are called **mushrooms**.

Activity 3

WE OBSERVE

Aim: To identify fungi.

Things we need : Compound Microscope, bread affected with fungi, slide, forceps.

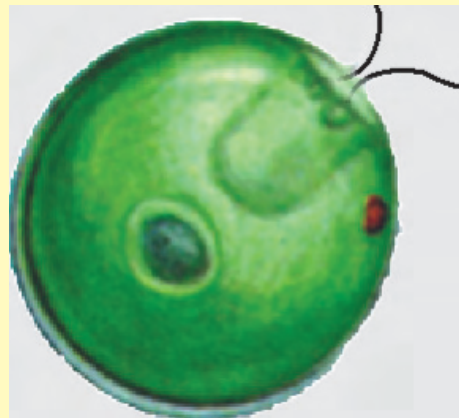
Procedure:

- ▶ Let us place a small piece of bread affected with fungi on the slide using forceps.
- ▶ Observe it under a compound microscope and draw the diagram.

1.1.4. Algae

Algae are unicellular and multicellular organisms. They have chlorophyll pigment which helps them to prepare their own food by the process of photosynthesis.

e.g. *Chlamydomonas*, *Volvox*, *Spirogyra*.



Chlamydomonas

Chlamydomonas is a motile, unicellular plant. It is an alga.

- ▶ Micro-organisms are the most diversified organisms on earth.
- ▶ A dot can be filled with 70,000 amoebae.
- ▶ 17,000 types of micro-organisms live in human body.

Discuss with the students in the classroom and draw a few seeded plants.

Algae which can be seen only under a microscope (microscopic algae) are called **micro algae**.

e.g. *Chlamydomonas*, *Volvox*.

Algae which can be seen with naked eyes are called **macro algae**.

These are found in pond and sewage. e.g. *spirogyra*.

Some algae are used as food for man and aquatic animals. They enrich the soil.



Algae

1.2. Plants

Where do you find seeds of mango, guava and bean? Most of the plants that we see in our day-to-day life are closed seeded plants.

In some plants, the seeds are exposed without any covering. These are naked seeded plants. These plants are found in snow-covered mountains and cool places.

Eg. **Cycas**, **Pine**.

Have you seen flowering plants? What does the flower change into? Have you tasted fruits? Discuss in small groups what is inside the fruit?

Activity 4

WE DO

Aim: To identify monocot and dicot plants.

Things we need :

soaked chick pea, ground nut, maize and paddy.

Procedure:

- ▶ Let us remove the seed coat of soaked chick pea, ground nut, maize and paddy. Try to separate the cotyledons.

We learn:

- ▶ Plants that have seeds which can be separated into two cotyledons are called dicot plants.
- ▶ Plants that have seeds which cannot be separated into two cotyledons are called monocot plants.

Can't we say a plant is a dicot or monocot without seeing the seed? Can it be identified only after separating the cotyledons?



Tap root system



Fibrous root system

Reticulate venation



parallel venation



Activity 5

I DO

Aim:

To classify plants based on the root system.

Things I need : Plants with roots, grass and water.

Procedure :

- ▶ I take plants with roots and some grass.
- ▶ I wash the roots with water.
- ▶ After observing the roots, I group the plants into A and B.
- ▶ I observe the venation on the leaves.

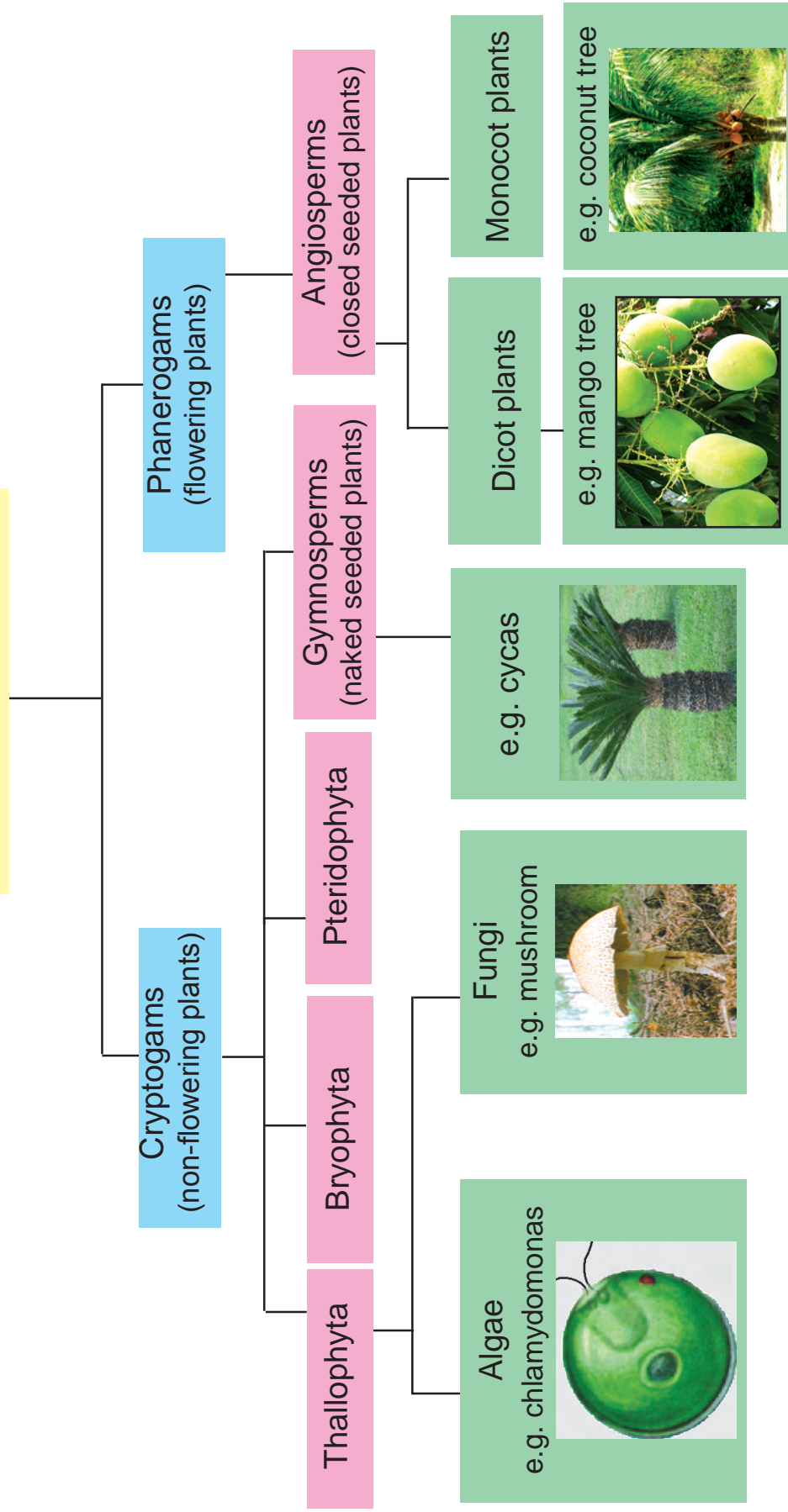
I infer :

Part	Dicot (A)	Monocot (B)
Root		
Venation		

- ▶ Group A plants have tap root system and reticulate venation.
- ▶ Group B plants have fibrous root system and parallel venation.

You understand the correlation between the root system and the venation in each group.

Plant Kingdom



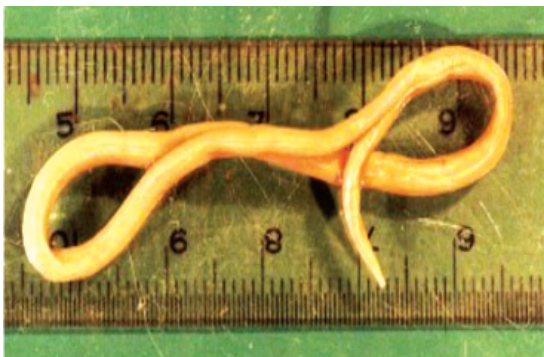
1.3 Animals

Based on the presence and absence of backbone, animals are classified as vertebrates and invertebrates.

First, let us see about some of the invertebrates.

Worms :

Worms like **tapeworm**, **hook worm** and **roundworm** live in the small intestine of man. These cause indigestion, stomach ache, dysentery, stomatitis in man. Intake of well cooked food and boiled water is good for our health.



Ascaris

Earthworm:

It has segmented body. It feeds on organic matter in the soil and is called the **friend of farmers**. Preparation



Earth worm

of vermicompost is carried out extensively using this organism.

Insects :

Insects like mosquito, housefly, honeybee are found everywhere. They have compound eyes. They are both beneficial and harmful to us.



Mosquito

Molluscs: These are softbodied organisms. They have muscular foot which helps in slow movement. They possess shell . **Eg: Snail.**



Snail

Echinoderms:

Some of these are exclusively marine. **Eg: starfish, sea cucumber.** Their skin is covered with calcareous spines. Using these spines they attack their enemies. They can regenerate the broken or lost parts.

Now let us see about vertebrate animals.

Fishes: These are aquatic. The body is covered with scales. Respiration takes place through the **gills**.



Fish

Frogs: These are amphibians which can live both on land and in water. The body is covered with moist skin. Respiration occurs through lungs, skin and gills. These are oviparous (egg laying).



Frog

Snakes: These belong to the class reptilia. They respire through lungs. Heart is three chambered. These are oviparous.

