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Tamil Nadu Textbook Class 6

Science - Term 2

(English)

For all TN Exams

GOVERNMENT OF TAMIL NADU

STANDARD SIX

TERM - II

VOLUME - 3

SCIENCE

A publication under Free Textbook Programme of Government of Tamil Nadu

Department Of School Education

Untouchability is Inhuman and a Crime

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FOREWORD

The Colourful world of children is full of excitement and spectacular thoughts! Their imaginative power can even attract the wild creatures to accompany them in a friendly manner. Their enthusiasum and innovative prescription can even trigger the non-living entities and enchant the poetic Tamil. It is nothing but a bundle of joy blended with emotions when you travel into their creative world.

We have tried our level best to achieve the following objectives through the new Text Books by gently holding the tender hands of those little lads.

- To tune their mind away from rote-learning and guide them into the world of creativity.
- To make the children be proud of their ancient history, culture, art and rich Tamil literature.
- To march triumphantly with confidence into the modern world with the help of Science and Technology.
- To facilitate them to extend their journey of learning beyond the text book into the world of wisdom.

These new Text Books are studded with innovative design, richer content blended with appropriate psychological approach meant for children. We firmly believe that these newly designed text books will certainly create a sparkle in your mind and make you explore the world afresh.

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PREFACE

The Science textbook for standard six has been prepared following the guidelines given in the National Curriculum Framework 2005. The book is designed to maintain the paradigm shift from the primary General Science to branches as Physics, Chemistry, Botany and Zoology.

The book enables the reader to read the text, comprehend and perform the learning experiences with the help of teacher. The Students explore the concepts through activities and by the teacher's demonstration. Thus the book is learner centric with simple activities that can be performed by the students under the supervision of teachers.

HOW TO USE THE BOOK

- The Second term science Book for has seven units.
- Two units planned for every month in addition computer science chapter has been introduced.
- Each unit comprises of simple activities and experiments that can be done by the teacher as demonstration if necessary student's can perform these activities.
- Colourful infographics and infobits enhances the visual learning.
- Glossary has been introduced to learned scientific terms.
- The "Do you know?" box can be used to enrich the knowledge of general science around the world.
- ICT Corner and QR code has been introduced in each unit for the first time to enhance digital science skills.

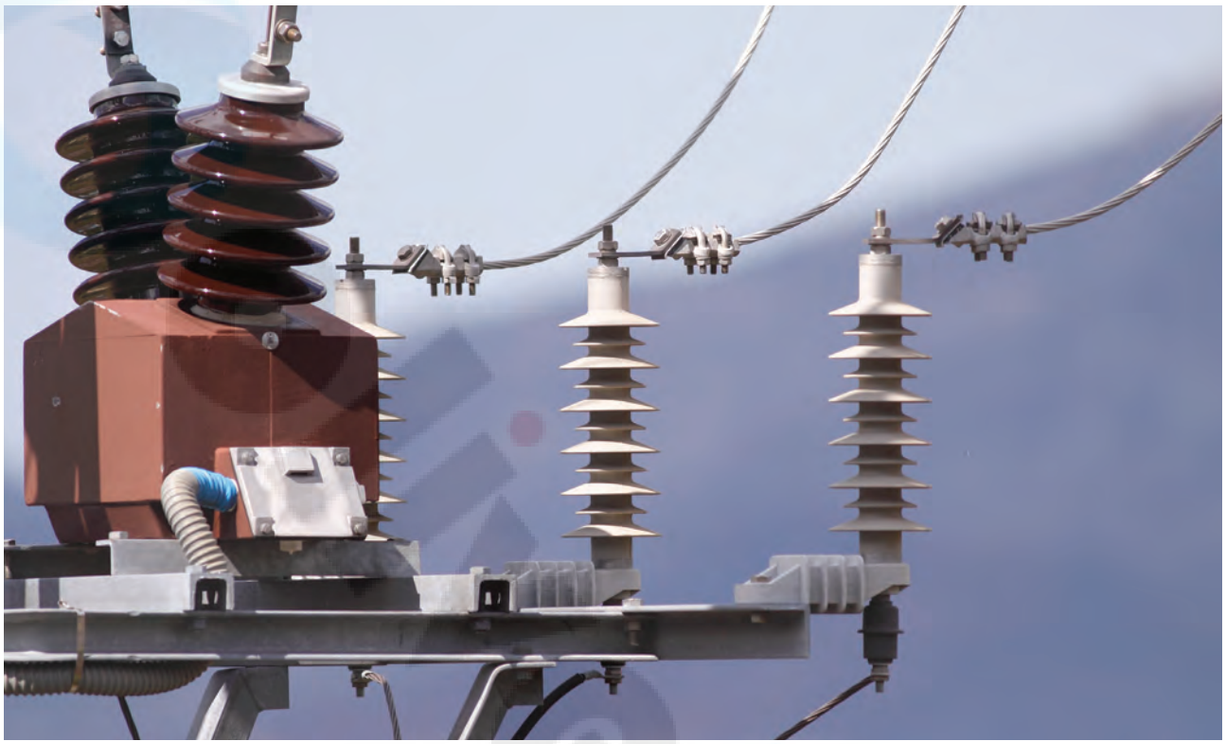
Lets use the QR code in the text books ! How ?

- Download the QR code scanner from the Google PlayStore/ Apple App Store into your smartphone
- Open the QR code scanner application
- Once the scanner button in the application is clicked, camera opens and then bring it closer to the QR code in the text book.
- Once the camera detects the QR code, a URL appears in the screen. Click the URL and go to the content page.

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SCIENCE TERM - II

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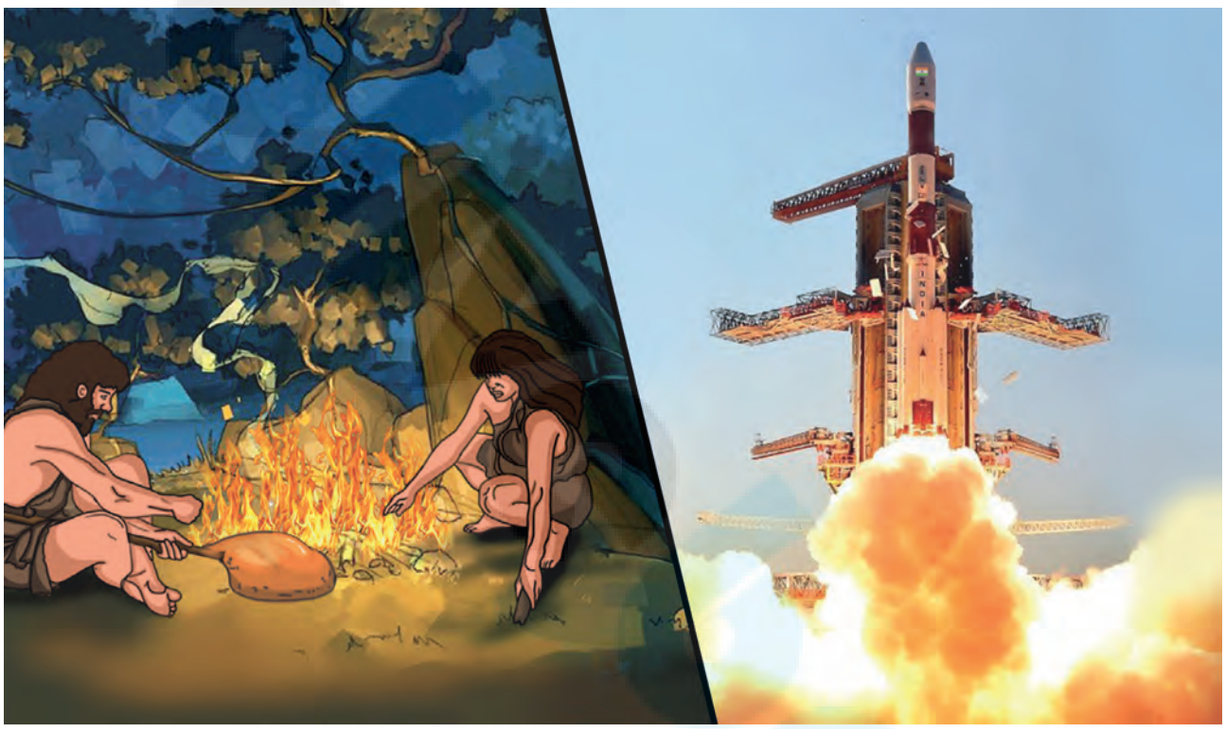
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Unit 1 Heat

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Learning Objectives

- To list out the sources of heat
- To define heat
- To distinguish hot and cold objects
- To define temperature
- To differentiate heat and temperature
- To understand the conditions for thermal equilibrium
- To understand why thermal expansion take place in solids
- To list out the practical applications of thermal expansion in day - to - day life

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Introduction

We are all familiar with heat. We feel it on our body when the sun shines. We use heat for cooking our food, We reduce the heat by adding ice cubes while preparing fruit juice. Let us learn about sources of heat.

1.1 Sources of heat

❖ **Sun**



We all know that the sun gives us light. Does it give us heat? After standing under the sun light for some time, touch your head. Does it feel hot? Yes, it feels hot because the sun gives out heat besides light. Now, You can understand why it is difficult to walk bare-footed on sunny days in the afternoon.

❖ **Combustion (Burning)**



Heat energy can be generated by the burning of fuels like wood, kerosene, coal, charcoal, gasoline/petrol, oil, etc., In your home, how do you get heat energy to cook food?

❖ **Friction**



Rub your palms for some time and then hold them to your cheeks. How do you feel? We can generate heat by rubbing two surfaces of some substances. In the past people used to rub two stones together to light fire.

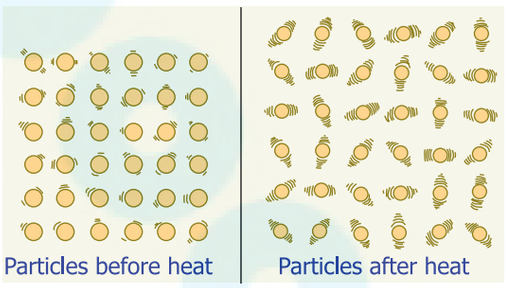
❖ **Electricity**



When electric current flows through a conductor, heat energy is produced. The water heater, iron box, electric kettle etc., work on this principle.

1.2 Heat

Molecules in objects are constantly vibrating or moving inside objects. We cannot see that movement with our naked eye. When we heat the object this vibration and movement of molecules increases and temperature of the object also increases.



Thus, **Heat is an energy that raises the temperature of a thing by causing the molecules in that thing to move faster.**

Heat is not a matter. It doesn't occupy space. It has no weight. Like light, sound and electricity, heat is a form of energy.

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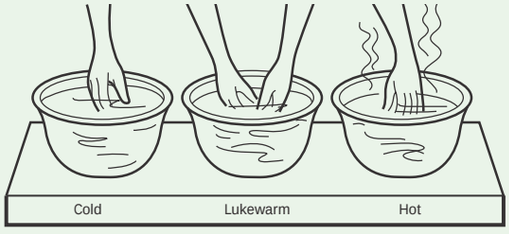
In short, Heat is the total kinetic energy of constituent particles of objects. **SI Unit of Heat is joule**. The unit calorie is also used.

1.3 Hot and cold objects

In our day-to-day life, we come across a number of objects. Some of them are hot and some of them are cold. How do we decide which object is hotter than the other?

We use the tip of our finger to find out whether the tea in a cup has enough heat to drink or whether milk has been cooled enough to set for making curds. We often determine heat by touching the objects. But is our sense of touch reliable?

Activity 1: Take three bowls. Pour very cold water in the first bowl. (you can also add ice cube for cooling). Place luke warm water in the second. Half fill the third with hot water (-not hot enough to burn!) Set them in a row on the table, with the lukewarm water in the center. Place your right hand in the cold water, and your left hand in the hot water. Keep them in for a few minutes. Then take them out, shake off the water and put both into the middle bowl. How do they feel?



Priya says,"My right hand tells me that the water in the bowl is hot and the left hand tells me that the same water is cold."

Write down in your own words what do you experience? Discuss in the class why this happens.

_____

_____

When you placed your left hand in the hot tub, the heat from the bowl made the molecules on your hand vibrate faster. When you keep the same hot hand in the second bowl the vibrations transferred from your hand to make the particles in the water vibrate. Therefore you feel loss of heat and hence your hand feels cold.

In the same way, your right hand which was placed in cold water, feels hot when you insert it into the lukewarm water. Because it takes heat energy from lukewarm water.

So, the same lukewarm water gives your hands different feeling according to the temperature of your hand. **Measuring temperature by touching is not correct.**

Thermometers are used to measure temperature accurately and quantitatively.

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1.4 Temperature

Definition of Temperature

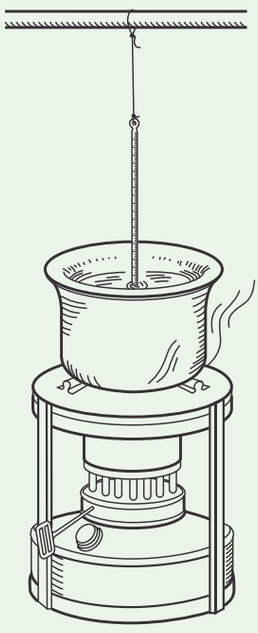
The measurement of warmness or coldness of a substance is known as its Temperature.

SI unit of temperature is kelvin. Celsius and Fahrenheit are the other units used. Celsius is called as Centigrade as well.

It determines the direction of flow of heat when two bodies are placed in contact.

Activity 2: The Temperature of Boiling Water

Take water in a vessel and place the vessel on a stove. Fix the thermometer as shown in figure (Caution: The thermometer should not touch the vessel in which the water is being heated. Otherwise the thermometer will be broken at high temperature.)



All students have to read the temperature of the water and note the reading on the blackboard. Do you notice that the temperature is raising?

What is the temperature of water when it is boiling?

_____

Does the temperature of the boiling water rise further after that?

_____

When boiling water is heated for some time, the water continues to receive more heat, but it's temperature does not rise further. The point at which the water boils and temperature becomes stable is called the **boiling point** of water.

Guess and Write:

(Check your assumption with the help of a thermometer.)

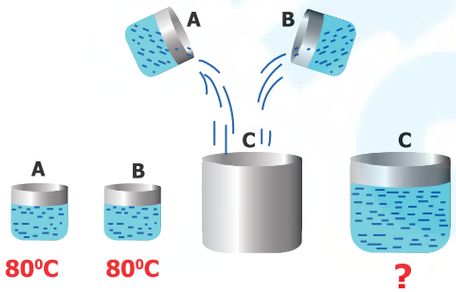
- Approximate temperature of the tea when you drink _____
- Approximate temperature of cool lemon juice when you drink _____

Normally, the room temperature of water is approximately 30°C. When we heat water, its temperature raises and it boils at 100°C. If we cool the water, it freezes at 0°C.

(Note : you have to say 30°C as 30 degree celsius or 30 degree centigrade)

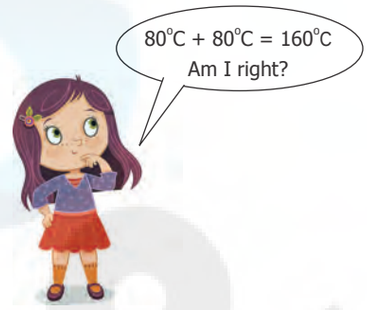
Is Neela correct?

Beaker A and B has water at 80° C.



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Then pour the water of A and B to an empty beaker C. Now, What is the temperature of the water in the beaker C? Neela says it will be 160°C.



What is your opinion? Does Neela say correctly? Make a guess and verify it experimentally.

_____

_____



One day in 1922, the air temperature was measured at 59°C in the shade in Libya, Africa. The coldest temperature in the world was measured in the Antarctic continent. It was approximately – 89°C. The minus sign (–) is used when the temperature falls below the freezing point of water, which is 0°C. If water becomes ice at 0°C, you can imagine how cold – 89° C would be. Our normal body temperature is 37°C. Our body feels cool if the air temperature is around 15 to 20 degree Celsius.



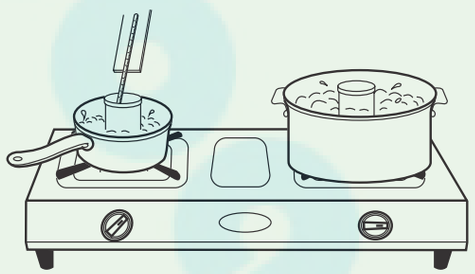
Can you estimate the night temperature in your village or city during winter?

1.5 Heat and Temperature

Heat and temperature are not the same thing, they in fact mean two different things;

- Temperature is related to how fast the atoms or molecules move or vibrate within the substance.
- Heat not only depends on the temperature of the substance but also depends on how many molecules are there in the object.
- Temperature measures the average kinetic energy of molecules. Heat measures the total Kinetic Energy of the molecules in the substance.

Activity 3: Take one litre water in a pan, and heat it on a stove. Calculate the time taken to start boiling. (i.e. the time taken to thermometer reading goes up to 100°C). Take five litre water in another pan and heat it on the same stove. Calculate the time taken by the water to start boiling.



In which pan the water starts to boil earlier?

- ☐ One litre water
- ☐ Five litre water.

Both, however, show a temperature of 100°C at the boiling point. Five litre

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water takes more time to boil i.e. more heat is needed to boil the larger amount of water. So, five litre boiling water has more heat energy than one litre water.

Place an open can of lukewarm water in each pan. Observe their temperature to find out which can gets hotter.

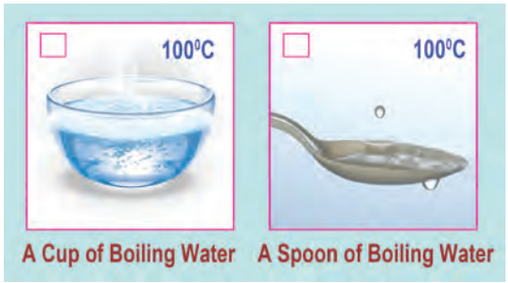
In which can water shows quick rise in temperature?

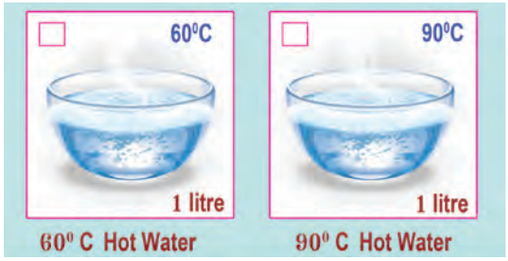
- ☐ Can in One litre boiled water
- ☐ Can in five litre boiled water.

You can see that, five litre water pan will raise the can of water to a higher temperature. Though, both pans of boiling water have the temperature of 100°C the five litre water can give off more heat energy than one litre water. Because it has more heat energy, and gives more energy to the water in the can.

Total heat is measured by **calorie,** the amount of heat needed to raise one gram of water by one degree centigrade.

❖ **Which has more heat energy in each pair? Put ✓ mark.**





Let Us Think

Pavithra is having tea while watching the pond near her house. Surely, tea is in higher temperature than the water in the pond. Now, a question is arising in Pavithra's mind. Which one has more heat energy, a cup of tea or the water in the pond? What do you think? _____

_____

_____

_____



Even though the temperature of the tea is higher than that of pond water, the volume of the water in pond is very high, hence the amount of molecules in the water in the pond is higher than the tea in the cup. So, pond has more heat energy than tea cup.

1.6 Flow of Heat

An analogy between temperature and water level:

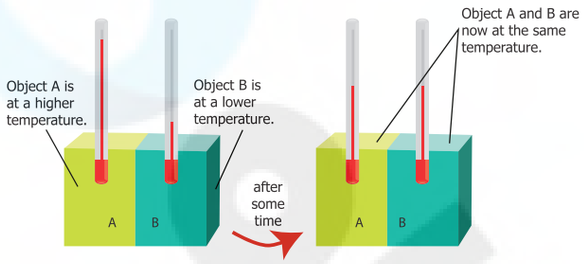
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Water **'flows'** when there is a difference in the **'levels'** of water in different places. It does not matter if there is more water in one place or another. Water from a puddle can flow into a reservoir or the other way around. The **'temperature'** of an object is like the water level – it

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determines the direction in which **'heat'** will flow. Heat energy flows from higher temperature to lower temperature.

Thermal contact and Thermal equilibrium



▲Two objects at different temperatures are put together

Consider two bodies A and B. Let the temperature of A be higher than that of B. On bringing bodies A and B in contact , heat will flow from hot body A to the cold body B. Heat will continue to flow till both the bodies attain the same temperature.

The temperature determines the direction of flow of heat.

1. You are holding a hot cup of coffee. Would the Heat energy transfer from



   a. Your body to the coffee, or

   b. The coffee to your body?



2. You are standing outside on a summer day. It is 40°C outside (note that normal body temperature is 37°C). Would the Heat energy transfer from.

   a. Your body to the air particles, or

   b. The air particles to your body?



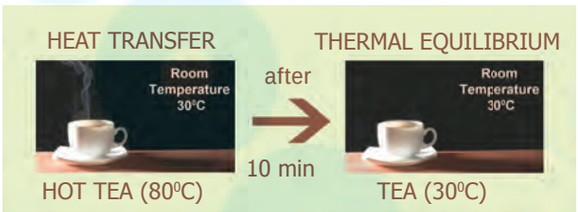
3. You are standing outside on a winter day. It is 23°C outside. Would the heat energy transfer from:

   a. Your body to the air particles, or

   b. The air particles to your body?

Two objects are said to be in **thermal contact** if they can exchange heat energy. **Thermal equilibrium** exists when two objects in thermal contact no longer affect each other's temperature.

For example, if a pot of milk from the refrigerator is set on the kitchen table, the two objects are in thermal contact. After certain period, their temperatures are the same, and they are said to be in thermal equilibrium.



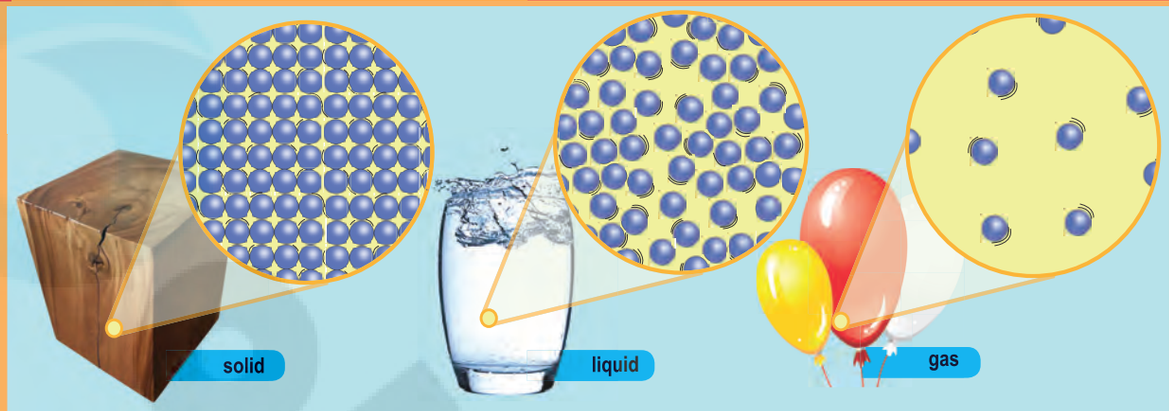
1.7 Expansion in solids

Sam is trying to open a tight jar, but he cannot open it. He asks his uncle to help. His uncle says that pour some hot water on the lid of the jar. Sam does so and tries to open it now. Wow! The jar is opened easily!

Do you have such experience? How do you open a tightly closed cap of the

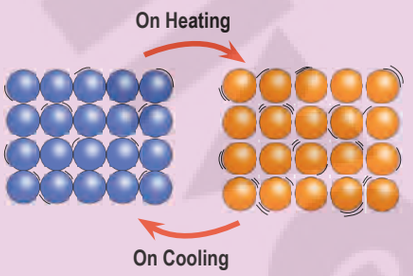
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HEAT - AN INTERNAL VIEW

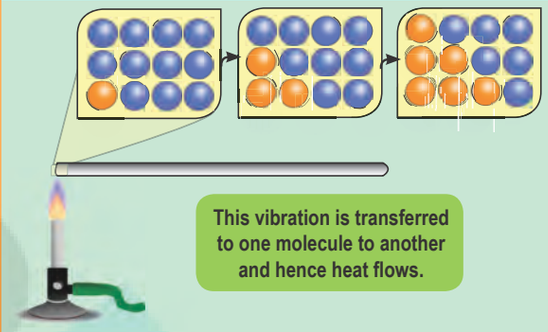


Substances are made up of molecules. The molecules in any object are in a state of vibration or movement. This cannot be seen with our naked eyes

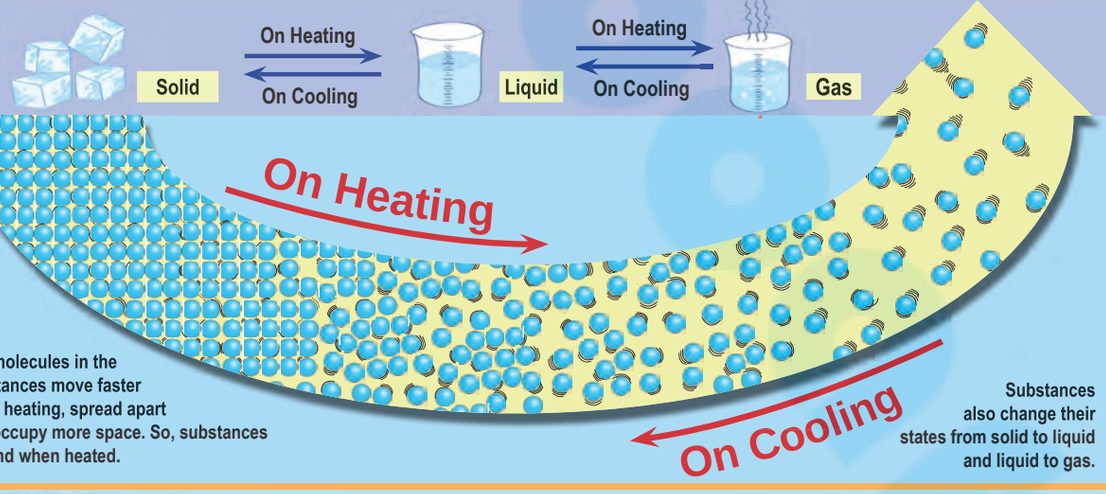
When substances are heated the vibration and movement are increasing



The total number of molecules remain unchanging after heating. Hence, No Change in weight.



