GOVERNMENT OF TAMILNADU

SCIENCE

VI STANDARD

Untouchability
Inhuman - Crime

Department of School Education

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CONTENTS

The World of Plants 1

What is science?

Why does the sun appear only in the day time? Why do the stars glow only at night? Why do plants grow towards the sunlight even when they are kept in a room?

The questions like what, why and how can readily be given answers with the help of science.

The things we use in our day to day life, for example, electrical equipments, various food items and sophisticated life style are gifts from the source of science. Physics deals with our galaxy, earth and other planets, stars and their dynamic motions, light, sound and other related sources of science. Chemistry deals with metals, non-metals, melting substances, odour and taste (salt or sweet) of materials used in our day to day life.

In the universe, the living organisms exist only in the earth. The study of herbs, shrubs, climbers, trees, domestic animals, wild animals, aquatic organisms, microbes and other life forms around us is called Biology. The branch of science that deals with herbs, shrubs, climbers and trees is called Botany. The study of animals is known as Zoology.

Can we live without plants?

Paddy field

Sugarcane field

Bajra farm

Vegetable farm

Turmeric farm

Coconut grove

Our ancestors were nomads, hunting and wandering for food. Then, after several thousands of years, they learned to cultivate the food crops on their own.

Do you know what are the food yielding plants? What are the things we will buy if we visit a vegetable shop with our parents? Those will be a part of a plant, either a leaf or an unripe fruit. Now we can list out the food items derived from the different parts of the plant.

Food item	Material required	Plant part
Sambar	Thoor dhal, Chilli, drumstick, Curry leaf Turmeric powder	Seed unripe fruit Leaf Stem
Pepper rasam		
Brinjal fry		

In addition to vegetables, cereals, pulses, fruits and oils, spices are also obtained from plants.

Plants are useful to us in many ways. It is used in the preparation of food items such as chips, pickle, dhal powder, jam etc.

Food industry depends on plant products. Can we now tabulate the different types of food crops cultivated in a particular place?

Paddy field, sugarcane field, bajra farm, corn field, vegetable farm, greens farm, turmeric farm, coconut grove.

Agriculture is also a branch of science.

Medicinal plants:

Plants are used not only as food, but also as medicines to cure our diseases.

Plants that have medicinal properties are known as herbal plants.

The herbal plants occur naturally in forests, mountains and hills and some are found in the road sides. Come; let us learn some of the medicinal values of herbal plants.

Neem

Carry me seed

Herbal plant	Diseases cured, Uses
"Purple fruited" pea egg plant (Thuthuvalai)	Cold, cough
Carry me seed (Keezhanelli)	Jaundice
Neem (vembu)	Destroys intestinal worms.
Gooseberry (Nelli)	Mouth ulcer, regulates body temperature,source of vitamin C.
Holy basil (Thulasi)	Cold, cough and fever.
Country borage (Omavalli)	Cold, dry cough, increases sweating to reduce fever.
Sweet flag(Vasambu)	Abdominal diseases.
Turmeric (Manjal)	Insecticide, food, cosmetic.
Veldt grape (Pirandai)	Indigestion (digestive problem), increases appetite.
Ginger (Inji)	Treatment for digestive disorders.
Pepper (Milagu)	Throat infection

Gooseberry

Holy basil

Our ancestors said that if we consume plants with medicinal values, it will help us to be healthy and strong without diseases. So it was rightly said by our ancestors "Food is medicine".

Sweet flag

Henna

Tulsi

Turmeric

Veldt grape

Teak

Uses:
construction materials, furniture

Coconut tree

Uses:
construction materials, tender coconut, coconut

Come on, let us go and list out the food crops that are cultivated in our place.We grow plants not only for food and medicine, but also for ornamentation, as construction materials and for other purposes.

Flowers and cosmetics

We all love beautiful flowers such as rose, lily, jasmine, etc. Flowers play a key role in the preparation of cosmetics like bathing soap, talcum powder, deodorant and perfumes.

Clothes, Ropes and Gunny bags

The dress we wear, the coir and gunny bag we use are the products of plants.

Our cotton dress is the gift from cotton plants. Coir ropes are produced from the coconut fibre. Apart from this, fibre plants are also used in making pillow, bed, mat and mattress.

Plants in construction

Most of the things in our house like doors, windows, chairs etc., are made up of wood.

It is necessary to know the uses of the various trees grown in and around our place.

Look into the pictures of various trees and know their uses! Herbs, shrubs and trees are inevitable for our life. Plants provide us the basic needs such as food, clothing and shelter. Forests are necessary for getting rainfall. Trees purify the air and they also protect us.

Silk cotton tree

Uses:
Match stick, match box, toys, bed, pillow

Jackfruit tree

Uses:
Construction material, Fruits

Eucalyptus tree

Uses:
Oil, paper

Mango tree

Uses:
Farming tools, construction materials, wooden boxes, fruits

Sandal tree

Uses:
Sandal, craft, furniture

Pine

Uses:
Railway sleepers, ship building

Babul bark tree (Karuvelam tree)

Uses:
Parts of bullock cart

1. Let me fill in :

- List of vegetable yielding plants that can be cultivated at the backyard:

- Facilities required / area:

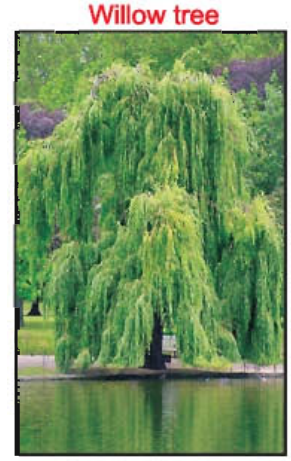
- List of trees already existing in the school campus:

- List of trees that can be planted:

- Facilities required / area:

So,we understand that it is harmful if we destroy trees! Let us not stop with just learning about it, but get involved in constructive activities like creating gardens in the backyard and planting trees in the school campus.

Willow tree

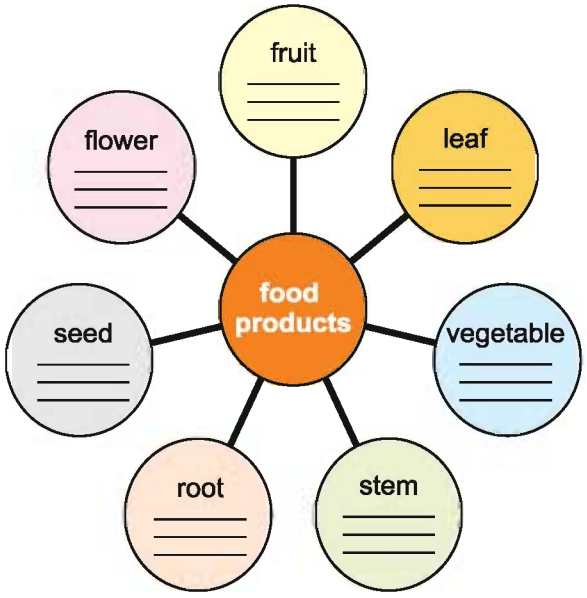


Uses:
Sports materials, Cricket bat

Mulberry tree

Uses:
Tennis racket and Hockey stick

1. Let me fill in



2.Names of some useful plants are hidden in the following checker. Find out at least ten and write their uses in one or two words.

P	E	P	P	E	R	O	S	E	P	C	A	C	T	U	S
T	Q	M	U	L	B	E	R	R	Y	R	T	H	V	G	U
S	N	A	K	E	G	O	U	R	D	L	O	I	F	S	T
K	O	N	I	O	N	W	Z	N	O	K	M	P	I	N	E
E	U	C	A	L	Y	P	T	U	S	J	A	E	I	W	B
N	A	J	C	D	G	A	R	L	I	C	T	G	U	V	M
E	X	O	K	E	B	F	H	C	A	L	O	D	T	Q	L
E	N	P	B	R	I	N	J	A	L	P	M	A	N	G	O
M	B	K	L	M	N	O	B	A	N	A	N	A	Q	R	W
R	Z	M	A	Z	C	O	C	O	N	U	T	S	X	Y	R

3. Rearrange the letters and find out the name of the plant.
(Eg: Ricturme-Turmeric)

1. finlagerdy's
2. reeogosbry
3. mutayhcrsnhem
4. irragonefut
5. werflouns

4. Some places are very popular for their products, like Tanjore for Paddy, Madurai for Jasmine, and Kumbakonam for Betel leaves. Find out such famous places known for their products and mark them in Tamil Nadu map.

Extended activities

1. Do you know that a small garden can be created near the window of your kitchen?

   Fill the bucket with soil and sow seeds of medicinal plants, greens, coriander and tomato. Water them regularly. Thus, a small garden can be created in your house. Now share your experience in the class room.

2. In countries like Japan, Russia and Cuba, vegetables are cultivated on the open terrace. Like this, you can also get benefitted by forming garden on the open terrace of your school or house and cultivate pumpkin, snake gourd, tomato and bitter gourd.

Fact file

1. Thickest African tree found in Zimbabwe is Baobab tree. This tree is used as a Bus Stop.
2. Orange trees yield fruits for about 400 years.
3. Rafflesia produces the largest flowers. The diameter of the flower is one metre.
4. Red wood tree doesn't easily catch fire.
5. From a watermelon, 6, 00,000 watermelon plants can be produced and from them watermelon weighing 180 tonne can be obtained.

Rafflesia

Red wood tree

Baobab tree

Evaluation

I. Choose the correct answer

1. Plants with medicinal value are called

   a) pulses b) scented plants

   c) medicinal plants d) barks

2. Of the following, which is the seed part of the plant?

   a) thoor dhal b) veldt grape

   c) banana d) turmeric

3. Select the food-related industry from the following

   a) coir making b) gardening

   c) cotton cultivation d) pickle-making

4. Name the food that we have to consume for blood purification.

   a) gooseberry b) neem

   c) bottle gourd d) keezhanelli

5. Name the tree used in paper industry.

   a) Teak b) Eucalyptus

   c) Coconut tree d) Sandal wood tree

II. Let us find answers for the following

1. How will you substantiate that agriculture is a science?
2. How will you explain to a foreign tourist about any five medicinal plants of our country?
3. We cut and use the trees, but at the same time it is instructed "Trees should not be cut off" How to find solution to this contradiction?

III. Think and answer

1. Where do the scent / odour in bathing soap and perfume come from?
2. What are the gifts given by cotton plants?
3. Write about the plants and parts of the plant from which coir ropes, and gunny bags are made.
4. Where do medicinal plants grow?
5. Name the plants that yield cooking oil.

Food Habits

2

We know about the cartoon hero Popeye. Don't we? In this story, Popeye, the sailor is thin and weak. But his opponent is obese and strong. His name is Brutus. Popeye is often beaten by him.

Immediately, Popeye consumes spinach. It gives him immense strength and that's all, his opponent Brutus is defeated. This cartoon story illustrates the importance of greens like spinach. It is true, that the food we consume must be nutritious. Obese person may appear stronger. But, it is not really healthy so.

I'm Popeye; you can watch me on Television cartoons, Video games, Advertisements and Films.

It is not advisable to eat noodles. Noodles we eat are different from the noodles eaten by Chinese. They consume home-made noodles. But we consume industry-made artificially flavoured noodles.

Food items like bubble gum, roadside food contaminated with housefly, factory made chemicals added, tinned or fast food are harmful to our health. It is good to avoid these food items. Why? Then what kind of food should we consume?

What are healthy food items? What are the unhealthy food items?

Substances that provide nutrients for the body are called food.

Activity 1

List out the food items that you consume in the following space provided.

Morning _____

Afternoon _____

Night _____

What are the various sources of food?

Food items obtained from plants and animals:

The root, stem, leaf, flower, vegetable, fruit and seed of the plants are used as food for us.Different food items like milk, egg and meat are obtained from animals.

Activity 2

List out the food items obtained from plants and animals in the following table.

Food items obtained from plants	Food items obtained from animals

Nutrients

The constituents of the food which are essential for the body are called nutrients. Does a food contain more than one nutrient? Do you know any food without nutrients? Why do we need nutrients?

Types of Nutrient

- Carbohydrates - Provide energy
- Proteins - Help in growth
- Fats - Provide energy
- Vitamins - Help in physiological activities
- Minerals - Act as regulators in physiological activities
- Water - Transports food, regulates body temperature.

Activity 3

Take a cucumber. Cut it into small slices. Water oozes out while cutting. Why?

Water content in vegetables, fruits and food items:

Name of the food	Water content	Name of the food	Water content
Cucumber	95%	Bread slice	25%
Potato	75%	Egg	73%
Mushroom	92%	Milk	87%

Balanced diet:

A food that contains all the nutrients in the right proportion is a balanced diet.

Go through the following table.

S.No	Food category	Nutrients present
1.	**Cereals:** Rice, Wheat, Ragi (Finger millet) Bajra (Pearl millet) , Sorghum, Corn Barley, Rye	Carbohydrate, protein, a small amount of lipid, vitamin B_1 & B_2, folic acid, iron, fibre.
2.	**Pulses:** Red gram, Black gram Green gram, Horse gram, Bengal gram, Chick pea, Pea, Soya beans, Country beans etc.,	More proteins, a small amount of lipid, vitamin B_1 & B_2, folic acid, iron, fibre
3.	**Milk and meat products:** Milk, Ghee, Curd, Yogurt, Skimmed milk,	Protein, lipid, vitamin B_2, calcium
	Chicken, Liver, Fish, Egg, Mutton.	Protein, lipid, vitamin B_2
4.	**Fruits & Vegetables:** Mango, Guava, Tomato	Carotenoid, vitamin C
	Papaya, Orange, Water melon, Sweet lime, Grapes	Iron, calcium
	Gooseberry, Greens, Drumstick leaves Coriander, Lettuce, Spring onion.	A small amount of lipid, carotenoid, vitamin B_2, folic acid, calcium, iron, fibre
	Carrot, Brinjal, Lady's finger, Capsicum, Country bean, Onion, Drumstick, Cauliflower.	Carotenoid, folic acid, calcium, Iron, fibre.
5.	**Ghee, Oils:** Butter, Ghee, Vanaspathi, Cooking oils like Groundnut oil, Coconut oil, Gingely oil.	Lipid, Essential fatty acids
6.	**Sugar, Jaggery**	Carbohydrate, iron.

Jaggery provides more benefits to the body than the sugar.

What should we consume to have a balanced diet? What are the ways to obtain it?

Note :

Vitamins are lost when vegetables are washed after chopping.

Vitamins and mineral salts are found in abundance in the peels of vegetables and fruits.

We lose vitamins and mineral salts from grains and pulses by repeated washing.

Food that provides all the nutrients in the right proportion is a balanced diet.

Do the different age groups require same quantity and same type of food? Can we get a balanced diet at low cost?

We can avoid diseases caused by deficiency by consuming nutritious food.

Activity 4

Name of any one of the grains, pulses, fruits, vegetables, tubers and dry seeds should be written by the students. Then they must discuss and know the nutritional value of these food substances. Then they must be divided into small groups. Each group must find whether the food substances written by them make up a balanced diet.

Deficiency diseases:

Diseases caused due to the deficiency of nutrients in the food that we eat are called deficiency diseases.

Kwashiorkar

Marasmus

Deficiency diseases and their symptoms:

Nutrient	Deficiency disease	Symptoms
Protein	1. Kwashiorkar (children from 1-5 age)	Weak appearance, retarded growth, oedema in abdomen and legs, weak limbs.
	2.Marasmus	Enlarged head, loss of weight, retarded growth of body and brain.
Vitamin A	Night blindness	Defective vision, blindness in dim light.

Vitamin B_1	Beri-beri	Weak muscle, fatigue
Vitamin C	Scurvy	Bleeding gums
Vitamin D	Rickets	Weak and bow bones
Calcium	Disintegration of bones and teeth	Weak bone and teeth, inflammation in neck.
Iodine	Goitre	Body fatigue
Iron	Anaemia	Giddiness

Scurvy

Goitre

How do living organisms get energy from these food substances?

Nutrition:

Ingestion, digestion, absorption and assimilation are the various stages of nutrition. Organisms consume both solid and liquid food substances by various methods.

Nutrition is the mode of intake of food.

Types of nutrition

1. Autotrophic nutrition

Mode of nutrition in which an organism prepares its own food is called autotrophic nutrition. E.g.: Green plants, Euglena. They prepare their own food by photosynthesis.

2. Heterotrophic nutrition

The mode of nutrition in which an organism depends on other organisms for food as they cannot prepare their own food is called heterotrophic nutrition.

Preparation of starch (sugar) by the plants with the help of sunlight, CO_2, water and chlorophyll is photosynthesis.

Types of parasites

1. Ectoparasites
2. Endoparasites

♦ The plant *Cuscuta* depends on other plants for food. This is an example for parasitic mode of nutrition.Organisms like head louse, leech etc., are found attached to the outer surface of the body and get nourishment from the host. So, these are called ectoparasites.

♦ Round worm lives inside the body (gut) and derives food from the intestine. So it is an endoparasite.

Saprophytes.

♦ In saprophytic nutrition, the organism decomposes the dead plant and animal substances and converts them into simple molecules and absorbs them through their body wall.