- ▶ Crocodile is the only living organism that cannot protrude its tongue.
- ▶ Anaconda, the world's biggest snake is **viviparous**. (gives birth to young ones)



Cobra



King Cobra

- ▶ It is 5.5m long. It is the biggest poisonous snake. A drop of its venom can kill 30 people.
- ▶ Except a few, most of the snakes are non-poisonous.
- ▶ Killing of snakes leads to their extinction.
- ▶ Crocodiles are colour blind.
- ▶ The tongue of a chameleon is twice as long as its body.

Birds:

Generally birds are the most attractive creatures in nature because of their appearance and sweet voice. They are economically beneficial to us in many ways. They have four chambered



Ostrich

heart. They are oviparous. Their body is covered with feathers. Respiration occurs through lungs.

Among the birds, ostrich lays the largest egg. It is almost the size of a coconut.

Mammals:

Their heart is four chambered. They feed their young ones with the



Elephant

help of milk producing glands. They have hairs, sweat glands and oil glands all over their body.

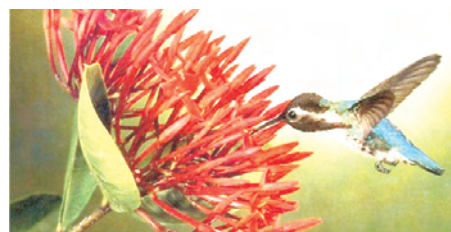
Monkey, elephant, bat, cat, rat, blue whale and man are examples of mammals.

More to know

- ▶ Blue whale is the largest living organism. Its weight is equal to the weight of 22 elephants. Its heart is of a size of a small car.
- ▶ Dog was the first animal sent to space. Its name was Laika. It was sent by Soviet Russia.
- ▶ In cows, sweat glands are found on the surface of nose.
- ▶ Man is the only living animal who can sleep with his back touching the floor.
- ▶ The trunk of an elephant is the modified form of nose and upper lip. Tusks are the incisors of the elephant.

There is a variety of plants and animals on earth. They range from microscopic unicellular organism to largest blue whale. It is our prime duty to preserve them from their extinction.

Humming Bird is the only bird that can fly forwards, backwards and sideways.



Humming bird

EVALUATION

I. Fill in the blanks by choosing the correct option

- _____ discovered bacteria.
(Anton Van Leeuwenhoek / Alexander Flemming)
- _____ is a motile plant.
(*Amoeba* / *Chlamydomonas*)
- _____ is the friend of farmers.
(locust / earthworm)
- _____ disease is caused by virus.
(Polio / Cholera)
- Chicken pox is caused by _____
(virus / fungi)

II. Choose the correct answer

- Unicellular plant
a) *Euglena* b) *Amoeba* c) *Chlamydomonas*
- To which class does man belong?
a) aves b) mammals c) reptiles
- Which is a vertebrate?
a) jelly fish b) starfish c) eel
- Which is a monocot plant?
a) mango b) jack fruit c) paddy
- Which is the characteristic feature of a dicot plant?
a) tap root b) parallel venation c) fibrous root

III. Pick the odd one out based on their scientific character and circle it

- Elephant, bat, cat, earthworm.
(based on backbone)
- Crocodile, tortoise, frog, fish.
(based on habitat)
- Mosquito, housefly, honey bee, bedbug.
(based on usage)
- Amoeba, Euglena, Plasmodium, scorpion
(based on cellular organisation)

5. Tapeworm, hookworm, earthworm, ascaris
(based on usage)
6. Tuberculosis, diphtheria, cholera, chicken pox
(based on causative organism)
7. Maize, sugarcane, coconut, mango.
(based on number of cotyledons)

IV. Find out who am I and circle me

1. I appear after rain. I have no chlorophyll. So I appear white. If I am unicellular, I am yeast. But I am a multicellular, Who am I?
(mushroom/alga)
2. Stagnant sewage water welcomes me. Human body is my vehicle. Their blood is my food. I am simple in my appearance but pierce like a needle. Disease is my partner. Who am I?
(mosquito/housefly)
3. I live in water as well as on land, but not a tortoise. I hop, but not a rabbit. My skin is moist. I am not a crocodile. Who am I?
(frog/snake)
4. I am green in colour. I am found in moist areas. Who am I?
(alga/chameleon)
5. I am long but not a rope. I creep but not a worm. I have no ear and legs, but I moult. Who am I?
(snake/eel)

V. FA (a): Choose any one project and submit the same

1. List out the different plants and animals that you see from morning to evening next Sunday.
2. Write about your pet animal in five lines.
3. Collect information about rearing of honeybee and silkworm and write down (direct observation/newspaper/news/books/library).
4. Collect different kinds of seeds that you get. Write their names. Sow it in a small container and water it. Observe how many seeds have germinated in a week.
5. Draw a picture of your favourite bird and colour it. Write a small poem about it.
6. Make one handicraft by using the feathers of birds and display it in the classroom.

VI. Answer the following

1. Mention a few advantages and disadvantages of micro-organisms.
2. Why do we call the earthworm the 'friend of farmers'?
3. Write any two adaptations of frog that enable them to live both on land and in water.
4. Write a short note on fungi.
5. How will you identify monocot and dicot plant?

VII. Think and answer

1. Reports from media say that sparrow, eagle, butterfly etc., once found in abundance are now seen scarcely. Is this statement true? Reason out. Can we save these organisms from extinction? Summarize your ideas to conserve them.
2. Among insects, mosquitoes are the leading vectors of disease causing organisms.
 - a) What are the diseases that spread by mosquito bite?
 - b) In what ways mosquitoes can be destroyed?
3. Tap root system and fibrous root system are seen in plants. What type of root systems are seen in big trees? Give reasons.
4. Scientific development has led man to discover new things every day. In spite of this, man is affected by microscopic organisms. Find out and discuss the causes and its preventive measures.



Camel



Polar bear

FURTHER REFERENCE

Websites :

<http://www.en.wikipedia.org/wiki/microorganism>

<http://www.aravindguptatoys.com>

<http://www.rhs.org.uk>

Air, light, land, soil, water bodies, plants and animals around us constitute our environment. Living organisms are not only inter-dependent on each other but also on the non-living components of the environment. Therefore, a small change in the environment causes a great impact on the living organisms.

Environment is polluted, due to industrial development, over population, modern life style and urbanization, which leads to undesirable and harmful effects.

2.1. Garbage



Garbage

A lot of waste is accumulated owing to our busy life style. Things like plastic bags, papers, water bottles, aluminium foils, chocolate wrappers, peels of fruits and vegetables are thrown away after use. Unwanted substances formed during a process or substances which cannot be reused are called wastes or effluents.

Garbage are generated in places like houses, classrooms, industries

and public places like streets, market and sea shore.

2.2. Types of garbage

Solid wastes which pollute environment are of two types, namely

- ▶ Bio degradable
- ▶ Non bio degradable

Bio-degradable wastes

In nature, some wastes are gradually degraded by bacteria, fungi (micro-organisms) and earthworm. These are bio degradable wastes. Leaves, agricultural wastes, animal wastes, vegetables, fruits and their peel, seed, nut are examples of bio degradable wastes.

Activity 1

I DO

- ▶ I collect waste papers and make them into small bits.
- ▶ I soak them in water for some time in a container.
- ▶ I smash them with my hand.
- ▶ Likewise I collect polythene wastes and do as above. I observe if any change occurs.

I Observe

From this activity we observe that paper is converted into pulp, whereas the polythene waste is not.



Degradable wastes

Non-biodegradable wastes

Waste substances that are not degraded by micro-organisms are non-biodegradable wastes. Eg: plastics, industrial effluents, metals.



Non-biodegradable wastes

2.3. Disposal of garbage

If the wastes are not handled properly, they get accumulated and besides occupying the land, they even cause bad odour and become abode of micro-organisms that cause diseases. Thus, people living in such area are affected with various diseases. Therefore, it is a must to dispose the garbage properly. The following methods are used to dispose the wastes.

1. Landfilling
2. Incineration
3. Composting
4. Reducing
5. Reusing
6. Recycling

Landfilling

Landfilling is a method in which wastes are dumped into naturally occurring or man-made pits and covered with soil. Garbage buried inside landfills remain here for a long time as they decompose very slowly and become manure. These places can be converted into parks, gardens, etc.



Landfill

Incineration

The burning of solid waste in **incinerator** is called Incineration.

Human anatomical wastes and bio-medical wastes (discarded medicines, toxic drugs, blood, pus) are disposed by means of incineration. During incineration, the enormous heat kills all contagious disease-causing germs.



Incineration



Compost pit

Composting

The process of degradation of organic wastes into manure by the action of microorganisms is

called **composting**. The manure thus obtained becomes natural fertilizer for the plants as well as increases the soil fertility.



Composting - schematic representation

Reducing

The best way to manage wastes is not to produce them. This can be done by using durable goods that last longer instead of things that are used once

and thrown away. Use of fountain pen in place of ballpoint pen is a good example of reduce.

Reusing

Reusing means using a thing again and again, rather than using and throwing it after a single use. Instead of using plastic bags for shopping, using cloth bags is the best example for reusing.

Recycling

The process by which waste materials are used to make new products is called recycling. Using old clothes to make paper and melting some plastics to make floor mats, plastic boards and hose pipes are example of recycling.



Though we use several methods, 3R - reducing, reusing and recycling play an important role in disposal of garbage.

Pyramid of solid waste management

The given diagram explains the hierarchy of the environmentally preferable ways to manage solid wastes.



From this pyramid, we infer that reducing the utilisation of material is the best method of garbage disposal.

2.4. Benefits of garbage disposal

- ▶ Pollution of air, water and land is reduced.
- ▶ Natural resources such as trees and metals are protected.
- ▶ Clean and hygienic surrounding is made.
- ▶ Unnecessary expenses are avoided.