This vibration is transferred to one molecule to another and hence heat flows.

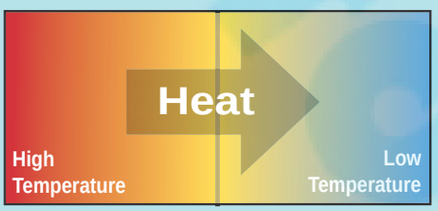


The molecules in the substances move faster when heating, spread apart and occupy more space. So, substances expand when heated.

Substances also change their states from solid to liquid and liquid to gas.



Water 'flows' when there is a difference in the 'levels' of water in different places. The 'temperature' of an object is like the water level – it determines the direction in which 'heat' will flow.



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pen which could not be opened by you normally?

Most substances expand when heated and



Activity 4:

Hammer a nail into a tin can. Ease the nail out. Put it in again to make sure that the hole is large enough for the nail. Then, holding the nail with a pair of pliers, scissors or forceps, heat the nail over a candle, in hot water, or over the stove. Try to put it into the hole in the can.

I see that:_____

_____

You will see that, now it is hard to put the nail into the hole. Heat expands solids. The molecules in the solid move faster, spread apart and occupy more space.



contract when cooled. The change in length / area or volume (due to contraction / expansion) is directly related to temperature change.

The expansion of a substance on heating is called, the thermal expansion of that substance.

1.8 Linear and Cubical Expansion

A solid has a definite shape, so when a solid is heated, it expands in all directions i.e., in length, area and volume, all increase on heating.

The expansion in length is called linear expansion and the expansion in volume is called cubical expansion.

Why is the iron rim of a bullock cart wheel heated before it is fitted onto the wheel? Why is a small gap left between two lengths of railway lines?

We can perform an interesting experiment to find out an answer to these questions. All we need to do is to heat a cycle spoke.

Activity 5: Linear Expansion

Take a bulb, dry cell, candle, cycle spoke, coin (or broad - headed nail) and two wooden blocks.

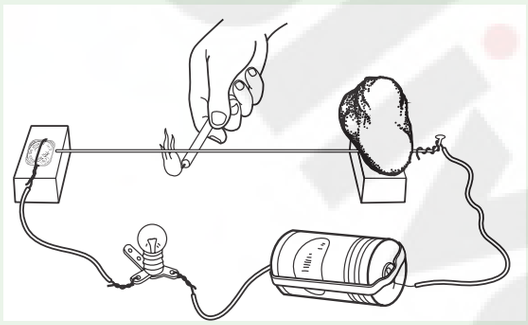
Place one end of the cycle spoke on a wooden block and connect an electric wire to it. Put a stone over the spoke to hold it firmly in place on the wooden block,

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as shown in Figure . The spoke should be parallel to the ground. Place the second wooden block under the free end of the spoke. Wrap some electric wire around the coin (or nail) and place it on the block. You may put a stone over the coin to hold it in place.

Connect a bulb and dry cell to the free ends of the wires connected to the coin and the spoke and make the circuit shown in the figure.



When the tip of the free end of the spoke touches the coin, the circuit is completed and the bulb lights up. Check to ensure this. If the bulb does not light up, it means the circuit is not complete, so check your connections properly. (**Note:** We will learn about electric circuit elaborately in electricity lesson.) Now slide a page of your book between the coin and spoke and then slide it out. That way you would get a gap between the coin and spoke equal to the thickness of the sheet of paper.

❖ Does the bulb light up? If it does not, what could be the reason?

_____

_____

You saw that the bulb does not light up when the spoke does not touch the coin. Now light the candle and heat the spoke with it.

❖ Did the bulb light up after the spoke was heated for some time?

_____

❖ If it did, then explain how the spoke touched the coin after it was heated.

_____

_____

❖ Why does the bulb go off some time after the candle is taken away from the spoke?

_____

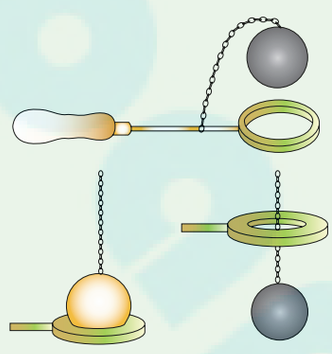
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❖ What happens to the length of the spoke when it is heated or cooled?

_____

Activity 6: Cubical Expansion

Take a metal ring and metal ball of such size that the ball just passes through the ring.



❖ Heat the ball and check whether it passes through the ring.

- ☐ Passed through
- ☐ Not passed through

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❖ Now let the ball cool down, and check whether it passes through the ring.

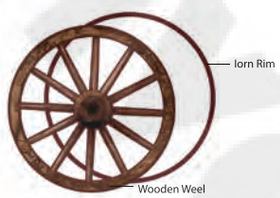
- ☐ Passed through
- ☐ Not passed through

Solids expand due to heat and come back to the original state if heat is removed.

1.9 Uses of Thermal Expansion

Fitting the iron rim on the wooden wheel

The diameter of the iron ring is slightly less than that of the wooden wheel. Therefore, it cannot be easily slipped on from the rim of wooden wheel.

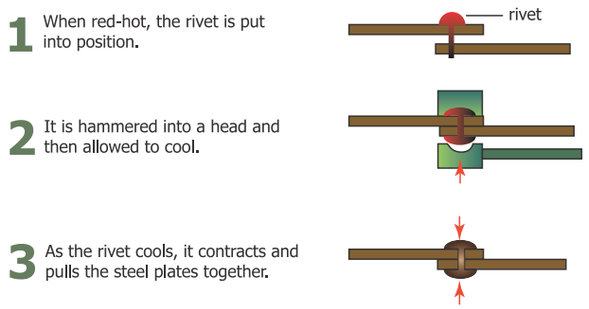


The iron ring is, therefore, first heated to a higher temperature so that it expands in size and the hot ring is then easily slipped over to the rim of the wooden wheel. Cold water is now poured on the iron ring so that it contracts in size and holds the wooden wheel tightly.

Rivetting

Rivets are used to join two steel plates together. Hot rivet is driven through the hole in the plates. One end of the rivet is hammered to form a new rivet head. When cooled, the rivet will contract and hold the two plates tightly together.





1.10 Thermal Expansion Examples

Give Reasons for the following

1. Gaps are left in between rails while laying a railway track.



_____

_____

_____

2. Gaps are left in between two joints of a concrete bridge.



_____

_____

_____

Cracking of a thick glass tumbler



Glass is a poor conductor of heat. When hot liquid is poured into the tumbler, the inner surface of the tumbler becomes hot and expands while the outer surface remains at the room temperature and does not expand. Due to this unequal expansion, the tumbler cracks.

Electric wires

Electric wires between electric posts contract on cold days and sag in summers. To solve this problem, we leave wires slack

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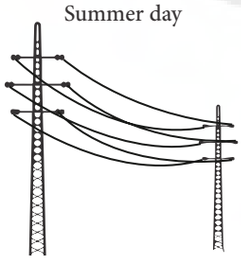
DO YOU KNOW?

Glassware used in kitchen and laboratory are generally made up of Borosilicate glass (pyrex glass). The reason is that the Borosilicate glass do not expand much on being heated and therefore they do not crack.

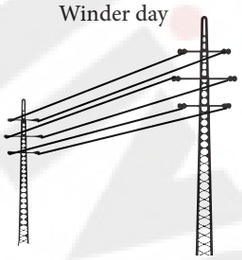


so that they are free to change length.

Summer day



Winder day

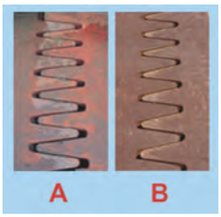


- The photographs below show an expansion joint at the end of a bridge in winter and in summer. Which season is shown in each picture? Explain how do you know?

_____

_____

_____



1.11 Numerical problems

1. I put a kettle containing 1 litre of cold water on the gas stove, and it takes 5 minutes to reach the boiling point. My friend puts on a small electric kettle, containing ½ litre of cold water, and it takes 5 minutes to get up to boiling point. Which gives more heat in 5 minutes?

a. the gas supply; or

b. the electricity supply?

Can you say how many times as much?

2. One calorie heat energy is needed to raise the temperature of the water from 30°C to 31°C. How much heat energy is needed to raise the temperature of the water from 30°C to 35°C.

Points to remember

- The main source of heat is sun, we can obtain heat from combustion, friction, and electricity.
- Heat is an energy that raises the temperature of a thing by causing the molecules in that thing to move faster
- Heat is the total Kinetic energy of constituent particles of objects.
- SI unit of Heat is joule (J).
- The measurement of warmness or coldness of a substance is known as its temperature.
- SI unit of temperature is kelvin.
- Temperature determines the direction of flow of heat when two bodies are placed in contact.
- Two objects are said to be in thermal contact if they can affect each other's temperature.
- Thermal equilibrium exists when two objects in thermal contact no longer affect each other's temperature.
- Most substances expand when heated and contract when cooled. The expansion of a substance on heating is called the thermal expansion of that substance.
- A solid has a definite shape, so when a solid is heated, it expands in all directions i.e., in length, area and volume, all increase on heating.

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ICT Corner

Heat

Through this activity you will be able to understand the 'Thermal Energy Transfer'.



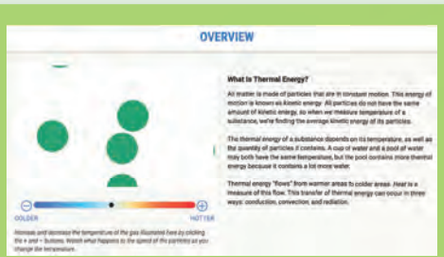
Step 1: Use the given URL in the browser. 'THERMAL ENERGY TRANSFER activity page will open.

Step 2: Click the = icon on the top left of the activity window, a list will drop down, from the list select a title.

Step 3: A small flash video window will open, click the play icon to play the video and observe.

Step 4: From the list select any title under the 'Example" list, a small flash activity window will open, click anyone of the tab given under the window to know the process of thermal transfer. Repeat the activity with different titles from the menu.

Step 1





Step 2

Step 3





Step 4

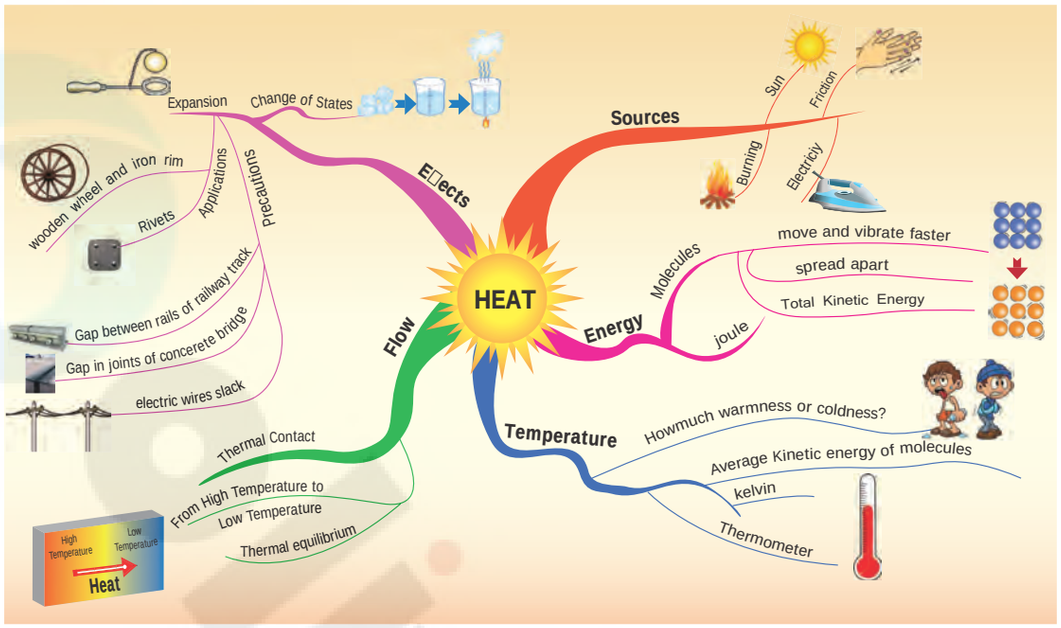
THERMAL ENERGY TRANSFER URL:

http://d3tt741pwxqwm0.cloudfront.net/WGBH/conv16/conv16-int-thermalenergy/index.html#/intro

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*Pictures are indicative only

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Evaluation

A1GUAH

I. Choose the appropriate answer

1. When an object is heated, the molecules that make up the object
   a. begin to move faster
   b. lose energy
   c. become heavier
   d. become lighter
2. The unit of heat is
   a. newton
   b. joule
   c. volt
   d. celsius
3. One litre of water at 30°C is mixed with one litre of water at 50°C. The temperature of the mixture will be
   a. 80°C
   b. More than 50°C but less than 80°C
   c. 20°C
   d. around 40°C
4. An iron ball at 50°C is dropped in a mug containing water at 50°C. The heat will
   a. flow from iron ball to water.
   b. not flow from iron ball to water or from water to iron ball.
   c. flow from water to iron ball.
   d. increase the temperature of both.

II. Fill in the blanks

1. Heat flows from a _____ body to a _____ body.
2. The hotness of the object is determined by its _____
3. The SI unit of temperature is _____
4. Solids_____ on heating and_____ on cooling.

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5. Two bodies are said to be in the state of thermal_____ if there is no transfer of heat taking place.

III. True or False. If False, give the correct statement

1. Heat is a kind of energy that flows from a hot body to a cold body.
2. Steam is formed when heat is released from water.
3. Thermal expansion is always a nuisance.
4. Borosilicate glass do not expand much on being heated.
5. The unit of heat and temperature are the same.

IV. Give reasons for the following

1. An ordinary glass bottle cracks when boiling water is poured into it, but a borosilicate glass bottle does not.
2. The electric wire which sag in summer become straight in winter.
3. Rivet is heated before fixing in hole to join two metal plates.

V. Match the following

1.	Heat	-	$0^{o}C$
2.	Temperature	-	$100^{o}C$
3.	Thermal Equilibrium	-	kelvin
4.	Ice cube	-	No heat flow
5.	Boiling water	-	joule

VI. Analogy

1. Heat : Joule :: Temperature : _____
2. ice cube : $0^{o}C$ :: Boiling water :_____
3. Total Kinetic Energy of molecules: Heat :: Average Kinetic Energy : _____

VII. Give very short answer

1. Make a list of electrical equipments at home which we get heat from.
2. What is temperature?
3. What is thermal expansion?
4. What do you understand by thermal equilibrium?

VIII. Give short answer

1. What difference do you think heating the solid will make in their molecules ?
2. Distinguish between heat and temperature.

IX. Answer in detail

1. Explain thermal expansion with suitable examples.

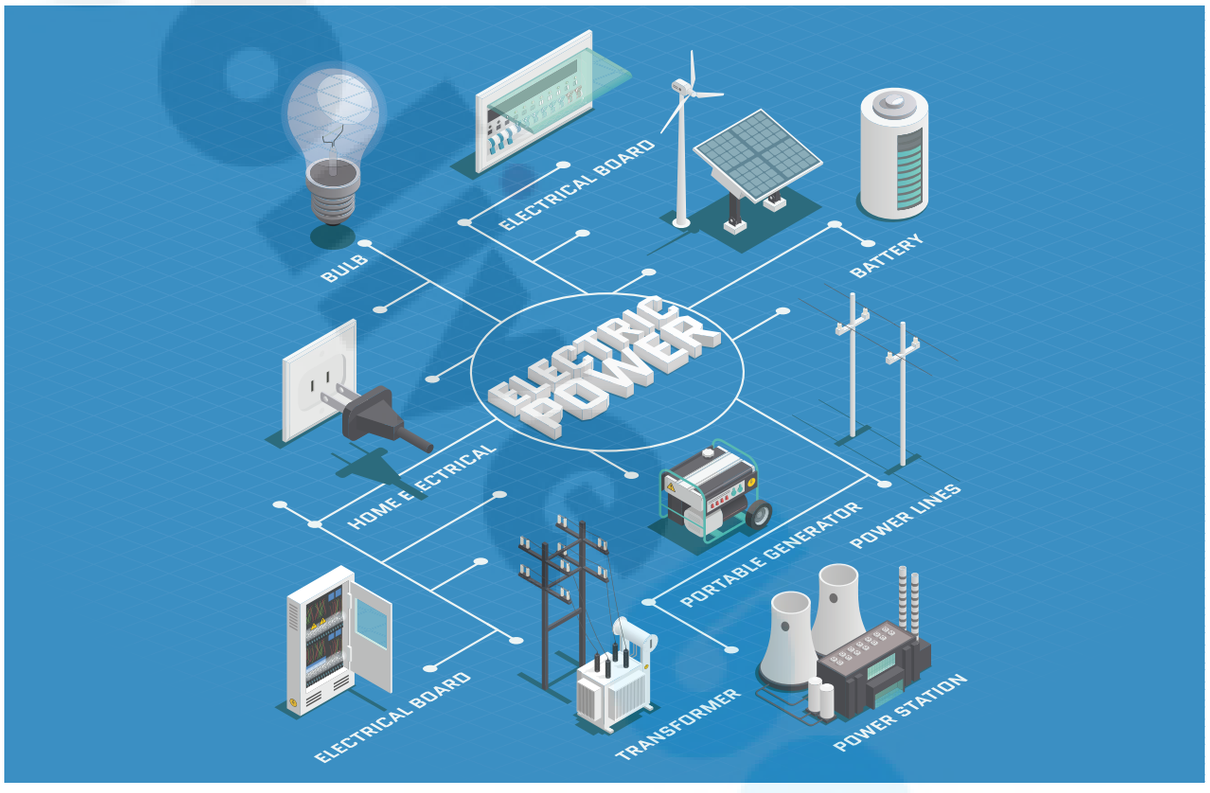
X. Questions based on Higher Order Thinking Skills

1. When a window is accidentally left open on a winter night, will you feel uncomfortable because the cold is getting in, or because the heat is escaping from the room?
2. Suppose your normal body temperature were lower than what it is. How would the sensation of hot and cold change?
3. If you heat a circular disk with a hole, what change do you expect in the diameter of the hole? Remember that the effect of heating increases the separation between any pair of particles.

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Unit 2 Electricity



Learning Objectives

- To know the sources of electricity
- To be aware of the equipments working on electricity
- To know the different kinds of electric cells and understand their applications
- To be able to use different types of cells in different applications
- To understand the symbols of circuits and apply them in different circuits
- To identify conductors and insulators
- To be able to make their own batteries

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Introduction

We use electricity in our day to day life. Have we ever wondered from where do we get this electricity? How does this electricity work? Can we imagine a day without electricity? If you ask your grandfather, you can come to know a period without electricity. They used oil lamps for light, cooked on fires of wood or coal. By the advent of electricity, our day to day works are made easy and the world is on our hands. What are the appliances those work on electricity? What are the materials those allow electricity to flow through? What are electric circuits? What are electric cells and batteries? Come on, let us descend into this lesson to know more about electricity.

Activity 1:

List out the electrical appliances used in your home.

_____

_____

_____

_____

2.1 Sources of Electricity

Selvan and Selvi are twins. They are studying in sixth standard. They visited their grandparent's village during summer vacation. At 6 O'clock in the evening Selvan's Grandfather switched on the light. The whole house was illuminated. Seeing this Selvan asked his grandfather "How do we get light by switching on the switch?" So, his grandfather took him to the nearest electricity board and enquired about the electricity.

Let us look in to the conversation given below.

Selvan: Sir, How do the electric bulb lighten up when we switch on the switch?

Engineer: Due to electricity.

Selvan: Oh! From where do we get this electricity?

Engineer: We get electricity from *thermal power, hydel power, tidal power, wind power, solar power* etc., as sources of electricity.

Selvan: Sir! Are these plants exist everywhere?

Engineer: No, these plants are constructed depending upon the natural resources available at that particular place. For example, we have thermal power plant in Neyveli, Tamilnadu as lignite is available there.

Selvan: Yes, I have seen wind mills near the hills of Tirunelveli District which has potential wind resource. Thank you sir, for your valuable information.

Grandfather: (while walking back to home) Do you think we get electricity only from the above mentioned sources.

Selvan: (while entering into the home, noticing the clock on the wall) Grandpa! look at that wall clock, How does it work?.

Grandfather: It needs electrical energy to work. Apart from the above mentioned sources, we get electricity from cells, and batteries.

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Selvan: Yes, Grandpa , now I am going to discuss about all these with Selvi.

What do you infer from the above dialogue? **Any device from which electricity is produced is called the source of electricity.** We get electricity from different sources.

The Major Electric power stations in Tamilnadu are: Thermal stations (Neyveli in Cuddalore District, Ennore in Thiruvallur District), Hydel power stations (Mettur in Salem District, Papanasam in Tirunelveli District), Atomic power stations (Kalpakkam in Kanchipuram District, Koodankulam in Tirunelveli District), and Wind mills (Aralvaimozhi in Kanyakumari District Kayatharu in Tirunelveli District). Apart from these Solar panels which are prevalent in many places are used to produce electricity.

Let us discuss in shortly about working power stations.

1. Thermal Power stations

In thermal power stations, the thermal energy generated by burning coal, diesel or gas is used to produce steam. The steam thus produced is used to rotate the turbine. While the turbine rotates, the coil of wire



kept between the electromagnet rotates. Due to electro magnetic induction electricity is produced. Here heat energy is converted into electrical energy.

2. Hydel power stations



In hydel power stations, the turbine is made to rotate by the flow of water from dams to produce electricity. Here kinetic energy is converted into electrical energy. Hydel stations have long economic lives and low operating cost.

3. Atomic power stations

In atomic power stations, nuclear energy is used to boil water.



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The steam thus produced is used to rotate the turbine. As a result, electricity is produced. Atomic power stations are also called as nuclear power stations. Here nuclear energy is converted into mechanical energy and then electrical energy.

4. Wind mills



In wind mills, wind energy is used to rotate the turbine to produce electricity. Here kinetic energy is converted into electrical energy.

2.2 Cell

A device that converts chemical energy into electrical energy is called a cell.

A chemical solution which produces positive and negative ions is used as electrolyte. Two different metal plates are inserted into electrolyte as electrodes to form a cell. Due to chemical reactions, one electrode gets positive charge and the other gets negative charge producing a continuous flow of electric current.

Depending on the continuity of flow of electric current cells are classified in to two types. They are primary cells and secondary cells.

Primary Cells

They can not be recharged. So they can be used only once. Hence, the primary cells are usually produced in small sizes.

Examples

cells used in clocks, watches and toys etc., are primary cells.



Secondary Cells

A cell that can be recharged many times is called secondary cell. These cells can be recharged by passing electric current. So they can be used again and again. The size of the secondary cells can be small or even large depending upon the usage. While the secondary cells used in mobiles are in the size of a hand, the cells used in automobiles like cars and buses are large and very heavy.



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Examples

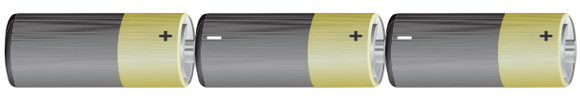
Secondary Cells are used in Mobile phones, laptops, emergency lamps and vehicle batteries.

Activity 2: From the following pictures, identify those use primary cell and secondary cell. Mark Primary cell as **'P'** Secondary cell as **'S'**.



Battery

Often, we call cells as 'batteries'. However only when two or more cells are combined together they make a battery. A cell is a single unit that converts chemical energy into electrical energy, and a **battery is a collection of cells**.



Battery

Activity 3: Take a dry cell used in a flashlight or clock. Read the label and note the following

1. Where is the '+' and '–' symbol?

2. What is the output voltage?

Look at the cells that you come across and note down the symbols and voltage.

Warning

All experiments with electricity should only be performed with batteries used in a torch or radio. Do not, under any circumstance, make the mistake of performing these experiments with the electricity supply in your home, farm or school. Playing with the household electric supply will be extremely dangerous!

2.3 Electric Circuits

Grandfather asked Selvi to bring torchlight. While taking the torchlight, it fell down and the cells came out. She puts the cells back and switched it on (Fig. A)

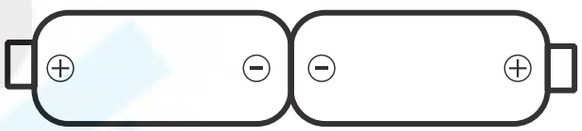


Fig: A

The torchlight did not glow. She thought the torchlight was worn out. She was afraid that grandfather might scold her. She started crying. Her uncle came there and asked the reason for crying. She conveyed the matter. Her uncle removed the cells and reversed them (Fig B)

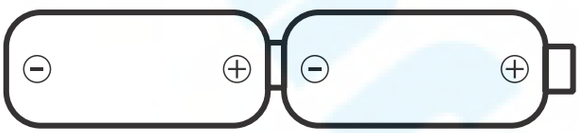
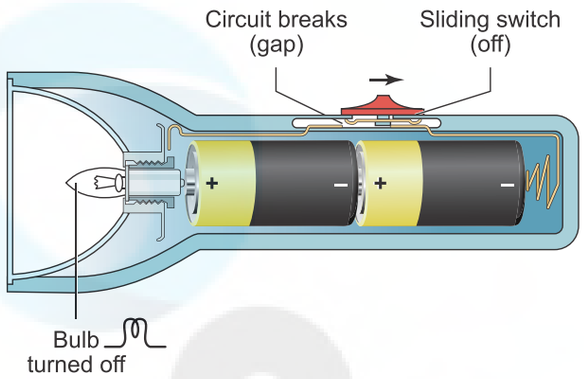


Fig: B

Now, the torch glows. Selvi's face also glows. Uncle told her the reason and explained her about electric circuits.