Discuss in the class about the mode of nutrition in animals and plants devoid of chlorophyll.

3. Special type of nutrition

Plants like *Nepenthes*, *Drosera*, and *Utricularia* are green in colour and are autotrophic.Since they are found in nitrogen deficient soil, they trap insects and kill them to get nitrogen from them. So they are called insectivorous plants.

Drosera

Animals based on nutrition

Activity 5

Can you write the names of animals that you know and mention their mode of nutrition?

Name of the animal	Herbivorous	Carnivorous	Omnivorous
Cockroach			✓
Deer	✓		
Lion		✓	
-			
-			
-			

Animals which feed only on plants are called herbivorous e.g. goat, cattle.
Animals which feed on other animals are called carnivorous e.g. tiger.
Animals which feed on both plants and animals are called omnivorous e.g. crow

What are the ways to prevent heart disease?

1. Be happy
2. Maintain weight according to height
3. Do regular exercise and involve in games
4. Avoid fried food items
5. Do not smoke

Extended activity

1. On a particular day, the students can list out the various food items they consumed along with the nutrients. By forming small groups, students have to discuss whether the food they consumed is a balanced diet? This will be beneficial to all the students.

2. List out the food items that you like and dislike in the diet that you take everyday.

My favourite food:

Name of the food	Nutrients	Use

The food I dislike:

Name of the food	Nutrients	Effect

Action plan

Organise a seminar by discussing the information on how food is wasted in marriage halls and parties with your peer and the class teacher.

Which is a good food?

We have to maintain our organs in a good condition to lead a healthy life for a long time. It is based on the choice of food we consume.

It is necessary to take care of organs like heart, kidney and lungs. Good exercises and games are required. Junk foods and fried items should be avoided. Instead, food items containing protein and fibre like peas, cabbage and greens can be added in daily diet.

Steamed fish items and brinjal rich in ascorbic acid,prevent heart diseases.

We have to add vegetables equally with our food containing starch like rice, wheat, bajra, maize and ragi.

Doctors also say that some kind of fruit should be taken along with the diet.

"Health is wealth"

Evaluation:

I. Choose the correct answer:

1. Choose the food which has more water content.

   a) potato b) cucumber
   c) egg d) milk

2. Name the food that contains Vitamin B_2.

   a) mango b) jaggery
   c) peas d) sugar

3. Which disease is caused due to the deficiency of protein?

   a) marasmus b) beri-beri
   c) night blindness d) scurvy

4. Which of the following is an omnivore?

   a) lion b) goat
   c) elephant d) crow

II. Answer the following:

1. Mala's gum became inflammated and started bleeding. Mala's mother took her to the doctor. What would the doctor have said as the reason for this disease?

III. Think and answer:

1. What is nutrient?
2. What are the stages of nutrition?
3. What are the symptoms of iodine deficiency?
4. What are the types of parasites? Name them.
5. Describe insectivorous plants.
6. What are the food items to be taken by us to prevent cardiac disease?
7. What are the good food habits that we have to follow in day-to-day life?
8. What type of food should be taken to prevent night blindness?
9. Which food is useful in strengthening the bones ?

Cell Structure 3

What is our human body made up of?

What is a tree made up of?

As a building is made up of many bricks, the human body is made up of several small units called cells. Cell is the basic structural and functional unit of all living organisms.

Can you see a cell with naked eyes? No. Cells are very minute and cannot be seen with our naked eyes. It can be only observed under a scientific instrument called microscope.

Not only human beings, but other organisms like plants and animals are also made up of cells.

microscope

wall

cells in an onion peel

When we see the cells in an onion peel and the wall, they are similar in structure.

Observe the cells in an onion peel with the help of a microscope.

Discovery of cells

Do you know who was the first person to see the cell? Robert Hooke an optic seller, observed a piece of cork through his hand made lens and found many identical small chambers.

In Latin word, 'cellula ' means "a small chamber". So Robert Hooke named this chamber as cell in 1665. He became a famous scientist by showing the cell magic through his lens.

Can we see inside of the cell?

Many scientists had the same question. So Robert Hooke initiated the work to invent a microscope. Following him, Robert Brown, a school teacher continued and invented an advanced microscope .He discovered the nucleus.

He revealed that cell is a small factory with nearly twelve or thirteen cell organelles which are involved in a heavy task.He found that there is a different world within a cell.

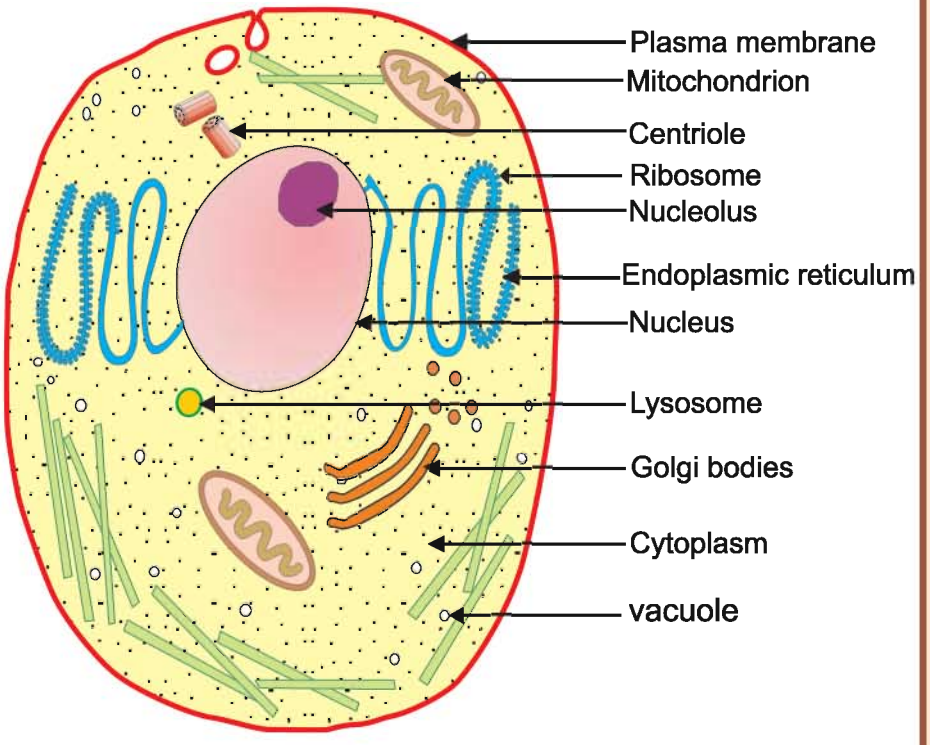
He did not stop with these observations and recordings. He would examine his food also with microscope before eating.

Cell types

Cells of plants and animals are not similar. Bacteria and some algae are made up of a single cell. Their cells lack membrane bound organelles.

- Cells that do not contain membrane bound organelles and possess "incipient nucleus" are called prokaryotic cells, i.e., simple cells. E.g.: Bacteria.

- Cells that contain a well-defined nucleus, nuclear membrane and all the cell organelles are called eukaryotic cell. i.e., complete cells. E.g. Cells of plants and animals.



Animal cell

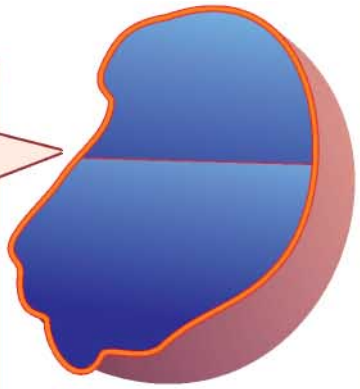
As we discussed earlier, plants cell and animal cell do not have similar structural organisation. This change in the cell organisation differentiates animals from the plants.

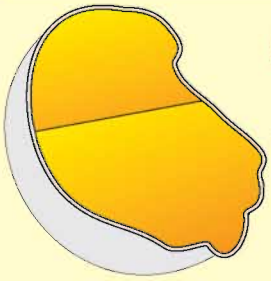
Animal cell :

Now, let us learn about animal cell. Cell is a small factory. Each organelle in the cell is involved in a specific function.

Plasma membrane

"Hi! Come! Animal cell welcomes you. I am plasma membrane, enveloping the cell. I give shape to the cell. I check the entry and exit of the cell and act as a guard. Come on my friends, come one after the other and introduce yourselves".





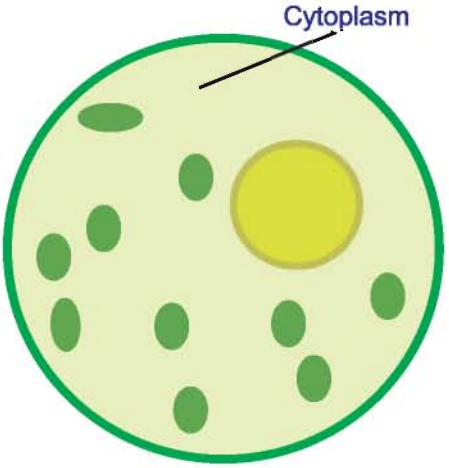
Protoplasm

"I am a colloid, found inside the plasma membrane. I have two components namely cytoplasm and nucleus of the cell".

J.E. Purkinjee coined the term protoplasm. 'Proto' means 'first' and 'plasma' means 'colloid'.

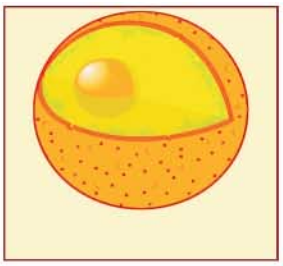
Cytoplasm

"Hello! I am cytoplasm, found in between the plasma membrane and the nucleus. I protect the nucleus and help in various cell activities controlled by nucleus".



Nucleus

"I am the controlling centre of the cell. But need not be present in the centre. I decide the structure of all organisms like human being, monkey, goat etc., I have nucleoplasm, nucleolus and chromatin reticulum and enclosed by nuclear membrane, I am spherical in shape. I carry the genetic characters from generation to generation".



Nucleus

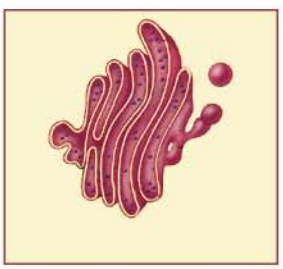
Mitochondria

"We are involved in cell respiration. We help in the oxidation of food materials that you eat and provide energy. We do not rest. We are also known as Power houses of the cell".

Mitochondrion

Golgi bodies

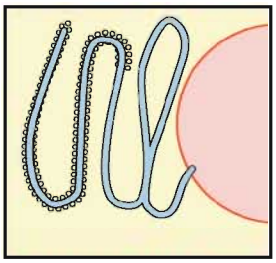
"Hi, come on! We are tubular structures, involved in the secretion of digestive enzymes. We separate proteins from the ingested food and give strength to the cells and the body".



Golgi bodies

Endoplasmic reticulum

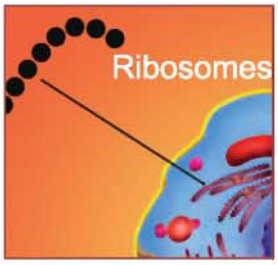
"Hello! I am endoplasmic reticulum. I help in transportation of materials from one part of the cell to another".



Endoplasmic reticulum

Ribosomes

"Come! We are granular structures. We are called " Protein factories of the cell". We help in protein synthesis".



Ribosomes

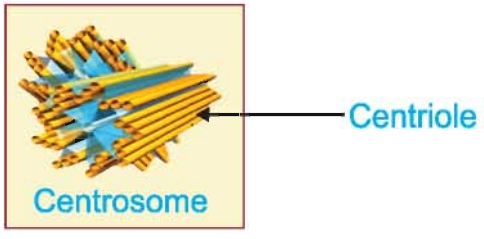
Lysosomes

"What are you looking at? We are spherical yellow coloured bodies. We help in cell protection. We destroy the pathogens entering into the cell. We are called "Suicidal bags of the cell" . In addition to this we also help in cell digestion".

Lysosome

Centrosome

"I am centrosome. I resemble the white colored hair that protrudes out of your head. I have centrioles in me. I am found only in the animal cell and not in the plant cell. Cell division is my function i.e., formation of new cells."



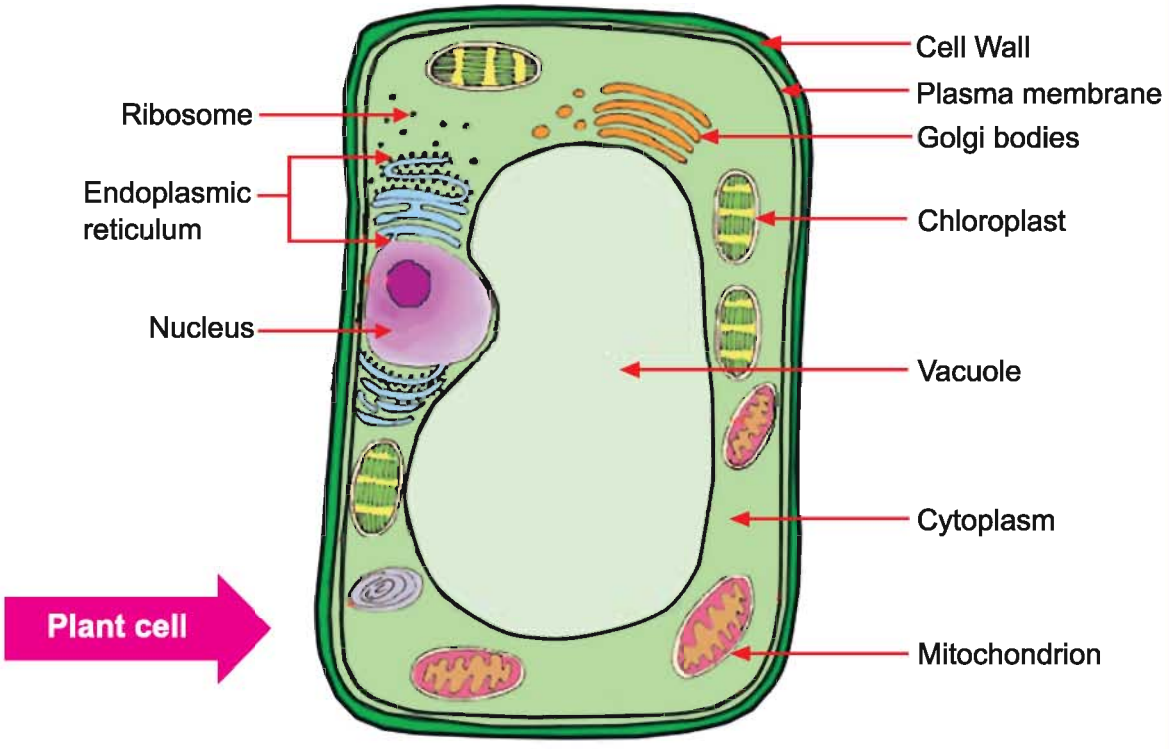
Vacuoles

"Wait! Don't neglect us. We are light blue in colour and appear like bubbles. We store cell sap. We maintain intracellular pressure." Oh! this work is very difficult. Plasma, my friend, bid bye to all".

Did you meet the workers of the animal cell factory? Now, let us know about the plant cell.

Plant cell:

Have you wondered about the difference in a plant cell structure? Centrosome is absent in plant cells. Before listing the differences between plant cell and animal cell, let us know the reason, why herbs, climbers and trees are rigid in nature.



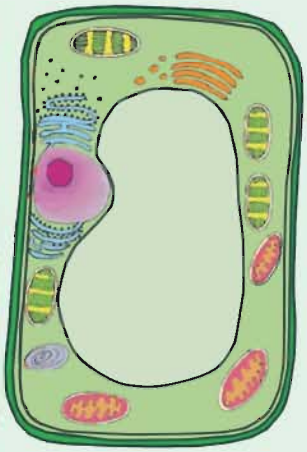
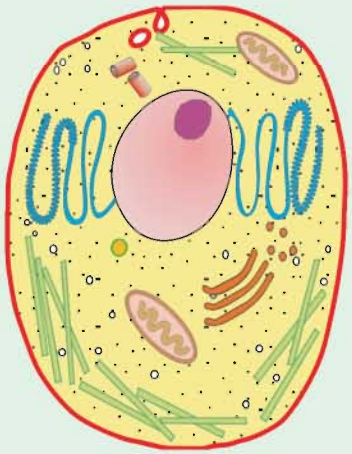
Plants are more rigid than animals due to the presence of cell wall.

Cell wall

It is an outer layer which gives shape to the cell. It is made up of cellulose. Its function is to protect the inner organelles and to give shape to the cell. Apart from this, plastids are the characteristic features of plant cells.

There are three types of plastids namely, chloroplast, chromoplast and leucoplast.

Let us now list out the differences between plant cell and animal cell.

S.No.	Plant cell	Animal Cell
1.	Presence of cell wall	Absence of cell wall
2.	Presence of plastids	Absence of plastids
3.	Centrosome is absent	Centrosome is present
4.	Vacuoles are larger in size	Vacuoles are smaller in size
		

All activities like eating, drinking of water, jumping, playing, and breathing, thinking and even sleeping are due to the functioning of the cells. Isn't, each cell, a small factory ? The brain has several millions of cells.