Activity 2 WE DO

- ▶ Let us collect waste papers and make them into small bits.
- ▶ Take a wide vessel containing water and put the bits of paper in it. Add some fenugreek and soak it for a day.
- ▶ Grind the soaked paper and make it into dough.
- ▶ With the help of this dough we can make some useful things like tumbler, plate, etc.

THINK.....!

- ▶ What happens if garbage is not removed frequently?
- ▶ How does it affect us?
- ▶ Can we convert these wastes into non hazardous substances?
- ▶ What should we do for that?



DO YOU KNOW ?

Garbage collectors sort out wastes from dustbins for recycling and reusing. They help us to lead a healthy life by disposing the garbage.



2.5. Vermicomposting

Vermicomposting is a type of composting where the organic wastes are degraded by using earthworms. The manure obtained by this process is called **vermicompost**.

Vermicompost pit in school campus

Make a pit of 30 cm or take a wooden box. Place a thin net on the base of the pit or wooden box. Fill it with sand for about 1-2 cms.

Spread some plant wastes (like dry leaf, flower) and biodegradable wastes on it.

Sprinkle some water. Add some earthworms to these substances and cover it with old cloth or dried coconut leaf.

We can find that vermicompost is formed after four weeks.

Create a garden in your school and use this vermicompost as manure for plants and conserve soil fertility.



Vermicomposting

FACT FILE

- ▶ Indraprastha Park in New Delhi is built on a landfill site.
- ▶ In 1862 Plastic was introduced for the first time in International Trade fair at London.
- ▶ In a vehicle only 30 % of fuel is used for driving , 70% of fuel is released as Carbon monoxide which is a poisonous gas.
- ▶ In a day an earthworm consumes food equal to its weight.
- ▶ June 5th is the World Environmental Day.
- ▶ When plastic is burnt, the harmful gas called dioxin is released.

EVALUATION

I. Choose the correct answer

1. _____decomposes degradable substances in the soil.
 a) micro-organism b) earthworm c) bird d) both 'a' and 'b'
2. An example for non-biodegradable product is _____
 a) paper b) cloth c) polythene bag d) fodder
3. Waste that can be converted into manure is _____
 a) glass b) plastic c) metal d) household waste
4. Bio-medical wastes can be removed by _____
 a) landfill b) composting c) incineration d) recycling
5. Organism used in vermicomposting is _____
 a) leech b) roundworm c) earthworm d) tapeworm

II. Match the following

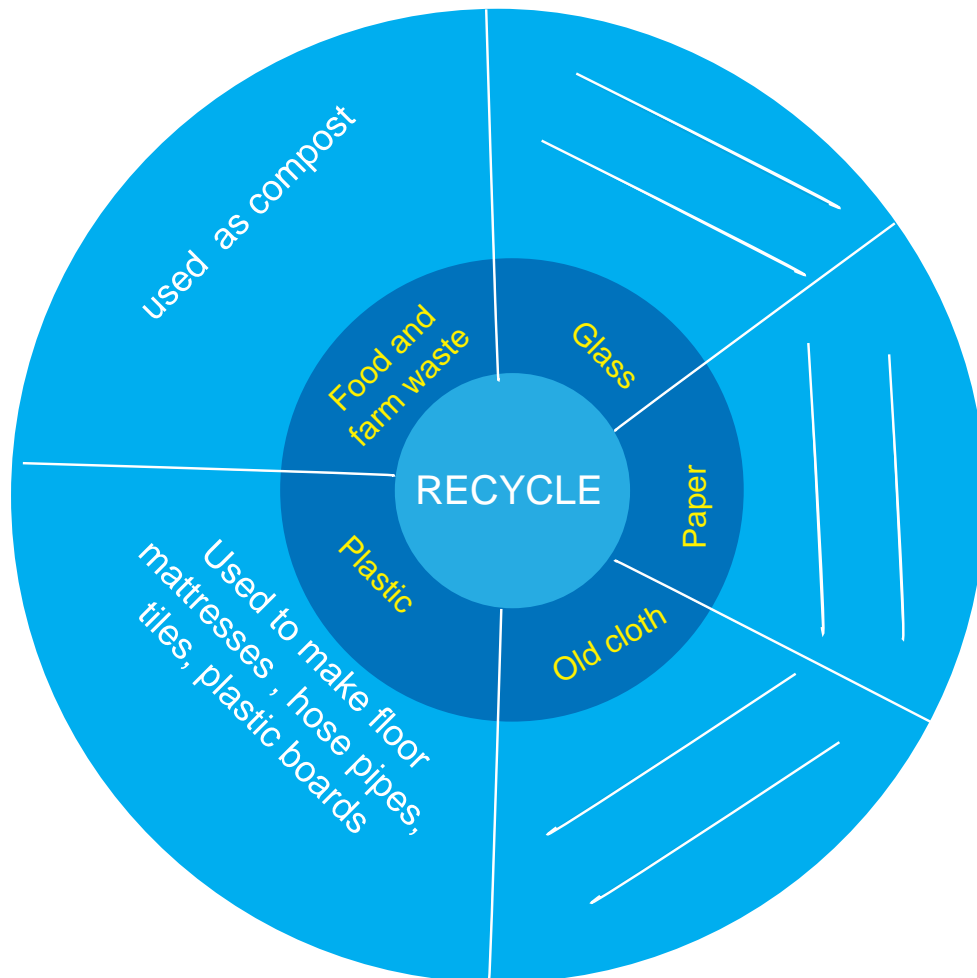
- | | |
|-----------------------|------------------------------------|
| 1. Household waste | - a) fertilizers, pesticides |
| 2. Industrial waste | - b) medicines, syringes |
| 3. Agricultural waste | - c) smoke |
| 4. Medicinal waste | - d) peel of vegetables and fruits |
| 5. Automobile waste | - e) chemicals |

III. Circle the odd one and give reason

1. Peel of fruit , plastic , leaves, vegetables
2. Glass , animal waste, metal, plastic.
3. Incineration, composting , landfill, evaporation.

IV. Fill in

1.



2. If dustbins shown below are placed in your school campus. List out the names of wastes that you would collect in each of the bins.



Biodegradable garbage

1. _____
2. _____
3. _____



Non-biodegradable garbage

1. _____
2. _____
3. _____

V. Shall we answer from environmental aspect?

1. Viji and Suji are students of standard VI. Viji brings her lunch packed in a plaintain leaf but Suji brings her lunch packed in an aluminium foil. Whose activity is right? Write down the reason.
2. Fountain pen is better than ballpoint pen. Why?
3. Madhan and Sudhan went to beach. They took some fruits, groundnuts and biscuits with them. After eating Madhan threw the biscuit wrapper, peel of fruit and groundnut on the beach. But Sudhan threw them in a dustbin which was kept there. Whose activity is appreciable? Why?

PROJECT

Collect the waste materials from the kitchen for a week's time and segregate them into degradable and non-degradable substances. After segregating these substances, place them into two different pits and cover them with soil. Make a note of the changes that occur after 30 days and fill the following table. Discuss and present in small groups.

Pit 1. Vegetables, peel of fruits, egg shell, food remains, tea dust, dry leaves and paper.

Pit 2. Polythene bag, glass pieces, Aluminium foils, nail and broken toys.

Pit	After 30 days
1	
2	

Our findings:

FURTHER REFERENCE

Websites

<http://www.indiaonestop.com/export-hazardwaste.htm>

<http://www.learner.org/exhibits/garbage/hazardous.html>

Do you know Tamizharasi?

What does Tamizharasi do from the time she wakes up till she goes to school? As we all get up in the morning and brush our teeth with toothpaste, she too brushes her teeth.

She washes her dirty clothes using detergents. She takes a bath using a toilet soap. She washes her hair with shampoo.

She also uses a notebook, pencil, pen and eraser to do her home work as we do.

She stands before a mirror to comb her hair, dresses herself, takes water in a plastic water bottle and wears her spectacles and rubber shoes and goes to school by a bicycle. These are the daily activities of Tamizharasi.

Tamizharasi's parents are constructing a house. So they have bought cement, bricks, gravels, and iron rods. She carefully crossed all these materials and reached the tar road.

Most of the things that she uses are chemical substances.

The ink used in our pen and chalk piece used by our teachers are also chemical substances.

Based on the chemical properties of naturally available raw materials,



we produce many things which are very useful in our daily life.

Chemistry plays a major role in manufacturing useful things that we need.

3.1. Cement and its uses

We all would have played making sand houses with our friends. We enjoy ourselves by heaping sand in the form of a mound and on its top build a castle with steps. In real life, can we build a house so easily with sand alone?

Tamizharasi's house and the school she goes to are stone buildings. List out the materials that are needed to construct these buildings.

Cement is an important chemical substance used in the construction of buildings.

In 1824 Joseph Aspidin, a mason in England synthesised cement. As this cement resembled the limestone found in Portland, he named the cement as Portland cement.

Cement is a mixture of limestone, clay and gypsum in definite proportion. This mixture is heated, cooled and powdered to get the chemical substance called cement. This greyish powdery cement is packed in airtight bags and sold.

What happens when a little water is added to cement?



We understand from the above activity that when water is added to cement, it sets to a hard substance within a few hours. This is known as setting of cement.

Uses of cement

Cement is used in different forms like mortar, concrete and reinforced cement concrete.

Mortar

Mortar is obtained in the form of thick paste by mixing cement, sand and water. This paste is used in flooring, constructing and plastering the walls of the houses.

