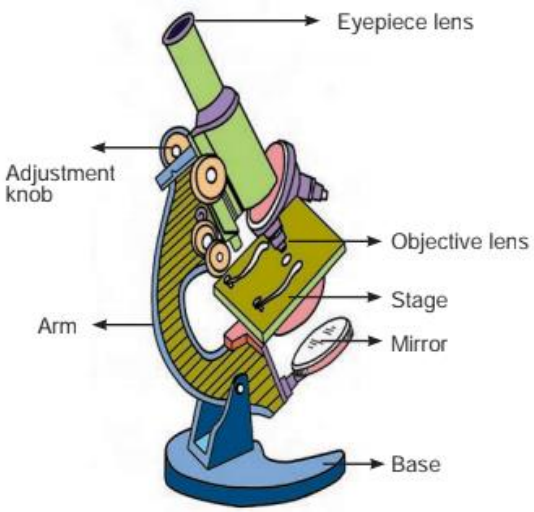
6th Science Notes Part 2 in English

6] Cell Structure

- ✓ Human body is made up of several small units called **cells**. The Cell is the basic structural and functional unit of all **living organisms.**
- ✓ Cells are very minute and cannot be seen with our naked eyes. They can be observed only through a scientific instrument called **'microscope'.**
- ✓ Not only human beings, but other organisms like plants and animals are also composed of **cells.**



compound microscope

Robert Hooke

Who saw the cell first?: 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. 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

Robert Brown

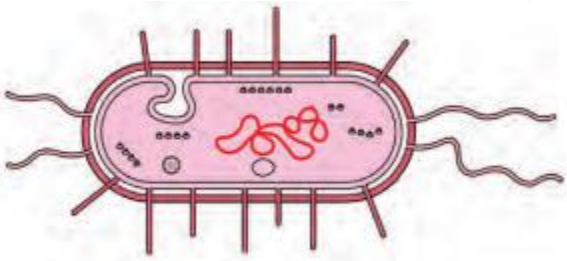
Robert Brown was a school teacher and he was studying the structure of a cell. He invented an **advanced microscope** with a higher degree of magnification through which very small objects could be viewed with greater clarity. With the help of that microscope, he examined the cell and found that there 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.

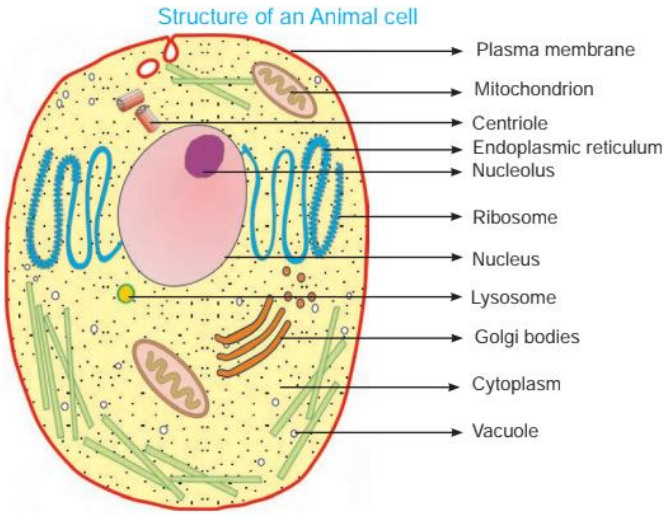
A cell that does not contain membrane-bound organelles and a well defined nucleus is called a **Prokaryotic cell** i.e. a simple cell. e.g. Bacteria.