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Inside view of torch



An **electric circuit** is the continuous or unbroken closed path along which electric current flows from the positive terminal to the negative terminal of the battery. A circuit generally has:

a) **A cell are battery**- a source of electric current

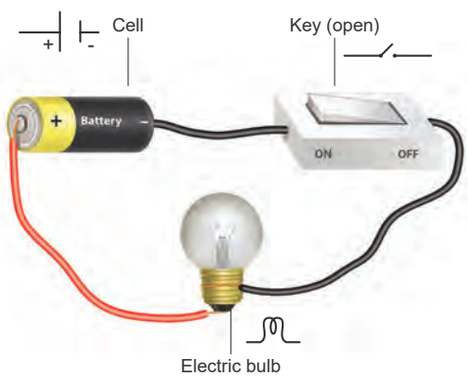
b) **Connecting wires**- for carrying current

c) **A bulb**- a device that consumes the electricity

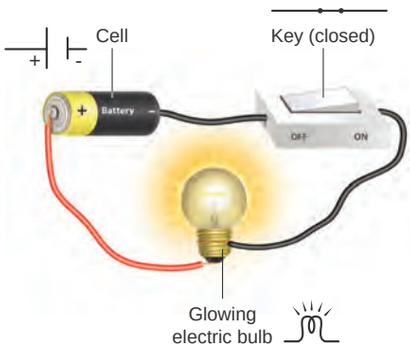
d) **A key or a switch**- this may be connected anywhere along the circuit to stop or allow the flow of current.

a. Open Circuit

In a circuit if the key is in open (off) condition, then electricity will not flow and the circuit is called an open circuit. The bulb will not glow in this circuit.



b. Closed Circuit



In a circuit if the key is in closed (on) condition, then electricity will flow and the circuit is called a closed circuit. The bulb will glow in this circuit.

Can you make a simple switch own by simple things available to you?

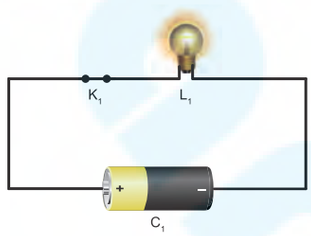
Types of Circuits

1. **Simple Circuit**
2. **Series Circuit**
3. **Parallel Circuits**

A1VYPV

1. Simple Circuit

A circuit consisting of a cell, key, bulb and connecting wires is called a simple circuit.

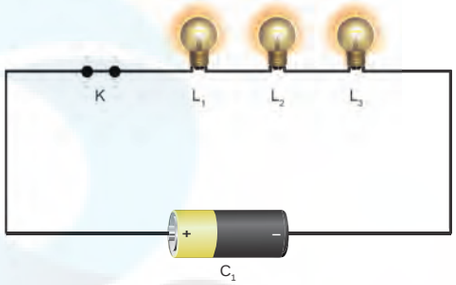


2. Series Circuit

If two or more bulbs are connected in series in a circuit, then that type of circuit is called series circuit. If any one of the bulbs

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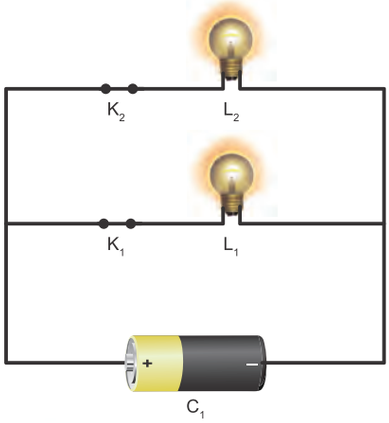
is damaged or disconnected, the entire circuit will not work.



3. Parallel Circuit

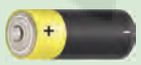
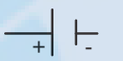
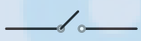
If two or more bulbs are connected in parallel in a circuit, then that type of circuit is called parallel circuit.

If any one of the bulb is damaged or disconnected the other part of the circuit will work. So parallel circuits are used in homes.



Symbols of Electric Components

In the circuits discussed above, we used the figures of electric components. Using electric components in complicated circuits is difficult. So, symbols of the components are used instead of figures. If these symbols used in electric circuits, even complicated circuits can be easily understood.

Sl.no.	Electric component	Figure	Symbol	Remarks
1	Electric cell	 Cell		Longer terminal refers positive and shorter terminal refers negative.
2	Battery	 Battery		Two or more cells connected in series
3	Switch-open		 Open	Switch is in off position
4	Switch-closed		Closed	Switch is in on position
5	Electric bulb			The bulb does not glow
				The bulb glows
6	Connecting wires			Used to connect devices.

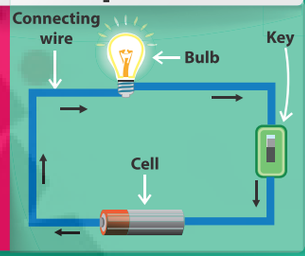
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The flow of electric charge in a circuit is called Electric Current.

electricity

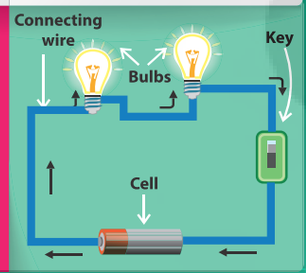
01 Simple Circuit

A circuit consisting of a cell, key, bulb and connecting wires is called a simple circuit



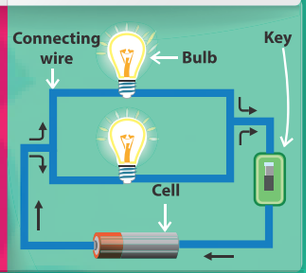
02 Series Circuit

A circuit consisting of a battery, key, bulbs and connecting wires connected in series is called a series circuit



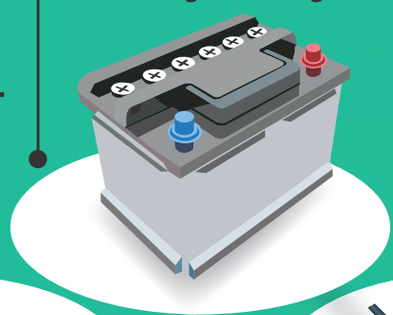
03 Parallel Circuit

A circuit consisting of a battery, key, bulbs and connecting wires connected in parallel is called a parallel circuit



SECONDARY CELL

Secondary cells can be recharged by passing current and used again and again.



PRIMARY CELL

Primary cells can be used only once.



CONNECTING WIRE

Connecting wires are made up of conductors & covered with insulators



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DO YOU KNOW?

Electric Eel is a kind of fish which is able to produce electric current. This fish can produce an electric shock to safeguard itself from enemies and also to catch its food.



More to Know

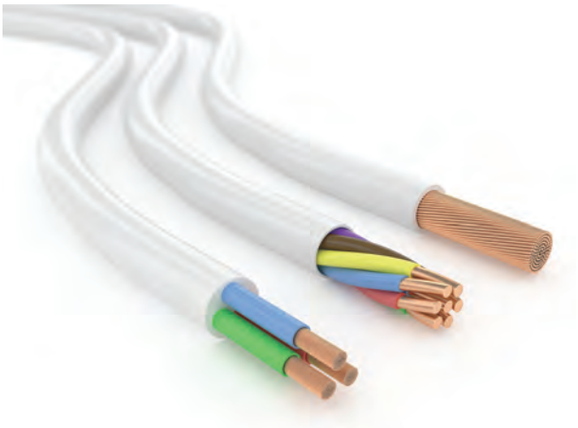
Ammeter is an instrument used in electric circuits to find the quantity of current flowing through the circuit. This is to be connected in series.



2.4 Conductors and Insulators

Will electric current pass throw all materials?

If an electric wire is cut, we could see a metal wire surrounded by another material. Do you know why it is so?



Conductors

The rate of flow of electric charges in a circuit is called electric current. **The materials which allow electric charges to pass through them are called conductors.** Examples: Copper, iron, aluminum, impure water, earth etc.,



Insulators (Non-Conductors)

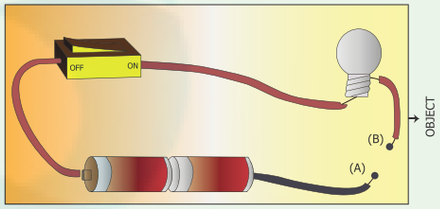
The materials which do not allow electric charges to pass through them are called insulators or non-conductors.

Examples: plastic, glass, wood, rubber, china clay, ebonite etc.,



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Activity 4: Connect the objects given in the table between A and B and write whether the bulb glows or not.



S l . No.	Objects	Materials of the objects	Glow or not glow
1.	Pin		
2.	Match stick		
3.	Safety pin		
4.	Pencil		
5.	Metal spoon		
6.	Rubber		
7.	Pen		
8.	Wooden scale		
9.	Hairpin		
10.	Glass piece		

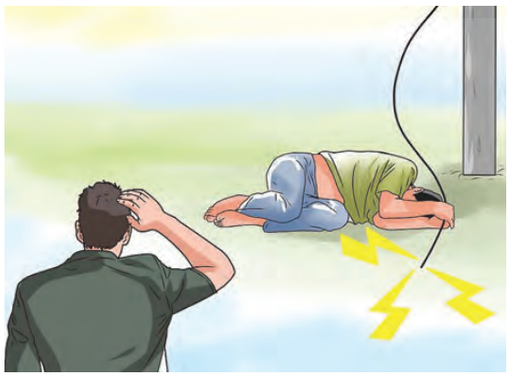
Safety measures to safeguard a person from electric shock

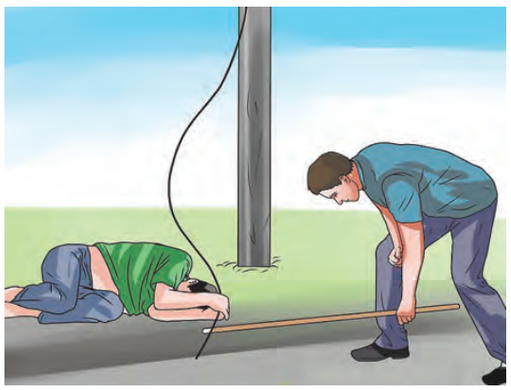
I. Switch off the power supply.

II. Remove the connection from the switch.

III. Push him away using non - conducing materials.

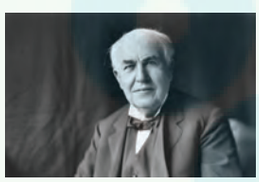
IV. Give him first aid and take him to the nearest health centre.

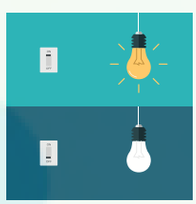




More to Know

Thomas Alva Edison (February 11, 1847 – October 18, 1931) was an American inventor. He invented more than 1000 useful inventions and most of them are electrical appliances used in homes. He is remembered for the invention of electric bulb.


Thomas Alva Edison



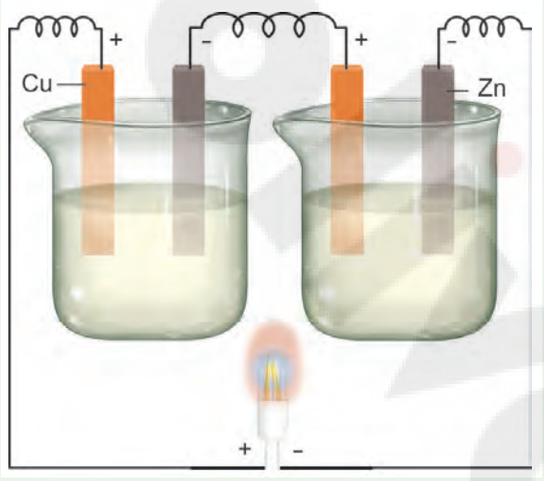
Activity 5:

Produce electricity using copper plates, zinc plate, connecting wires, key, beaker and porridge (rice water) [the older the porridge the better will be the current]

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Arrange copper and zinc plates in series as shown in the figure. Half fill two beakers with porridge. Connect the copper plate with the positive of and LED bulb and zinc to the negative. Observe what happens.

Now you can replace porridge with curd, potato, lemon etc.



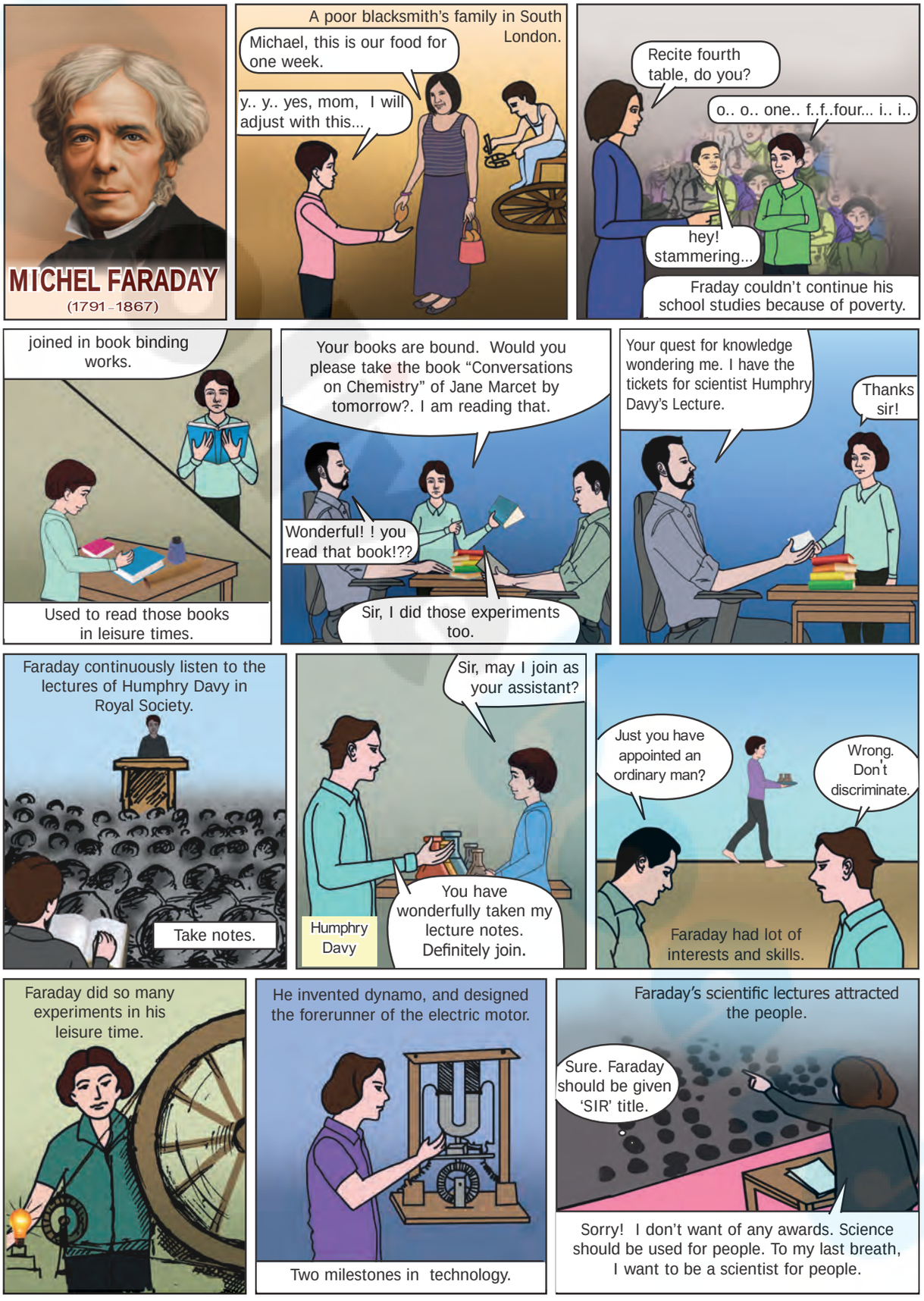
A1ZLDS

Points to remember

- Any device from which electricity is produced, is called the source of electricity.
- There are many sources of electricity such as thermal power stations, hydel electric power stations, wind mills, atomic power station etc.
- Device that converts chemical energy into electrical energy is called a cell.
- Electric cells are of two types depending on the continuity of flow of electric current.
- Primary cell is a cell that is designed to be used once and discarded.
- A cell that can be recharged many times is called secondary cell.
- Two or more cells combined together to make a battery.
- An electric circuit is the continuous or unbroken closed path along with electric current flows from the positive terminal to the negative terminal of the battery.
- A circuit consisting of a cell, key, bulb and connecting wires is called a simple circuit
- If two or more bulbs are connected in series in a circuit, then that type of circuit is called series circuit.
- If two or more bulbs are connected in parallel in a circuit, then that type of circuit is called parallel circuit.
- Symbols of electrical components are used to represent complicated circuits in simple way.
- The materials which allow electric charges to pass through them are called conductors.
- The materials which do not allow electric charges to pass through them are called insulators or non-conductors.

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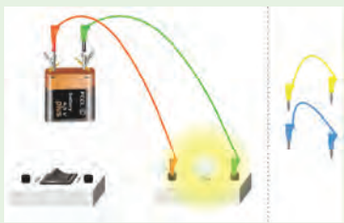
Scientist for the People



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ICT Corner

Electricity



Through this activity you will be able to form a simple circuit.

Step 1: Use the given URL in the browser. 'Simple Circuit will open.

Step 2: In right side of the activity window there are diagrams of some wires and in the left side diagrams of a battery, switch and a bulb are given.

Step 3: By using the mouse drag and drop the wires to the battery and switch to make connections. Click on the switch, if the circuit is formed correctly the bulb will glow.

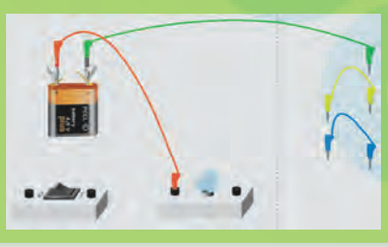
Step 4: Use the second URL to try Series and parallel circuits.

Step 1





Step 2



Step 3

Simple Circuit's URL:

http://www.physics-chemistry-interactive-flash-animation.com/electricity_electromagnetism_interactive/simple_circuit.htm

Series and parallel circuits url

http://www.physics-chemistry-interactive-flash-animation.com/electricity_electromagnetism_interactive/components_circuits_association-series_parallel.htm

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*Pictures are indicative only

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Evaluation

A25URI

I. Choose the appropriate answer

1. The device which converts chemical energy into electrical energy is

   a. fan b. solar cell

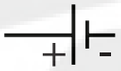
   c. cell d. television

2. Electricity is produced in

   a. transformer b. power station

   c. electric wire d. television

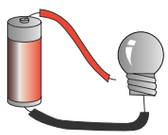
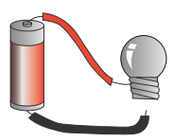
3. Choose the symbol for battery

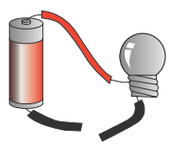
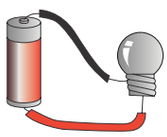
a.  b. 

c. 

d.

4. In which among the following circuits does the bulb glow?

a.  b. 

c.  d. 

5. _____ is a good conductor

   a. silver b. wood

   c. rubber d. plastic

II. Fill in the blanks

1. _____ are the materials which allow electric current to pass through them.
2. Flow of electricity through a closed circuit is _____.
3. _____ is the device used to close or open an electric circuit.
4. The long perpendicular line in the electrical symbol represents its _____ terminal.
5. The combination of two or more cells is called a _____.

III. True or False. If False, give the correct statement

1. In a parallel circuit, the electricity has more than one path.
2. To make a battery of two cells, the negative terminal of one cell is connected to the negative terminal of the other cell.
3. The switch is used to close or open an electric circuit.
4. Pure water is a good conductor of electricity.
5. Secondary cell can be used only once.

IV . Match the following

sl.no.	Symbol	Description
1		open key
2		cell
3		bulb glows
4		battery
5		bulb does not glow

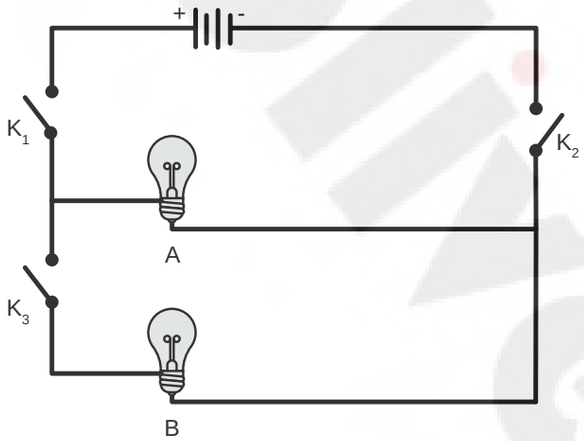
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V. Arrange in sequence

A CELL	A DEVICE	ELECTRICAL ENERGY
IS CALLED	IN TO	CHEMICAL ENERGY
THAT CONVERTS		

VI. Give very short answer

1. In the given circuit diagram, which of the given switch(s) should be closed. So that only the bulb A glows.



2. Assertion (A) : It is very easy for our body to receive electric shock.

   Reason (R) : Human body is a good conductor of electricity.

   a. Both A and R are correct and R is the correct explanation for A.

   b. A is correct, but R is not the correct explanation for A.

   c. A is wrong but R is correct.

   d. Both A and R are correct and R is not the correct explanation for A.

3. Can you produce electricity from lemon?

4. Identify the conductor from the following figures.






5. What type of circuit is there in a torch light?

6. Circle the odd one out. Give reason for your choice.

   Switch, Bulb, Battery, Generator.

VII. Give short answer

1. Draw the circuit diagram for series connection.

2. Can the cell used in the clock gives us an electric shock? Justify your answer.

3. Silver is a good conductor but it is not preferred for making electric wires. Why?

VIII. Answer in detail

1. What is the source of electricity? Explain the various power stations in India?

2. Tabulate the different components of an electric circuit and their respective symbols.

3. Write short notes on conductors and insulators.

IX. Question based on Higher Order Thinking Skills

1. Rahul wants to make an electric circuit. He has a bulb, two wires, a safety pin and a piece of copper. He does not have any electric cell or battery. Suddenly he gets some idea. He uses a lemon instead of a battery and makes a circuit. Will the bulb glow?

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X. Search ten words in the given word grid and classify them as conductors and insulators

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

S.No.	CONDUCTORS	INSULATORS

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Unit 3 Changes Around Us



Learning Objectives

- To recognize and enlist a few changes that happen in our day-to-day life
- To classify the observed changes as,
  - slow / fast, reversible / irreversible
  - physical and chemical changes
  - desirable / undesirable, natural / human made
- To explain the process of dissolution
- To distinguish between a solvent and a solute

A29HFF

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Observe the pictures in the previous page and fill in the gaps.

Initial stage	Changing stage
Seed	Sapling
	Night
Rock	
raw fruit	

What is common in all the above pairs?

_____

Introduction

What is a change?

The process in which something becomes different from what it was earlier? It is the observable difference between initial state and the final state of any substance.

Change is the law of nature. In our day - to - day life we see many changes around us. Weather changes periodically (daily/ seasonly), season change periodically. A paper burns readily while it takes a few days for an iron nail to rust. It takes a few hours for milk to turn into curd but vegetables get softened in a few minutes when cooked.

The what happense during a change? said changes are accompanied by change in properties like shape, colour, temperature, position and composition. Some changes can be observed while some are not possible to notice.

Can you list some of the changes that you have observed in your daily life?

Activity 1: What happens when you blow air into a balloon?



- Is there any change in size?
  ☐ Yes ☐ No
- Is there any change in shape?
  ☐ Yes ☐ No
- Is there any other change?

_____

3.1 Classification of Changes

A2EQT6

There are different types of changes that occur around us. Some changes take place very quickly while others take hours, days or even years. Some changes are temporary while some others are permanent. Some changes produce new substances while others do not. Some changes are natural while others are made by human beings. Some changes are desirable to us but some changes are not desirable.

We shall now try to classify changes on the basis of certain similarities and differences.

- **slow and fast changes**
- **reversible and irreversible changes**
- **physical and chemical changes**
- **desirable and undesirable changes**
- **natural and man - made changes**

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3.1.1 Slow and Fast changes

Activity 2: Look at the pictures and discuss about the duration for the changes to take place.



Slow changes

Changes which take place over a long period of time (hours / days / months / years) are known as slow changes.

Examples: growth of nail and hair, change of seasons, germination of seed.

Fast Changes

Changes which take place within a short period of time (seconds or minutes) are known as fast changes.

Examples: Bursting of balloon, breaking of glass, bursting of fire crackers, burning of paper.

3.1.2 Reversible and Irreversible changes

Reversible change

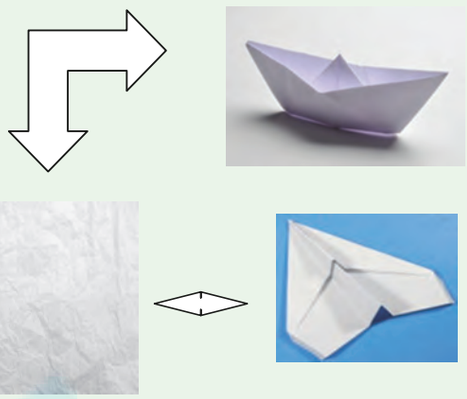
Changes which can be reversed (to get back the original state) are known as reversible changes.

Examples: Touch me not plant (Responding to touch), stretching of rubber band, melting of ice.

Touch me not plant



Activity 3: Try to make a boat and an aeroplane one by one using the same piece of paper. This means the change of shape discussed here is reversible.



Irreversible change

Changes which cannot be reversed or to get back the original state are known as irreversible changes.

Activity 4: What kind of changes are they?



a) Burning of a candle.

