

# **SCIENCE**

## **Standard Six**

### **Term II**

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## Note to the teacher...

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

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

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

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

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

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

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

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

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

- Authors

[scienctextbook@gmail.com](mailto:scienctextbook@gmail.com)

# Cell Structure

What is a building made up of?  
What is our human body made up of?

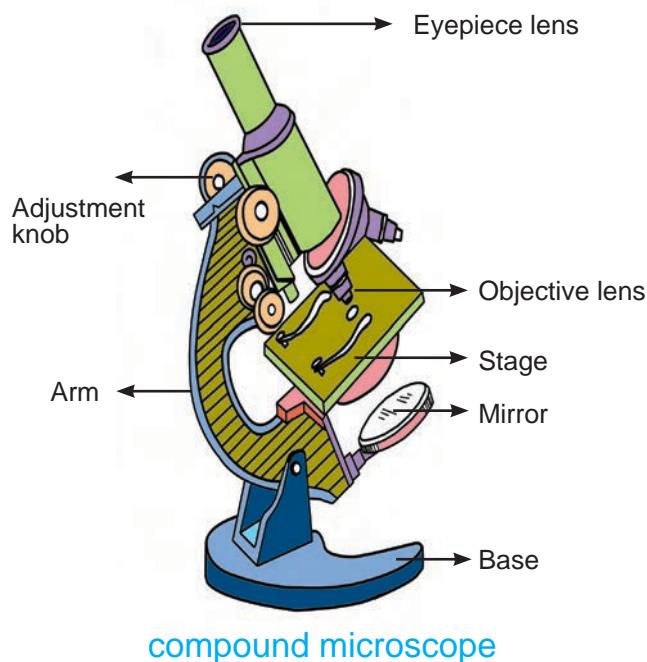
Just as a building that is made up of many bricks, the human body is also made up of several small units called **cells**. The Cell is the basic structural and functional unit of all living organisms.

Can you see a cell with your naked eye? No, cells are very minute and cannot be seen with our naked eyes. They can be observed only through a scientific instrument called 'microscope'.

## Activity 1

### We Observe

To show the parts of a compound microscope.



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

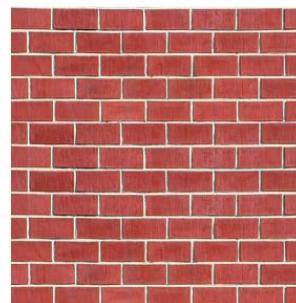
## Activity 2

### We Observe

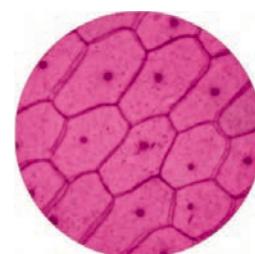
If there is a microscope in your school laboratory, observe the cells of an onion peel under it with the help of your teacher.

Do you know who saw the cell first? It was Robert Hooke, an optic seller. In those days, glass bottles were closed with lids made of cork. He cut thin sections of the cork and observed them through his hand-made lens and saw many small identical hexagonal chambers. Robert Hooke named these chambers '**cells**' in 1665. In Latin, the word 'cellula' means "a small chamber". He became a famous scientist by showing the cell magic through his lens.

When we observe the cells of an onion peel and the bricks on the wall, we will find that they are similar in structure.



The wall of a building



cells of an onion peel

## Chapter - 1

### Can we see the inner parts of a cell?

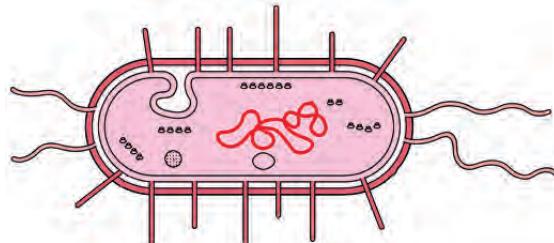
The same question arose in the minds of Robert Hooke and the biologist Robert Brown. Robert Brown was a school teacher and he was studying the structure of a cell. He invented an advanced microscope with a higher degree of magnification through which very small objects could be viewed with greater clarity. With the help of that microscope, he examined the cell and found that there is a different world within a cell.

The cell is like a small factory with nearly twelve to thirteen cell organelles, which are involved in various specified tasks.

### Classification of Cells :

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

A cell that does not contain membrane-bound organelles and a well defined nucleus is called a Prokaryotic cell i.e. a simple cell. e.g. **Bacteria**.