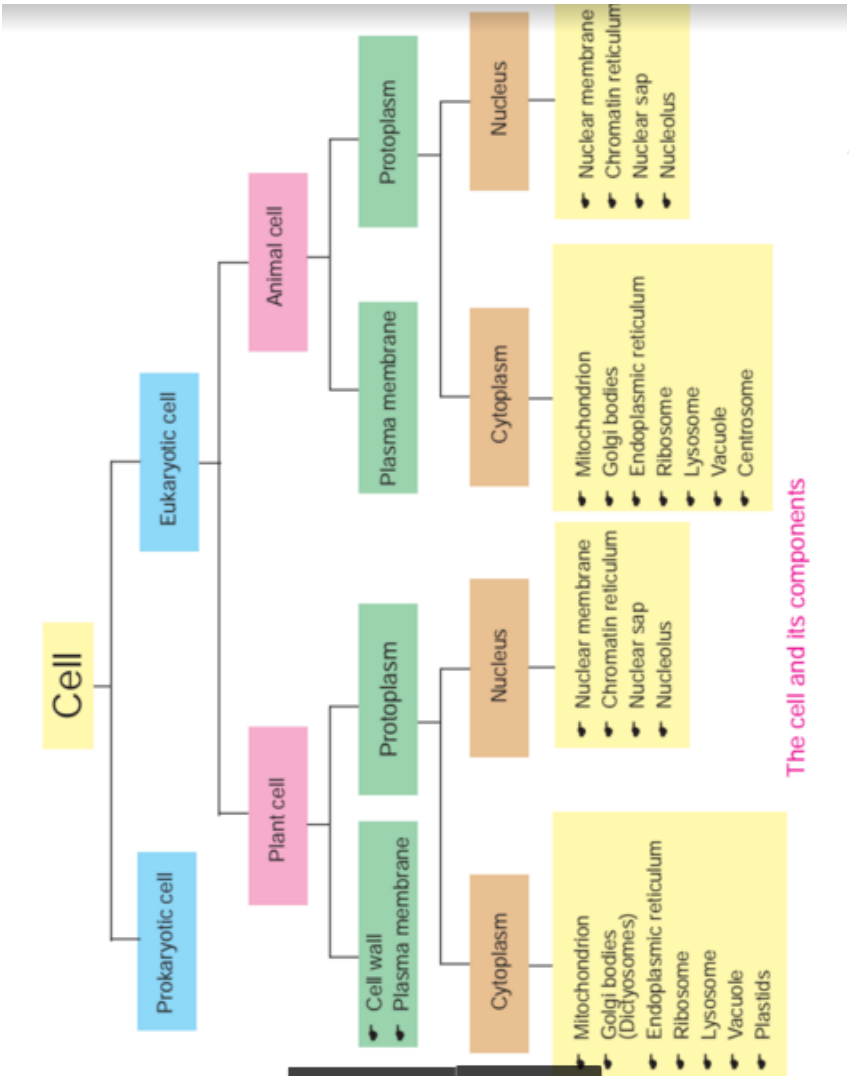


A cell that contains a well defined nucleus,a nuclear membrane and membrane-bound cell organelles is called a **Eukaryotic cell**, i.e. a complete cell. e.g. cells of plants an animals.

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.

animal cell





Each cell is a small factory by itself.

Plasma membrane :

Plasma membrane, enveloping the cell. It gives shape to the cell. It acts as a guard. It control the entry and exit of materials.

Protoplasm:

"It is like colloid, found inside the plasma membrane. It has two components of the cell namely the cytoplasm and the nucleus.

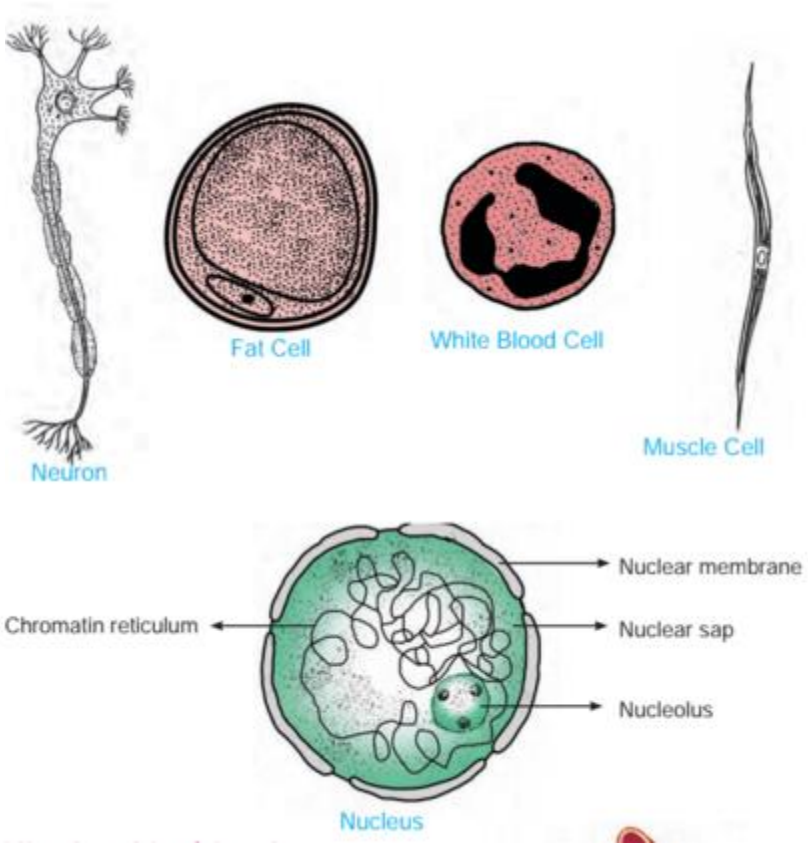
J.E. Purkinjee coined the term **protoplasm.** 'Proto' means **'first' and 'plasma'** means **'colloid'.**