_____

b) Piercing a balloon with a pin.

_____

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Examples : Change of milk into curd, digestion of food, making idly from batter.



3.1.3 Physical and Chemical Changes

Activity 5: Take an apple and cut it into two halves.



Cut one half into pieces and share it with your friends.

Is there any change in the composition of the apple while cutting?

No, only the shape and size have changed. This can be called a **physical change.**

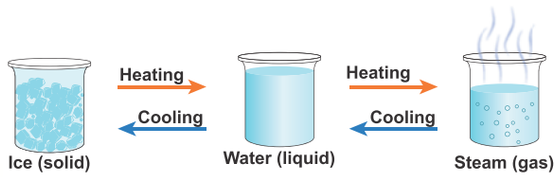
Leave the other half on the table for some time. You can see brown patches formed on the cut surface because of the reaction between some substances in the apple and the air around it. This is a **chemical change.**

Physical changes

Physical changes are the temporary changes in which there is change in the physical appearance or physical state of the substance but not in its chemical composition. Here no new substance is formed.

Example: Melting of ice, the solution of salt or sugar, stretching of rubber band.

Let us now understand **the physical changes that take place in water**. You already know that water exists in three states as solid, liquid and gas. Change of state takes place either by heating or cooling. By heating energy is supplied and by cooling energy is taken away. These are the reasons for the changes.



Let us name a few processes connected with the changes in states of water.

Change	Process
ice into water on heating	melting
water into steam on heating	vapourisation
steam into water on cooling	condensation
water into ice on cooling	freezing

More to Know

The change of state from solid to gas directly is called **sublimation.**

Example : Camphor

Let us understand one more physical change

Dissolution

The spreading of the solid particles (broken into individual molecules) among the liquid molecules is called as dissolution.

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- **Solvent** is a substance that dissolves the solute.
- **Solute** is a substance that is dissolved in a solvent to make a solution.
- When solute is dissolved in a solvent it forms a **solution**.

Solute + Solvent ⟶ Solution



Water is known as the universal solvent. It dissolves a wide range of substance.

Activity 6: Take half a cup of water, add one spoon full of sugar and stir well.



a. What do you observe?

_____

b. What happened to the sugar?

_____

c. Where is it gone?

_____

d. The solute in the above solution is _____.

e. The solvent in the above solution is _____.

f. Have you seen a glass of water and a glass of sugar solution looking alike? _____

Chemical changes

Chemical changes are the permanent changes in which there is a change in the chemical composition and new substance is formed.

Examples: Burning of wood, Popping of popcorn, Blackening of silver ornaments, and Rusting of iron.

Physical Change	Chemical Change
No new substance formed	New substance formed
No change in the chemical composition	There a is change in the chemical composition
It is a temporary change	It is a permanent change
It is reversible	It is irreversible

Activity 7: Look at the pictures and write whether they are **physical** or **chemical** changes.



_____



_____



_____



_____

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3.1.4 Desirable and Undesirable Changes

Activity 8: Look at the pictures and write whether they are **desirable** or **undesirable** changes.

forest fire



_____

decaying of fruit



_____

egg to chicken



_____

Wind mills



_____

Desirable changes

The changes which are useful, not harmful to our environment and desired by us are known as desirable changes.

Examples: Ripening of fruit, growth of plants, cooking of food, milk changing to curd.

Undesirable changes

The changes which are harmful to our environment and not desired by us are known as undesirable changes.

Examples: Deforestation, decaying of fruit, rusting of iron.

3.1.5 Natural and human made changes

A2IDH3

Activity 9: Identify the type of changes

Natural / Human made

Floods



_____

Carpentry



_____

Planting of seedlings



_____

Land slides



_____

Natural changes

Changes which take place in nature on their own and are beyond the control of human beings are known as Natural changes.

Examples: Rotation of the earth, Changing phases of the Moon, Rain.

Human made or artificial changes

The changes which are brought about by human beings are known as human made or artificial changes. They will not happen on their own.

Examples: Cooking, Deforestation, Cultivating crops, construction of buildings.

Points to remember

- Everything in this world undergoes changes. Changes occur in position, shape, size, state, colour, temperature, composition etc.,

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- Fast change – short period of time

  Slow change – long period of time

- Reversible change – can go back to its original state

  Irreversible change – cannot go back to its original state

- Desirable change - changes that are useful and harmless to our environmental

  Undesirable change - changes that are harmful to our environment.

- Natural change - changes that take place in nature on their own

  Human made change - changes that are brought about by human beings

- A solute when dissolved in a solvent makes a solution.

- The process of dissolving the solute in solvent is called dissolution.



ICT Corner

Changes Around Us



Through this activity you will be able to understand reversible & irreversible changes.

Step 1: Use the given URL in the browser. 'Reversible and irreversible changes's page will open. Use the arrow marks on both sides of the substance to choose another substance to test.

Step 2: Click and drag the substance into the beaker, observe whether it dissolves or not. Click the Dissolving / Reversing button to switch between the both activities.

Step 3: In the Reversing activity, with some substances you can choose either to cool or to Heat them. With other substances you can choose either to Heat or to filter them by clicking the respective buttons.

Step 4: Click on the Reset button to clear.

Step 1



Step 2



Step 3



Step 4



Reversible and irreversible changes's URL:

http://www.bbc.co.uk/schools/scienceclips/ages/10_11/rev_irrev_changes_fs.shtml

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*Pictures are indicative only

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Evaluation

A2NLUT

I. Choose the appropriate answer

1. When ice melts to form water, change occurs in its

   a. position b. colour

   c. physical state d. composition

2. Drying of wet clothes in air is an example of

   a. Chemical change

   b. Undesirable change

   c. irreversible change

   d. physical change

3. Formation of curd from milk is

   a. a reversible change

   b. a fast change

   c. an irreversible change

   d. an undesirable change

4. Out of the following an example of a desirable change is

   a. rusting b. change of seasons

   c. earthquake d. flooding

5. Air pollution leading to acid rain is a

   a. reversible change

   b. fast change

   c. natural change

   d. human made change

II. Fill in the blanks

1. Magnet attracts iron needle. This is _____ change. (a reversible / an irreversible)

2. Boiling of egg results in _____ change. (a reversible / an irreversible)

3. Changes that are harmful to us are _____. (desirable / undesirable)

4. Plants convert carbon-di-oxide and water into starch. This is an example of _____ change. (natural / human made)

5. Bursting of fire crackers is a _____ change whereas germination of seeds is a _____ change. (slow / fast)

III. True or False. If False, give the correct statement

1. Growing of teeth in an infant is slow change.

2. Burning of match stick is a reversible change.

3. Change of new moon to full moon is human made.

4. Digestion of food is a physical change.

5. In a solution of salt in water, water is the solute

IV. Analogy

1. Curdling of milk : irreversible change :: Formation of clouds : _____change

2. Photosynthesis : _____ change :: burning of coal : Human – made change

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3. Dissolution of glucose : reversible change :: Digestion of food: _____ change

4. Cooking of food : desirable change :: decaying of food : _____change

5. Burning of matchstick :_____ change: Rotation of the Earth : Slow change

V. Circle the odd one out. Give reason for your choice

1. Growth of a child, Blinking of eye, Rusting, Germination of a seed

2. Glowing of a bulb, lighting of a Candle, breaking of a coffee mug, curdling of milk

3. Rotting of an egg, condensation of water vapour, trimming of hair, Ripening of fruit

4. Inflating a balloon, popping a balloon, fading of wall paint, burning of kerosene

VI. Give very short answer

1. What kind of a change is associated with decaying of a plants?

2. You are given some candle wax. Can you make a candle doll from it? What kind of change is this?

3. Define a slow change.

4. What happens when cane sugar is strongly heated? Mention any two changes in it.

5. What is a solution?

VII. Give short answer

1. What happen when paper is burnt? Explain.

2. Can deforestation be considered a desirable change? Explain.

3. What type of changes is associated with germination of a seed? Explain

VIII. Answer in detail

1. Give one example for each case that happens around you.

   a. Slow and fast change

   b. Reversible and irreversible change

   c. Physical and chemical change

   d. Natural and man-made change

   e. Desirable and undesirable change

IX. Question based on Higher Order Thinking Skills

1. When a candle is lit the following changes are observed.

   a. Wax melts.

   b. Candle keeps burning.

   c. The size of the candle decreases.

   d. The molten wax solidifies

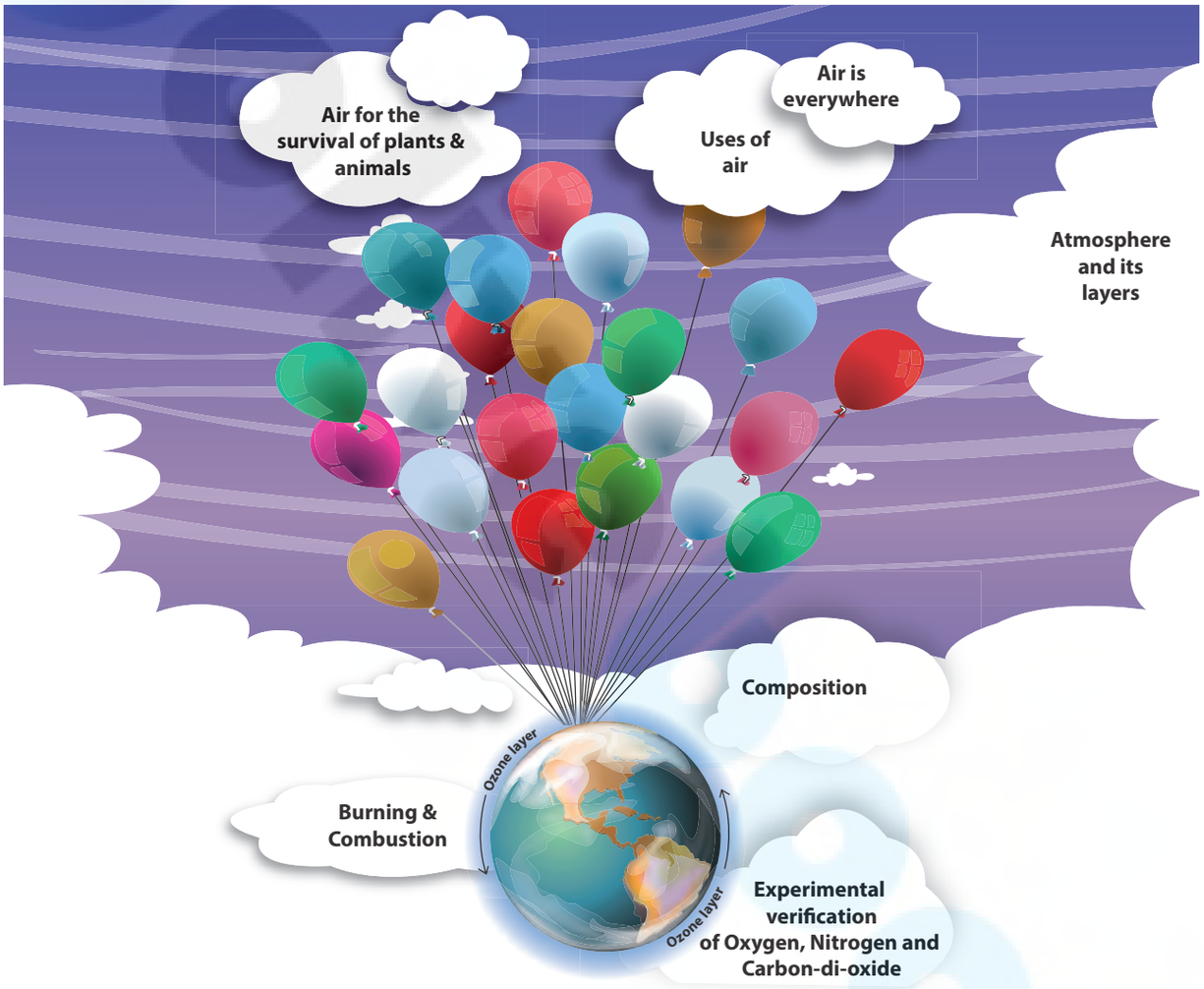
   e. Which of the changes can be reversed? Justify your answer.

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Unit 4 Air

A2S9IQ



Learning Objectives

- To identify the components and uses of air
- To develop skills in performing experiments and arriving at conclusions
- To clarify the role of oxygen in the process of burning
- To realize the significance of air for the survival of plants and animals on earth
- To appreciate the need of air in protecting our atmosphere

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Introduction

Air is present everywhere around us. We cannot see air. But we can feel its presence in so many ways. For example, we feel air when the trees rustle, clothes hanging on a clothes-line sway, pages of an open book flutters when the fan is switched on, when kites fly in the sky. We cannot see, touch or taste air but we can feel it. It is the air that makes all these movements possible. Thus, we can understand that **air is present all around us.**

Air is necessary for us to live. We can live without food for some days, without water for a few hours, but cannot survive without air for more than a few minutes. So, **air is very important for all living beings to survive.**

When air is moving it is called wind. It is cool and soothing as breeze. When air moves with force it can even uproot trees and blow off the roof tops. Air is necessary for breathing and also for combustion. Shall we do an activity?

Activity 1: Air is everywhere

Let us take an empty glass bottle. Is it really empty or does it have something inside?

Now, shall we turn the glass bottle upside down? Can you agree that there is still something inside the empty glass bottle? Let us do the following activity to find what is there inside an empty glass bottle.

Dip the open mouth of the bottle into



the trough filled with water as shown in Fig 1. Observe the bottle. Does water enter the bottle? _____

Now tilt the bottle slightly. Now again dip the open mouth of the bottle as shown in Fig 2. Do you think that water will enter the bottle? _____

Kindly observe the Fig 2 carefully. You can see bubbles coming out of the bottle.

When you perform the experiment, can you hear the bubbly sound? can you now guess what was inside the bottle? _____

Yes, you are right. It is **"air"** that was present in the bottle.

The bottle was not empty at all. In fact, it was filled completely with air even when you turned it upside down. That is why we notice that water does not enter the bottle when it is pushed in an inverted position, as there was no space for air to escape.

When the bottle was tilted, the air was able to come out in the form of bubbles, and water filled up the empty space that the air has occupied.

Hence **we can see that air fills all the space inside the bottle.**

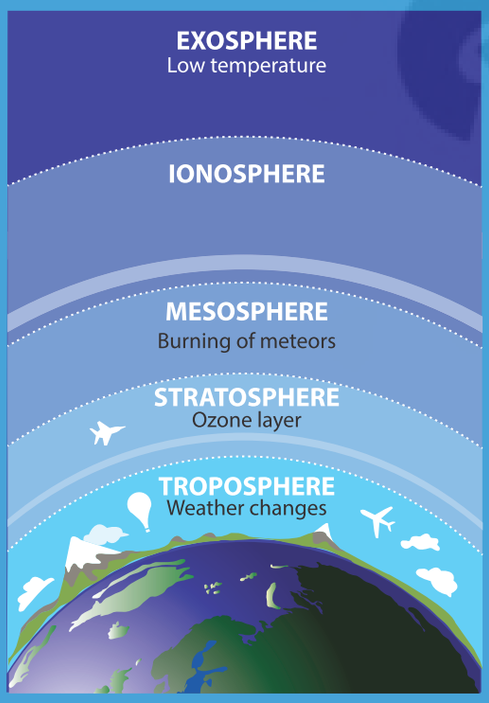
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AIR

A2XHWG

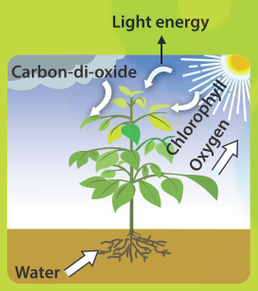


ATMOSPHERE AND ITS LAYERS

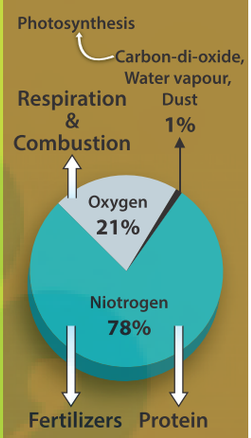




AIR FOR SURVIVAL OF PLANTS AND ANIMALS



COMPOSITION



USES OF AIR

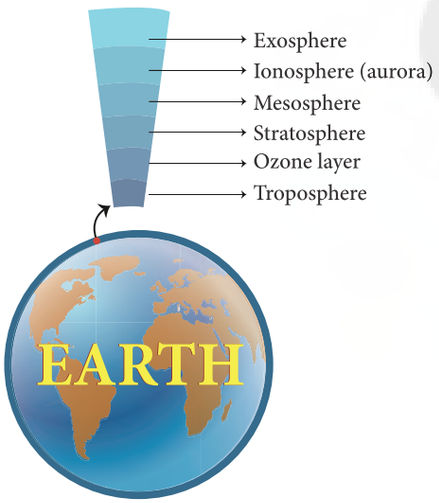


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4.1 Atmosphere

Our earth is surrounded by a huge envelope of air called the atmosphere. Atmosphere extends to more than 800km above the surface of earth and is held in place by the earth's gravity. The atmosphere protects us from many harmful rays coming from the sun. The air envelope is thicker near the earth's surface and as we go higher the density and the availability of air gradually decreases. This is because, as we go higher, the force of gravity decreases, so it is not able to hold large amount of air.

The atmosphere is made of five different layers – **the troposphere, the stratosphere, the mesosphere, the ionosphere and the exosphere.**



The troposphere is the layer closest to the earth. It is the layer in which we live. It extends upwards for about 16km above the surface of the earth. Movement of wind takes place in this layer. It also contains water vapour, which is responsible for making clouds. This layer is responsible for the weather we experience on earth. Aircrafts usually fly above this layer to avoid strong winds and bad weather.

The stratosphere lies above the troposphere. This layer has the ozone layer in it. The ozone layer protects all life on earth from the harmful ultraviolet rays of the sun.



A weathercock shows the direction in which the air is moving at a particular place. You can also make a wind sock to find the direction of the wind. Can you try it yourself?





4.2 Experimental verification of presence of Oxygen, Carbon-di-oxide and Nitrogen in Air

Is air a thing or a composite mixture?

For long time, that is, until eighteenth century, human thought 'air' as a fundamental constituent of matter. However an ingenious experiment conducted by Joseph Priestley in 1774 showed that **"air is not an elementary substance, but a composition,"** or mixture of gases. He was also able to identify a colourless and highly reactive gas which was later named **'oxygen'** by the great French chemist Antoine Lavoisier.

Priestley took a tub of water and made a float and placed a candle on it. He covered

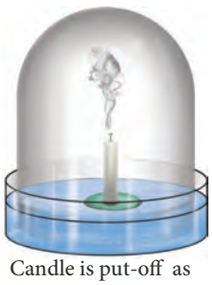
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Fig-1



Candle Glows

Fig-2



Candle is put-off as there was no oxygen

Fig-3



Mouse is inserted

Fig-4



Mouse died as there was no oxygen in candle glass jar.

Fig-5



Mint plant is introduced

Fig-6



Candle continued to glow because mint provides oxygen

Fig-7



Candle glows, mouse survies with a mint plant inside.

the candle with a glass jar. [As the bottom portion of the jar was filled with water, no air can enter or exit and hence the jar was completely sealed **(Fig-1)**]. As you would have guessed the candle flame was extinguished in a very short time. He used a magnifying glass to focus the sun rays to light the candle. Thus he tried to relight the candle many times without opening the sealed jar **(Fig-2).** The candle could not be relit. What can we make out of it?

It was clear that something in the air was being used for burning and being converted into another substance. Once the substance in the air that was aiding the burning was completely used by the burning flame and converted into another substance, the flame went out.

[Later chemist named the substance necessary for burning as oxygen and during the process of burning oxygen is converted mostly into carbon dioxide.]

Now as the jar was inside the water, Priestley could gently lift the jar and place a live mouse inside it without allowing outside air to enter the jar **(Fig-3).** Without oxygen, as you would have guessed, the mouse died **(Fig-4).** It was clear that oxygen was necessary for the survival of the mouse.

In the next step, he gently lifted the jar and placed a mint plant **(Fig-5).** (**Note**: Look at the Figure- 5; you could see that the plant is inserted into the bell jar when the jar is very much inside the water. This is done to ensure that the outside air is not entering into the bell jar.) Plant being a living thing like mouse, perhaps he thought, would die. Instead, the plant survived. After placing the mint plant, he lit up the candle and it continued to burn **(Fig-6).**

In fourth experiment, he took a jar, burned a candle and converted all oxygen into carbon dioxide. He placed a mint plant

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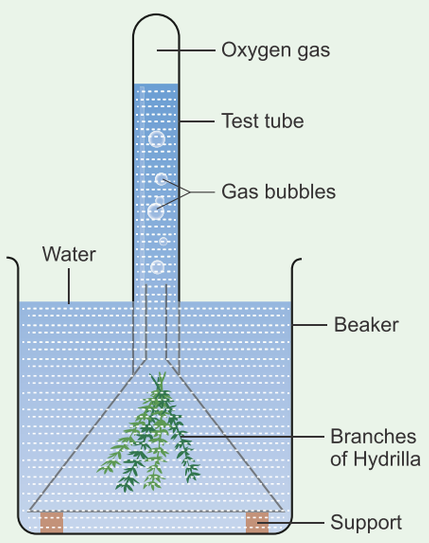
and a mouse into this jar. Both the plant and the mouse survived **(Fig-7).** He found that plants and animals have a synergy. Animals consume oxygen and release carbon-di-oxide and plants take up carbon dioxide and release oxygen.

During 1730 – 1799, Jan Ingenhousz showed that sunlight is essential to plants to carry out photosynthesis and also to purify air that is fouled by breathing animals or by burning candles.

From these experiments **it was clear that "air" is a composite mixture of many gases like oxygen and carbon-di-oxide.**

Proof for release of oxygen in photosynthesis

Activity 2: Take a healthy branch of Hydrilla and place it in a funnel. Invert the funnel in a beaker of water as shown in the figure. Invert a test tube over the stem of the funnel. The stem of the funnel should be kept immersed inside the water.

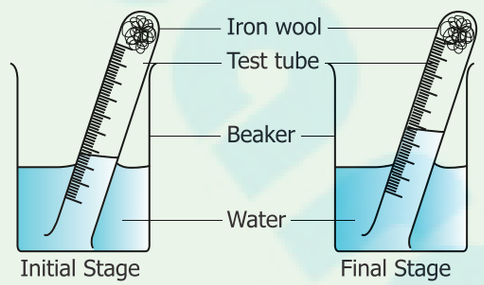


Leave the beaker in sunlight for some time. You will notice some bubbles rising in the test tube. The bubbles contain oxygen released by the plant during photosynthesis. If we show a glowing splinter to the collected air, it burns brightly. **This shows that the collected gas is oxygen.**

Test for the proportion of oxygen and nitrogen in air

Activity 3: We know that iron undergoes rusting with oxygen and forms iron oxide. This process can be used to estimate the percentage of oxygen in air, which has been removed by the rusting reaction.

Take a small portion of iron wool, press it into a 20 ml graduated test tube and wet it with water. Tip away excess of water. Take a 500ml beaker and fill half of the beaker with water. Invert the test tube and place it in air. Leave the arrangement at least for a week without making any disturbance to the test tube.



Observe the changes that had happened in the iron wool and to the level of water inside the test tube. We could

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see that the water level has increased inside the test tube. The rise in water is because of oxygen in air which has been removed by the rusting reaction. **This will be about 20% which is approximately the percentage of oxygen in the air.**

More to Know!

Daniel Rutherford, a Scottish chemist, discovered nitrogen. He removed oxygen and converted it into carbon-di-oxide using an inverted bell jar using a burning candle. He passed this air without oxygen through lime water and removed carbon-di-oxide also.

Once the carbon-di-oxide was removed in that air, neither a candle burned nor a plant breathed. Hence he was sure that the remaining air that he had, did not have oxygen and carbon-di-oxide. He was able to produce a gas, which showed the same property of the air without oxygen and carbon-di-oxide. Hence this gas was named **'nitrogen'.**

Test for Carbon-di-oxide in air

Pour some lime water in a glass tumbler. Bubble some air using a straw through the limewater. After a few minutes, look at the lime water carefully. The lime water will produce a white precipitate and that the lime water will eventually turn to a milky white solution. **This shows the presence of carbon-di-oxide in air.**

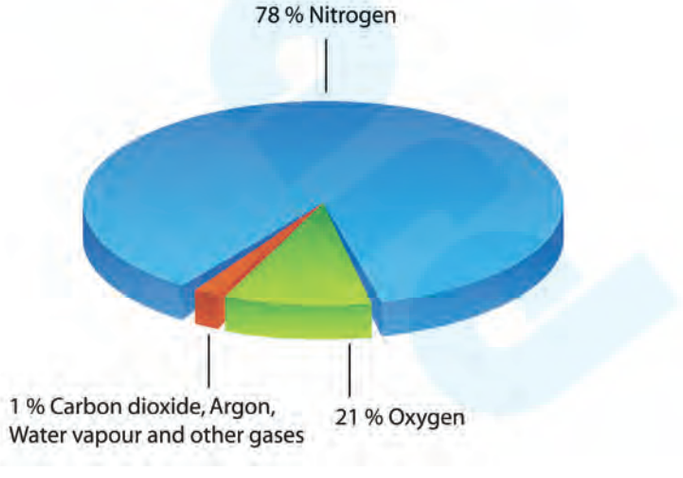


4.3 Composition of Air

From Priestley's experiment which was followed by Ingenhousz and Rutherford, we came to know that air was not just one substance. We will now describe what air is made up of. This is called composition of air.

The major component of air is nitrogen. Almost four – fifth of air is nitrogen. The second major component of air is oxygen. About one – fifth of air is oxygen. In addition to nitrogen and oxygen gases, air also contains small amount of carbon–di–oxide, water vapour and some other gases like argon, helium etc. The air may also contain some dust particles.