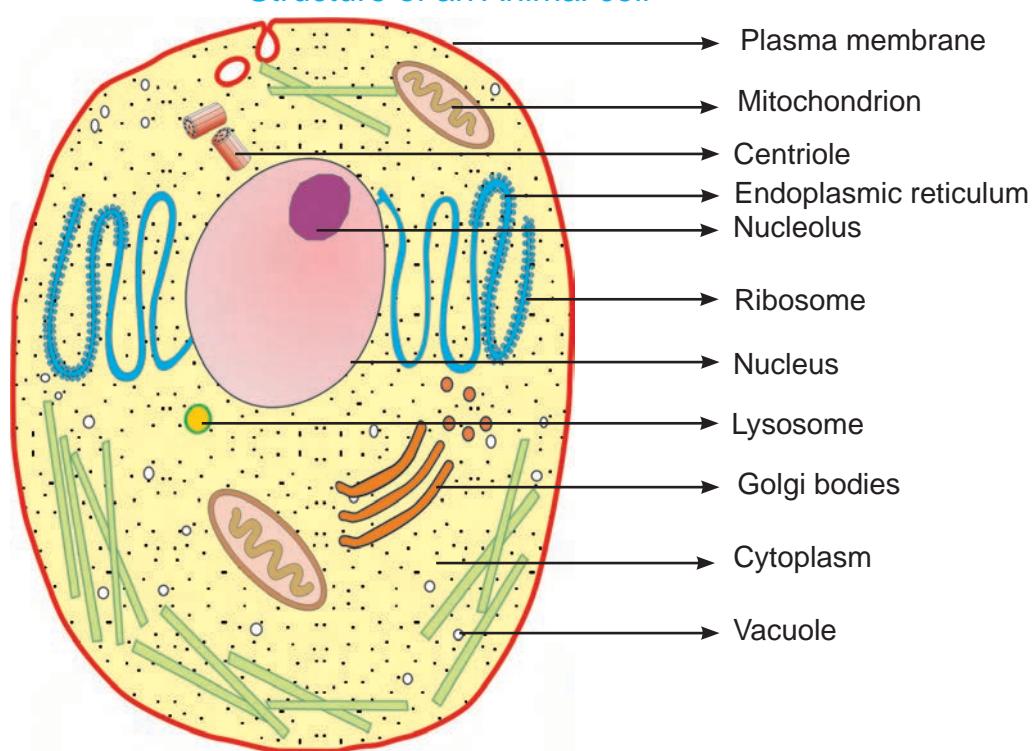


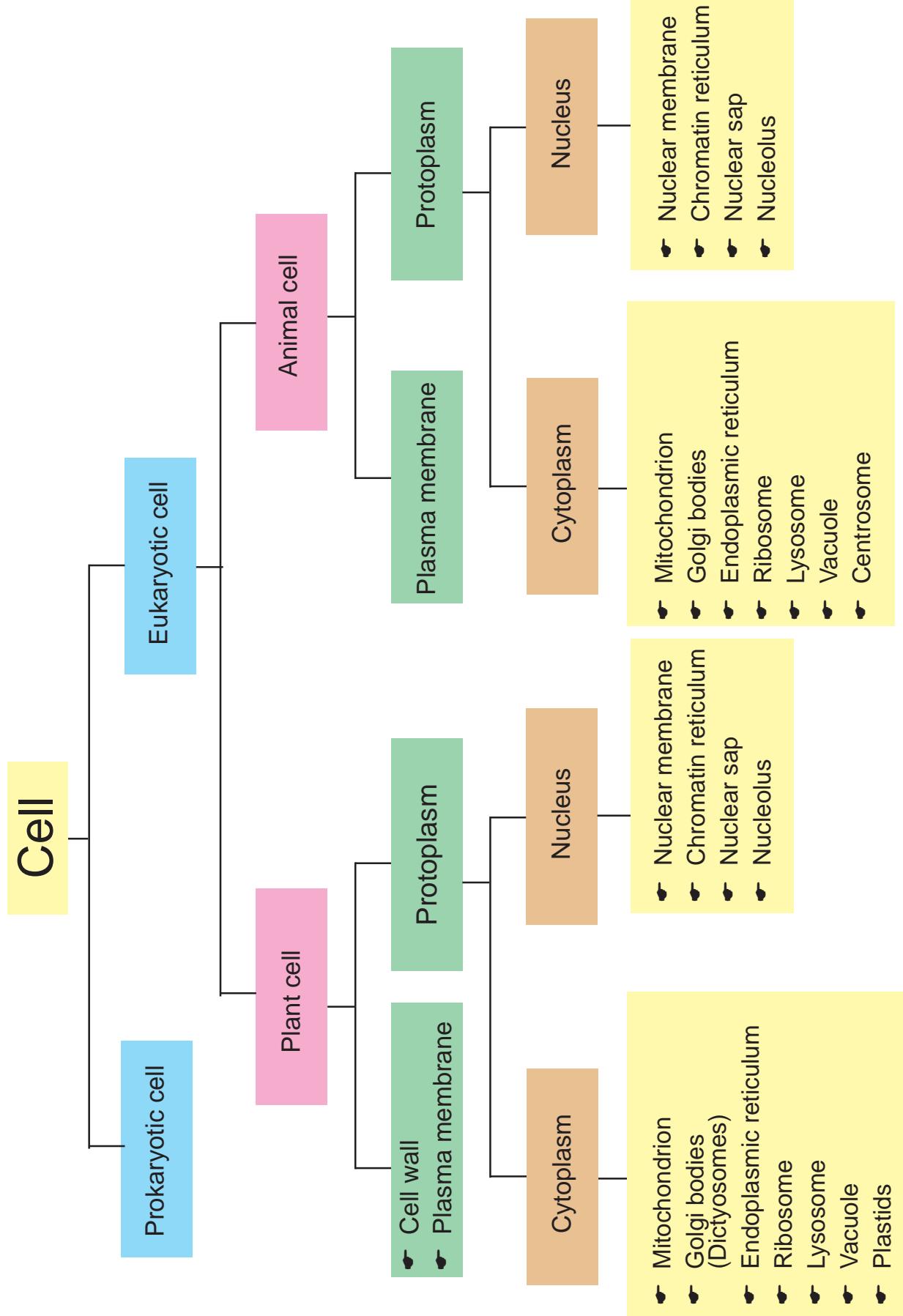
A cell that contains a well defined nucleus, a nuclear membrane and membrane-bound cell organelles is called a Eukaryotic cell, i.e. a complete cell. e.g. cells of plants and animals.

The plant and animal cells are not alike. They vary in their size and structure according to their functions, but both the cells are similar in their basic organisation.

Now, let us observe an animal cell.

**Structure of an Animal cell**





The cell and its components

## Chapter - 1

Each cell is a small factory by itself. Let us learn the specific function of each component of an animal cell.

Shall we enter a busy cell factory and explore it?

I hear someone calling me.....

### Plasma membrane :

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

"Please come inside. The Protoplasm is waiting for you."

### Protoplasm:

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

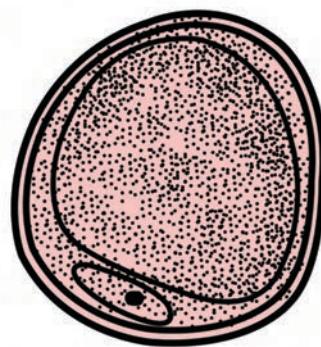
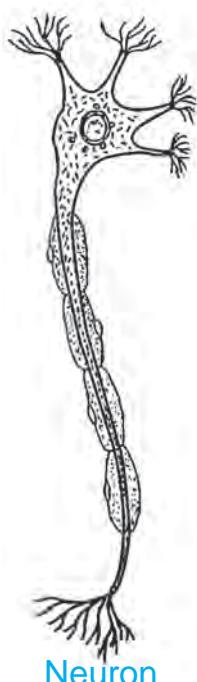
J.E. Purkinjee coined the term protoplasm. 'Proto' means 'first' and 'plasma' means 'colloid'.

### Cytoplasm :

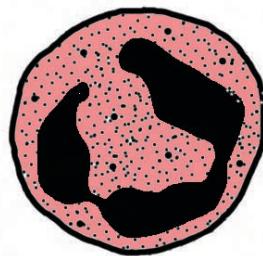
"Hello! I am cytoplasm. I am located inbetween the plasma membrane and the nucleus. I am made up of carbohydrates and proteins. Organelles and lipid droplets are present in me."

### Nucleus :

"I am the control centre of the cell, but I need not be present at the centre. I am known as the nucleus. I am spherical in shape. I have the nucleoplasm, the nucleolus and the chromatin reticulum. I am enclosed by the nuclear membrane. I carry the genetic characters from generation to generation".



Fat Cell



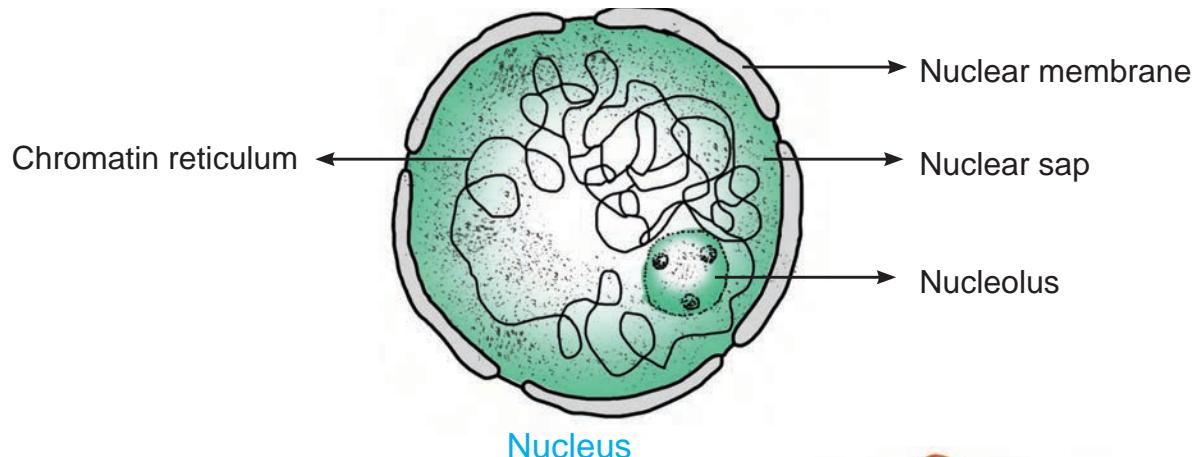
White Blood Cell



Muscle Cell

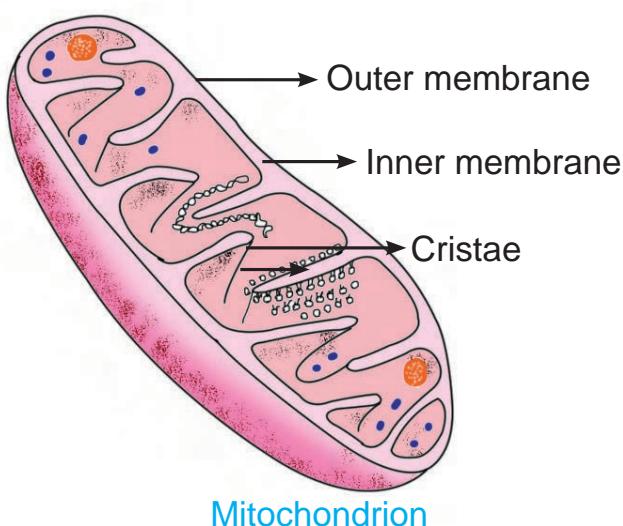


Neuron



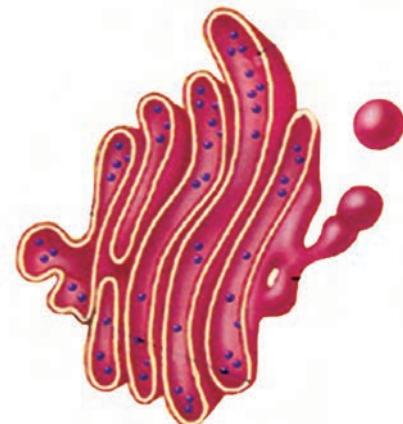
### Mitochondria- (singular - Mitochondrion)

"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 the **Powerhouses of the cell.**"



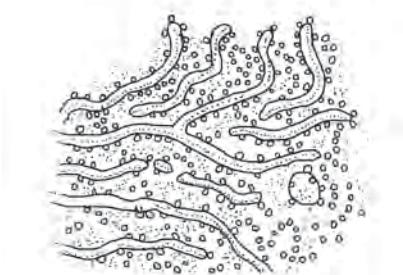
### Golgi bodies:

"Hi, come on! We are tubular structures, involved in the secretion of digestive enzymes and the formation of lysosomes. We separate proteins from the ingested food and give strength to the cells and the body. In plant cells, we are known as **Dictyosomes.**"



### Endoplasmic reticulum :

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



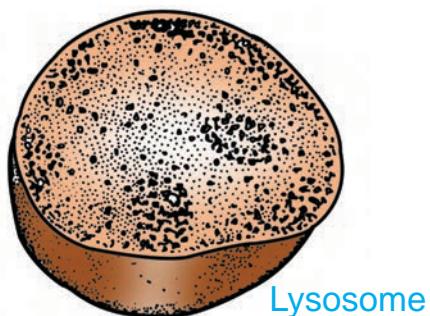
### Endoplasmic reticulum

### Ribosomes :

"Please come. Take a look at us! We are granular structures. We are called the **Protein factories of the cell.** We help in protein synthesis."