Cytoplasm :

Cytoplasm located in between the plasma membrane and the nucleus. It is made up of carbohydrates and proteins. Organelles and lipid droplets are present in **Cytoplasm**.

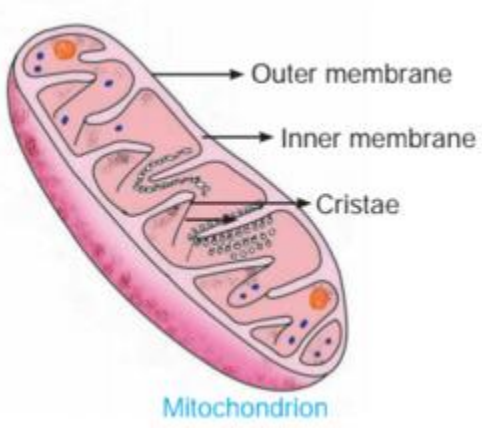
Nucleus :

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



Mitochondria - (singular - Mitochondrion)

Involved in cell respiration. It 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."



Mitochondrion

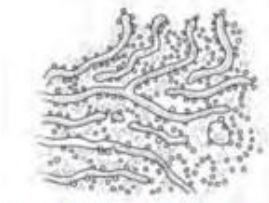
Golgi bodies:

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, IT IS known as **Dictyosomes."**


Golgi bodies

Endoplasmic reticulum :

It helps in transportation of materials from one part of the cell to another.

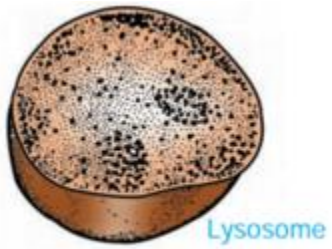

Endoplasmic reticulum

Ribosomes :

- ✓ Granular structures.
- ✓ Protein factories of the cell.
- ✓ It helps in protein synthesis.

Lysosomes :

- ✓ Spherical yellow coloured bodies.
- ✓ It helps in cell protection.
- ✓ It destroy the pathogens that enter the cell.
- ✓ These are called the Suicidal bags of the cell.
- ✓ In addition to this, we help in cell digestion."



Centrosome :

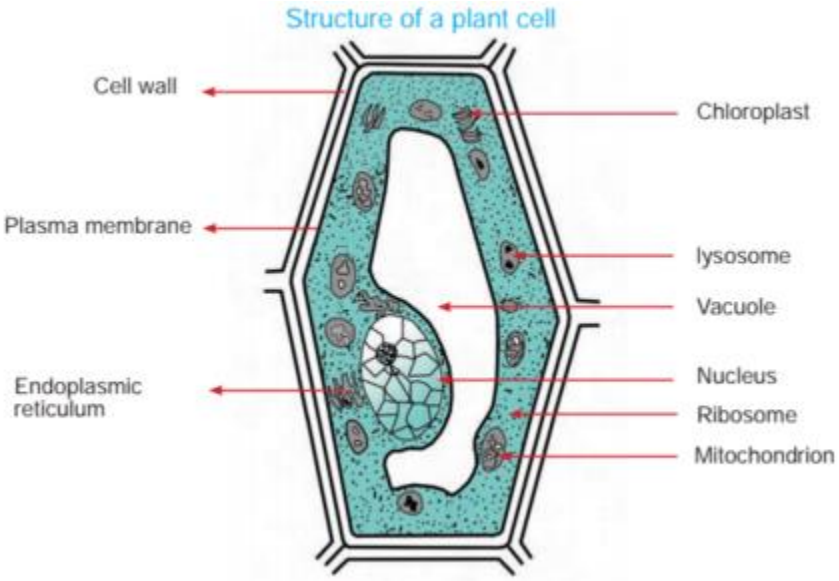
Centrosome :