Concrete

Concrete is a mixture of cement, sand, gravel and water. It is used in the construction of buildings, bridges, dams or reservoirs.



Activity 1

WE DO

Aim: To know about the nature of cement.

Materials we require: paper cups, a small amount of cement, water, a stick or glass rod.

Procedure :

- ▶ Let us take a small amount of cement in the paper cup and add required amount of water and stir it well with the help of the glass rod/stick.
- ▶ After a few hours let us observe the change that has occurred.

Our observation :



Reinforced cement concrete(RCC)

When concrete is filled in and around a steel wire netting or skeleton of iron rods and allowed to set we get reinforced cement concrete. This RCC is very strong and durable. This type of concrete is used in the construction of dams, bridges, pillars and roofs of the buildings. It is also used in making pipes, constructing water tanks, and laying sewage and drainage canals.

3.2. Plastics

We are familiar with the term plastics. Only glass bottles and iron pipes were in use for a very long period. Do we find them in large numbers at present? No, today we use mostly things made of plastics. Tamizharasi's water bottle is also not an exception.

Nowadays plastics are very much used in making pipes, toys, utensils, stationeries, medical instruments etc. Plastic water bottles are commonly used everywhere. Plastic is also a type of chemical substance.

3.3. Types and uses of plastics

Tamizharasi's father bought a plastic hosepipe for construction purpose. But he could not join it with the water tap as the size of the plastic pipe was smaller in diameter than the water tap. What should be done to join the plastic pipe with the water tap?



What happens when we pour boiling water into a plastic (PET - Polyethylene terephthalate) bottle?

In the above incidents, plastic pipe and plastic bottle melt and become soft on heating. On cooling, they become hard. These types of plastics are known as 'Thermo Plastics'. Polythene bags, PET bottles, PVC(Polyvinyl chloride) pipes, buckets, mugs, combs, toys etc. are made of thermo plastics.

Do the plastic handles of cookwares melt on heating? Can we expand them like PVC pipes by heating? No, we cannot. It is because they are thermo setting plastics.



An object made of thermo setting plastics cannot be softened or melted by heating. Example: Bakelite and melamine.

Bakelite is a non conductor of heat and electricity. It is used to make electrical insulators, switches and handles of cookwares. Melamine is a non-inflammable substance. Moreover, it can withstand very high temperature. Therefore, it is used to make floor tiles, cookwares, fireproof clothes etc.



3.4. Plastics and environment

We know that plastics are widely used in our day-to-day life. At the same time they are also a great threat to our planet Earth. The disposed plastics bring about the following effects,

- ☛ Plastics do not get degraded.
- ☛ They do not allow rainwater to seep through the soil.

- ☛ They affect the growth of the plants.
- ☛ Water gets stagnant in these disposed plastic pieces. It becomes the breeding place for mosquitoes, which in turn spread contagious diseases.
- ☛ They arrest the flow of water.
- ☛ When food contaminated with plastic material is consumed, it leads to the death of living organisms.
- ☛ When Plastics/Polythene bags are burnt, they emit toxic gases. These gases mix in air and cause respiratory problems.

As plastics pollute land, air and water, we must avoid the usage of plastics. Instead of plastics we can use things made of cloth, jute, coir and areca-plate which are bio-degradable.

3.5. Glass and its uses

When we hear the word glass, it immediately reminds us of plane mirrors and spectacles. Glasses are also used in window panes, automobiles, decorative lamps etc., There is a plane mirror in Tamilazhrasi's house also. She is wearing spectacles.

Some glasses allow the light to pass through them like Tamizharasi's spectacles. But the plane mirror does not allow light to pass through it. A chemical substance coated at the

back of the mirror reflects the light thereby we could see the image.

What is glass made of ?

Glass is made of chemical substances like silica(sand), calcium carbonate(limestone) and sodium carbonate. The above mixture is melted into a viscous liquid by heating it to a very high temperature. This liquid is poured into a suitable mould and cooled to get glass objects of desired shape. When molten glass is cooled rapidly it becomes brittle. When the molten glass is cooled very slowly, it will not allow light to pass through. Therefore glass should not be cooled either very slowly or rapidly. It should be cooled gradually. This method of cooling is called **annealing**.

Glass finds a wide range of application in the manufacture of window panes, automobile windows, electric bulbs, medical instruments, laboratory apparatus like standard flasks, test tubes, beakers, measuring jars etc.



3.6. Soap –preparation and uses

Every morning Tamizharasi uses toilet soap for bathing; Detergents for washing her clothes. We also use different types of soaps in our daily life to keep ourselves and our clothes clean.

Different types of soaps like washing soap, toilet soap, baby soap, liquid soap, medicinal soap etc. are in use.

All the above mentioned soaps are not prepared from the same raw materials. The ratio of raw materials also differ. The raw materials used for the preparation of the soap are mentioned on the wrapper of the soap.

Activity 2

WE OBSERVE

Aim: To prepare soap

Materials we require:

- ♦ water-35 ml
- ♦ sodiumhydroxide -10 g
- ♦ coconut oil - 60 g
- ♦ glass rod
- ♦ beaker

Procedure:

Take 35 ml of water in a beaker and dissolve 10g of



sodiumhydroxide pellets in it. Allow the liquid to cool. Add 60g of coconut oil to this solution little by little. Stir it gently with the glass rod till it becomes a paste. Pour this paste into an empty match box and dry it to get the soap.

Food particles get contaminated with the germs in our hands and cause diseases. We can prevent any infection by washing our hands using soap before we consume food.

How is soap prepared? Can we prepare soap at home? Yes, we can prepare soap at home provided sodiumhydroxide is available.

3.7. Fibres

We come to know from history, that ancient man wore the leaves of plants and skin of animals as clothing. But in our present civilized and modern scientific world we have developed fashionable and attractive dresses using different types of fibres. Are all of them alike?

Which kind of clothes do you wear during the following seasons?

1. Monsoon / rainy season:

2. Winter season :

3. summer season :

During hot summer season we like to wear cotton clothes. During winter season we wear woollen clothes to protect ourselves from severe cold. During rainy season, we use umbrellas and rain coats made of polyester. The clothes which we wear are of different kinds. Let us know how we get all these.

Activity 3

I DO

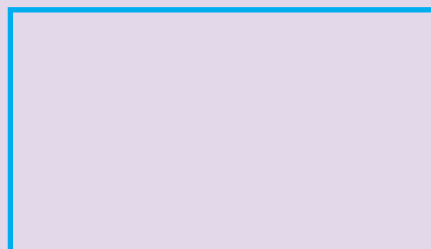
Aim: To separate the fibres from the cloth.

Materials I require: a piece of cotton cloth.

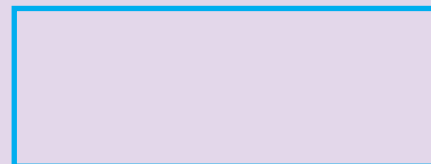
Procedure:

- ▶ I take a piece of cotton cloth.
- ▶ I slowly remove the threads from the edge of the cloth.
- ▶ I press one end of the thread on the table and scratch it gently with the nail till the fibres are separated.
- ▶ I will stick the samples as below.

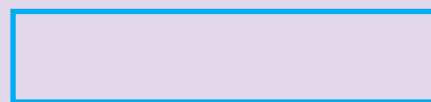
Cloth



Thread



Fibre



My observation:

In the above activity, the thin strands we get while separating thread are fibres. Fibres are drawn together and twisted to get thread. Clothes are woven using the thread.

3.7.1.Types of fibres and their uses

Fibres are classified into two types based on their source.

- ☛ natural fibres
- ☛ synthetic fibres

Natural fibres

Fibres which are obtained from plants and animals are known as natural fibres. Jute is obtained from the stem of the jute plant. It is used to make bags, curtains, carpets, etc.

Cotton is obtained from cotton plant. Cotton fibres are twisted to get threads which are used to make cotton cloth. Cotton fibre consists a chemical substance called “cellulose”.

The fibres on the coconut shell are

removed and processed to get coir. Coir is used to make ropes, carpets and other household articles. We get silk from the silkworms and wool from the fur of sheep.

Synthetic fibres

The fibres which are synthesized from chemical substances using scientific technology are called synthetic fibres. Polyester, nylon, rayon are some of the examples of synthetic fibres. These fibres are not only used in making clothes but also used in making fishing nets, ropes and parachutes. They are also used widely in various industries.

Can you differentiate the clothes which are made out of natural fibres and made out of synthetic fibres?

Activity 4

WE DO

Aim: To differentiate various types of clothing materials.

Materials we require: Cloth bits of cotton, wool, silk, polyester and a magnifying glass.

Procedure:

- ▶ We identify the type(natural/synthetic) of fibre used for making each cloth. We record our findings in the following table.
- ▶ We touch and feel each cloth bit to know the nature (soft /rough).

S. No.	Material	Type of the fibre (Natural / synthetic)	Nature (soft /rough)
1	Cotton		
2	Wool		
3	Silk		
4	Polyester		



Each group should share their observations with peer groups.

Chemical substances are not only used to prepare the things that we have seen in this lesson but also used in the preparation, preservation, enriching taste and colouring of every substance that we use.

Thus in our daily life chemical substances are used in food, clothing, shelter, transportation, medicine, entertainment and in industries. Since they have become part of our life, it is

the duty of each and every one of us to use them carefully and wisely so as to preserve our environment.

Science club debate topic

“Invention of plastics by man is a crime”

Students can be divided into two groups and they can have a debate on this topic.

Importance should be given for scientific information and effects of science. A science teacher or a student can be the judge.