**Chapter - 1****Lysosomes :**

"Are you interested in knowing about us? We are spherical yellow coloured bodies. We help in cell protection. We destroy the pathogens that enter the cell. We are called the **Suicidal bags of the cell**. In addition to this, we help in cell digestion."

**Lysosome****Centrosome :**

"Let me introduce myself. I am the centrosome. You can see me only in the animal cell. I look like a stick and I am a microtubule. I am found near the nucleus. I have centrioles in me. I play an important role in cell division i.e., formation of new cells."

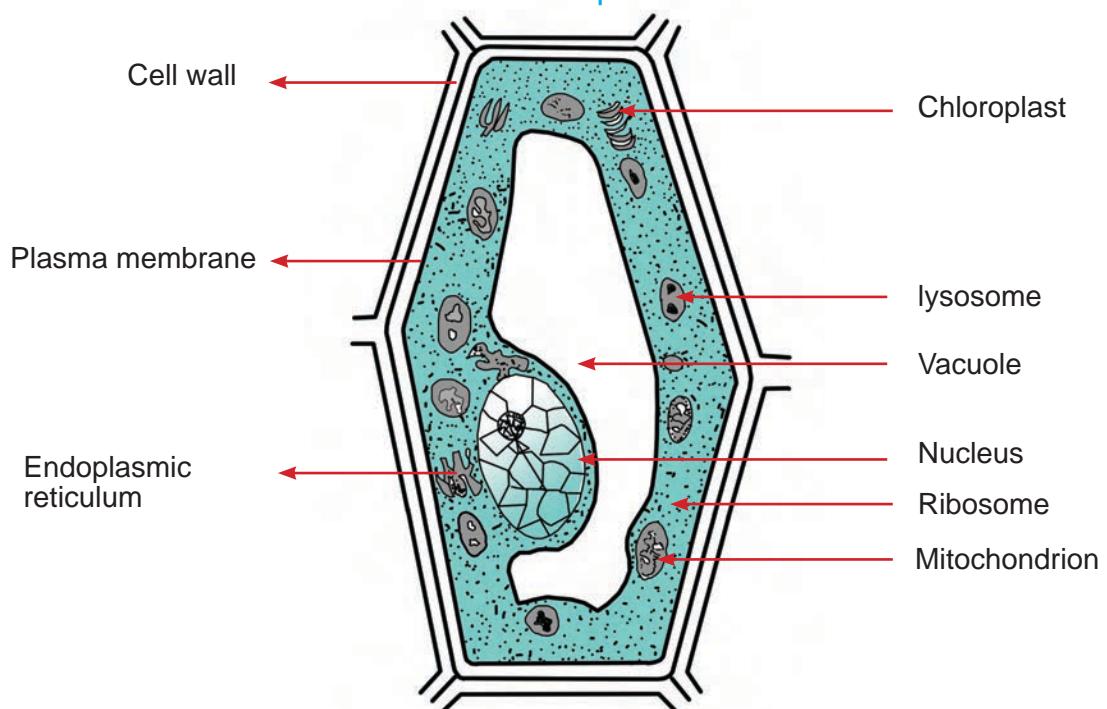
**centrosome****Vacuoles :**

"Wait! Please don't avoid us. We are vacuoles. We are light blue in colour and appear like bubbles. We store cell sap. We maintain intracellular pressure. Oh! This work is very difficult."

Did you meet all the workers in the animal cell factory? Now, let us learn about the plant cell.

**Plant cell :**

Have you ever wondered about the different features of a plant cell? Let us examine a plant cell and see how it differs from an animal cell. We see that:

**Structure of a plant cell**

- The centrosome is absent in the plant cell.
- Plants are more rigid than animals due to the presence of the cell wall.
- They have plastids.
- They have larger vacuoles.

### 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.

### Plastids :

These organelles are found only in plant cells. They contain pigments. Based on the pigments, they are classified into three types.

Type	Pigment	Functions
Chloroplast	Chlorophyll - green pigment	gives green colour to the stem and leaves
Chromoplast	Carotene - orange pigment Xanthophyll - yellow pigment	gives colour to flowers and fruits
Leucoplast	No pigments - colourless	found in roots and underground stems

### Activity 3

### We Do

*We divide ourselves as various components of the cell factory and enact their functions.*

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

Sl.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 large in size	Vacuoles are small in size

All activities like eating, drinking, jumping, playing, breathing, thinking and even sleeping are due to the functioning of the cells. Each cell is a small factory. The brain has several million cells.

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

e.g. **cancer, hereditary diseases, diabetes, etc.**

**Chapter - 1****Activity 4****We Do****Making a cell model**

We shall divide ourselves into groups and make the structure of a plant cell using easily available materials. We shall build the model of a cell and learn about cell organelles.

**Materials required :**

A thick cardboard from any old notebook, a white sheet of paper, paste, broomsticks, colour thread, sand, broken pieces of bangle, bindhi, groundnut shells, green gram, cowpeas, broken chickpeas, pepper, peas, mustard, cardamom, colour papers.

**Method we follow:**

- We take a thick cardboard and paste a white sheet of paper over it.
- We draw the outline of the plant cell (from the textbook) on the white sheet.
- We draw the nucleus at the centre of the plant cell.
- We make the organelles by pasting the materials as listed in the given table.

We label the parts one below the other, by sticking black threads.

**We have learnt**

The structure of a plant cell and the difference between a plant cell and an animal cell.

<b>Organelles</b>	<b>Materials we use</b>
Nucleolus	bindhi
Chromatin reticulum	colour thread
Nuclear membrane	bangle pieces
Cytoplasm	paste, sand
Endoplasmic reticulum	colour thread
Ribosome	mustard
Lysosome	broken chickpeas
Golgi bodies (dictyosomes)	bangle pieces, pepper
Mitochondria	groundnut shells
Plastids	green gram/peas/ cardamom
Vacuoles	bits of paper
Plasma membrane	thread
Cell wall	broomstick

**Facts at a glance**

1. There are about 6,50,00,000 cells in the human body.
2. Bones are made up of a special type of dry cells.
3. Anton Van Leeuwenhoek (1675) discovered that blood contains RBC (Red Blood Cells).
4. In animals, the nerve cell is the longest cell.
5. In animals, the bone cell is the toughest cell.
6. Mature Red Blood Cells of mammals do not contain a nucleus.



**Activity 5****We Do**

*We divide ourselves into groups. We discuss and present the structure of a cell, the functions of the cell components and their names with the help of the model we have made.*

Having learnt the various components of the cell, shall we now learn their functions too?