- ✓ We can see this only in the animal cell.
- ✓ look like a stick and microtubule.
- ✓ found near the nucleus.
- ✓ It has centrioles in **Centrosome**.
- ✓ It plays an important role in cell division i.e., formation of new cells."

Vacuoles :

- ✓ light blue in colour and appear like bubbles.
- ✓ It stores cell sap.
- ✓ It maintain intracellular pressure.

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

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.

Cell organelles and their functions

S. No	Cell components	Functions
1.	Plasma membrane	• It gives shape to the cell. • It selects the substances required by the cell and transports them in and out. • It controls the movements of substances in and out of the cell. • It protects the cell.
2.	Cytoplasm	• It distributes the nutrients within the cell.
3.	Nucleus	• It controls all the activities of the cell. • It carries the hereditary characters from one generation to another.
4.	Mitochondria	• They provide energy to the cell.
5.	Golgi bodies	• They secrete enzymes and hormones. • They store protein. • They help in the formation of Lysosome.
6.	Endoplasmic reticulum	• It helps in transportation within the cell. • It helps in protein synthesis.
7.	Ribosomes	• They synthesize protein.
8.	Lysosome	• It destroys the germs that enter the cell. • It helps in intracellular and extracellular digestion.
9.	Centrosome	• It helps in cell division.
10.	Vacuoles	• They control intracellular pressure. • They store cell sap.
11.	Plastids	• They help in photosynthesis. • They give colour to flowers and fruits.
12.	Cell wall	• It gives shape and protection to the plant cell.

7] Separation of Substances

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.

Methods used to separate mixture of solids:

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

Hand picking

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

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 :

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

Methods of separation of insoluble solids from liquids

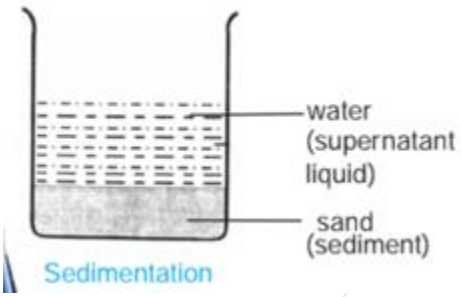
We cannotseparate a mixture of sand and water by using methods like hand picking, sieving, winnowing or by magnetic separation. It is because water is in liquid state and the methods used to separate solid

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

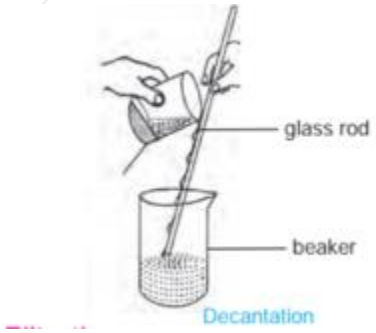
The mixture of insoluble solids and liquid is taken in a beaker and the solid subtances are allowed to settle down as sediments. This is known as sedimentation. The clear liquid above the sediment is called supernatant liquid.



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

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

Methods of separation of solid substances dissolved in liquids

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

Evaporation

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

Condensation

Take a mixture of sand and salt in a beaker. Add water to this mixture and stir. The salt gets dissolved.

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

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.

8] Types of Energy

- ✓ We can define energy as the capacity or ability to do work. The unit of energy is joule. 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.

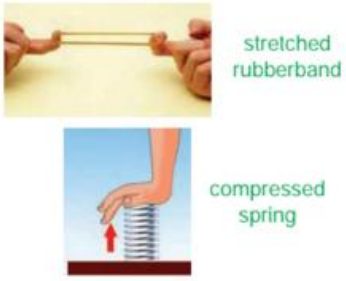
1. Mechanical energy:

Mechanical energy is the energy possessed by an object due to its movement or position. There are two types of mechanical energy.

i) Potential energy ii) Kinetic 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.