FACT FILE

- ▶ The first Government approved Indian cement factory was started in the year 1914 at Porbandar in Gujarat by India Cement Ltd.,
- ▶ Broken glass pieces found during the archeological survey at Mesopotamia confirms that Mesopotamians were the first to use glass in the third century.
- ▶ Nowadays a new kind of plastics namely Bio-plastics are manufactured. This kind of plastics is Bio-degradable in nature.

EVALUATION

I. Choose the correct answer

1. Identify the one which is not a natural fibre.
(a) silk (b) wool (c) polyester (d) jute
2. Which kind of clothes do you prefer in summer?
(a) nylon (b) wool (c) silk (d) cotton
3. The clothes which are made from the fur of the animals
(a) woollen (b) cotton (c) silk (d) nylon
4. Which of the following is widely used in the manufacture of medical instruments?
(a) polyester (b) plastics (c) glass (d) cotton
5. The important chemical substance used in the preparation of soap is _____
(a) sodiumhydroxide (b) sodium amalgam (c) sodiumsulfate
(d) sodiumbicarbonate.


II. Fill in the blanks

1. The basic raw materials used in the manufacture of cement are _____, _____ and _____
2. The expansion of P.V.C. is _____
3. _____ is used to make fireproof clothes.
4. The process of slow and steady cooling of glass is called _____
5. The fibre obtained from the stem of the plant is _____
6. The chemical substance present in the cotton fibre is _____

III. Match the following

- | | | |
|-----------|---|--------------------|
| 1. Glass | - | a. gypsum |
| 2. Switch | - | b. silica |
| 3. Tiles | - | c. synthetic fibre |
| 4. Cement | - | d. bakelite |
| 5. Nylon | - | e. melamine |

IV. Think and answer

1. Why do we spray water (i.e. curing) on the building that is being constructed?
What will happen to the building if water is not sprayed?
2. We use mortar for flooring and plastering the walls. But we use _____ to construct dams and bridges. Find out the differences between the two?
3. Name the part of the cookwares labelled as 'X' in the given diagram. Name the material used to make it. Why is it used? What type of material is it?
 
4. You know that switches and waterbottles are made of plastics. Under what category do you classify them based on the kinds of plastics?
5. During winter season how will you feel when you wear two or three clothes one over the other instead of wearing a woollen sweater? Why?
6. Explain in your own words whether the chemical substances that we use in our daily life are useful and do not pollute the environment.
7. Plastics are 'a great threat to the life of the planet Earth'. How?
8. Classify the following :
jute, rayon, nylon, silk, cotton, polyester, wool - Give reason.
9. Molten glass should not be cooled rapidly or very slowly during its preparation. Why? Instead of that what should be done?

V. Project

1. Visit a nearby construction site. Collect the following information and prepare an assignment.
 - i) List of materials used for construction
 - ii) The method of preparation of concrete.
 - iii) The type of cement mixtures used in flooring and construction of roofs.

2. Observe your school campus and its surroundings for a week, collect the following information and present them in your class.
- i) What are the plastic materials accumulated in your class, school and its surroundings?
 - ii) How do they get accumulated?
 - iii) What are the steps that you will take to make your school a 'plasticfree zone'?

FURTHER REFERENCE

Websites:

<http://www.jute.com/html/indian-jute.htm>

<http://www.fabrics.net/cotten.asp>

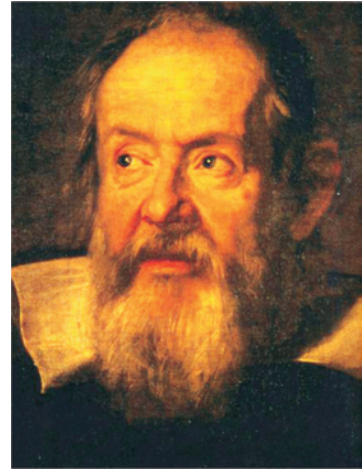


Have you heard about Galileo? He was a great scientist born in Italy. Earlier, people believed that the earth was stationary and it was in the centre of the solar system. According to scientist Copernicus, “The earth is not stationary. It spins on its own axis and revolves around the Sun”. Galileo proved this concept by his experiments.

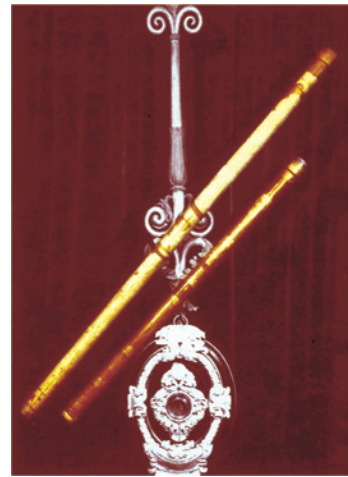
In 1609, Galileo invented the telescope, through which he saw the stars, planets and the moon. According to Galileo, the Sun is a star. All stars are like the Sun whereas the moon is spherical in shape.

We were able to know more about the solar system only by using the telescope invented by Galileo. To commemorate the 400th anniversary of this invention, the year 2009 was declared the “Year of Astronomy”.

Today we are marching ahead in all fields of science following Galileo’s discoveries. Now we will learn about light. Have you ever wondered how visually challenged people move about? Let us understand this by doing an activity along with our friends.



Galileo



The telescope used by Galileo is presently kept in Florence in Italy.

Activity 1

- The whole class must be divided into groups of two students each.
- One student is blindfolded using a handkerchief. For his safety another student is made to accompany him.
- The student is asked to walk around the classroom carefully without bumping against any object.
- At the same time he/she is asked to touch and feel the shape, size and nature of different objects in the classroom.

- ☛ The students must be asked to go out of the classroom and to listen to various sounds carefully and visualise them.
- ☛ Similarly other students must be asked to do the same.
- ☛ The students must be given a chance to discuss and share their experiences in small groups.

4.1 Sources of light

In our daily life we see many objects. How do we see them? Have you ever thought of it? We need light to see objects. The objects that give light are called as **sources of light**.

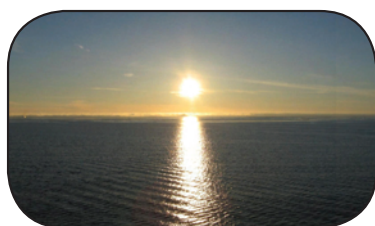
Sources of light are of two types **natural and artificial**. The sun is the primary and the natural source of light. Some of the man-made objects also produce light. These are called artificial sources of light.

During the day, we are able to see with the help of sunlight and during

the night, we can see with the help of light from the electric bulb, torch light, candle etc. Bodies that emit light on their own are called **luminous bodies**.

Do things like table, chair, book, blackboard in our classroom emit light? No, then how do we see them? We are able to see objects like chair, table etc. when the light from luminous bodies like the sun, torchlight etc reaches our eyes after falling on them. Objects like table, chair etc. do not emit light on their own. Objects like these that do not emit light on their own are called **non-luminous** bodies.

Natural sources of Light



Sun



Fire flies



Jelly fish

Artificial sources of Light



Oil lamp



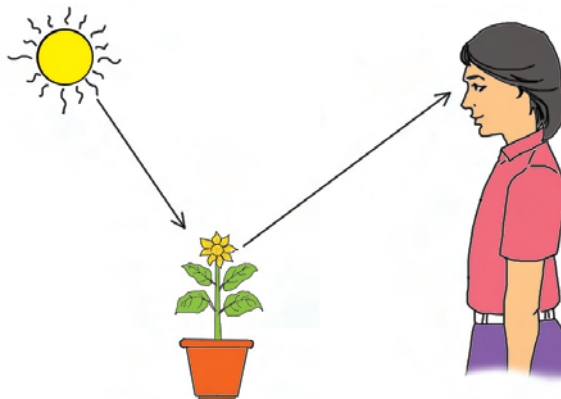
Decorative lamp



Chimney lamp

Therefore we understand that to see an object we need the following

- ▶ a source of light
- ▶ object to be seen
- ▶ eyes.



Do you know ?

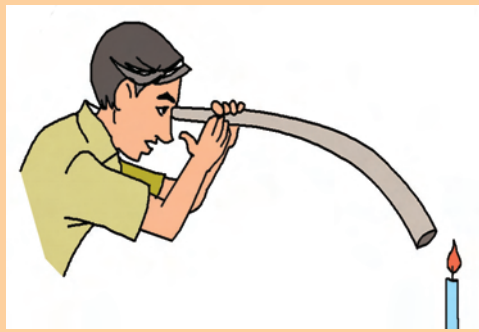
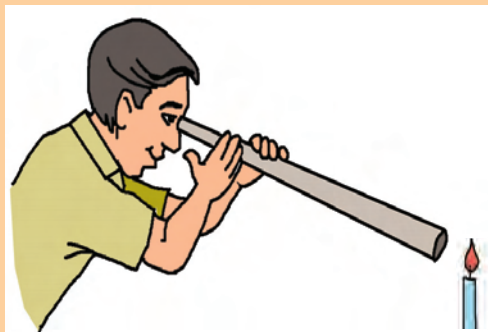
- ★ Though the moon looks bright, it is not a luminous body. It shines by getting light from the sun.
- ★ The sunlight takes 8 minute and 20 second to reach the earth.
- ★ We should not see the sun directly with naked eyes. It may affect our eyesight.

4.2. Propagation of light

How does light travel?

Activity 2

Let us take a thick paper (chart paper), roll it into a cylinder, observe the candlelight/objects in the classroom through this cylinder by keeping it straight. Now bend the paper cylinder slightly and observe the same. (Instead of a paper cylinder, a plastic/rubber pipe can be used.)