### Cell organelles and their functions

S. No	Cell components	Functions
1.	Plasma membrane	<ul style="list-style-type: none"> <li>• It gives shape to the cell.</li> <li>• It selects the substances required by the cell and transports them in and out.</li> <li>• It controls the movements of substances in and out of the cell.</li> <li>• It protects the cell.</li> </ul>
2.	Cytoplasm	<ul style="list-style-type: none"> <li>• It distributes the nutrients within the cell.</li> </ul>
3.	Nucleus	<ul style="list-style-type: none"> <li>• It controls all the activities of the cell.</li> <li>• It carries the hereditary characters from one generation to another.</li> </ul>
4.	Mitochondria	<ul style="list-style-type: none"> <li>• They provide energy to the cell.</li> </ul>
5.	Golgi bodies	<ul style="list-style-type: none"> <li>• They secrete enzymes and hormones.</li> <li>• They store protein.</li> <li>• They help in the formation of Lysosome.</li> </ul>
6.	Endoplasmic reticulum	<ul style="list-style-type: none"> <li>• It helps in transportation within the cell.</li> <li>• It helps in protein synthesis.</li> </ul>
7.	Ribosomes	<ul style="list-style-type: none"> <li>• They synthesize protein.</li> </ul>
8.	Lysosome	<ul style="list-style-type: none"> <li>• It destroys the germs that enter the cell.</li> <li>• It helps in intracellular and extracellular digestion.</li> </ul>
9.	Centrosome	<ul style="list-style-type: none"> <li>• It helps in cell division.</li> </ul>
10.	Vacuoles	<ul style="list-style-type: none"> <li>• They control intracellular pressure.</li> <li>• They store cell sap.</li> </ul>
11.	Plastids	<ul style="list-style-type: none"> <li>• They help in photosynthesis.</li> <li>• They give colour to flowers and fruits.</li> </ul>
12.	Cell wall	<ul style="list-style-type: none"> <li>• It gives shape and protection to the plant cell.</li> </ul>

**Chapter - 1****EVALUATION****I. Choose the correct answer:**

1. The structural and functional unit of the living organism is \_\_\_\_\_.

- a) nucleus      b) cell      c) mitochondria    d) ribosome

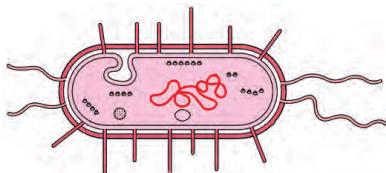
2. The instrument used to magnify things placed on a slide is \_\_\_\_\_.

- a) telescope      b) microscope    c) binocular      d) periscope

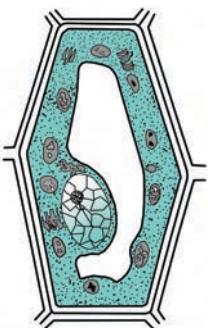
3. Select the prokaryotic cell from the given cells.



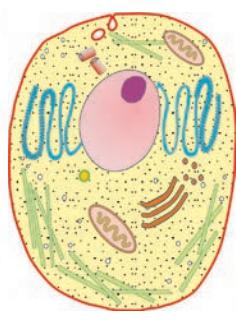
(a)



(b)



(c)



(d)

4. The \_\_\_\_\_ is the powerhouse of the cell.

- a) mitochondria    b) ribosome    c) lysosome    d) nucleus

5. The organelle which is known as 'suicidal bag' is the \_\_\_\_\_.

- a) dictyosome    b) ribosome    c) centrosome    d) lysosome

6. The spherical organelle which controls the activities of the cell is \_\_\_\_\_.

- a) golgi bodies    b) ribosome    c) nucleus    d) lysosome

7. The organelle that involves in destroying the germs which enters the cell is \_\_\_\_\_.

- a) dictyosome    b) ribosome    c) centrosome    d) lysosome

8. The organelle which is found only in the animal cell is \_\_\_\_\_.

- a) mitochondria    b) centrosome    c) plasma membrane    d) chloroplast

9. The cell of a /an \_\_\_\_\_ contains a large vacuole.

- a) onion peel    b) bacteria    c) nerve    d) muscle

10. The longest cell is the \_\_\_\_\_.

- a) bone cell    b) nerve cell    c) cell of a muscle    d) blood cell

**II. Who am I?**

1. I'm a tiny organelle. Cell respiration occurs in me. I'm also called the 'Powerhouse of the cell'. Who am I?



2. I help in Photosynthesis. I am found only in plants. Who am I?
3. I give shape and protection to 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 the animal cell. Who am I?
5. I'm a colloid, found inbetween the plasma membrane and the nucleus. I distribute the nutrients within the cell. Who am I ?

### III. Pick the odd one out:

1. nucleus, nucleolus, chromatin reticulum, plasma membrane
2. Robert Hooke, Anton Van Leeuwenhoek, Schleiden and Schwann, Newton
3. lysosome, centrosome, ribosome, chromosome
4. cell wall, chloroplast, large vacuole, centrosome

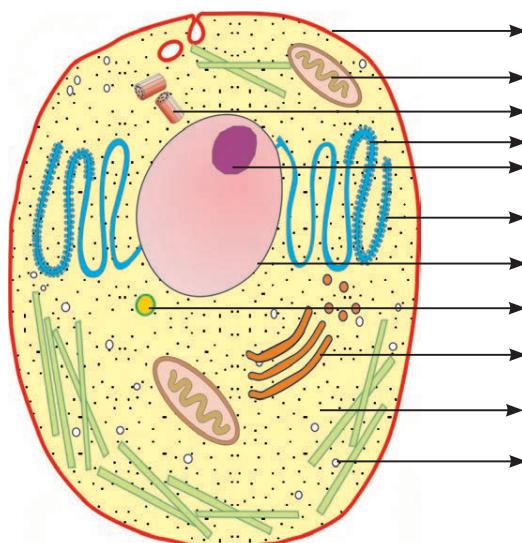
### IV. Match:

Cell Organelles	Other names	Functions
Mitochondria	“Suicidal bag”	protein synthesis
Ribosome	“Powerhouse of the cell”	transfer of hereditary characters
Lysosome	“Control centre of the cell”	production of energy
Nucleus	“Protein factory of the cell”	cell destruction

### V. Draw and label:

1. Nucleus (nuclear membrane, chromatin reticulum, nuclear sap, nucleolus)
2. Mitochondria (outer membrane , cristae, inner membrane)

### VI. Draw the following diagram of the animal cell and label the parts:

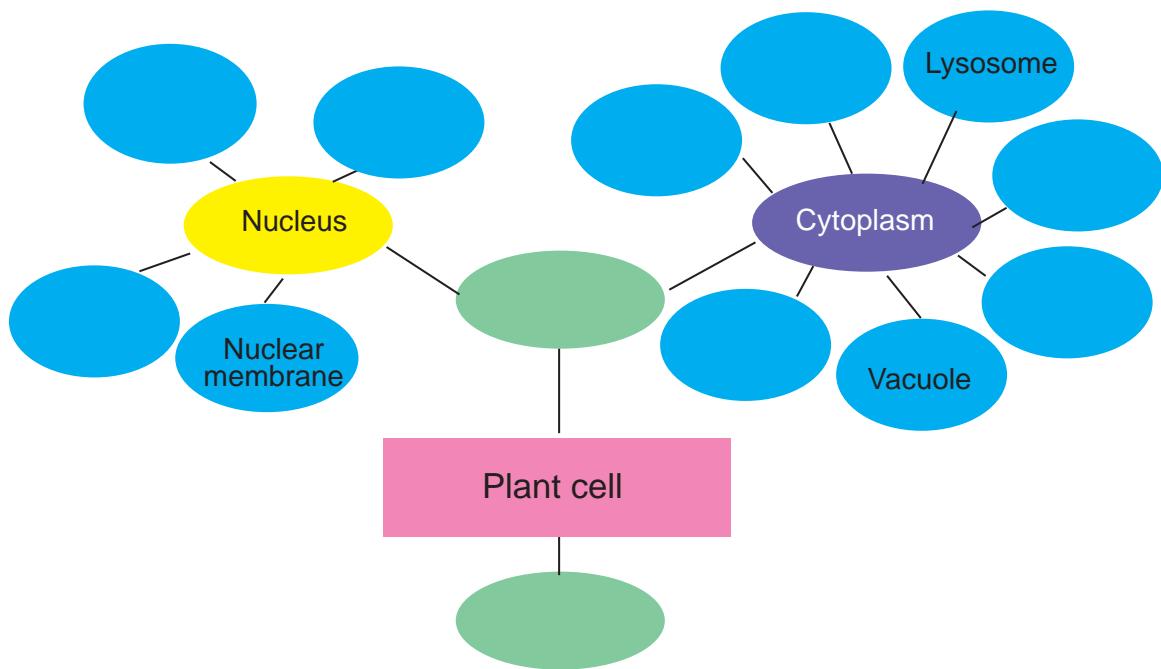


**Chapter - 1****VII. Answer the following questions based on the given diagram:**

1. Name this organelle.
2. How is this organelle known in a plant cell?
3. What is the function of this organelle?

**VIII. Explore and answer:**

1. The leaves appear green due to the presence of a green pigment called chlorophyll. A ripened mango appears yellow. Give reason.
2. Nucleus is known as the 'control centre of the cell'. Give reason.

**IX. Fill in the empty bubbles:****FURTHER REFERENCE****Webliography:**

[www.enchanted learning.com](http://www.enchanted learning.com)  
[www.biology4 kids.com](http://www.biology4 kids.com)  
[www.teacher vision.fen.com](http://www.teacher vision.fen.com)  
[www.differ .com](http://www.differ .com)  
[www.wiki.answers.com](http://www.wiki.answers.com)



# Separation of Substances

2

Ibrahim loves science and participates in all science competitions. Last week, he won the first prize at the Science Talent competition interesting was provided with Search Competition. Ibrahim found the and challenging. Each participant (i) an empty bucket (ii) a bucket full of water (iii) a bag of sand (iv) gravel (v) a sieve.