The composition of air in terms of percentage of its various components can be written as follows:



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The composition of air changes slightly from place to place and also from season to season. For example,

- Air over industrial cities usually has a higher amount of carbon-di-oxide in it than the air over open spaces.
- Air in coastal areas may have more water vapour than inland areas.
- Air also contains more water vapour in rainy season.
- The amount of dust in the air is more in windy places than other areas.

Test for the presence of dust particles in air

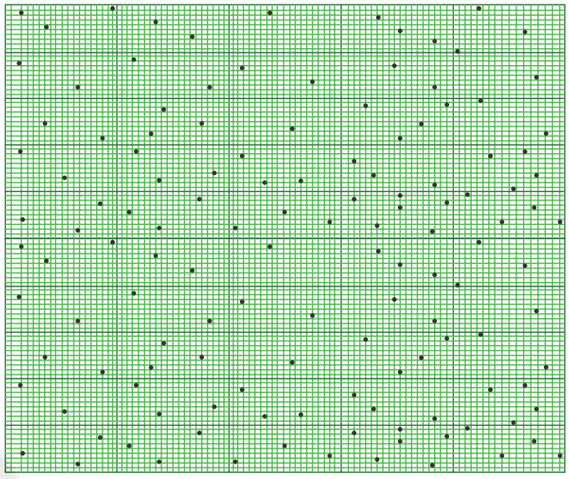
You might have seen the sunlight entering into a dark room through a narrow slit and making shiny dust particles dancing merrily on the path of sunlight. Actually, the air in a room always contains some dust particles, but they are so small that normally they are not visible to us. When a beam of sunlight falls on them, the tiny dust particles become visible.

Shall we do an activity to calculate the amount of dust particles in air from our area?

Take a graph sheet. Using marker pens draw a 5x5 cm square on the graph. Apply a thin film of grease on the graph sheet. This sheet will serve as dust collector. Make four or five graph sheets.

Discuss in the whole class, as where to place the dust collectors, how long to collect dust particles and place the dust collectors in agreed positions.

Ensure that the dust collectors do not get blown away. After the time scheduled for performing this activity is reached, remove the paper and count the number of collected dust particles in the marked area in all the sheets, using a magnifying glass at the dust collector. We can see something similar to the diagram below:-



Then, calculate the mean number of dust particles in the marked area.

$$Mean = \frac{total\ number\ of\ dust\ particles\ on\ collector}{number\ of\ squares\ on\ collector}$$

The range of the dust can also be calculated as given below:-

Range = Maximum value – minimum value

Collect details from all the areas where we have kept the dust collector sheets. Tabulate the recordings in the table given below:-

Location of dust collector	Mean number of dust particles per small square	Range

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❖ Which area do you think will have the most dust?

_____

❖ Which area do you think will have the least dust?

_____

Test for water vapour in air



Take a few ice cubes in a glass. Keep it on the table for a few minutes. Observe what happens. You could see tiny droplets of water all over the outer surface of the glass. From where do these droplets come? **The water vapour present in the air condenses on the cold surface of the glass. This shows that air contains water vapour.**

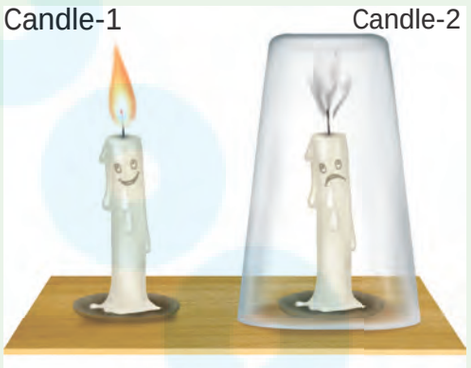
4.4 Burning and Combustion

When we burn a candle, paper, kerosene, coal, wood or cooking gas (LPG), oxygen is needed. The oxygen needed for the burning of candle, paper, kerosene, coal, wood and cooking gas comes from the air around us. Thus, for burning a substance continuously so as to make fire, a continuous supply of fresh air is needed. If we cut off the supply of fresh air to a burning substance, then the burning substance will not get oxygen necessary for burning to continue and hence the substance will stop burning. In rockets, as they go high in the atmosphere, the availability of oxygen is considerably reduced. Therefore in rockets along with the fuel, oxygen is also carried for combustion.

The process of burning of a substance in the presence of oxygen and releasing a large amount of light and heat is called **burning**. If the process does not emit flame then it is called **combustion.**

Activity 4: Oxygen is necessary for burning

Place two candles on a table. Ensure that both the candles are of same size and height. Mark them as candle 1 and candle 2 using a chalkpiece. Light both the candles. Now, cover candle 2 with glass tumbler as shown in the figure Observe the happenings at both the



candles.

What does happen to candle 1?

_____

What does happen to candle 2?

_____

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Can you guess why did the covered candle extinguish?

_____

Let us summarize the happenings.

The candle 1 continues to burn, unless it is blown – off by strong moving air or any other external force. This is because fresh air is continuously available to the candle for its burning process.

Candle 2 glows for a while and then gets put – off. When the burning candle is covered with a glass tumbler, the candle can use the oxygen available in the air inside the glass tumbler. Since only a small amount of air is present inside the glass tumbler – only a small portion of oxygen is available for the candle to continue glowing. When all the oxygen of the air inside the gas jar is used up, then the burning candle gets extinguished.

Now, repeat the candle – glowing experiment taking four containers of different sizes. For example, you can take a 250ml conical flask, a 500ml bottle, a one – litre jar, a two – litre jar. Cover the burning candle one by one with these containers and find out how long it takes for the candle to extinguish in each case. Record your observations in the following table.

S. No.	Volume of the container (ml)	Time taken for candle to extinguish (second)

Can you write interpretation based on your observations at the table?

_____

4.5 Importance of air for survival of plants and animals

Respiration in plants

Plants require energy for their growth and hence respiration also occurs in plants. During respiration, plants take in oxygen and release carbon–di–oxide, just as animals do. Gaseous exchange with air in atmosphere takes place in plants with the help of tiny holes called stomata present on their leaves.

Photosynthesis

Plants manufacture food by a process called photosynthesis. During photosynthesis, carbon-di-oxide from the air and water from the soil react in the presence of sunlight to produce food. Most plants possess a green pigment called chlorophyll and it is also used-up in the process of photosynthesis. The word equation given below explains the process of photosynthesis.

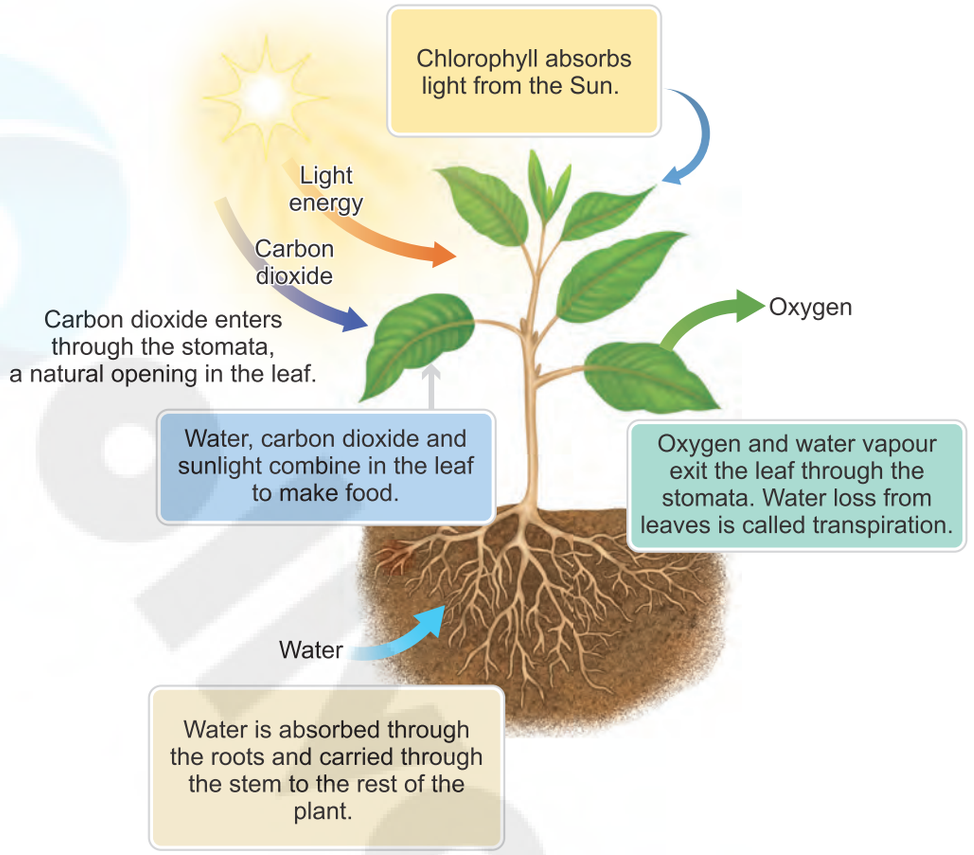
$$\text{Carbon-di-oxide + water} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Food + Oxygen}$$

Plants release oxygen during photosynthesis which is much more than the oxygen consumed by the plants, during respiration.

Respiration in Animals

When we breathe in air, the oxygen present in the air reacts chemically with digested food within the body to produce carbon-di-oxide gas, water vapour and energy.

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This energy is required to carry out many processes in the body such as movement, growth and repair. This process by which oxygen reacts with digested food to form carbon-di-oxide, water vapour and energy is called respiration. The process can be represented by a word equation as given below :-

Food + Oxygen ⟶ Carbon-di-oxide + water + Energy

Carbon-di-oxide formed during respiration dissolves in the blood and is exhaled out of the body through the lungs. The inhaled and exhaled air thus contain the same substances but in different proportion, except nitrogen which is present in the same amount. Inhaled air contains more oxygen while the exhaled air contains more carbon-di-oxide.

Let us have a look at the following table to compare the composition of air in inhaled and exhaled air.

Component	Inhaled air	Exhaled air
Nitrogen	78%	78%
Oxygen	21%	16%
Carbon-di -oxide	0.03%	4%
Water vapour	Variable amount	amount increases in exhaled air
Noble gases	0.95%	0.95%
Dust	Variable amount	none
Temperature	Room temperature	Body temperature

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Respiration of plants and animals in water

The water of ponds, lakes, rivers and seas have some amount of dissolved air containing oxygen in it. The plants and animals that live in water use the oxygen dissolved in water for breathing. For example, frogs respire through their skin, fish respire using their gills.

DO YOU KNOW?

When carbon-di-oxide is cooled to -57^0 C, it directly becomes a solid, without changing to its liquid state. It is called **dry ice** and is a good refrigerating agent. Dry ice is used in trucks or freight cars for refrigerating perishable items such as meat and fish while transporting them.



4.6 Uses of Air

- Air is used by plants and animals for breathing.
- Air is used for burning fuels like wood, coal, kerosene, LPG etc.
- Compressed air is used to fill tyres of various kinds of vehicles.
- Air plays an important role in maintaining the water cycle in the nature.
- Ozone layer, present in the atmosphere, helps in preventing harmful radiations of the sun from reaching the earth's surface.
- Under extra – ordinary conditions such as:

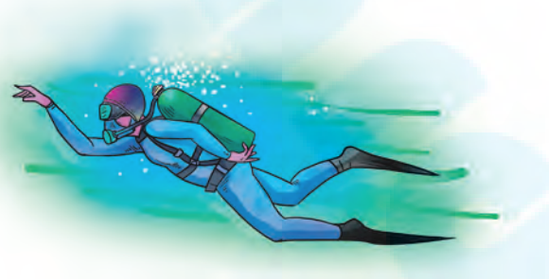
a. a patient having breathing difficulties,



b. a mountaineer climbing a high mountain,

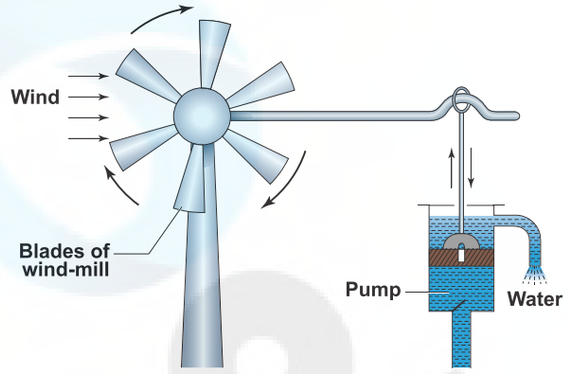


c. a diver going deep into the sea- oxygen gas cylinders are used for breathing purposes.



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❖ Blowing air is used to turn the blades of wind mills.



The wind mills are used to draw water by running pumps, run flour mills and to generate electricity.

Points to Remember

❖ Air is every where around us.

❖ Our earth is surrounded by a huge envelope of air called the atmosphere.

❖ The process of burning of a substance in the presence of oxygen and releasing a large amount of light and heat is called combustion.

❖ Priestley helped us in understanding the presence of oxygen in air that is produced by plants during photosynthesis which can be used by animals for respiration.

❖ Ingenhousz experiment helped us to know the role of sunlight in evolving Oxygen during photosynthesis.

❖ Air contains 78% Nitrogen, 21% Oxygen, 1% of carbon-di-oxide, water vapour, Noble gases, and dust particles.

❖ Composition of air changes slightly from place to place and also from season to season.

❖ In plants,

$$\text{Carbon-di-oxide + water} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Food + Oxygen}$$

❖ In animals,

$$\text{Food + Oxygen} \longrightarrow \text{Carbon-di-oxide + water + Energy}$$

❖ Aquatic plants and animals use oxygen dissolved in water for breathing.

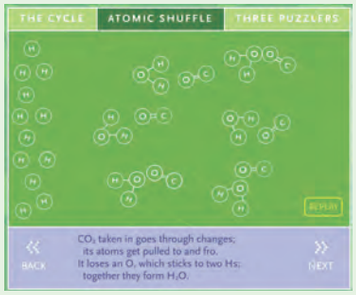
❖ Ozone layer, present in the atmosphere helps in preventing harmful radiations hitting the earth directly.

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ICT Corner

Air



Through this activity you will be able to understand the atomic level of the process that plants use to convert solar energy into chemical energy.

Step 1: Use the given URL in the browser. 'Illuminating Photosynthesis page will open.

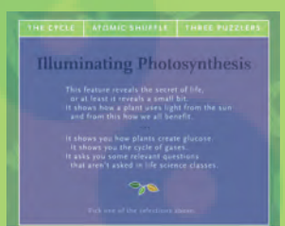
Step 2: Three buttons given on the top of the activity window to explore. Click the 'The Cycle' button, in this window you can open the curtain and water the plant by click on the curtain and the watering pot.

Step 3: Explore the atomic level process of the photosynthesis by clicking the 'Atomic Shuffle' button.

Step 4: Click 'Replay" to view the process again and 'Next' to view the next level of the process.

Step 1

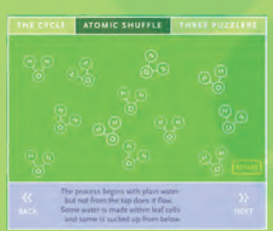




Step 2

Step 3





Step 4

Illuminating Photosynthesis URL:

http://www.bbc.co.uk/schools/scienceclips/ages/10_11/rev_irrev_changes_fs.shtml

B443_SCI_6_T2_EM

*Pictures are indicative only

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Evaluation

A37DY4

I. Choose the appropriate answer

1. _____ is the percentage of nitrogen in air.

   a. 78% b. 21%

   c. 0.03% d. 1%

2. Gas exchange takes place in plants using _____.

   a. Stomata b. Chlorophyll

   c. Leaves d. Flowers

3. The constituent of air that supports combustion is _____.

   a. Nitrogen b. carbon-di-oxide

   c. Oxygen d. water vapour

4. Nitrogen is used in the food packaging industry because it _____.

   a. provides colour to the food

   b. provides oxygen to the food

   c. adds proteins and minerals to the food

   d. keeps the food fresh

5. _____ and _____ are the two gases, which when taken together, make up about 99 percentage of air.

   I.Nitrogen

   II. carbon-di-oxide

   III. Noble gases

   IV. Oxygen

   a. I and II b. I and III

   c. II and IV d. I and IV

II. Fill in the blanks

1. _____ is the active component of air.

2. The gas given out during photosynthesis is _____.

3. _____ gas is given to the patients having breathing problems.

4. _____ can be seen moving in a beam of sunlight in a dark room.

5. _____ gas turns lime water milky.

III. True or False. If False, give the correct statement

1. Inhaled air contains a large amount of carbon-di-oxide.

2. Planting trees help in decreasing global warming.

3. The composition of air is always exactly the same.

4. Whales come up to the water surface to breathe in oxygen.

5. The balance of oxygen in atmosphere is maintained through photosynthesis in animals and respiration in plants.

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IV. Match the following

1.	Moving Air	-	Photosynthesis
2.	Layer in which we live	-	Troposphere
3.	Stratosphere	-	Wind
4.	Oxygen	-	Ozone layer
5.	carbon-di-oxide	-	Combustion

V. Arrange the following statements in correct sequence

1. Plants manufacture food by a process called photosynthesis.
2. Plants require energy for their growth.
3. Plants take in oxygen and release carbon-di-oxide just as animals.
4. Plants take carbon-di-oxide from the atmosphere, use chlorophyll in the presence of sunlight and prepare food.
5. Such oxygen is available to animals and human beings for breathing.
6. During this process, oxygen is released by plants.

VI. Analogy

1. Photosynthesis : _____ :: Respiration : Oxygen
2. 78% of air : Does not support combustion :: _____ : Supports combustion

VII. Observe the given figure carefully and answer the questions.



1. What will happen if we remove plants from the aquarium?
2. What will happen if we remove the fish from the aquarium and keep it (with green plants) in a dark place?

VIII. Give very short answer

1. What is atmosphere? Name the five layers of atmosphere.
2. How do the roots of land plants get oxygen for breathing?
3. What should be done if the clothes of a person catch fire accidentally? Why?
4. What will happen if you breathe through mouth?

IX. Give short answer

1. Biscuits kept open on a plate during monsoon days lose its' crispness. Why?
2. Why do traffic assistants wear a mask on duty?

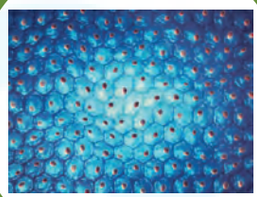
X. Answer in detail

1. How do plants and animals maintain the balance of oxygen and carbon-di-oxide in air?
2. Why is atmosphere essential for life on earth?

XI. Question based on Higher Order Thinking Skills

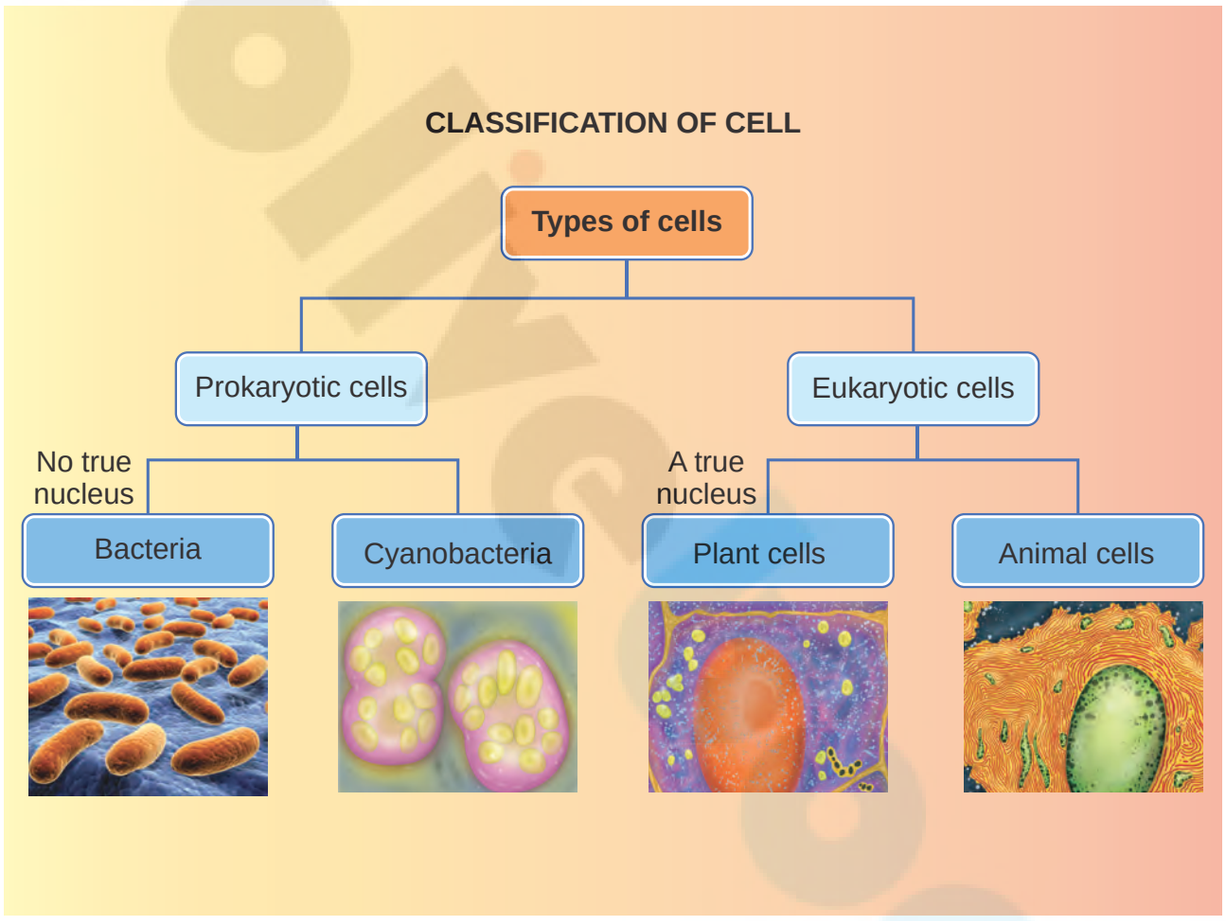
1. Can you guess why fire extinguishers throw a stream of carbon-di-oxide while putting - off fire?

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Unit 5 The Cell

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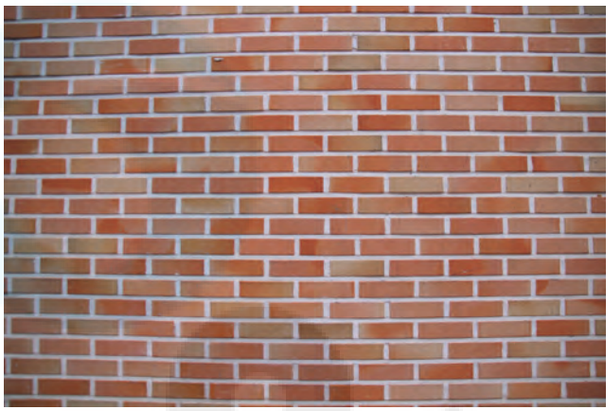


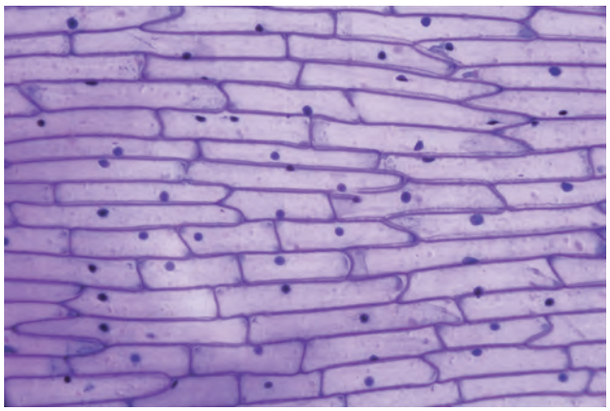
Learning Objectives

- To know that all living things are made up of cells
- To observe the cell structure using microscope
- To understand the structure of a cell
- To explain the components of a cell
- To understand the structural difference between animal and plant cell

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Introduction





Observe the two pictures given above. Do you observe any similarity between them?

Close your eyes and imagine a brick wall. What is the basic building block of the wall? A single brick, of course.

Like a brick wall, your body is composed of basic building blocks, and are named as **"Cells".**

The **cell is the basic structural and functional unit of every living organism.**

The cell is self-sufficient to carry out all the fundamental and essential functions of an organism.

5.1 The Cell

All living things are made of one or more cells. There are variety of cell types however, they all have some common characteristic features.

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More to Know

Can you see a cell with your naked eye?

Cells are very minute and said to be microscopic and cannot be seen with our naked eyes.

They can be observed only through a specialized scientific instrument called "microscope".

Now a days an electron microscope is used to magnify and observe the cells.

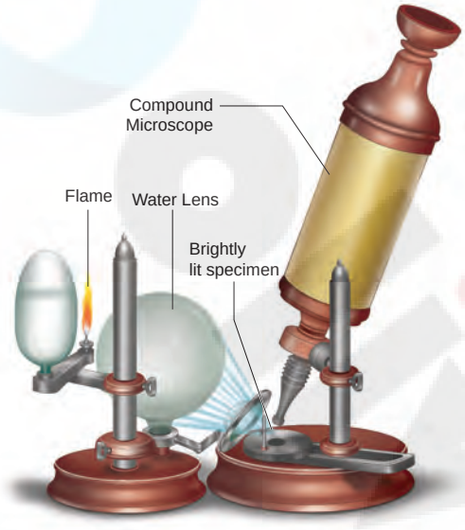


5.1.1 Discovery of the cell

The Englishman Robert Hooke was a scientist, mathematician, and inventor. He improved microscope which was used

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in those days, and built a compound microscope. He placed water-lens beside the microscope to focus the light from an oil-lamp on specimens to illuminate them brightly. So that he was able to see the minute parts of the objects clearly.





Robert Hooke

One day Hooke made thin sections of the cork and observed them through his microscope. He observed many small identical chambers which were hexagonal in shape. He was surprised.

After that he observed many objects like Butterfly's wings, Bee's compound eyes etc.,

Based on this observations, Hooke published a book named Micrographia in the year 1665, where he first used the term Cell. He described the structure of tissue using the term cell.