Could you see the objects when the paper cylinder was straight? Or when it was bent? Write down your observations.

From the above activity, the candlelight/object was seen when the cylinder was straight. When the cylinder was bent the same candlelight/object could not be seen. This is due to the property of **rectilinear propagation of light**.

Activity 3

WE DO

Aim : To know the path of light.

Materials we require : Torchlight, stand, two used dusters

Procedure:

- ☛ We shall fix the torchlight on the stand in such a way that the light falls on the wall of our classroom.
- ☛ We shall ensure that the distance between the torch and the wall is atleast six to ten feet.
- ☛ We shall take two used dusters.
- ☛ We shall tap them in such a way that the chalk powder falls in the space between the wall and the torch.
- ☛ We shall observe the path of light when the light passes through the chalk powder.
- ☛ We shall discuss our observations in small groups and try to find out the reasons.

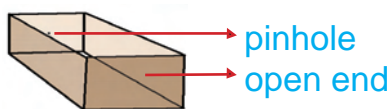
Inference

This activity confirms that light travels only in a straight line.

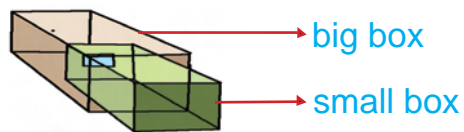
4.2.1. Pinhole camera

Shall we make a pinhole camera?

- ☛ Let us take two cardboard boxes (a small one and a big one) such that one slides into the other.
- ☛ Cut open on one side of the bigger box.
- ☛ On the opposite face of the larger box, make a small hole in the middle. (the hole should be very small to get a clear image)
- ☛ Then a square has to be cut off on one side of the small box.
- ☛ An oil paper is pasted inside. (Tracing paper can also be used.)
- ☛ Make a hole on the other side of the small box such that the pasted trace paper can be seen.
- ☛ Slide the smaller box inside the larger one with the hole, in such a way that the side of the tracing paper is inside.



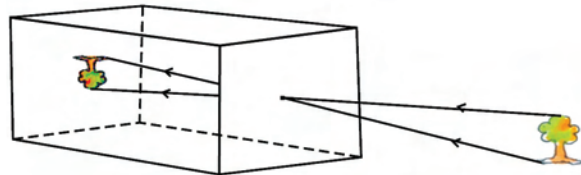
big box



camera



small box



- Let us make sure that there is no hindrance between the two boxes.
 - This set up has to be placed in the sunlight and should be covered with a black cloth so that light will enter only through the pinhole.
 - The pinhole of the big box should be focused towards the distant object (tree or candle) and the tracing paper is observed.
1. Is anything seen on the tracing paper ?
 2. Is there any difference between the object and its image formed on the tracing paper? (Image is the same copy of the object)
 3. Shall we trace out the image

formed on the tracing paper and compare it with the object?

4. Do we observe any change in size of image, when the distance between the pinhole and the tracing paper is increased or decreased ?

Let us share our experiences with friends.

Observation and conclusion:

The light that comes from the object passes through the pinhole and forms an inverted image on the tracing paper. When the distance between the pinhole and the tracing paper is increased, the size of the image also increases. When the distance is decreased, the size of the image decreases. If the size of the pinhole is increased, the clarity of the

Let us play and enjoy :

Mount a convex lens on a stand and focus it to a distant object (tree, building, electric pole.) A white screen is placed on the other side of the convex lens and its position is adjusted to get a clear, inverted image of the distant object on it. Don't you think that this image formed is similar to the image formed on the pinhole camera?

From this we understand that the hole of a pinhole camera acts like a convex lens.

image decreases and the image becomes blurred.

Why the image formed in a pinhole camera is inverted?

The reason is light travels in a straight line. The light rays from the top of the object travel through the centre of the pinhole in a straight line and go downwards. Similarly the light rays from the bottom of the object travel through the centre of the pin hole in a straight line and go upwards. Therefore, we get an inverted image on the screen.

4.3. Transparent, Translucent and Opaque objects

Place a glass tumbler/beaker before you and view the objects in your classroom through it. You see all the objects clearly. Don't you ? It is because glass is a transparent object.

The objects which allow light to pass through them are called **transparent objects**.



Spectacles, clear water, pure air etc. are some more examples of transparent objects.

Take water in a glass tumbler and add a few drops of milk. Now see the objects in your classroom, through the tumbler. The objects are not seen

clearly. They appear blurred because water mixed with milk allows only some amount of light to pass through it.

The objects which allow the light to pass through them partially are called **translucent objects**.

Air with dust particles, mist, ground glass, a sheet of paper smeared with oil etc. are some more examples of translucent objects.



Look at the objects in your classroom through your note book. Can you see them? No, you cannot because note book is an opaque object.

Thus the objects which do not allow light to pass through them are called **opaque objects**.

Wooden door, plastic chair, brick etc. are some more examples of opaque objects.



Aim: To differentiate various objects based on their transmission of light.

Materials we require:

A glass plate, black cloth, white muslin cloth, clear water, muddy water, water with a few drops of milk, plastic scale, oiled paper, stone, handkerchief, blotting paper, ball, a piece of rubber, book, leaves, metal scale etc.

Procedure:

- ☛ We are going to see the objects in the classroom through each collected material.
- ☛ We are going to find out through which material we could see the objects very clearly and could not see clearly and could not see at all.
- ☛ Based on the observations we are going to differentiate the nature of the materials we used.

Our observations:

Sl. No.	Name of the Material	Could see through it clearly/ could not see clearly/ could not see at all	Nature of the materials used (Transparent/ Translucent/ Opaque)
1.	book	Could not see at all	Opaque object
2.			
3.			
4.			
5.			

4.4. Shadows

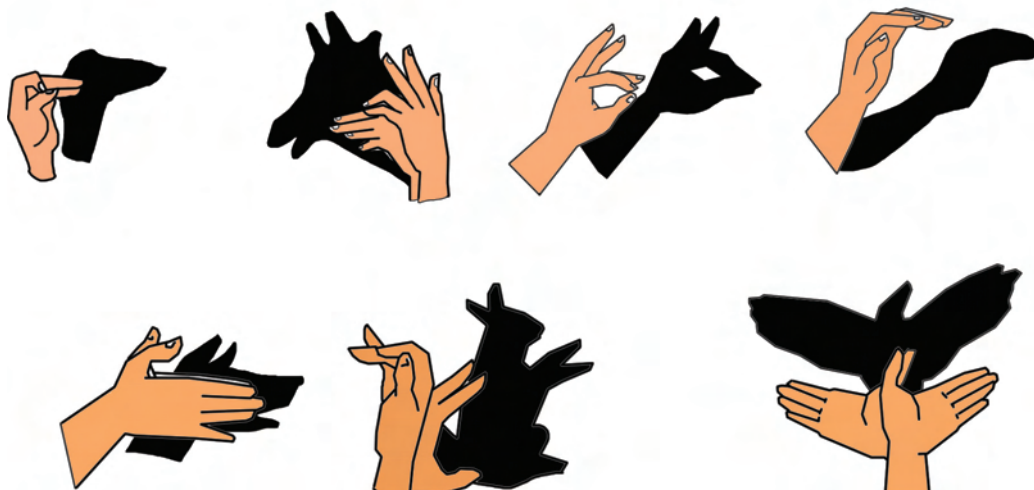
Answer this riddle!

A friend who is always with us and follows us wherever we go. Who is he? To know the answer for this riddle, let us play the following game with our friends.

Keep your fingers in front of an intense source of light. Adjust your fingers to get shapes of different animals as shown in the picture. Ask your friends to identify the different animals from the different shapes. Did they identify?

Now you would have got the answer for the above riddle. The answer is - shadow.

Note: Better results can be obtained by using Overhead Projector (OHP)



How shadows are formed?

Activity 5

WE DO

Aim: To find out the objects that cast shadow.

Materials we require:

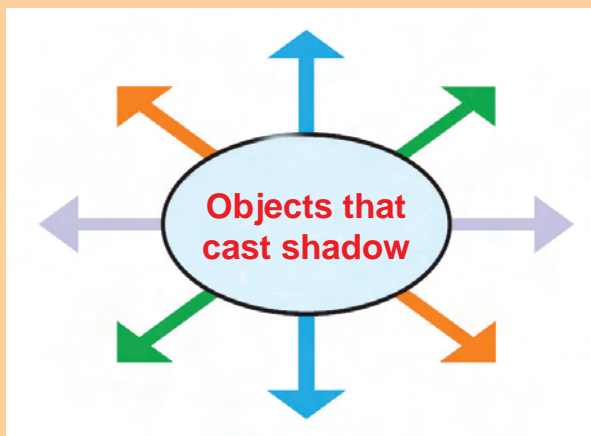
Things we used in Activity 4 and a torchlight etc.

Procedure:

- ☛ We shall hold these objects one by one in the path of sunlight entering through the window of our classroom / torchlight and see whether we get the shadows of the objects?
- ☛ Let us see whether all the objects cast shadow?
- ☛ Let us tabulate which objects cast shadows and which did not.

Sl. No.	Object Name	Casts shadow Yes / No
1.		
2.		
3.		
4.		

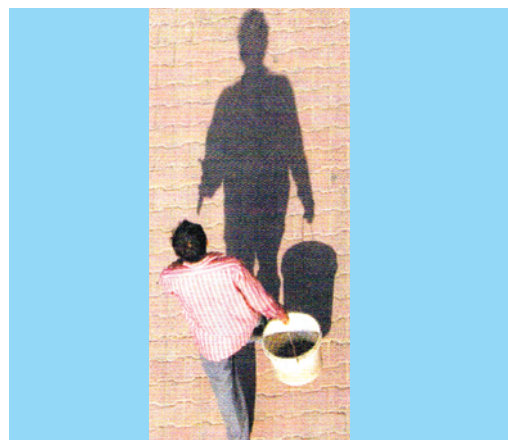
We shall write from the table one by one which objects cast shadow.