The contestants were asked to fill the empty bucket with the given water, sand and gravel. They should use up the entire material. The participant who filled the bucket without the water overflowing was declared the winner.

Some of them first poured water into the empty bucket and then added the gravel. Immediately the water overflowed.

Some put the sand in the bucket first and then poured the water on it. The bucket became full and the gravel could not be added.

Are you eager to know what Ibrahim did?

First, he put the gravel in the empty bucket. Then he put the sand gently over it and poured the water slowly over it. The bucket became full but did not overflow. He used his knowledge of science to fill the bucket with the materials given .

Then, Ibrahim was asked to separate the mixture. How did he do that? First he drained out the water slowly from the bucket. Then he spread the wet sand and gravel mixture on a newspaper and dried it. Next he poured the mixture of gravel and sand in the sieve. The sand fell through and the gravel remained on the mesh. Thus he separated all the three components.



## Discuss and give reasons why the others lost to Ibrahim

In the above competition, Ibrahim used methods of separation like decantation and filtration.

We drink water after it is boiled and filtered. We know that before cooking, rice is rinsed in water. While preparing tea, we separate tea leaves by filtration. We purify rava and wheat flour by sieving. We clean rice and pulses by winnowing.

## What do we understand from this?

We need to use various methods of separation:

- ▶ to remove unwanted substances
- ▶ to remove substances which are harmful to our body
- ▶ to obtain the substances which are useful to us in a pure state.

## Chapter - 2

Let us learn about the different methods of separation we adopt in our daily life.

### Methods used to separate mixture of solids:

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

#### Hand picking



How do we separate vegetables at home? We separate them into their kinds like tomatoes, chillies etc. by using our hands. Separation is easy as they differ in size, colour and shape.

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

- Which method does the woman in the picture follow to separate the substances?
- Mention some substances that can be separated by this method.

Lighter particles present in a mixture can be separated by winnowing.



Hand picking method can be applied, when the quantity is small and are of reasonable size.

#### Winnowing

Farmers allow the mixture of grain and husk to fall from a height. 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 with the help of wind is called 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 in the sieve.



**Components of a mixture can be separated by the method of sieving only when they differ in their size.**

At construction sites, you would have seen the separation process of pebbles and stones from sand. It is done by sieving using a sieve.

**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 a magnet.

Can we separate iron substances from water, using a magnet?

**Activity 1****I Do**

**I need:** Beaker, water, bell pins and a magnet

*I take a beaker and fill half of it with water.*

*I drop some pins into it.*

*I hold a magnet over the surface of water or by the side of the beaker.*

**My inference:**




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**Chapter - 2****Shall we complete the table?**

Mixture	Method of separation	Physical state of the components (Solid, Liquid, Gas)
Paddy and chaff		
Ragi and pulses		
Sand and stones		
Rava and iron particles		

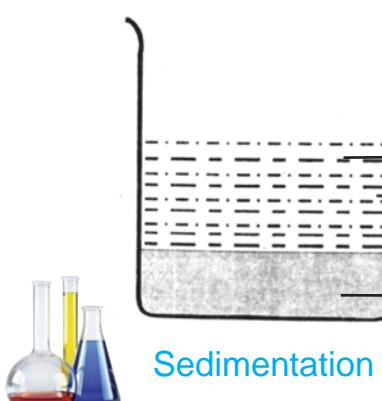
**Methods of separation of insoluble solids from liquids**

Can we separate a mixture of sand and water by using methods like hand picking, sieving, winnowing or by magnetic separation? No, we cannot separate them. Why? It is because water is in liquid state and the methods used to separate solid mixtures cannot be used here. The method of separation depends on the nature of the substances to be separated.

Hence, we can separate insoluble solids from liquids by using the method of sedimentation, decantation and filtration.

**Sedimentation**

The mixture of insoluble solids and liquid is taken in a beaker and the

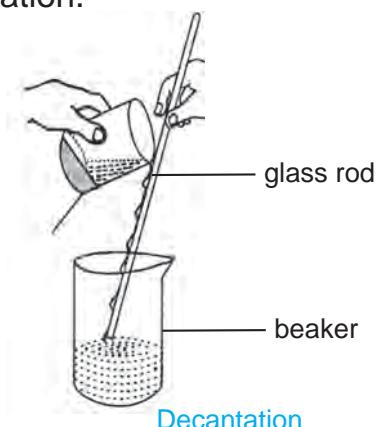


solid substances are allowed to settle down as sediments. This is known as sedimentation. The clear liquid above the sediment is called supernatant liquid.

e.g. a mixture of sand and water

**Decantation**

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

**Filtration**

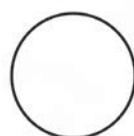
Observe the liquid obtained by decantation and see whether it contains suspended impurities. Try to filter the impurities using a clean cotton cloth. As there are tiny pores in the cloth (like the pores in a sieve), the clear water passes through the pores and the suspended impurities like sand

**Separation of Substances**

remain on the cloth. In the laboratory, we use a filter paper instead of a cloth to purify water. There are tiny pores in the filter paper also.

Let us filter the mixture in the laboratory using a filter paper.

Take a filter paper and fold it like a cone. Fix it inside a glass funnel. Fix the funnel on a stand and place a beaker below it. Pour the impure liquid containing suspended impurities into the funnel. The liquid drains through pores of the filter paper. The clear liquid that is collected in the beaker is known as filtrate. The dust particles that remain on the filter paper is called "residue".



filter paper



first fold



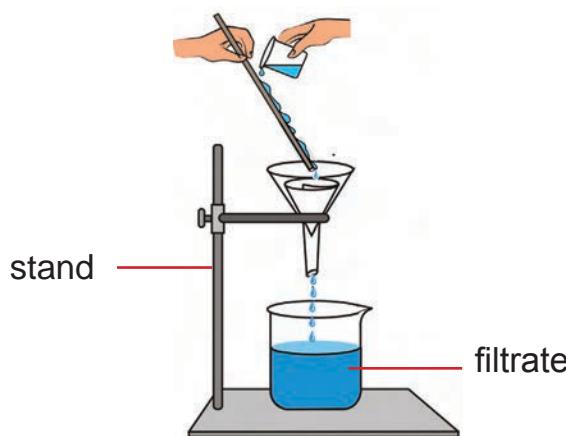
second fold



cone



filter paper cone in the funnel



## Methods of separation of solid substances dissolved in liquids

Evaporation and condensation processes are used to separate solid substances dissolved in liquids.

### **Activity 2**

### **We Observe**

*Take a small amount of salt solution in a beaker and place it over a wire gauze on a tripod stand. Heat the solution well. After complete evaporation of water, see what is left in the beaker.*

**Our observation and inference:**

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---

## Evaporation

We have separated salt from water by evaporation method.

Evaporation is a process in which a liquid changes into vapour on heating. Evaporation method is used to separate dissolved solids from liquids.

Salt pan



**Do you know?**

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

**Chapter - 2****Condensation**

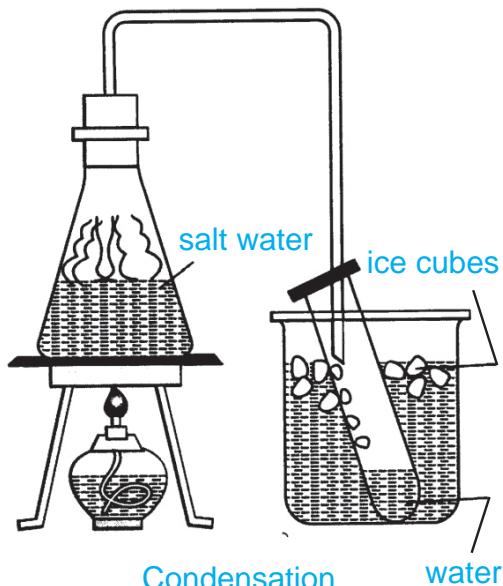
Take a mixture of sand and salt in a beaker. Add water to this mixture and stir. The salt gets dissolved. How can we separate the components from this mixture?

Filter this solution using a filter paper. The sand can be separated from the salt solution by filtration.



I should get both salt and water back. What shall I do for this?

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. The salt remains as residue in the conical flask, once all the water gets evaporated. When the vapours of a substance get cooled, they condense into liquid. This process is known as condensation.