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.

ii) Kinetic energy:

A flowing river, a moving bus, a galloping horse or a freely falling stone possess mechanical energy due to their motion.

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.

Uses:

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

ii) 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

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

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

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:

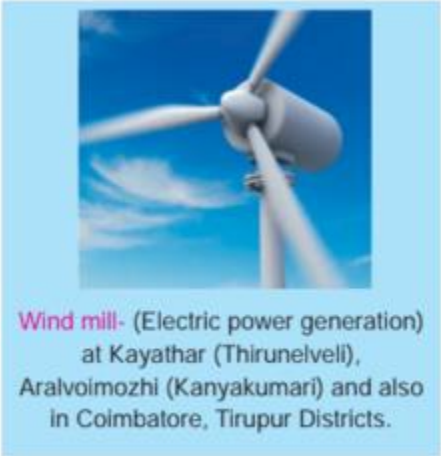
1. In industries, electrical energy is used to operate machines and is also used in telecommunication.

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.

The chemical energy stored in wood, kerosene and LPG is converted into heat energy.

Due to friction and chemical reaction, heat energy is produced.

Heat energy

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. 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.

Different ways of using solar energy

Can we convert one type of energy into another?

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.

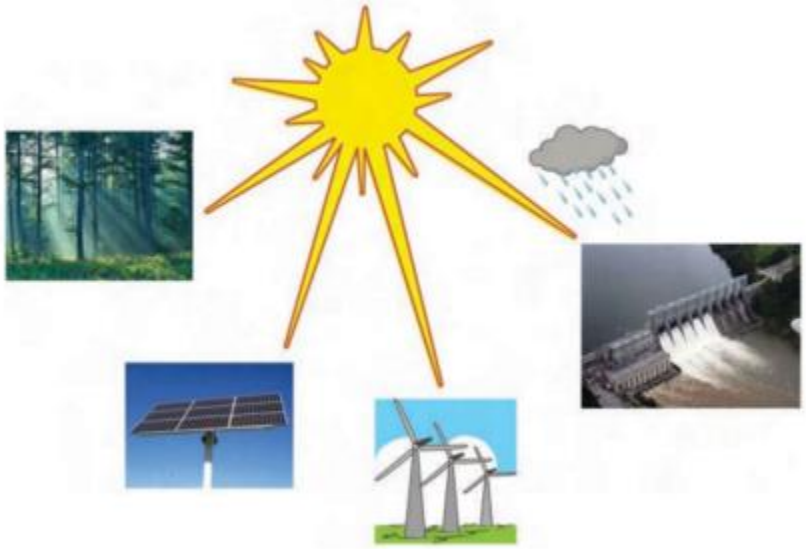
5. During photosynthesis, plants convert light energy from the sun into chemical energy and store it.

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.

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.



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 electric motor) (to lift water) (released when electric motor works)

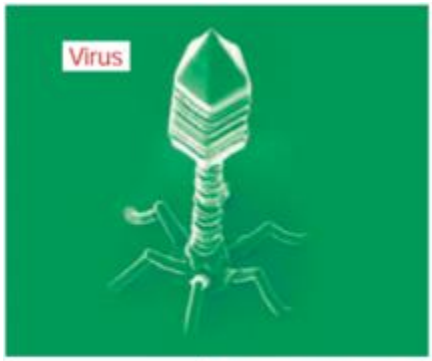
9] Diversity of Organisms

- ✓ Organisms differ in their character, habit, size, structure, nutrition and habitat. This is known as Bio-diversity.
- ✓ Organisms exist in different forms such as micro-organisms, plants, animals,worms, insects and birds.
- ✓ Organisms that can be seen only under a microscope are called micro-organisms. They can be either unicellular or multicellular. They occur in air, water, land, food and even in other living organisms.
- ✓ The study of micro-organisms is called Microbiology. Bacterium, virus, fungus, alga, protozoan etc. are micro-organisms.
- ✓ Bacterium and protozoan are unicellular micro-organisms. Most of the fungi and algae are multicellular micro-organisms.