What did we learn from the above activity? We learnt that when certain objects are placed in front of sunlight or torch light a shadow is formed behind the object. Since the object placed in the path of light do not allow light to pass through it, there is no possibility of light rays to go behind the object. Hence that region is dark. This is because light travels in a straight line. Objects that cast shadow are opaque objects.

From this we know that all objects do not cast shadow, only opaque

objects cast shadow. We also understand that we need a source of light, an opaque object and a screen (wall, floor, building etc. act as a screen) to cast shadow.



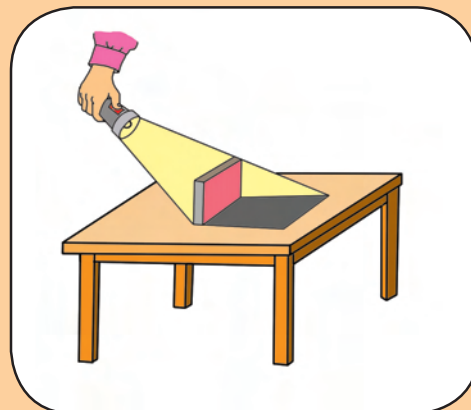
Activity: 6

WE DO

Aim: To study the size, colour and shape of the shadow.

Materials we require:

a torch, ball, book, pen, rectangular card board, stick, pencil, eraser, different types of colourful flowers, a white screen. (a piece of cardboard covered with white paper) etc.



Procedure:

- ☛ Let us turn on the torch and place the object (whose shadow we want to study) in front of it.
- ☛ Hold the screen on the other side of the object to get the shadow. Ask your friend to trace out the outline of the shadow on the screen.
- ☛ Repeat the above steps for different objects and note the colour, shape and size of the shadow and compare the same with the original objects.

Observation:

Properties of shadow :

- ▶ Shadow is always formed on the opposite side of the light source.
- ▶ It only shows the shape or outline of the object and not the details.
- ▶ A shadow cast by an intense beam of light is dark.
- ▶ A shadow is always black regardless of the colour of the object and the light source.
- ▶ The size of a shadow varies depending on the distance between the object and the source of light, and the distance between the object and the screen. (As the distance between the object and the source of light increases the size of the shadow decreases and as the distance between the object and the screen increases the size of the shadow increases)
- ▶ Source of light, an opaque object and the shadow will always lie in a straight line.

**4.5. Reflection of light and plane mirror**

When a tennis ball is thrown against a wall, it bounces back. Similarly when a beam of light falls on a smooth shining surface, it bounces back into the same medium (solid, liquid or gas). This phenomenon is called **reflection**.

Plane mirrors :

Have you seen your face in a mirror? What you see on the mirror is your own reflection. This is called image. Shall we learn, how we are able to see our own image on the mirror?

Light rays from the light source which fall on our face are reflected.



These reflected rays are reflected back again when they fall on a mirror. When these reflected rays from the mirror reach our eyes we are able

to see the image of our face (object) in the mirror. Isn't the surface of the mirror plane and smooth? This is called plane mirror.

More to know

When one side of the transparent glass is coated with a chemical substance, it becomes a plane mirror (opaque). All the highly polished opaque objects show the property of reflection.

Activity: 7

WE DO

Aim: To study different types of reflecting surfaces and formation of images on them.

Materials we require: Materials we use daily.

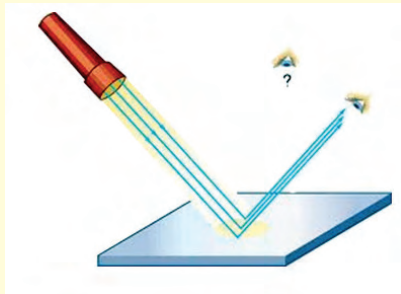
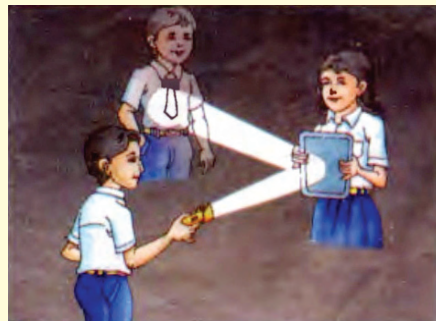
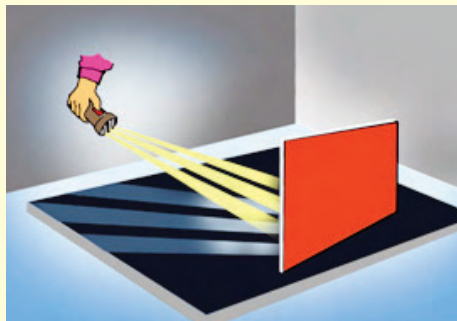
Procedure:

We Study the reflected image of our face on various surfaces chosen by us and observe the nature of the surfaces and the same will be tabulated as follows:

Sl.no.	Name of the surface	Image obtained (clear/not clear)	Nature of surface (smooth and polished/ rough)
1	plane mirror		
2	marble floor		
3	still water		
4	wall		
5	a new stainless steel plate		
6	a plate with scratches		
7	table top		

What do we learn from this?

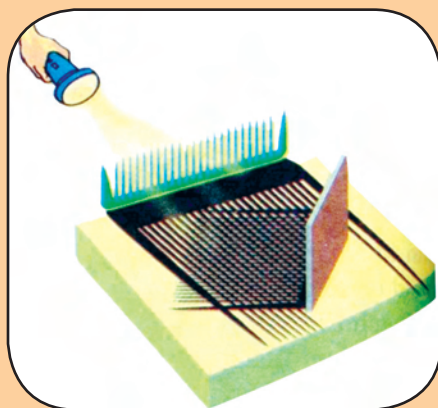
We have learnt that polished plane surfaces like new stainless steel plate, glass, marble floor, still water, produce clear images. Other surfaces do not produce clear images.



Look at the pictures given here. When a beam of light falls on a plane surface, the surface changes the direction of the light rays. We have learnt that the direction of light is changed when it is reflected.

Activity: 8

WE OBSERVE



Fix a comb on one side of a thermocol and a mirror on the other side as shown in the picture. Spread a thick coloured paper in between the comb and the mirror. Keep this set up in sunlight or pass light from a torch through the comb. What do you observe? Is it not the same as given in picture?

From this we learn how light is reflected by mirror.

Do you know?

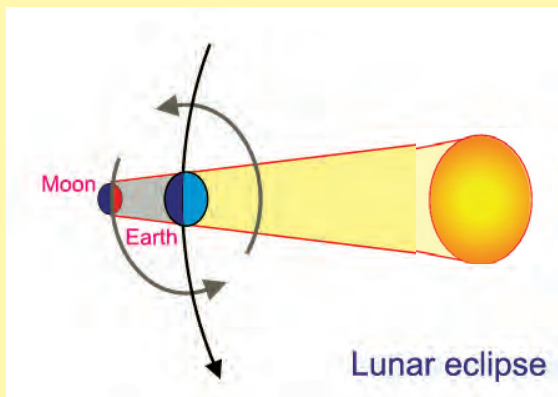
Shadow is cast since light travels in straight line. Solar and lunar eclipses occur because of this property of light. When the sun, the earth and the moon come in a straight line eclipses are formed.

Lunar Eclipse: (Eclipse of the moon)

When the earth comes between the sun and the moon, lunar eclipse occurs. This happens on a full moon day.

- ▶ The Sun - source of light
- ▶ The Earth - opaque object
- ▶ The Moon-screen

When the shadow of earth falls on the moon, the moon is hidden. This is called **lunar eclipse**.

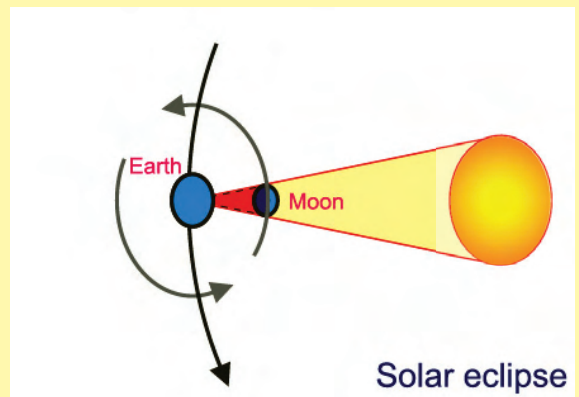


Solar Eclipse: (Eclipse of the sun)

When the moon comes between the sun and the earth, solar eclipse occurs. This happens on a new moon day.

- ▶ The Sun - source of light
- ▶ The Moon - opaque object
- ▶ The Earth-screen

When the shadow of the moon falls on the earth, the sun is hidden. This is called **solar eclipse**.



Group discussion :

Can we organize a science awareness play to the common people in order to eradicate the superstitious beliefs about solar eclipse and lunar eclipse?
(You have learnt about solar eclipse and lunar eclipse in Geography also.)

EVALUATION

I. Choose the correct answer

- The name of the instrument invented by Galileo
 a. microscope b. telescope c. mirror
- Which is an artificial source of light?
 a. Sun b. fire fly c. torch light.
- An example for Non- luminous body.
 a. Sun b. candle c. moon
- Human body is _____.
 a. translucent b. opaque c. transparent
- The colour of the shadow of any coloured opaque object is
 a. white b. the same colour c. black
- Reflected image can be clearly seen on a _____ .
 a. polished surface b. rough surface c. shadow.