In Latin the word 'cellua' means a small chamber.

The branch of science that deals with the study of cells is called **'Cell Biology'.**

5.2 The Structural Organization Of The Cell

A typical cell consists of three major parts:

1. An outer **cell membrane.**
2. A liquid **cytoplasm.**
3. A **nucleus.**

Analogous to the body's internal organ, like eyes, heart, lungs, etc..., organelles are specialized structures and perform valuable functions necessary for normal cellular operation. Many distinct structures called **Organelles** lie within the cell.

5.2.1 Size of the cell

The size of cells may vary from a micrometer (a million of a metre) to a few centimeters. Most cells are microscopic and cannot be seen with the naked eye. They can be observed only through the Microscope.

Smallest size of the cell is present in Bacteria. The size of the bacterial cell ranges from 0.01 micrometer to 0.5 micro meter.

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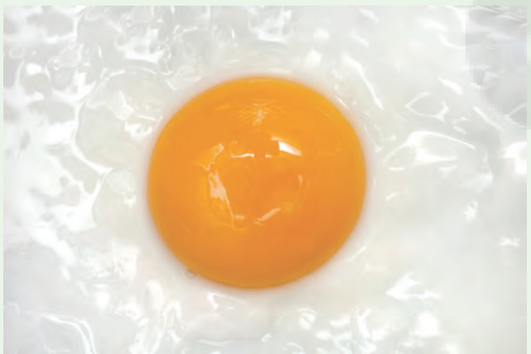
Activity 1:

Aim: To observe the structure of a single cell (Hen's egg).

Materials Needed: A Hen's egg and a plate.

Method: Crack the shell and break open the egg in a plate.

Observation: The egg has a yellow part and a transparent part surrounding it. The white transparent part (albumin) is jelly-like and represents the cell's cytoplasm, while the yellow part (yolk) is thicker and represents the cell's nucleus. On the internal side of the shell can be seen a thin membrane-like structure, which represents the cell membrane.



On the other hand the largest cell is the egg of an ostrich with 170 millimeter width. We can see this with the naked eye.

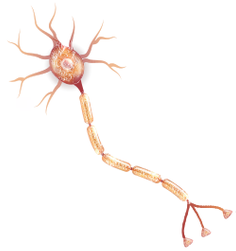
In Human body the nerve cells are believed to be the longest cells.



Cell size has no relation to the size of an organism. It is not necessary that the cells of, say an Elephant be much larger than those of a Mouse.

5.2.2.Shapes

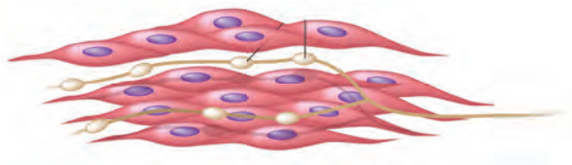
Cells are of different shapes. For example some shapes are given in the below pictures.



Nerve cell



Red Blood cell



Muscle cell

5.2.3.Number

The number of cells present in different organisms may vary. Organisms may be either unicellular (single cell) or multicellular. Organisms such as Bacteria, Amoeba, Chlamydomonas, and Yeast are unicellular.

On the other hand, organisms such as Spirogyra, Mango, and Human beings are multicellular. (i.e) made up of a few hundreds to millions of cells.

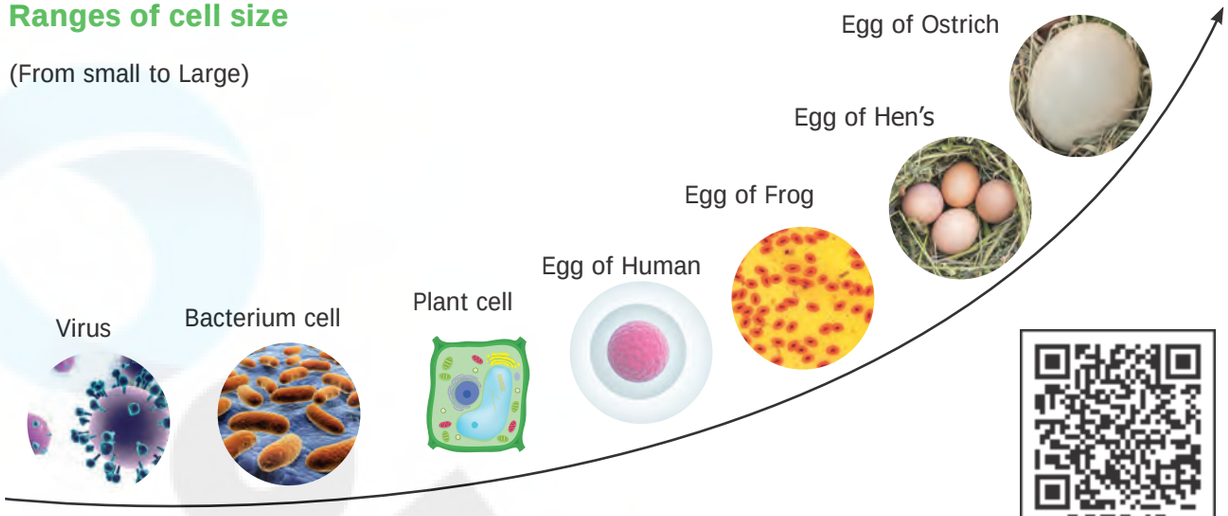


Approximate number of cells in the Human body is 3.7 X10^{13} or 37,000,000,000,000.

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Ranges of cell size

(From small to Large)



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5.3 TYPES OF CELL

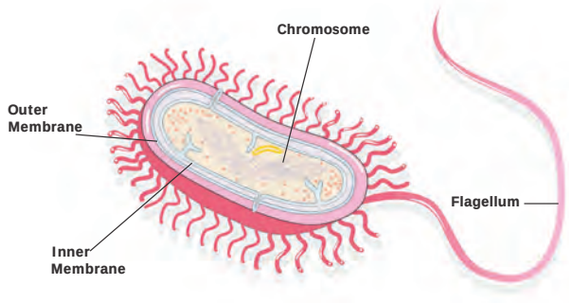
Generally cells are classified into two types. First one is Prokaryotic cell .It has no true nucleus and no nuclear membrane. Another one is Eukaryotic cell. It has true nucleus consisting of nuclear membrane.

5.3.1 Prokaryotic cell

The unicelluar organisms like Bacteria has Prokaryotic cells. It has no true nucleus. This type of nucleus is called as nucleoid. No nuclear membrane is around this nucleoid. These cells were the first form of life on Earth. It is ranging from 0.003 to 2.0 micro meter in diameter.

Eg. Escherichia coil bacteria.

Structure of Prokaryotic cell Eg.Escherichia coli

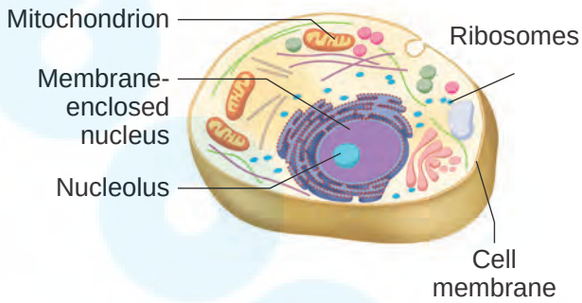


5.3.2 Eukaryotic cell

Cell which has true nucleus is called as eukaryotic cell. It is bigger than prokaryotic cell. It's organelles are bounded by membrane.

Ex. Plants,animals, most of the fungi and algae.

Eukaryote



Activity 2:

Aim: To observe onion peel cells under a microscope

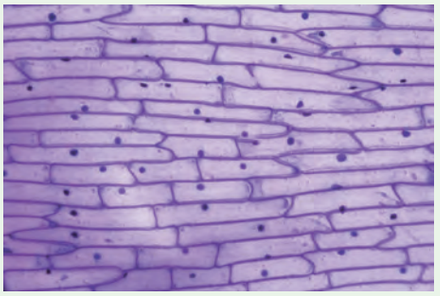
Materials Required: Glass slide, cover slip, onion, iodine solution, knife and microscope.

Procedure: Take an onion and cut it into two halves along its length. Take

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out one of its fleshy leaves. With the help of a pair of forceps, remove a transparent, thin peel from the inner surface of the leaf. Take a glass slide and put a drop of water at the centre. Place the peel on the drop of water. Pour a drop of iodine solution on the peel. Now place a cover slip over the material. Observe under the microscope.

Observation: You will be able to see rectangular cells of the onion peel, with a nucleus in each of them.



Differences between Prokaryotic cell Eukaryotic cell

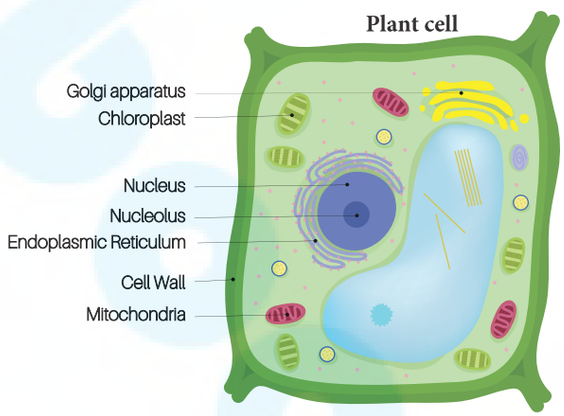
Prokaryotic cell	Eukaryotic cell
It's diameter ranges from 1 to 2 micron	It's diameter ranges from 10 t0 100 micron
Absence of membrane bound organelles	Presence of membrane bound organelles
Nucleus is not surrounded by nuclear membrane	True nucleus is surrounded by nuclear membrane
Absence of nucleoli	Presence of nucleoli

5.3.3. Plant cell and Animal cell

Both plant and animals are made up of cells. Both cells are eukaryotic in nature, having a well defined membrane – bound nucleus.

Plant cell

- ❖ It is usually larger in size. It is hard in nature.
- ❖ Plant cells have a cell wall in addition to their cell membrane.
- ❖ Plant cells have chloroplast which contain chlorophyll
- ❖ Plant cells have large vacuoles. Centrioles are absent.

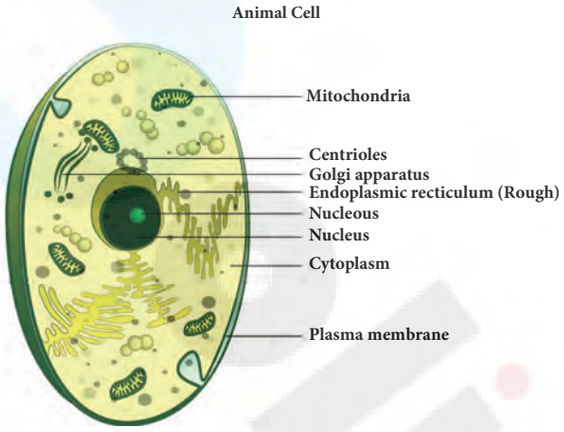


Animal cell

- ❖ Animal cells are generally smaller than plant cells. It is not so hard as plant cell.
- ❖ Cell wall is absent.
- ❖ Chloroplast is absent.

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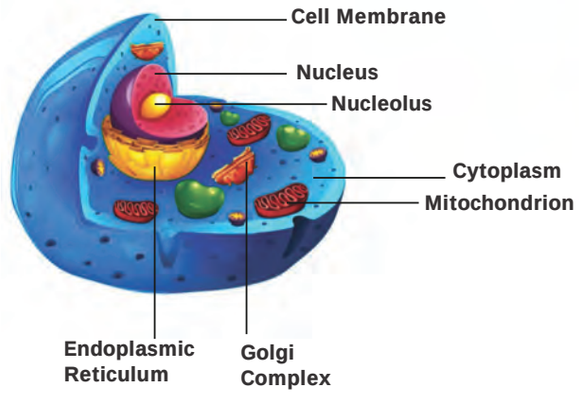
- An animal cell may have many small vacuoles.
- Centrioles are found in animal cells.



3 Dimension - cell structure

1. How does a cell look like?
2. What is its shape and size?

A48X5P



The above cell shows a three dimensional view. We can see the three sides of the cell structure. You can also view the size, shape and location on the organelles of the cell.

3-D view is appealing because it is more like reality.

In 3-D, view we can see the entire view of the cell. It exposes the accurate size and shape and shows the correct location of the cell organelles.

Activity 3:

Aim:

To rectify the variation between 2-D shape and 3-D shape.

Materials required:

Polythene bag, water, marble ball (golli gundu)

Procedure:

Take a polythene bag with water. Put a marble ball into the polythene bag. Then draw a picture in your note book about this task.

If you draw a picture in round shape. It will be called 2-Dimensional picture.

If you draw a picture in spherical shape it is called 3-Dimensional.

Result:

Now you can realize your misconception. So, the animal cells are spherical in shape and structure, not in a round shape.

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5.3.4.Cell components and their functions

S.No	Cell Components	Main Functions	Special Name
1	Cell wall	• Surrounds and protects the cell • Make the cell stiff and strong	Supporter and protector
2	Cell membrane	• Holds and protects the cell • Controls the movement of materials in and out of the cell	Gate of the cell
3	Cytoplasm	• A watery, gel-like material in which cell parts move	Area of movement
4	Mitochondria	• Produce and supply most of the energy for the cell	Power house of the cell
5	Chloroplasts	• Contain green pigment chlorophyll • Capture the energy of sunlight and use it to produce food for the cell by photosynthesis.	Food producers for the cell (Plant cell)
6	Vacuoles	• Store food, water, and chemicals	Storage tanks
7	Nucleus	• Acts as 'brain' of the cell • Regulates and controls all the cell activities	Control centre
8	Nucleus membrane	• Surrounds and protects the nucleus control the movement of materials in and out of the nucleus	Gate of the nucleus

Points to Remember

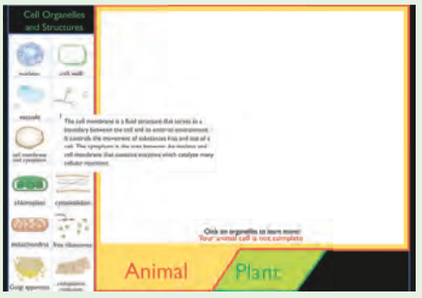
- ❖ Cells are the basic units of all living organisms.
- ❖ There are two major cell types such as prokaryotic and eukaryotic cell.
- ❖ Both plant and animal cells have unique organelles which are capable of carrying out specialized functions.
- ❖ Plant cells have two unique components such as cell wall and chloroplasts compared to animal cells.

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ICT Corner

The Cell



Through this activity you will be able to understand the differences between Plant and Animal Cell, their organelles and their functions.

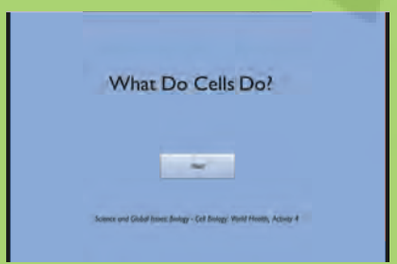
Step 1: Use the given URL in the browser. 'What do Cells do? Page will open. Click the Start Button to begin the activity.

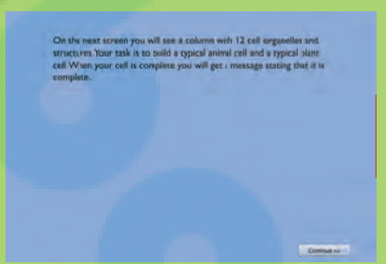
Step 2: Click continue to proceed to the activity, a column with cell organelles is given. Your task is to build a plant cell and animal cell. Roll the mouse over each organelle to learn about it.

Step 3: Use the mouse to drag the appropriate organelles to build the cell.

Step 4: After finishing the animal cell, continue the same process to finish the plant cell.

Step 1





Step 2



Step 3

What do Cells do? URL:

http://sepuplhs.org/high/sgi/teachers/cell_sim.html

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*Pictures are indicative only

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Evaluation

A4HT7C

I. Choose the appropriate answer

1 The unit of measurement used for expressing dimension (size) of cell is ____

a. centimeter b. millimeter

c. micrometer d. meter

2. Under the microscope Priya observes a cell that has a cell wall and distinct nucleus. The cell that she observed is

a. a plant cell b. an animal cell

c. a nerve cell d. a bacteria cell

3. The 'control centre' of the eukaryotic cell is

a. Cell wall b. Nucleus

c. Vacuoles d. Chloroplast

4. Which one of the following is not an unicellular organism?

a. Yeast b. Amoeba

c. Spirogyra d. Bacteria

5. Most organelles in an eukaryotic cell is found in the

a. Cell wall b. cytoplasm

c. nucleus d. Vacuole

II. Fill in the Blanks

1. The instrument used to observe the cell is _____

2. I take part in food production of a cell. Who am I? ____

3. I am like a policeman. Who am I ____?

4. The Term " cell" was coined by _____

5. The egg of an Ostrich is the _____ single cell.

III. True or False. If False, give the correct answer.

1. A cell is the smallest unit of life.

2. Nerve cell is the longest cell

3. Prokaryotes were the first form of life on earth.

4. The organelles of both plants and animals are made up of cells.

5. New cells are produced from the existing cells.

IV. Match the following

1.	Control center	-	Cell membrane
2.	Food producer (Plant cell)	-	Mitochondria
3.	Gate of the nucleus	-	Nucleus
4.	Gate of the cell	-	Chloroplasts
5.	Energy producer	-	Nuclear membrane

V. Arrange in a correct sequence

1. Elephant, Cow, Bacteria, Mango, Rose plant.

2. Hen's Egg, Ostrich's egg, Insect's egg.

VI. Analogy

1. Prokaryote : Bacteria :: Eukaryote :_____

2. Spirogyra : Plant cell :: Amoeba : _____

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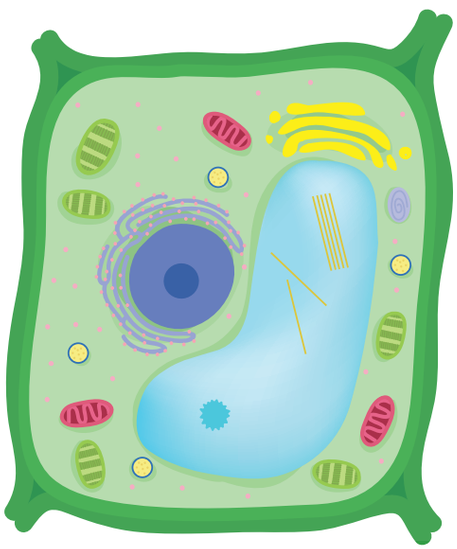
3. Food producer : Chloroplasts :: Power house :____

VII. Give very short answer

1. Who discovered the cell in 1665?
2. What type of cells do we have?
3. What are the essential components of a cell?
4. What are the organelles found only in plant cell?
5. Give any three examples of eukaryotic cell?
6. Which one is called as “Area of movement”?
7. Shiva said “ Bigger onion has larger cells when compared to the cells of smaller onion”! Do you agree with his statement or not ? Explain Why?

VIII. Give short answer

1. Why cells are called building blocks of life?
2. Identify any four parts of the Plant cell.



3. Distinguish between prokaryotic and eukaryotic cells
4. Make sketches of animal and plant cells which you observe under microscope.
5. Write about the contribution of Robert Hooke in cell biology.

IX. Answer in detail

1. Tabulate any five cell organelles and their function.
2. Draw a neat labelled diagram of a prokaryotic cell.

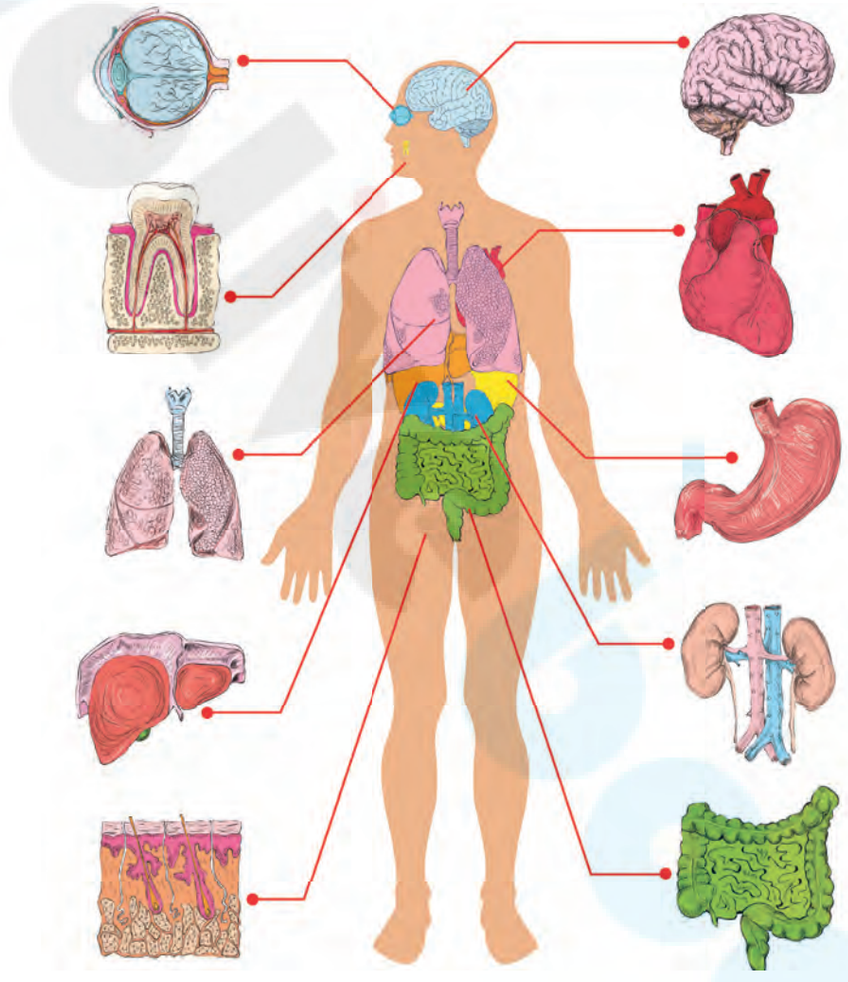
X. Project

1. Use your imagination and create 3-D model of a plant cell?
2. You can use numerous food materials such as jelly and some cake to make a cell body. Cell organelles can be made using nuts and dry fruits. You can display the model in your class room and invite teachers or students from other classes. If they rise questions on the project try to give answer.

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Unit 6 Human Organ systems



Learning Objectives

- To understand the structure and function of organs and organ systems of human body
- To gain knowledge of various human body systems and their coordination
- To understand the importance of the life processes such as Digestion, Absorption, Respiration, Excretion

A4RP8Z

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Introduction

Organ systems are formed by the association of organs which are organized from tissues. This kind of organization helps the organism to perform various activities more efficiently. A group of organs that work together to perform a particular function is known as an **organ system.** The Human body has eight major organ systems. They are

❖Skeletal System ❖Muscular System

❖Digestive System ❖Respiratory System

❖Circulatory System ❖Nervous System

❖Endocrine System ❖Excretory System

In this lesson, let us study more about the structure and function of these organ systems of our body.

6.1 Skeletal System

The skeletal system consists of bones, cartilages and joints. Bones provide a frame work for the body. Bones along with muscles help in movements such as walking, running, chewing and dancing etc.,

The adult human skeletal system consists of 206 bones and few cartilages, ligaments and tendons. Ligaments help in connecting bone to bone. Tendons connect bone to muscle. The two major divisions of the skeletal system are **Axial skeleton and Appendicular skeleton.**

Axial skeleton forms the upright axis of the body which includes

- ❖ **Skull**
- ❖ **Vertebral column**
- ❖ **Rib cage**

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Appendicular skeleton consist of the bones of the limbs along with their pectoral and pelvic girdles.

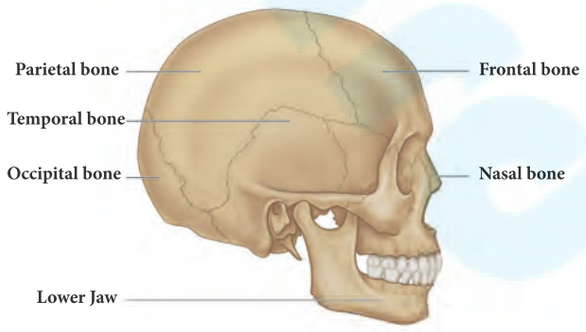
Activity 1: Sit absolutely still. Observe the movements taking place in your body. You must be blinking your eyes time to time. Observe the movements in your body as you breathe. Write down the movements in your note book.

We are able to move a few parts of our body easily in various directions and some, only in one direction. Why we are not able to move some parts at all directions?

Skull

The skull is made up of cranial bones and facial bones. It protects the brain and the structures of the face. The hyoid bone present at the base of the buccal cavity and the auditory ossicles (Malleus, Incus and Stapes) are also included in the skull. Lower jaw bone is the largest and strongest bone in the human face.

Skull



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Vertebral Column

Vertebral column extends from the base of the skull. It protects the spinal cord. It is formed by a number of serially arranged small bones called **vertebrae** (singular : vertebra)

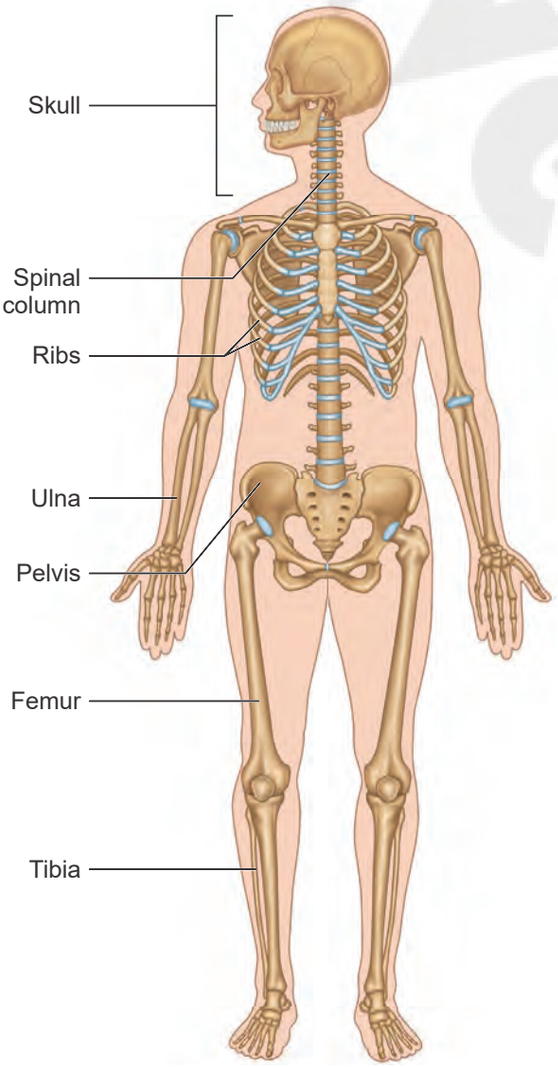
Rib cage

The rib cage is made up of 12 pairs of curved, flat rib bones. It protects the delicate vital organs such as heart and lungs.