### Need for applying more than one method of separation

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

For example, in the preparation of sugar from sugarcane juice, the methods of separation like filtration, evaporation and crystallization are used. More than one method of separation are used to extract metals like iron, gold, aluminium and copper in pure state, from their ores.

### Shall we complete the table?

	Mixture	Method of separation	Physical state of the components (Solid, Liquid, Gas)
sand and water			
rava and water			
salt and water			

### Do you know?

Evaporation and Condensation are the basic processes involved in the water cycle. Formation of rain involves these two reverse processes.



**Activity 3****We Do**

*We are going to separate iron filings, salt and chalk powder from the given mixture.*

**We need:** bar magnet, beaker, water, filter paper, funnel, tripod stand, glass rod, watch glass, matchbox, wire gauze, bunsen burner.

1. We take the mixture in a watch glass and stir it using a bar magnet.

Our observation	Substance separated

2. We take the remaining portion of the mixture containing salt and chalk powder in a beaker. Then we add water and stir it well using a glass rod. We allow the liquid to remain undisturbed.

**Our observation :**

3. We fold the filter paper into a cone and keep it inside a funnel.
4. We keep the funnel on a tripod stand and place a beaker below it.
5. We transfer the liquid mixture slowly into the funnel using a glass rod.

Our observation	Substance separated

6. We take the beaker containing salt water and place it over a wire gauze on a tripod stand. We heat the solution strongly using a bunsen burner.

Our observation	Substance separated

**Chapter - 2*****Our inference:***

S.No.	Separated substance	Method used for separation

**Facts at a glance:**

- Crude oil is a mixture from which nearly eighty six substances like petrol, kerosene and naphtha are obtained.
- Air is a mixture of gases.

**Evaluation****I. Choose the correct answer:**

- A suitable method to separate lighter impurities from a mixture is \_\_\_\_\_.  
 a) winnowing                                  b) hand picking  
 c) evaporation                                 d) magnetic separation
- In a mixture, solids of different sizes can be separated by \_\_\_\_\_.  
 a) magnetic separation                        b) winnowing  
 c) sieving                                        d) evaporation
- The method used to separate seeds from fruit juice is \_\_\_\_\_.  
 a) filtration                                    b) sieving  
 c) crystallization                              d) winnowing
- Separation of common salt from the sea water is done by \_\_\_\_\_.  
 a) sieving                                        b) evaporation  
 c) magnetic separation                        d) winnowing
- The method used to separate substances that differ in colour, size and shape from a solid mixture is \_\_\_\_\_.  
 a) magnetic separation                        b) decantation  
 c) hand picking                                d) sieving

**II. Encircle the odd one and give reason:**

- hand picking, evaporation, winnowing, sieving
- filtration, sedimentation, decantation, condensation



3. evaporation, magnetic separation, condensation, crystallization
4. filter paper, sieve, funnel, glass rod

**III. Replace the underlined in the following statements with suitable methods of separation:**

- a) We can segregate 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 by heating is known as condensation.
- d) Sieving method is used to remove a magnetic substance from a mixture.

**IV. Draw and label the apparatus used in the laboratory for the process of filtration.**



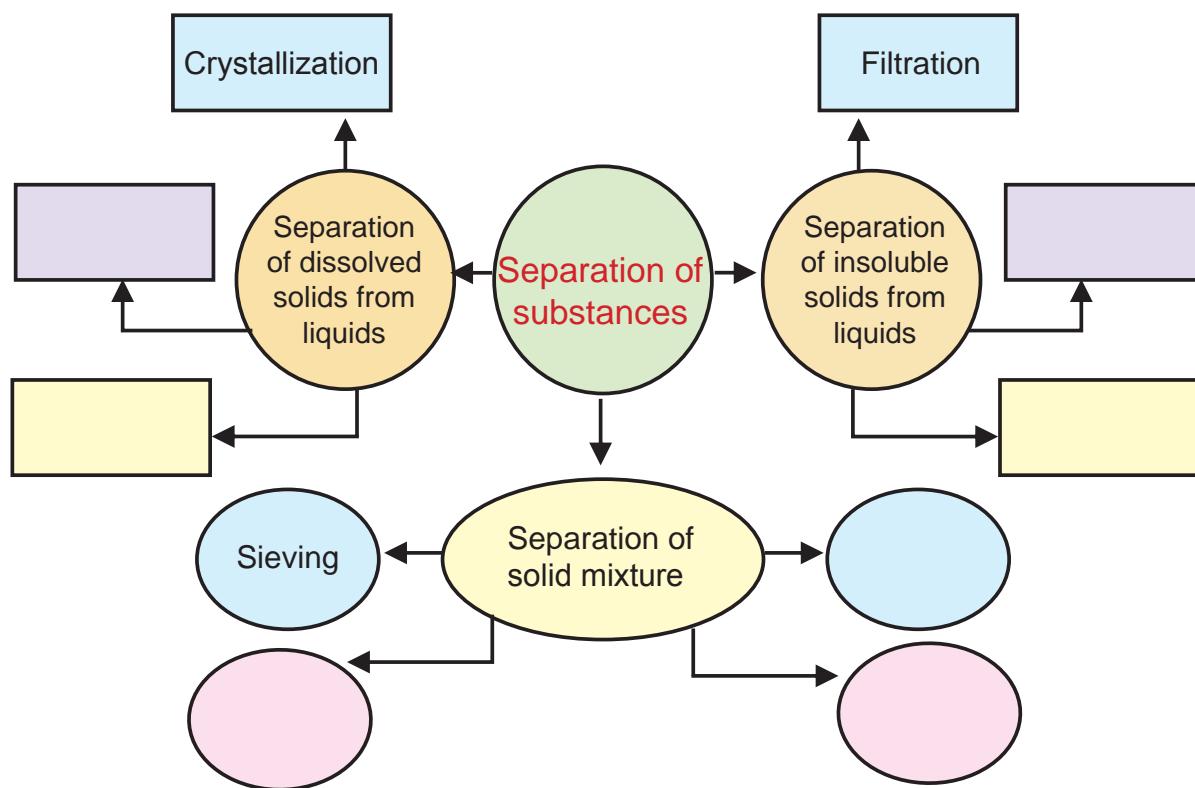
**V. Explore and answer:**

1. Amudha's family gets water from the nearby pond which is turbid in nature. Suggest certain methods to purify and convert this water into safe drinking water.
2. We do not apply the same method of separation to separate a mixture of chalk powder and water, a mixture of green peas and groundnuts, and iron objects from garbage. Why?
3. Why is separation of substances necessary in our daily life?
4. You are given a sample of salt solution. You are asked to separate the salt from it. Filtration method cannot be applied here. Why? Mention the correct method of separation.
5. Differentiate the following:
  - a. filtrate and residue
  - b. winnowing and sieving
6. While preparing lemonade, how will you remove the seeds of the fruit from the juice? We add ice cubes to get chilled juice. When will you add sugar to the juice, before or after adding ice cubes? Why? When can you dissolve more amount of sugar?
7. A mixture contains saw dust and some iron nails. Which method will the carpenter use to collect the iron nails from the saw dust?
8. During winter season, we see dew drops on grass and plants. Can you give reason for this?

**Chapter - 2**

9. Can we separate tiny white stones from 100kg of rice by the method of hand picking? Give reason for your answer.

**VI. Fill in the empty boxes and bubbles with suitable answers:**



**VII. Find the terms that denote different methods of separation hidden 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



**VIII.** Observe the pictures given and arrange them in proper order based on the activities they indicate. Encircle the methods of separation found in them.



Sowing



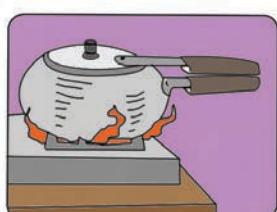
Ploughing



Winnowing



Hand picking



Cooking



Thrashing



Eating



Harvesting

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

### Projects:

1. List the various methods of separation used in our day-to-day life. Describe each process and mention the places they are used in. Explain their significance.
2. Discuss in groups on how salt is obtained from sea water. Collect relevant pictures and stick them in your scrapbook. Find out the places of salt pans in Tamilnadu.

### FURTHER REFERENCE

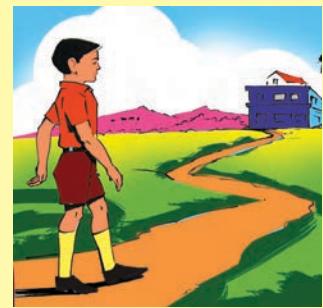
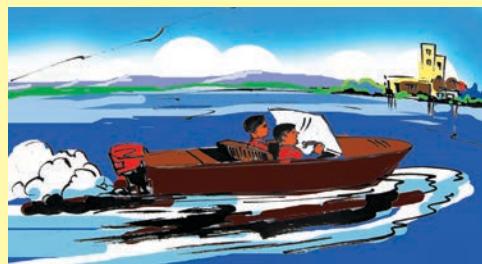
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# Types of Energy



A students' Science Conference was held on the terrace of a multi-storeyed building. Many high school students took part in this conference. They used different modes of transport to reach the venue.