When the cells, so called small factories are affected and injured, diseases are caused and we visit a physician.

E.g. Cancer , Hereditary diseases, Diabetes.

Evaluation

I. Shall we give some activity for our brain cells to remember what we have studied?

1. I'm a tiny organelle. Cell respiration occurs in me. I'm otherwise called "Power house of the cell". Who am I?
2. I help in Photosynthesis. Found only in plants. Who am I?
3. I give shape and protection to the plants. I'm made up of cellulose. I'm found only in plants. Who am I?
4. I help in cell division. I'm seen only in animal cell. Who am I?

II. Pick the odd one out

1. *Amoeba, Euglena,* Man, *Paramecium*
2. Nucleus, Nucleolus, Chromatin reticulum, Plasma membrane
3. Robert Hooke, Anton Van Leeuwenhoek, Schleiden and Schwann, Newton.
4. Lysosome, Centrosome, Ribosome, Chromosome.
5. Cell wall, chloroplast, larger vacuole, Centrosome.

III. Choose the correct answer

1.The 'power houses of the cell' are

a) lysosomes b) mitochondria c) ribosomes

2.Which is found only in the plant cell?

a) cell wall b) cytoplasm c) nucleus

3.Which is found only in the animal cell?

a) mitochondria b) centrosome c) plasma membrane

4.Which is a eukaryotic cell of the following?

a) blue green algae b) *Amoeba* c) bacteria

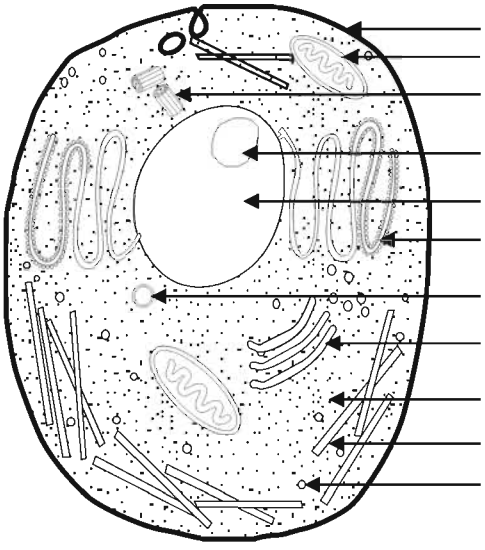
5.Which is a prokaryotic cell of the following?

a) bacteria b) *Euglena* c) *Paramecium*

IV. Give an example for Prokaryotic and Eukaryotic cell.

V. Play a skit to explain the functioning of various organelles of a cell factory.

VI. Colour the diagram of animal cell and label the parts.



VII. Shall we search and answer the following?

1. Can you imagine the changes in a cell after the death of a person? What happens to the cell?
2. Which gives colour to the leaf? Why the flowers are different in colour?

VIII. Think and answer

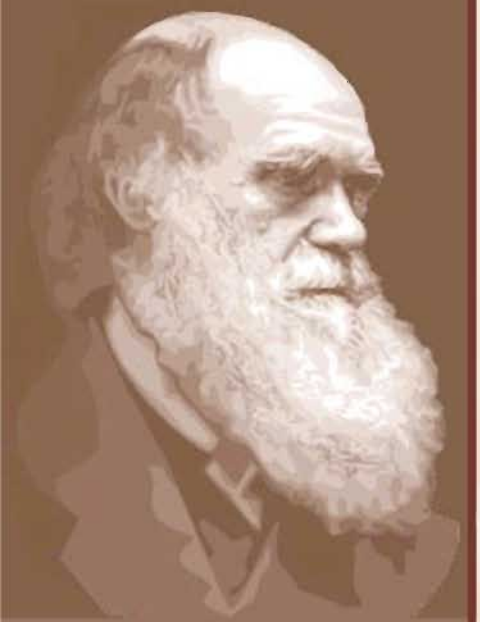
1. Which cell organelle is called the 'protein factory'?
2. How does the cytoplasm introduce itself?
3. List the differences between animal cell and plant cell.
4. Which is involved in photosynthesis in the plant cell?
5. Write what you know about nucleus of the cell?

Fact file

1. There are about 6,50,00,000 cells in human body.
2. Bones are made up of special type of dry cells.
3. Anton Van Leeuwenhoek (1675) discovered that blood contains RBC (Red Blood Corpuscles).

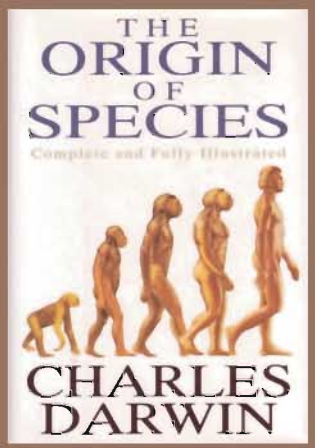
4 Structure of Living Organisms

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' which was published in the year 1859. It was written by a Naturalist named Charles Darwin. Why did it raise criticism?



Charles Darwin

Darwin sailed to several important islands of the world in the ship, H.M.S.Beagle, for more than 10 years and collected 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 the similarities between ape and man, cat and tiger.



Mushroom grows in our garden when it rains. Frogs croak when water stagnates. Dragonflies fly, fire flies illuminate during night time. Are you not interested to know more about the various characteristic features of organisms living on this earth?

Darwin too was interested. He collected and preserved one hundred and seventeen types of beetle, when he was young. We too keep peacock feather in our book for it to grow. Can we rear golden beetle? How many life forms like this are there on the earth?

When did life originate on this earth? How did the first formed organism appear? How did they 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.

Activity 1

Mix a drop of buttermilk with five drops of water. Place a drop of this mixture over a glass slide. Observe under microscope. Shall we draw and colour the forms what ever we have observed? These organisms that can be seen only under microscope are microorganism. These can be either unicellular or multicellular. These occur in air, water, land, food and other living organisms . The study of microorganisms is called Microbiology.

Organisms differ in their character, size, nutrition, habit and habitat. This is called Bio-diversity.

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

Let us think!

Are the microorganisms beneficial or harmful to us?

We know many people suffering from diseases like swine flu, bird flu, chikungunya, jaundice, polio, chicken pox, rabies and AIDS. What is the reason for this?

Virus

Virus cannot be seen with naked eye. It can be seen only through Electron microscope. Viruses cause a variety of diseases in plants and animals. These infect us when we are not aware of them.

The branch of science that deals with viruses is called Virology.

HIV

In 1984, Robert Gallo discovered HIV which causes AIDS

The branch of science that deals with bacteria is Bacteriology

Beneficial activities of bacteria

- Curdling of milk.
- Decomposition of organic wastes into manure.
- Fermentation of idly and dosai flour.
- Some bacteria act as bio-fertilizer increasing the yield.

Bacteria

How are Diphtheria and Pyorrhea caused?
How milk gets converted into curd?
How garbage becomes manure?
These are due to the minute organisms called bacteria, which was discovered by Anton Van Leeuwenhoek in 1675.

I am small. I have no shape. I am unicellular. Who am I?

Amoeba

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

Earthworm

Bacterial diseases

Plants - Citrus canker, Tomato blight

Animals - Anthrax, Tuberculosis

Human beings- Pneumonia, Tetanus, Tuberculosis.

Let us discuss.

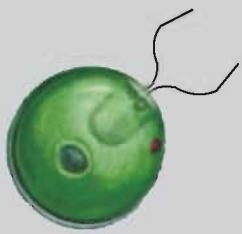
Let us divide into groups and debate on advantages and disadvantages of bacteria.

Activity 2

Observe a drop of dirty water placed on a slide under microscope. Can you see some moving microorganisms? Shall we draw what we have observed?

What a surprise! Cell cannot be seen with naked eye. It is surprising to know that there are organisms made up of a single cell. All activities like ingestion, digestion, respiration, excretion and reproduction are carried out by the same cell.

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



Activity 3

Have we not seen spongy layers on bread, pickle and on leather goods during rainy seasons? Take a layer from the bread with a needle and place it on a glass slide. Add a drop of water on it and observe under microscope? Shall we draw and colour what we have observed?

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

I have Segmented body. My food is found mixed with soil. I am also known as **"Friend of farmers'.** I can produce manure. Who am I?

Earthworm

Worms like tape worm, hook worm, *Ascaris* live in the human intestine. They cause indigestion, frequent stomach ache, dysentery and stomatitis.

It is good to intake properly cooked food and drink boiled water.

Activity 4

Shall we visit a vermicompost farm near by and discuss in the class room how vermicompost is prepared?

Mosquito, housefly and honey bee are insects. They can live in any part of the world. They have compound eyes. Among the animals, insects are found in large numbers. They are both beneficial and harmful to us.

Stagnant sewage water welcomes me, Human body is my vehicle, Their blood is my food, I am simple in my appearance and pierce like a needle. Disease is my partner. Who am I?

Mosquito

Activity: 5

List some of the insects that you find around your house observe the colour and number of wings of these insects.

I have fish in my name, but not a fish. I have spiny skin, but not a jack fruit. I have many colours, but not a rainbow. Even when broken into several pieces, I regenerate. Who am I?

Star fish

Some animals are marine, e.g., Star fish and Sea cucumber. Their skin is entirely covered with calcareous spicules. Using this they attack their enemies. What a surprise! These organisms regenerate the broken or lost parts.

Let's know

October 20
Mosquito Eradication Day

Locusts are called 'Farmers' enemy'.

Shell is my shelter. I have feet, but no fingers. I have soft body and slow walk. Who am I?

I'm snail!

I am four lettered. My habitat is five lettered. I'm found both in river and sea. If you consume me you are benefitted. If you don't consume, I am benefitted. Who am I?

Fish

I am green in colour. I am found in moist areas. Who am I?

Alga

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

Activity 6

We can go to the beach or river bank with our family members. We can collect different kinds of shells and make different shapes from this. Display it in the class. Classify the following based on their habitat.

Catfish, Shark, Murrel, Ribbon fish, Carp, Seer fish.

Marine living	Fresh water living (River, pond and well)

Have you seen slimy plants in stagnant water pools and canals? These are algae.

My species are found on the land. I reproduce in the water. I am an amphibian but not a frog. I am a Plant who am I?

Moss

Wow! Like frog, Moss is also an amphibian.

I am found in hills area.
I am an ornamental plant.
I grow in gardens and even in pots. Find me out!

Ferns

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

Activity 7

Where are the seeds of mango, guava and bean found? Most of the plants that we see in day to day life have closed seeds. Can we discuss and draw a few seeded plants along with peer in the class room.

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 e.g. Cycas, Pinus.

Activity 8

Take some soaked chick pea / groundnut / paddy / maize. Remove the skin. Can you separate the cotyledons inside?

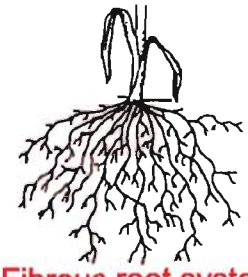
What I have learnt :These seeds can be divided into two halves.

Plants with seeds that can be separated into two cotyledons are called Dicotyledonous plants.

Plants with seeds that cannot be separated into two cotyledons are called monocotyledonous plants.

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

Tap root system



Fibrous root system

Activity 9

We have seen many weeds in the garden. Bring some uprooted plants to the class room. Wash the root with water and observe it. Like the pictures here, all the weeds will have any one of the root systems. Based on the root system divide them into two groups as A and B. Group A contains plants with tap root system. Group B contains plants with fibrous root system.

A.....

B.....

Let us observe the venation of the leaves in both the groups. Do the plants of group A contain web-like reticulate venation?

Reticulate Venation

Parallel Venation

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

Cobra

Caution!

Poisonous snakes :

Cobra
Krait
King Cobra

King Cobra

Most of the snakes are non-poisonous except a few. Killing snakes leads to destruction of such species.

Plants of group B contain parallel venation. What a surprise! Plants of each group have similarities in their root system and venation.

S.No.	Part	Monocot plant	Dicot plant
1.	Root	Fibrous root	Tap root
2.	Venation	Parallel venation e.g. grass	Reticulate venation e.g. shoe flower

Fill the following column by observing the stem and leaves of maize, coconut, shoe flower, sugarcane, bamboo and pipal tree.

Name of the plant	Branches			Venation- Reticulate / Parallel
	Big branches	Small branches	Without branches	

Let us know

- Crocodiles have colour blindness.
- Tongue of chameleon is twice long as its body.
- King cobra is about 5.5 m length. This is the most poisonous snake in the world. A drop of this poison can kill 30 persons.

Generally birds are the most attractive creatures in nature. They have sweet voice. They are economically important to mankind.

Activity 10

1. Draw a picture of your favourite bird and colour it. Write a small poem about it .
2. Can we visit a nearby poultry-farm and discuss in group about how they are maintained. Make a record of it.
3. Can we make some handicrafts by using feathers of birds and display in the class room.

On earth plants and animals are of diverse forms. They range from microscopic unicellular organism to the largest blue whale. It is our prime duty to preserve them from extinction.

Let us know

- Blue whale is the largest living organism. Its weight is equal to weight of 22 elephants. Its heart is of a size of a small car.
- Dog was the first animal to be 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 creature who can sleep with his back touching the floor.
- Trunk of the Elephant is a modified form of its nose and upper lip.
- Tusks are the Incisors of Elephant.

Ostrich

Ostrich's egg

Elephant

The size of an Ostrich's egg is equal to the size of 22 eggs of a hen.

Evaluation

I . Who am I?

1. I am an animal with a long neck. My height is about 20 feet. I have seven cervical vertebrae like other mammals. Who am I?
2. I am a flower. I am also called Vegetable Gold. Who am I?
3. I live in man, I cause diseases to man. I am a worm. Who am I?
4. I am a friend of farmers. I live in soil, I live in all continents, my body is segmented. Who am I ?
5. Shell is my shelter, I have feet but no fingers. Who am I?
6. I live in water and on land. I am an amphibious plant. Who am I?
7. I can change into living and non-living forms. Mostly I cause diseases. Who am I?
8. I am a plant, I have no stem, leaf and root. Who am I?

II. Choose the correct answer

1. Unicellular plant is

   a) *Euglena* b) *Amoeba* c) *Chlamydomonas*

2. Human being is

   a) Aves b) Mammal c) *Reptile*

3. Which is an Echinoderm?

   a) Jelly fish b) Star fish c) *Octopus*

III. Pick out the odd one

1. Elephant, Bat, Cat, Tortoise.
2. Crocodile, Tortoise, frog, snake
3. Mosquito, Housefly, Honey bee, Ascaris.
4. Sponge, *Amoeba, Hydra, Paramecium*
5. Tapeworm, Hookworm, Earthworm, Ascaris.
6. Tuberculosis, Diphtheria, Cholera, Chicken pox
7. Paddy, Sugarcane, Sunflower, Maize.

IV. Activity Plan

1. Collect and arrange the stamps with pictures of plants and animals.
2. Visit a nearby park and classify the living organisms which you see around.
3. Write about your pet animal in five lines.
4. Collect information about rearing of honeybee and silk worm (direct observation/newspaper/news/books/Library).
5. Collect different kinds of seeds. Write their names, measure and record their diameter. Draw any shape on a cardboard and decorate it with seeds.
6. Visit a nearby zoo, observe the various animals and discuss about their activities in the classroom.
7. Watch a T.V programme based on animals and forests. Make a detail note and give a speech in the classroom.

V. Answer the following

1. Organise a group discussion on advantages and disadvantages of microorganisms.
2. Why do we call earthworm as "Friend of farmers"?
3. How do you convince your friend that boiled water is good for drinking?

VI. Think and answer

1. What are microorganisms?
2. Write about fungi.
3. How will you differentiate dicot from monocot plants?

Fact File

1. The bird that can fly forward, backward and side ways is the Humming bird.
2. Birds like woodpecker and humming bird can't walk.
3. Do you know which organism is not affected with any kind of diseases? Shark.
4. Camel's milk cannot be converted into curd.
5. The only living organism that cannot stretch out its tongue is crocodile.
6. Lion's roar can be heard to a distance of 5 km.
7. Anaconda is the largest snake which will not lay eggs but give birth.
8. Kangaroo rat survives without water for many days than camel.
9. There are 17000 kinds of micro organisms in the human body.
10. All polar bears habituated to use their left hand.
11. Snail can pass through the edge of a sharp blade without getting hurt.
12. Microorganisms are the living forms having more number of types on the earth.
13. A dot can be filled with 70,000 Amoebae.

Humming bird

Camel

Kangaroo rat

Polar bear

Our Environment 5

This is the scene we see in public places.
Wastes and garbage are everywhere!

List out how the garbage is formed in the picture given above.

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Wastes are dumped everywhere due to the industrial development, over population and urbanization.

Shall we know how wastes are formed in our classroom?