Virus

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

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



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

Some viruses are also useful. They are used in genetic researches. Eg: **Bacteriophage**.

Bacteria

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

How does milk get converted into curd?, How does garbage become manure?

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

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

Beneficial activities of bacteria:

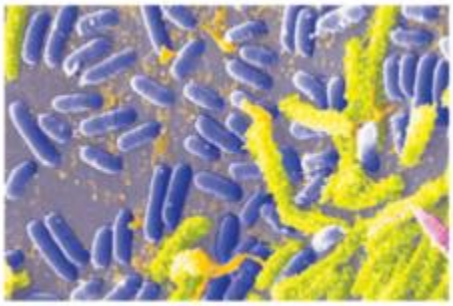
- curdling of milk
- decomposition of organic wastes into manure.
- fermentation of idly and dosai flour
- act as bio-fertilizer increasing the yield.

In 1984, **Robert Gallo** discovered HIV which causes AIDS.

Diseases caused by bacteria

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

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



Bacteria

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

Example: Chlamydomonas, Amoeba, Euglena, Plasmodium.

Unicellular animalcule – Amoeba

Fungi

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

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

Algae

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

e.g. Chlamydomonas, Volvox, Spirogyra.

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

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

Algae which can be seen only under a microscope (microscopic algae) are called **micro algae**. e.g. Chlamydomonas, Volvox.

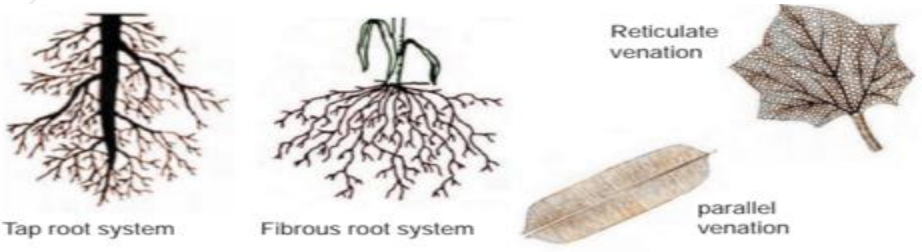
Algae which can be seen with naked eyes are called **macro algae.** These are found in pond and sewage. e.g. spirogyra.

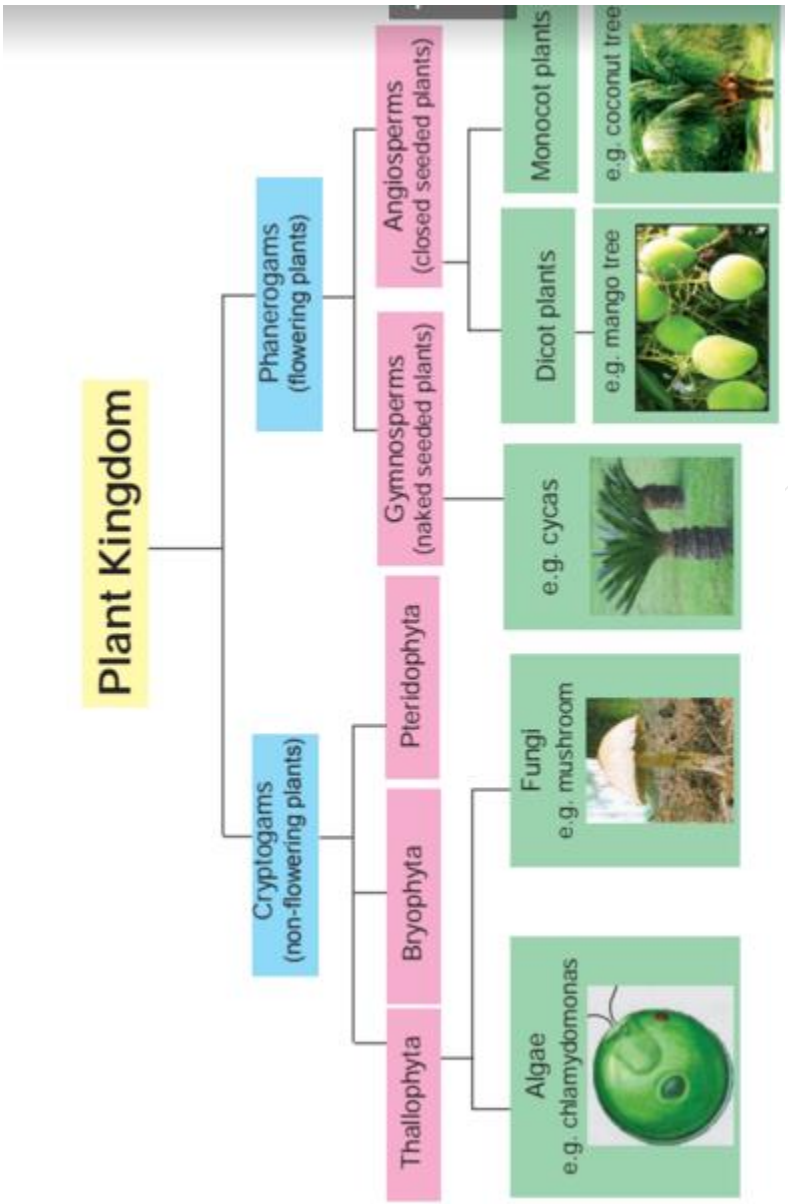
Some algae are used as food for man and aquatic animals. They enrich the soil.