- ☛ One student flew by a mini helicopter and landed on the terrace.
- ☛ A few students travelled by a motor boat to reach the destination as the building was located close to a river.

- ☛ A few students rode a bicycle to reach the spot.
- ☛ Some took a bus to reach the place.

Some students used the lift to reach the terrace, while others climbed the stairs.

In each case, a different type of energy has been used. Before we discuss various types of energy, let us learn what energy is.



We need energy to perform both mental and physical activities like thinking, reading, analysing, running, walking, cycling, climbing, playing and jumping. How do we perform these activities? Don't we need energy to do these activities? Where does this energy come from? We obtain energy from the food we eat. When we are tired and hungry, we lack energy to do our work.

The bus, the boat and the helicopter get the energy to run from fuel. Have you seen ants and bees working busily? They need energy to do work and they get that energy from the food they eat.

### Energy in day-to-day activities



#### Activity 1

#### We Observe

*Take a pinch of baking soda in a small bottle and add a few drops of lime juice or vinegar to it. Close the bottle lightly with a cork. What do you see? What happens to the cork after sometime?*

*We see bubbles form inside the bottle and the cork is soon ejected from the mouth of the bottle. Why does this happen? It is because of the formation of bubbles, which indicate that a gas has evolved. The gas pushes the cork out.*

**Chapter - 3****Activity 2****I Do**

List out a few sources from which we get energy to carry out our daily activities:

**My list**

Sl.No	Activity	Required energy
1	To dry clothes	heat energy from the sun.
2	To run a bus	energy from diesel or petrol.
3		
4		

**I have inferred**

Based on the above activity, we can define **energy as the capacity or ability to do work**. The unit of energy is **joule**.



stretched rubberband

There are many different types of energy.

Some of them are:

Mechanical energy, chemical energy, light energy, sound energy, electrical energy, heat energy, wind energy. Let us learn more...



compressed spring

Similarly, things like a compressed spring or a stretched rubberband have potential energy due to its configuration.

Hence, the energy possessed by an object by virtue of its position or configuration is called potential energy.

i) **Potential energy:** Water stored in a dam, a rock on top of a mountain and water stored in a tank possess potential energy due to its position.



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

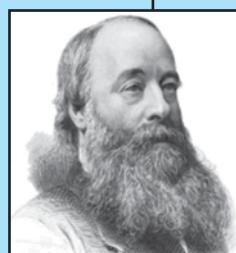
Potential energy and kinetic energy are interconvertible. This property is used to generate electricity in hydro-electric power stations.

When water is stored in a dam, the stored water contains potential energy. When this water is allowed to flow down, it changes into kinetic energy. This kinetic energy of water is used to rotate the turbines and generate electricity.

We also observe that the mechanical energy of the rotation of turbines is converted into electrical energy in a generator.



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



Mechanical energy



### Uses:

- Mechanical energy can bring a moving body to rest or can make a body at rest to move.
- Using wind energy, we can generate electricity through windmills.

## 2. Chemical energy

Energy that is stored in the bonds of chemical compounds is called chemical energy. Chemical energy is released during a chemical reaction, often in the form of heat and light. A type of energy is released, when wood, charcoal, petrol etc., are burnt. This is because of a chemical reaction that takes place when they burn.

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



Chemical energy

In Mettur and Bhavani-sagar, electricity is generated using hydroelectric power.

## Chapter - 3

### Uses:

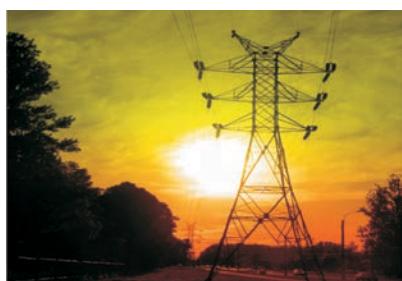
1. The chemical energy stored in the food of plants and animals is used for their growth and function.
2. A battery or an electric cell converts chemical energy into electrical energy.
3. While using fuels, chemical energy is converted into heat energy and light energy.

### 3. Electrical energy

Do you know how a fan rotates or an electric bulb glows, when we switch them 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 a windmill, the wind energy (kinetic energy) is converted into electrical energy.

### Uses:

1. In industries, electrical energy is used to operate machines and is also used in telecommunication.
2. In cities, electrical energy is used to run electric trains.



**Electrical energy**

### 4. Heat energy

Can you guess what the primary source of heat energy is? It is the Sun.

What fuel do you use for cooking in your houses? Do you use wood,



**Wind mill-** (Electric power generation) at Kayathar (Thirunelveli), Aralvoimozhi (Kanyakumari) and also in Coimbatore, Tirupur Districts.

kerosene or LPG for cooking? What energy is released when you burn wood, kerosene or LPG?

The chemical energy stored in wood, kerosene and LPG is converted into heat energy. Rub your hands together and feel your palm. They feel warm because friction causes heat. Due to friction and chemical reaction, heat energy is produced. Discuss with your friends and find out the various other sources of heat energy.



**Heat energy**

#### Activity 3

#### We Observe

*Hold a magnesium ribbon with tongs and burn it. Observe the energy changes that occur in it.*

**Uses:**

1. We get rain due to evaporation of water from water bodies. It is because of the heat energy from the sun.
2. In a thermal power station, of electricity is generated from the heat energy obtained by burning coal.
3. In an electric stove, electric iron etc., electrical energy is converted into heat energy.

**5. Solar energy**

The energy obtained from the sun is called solar energy. What are the types of energy obtained directly from the sun? Can you list them?

**Uses:**

1. Solar energy is directly used in solar heater, solar cooker etc.,
2. Solar cells are used in artificial satellites, watches, calculators and is used to operate solar vehicles.

**Can we convert one type of energy****Activity 4**

*Let us know how energy is obtained directly from the sun.*

**We need :**

Magnifying lens and bits of paper.

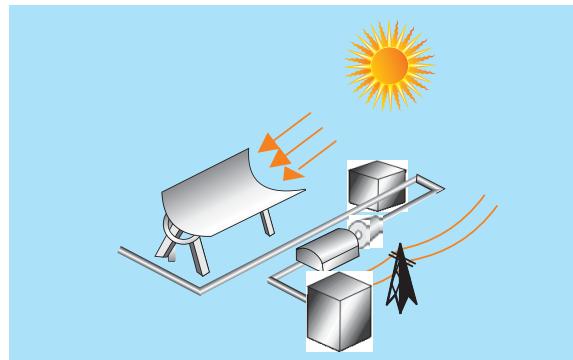
1. Using the magnifying lens, focus the sunlight on the bits of paper.
2. Observe what happens to the bits of paper, after sometime.

**We observed and inferred**


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**Different ways of using solar energy****Do you know?**

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

**We Do**

*Share what you have observed in this activity with your friends.*

### Chapter - 3

into another?

Look at the pictures given below. What do we understand from them?

We know that most forms of energy are obtained from the sun.

1. In Tamilnadu, at Neyveli and Ennore, thermal power stations, coal is burnt to generate electricity. Here the chemical energy of coal is first converted into heat energy and then into electrical energy.
2. The loudspeaker converts electrical energy into sound energy.
3. When water stored at a height flows down, its potential energy is converted into kinetic energy, which rotates the turbine of a generator and generates electrical energy.
4. When wood, charcoal, petrol, diesel and other fuels are burnt, chemical energy is converted into heat energy.