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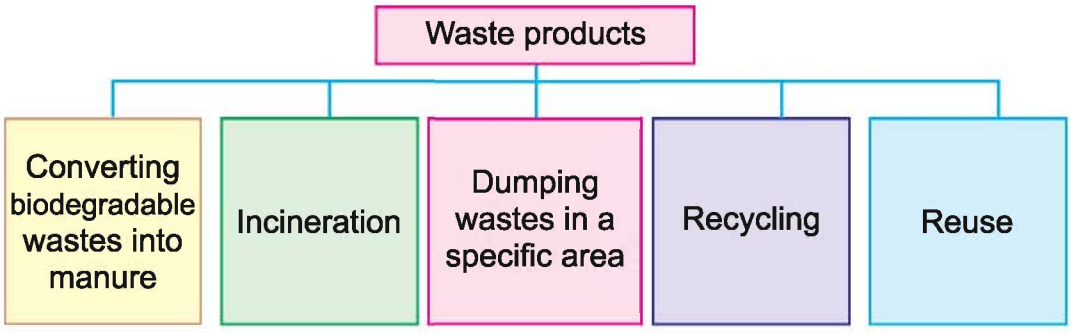
Shall we think?

- What will happen if wastes are not removed, then and there?
- How will this affect us?
- Can we change these wastes into non-hazardous products?
- What should we do for that?



The advantages and disadvantages of the above mentioned processes are given below:

Sl.No	Methods	Advantages	Disadvantages
1.	Composting	Soil fertility can be improved by using manure from wastes.	In most of our houses biodegradable and non-biodegradable wastes are not segregated. This prevents manure formation.
2.	Incineration	Ash obtained by incineration of plant and animal wastes can be used as manure increases soil fertility.	When wastes containing non-biodegradable substances like plastics are burnt, they produce toxic substances. These pollute the air we breathe.
3.	Land filling		• Occupies the land. • Produce foul smell. • While burning the dumped wastes, people around that area are affected. • Toxic substances from battery percolate down the earth and pollute the ground water. • Several diseases are caused by vectors which are attracted by decomposing wastes.

Sl.No	Methods	Advantages	Disadvantages
4.	Recycling	Waste products are recycled into useful products.	It is more expensive.
5.	Reuse	All resources are preserved	

Because of human activities, waste products are formed in public places like class room, house, street, transport vehicle, roadside, market and seashore.

Do you know?

Scavengers sort out wastes from dust bin and garbage. They play an important role in removing these wastes and help us to lead a healthy life.

Activity 1

- Collect waste papers from the school campus and make them into small pieces.
- Soak these papers in water for some time.
- Make them into a paste, so that paper is smashed well.

clearing the garbage

Do the same procedure with polythene covers. Is there any change?

Waste substances which pollute the environment can be divided into two as bio-degradable and non bio-degradable.

Wastes formed in our houses are also decomposed by microorganisms (bacteria) and earthworms, like the paper which is decomposed.

Decomposed substances are used as manure for plants. This is known as composting.

The product formed by the worms by decomposing the wastes is termed as "Vermicompost".

Shall we form a vermicompost pit in school campus?

Make a pit of 30cm 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 cm. 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.

In a day, earthworm consumes food equal to its weight.

Compost pit

Recycling is the conversion of unwanted used products, into useful products by decomposition.

Paper is a degradable substance. How can it be recycled? Shall we do an activity?

- Unwanted papers are collected and made into small pieces.
- Take a vessel and pour some water into it. The papers are soaked inside this for a day. Add some fenugreek into it.
- Take the soaked papers and grind it well like flour.
- Take this grinded paste and make some science models.
- Can we recycle all the substances as we have done with paper?

What is our role in removing garbage? Discuss about this in small groups and implement.

Most plastic items cannot be recycled. Even if recycled, the products formed are harmful to us. So it is necessary to avoid plastic items.

Our water resources (pond, lake, river, canal, and well) are polluted by sanitary water, industrial wastes, insecticides and fertilizers. Because of this many diseases like cholera, typhoid, dysentery and jaundice are caused.

The air we breathe is polluted due to the poisonous smoke emitted from the industries, exhausts from the vehicles, garbage, burning of tyre and rubber products.

The polluted air causes many diseases like allergy, cough, cold, cardiac diseases, respiratory diseases and cancer.

25% of the world population does not get safe drinking water.

Note:

The teacher must collect the information about prevention of water pollution from the students and summarize them.

Divide the students in groups of five or six and ask them to discuss about the reasons for land pollution. Then, each group must be asked to summarize the points and present it in the classroom. Finally, the teacher must summarize the reasons with related points.

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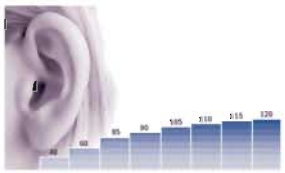
Every student should be asked simultaneously to sing loudly a few lines of a known song. The effects of the noise created by this act is to be elicited from the students. The teacher should summarize this.

Important words

- Biodegradable wastes
- Non-biodegradable wastes
- Composting
- Vermicompost
- Recycling
- Decibel

Points to Remember

- Waste products are classified into two- degradable and non-degradable.
- Degradable wastes can be converted into manure by using earthworm.
- Waste paper can be recycled and used again.
- The living organisms are affected by air, water, land and noise pollution.
- We can control pollution.



Sound is measured in decibel(dB).

Human being can hear about 10 to 120 dB.

Which of the following are biodegradable and non-biodegradable?

a) pieces of glass
b) paper
c) orange peel
d) plastic toy
e) egg shell
f) polythene bag.

Biodegradable

Non-biodegradable

Extended activity:

Identification of biodegradable and non-biodegradable materials:

Collect the waste materials from the kitchen for a week's time and segregate them into degradable and non-degradable substances.

1. Vegetables, peel of fruits, egg shell, food remains, tea dust, dry leaf and paper.
2. Polythene bag, glass pieces, Aluminium foils, nail and broken toys.

After segregating these substances, place them into two different pits and cover it with soil. Make a note of the changes and fill the following table. Discuss and present in small groups.

Pit	After 4 days	After 8 days	After 15 days	After 30 days
1				
2				

Our observation

.....

.....

.....

.....

.....

1. Recently it was informed in Mumbai that electricity can be produced from non-biodegradable products. What else can be produced from non-degradable materials?

2. Ink pen is better than use and throw pen, why? (Explain with a view on environmental conservation)

Evaluation

I. Choose the correct answer

1. ---------- decomposes degradable substances in the soil.

   a) microorganism b) scavenger c) earthworm d) machine

2. An example for the non-biodegradable product is ----------.

   a) paper b) cloth c) polythene bag d) egg shell

3. ----------is a place where the earthworm is reared in school premises.

   a) compost pit b) Solid waste c) dust bin d) liquid waste

4. Which waste product cannot be converted into manure?

   a) paper b) leaves c) cloth d) rubber tyre

5. Noise pollution can be measured by----------.

   a) decibel b) watts c) gram d) metre

II. Answer the following questions

1. Write how over population is related with increase in waste products and garbage?
2. Explain how non-biodegradable product like plastic can be recycled?
3. What is the reason for mosquitoes menace? Write about the diseases caused by them.

III. Think and answer

1. Write about the merits and demerits of composting?
2. What is meant by recycling?
3. How is our water bodies polluted?
4. List out the reasons for land pollution.
5. When is the world environment day? How is it celebrated?

Fact file

1. In 1862 the plastic was introduced in International Trade fair at London.
2. Only 1% of water in the world is used for drinking.
3. In a vehicle only 30% of fuel is used for driving, 70% of fuel is released as Carbon monoxide, which is a poisonous gas.

Dustbins used to collect wastes

Biodegradable wastes

Non-biodegradable wastes

Changes Around Us

6

Kalpana Chawla was the first Indian woman who travelled to the space. This is an excerpt from the interview given by her in the year 1997 when she returned from space .

Interviewer : How did you feel when you flew in the space? What were the changes you felt?

Kalpana Chawla

Kalpana Chawla :- In the beginning, all parts of the body seemed to lose weight. I was not able to feel any of my body parts, as our body loses weight in space. I was crossing India with excitement as the space shuttle was whirling with high speed. The Gangetic plains looked like a thin line, Africa looked like a desert and the river Nile was like a thin streak. I went round the whole world within one and a half hour. I observed with wonder, the changes of day and night within short span of time. The tremendous changes in the different phases of moon from New moon to Full moon within a short duration created thrill and amazement. Everything took place very fast.

How do you feel when you read her statements? Is it not wonderful? The slow and natural changes that take place on earth seemed to take place at a faster rate while we travel in the space.

What are the changes you come across, when you return from your vacation ?

We notice :

- the dried up canals
- the newly laid road
- the rusted bicycle.

I too want to go around the space

During the space travel kalpana chawla observed many changes like day and night which is due to rotation of the Earth. Shall we also observe the changes around us starting from the seasonal changes like rainy to winter, from winter to summer?.

Do all the changes take place at the same speed ?

Do you know ?

Trees which are buried under the earth nearly 34 crore years ago had undergone many changes and turned into coal.

Activity 1

Discuss in small groups and fill in the table

Changes	Duration few hours/ days/weeks/months/ years
Growth of a child Rusting of iron Germination of a seed The cooking of food Curdling of milk	_____ _____ _____ _____ _____

My Inference :

All changes take place in.....
(the same / different) time duration.

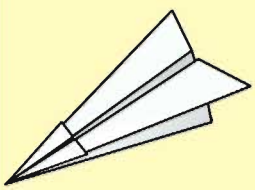
Changes that take place in a few hours, days months or years are called slow changes.

Fast Changes

Burning of a paper, bursting of crackers, glowing of an electric bulb take place in a few seconds or minutes. Is n't it ?

The changes that take place in a short duration of time are called fast Changes .

Is it possible to get back a substance after it had undergone a change ?



Activity 2

Take a piece of paper and make a model of rocket as shown in the picture. Shall we unfold it after playing? Can you get back the same piece of paper ?

What do you infer?.....

Can we get back the green vegetables from cooked ones?
The batter from Idly or dosa?
Raw rice from cooked rice?

Is it possible to get back the original substances in the above changes ? .....(yes/No)

Things required for the activity :
paper, balloon, bell pin and thread.

Take a balloon and inflate it by blowing air . After sometime release the air from it. Does the balloon get back its original shape?

What do you infer ? .....

Inflate the same balloon and tie it using a thread. Pierce it with a bell pin. Can you inflate the balloon again?

What do you infer ? .....

In some changes, the substance can be brought back to its original state. Such changes are called reversible changes.

You would have seen some hard metals like gold, silver, and Iron being used to make ornaments and instruments. In this process, metals are heated, melted and cast into desired shapes. On cooling they become hard. This is also a reversible change.

The change in which the substance cannot be converted back into its original form is called Irreversible change.

I have seen workers laying road using black substance (Tar). Is melting of tar a reversible change?

Shall we classify the following changes.

Reversible		Irreversible
_____	■ Curdling of milk	_____
_____	■ Melting of ice	_____
_____	■ Burning of wood	_____
_____	■ Batter into Idly	_____
	■ Evaporation of water	
	■ Ripening of fruits	

Are all changes useful?

Look at the pictures and write whether the changes are useful to us or not.

_____

_____

_____

_____

_____

_____

We find that some changes are useful and some others are not useful.

Changes that are useful are desirable changes.

Changes that are not useful are undesirable changes.

Do all the changes occur periodically?

1. Occurrence of day and night
2. Seasonal changes
3. Phases of Moon
4. Heart beat
5. Oscillation of pendulum

The above changes occur periodically, don't they?

The changes that occur frequently at regular intervals of time are called periodic changes.

Do you know any change that does not occur periodically?

1. Eruption of volcano
2. Earth quake
3. Land slide
4. Accident

The above changes do not occur frequently at regular intervals of time.

The changes which do not occur frequently at regular intervals of time are called Non-periodic changes.

Does energy evolve during changes?

Activity 3

1. Take a small amount of detergent powder in your palm and add water? How do you feel?
2. Take a small amount of quick lime in a beaker and add water to it. Touch the beaker . Share your experience with your peer.
3. Take a small amount of glucose in a beaker and add water to it. Now touch the beaker. How do you feel?
4. Take a small amount of water in a beaker. Add Ammonium chloride salt and stir it. Touch the beaker. How do you feel?

Experiment No.	My inference
1.	
2.	
3.	
4.	

Changes in which heat is liberated are called exothermic changes.

Changes in which heat is absorbed are called endothermic changes.

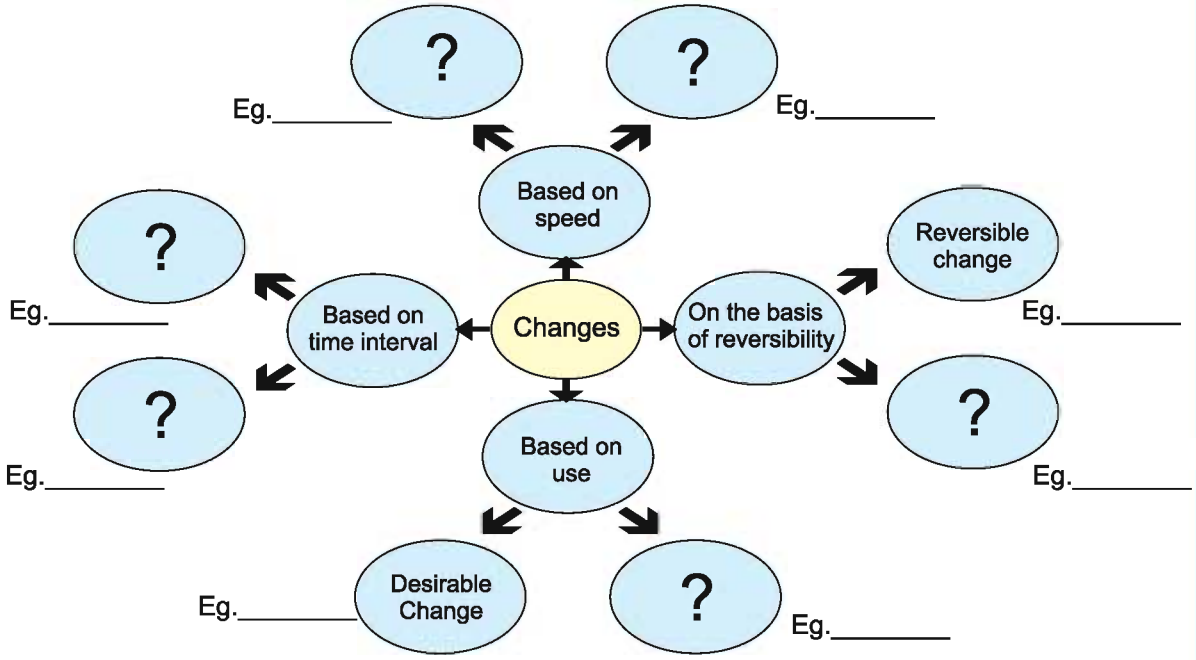
Activity 4

1. Observe the changes that take place in our classroom and school campus. Discuss , record, summarize and present it in the class .

2. Have you seen pot making? The potter is making the pot by heating wet clay. When can you get back the wet clay from the pot? (before heating /after heating) Discuss in small groups and find the changes that take place in this process.

Evaluation:

I. Fill in the blanks and question marks.



II. Identify the changes in the following.

(a) Tsunami (b) Swinging

(c) Occurrence of New Moon and Full Moon (d) Melting of wax

III. Answer the following.

1. Give five examples each for desirable and undesirable changes.
2. What type of change is earthquake? Why?
3. What is meant by slow change?
4. What is an irreversible change? Give example.
5. Explain periodic change.
6. You have broken your toy car. Under what type of changes do you classify this?

Separation of Substances

7

Ibrahim is very much interested in science. He won the first prize in a science talent search competition last week.The competition was very interesting and challenging. Let us know about it. Each participant was provided with (i) an empty bucket (ii) a bucket full of water (iii) a bag of sand and (iv) 1 ½" gravels.

- Participants are asked to fill the empty bucket with water, sand and gravels. The condition is that everything should be used and water should not overflow.
- Some of them poured water into the empty bucket first and then dropped the gravels. Immediately water overflew.
- Some put the sand first and then poured water. Bucket became full and gravels could not be put in that.
- Do you want to know what Ibrahim did?
- First, he put the gravels in the bucket, then he put sand gently on it and poured water slowly over it. The bucket was full. Everyone appreciated him and the place was filled with applause.

Then, Ibrahim was asked to separate the mixture. Shall we see how Ibrahim separated the mixture? First he poured out the water slowly from the bucket, and spread the wet sand and gravel mixture on a newspaper and dried it. Later he picked up the 1 ½" gravels using his hands and thus he separated the three components.

We drink water after filtering and boiling it.

We know that before cooking rice, it is cleaned with water.

When we drop a chocolate on the floor, do we eat it?
No. Why?

Dust particles stick to it. So we don't eat it.

The substances we use in our daily life should be clean and pure. We remove impurities and use pure substances.

While preparing tea, we separate tea dust by filtration. We purify Rava and wheat flour by sieving, rice and pulses by winnowing. All these methods are used to separate unwanted substances.

Let us learn about different methods of separation.

Do you know?
Agmark seal is used to ensure purity of food products.
(That is they are not adulterated)

Methods used to separate mixture of solids:

Solid mixtures can be separated by methods like hand picking, winnowing, sieving and magnetic separation.