Plants

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

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





Animals

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

Worms :

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

Ascaris

Earthworm:

It has segmented body. It feeds on organic matter in the soil and is called the friend of farmers. Preparation of vermicompost is carried out extensively using this organism.

Earth worm

Insects :

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

Mosquito

Molluscs:

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

Snail

Echinoderms:

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

Fishes:

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

Fish

Frogs:

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

Frog

Snakes:

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

- Crocodile is the only living organism that cannot protrude its tongue.

- Anaconda, the world's biggest snake is viviparous. (gives birth to young ones)

King Cobra

- It is 5.5m long. It is the biggest poisonous snake. A drop of its venom can kill 30 people.
- Except for a few, most of the snakes are non-poisonous.
- Killing of snakes leads to their extinction.

King Cobra

- Crocodiles are colour blind.
- The tongue of a chameleon is twice as long as its body.

Birds:

Generally birds are the most attractive creatures in nature because of their appearance and sweet voice. They are economically beneficial to us in many ways. They have four chambered heart. They are oviparous. Their body is covered with feathers. Respiration occurs through lungs.

Ostrich

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

Mammals:

Their heart is four chambered. They feed their young ones with the help of milk producing glands. They have hairs, sweat glands and oil glands all over their body. Monkey, elephant, bat, cat, rat, blue whale and man are examples of mammals.

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

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


Humming bird

10] Our Environment

- ✓ Air, light, land, soil, water bodies, plants and animals around us constitute our environment.
- ✓ Living organisms are not only inter- dependent on each other but also on the non-living components of the environment.
- ✓ Therefore, a small change in the environment causes a great impact on the living organisms.
- ✓ Environment is polluted, due to industrial development, over population, modern life style and urbanization, which leads to undesirable and harmful effects.

Garbage

Garbage

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

Garbage are generated in places like houses, classrooms, industries and public places like streets, market and sea shore.

Types of garbage

Solid wastes which pollute environment are of two types, namely

- Bio degradable waste
- Non bio degradable waste

Bio-degradable waste

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

Degradable wastes

Non-biodegradable waste

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

Non-biodegradable wastes

Disposal of garbage

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

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

1. Landfilling

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

Landfill

2. Incineration

The burning of solid waste in incinerator is called Incineration. Human anatomical wastes and bio medical wastes (discarded medicines, toxic drugs, blood, pus) are disposed by means of incineration. During incineration, the enormous heat kills all contagious disease-causing germs.

Incineration

3. Composting

The process of degradation of organic wastes into manure by the action of microorganisms is called composting. The manure thus obtained becomes natural fertilizer for the plants as well as increases the soil fertility.

Composting - schematic representation

4. Reducing the usage

The best way to manage wastes is not to produce them. This can be done by using durable goods that last longer instead of things that are used once and thrown away. Use of fountain pen in place of ballpoint pen is a good example of reduce.

5. Reusing

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

6. Recycling

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

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

Pyramid of solid waste management

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

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

Benefits of garbage disposal

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

Vermicomposting

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