II. Match the following

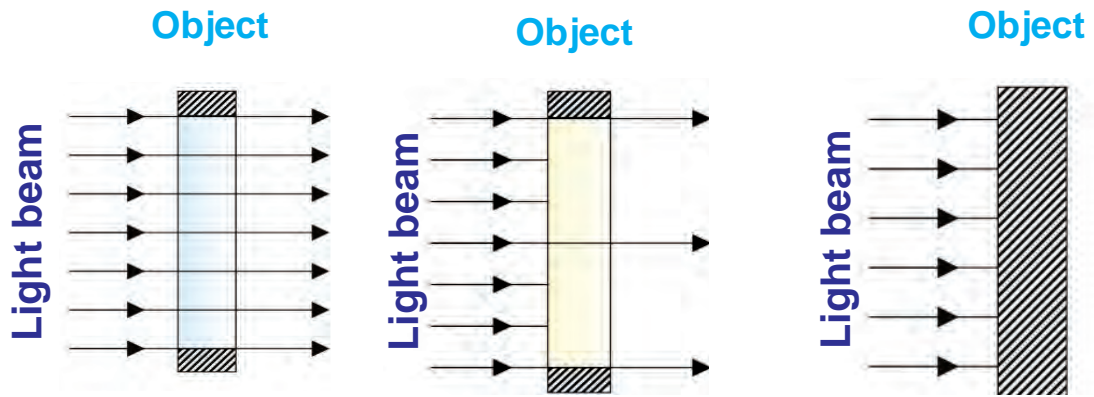
- | | | |
|----------------------------|---|-----------------|
| 1. Artificial light source | - | a. moon |
| 2. Non – luminous body | - | b. turbid water |
| 3. Reflecting surface | - | c. spectacles |
| 4. Translucent object | - | d. tree |
| 5. Transparent object | - | e. disc |
| 6. Opaque object | - | f. burning lamp |

III Circle the odd one out and give reason

- oil lamp, blackboard, electric bulb,
- oiled paper, rough surfaced window pane, wooden door
- formation of shadow, formation of eclipse,
 appearance of face on the mirror

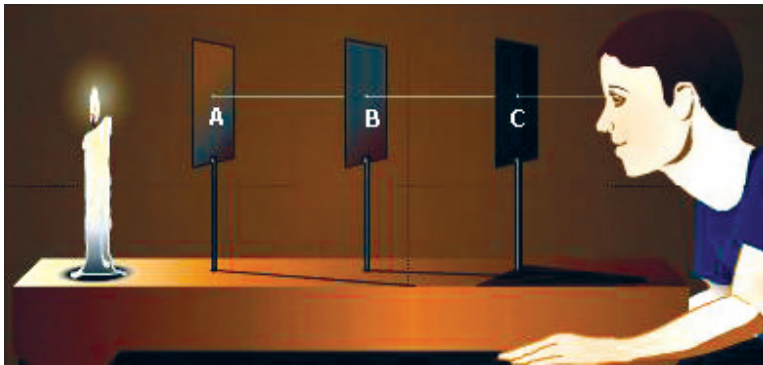
IV. Fill in the blanks

1. Look at the picture and write down the nature of the given objects.



Object : A) _____ B) _____ C) _____

2. Which property of light is shown by the diagram given below?



3. Mention the nature of each object A,B,C given in the picture

A _____
 B _____
 C _____



4. The Objects which are seen clearly through the glass tumbler from outside are _____ , _____.

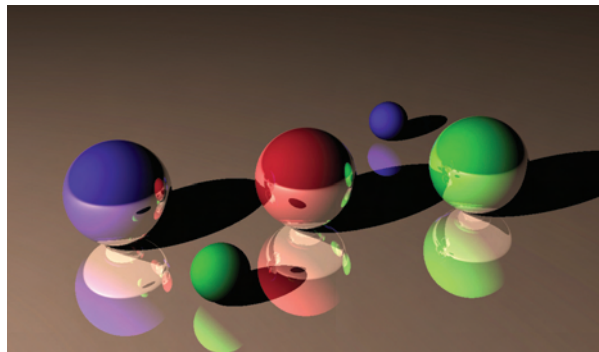
Classify the materials in the picture according to their property.

Sl.no.	Object	Property
1		
2		
3		

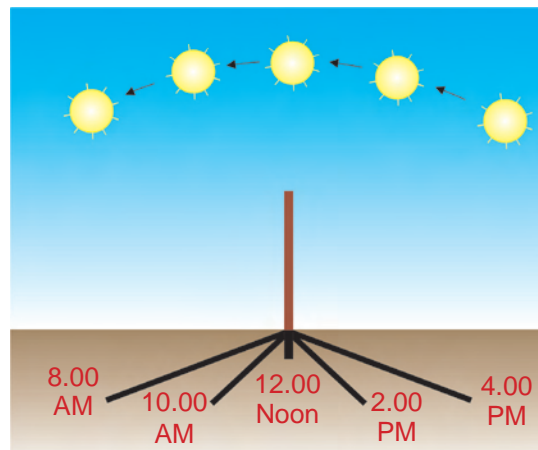


V. What do you understand from the given pictures? Explain

Picture 1



Picture 2



VI. Answer the following in one or two words

1. The objects that emit their own light.
2. The objects that do not emit their own light.
3. Objects that allow light to pass through.
4. Objects that allow light to pass through partially.

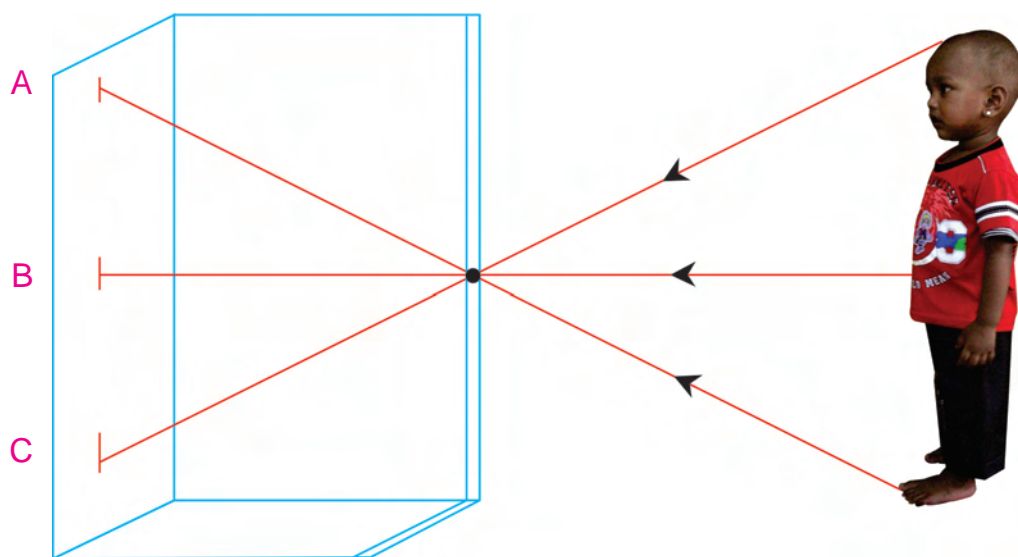
5. Objects that do not allow light to pass through.
6. Things that cast shadow.
7. Things required to see the objects.

VII. Differentiate the following

1. Shadow, image.
2. Natural source of light, artificial source of light.
3. Transparent object, opaque object.
4. Luminous body, non – luminous body.

VIII. Think and answer

1. Hold various colours of ball, flowers, cubic block, square block and coin in front of the source of light and observe clearly the shadow of these objects on the floor.
 - a. Will the shape and colour of the shadow be similar to the objects or not?
 - b. Which of the objects have similar shadows?
2. A boy is standing in front of the pin hole camera, which is below the source of light in the picture. Look at the picture and answer the following questions.



- ▶ At which point does the light ray from the boy's head fall on the screen of pinhole camera?
- ▶ At which point does the light ray from the centre of the boy fall on the screen of pinhole camera?
- ▶ At which point does the light beam from the foot of the boy fall on the screen of pinhole camera?
- ▶ Will the image of the boy formed on the screen be erect or inverted ?

3. Observe the picture and Identify the errors.



Project

1. Reflect sunlight on a wall using stainless steel plate, metal scale and stainless steel lunch box.
2. Stand for a few minutes in the sunlight with a mirror. Look at your image on the mirror and your shadow cast on the ground. List out the similarities and differences between the two.
3. Shall we do this activity along with our friends on a holiday? Draw a large circle on the play ground at any place and one can stand in the centre of the circle. The shape of the shadow can be traced on the ground, in the morning, at noon and in the evening with the help of his friends. The length of the shadow, the direction of the Sun and the direction of the shadow can be noted each time and tabulated.

Time	Length of the shadow	Direction of Sun	Direction of shadow
Morning			
Noon			
Evening			

Three questions to know more about the study of light.

1. A person is eating in front of a plane mirror. Why does the image appear as if he is eating with his left hand?
2. In a car or a bus, why do the objects seen on the mirror at the driver's side appear small and very close?
3. In some textile showrooms, the four walls of the trial room are fitted with mirrors. We see many images of us when we enter in. How?

FURTHER REFERENCE

Websites:

<http://imagine.gsfc.nasa.gov/docs/science/know-l1/emspectrum.html>

<http://www.howstuffworks.com/light2.htm>

<http://uhaweb.hartford.edu/nasa/basic/light-6.htm>