Handpicking

How do we separate vegetables at home? We separate them into tomato, chilly etc. by using our hands. Separation is easier as they differ in size, colour and shape .

The method of separating the substances based on size , colour and shape using hands is called handpicking.

What is the method of separation shown in this picture?
What are the other things can be separated by this method?

Winnowing

Farmers allow the mixture of grain and husk to fall from a height when wind blows. Grains being heavier fall down and form a heap. Husk being lighter is carried away by wind and forms a separate heap.

The method of separating lighter particles from heavier particles using wind is called winnowing.

How will you separate a mixture of wheat flour and wheat granules?

Mixture containing lighter particles can be separated by winnowing.

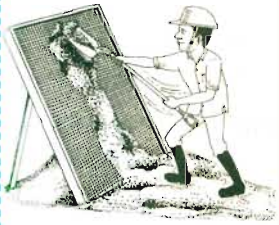
Sieving:

We can separate the impurities like bran, husk, stone, worms, stalk and tiny insects from flour by sieving. It allows the fine particles to pass through the pores while the coarser particles remain on the sieve itself.

This method is applicable only for the mixtures containing components of different sizes.

At construction sites, you would have seen the separation of pebbles and stones from sand by sieving.

The method of separation of components of different sizes from a mixture using a sieve is called sieving.



Magnetic separation

Insert a magnet into a heap of sand and take it out. If iron particles are present in the heap of sand, we can see them clinging to the ends of the magnet.

Magnetic separation is used to separate mixtures containing components which are attracted by magnet.

Can we separate iron substances from water using a magnet? Take a beaker and fill half of it with water. Drop some bell pins into it. Hold a magnet over the beaker and see what happens.

Our inference

Do you know?
Elevators which are used to lift heavy loads in harbor and construction sites uses electro magnets.

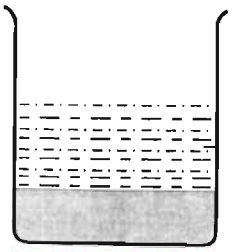
Shall we complete the table?

Mixture	Method of separation	States of components (Solid, Liquid, Gas)
1. Rice and pulses 2. Ragi and pulses 3. Sand and stone 4. Rava and Iron particles		

Can we separate a mixture of sand and water by the methods like sieving, winnowing or by magnetic separation? why?

Decantation, sedimentation and Filtration

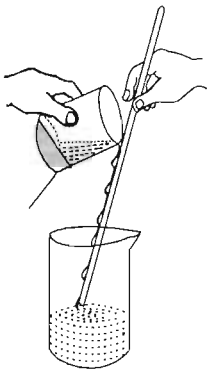
Decantation, sedimentation and filtration are the processes which help in the separation of insoluble solid from a mixture of solid and liquid.



Sedimentation

Sedimentation

In the mixture of insoluble solids present in liquid, solid particles are allowed to settle down as sediments. This is known as **sedimentation.** The clear liquid above the sediment is called **supernatant liquid.**



Decantation

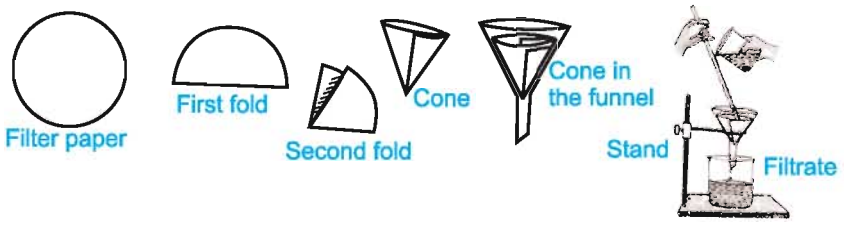
Decantation

Transferring the clear liquid (supernatant liquid) into another container using a glass rod is called Decantation.

Filtration

Observe the liquid obtained by decantation and see whether it contains suspended impurities. Try to filter the impurities using a clean cotton cloth. As there are minute pores in the cloth, the clear water passes through the pores and the suspended impurities like sand will remain over the cloth. In the laboratory we use a filter paper instead of a cloth to purify water.

Let us perform the experiment to purify water. Take a filter paper and fold it like a cone. Fix it inside a glass funnel. Fix the funnel in a stand and place it over a beaker. Pour the impure water containing suspended impurities through the filter paper. Clear water that is collected in the beaker is known as **filtrate.** The dust particles which remain on the filter paper is called **"residue".**



Do you know by which method salt is separated from sea water?

Methods used to separate mixture of soluble solids from solid in liquid mixture.

1. Evaporation 2. Condensation 3. Crystallisation

Evaporation

Take common salt solution in a container and place it over a wire gauze on the tripod stand. Heat the solution using a Bunsen burner. Allow the water to evaporate and observe what is left in the container.

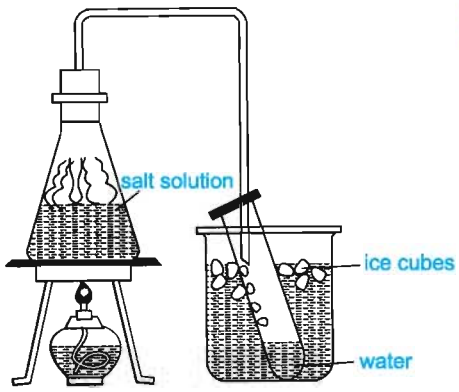
My inference

.....
.....
.....

We come to know that Common salt can be separated from water by the process evaporation.

Evaporation is a process in which a liquid changes into its vapour.

Let us separate a mixture of sand and salt. Dissolve this mixture by adding water to it. Salt gets dissolved. Filter this solution using a filter paper. Sand remains on the filter paper. Thus sand can be separated from the salt solution.



Condensation

Set up the apparatus as shown in the picture. Take the salt solution in a conical flask and heat it strongly. The water vapours pass through the delivery tube and get collected in a test tube. The test tube is placed inside a pack of ice cubes. The water vapours get cooled and condense into water. Salt remains as residue in the conical flask, once the whole water gets evaporated.

When the vapours get cooled, they condense into liquid. This process is known as condensation.

Do you know?

One litre of sea water contains about 3.5 grams of salts. Sea water contains not only common salt but also more than 50 other mineral salts. These salts are industrially important.

I want to get back the salt. Don't worry, you can get back water also.

Salt pan

Shall we complete the table?

Mixture	Method of separation	Physical states of the components (Solid,Liquid, Gas)
Sand and water		
Mixture of rava and water		
Salt and water		

Do you know?

Evaporation and Condensation are the processes which are responsible for Water cycle. Formation of rain involves these two processes.

In some cases there is a need for using more than one method of separation to get a pure substance.

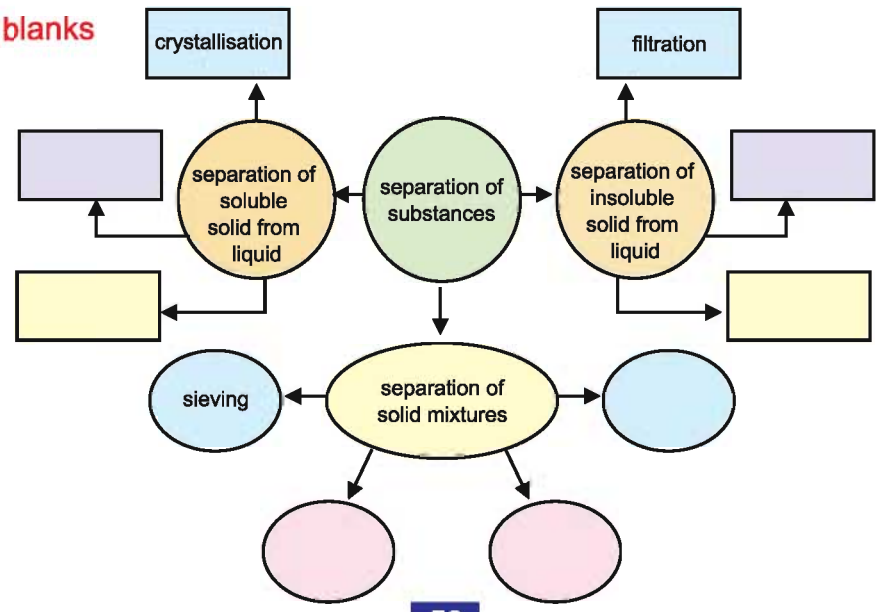
The various substances which we use in our life, reach our hand only after undergoing different methods of separation and purification.

For example, in the preparation of sugar from sugar cane juice, filtration, evaporation and crystallisation methods are used.

Discuss the different methods involved in the separation of sand and salt and list out.

Evaluation

I. Fill in the blanks



II. Choose the correct answer

1.Suitable method of separating lighter impurities from a mixture.
a) winnowing b) handpicking c) vapourisation

2.In a mixture, solids of different size can be separated by ..... Process
a) magnetic separation b) winnowing c) sieving.

3.The method used to separate the seeds from the fruit juice is .....
a) filtration b) sieving c) crystallisation

4.Separation of common salt from the sea water is by .....
a) sieving b) evaporation (c) magnetic separation.

5. The method used to separate substances differing in colour, size and shape
a) Magnetic separation b) decantation c) handpicking.

III. Answer the following

1.Explain decantation.

2.Mention the method of Separation involved in obtaining clear water from muddy water.

3.Explain winnowing method of separation of mixtures.

4.Explain the process of sieving

5.Define filtrate and residue.

6.Explain condensation method.

7.Explain magnetic separation method.

8.While preparing a lemonade, we add ice cubes to make it cool. When will you add sugar into the juice, before or after adding ice cubes? Why?

IV. Correct the following wrong statements

a) We can separate the different kinds of vegetables by winnowing.

b) Lighter particles present in a mixture can be separated by magnetic separation.

c) The method of converting liquid into vapour is known as condensation.

d) Sieving method is used to separate a magnetic substance from a mixtrure.

V. Fun with science

Spot out the different methods of separation in this word puzzle.

P	W	X	N	C	B	A	T	I	M	C	F	I	L	T	I	Q	F	O
Q	R	A	C	O	N	D	O	L	I	N	I	A	I	E	X	Y	I	E
L	T	C	R	N	Y	S	N	I	X	Y	L	O	Q	U	I	D	L	V
T	O	L	Z	D	E	C	A	N	T	A	T	I	O	N	A	C	T	A
S	J	S	I	E	V	S	O	L	U	T	H	Y	X	O	U	V	E	P
M	I	X	E	N	W	A	T	E	R	V	A	P	O	U	R	T	R	O
T	L	R	E	S	I	D	U	E	E	X	T	L	M	O	S	Q	P	R
I	S	E	V	A	P	T	I	O	S	I	E	V	I	N	G	O	A	A
C	R	Y	S	T	A	L	L	I	S	A	T	I	O	N	N	G	P	T
L	I	Q	U	I	D	V	A	P	T	N	I	O	I	A	Q	R	E	I
I	L	T	S	O	L	U	T	I	O	N	L	E	O	T	X	Y	R	O
Q	M	A	G	N	E	T	I	C	S	E	P	A	R	A	T	I	O	N
P	T	R	O	A	D	D	X	Z	L	J	Y	D	C	S	Q	R	W	A

Project:

1. List out the various methods of separation used in our day to day life. Mention how and where they are used. Mention their significance.
2. Identify the kind of mixture used in the construction sites. Collect information and conduct group discussion in the class.
3. Discuss in groups how salt is obtained from sea water. Collect relevant pictures and stick in your scrap book. Find out the places of salt pans in Tamil Nadu.

Fact file

1. Crude oil is a mixture from which nearly eighty six substances like petrol, Kerosene and Naphtha are obtained.
2. Air is a mixture of gases.

Chemistry in Daily Life 8

Let us know the daily routine of Tamilarasi.

Shall we compare our daily activities with that of Tamilarasi? Like us, she too uses tooth paste to brush her teeth, a soap to take bath and shampoo for head bath.

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

She washes her clothes using detergents.

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

Tamilarasi's parents are constructing a house and she observes all the materials which are purchased like cement , bricks , gravels , and iron rods before she goes to school.

Most of the things which she has used at home, and the materials which she has observed are chemical substances. Are n't they?

Today we are living in consumer Era.

We buy things from the leading manufacturers and consume them. So we are called as consumers.

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

Considering the chemical property of naturally available raw materials , we produce many things which are very useful in our daily life. These substances are called chemical substances.

We also manufacture things which are in great demand using the knowledge of chemistry .

Tamilarasi's house and school

We all would have enjoyed making sand houses with our friends during our childhood days . In real life, can we build a house only with the help of sand?

List out the materials used in the construction of Tamilarasi's house and school.

_____ _____ _____

_____ _____ _____

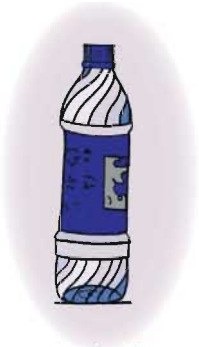
Cement is a chemical substance which is mainly used in the construction of buildings. Cement is a mixture of clay, limestone and gypsum added in right proportion. It is a very soft greyish powder, which gets hardened when water is added to it.

In olden days, houses were built using limestone mixture . Nowadays we build houses, dams, etc. using cement.

Mixture of cement, sand and water is used to give smooth finish to our floors and walls of buildings. The roof of Tamilarasi's house is laid using concrete material.

Concrete is a mixture of sand, cement, gravel and water in correct proportion. Do you know? we use concrete not only to build roofs but also pillars, bridges, dams, water tanks, drainage pipes and roads.

Tamilarasi's water bottle



water bottle

We are very familiar with the word Plastics. Decade ago, people used containers and vessels made of glass and metals. But today's world is dominated by plastics. Plastics is also a chemical compound. It can be made out of P.V.C. (Poly vinyl chloride). Water bottles are also made out of P.V.C. Tamilarasi's water bottle is also not an exeption. What type of plastics is it made of?

Plastics are of two types. Plastics which melt on heating and can be remoulded is known as thermo plastics .

Example: polythene bags, plastic toys, plastic buckets, combs etc.

Plastics which gets hardened on heating and which cannot be melted and remoulded again is termed as thermosetting plastics .

Plastic chairs, switches, handles of pressure cooker and insulators all are made of thermosetting plastics .

Though plastics are widely used in all fields of our activities, they also affect our environment in various ways.

Plastics which are disposed by us bring about the following effects.

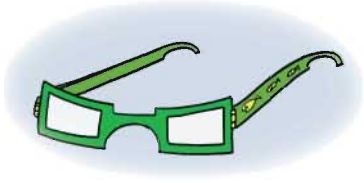
- Plastics do not get easily degraded.
- They do not allow the rainwater to seep through the soil.
- They affect the growth of the plants.
- Water gets stagnant in these disposed plastic pieces. It becomes the breeding place for mosquitoes, which in turn spreads contagious diseases .
- They arrest the flow of rivers and fresh water streams .
- When food contaminated with plastic material is consumed, it leads to the death of living organisms .
- When Plastics are burnt, they emit toxic gases which cause respiratory problems.

As plastics cause a lot of pollution in land, air and water, we must avoid the usage of plastics. Instead of plastics we can use things made of cloth, jute, coir and paper which are degradable.

Discuss with your peer and find the ways of keeping your school a 'Plastics free zone'.

Tamilarasi's Spectacles

As soon as we hear the word glass, it reminds you of your spectacles and mirrors. Where are glasses used in general?



Glasses are also used in window panes, automobiles. They are used widely for domestic purposes.

Discuss in small groups and present how we make use of glasses in our day-to-day life.

There is a plane mirror in Tamilarasi's house. She is wearing glass spectacles.

There are different variety of glasses.

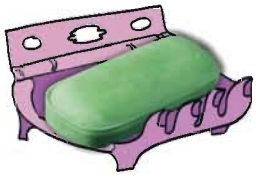
- Some glasses like spectacles can allow the light to pass through them, as they are transparent in nature.
- But in the case of mirrors, there is a coating of a special chemical substance at the back. So the light rays get reflected and we are able to see our images.

Let us know what are glasses made of ? Glass is obtained from chemical substances like sand, lime stone and sodium silicate.

The above mixture is heated to a high temperature, melted and poured into a suitable mould to get a desired shape.

Glass finds a wide range of application in the manufacture of window panes, automobile windows, laboratory apparatus like standard flasks, test tubes etc.

The only material which can be recycled to 100% is glass



Tamilarasi's Soap

We also use two different types of soaps for bathing and washing in our day to day life like Tamilarasi.

How is soap prepared? Can we prepare soap at home?Yes, we can prepare soap at home provided sodium hydroxide is available. Sodium hydroxide can be bought from chemical suppliers.

Let us note the raw materials required to prepare soap.

(I) Water - 35 ml

(ii) Sodium hydroxide (caustic soda)- 10 g

(iii) Coconut oil – 60 g

Procedure

Take 35 ml water in a beaker and dissolve 10 g of sodium hydroxide pellets in it . Allow the liquid to cool. Add 60 grams of coconut oil to this solution little by little. Stir it gently till it becomes a paste. Pour this paste into an empty match box to get the soap.