Limbs

Man has two pairs of limbs namely upper limbs (fore limbs) and lower limbs (hind limbs). Fore limbs are used for holding, writing etc., while hind limbs are used for walking, sitting etc.,

Skeletal System



Girdles

The fore limbs and hind limbs are attached to the axial skeleton with the help of pectoral and pelvic girdle respectively.

Activity 2: To show that we can bend or move our body only at those points where the bones meet.

Materials required: A wooden scale and string.

Method: Ask your friend to tie a wooden scale and your arm together. So that the elbow is at the centre. Even if you try hard, you cannot bend your elbow.



Conclusion: A single bone cannot bend. The different bones joined together at the elbow, help the elbow to bend.



1.The smallest bone in our body is present inside the ear. It is called **Stapes**. It is only 2.8 millimeters long (average length). The longest bone in the body is the **thigh bone.** (Femur)

2. A new born baby has more than 300 bones. As the baby grow, some bones are joined together, hence the skeleton of an adult has 206 bones.

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6.2 Muscular System

In the body, muscular system along with the skeletal and nervous system, is responsible for the body movements.

Muscles can contract and therefore, help in moving other parts of the body. It maintains the posture and body position. There are three types of muscles namely

- **Skeletal muscle**
- **Smooth muscle**
- **Cardiac muscle**

Activity 3: Move your lower arm up and down gently. Feel the contraction and relaxation of your biceps and triceps muscles. The muscles present in the upper arm help in the contraction of front biceps muscles (become short and thick), and also relaxation of rear triceps muscles (become long and thin). You can feel the muscles on top that go stiff. When the arm is moved downwards, the front muscles relax and the rear muscles contract.

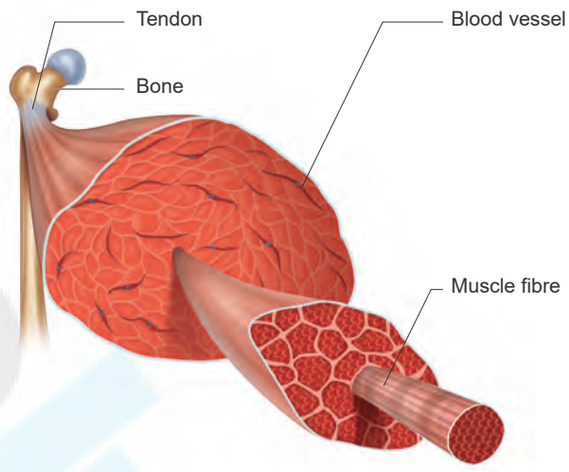
How do muscles work?

Muscles of the body can only pull and they cannot push. Two muscles are required to move a bone at a joint. When one muscle contracts, the other muscle relaxes.

For example, to move 'the lower arm up and down two type of muscles called biceps and triceps are required. When we raise our lower hand, the biceps in front become short by contraction and the triceps at the back stretch to pull up the arm. When we lower our arm, the triceps at the back contract and biceps stretch to pull the arm down.

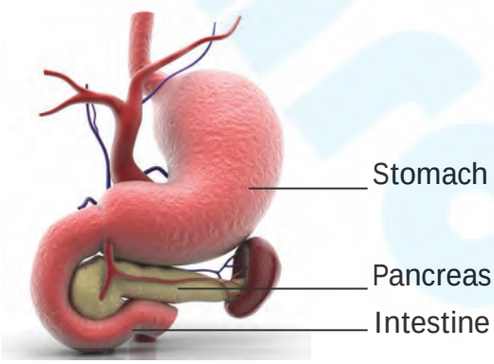
Skeletal Muscles

Skeletal muscles of our body are attached to the bones. They are called **Voluntary muscles** because they can be controlled by our will. Example: Muscles of arm.



Smooth muscles

Smooth muscles are found in the walls of the digestive tract, urinary bladder, arteries and other internal organs. They are called **'Involuntary muscles'** because they are not controlled by our will.

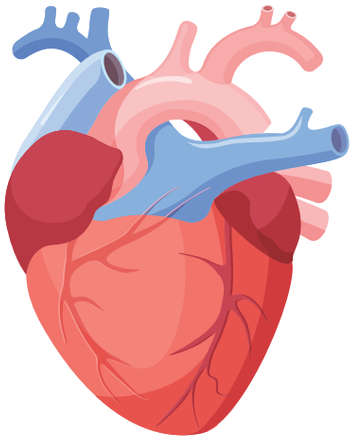


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Cardiac muscles

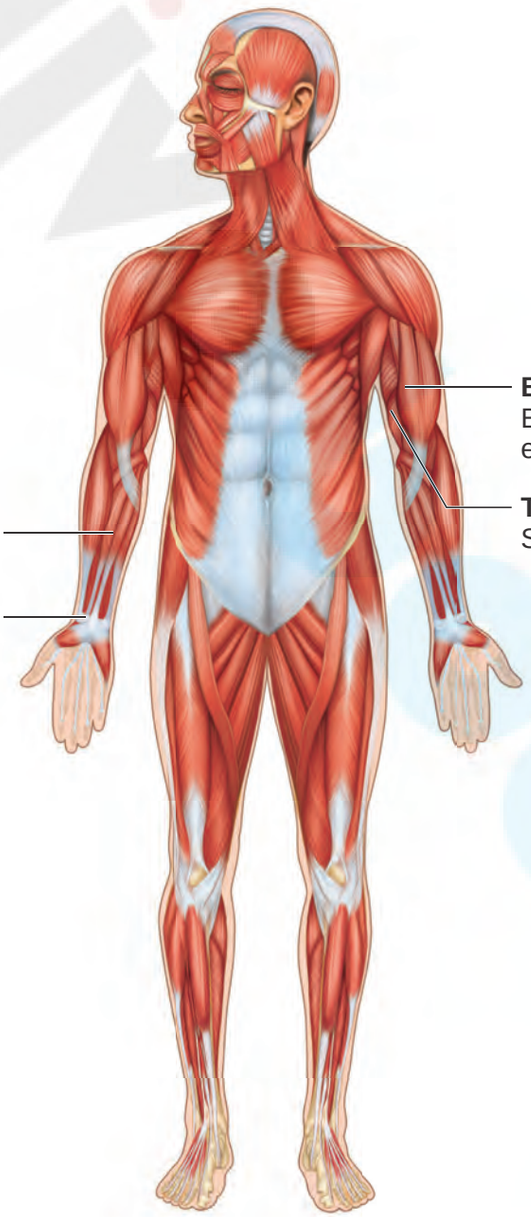
The walls of the heart is made up of cardiac muscles. They are capable of rhythmic, contraction continuously and involuntary in nature.

Heart



Muscular System

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Biceps
Bends the arm at the elbow

Triceps
Straightens the elbow

Finger flexors
Bend the fingers

Finger extensors
(behind)
Straighten the fingers

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6.3 Digestive System

Digestive system consists of the alimentary canal and associated glands. This system is involved in the conversion of complex food substances into simple forms and absorption of digested food.

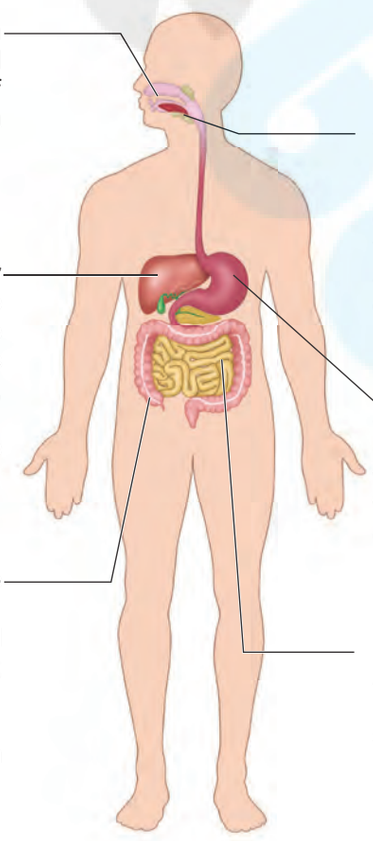
The digestive glands associated with the alimentary canal are salivary glands, liver, and pancreas. They secrete enzymes which help in the process of digestion of food in the digestive tract or alimentary canal.

The alimentary canal is about 9 meters long. Stomach is a major organ for digestion of food materials. Absorption of digested food occurs in the small intestine.

Parts of Alimentary canal	
1.	Mouth
2.	Buccal cavity
3.	Pharynx
4.	Oesophagus or Food pipe
5.	Stomach
6.	Small Intestine
7.	Large Intestine
8.	Anus

Associated glands for digestion	
1.	Salivary glands
2.	Gastric glands
3.	Liver
4.	Pancreas
5.	Intestinal glands

Digestive System



Mouth
Starts mechanical and chemical digestion of food with the help of teeth, tongue and saliva

Liver
Blood carrying nutrients from the small intestine passes through the liver, which filters it and breaks down and synthesizes proteins, converts glucose into glycogen, and also produces bile

Small intestine
A long tube about six metres in which most of chemical digestion occurs; nutrients are absorbed from here into the bloodstream

Salivary glands
Produces saliva, which helps to lubricate food for easier swallowing; contains antibacterial agents and the enzyme salivary amylase, which breaks down strach

Stomach
Stores, mixes, and digests food with the gastric juice it produces, which consists of mucus, enzymes,and hydrochloric acid.

Large intestine
Absorbs water from the food that have not been digested in the small intestine; also absorbs some important vitamins that are produced by the large number of bacteria it harbours

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6.4 Respiratory System

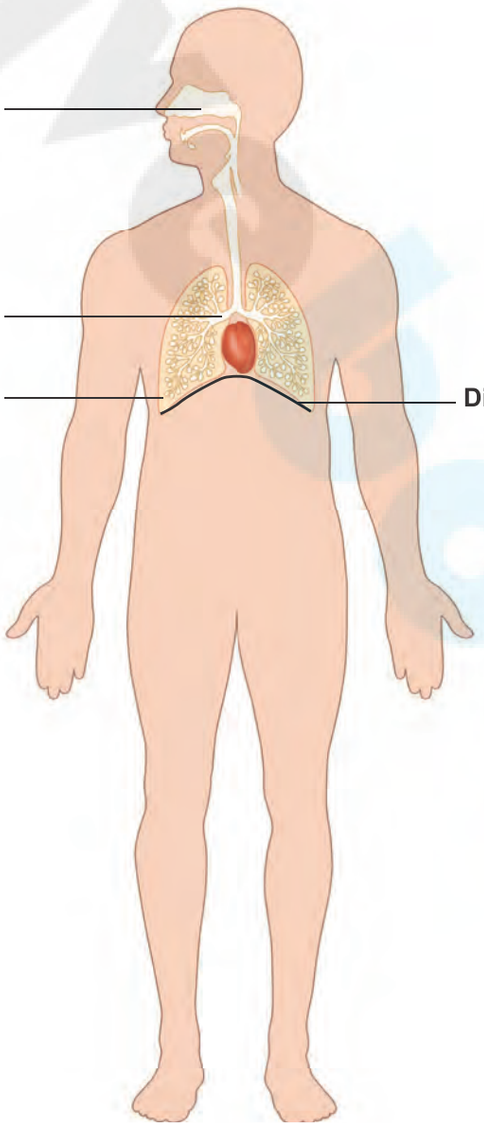
Respiratory system is involved in exchange of respiratory gases and there by helps us to breathe. The human respiratory system consists of nostrils, nasal cavity, pharynx, larynx, trachea, bronchi and lungs. It helps in the movement of air in and out of the body. Exchange of O_2 and CO_2 occurs between air in the lung and blood. The entry of food into the wind pipe is prevented by a flap like structure called **Epiglottis**.

Lungs

Lungs are the main respiratory organ. They are located within the chest cavity. The trachea, commonly called **windpipe**, is a tube supported by cartilaginous rings that connects the pharynx and larynx to the lungs, allowing the passage of air. The trachea divides into right and left bronchi and enter into the lungs. They divide further and ends in small air sacs called **alveoli**. The lungs are covered by a double layered **pleura**. Diffusion of gases (O_2 and CO_2) occurs across the alveolar membrane.

Respiratory System

A5JCDX



When we inhale, where does the air go?

Nostrils
↓
Nasal cavity
↓
Pharynx
↓
Larynx
↓
Trachea
↓
Bronchus
↓
Bronchiole
↓
Alveolus

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Exchange of gases by the respiratory system involves three different processes such as;

1. **External Respiration:** Intake of O_2 from the air and releasing of CO_2 from the lungs occurs through nostrils.
2. **Internal Respiration:** Taking in of oxygen and giving out CO_2. The circulatory system transports O_2 and CO_2 to and from all parts of the body. Hemoglobin in the red blood cells (RBCs) transport O_2 and CO_2.
3. **Cellular Respiration:** Cells take in O_2 and release CO_2

Activity 5:

Aim: To prove that exhaled air is rich in carbon- di- oxide

Materials required: Two glass jars with lime water and a straw

Procedure: Leave the first jar with lime water undisturbed, blow air in to the second jar with the help of a straw

Observation: Lime water turns milky in few seconds in the second jar. The CO_2 gas alone can change the lime water into milky white.

Conclusion: Carbon-di-oxide is present in the air that we exhale.



Each lung has about 300 million air sacs or alveoli.

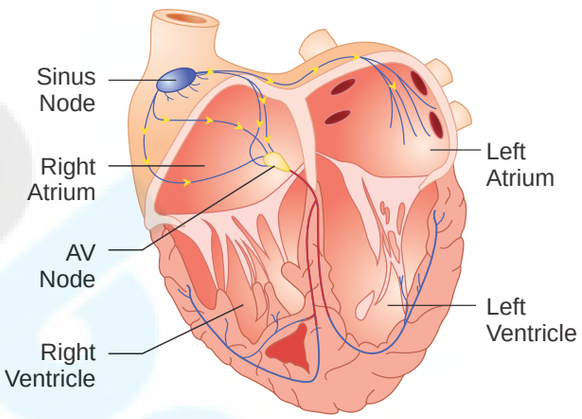
Yawning helps us to take in more amount of O_2 and to give out CO_2.

6.5 Circulatory system

The circulatory system is one of the important system consisting of heart, blood vessels and blood. It transports respiratory gases, nutrients, hormones and waste materials within the body. It protects the body from harmful pathogens and also regulates the body temperature.

Heart

Heart is located in the thoracic cavity between the two lungs. The heart is four chambered and is surrounded by a double layered membrane called **pericardium**. The heart pumps blood continuously throughout our life time.



Blood vessels

Three types of blood vessels are present in the body. They are **arteries, veins and capillaries.** They form a closed network through which the blood is circulated.

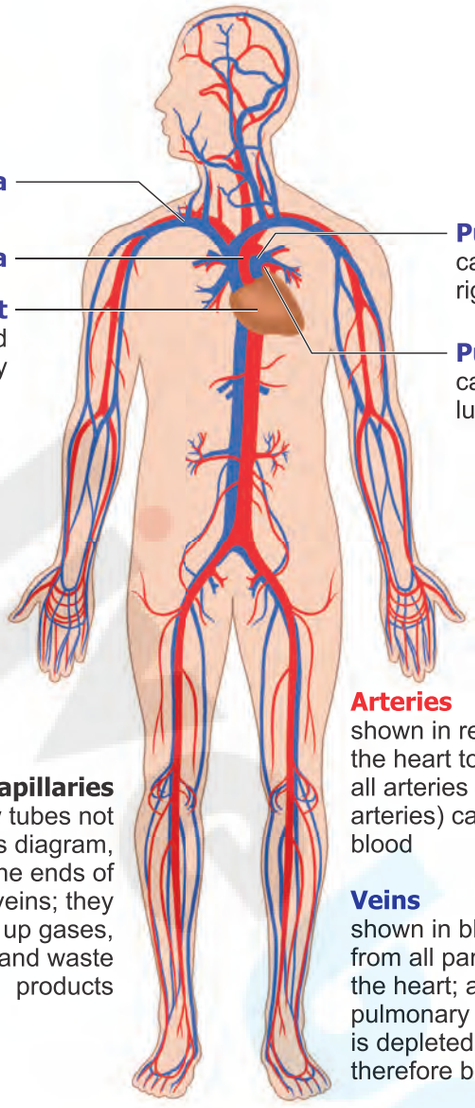
Blood

Blood is a fluid connective tissue of red colour containing plasma and blood cells. There are three types of blood cells namely, Red blood corpuscles (RBCs), White Blood corpuscles (WBCs) and Blood Platelets. RBCs are produced in the bone marrow.

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Circulatory System

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Superior vena cava

Aorta

Heart
pumps blood to the body

Pulmonary artery
carries blood from the right ventricle to the lungs

Pulmonary vein
carries blood from the lungs to the left atrium

Capillaries
are very narrow tubes not shown in this diagram, they connect the ends of all arteries to veins; they deliver and pick up gases, nutrients, and waste products

Arteries
shown in red they carry blood from the heart to all parts of the body; all arteries (except the pulmonary arteries) carry oxygenated, red blood

Veins
shown in blue, they carry blood from all parts of the body back to the heart; all veins (except the pulmonary veins) carry blood that is depleted of oxygen and therefore bluish in colour

Activity 6: Place the middle and index fingers of your right hand on the inner side of your left wrist. Can you feel a throbbing movement. Why do you feel the throbbing? This throbbing is called the **pulse** and it is due to the blood flowing in the arteries. Count the number of pulse in one minute.

How many pulse beats could you count in one minute? The number of beats per minute is called the **Pulse rate**. A resting person usually has a pulse rate between 72 to 80 beats per minute.



Find other places in your body where you can feel the pulse. Record your own pulse beats and your classmates as beats per minute; Compare the values.

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Donate Blood

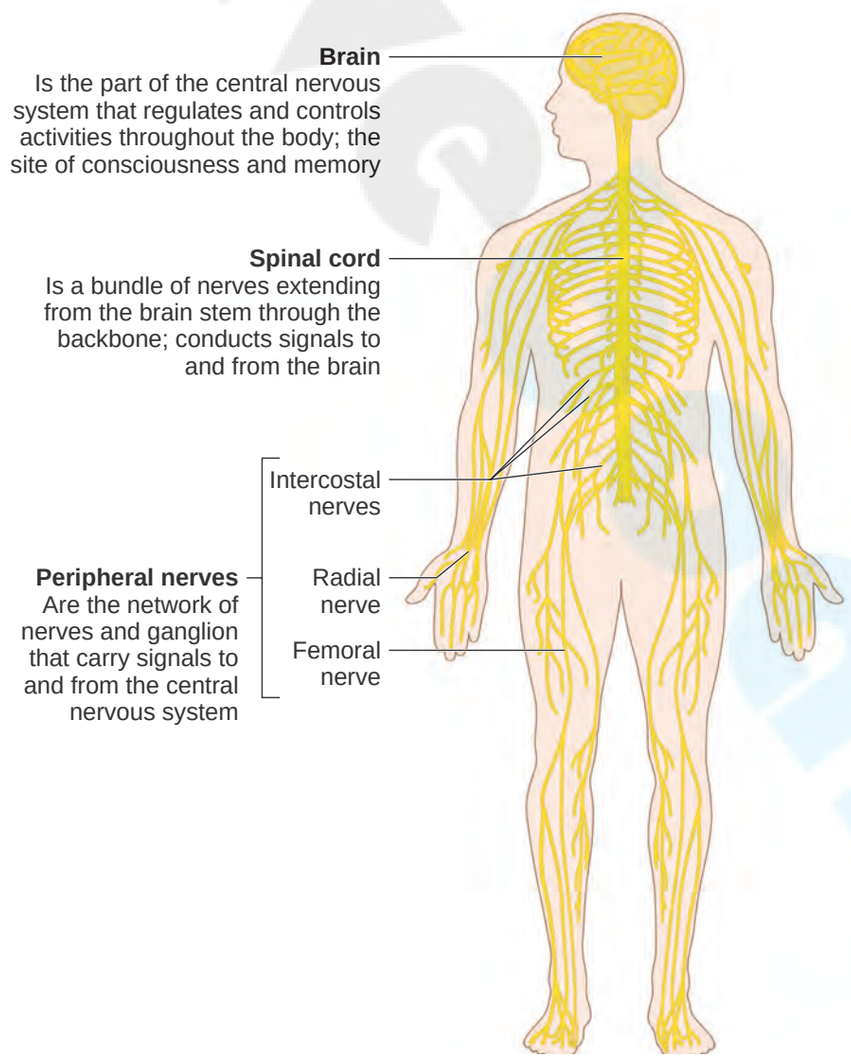
Hospitals have blood banks where blood can be temporarily stored before it is given to the patients in need. Every healthy person over 18 years of age can donate blood. So that, it can be given to persons in need during emergencies of accidents or operations. Blood donation saves their life.



6.6 Nervous System

Nervous system is well developed in human and is composed of neurons or nerve cells. This system includes brain, spinal cord, sensory organs and nerves. The two important functions of the nervous system along with the endocrine system are **conduction and co-ordination.**

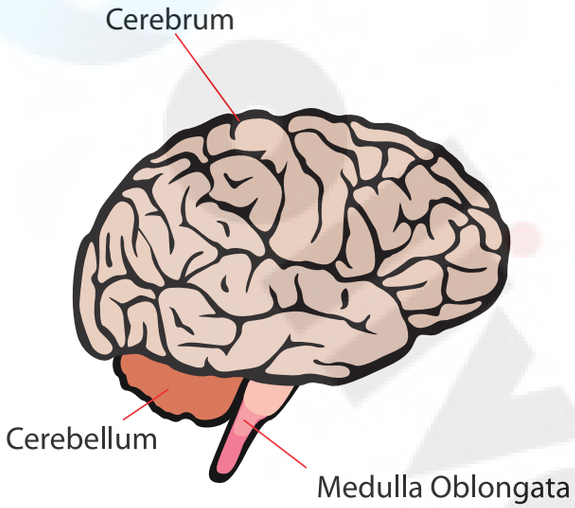
Nervous System



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Brain

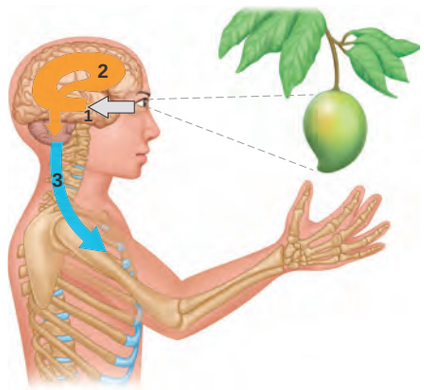
The brain is a complex organ which is placed inside the cranium. It is protected by a three layered tissue coverings called **meninges**. Brain has three regions namely fore brain, mid brain and hind brain. It is the controlling centre of the body.



Spinal cord

It is the extension of medulla oblongata of the hind brain and is enclosed within the vertebral column. Spinal cord connects the brain to different part of the body through nerves.

The Functions of the Nervous System



1. Sensory Input

The conduction of signals from sensory receptors.

2. Integration

The interpretation of the sensory signals and the formulation of responses.

3. Motor output

The conduction of signals from the brain and spinal cord to effectors, such as muscle and gland cells.



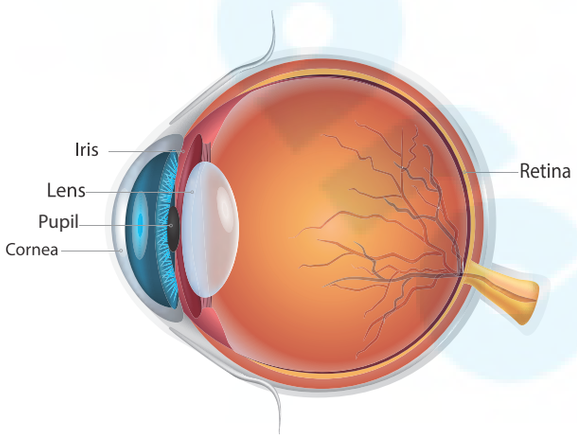
Brain is said to store as many as 100 million bits of information in a life time.

6.7 Sense organs

Sense organs are like the windows to the outside world. There are five sense organs in our body such as eyes, ears, nose, tongue and skin. They make us aware of our surroundings. We are able to see, hear, smell, taste and feel, only through sense organs.

Eyes

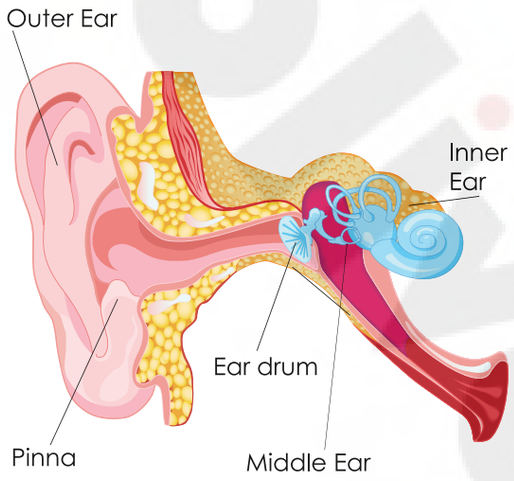
Eyes help us to see things around us i.e., their colour, shape, size whether they are near or far, moving or at rest. The eyelids and eyelashes keep the eyes safe. The eye has three main parts namely cornea, iris and pupil.