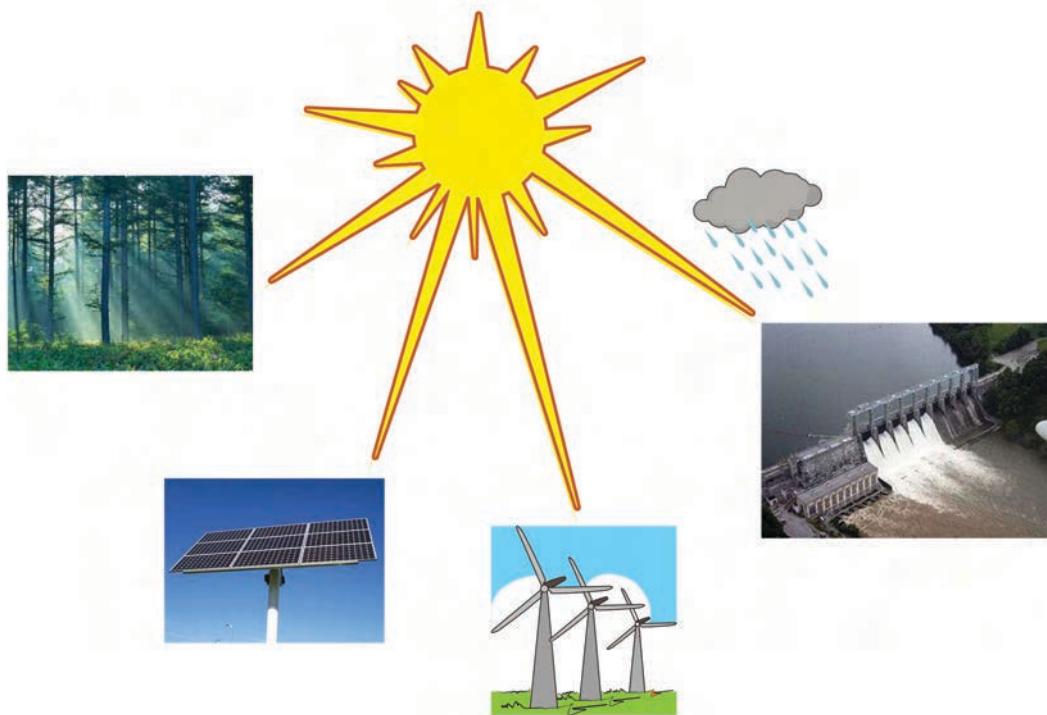
5. During photosynthesis, plants convert light energy from the sun into chemical energy and store it.

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

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

From the above examples, we have learnt that one type of energy can be converted into another type of energy. When one type of energy is used, an equal amount of another type of energy is released. Therefore in any conversion of energy, the total amount of energy will not change.

Hence, we say that **energy can neither be created nor be destroyed, but can be transformed from one form into another. This is called the Law of Conservation of Energy.**



**Activity 5****We Do**

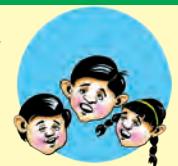
*We shall form small groups and discuss the various uses of solar energy in our daily life to list them hereunder.*

**My list**

- |                               |             |
|-------------------------------|-------------|
| 1. To get salt from sea water | 2. For rain |
| 3. _____                      | 4. _____    |
| 5. _____                      | 6. _____    |

**Activity 6****We Do**

*Discuss in small groups how diesel and petrol can be consumed economically . Present a report.*



For example, let us see how energy conversion takes place, when an electric motor pumps water.

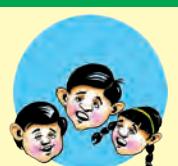
To operate the electric motor, electrical energy is used. This electrical energy is converted into kinetic energy, sound energy and heat energy.

**Electrical energy → Kinetic energy + Sound energy + Heat energy**

(To operate the            (to lift water)        (released when electric motor works)  
electric motor)

**Activity 7****We Do**

*A man carried a heavy load on his head to his house located on top of a hill slope. He left the load by the side of his house and took rest for sometime. When he came back, he noticed that the load had rolled down to the bottom of the hill.*



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

**Chapter - 3****We answer**

*Shall we discuss and answer the above questions related to this event?*

**Our answers**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

**We have learnt**


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**Evaluation****I. Choose the correct answer:**

1. Energy required to dry clothes quickly is \_\_\_\_\_.  
 a) solar energy                                  b) sound energy  
 c) kinetic energy                                d) potential energy
2. "Heat is a form of energy". This was discovered by \_\_\_\_\_.  
 a) Volta    b) James Joule  
 c) Thomas Alva Edison                        d) Galileo
3. Which of the following requires electrical energy?  
 a) windmill                                        b) industry  
 c) bicycle    d) parachute
4. The \_\_\_\_\_ energy cannot be used to run vehicles.  
 a) solar    b) chemical  
 c) electrical                                        d) sound



5. When charcoal is burnt, chemical energy is converted into \_\_\_\_\_ energy.
- a) heat                          b) sound  
 c) mechanical                    d) solar

**II. Tick the correct answer:**

1. Energy obtained by wind energy in wind farms  
*(Chemical energy / Electrical energy)*
2. Energy possessed by a rustling leaf  
*(Kinetic energy / Chemical energy)*
3. Energy possessed by a person landing from a parachute  
*(Kinetic energy of wind / Chemical energy in food)*
4. Energy produced by rubbing the two palms of your hands  
*(Heat energy / Electrical energy)*

**III. Match the following:**

- |                                    |                            |
|------------------------------------|----------------------------|
| 1. Electric bell                   | : Electrical energy        |
| Solar cooker                       | : _____                    |
| 2. The sailing of yacht            | : _____                    |
| Air filled in a balloon            | : potential energy         |
| 3. For the growth of living things | : Chemical energy in food  |
| To run vehicles                    | : Chemical energy in _____ |

**IV. Say true or false:**

1. Energy is the capacity or the ability to do work.
2. Potential energy and kinetic energy are types of mechanical energy.
3. Electrical energy is released during chemical reaction.
4. Heat energy can be produced by friction.
5. One type of energy cannot be converted into another type of energy.

**V. What type of energy do the following possess?**

- |               |                 |                      |
|---------------|-----------------|----------------------|
| 1. sun        | 2. charcoal     | 3. water in a lake   |
| 4. solar cell | 5. waterfalls   | 6. compressed spring |
| 7. fuel       | 8. moving cloud | 9. firewood          |

**Chapter - 3****VI. Find out the energy conversion that takes place in the following:**

1. Torchlight \_\_\_\_\_ → \_\_\_\_\_
2. Radio \_\_\_\_\_ → \_\_\_\_\_
3. Iron (box) \_\_\_\_\_ → \_\_\_\_\_
4. Generator \_\_\_\_\_ → \_\_\_\_\_

**VII. Explore and answer:**

1. We know that we need energy to ride a bicycle, to play cricket or to do any kind of work. How do we define the energy used in these activities and what is the unit of measurement?

2. The coconut in the picture possesses three types of energy. Can you find out what they are?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_



3. What type of energy is stored in each of the objects shown in the pictures given below? In which way is this energy useful to us?



Diesel can



Gas cylinder



Plant

(1)

(2)

(3)

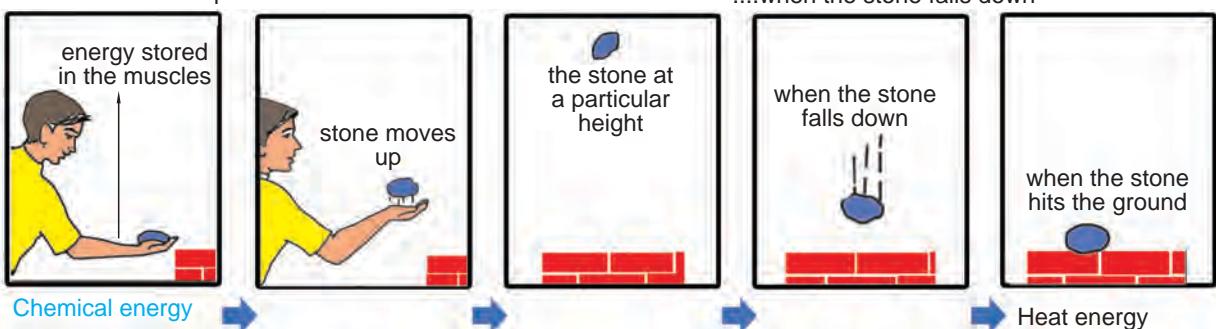
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

4. We know that the water stored in Mettur dam and Bhavanisagar dam is used to generate electricity. List the conversion of energy that occurs in the hydroelectric power stations.



5. Observe the pictures given below and write down the energy possessed by the stone at each level.

a stone is thrown upwards....



### VIII. Answer the following:

1. Differentiate potential energy from kinetic energy.
2. Explain the Law of Conservation of Energy with an example.

### IX. Project work

Write down the names of the gadgets used in your house, the changes in energy that happens and their uses in the tabular column given below.

S.No	Name of the gadget	Change in energy	Use
1.	Electric bulb	Electric energy into light energy	to get light
2.			
3.			
4.			
5.			

### FURTHER REFERENCE

Webliography:

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- <http://www.arvindguptatoys.com>
- <http://www.wikipedia.org>



**'I can, I did'**  
**Student's Activity Record**

**Subject:**

Sl. No	Date	Lesson No.	Topic of the Lesson	Activities	Remarks