We use variety of soaps in our day to day life.

1. Washing soap
2. Bathing soap
3. Baby soap
4. Liquid hand washing soap

The above variety of soaps are made of different raw materials. Look for the information on the soap wrappers, tabulate and discuss in small groups.

Sl.No.	Name of the soap	Ingredients

We can also discuss the medicinal uses of soaps in small groups.

Food particles get contaminated with the germs in our hands and causes diseases. We should always wash our hands before we eat any food item. We can prevent the spread of viral fever and other infections by using soaps.

Demonstrate in the class the usage of liquid soap for maintaining hygiene.

Tamilarasi's Uniform

Ancient man wore the leaves of plants and skin of animals as clothing. But in our civilized world we have developed fashionable and attractive dresses.

Let us find answers for the following questions.

- Do you know out of which material your uniform is stitched?
- How are clothes manufactured ?
- Do we use the same kind of cloth?

- Which cloth is suitable for summer?
- What kind of cloth did Mahatma Gandhi wear?
- What is rain coat made of?
- Have you heard of terrylene and polyester? what are they?
- From which do we get the woollen clothes, we use in winter ?

When we try to tear the bit of cloth into fine strands, we can get the fibre.

Natural fibres

When the cotton fruit matured, they burst open and the seeds covered with cotton fibre is seen. The seeds are separated to get the fine fibre of cotton. Fibres are drawn together and twisted to get thread. Cotton threads are used to make cloth. Cotton fibre consists of a chemical substance called "Cellulose".

We get the natural fibre from cotton, Jute and coconut plants. We get woollen fibre from sheep. Silk fibre is obtained from silk worms. These fibres are called natural fibres.

Natural fibres

The fibres like polyester, nylon and rayan are synthesized using scientific technology. They are called synthetic fibres.These synthetic fibres are not only used in making cloth but also used to make fishing nets, ropes, parachute. They are also used in industries.

Discuss in small groups about the kind of dress one has to wear for space travel.

Synthetic fibres

Have a debate on the topic, " Invention of plastics is a boon or bane" in your science club.

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

Eureka questions

1. Is the usage of mosquitoes repellant good? Is it a chemical substance?
2. What is paper made of ?

Evaluation

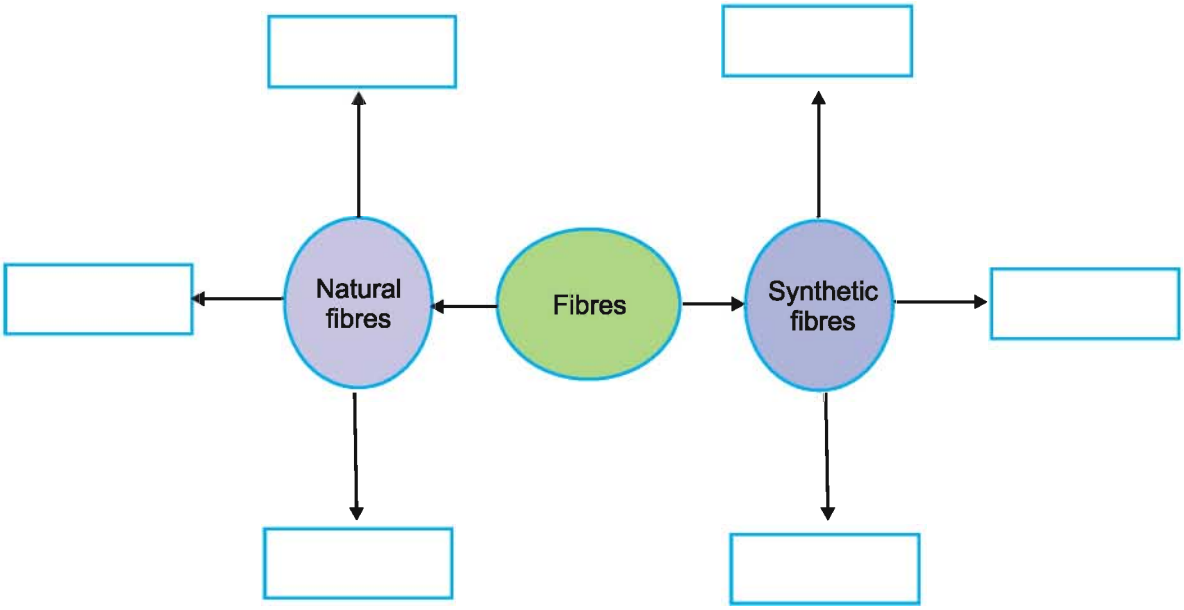
I. Match the following

Eyes	Tooth paste
Teeth	Glass
Hair	Soap
Clothes	Shampoo

II. Answer the following

1. Ban on plastic - List out the reasons.
2. Write the components of cement and mention its uses.
3. Explain the two types of plastics.
4. Explain the methods of preparing soap
5. Which is used to manufacture fishing net and parachute?
6. What are the different types of soaps?
7. What is concrete?
8. What is glass made of?. List out its uses.

III. Fill in the blanks



Measurement and Motion 9

Measurement

On a holiday Ezhil went to market with his father. First they went to a grocer's shop. Ezhil 's father asked for the following.

Rice	- 10 kg
Bengal gram	- 500 gm
Groundnut oil	- 2 litres
Ghee	- 200 millilitres

The shopkeeper used a balance for measuring rice and bengal gram. He measured oil and ghee with a measuring jar.

They went to a flower shop and bought 5 cubit garland. Then they went to a textile showroom and selected a shirt material and asked 2 metre. The shopkeeper measured 2 metre of the cloth with a metre scale and gave them.

They went to a vegetable shop and asked for the following vegetables.

Lady's finger	- 1 kg
Green chillies	- 100 gm
Onions	- 2 kg

The shopkeeper weighed the vegetables with the help of a balance. On their way, they went to a fruit stall and asked for a dozen bananas. The shopkeeper counted and gave 12 bananas. After buying fruits they returned home. Ezhil had a doubt and asked his father, "Why do we need to order different items in different terms?"

In order to clear his doubt , his father asked him to prepare a list of the items purchased, their quantities and the instruments used for measuring them. Ezhil started preparing the list. Shall we help Ezhil?

Activity 1

Item	Quantity	Measuring Instrument

Activity 2

What are the instruments used to measure the following? Discuss in small groups and write them down.

1. Shirt material : ----------
2. Sugar : ----------
3. Cooking oil : ----------
4. Tomatoes : ----------
5. Length of your science text book : ----------
6. Time taken to reach school : ----------
7. Kerosene : ----------
8. Duration of Tamil period : ----------

From the above activity we have learnt that metre scale, balance , clock, measuring jar, etc. are measuring instruments.

What is measurement?

Now, shall we measure the length of our class room cupboard using a metre scale? Have you measured the length? If it is 2 metre then 2 is the magnitude and metre is the unit of length. Metre is a fixed quantity but the quantity 2 is to be determined.Here the length of the cupboard is two times length of 1 metre.

Can we measure the mass of your school bag using a balance? If it is 3 kilogram, here 3 is to be determined. Kilogram is the unit of mass. That is, the mass of the bag is 3 times the mass of 1 kilogram.

Similarly, if it takes 20 minute to reach your school from home, then 20 is to be determined and minute is the unit of time.

Measurement is a process of comparision of an unknown quantity with a standard quantity of the same kind. Here metre, kilogram and minute are units. We have learnt that many physical quantities have both magnitude and unit.

The need for Standard Unit

Activity 3

Each of you, measure the length of the table in your classroom in terms of hand span. Fill up the following table.

	Name of the Student	Length of the table in hand span
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

In the above activity even though length of the same table is measured, each one gets a different value. It is because the length of hand span differs from person to person. That is why measurement of length of garland in cubit by you and shopkeeper differs.

Measurement of a quantity by different people should give the same value. This is called standard measurement. Hence cubit, hand span are not standard units. Metre, kilogram and second are the standard units.

SI system (System International d'Unites)

In early days people in different parts of the world used different system of units for measuring length, mass and time. A few systems of units are

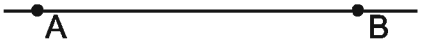
1. FPS (Foot, Pound, Second) system
2. CGS (Centimetre, Gram, Second) system
3. MKS (Metre, Kilogram, Second) system

In order to overcome the difficulties of using different systems of units, an International system was adopted in 1971. This system is called SI System. Shall we know the SI units of length, mass and time?

Physical quantity	SI Unit	Symbol
Length	Metre	m
Mass	Kilogram	kg
Time	Second	s

Measurement of length

Draw a straight line in your note book. Plot two points A and B on the line.



Measure the distance between the two points using a scale. Now what you have measured is length. The distance between two points is called length. The SI unit of length is metre. To measure length we use measuring tape , metre scale etc.

Activity 4

Shall we measure the length of the following and write them in proper units?

Length of your pencil ----------

Length of your thumb ----------

Length of your eraser ----------

Length of a leaf ----------

Length of your pen nib ----------

Length of the nail of your little finger ----------

Know yourself

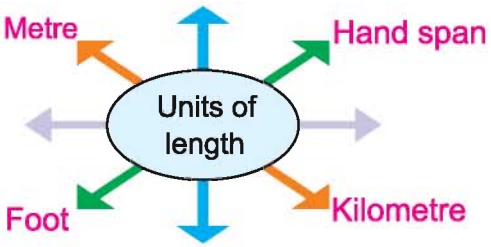
Length of cloth required for stitching your shirt ----------

Distance of your home from school ----------

Distance of your neighbouring town from home. ----------

Distance of the state capital from your place. ----------

Shall we write down the different units of length used in the above activities?



Multiples and submultiples

In the above activity, larger distances such as the distance between two places are expressed in kilometre. This is called multiple of length. We express smaller lengths such as length of a pencil, pen nib etc. in centimetre and millimetre. These are called submultiples.

Physical quantity	SI unit	Multiples	Submultiples
Length	Metre	Kilometre	Millimetre Centimetre

1 metre	= 1000 millimetre
1 metre	= 100 centimetre
1 kilometre	= 1000 metre

Measurement of mass

Activity 5

Have you ever gone to a market? How do they measure rice, pulses, vegetables etc.? What instrument do they use to measure? Why do they not use the units millimetre and centimetre in measuring rice, pulses, vegetables etc.? In what units do they measure? Discuss with your friends and find out the answer.

Physical balance

From the above activity, we have learnt that all the quantities are not measured in the same unit. Different units are used for different quantities.

Activity 6

Among the three , a handful of rice, a handful of sand and handful of cotton, which one is heavier?

Sand is heavier beacuse the amount of matter contained in sand is more than the amount of matter contained in rice and cotton.

The mass of a body is the amount of matter contained in it. The SI unit of mass is kilogram. We use beam balance, physical balance and electronic balance for measuring mass.

Multiples and submultiples of mass

The mass of sugarcane, cotton etc. larger than 1 kilogram are measured in quintal and metric tonne. These are called multiples of mass. Similarly, the mass less than 1 kilogram is measured in gram and the mass less than 1 gram is measured in milligram. These are called submultiples of mass.

Activity 7

Carefully observe the wrapper of the following items and write down masses mentioned on it.

Mass of toilet soap ----------

Mass of washing soap ----------

Mass of a biscuit packet ----------

Know yourself

The quantity of rice purchased per month at home _____

The quantity of vegetables used at home per day _____

Physical quantity	SI unit	Multiples	Submultiples
Mass	kilogram	quintal metric tonne	gram milligram

1 gram	= 1000 milligram
1 kilogram	= 1000 gram
1 quintal	= 100 kilogram
1 metric tonne	= 1000 kilogram

Measurement of time

We perform many activities in our day-to-day life. Many events take place, but duration of each event differs.

Activity 8

Look at the following activities. Discuss in small groups and tabulate the events / activities according to their duration.

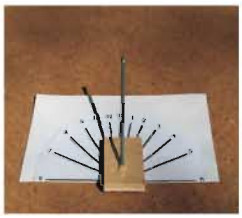
1. Time taken for bathing
2. Duration of sleep
3. Working hours of your school
4. Time taken to blink your eyes
5. Time taken for ripening of fruits
6. Time taken for a plant to grow into a tree
7. Time taken for curdling of milk
8. Time taken to weave a saree
9. Time interval between a new moon and full moon
10. Duration of child to become a grandfather / grandmother
11. Time taken for a paddy to grow
12. Duration between quarterly and half-yearly examination
13. Time of fall of a coconut from a coconut tree

Events / activities occurring in second	Events / activities occurring in minute	Events / activities occurring in hours	Events / activities occurring in days / months	Events / activities occurring in years

From the above events / activities, we have learnt that we use different units for measuring time.

Time is defined as the interval between two events. The SI unit of time is second.

For measuring time we use pendulum clock, wrist watch, wall clock, stop clock etc. In olden days people used sundial, sand clock, water clock etc. For measuring time accurately nowadays we use electronic clock and atomic clock.



Multiples and sub multiples of time

Time interval larger than 1 second is expressed in minute, hour, day, week, month, year etc. These are called multiples of time. Any time interval less than 1 second is expressed in millisecond, microsecond etc. These are called submultiples of time..

Physical quantity	SI unit	multiples	sub multiples
Time	second	minute, hour, day, week, month, year	millisecond, microsecond

1 minute = 60 second
1 hour = 60 minute
1 day = 24 hour
1 year = 365 ¼ days
1 second = 1000 millisecond
1 second = 1000000 microsecond

Evaluation

I. Choose the correct answer.

1. SI unit of length is

   a) centimetre b) millimetre c) metre d) kilometre

2. SI unit of mass is

   a) gram b) kilogram c) milligram d) centigram

3. 1 metric tonne is equal to

   a) 1000 kilogram b) 100 kilogram c) 1 kilogram d) 10 kilogram

4. SI unit of time is

a) second b) minute c) week d) day

5. _____ second is equal to an hour

a) 60 b) 3600 c) 24 d) 1000

II. Fill in the blanks

1. 1 metre = _____ centimetre
2. 1 kilometre = _____ metre
3. 1 quintal = _____ kilogram
4. 1 minute = _____ second

III. Answer the following questions

1. Define measurement and unit.
2. What is the significance of standard units?
3. What are the SI units of length, mass and time? Mention their symbols.
4. What are the multiples and submultiples of length?
5. What are the multiples and submultiples of mass?
6. What are the multiples and submultiples of time?
7. Expand the following

(i) FPS (ii) CGS (iii) MKS (iv) SI

Project

1. Measure the length and breadth of your class room and write them in foot, hand span, centimetre and metre.

2. Make model of a sand clock.

Motion

We look at different objects in our daily life .Of them, many move from one place to another place. Some of them remain stationary. With our experience, shall we do the following activity?

Activity 1

On your way to school, observe your surroundings and classify the objects into moving and stationary objects.

Objects in motion	Objects at rest
.....	.....
.....	.....

From the above activity we have learnt that some objects move and some remain stationary.

Can we find out whether an object is at rest or in motion only by observing them directly?

Activity 2

Do the earth, air etc. move ? If they move, how do we know? We may get more information through a small group discussion.

From the above discussion, we see that some objects change their position with time. Even though in some cases, we do not see the objects changing their position directly we come to know their motion from other effects. If an object does not change its position with respect to time, it is said to be stationary. If the object changes its position with respect to time then it is said to be in motion.

How do we differentiate rest from motion?

Have you travelled in a bus? When you look out from a moving bus, do the trees, houses, lamp post appear to be stationary or in motion? Share your experience in small groups.

Akilan had two friends Mugilan and Selvam. Akilan invited his friends to his town for a circus show. The three friends went for the circus show and enjoyed the funny dance of the clown. Akilan returned home and his friends reached the bus terminus and got into a bus. The bus passed by Akilan's house. As Akilan was in the sit-out, he waved hands to his friends.

Next day when Akilan met his friends in school, he shared his experience with his friends. Akilan said, "When I was in the sit-out, I saw you in the moving bus and I waved hands".

Mukilan and Selvam said, "When you waved your hands we were in the moving bus. You and your house appeared to move backwards" .

What do we learn from this?

An object may appear to be stationary for one observer and appear to be moving for another. An object is at rest in relation to a certain set of objects and moving in relation to another set of objects. This implies that rest and motion are relative terms.

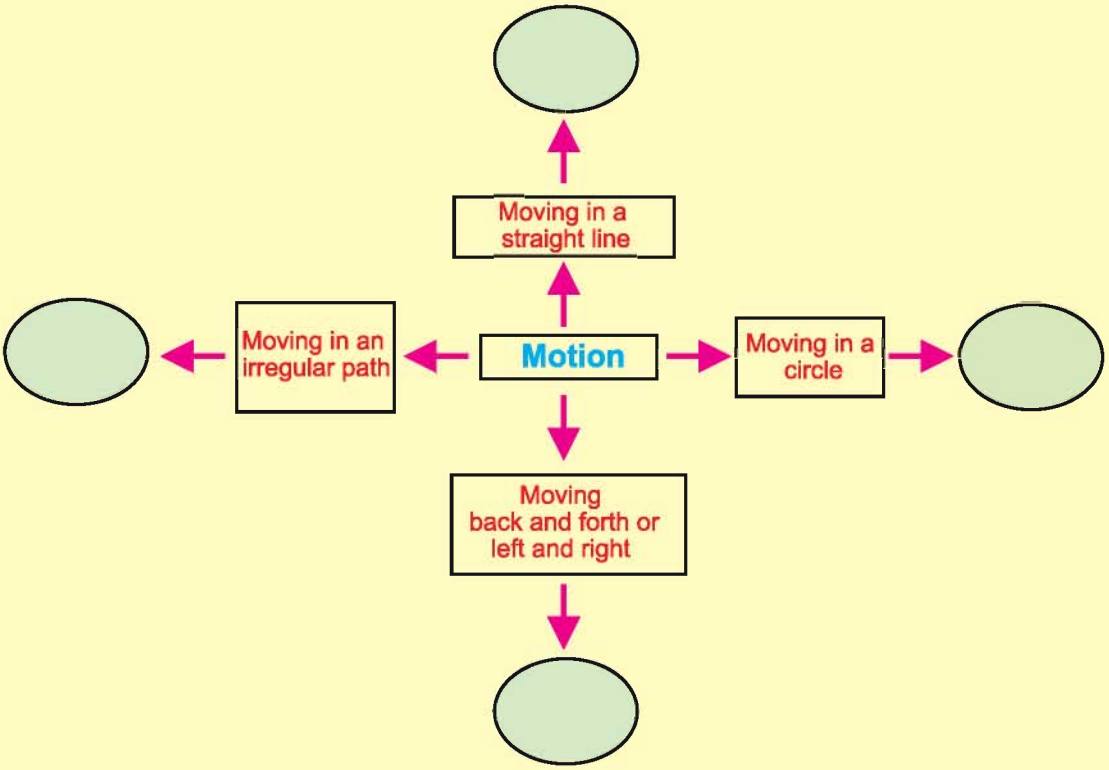
Motion is defined as the change of position of an object with respect to time.

Are the following motions same or different type? Discuss in small groups and classify.

Activity 3

1. Motion of a sprinter running a 100 m race
2. Motion of a coconut falling from a tree
3. Marching of soldiers
4. Motion of blades of a fan
5. Movement of your hand when you write on a note book
6. Motion of the moon around the earth
7. Motion of a ball in a foot ball match
8. Motion of the earth revolving around the sun

9. Motion of children playing on a sliding board
10. Motion of the wagging tail of a dog
11. Motion of children playing in a play ground
12. Motion of flies and mosquitoes
13. Motion of children playing in a swing
14. Motion of flapping of elephant's ears
15. Motion of people in a bazaar
16. Motion of people on a carnival day
17. Motion of a spinning top
18. Motion of opening and closing of a draw



From the above activity, we have come to know that there are different types of motion.

Linear motion and Circular motion

Linear motion

When an object moves along a straight line, it is said to be in linear motion.

Motion of a body dropped from the top of a building and motion of a lift are examples for linear motion.

Circular motion

If an object moves along a circular path, it is said to be in circular motion.

Motion of a merry go round, motion of hands of a watch and motion of grinder are examples for circular motion.

Can a body perform more than one type of motion at a time? We ride a bicycle. What type of motion does the wheel perform? What type of motion does the entire cycle perform? What do we understand from this?

The motion of the wheels of a bicycle is circular, whereas the motion of the entire bicycle is linear. The wheels of a bicycle perform circular as well as linear motion simultaneously. Similarly, a rolling ball and a drilling machine perform more than one type of motion simultaneously.

Can you think of any other object performing more than one type of motion simultaneously? Explain.

Science Today

Robot

Issac Asimov is called as father of Robot. It is he who named the machine as Robot (derived from Philippines language). Robot is a human machine. We programme the machine (Robot) to do the work we want it to do.

The machinery parts of Robot follow and implement the commands already programmed. Robots are run by heavy batteries. Robot's brain is nothing but an electronic chip. The movements of Robot are controlled by electronic chip or computer. Nowadays well designed Robots are used for complicated and minute clinical surgeries. Very soon we may have Robots in our homes to do house hold work. How nice would it be to have a Robot to do our home work?

Imagine and draw the various activities, a Robot can do in your school.

Evaluation

I. Choose the correct answer.

1. The motion of a rolling ball is

   a) circular b) linear

   c) circular and linear d) oscillatory

2. Who is the father of Robot?

   a) Sir Issac Newton b) Issac Asimov

   c) Galileo d) Thomas Alva Edison

II. Answer the following questions.

1. When do you say that an object is in motion?
2. Distinguish between linear motion and circular motion.
3. Give three examples for circular motion.
4. What type of motion does a drilling machine perform while in operation?

Do it yourself

Spread a large sheet of white paper on the ground and keep a little sugar on it. Ants are likely to be attracted to the sugar and you will find many ants crawling on the sheet of paper soon. For any one ant, try and make a small mark with a pencil near its position when it has just crawled on to the sheet of paper. Keep marking its position often a few seconds as it moves along on the sheet of paper. After some time, shake the paper free of the sugar and the ants, and connect the different points you have marked with arrows to show the direction in which the ant was moving. Each point you have marked shows where the ant moved to, in intervals of a few seconds.

Motion seems to be some kind of a change in the position of an object with time, isn't it?

10 Magnetism

You might have seen magnets. Have you ever enjoyed playing with them? Why do the pins stick to the pin holder placed on headmaster's / headmistress's table?

Why does the door of a refrigerator close by itself after opening? Because the magnets are attached to the pin-holder and the refrigerator.

Already we know that magnet attracts pins, iron pieces and iron particles in sand. Cranes are used to lift heavy iron loads. Powerful magnets are used in cranes.

Powerful electromagnets are used to operate electromagnetic trains, lifts and escalators.

Magnes

Discovery of magnets

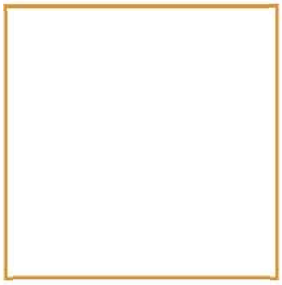
How magnets were discovered? It is an interesting story.

It is said that, there was a shepherd named Magnes, who lived in Magnesia in Asiaminor. He used to take his herd of sheep and goats to the nearby mountains for grazing. He would take a stick with him to control his herd. The stick had a small piece of iron attached to one end.

One day he was surprised to find that he had to pull hard to free his stick from a rock on the mountain side. It seemed as though the stick was being attracted by the rock. He thought that the rock was God. The rock was a natural magnet and it attracted the iron tip of the shepherd's stick. It is said that this is how natural magnets were discovered.

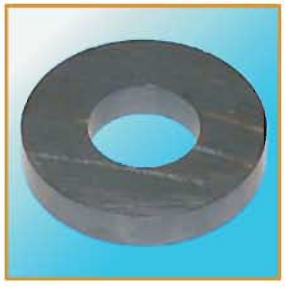
People have discovered that certain rocks have the property of attracting pieces of iron. In early days Chinese navigators used magnets to find the direction. The magnetites are the natural magnets. They are called as magnetic stones. Natural magnets do not have definite shape. When a magnet is freely suspended, it always comes to rest in north- south direction. That is why they are called as leading stones or load stones.

After the method of magnetization of iron plate came into practice, we started making different types of magnets and using them.



Bar magnet

Horse shoe magnet



Ring magnet

Substances attracted by magnets

Shall we find out whether pen cap, plain pins, pencil, blade, nail, chalk piece, iron ball, plastic scale, wooden scale and coin are attracted by magnet or not? Shall we discuss in small groups and list them?

Substances attracted by magnets	Substances not attracted by magnets

We understand that, magnet attracts certain substances whereas some other substances do not get attracted.

The substances that are attracted by a magnet are called magnetic substances.

The substances that do not get attracted by a magnet are called non-magnetic substances.

Does magnet have poles?

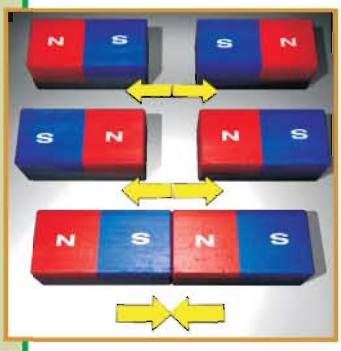
Is it not an interesting question? It is better to find out by ourselves. To perform a simple experiment, it is sufficient to have iron filings and a magnet. Spread some iron filings on a sheet of paper. Now place a bar magnet on the iron filings. What do you observe? The iron filings stick all over the magnet, but more iron filings stick to the ends. Even in a horseshoe magnet more iron filings stick to the two ends.

The attractive force is more at the two ends of a magnet. We call the ends as poles.

Which is north pole? Which is south pole?

The poles of a magnet are easily found by freely suspending the magnet as shown in the diagram. A freely suspended magnet always comes to rest in north–south direction after being disturbed. North seeking pole is called north pole. South seeking pole is called south pole.

Attraction and repulsion



Shall we find out what happens when two bar magnets are brought closer? When we bring two north poles of two bar magnets closer as shown in the figure they move away from each other. Similarly when two south poles of two bar magnets are brought closer they too move away from each other. When a north pole and a south pole are brought closer, they pull towards each other.

Like poles repel each other.
Unlike poles attract each other.

Science today

Let us now learn about electromagnetic train. Electromagnetic train is also called as suspension train. In France it is called as flying train. It does not require diesel, petrol or any other fuel.

Electromagnetic train

The technology in which the property of magnetic attraction and repulsion used gave birth to super fast electromagnetic trains. Let us now, know the working of electro magnetic trains.

Electromagnetic trains do not have wheels.Powerful electromagnets are attached to the bottom of the train as well as on the track. The north pole of the electromagnet on the track faces upwards and the north pole of the electromagnet on the train, faces downwards. The north pole in the track repels the north pole on the train and levitates the train. The electric current that changes constantly allows a change in polarity of electromagnets. This change in polarity pushes and pulls the train.

Electromagnetic train runs faster than ordinary train. Another significance of electromagnetic train is that it does not make noise. We can see electromagnetic train in Japan, China, France, Germany and America.

Very soon electromagnetic trains will be introduced in Chennai.

Write any 5 differences between a train and an electromagnetic train. (First difference is given)

1. Electromagnetic trains do not have wheels whereas ordinary trains have.
2. _____
3. _____
4. _____
5. _____

Evaluation

I. Choose the correct answer

1. It is a natural magnet

   a) Bar magnet b) Magnetite
   c) Ring magnet d) Horse-shoe magnet

2. An object that is attracted by magnet.

   a) wooden piece b) plain pins
   c) eraser d) a piece of cloth

3. Attractive force of a magnet is maximum at

   a) two ends b) mid point
   c) entire magnet d) at one end.

4. Mariner's compass was first used by

   a) Indian b) European
   c) Chinese d) Egyptian

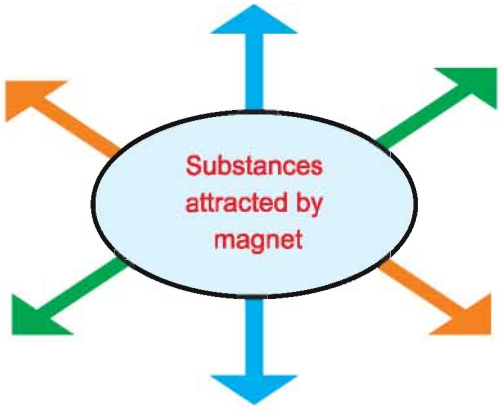
5. A freely suspended magnet always comes to rest approximately in the _____ direction.

   a) north-east b) south-west
   c) east-west d) north-south

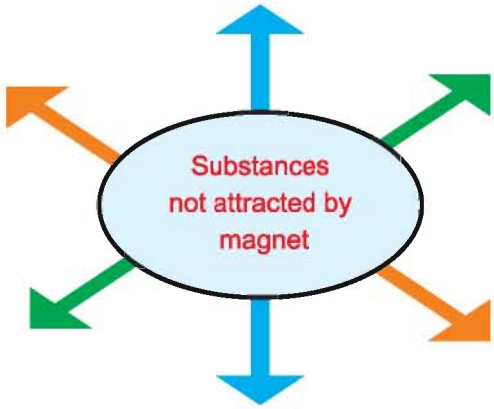
II. Answer the following

1. Describe the magnetic poles.
2. Explain the attraction and repulsion between magnetic poles
3. Write the properties of magnet.

III Fill up



Plain pins



Chalk piece

Let us muse upon.

1. In India the train was first introduced between Mumbai and Thane in 1853.
2. Electromagnets are used in giant wheels.

Types Of Energy

11

Do you watch television? What a wonderful invention it is! In radio we only hear sound but in television we see and hear with our eyes and ears. You like to see quiz programme in television don't you? It is interesting to see people participating and answering questions in a quiz competition.

Recently, an English television channel conducted a programme and an interesting question was asked. The T.V.programme was about a science conference held on the terrace of a multistoreyed building. Many students took part in this conference. Each student used different modes of transport to reach that building.

- A student reached the terrace directly by a parachute.
- Another student reached by a lift
- Two other students sailed in a boat
- One student reached the building by walk
- At the end, a student rode very fast on a bicycle and reached the building.

The question is

What type of energy did each student use? This is a thought provoking question. To answer this question we should first know the different types of energy. Let us learn about this in this lesson.

In the above pictures, we see people in various activities and machines working for them.

How do they perform these activities? Don't they need energy to do these activities? From where do they get this energy? Moving air, working machines and flowing river do the work, don't they? To do this work they spend their energy.

Energy in day-to-day activities

Walking, running, washing etc. will not take place without energy. The energy required to do these activities is obtained from the food we eat. Do you understand why you feel hungry?

Have you seen ants and bees working busily? They too spend energy to do their work.

Activity 1

Take a pinch of baking soda in a bottle and add few drops of lime juice or vinegar. Cover the bottle with a cork. What happens to the cork after some time?

The cork jumps out of the bottle, doesn't it? What is the reason for this? It is due to the release of energy. Where do we get energy to do our day-to-day activities? Think and list out a few.

S. No.	Activity	Required energy
1.	To dry clothes	Sun's heat energy
2.	To run a bus	energy from diesel (or) petrol
3.	_____	_____
4.	_____	_____

Energy is defined as the capacity or ability to do work.

Shall we learn about different types of energy?

What type of energy do we need to perform various activities? From where do we get this energy? We shall learn about certain types of energy.

1. Mechanical energy

Water stored in a dam, flowing river, moving bus, galloping horse, a freely falling stone, and water stored in a tank possess energy.

Water falling from a dam, rotates turbines of a generator and generates electricity.

Hydro power station at Mettur and Bhavani sagar

Water stored in a dam and water stored in a water tank possess potential energy.

Similarly moving bus, galloping horse, running water possess kinetic energy.

The energy possessed by a body by virtue of its position is called potential energy.

The energy possessed by a body by virtue of its motion is called kinetic energy.

Potential energy and kinetic energy are called mechanical energy.

"Heat is a form of energy"
- James Joule.
The unit of energy (joule) is named after him.

Uses

(i) Mechanical energy can bring a moving body to rest or can make a resting body move.

(ii) Wind mill converts wind energy (kinetic energy) into electrical energy.

Mechanical energy

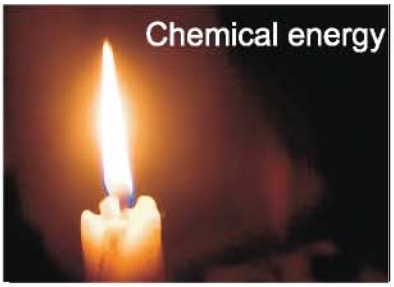
2. Chemical energy

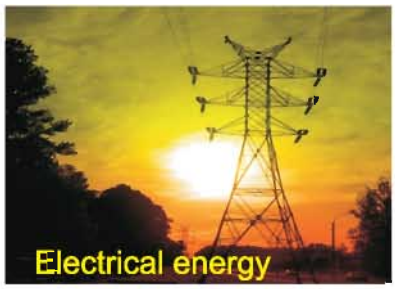
Energy released during chemical reaction is called chemical energy. For example, chemical energy is released due to the chemical reaction taking place when wood, charcoal, petrol etc. are burnt.

The food we eat undergoes chemical reaction and releases energy to do work.

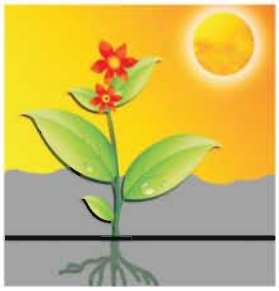
Uses

(I) Chemical energy is used for the growth of plants and animals.





(ii) A battery or a cell converts chemical energy into electrical energy.



(iii) Chemical energy of a fuel is converted into heat energy and light energy.

3. Electrical energy

Do you know why a fan rotates or an electric bulb glows when we switch on ? In an electric bulb, electrical energy is converted into light energy and in an electric fan electrical energy is converted into mechanical energy.In thermal power station heat (thermal) energy, obtained by burning coal is converted into electrical energy. In wind mill, the wind energy (kinetic energy) is converted into electrical energy.

Wind mill– (Electric power generation) at Kayathar (Thirunelveli) and Aralvoimozhi (Kanyakumari)

Uses

(i) In industries, electrical energy is used to operate machines. Electrical energy is also used in telecommunication.

(ii) In cities, electrical energy is used to run electric trains.

Shall we discuss and find out the various sources of electrical energy?

4. Heat energy

Do you know the primary source of heat energy? It is the Sun.In your home do you use wood or cooking gas for cooking? What energy is released when you burn wood or cooking gas?

The chemical energy stored in wood and cooking gas is converted into heat energy. Due to friction and chemical reaction heat energy is produced. Discuss with your friends and find out various other sources of heat energy.

Uses

The heat energy obtained from coal is used for generating electrical energy. The heat energy obtained from petrol and diesel is used to run vehicles.

Activity 2

Hold a magnesium ribbon with tongs and burn it. Observe the energy changes.

Activity 3

Using a magnifying lens focus the sunlight on the tip of a match stick and see what happens. (Do this activity under your teacher's supervision).

5. Solar energy

The energy obtained from the Sun is called solar energy. What are the types of energy obtained directly from the Sun?

Activity 4

Discuss the various uses of solar energy in our daily life in small groups and list out.

1. To obtain salt from sea water
2. For rain
3. _____
4. _____
5. _____
6. _____

Uses

(I) Solar energy is directly used in solar heater, solar cooker, street light etc.

(ii) Solar cells are used in artificial satellites and calculators.

(iii) Solar energy is used to operate solar vehicles.

Conversion of energy

Look at the given pictures. What do we understand from this? We know that most forms of energy are obtained from the Sun.

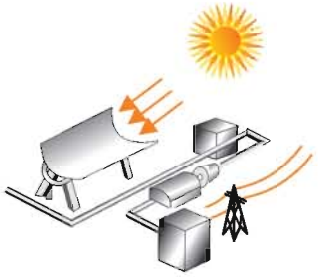
1. In thermal power stations coal is burnt to generate electrical energy.Here the chemical energy of the coal is first converted into heat energy and then into electrical energy.

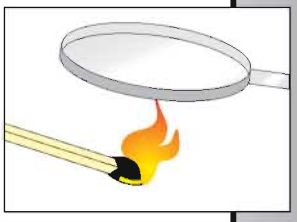
2. Loudspeaker converts electrical energy into sound energy.

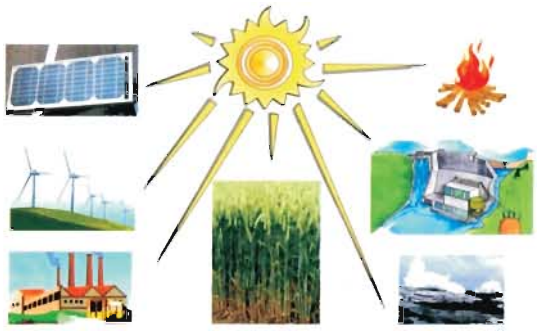
Do you know?

In 212 BC Archimedes, the Greek scientist used magnifying glass to burn Roman warships with solar energy.

Different ways of using solar energy







3. When water stored at a height flows down, its potential energy is converted into kinetic energy. The water rotates the turbines of a generator and electrical energy is generated.

4. When wood, charcoal, petrol, diesel and other fuel are burnt chemical energy is converted into heat energy.

5. During photosynthesis plants convert light energy from Sun into chemical energy and store it.

6. In electric bell and horns of automobiles electrical energy is converted into sound energy.

7. In a torch light, chemical energy of the cell is first converted into electrical energy and then into light energy.

What do we learn from this?

Energy can neither be created nor be destroyed, but can be converted from one form into another form. This is called law of conservation of energy.

Activity 5

A man carried a heavy load on his head to his house which is at the top of a mountain. He left the load by the side of his house and took rest. After sometime he came back and noticed that the load rolled down and reached the ground. Shall we discuss and answer the following questions related to this event?

1. From where did he get the energy to lift the load?
2. What energy did the load possess when it was placed on the mountain?
3. From where is the energy obtained for the load to roll down?
4. What energy does the load possess while rolling?
5. What energy does the load possess on reaching the ground?
6. Write down the energy changes in the above activity in order.

Activity 6

Discuss in small groups, how economically diesel and petrol can be consumed and present a report.

Evaluation

I. Find out the energy changes in the following.

1. Torch light ——— → ———
2. Radio ——— → ———
3. Iron box ——— → ———
4. Electric motor ——— → ———
5. Generator ——— → ———

II. Find out what type of energy the following possess.

1) sun 2) charcoal 3) rocket 4) water in a lake
5) solar cell 6) waterfalls 7) compressed spring
8) cow dung 9) moving cloud 10) firewood

III. Choose the correct answer

1. Energy required to dry clothes quickly
   a) solar energy b) sound energy
   c) kinetic energy d) potential energy
2. "Heat is a form of energy". This was discovered by
   a) Voltas b) James Joule
   c) Thomas Alva Edison d) Galileo
3. Which of the following require electrical energy?
   a) windmill b) Industry
   c) bicycle d) parachute
4. The energy that cannot be used to run vehicles.
   a) solar energy b) chemical energy
   c) electrical energy d) sound energy
5. When charcoal is burnt, chemical energy is converted into
   a) heat energy b) sound energy
   c) mechanical energy d) solar energy

IV. Answer the following questions.

1. What is energy? Write down its various types.
2. What energy is used by a person using a parachute?
3. Explain the energy conversion in a hydro power station.
4. What are the uses of electrical energy?
5. How is electricity generated in thermal power station?
6. What is chemical energy? Write its uses.
7. Explain law of conservation of energy with an example.
8. Distinguish between potential and kinetic energy.

12 Light

Galileo

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 Copernicus, the earth is not stationary. It spins on its own axis and revolves round the Sun. Galileo proved this by his experiment.

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

We were able to study more about the solar system only by using telescope. The telescope was invented 400 years ago by the scientist Galileo and the year 2009 is declared as year of Astronomy in recognition of his invention.

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 blind people move about? Let us understand this by an activity.

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

Activity 1

- ✓ Divide the whole class into groups of two students each.
- ✓ One student is blindfolded using a handkerchief.
- ✓ The student is asked to walk through the classroom without dashing against any object. For his safety another student is made to accompany him.
- ✓ While doing so he/she touches objects and feels the shape, size and the texture.

- ✓ Then the student moves out of the classroom to listen to different sounds.
- ✓ Similarly allow all other students to do the same.

  Discuss your observation in small groups.

Role of light in day-to-day life

In our daily life we see many objects. How do we see them? We need light to see objects. The objects that give light are called as sources of light. In day, we are able to see with the help of sunlight and during night we are able to see with the help of light from the moon, electric bulb, torch light and candle.

The Sun, stars, candle, torch light etc. give us light. When light from these objects reaches our eyes, we are able to see them. Such bodies are called luminous bodies.

Table, chair, book, black board etc do not emit light. Then how are we able to see?

The light from the luminous bodies (Sun, torchlight, and electric bulb) falls on the table, chair etc and reaches our eyes. Thus we are able to see them. Here table, chair etc. are called non-luminous bodies.

The body that emits light of its own is called luminous body.

The body that does not emit light of its own is called non-luminous body.

To see an object we need the following

(1) source of light

(2) an object

(3) eyes

Do you know?

Moon is not a luminous body. It reflects sunlight.

Sunlight reaches the earth in 8 minute and 20 second.

We should not see the sun directly for a long time. It may affect our eye sight.

Propagation of light

How does light travel?

Activity 2

Let us take a thick paper. Roll it into a cylinder. Observe the candle light through this cylinder. Now bend the paper cylinder slightly and observe. In which of the above cases are you able to see the candle flame? Write your observation.(You can also use a plastic or rubber tube instead of paper).

When you observe through the cylinder without bending you can see the flame, whereas you cannot see the flame when the cylinder is bent. From this we understand that light travels in a straight line.

Activity 3

Fix a torch light in such a way that the light falls on the walls of your classroom.

Ensure that the distance between the torch and the wall is atleast six to ten feet.

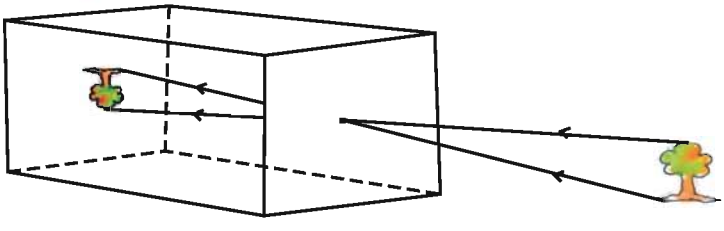
Take two dusters and tap them such that the chalk powder falls in the space between the wall and the torch.

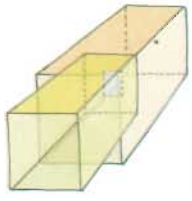
1. What do you observe?
2. Do the chalk particles that you see lie in a straight line?
3. What do you understand from this?

Discuss your observation in small groups.

This activity clearly shows that light travels in a straight line.

Shall we make a pin-hole camera?





- Take two cardboard boxes such that one slides into the other.

- Cut one side of each box so that the smaller box slides into the bigger box.
- Ensure that there is no hindrance between the two boxes.
- Cut off a square on the opposite side of the bigger box and paste a tracing paper over it.
- Make a pin-hole on the other box (The hole should be very small to get a clear image).
- Place this set up in the sunlight and cover it with black cloth.
- Point the pin-hole to a distant object (tree or candle) and observe the image on the tracing paper.

1. Do you see any image on the tracing paper?
2. Is there any difference between the object and its image formed on the tracing paper?
3. Trace out the image formed on the tracing paper and compare it with the object.
4. Do you observe any change in size of image, when the distance between the pin-hole and the tracing paper is increased or decreased?

Share your experience with your friends.

You see an inverted image of the object on the tracing paper, because light travels in a straight line. When the distance between the pin-hole and the tracing paper is increased, the size of the image increases. When the distance is decreased, the size of the image decreases. When the pin-hole is enlarged, the clarity of the image decreases and hence the image becomes blurred.

Transparent and opaque objects

We are able to see objects clearly through a glass or pure water. So glass and pure water are transparent objects. We cannot see objects through a stone or a ball. So stone and ball are opaque objects. When we see through a tracing paper or water with few drops of milk, the objects are not clearly seen and appear blurred. These are translucent objects.

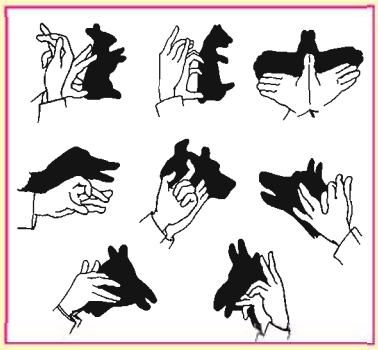
The objects which allow light to pass through them are called transparent objects.

The objects which do not allow light to pass through them are called opaque objects.

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

Can you answer this riddle?

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



Activity 4

Keep your fingers in front of an intense source of light. Adjust your fingers to get shades of different animals as shown in the picture. Were your friends able to identify the animals from shades? Did you get the answer for the above riddle? The answer is your shadow.

Note: Better results can be obtained by using overhead projector (OHP)

Shadow formation

Activity 5

Shall we collect some objects which we use in our day-to-day life such as plastic scale, piece of rubber, pen, piece of thin cloth, blank paper, handkerchief, bottle filled with fresh water, wooden scale, blotting paper, stone, glass, tracing paper, water with few drops of milk, ball etc.?

Hold these objects one by one in the path of sunlight, entering through the window of your classroom and observe the floor carefully.

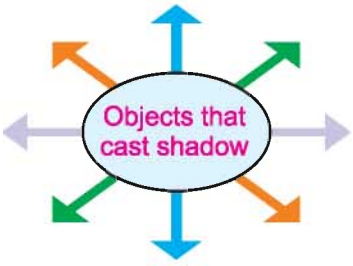
Do you observe shadow on the floor?

Do you observe shadow for all the objects?

Find out objects that cast shadow and objects that do not and tabulate it.

Object	Casts shadow Yes / No

From the table, shall we write the objects that cast shadow?



If the activity is repeated in a dark room, will the objects cast shadow? What do you infer from the above?

When some objects are placed in the path of light, a dark portion is formed on the opposite side of the objects. This dark portion is called shadow.

1. All objects do not cast shadow.
2. Opaque objects alone cast shadow.
3. Shadow is always cast opposite to the direction of light source.
4. For the formation of shadow, source of light, opaque object and screen are required (wall, floor, a building serve as screen)

Plane mirrors and reflection of light

Have you seen your face in a plane mirror?

What we see on the mirror is our reflected image. Light rays from source fall on our face and get reflected. This reflected rays fall on the mirror and get reflected by the mirror. When these reflected rays reach our eyes, we see image of our face.

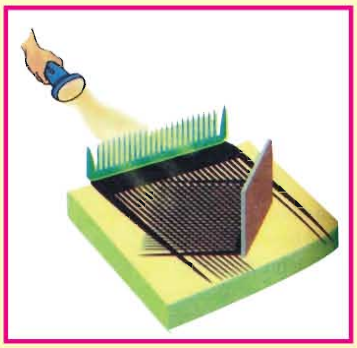
Activity 6

- Look at your face in a stainless steel plate.
- Similarly look at your face in a scratched plate.

In which case are you able to see your face clearly? On which other objects can you see your face clearly? Discuss in small groups.

We can see our face on the stainless steel plate, glass, marble floor and crystal clear water. Don't we? What do we learn from this? Polished and plane reflecting surfaces produce clear image.

Activity 7

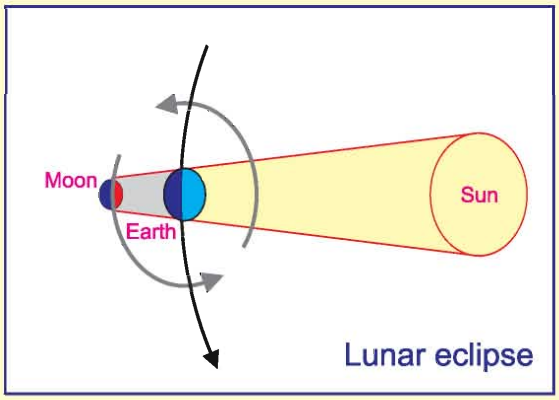


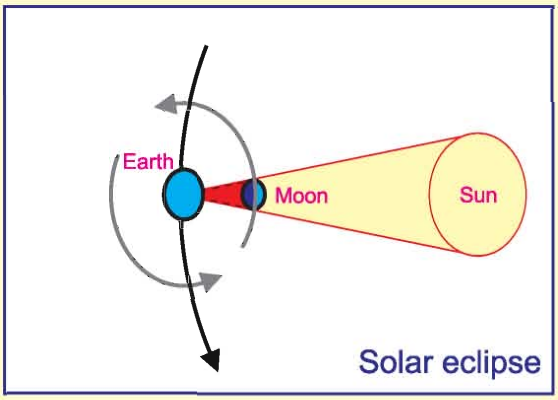
Fix a comb on one side of a thermocol and a mirror on the other side as shown in the picture. Spread a thick coloured paper in between the comb and the mirror. Keep this set up in sunlight or pass light from a torch through the comb. What do you observe? Is it not the same as given in picture?

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

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.

Solar eclipse

The Sun – source of light

The Moon – opaque object.

The Earth – screen.

When the shadow of the moon falls on earth the Sun is hidden.

Group discussion

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

Questions to ponder over

1. When we look at the image of a person eating, on a plane mirror it appears that he eats with left hand. Why?

2. The image of vehicles seen on the rear view mirror of automobiles are small and appear to be nearer. Why?

3. In textile showroom, four walls of the trial room are fitted with mirrors. We see many images when we enter in. Why?

Evaluation

I. Answer the following questions.

1. Name the instrument invented by Galileo.

2. Name a light emitting object.

3. What are the necessary things required to see an object?

4. Which objects do not cast shadow?

5. Name the eclipse formed when the shadow of earth falls on moon.

6. In what direction is shadow of an object formed?

7. Distinguish between luminous and non-luminous bodies?

8. How will you show that light travels in a straight line?

9. Explain the construction and working of a pin-hole camera.

10. How are shadows formed? What are the things required for shadow formation?

11. How do we see image of an object on a plane mirror?

Do yourself

1. Reflect sunlight on a wall using stainless steel plate, metal scale and stainless steel lunch box.
2. Shall we perform the following activity with our friends on a holiday?

Draw a large circle on the play ground. A student is asked to stand at the centre of the circle. His friends are asked to trace the shape of the shadow on the ground. The shape of the shadow is traced on the ground in the morning, noon and in the evening. The length of the shadow, the direction of the Sun and the direction of the shadow are noted each time and tabulated.

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

What did you understand from this?

Share it in small groups.

You will observe that the shadow will be long in the morning and starts decreasing till noon. The shadow will be shortest at noon and thereafter it increases in the afternoon and becomes longest at the sunset.

The reason for the above observation is that the angle between the source of light (Sun) and the object that casts shadow changes with time.