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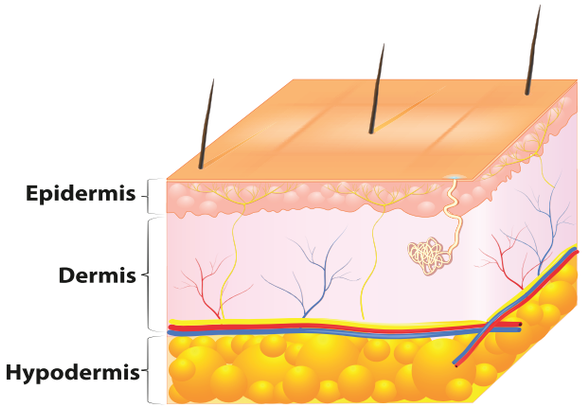
Ears

Ears help to hear and differentiate sounds around us. The ears also help us in maintaining the balance of the body when we are walking, running or climbing. The ear has three major parts, **the outer ear, the middle ear and the inner ear.** The outer ear in human beings is made up of an external flap called **pinna**.



Skin

Skin is the largest sense organ as it covers the whole body. The skin helps to feel the things around us by touching, that is whether they are hot or cold, smooth or rough, dry or wet, hard or soft. Skin covers the body and protects it from germs. It also keeps the body moist and regulates the body temperature.



Functions of the skin

1. Skin forms an effective barrier against infection by microbes and pathogens.
2. Skin helps us to synthesize vitamin D using sunlight.

Take Care of Your Sense organs

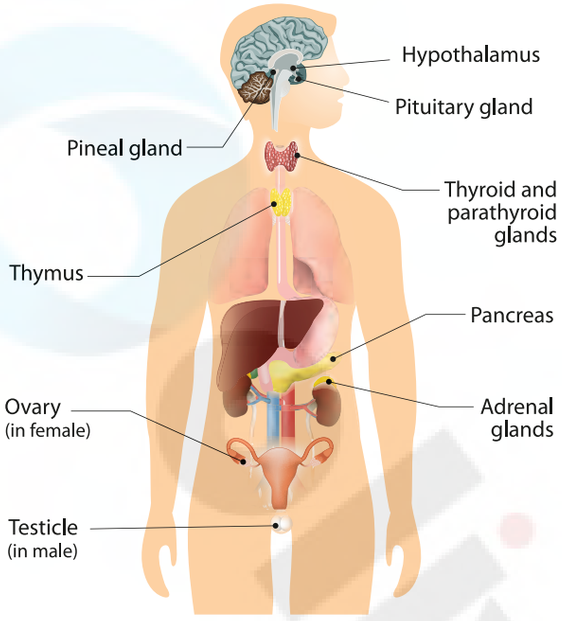
- ❖ Do not read in very bright or very dim light and also in moving vehicle.
- ❖ Avoid exposing eyes to screens of television, computer, laptop and cell phone for a long time.
- ❖ Do not rub your eyes harshly.
- ❖ Wash your eyes gently with clean water, two or three times a day.
- ❖ Ears should be protected from hard blows.
- ❖ One should never try to prick ears with toothpicks or hairpins, which are dangerous practices because it may puncture the ear drum and cause ear infection.
- ❖ One should bath at least once a day to keep skin clean and fresh.

6.8 Endocrine System

Endocrine system regulates various functions of the body and maintains the internal environment. Endocrine glands are present in the body, produce chemical substances called **hormones**.

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Endocrine System



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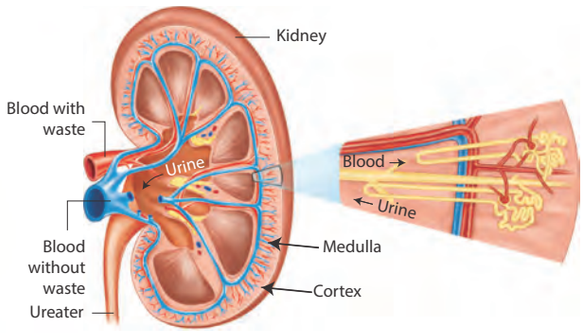
Glands	Location
Pituitary gland	At the base of brain
Pineal Gland	At the base of brain
Thyroid Gland	Neck
Thymus Gland	Chest
Pancreas (Islets of Langerhans	Abdomen
Adrenal Gland	Above the kidney
Gonads	Pelvic cavity

6.9 Excretory System

The nitrogenous wastes are removed from the body by the excretory system. It is composed of kidneys, ureters, urinary bladder and urethra.

Kidneys

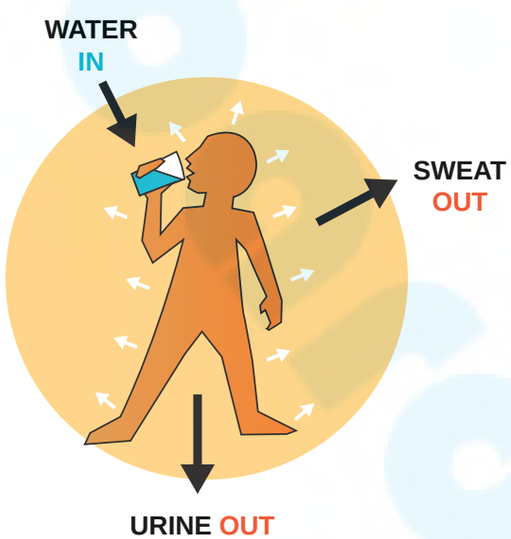
These are bean shaped structures present in the abdominal cavity. The functional units of the kidney are called **Nephrons** which filter the blood and form the urine.





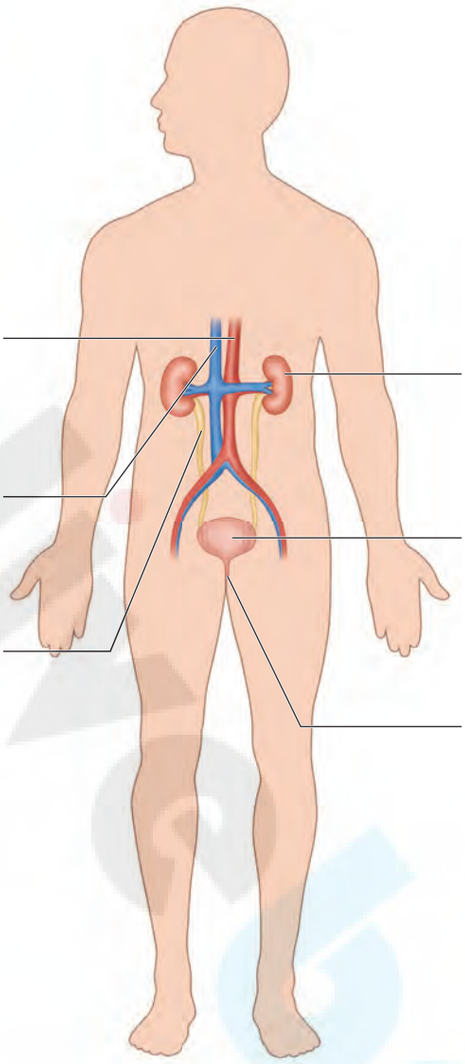
Why do we drink water? Our body contains about 70% water. Some parts have more water like the grey matter of the brain (about 85%) and some less, like fat cell (about 15%).

We normally consume 1.5 to 3.5 litres of water every day in the form of food and water.



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Excretory System



Points to Remember

- The skeletal system gives shape to the body and protects the soft internal organs.
- There are three types of muscles – skeletal muscle (voluntary), smooth muscle (involuntary) and cardiac muscle.
- Circulatory system constitutes the heart, blood vessels and blood.
- Diaphragm – A large flat muscle forming the floor at the chest cavity.
- Digestion is the process of breaking complex food into simple and soluble substances.
- Brain is protected by the skull. It has three parts – cerebrum, cerebellum and medulla oblongata.
- The sense organs are Eyes, Ears, Nose, Tongue and Skin.

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ICT Corner

Human Organ systems



Through this activity you will be able to understand the organ system of the human body.

Step 1: Use the given URL in the browser. 'The human body systems page will open. Select any human organ system from the list given to explore.

Step 2: In the activity window the selected organ system will appear, you can zoom it by scrolling the mouse wheel or by clicking the + icon given.

Step 3: The multiple layers of the organ system can be increased or decreased by scroll over the ' Layers" button given..

Step 4: You can view a particular organ of a system by zooming over or by selecting the organ from the list given in the description below the activity window.

Step 1





Step 3



Step 2

The human body systems URL:

https://www.healthline.com/health/human-body-maps

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*Pictures are indicative only

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Evaluation

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I. Choose the appropriate answer

1. Circulatory system transports these throughout the body

   a. Oxygen b. Nutrient

   c. Hormones d. All of these

2. Main organ of respiration in human body is

   a. Stomach b. Spleen
   c. Heart d. Lungs

3. Breakdown of food into smaller molecules in our body is known as

   a. Muscle contraction

   b. Respiration

   c. Digestion

   d. Excretion

II. Fill in the blanks

1. A group of organs together make up an _____ system
2. The part of the skeleton that protects the brain is _____
3. The process by which the body removes waste is _____
4. The _____ is the largest sense organ in our body
5. The endocrine glands produce chemical substances called _____

III. True or False. If False, give the correct statement

1. Blood is produced in the bone marrow.
2. All the waste products of the body are excreted through the circulatory system.
3. The other name of food pipe is alimentary canal.
4. Thin tube like structures which are the component of circulatory system are called blood vessels.
5. The brain, the spinal cord and nerves form the nervous system.

IV. Mach the following

1. Ear	-	Cardiac muscle
2. Skeletal System	-	Flat muscle
3. Diaphragm	-	Sound
4. Heart	-	Air sacs
5. Lungs	-	Protection of internal organs

V. Arrange in Correct sequence

1. Stomach → Large intestine → Oesophagus → Pharynx → Mouth → Small Intestine →Rectum → Anus
2. Urethra → Ureter → Urinary Bladder → Kidney

VI. Analogy

1. Arteries : Carry blood from the heart:: _____ :carry blood to the heart.
2. Lungs: Respiratory system:: _____: Circulatory system.
3. Enzymes: Digestive glands:: _____: Endocrine glands

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VII. Give very short answer

1. Describe about skeletal system.
2. Write the functions of epiglottis.
3. What are the three types of blood vessels?
4. Define the term "Trachea".
5. Write any two functions of digestive system.
6. Name the important parts of the eye.
7. Name the five important sense organs.

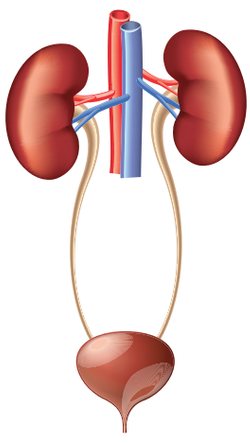
VIII. Give short answer

1. Write a short note on rib cage.
2. List out the functions of the human skeleton.
3. Differentiate between the voluntary muscles and involuntary muscles.

IX. Answer in detail

1 List out the functions of Endocrine system and Nervous system.

2. Label the diagram given below to show the four main parts of the urinary system and answer the following questions.



A. Which organ removes extra salts and water from the blood?

B. Where is the urine stored?

C. What is the tube through which urine is excreted out of the body?

D. What are the tubes that transfer urine from the kidneys to the urinary bladder called?

X. Questions based on Higher Order Thinking Skills

1. What will happen if the diaphragm shows no movement?
2. Why is the heart divided into two halves by a thick muscular wall?
3. Why do we sweat more in summer?
4. Why do we hiccup and cough sometimes when we swallow food?

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Unit 7 Parts of Computer



Learning Outcomes

- To know the Input unit, CPU and the Output unit.
- To understand the memory unit.
- To differentiate the input and output devices.
- To link the connections in Computer.

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Is it easy to connect our sprawling planet to a point? If it is easy, then how would it be possible? The answer to these questions in today's world is the Computer. In this Modern World computer eases the effort and speeds up the processes to a great extent. Now-a-days the usage of computer plays an important part in every walk of life. So, it is apt time to learn about computers. To start, it is necessary to note that there are three key units in the computer. Understanding of this three units will make us to operate a computer in ease. In this section, let us learn what are the three units? What are the functions of each of these units.

7.1.1 Parts of a Computer

- ❖ Input Unit
- ❖ Central Processing Unit (CPU)
- ❖ Output Unit

Input Unit



The input unit helps to send the data and commands for the processing. The devices that are used to input data are called input devices.

Keyboard, Mouse, Scanner, Barcode reader, Microphone-Mic., Web camera, Light Pen are some of the input devices.

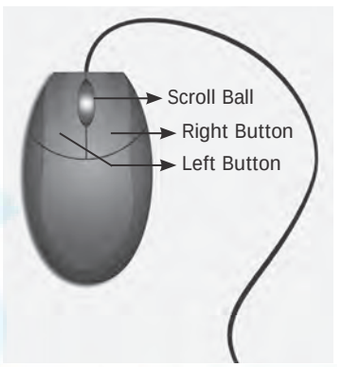
Keyboard

Keyboard and mouse are the important input units. Keyboard plays an important role in a computer as a input device. Numbers and alphabet plays a role of Data in computer. Keyboard helps to enter data. Keyboard has two types of keys, namely number keys and alphabet keys. The keys with numbers are called number keys and key with letters are called alphabet keys.



Mouse

Mouse is an essential part of the computer. Mouse has two buttons and a scroll ball in the middle. The mouse is used to move the pointer on a computer screen. Right button is used to select files and to open the folder. Left button is used to carryout corrections in the file. The page on the monitor can be moved up and down using the scroll ball.



Central Processing Unit (CPU)

CPU is the brain of the Computer. The

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data is processed in the CPU. The CPU has namely three parts.

1. Memory Unit
2. Arithmetic Logic Unit (ALU)
3. Control Unit

Control Unit

The control unit controls the functions of all parts of the computer.

Arithmetic Logic Unit

Arithmetic and Logic unit performs all arithmetic computations like addition, subtraction, multiplication and division.

Memory Unit

The memory unit in the computer saves all data and information temporarily. We can classify memory unit into two types namely primary and secondary memory. Memory can be expanded externally with the help of Compact Disk (CD), Pendrive, etc.

Output Unit

The output unit converts, command received by the computer in the form of binary signals into easily understandable characters. Monitor, Printer, Speaker, scanner are some of the output devices.

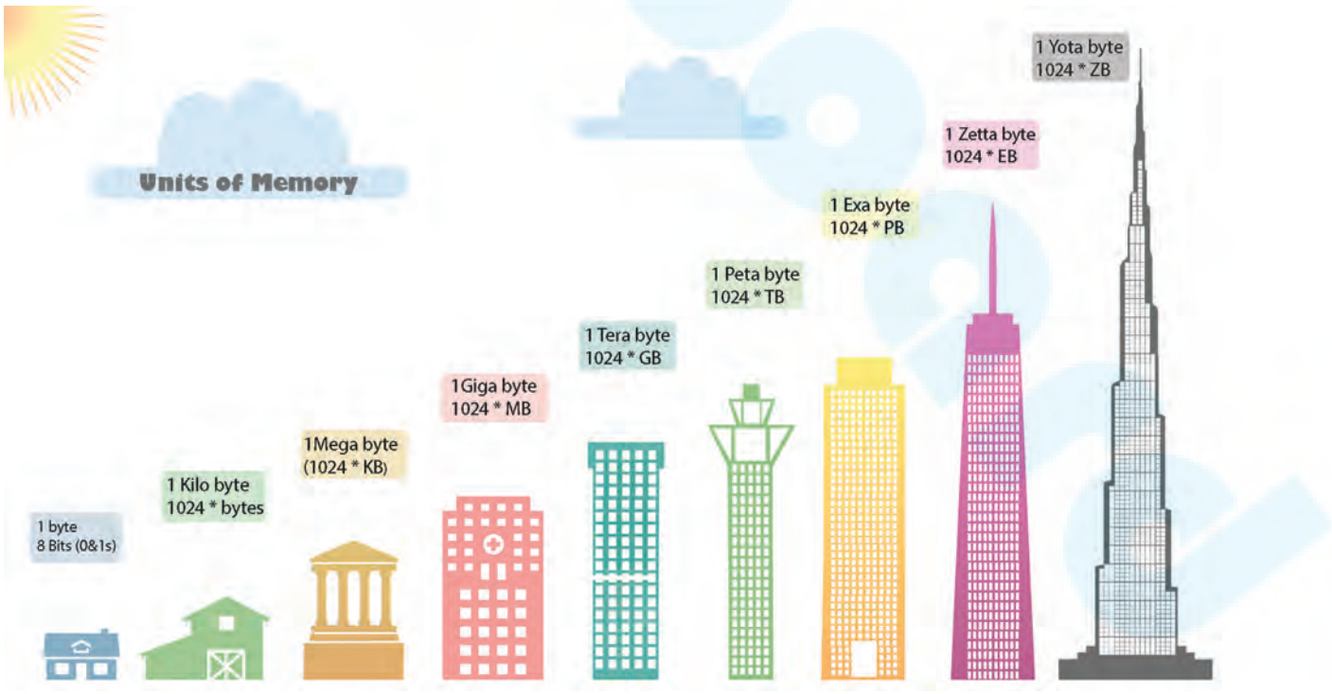
Of the various output devices, monitor is the important output device because it is link to the computer. Monitor screen looks like TV screen. The input data in the form of Alphabets, Numbers, Pictures or Cartoons and Videos it will be displayed on a monitor. There are two types of monitor namely,

1. Cathode Ray Tube Monitors (CRT)
2. Thin Film Transistor Monitors (TFT)

Now a days computer system has TFT monitor as they occupy less space and emit less heat than CRT monitors.

7.1.2 Memory Units

The data is measured in units which is



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DO YOU KNOW?

A DVD is capable of storing 6 times more data than a CD.

called as Bit. A Bit has a single binary value either 0 or 1.

Classification of Computer

The computers can be classified as follows based on their design, shape, speed, efficiency, working of the memory unit and their applications.

- Mainframe Computer
- Mini Computer
- Micro or Personal Computer
- Super Computer



Mainframe computer



Mini computer



Micro personal computer



Super computer

Personal computer and its types

Personal computer comes under the microcomputer. Based on the memory and efficiency in PC they can be classified as



Desktop



Laptop



Tablet

1. Desktop
2. Laptop
3. Tablet

7.1.3 Connecting the Computer

You must have seen tube light and fan working by connection through electric wire. Likewise various parts of the computer are linked through connecting cables. We call computer as system as it is connected with one another. Do you know how these parts are connected? There are many cables used to connect these parts. These cables are called as connecting cables. These cables are found in different sizes. Each cable has its own specific use. Let us see the different types of cables and its uses.

Types of Cables

- Video Graphics Array (VGA)
- High Definition Multimedia Interface (HDMI)
- Universal Serial Bus (USB)
- Data cable
- Power Cord
- Mic cable
- Ethernet cable

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1. VGA cable

It is used to connect the computer monitor with the CPU.



2. USB cable / cord

Devices like Printer, Pendrive, Scanner, Mouse, Keyboard, web camera, and Mobile phone devices are connected with the computer using USB cord or cable.

3. HDMI cable



HDMI cable transmits high quality and high bandwidth streams of audio and video. It connects monitor, projector with the computer.

4. Data cable



Data cable transmits data and it is used to connect tablet, mobile phones to the CPU for data transfer.

5. Audio jack



The audio jack is used to connect the speaker to the computer.



6. Power cord

Power cord temporarily connects an appliance to the main electricity supply.



7. Mic cable

To connect the Mic to the CPU, Mic wire/ cord is used.



8. Ethernet

Ethernet cable helps to establish internet connectivity.

7.1.4 Wireless Connections

Bluetooth, Wi-Fi are used to connect to internet without using any connecting cables / devices.

1. Bluetooth



Mouse, Keyboard can be connected to the computer using the Bluetooth. Using the Bluetooth the data can be shared with nearby devices

2. Wi-Fi

Net connectivity can be obtained using the Wi-Fi without any connecting cables. Any data from anywhere can be shared using Wi-Fi.



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Evaluation

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I. Choose the correct answer

1. Which one of the following is an output device?

   a. Mouse b. Keyboard

   c. Speaker d. Pendrive

2. Name the cable that connects CPU to the Monitor

   a. Ethernet b. Power Cord

   c. HDMI d. USB

3. Which one of the following is an input device?

   a. Speaker b. Keyboard

   c. Monitor d. Printer

4. Which one of the following is an example for wireless connections

   a. Wi-Fi b. Electric wires

   c. VGA d. USB

5. Pen drive is _____ device.

   a. Output b. Input

   c. Storage d. Connecting cable

II. Match the following

1.	VGA	-	Input device
2.	Bluetooth	-	Connecting cable
3.	Printer	-	LDMI
4.	Keyboard	-	Wireless connection
5.	HDMI	-	Output device

III. Give short answer

1. Name the parts of a computer.
2. Bring out any two differences between input and output devices.

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Activity

(Look at the magic of connecting cables to desktop computer with 4,3,2,1 formula, start from 4 proceed till 1. Now your computer is ready to use).

By connecting the various parts of a computer we can assemble a computer. For the construction activity, students have to use 4-3-2-1 formula.

A system consist of mouse, key board, monitor, CPU, power cables, and connecting cables Students has to connect the four parts of a computer in row 4, using the cables in row 3, through the power cables in row 2 to construct a system.

<table>
<tr><th colspan="5">Using the 4-3-2-1 formula we can connect the parts of the computer</th></tr>
<tr><td rowspan="2">4
Parts</td><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Mouse</td><td>Keyboard</td><td>Monitor</td><td>CPU</td></tr>
<tr><td colspan="2" rowspan="2">3
Connection cables</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>VGA</td><td>USB (connecting cable)for Keyboard</td><td>USB (connecting cable)for Mouse</td></tr>
<tr><td colspan="3">2
Power cords</td><td>  </td><td>  </td></tr>
<tr><td colspan="3" rowspan="3"></td><td>USB (connecting cable)for CPU</td><td>USB (connecting cable) for Monitor</td></tr>
<tr><td rowspan="2">1
Working system</td><td>  </td></tr>
<tr><td>A complete computer</td></tr>
</table>

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GLOSSARY

A7MES4

Atmosphere	-	வளிமண்டலம்
Arithmetic Logic Unit	-	கணிதத்தருக்கச் செயலகம்
Audio jack	-	ஒலி இணைப்பான்
Battery	-	மின் கல அடுக்கு
Basic Unit	-	அடிப்படை அலகு
Barcode Reader	-	பட்டைகுறியீடு படிப்பான்
Bluetooth	-	ஊடலை
Combustion	-	எரிதல்
Contraction	-	சுருங்குதல்
Cortical Expansion	-	பரும விரிவு
Cracking	-	விரிசல்
Cell	-	மின்கலன்
Chemical energy	-	வேதி ஆற்றல்
Conductors	-	மின் கடத்திகள்
Composition	-	இயைபு
Compressed air	-	அழுத்தப்பட்ட காற்று
Chloroplast	-	பசுங்கணிகம்
Chlorophyll	-	பச்சையம்
Compound microscope	-	கூட்டு நுண்ணோக்கி
Cell organelles	-	செல் உறுப்புகள்
Circulatory system	-	இரத்த ஓட்ட மண்டலம்

Control Unit	-	கட்டுப்பாட்டகம்
Compact Disk	-	குறுவட்டு
Cord/cable	-	கம்பி
Digestive system	-	செரிமான மண்டலம்
Data cable	-	தரவுக்கம்பி
Electrical energy	-	மின் ஆற்றல்
Electrical circuit	-	மின் சுற்று
Eukaryotic cell	-	உண்மையான உட்கரு உடைய செல்
Excretory system	-	கழிவு நீக்க மண்டலம்
Endocrine system	-	நாளமில்லாசுரப்பி மண்டலம்.
Friction	-	உராய்வு
Fuel	-	எரிபொருள்
Flame	-	சுடர்
Freezing	-	உறைதல்
Flagella	-	கசைஇழை
Food production	-	உணவு உற்பத்தி
Heat	-	வெப்பம்
Heat transfer	-	வெப்பம் கடத்தல்
Insulators	-	மின்கடத்தா பொருள்
Inflammable	-	எளிதில் எரியக்கூடிய
Input unit	-	உள்ளீட்டகம்
Kinetic energy	-	இயக்க ஆற்றல்
Linear Expansion	-	நீள் விரிவு
Leucoplast	-	வெண்கணிகம்
Light Pen	-	ஒளிப்பேனா
Laptop	-	மடிக்கணினி

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Molecules	-	மூலக்கூறுகள்
Mountaineer	-	மலையேறுபவர்
Muscular system	-	தசை மண்டலம்
Microphone	-	ஒலிவாங்கி
Memory Unit	-	நினைவகம்
Monitor	-	திரையகம்
Mainframe Computer	-	பெருமுகக்கணினி
Mini Computer	-	குறுமுகக்கணினி
Micro computer	-	நுண்கணினி
Nerve cell	-	நரம்புச் செல்
Nucleus	-	உட்கரு
Nervous system	-	நரம்பு மண்டலம்
Output unit	-	வெளியீட்டகம்
Poor conductor	-	அரிதிற் கடத்தி
Photosynthesis	-	ஒளிச்சேர்க்கை
Pyrex glass	-	பைரக்ஸ் கண்ணாடி
Primary cell	-	முதன்மை மின் கலன்
Plasma membrane	-	பிளாஸ்மா சவ்வு
Prokaryotic cells	-	உட்கரு முதலில் தோன்றிய செல்
Parallel circuit	-	இணை மின் சுற்று
Plotter	-	வரைவி
Pen drive	-	விரலி

Projector	-	ஒளிவீழ்த்தி
Rusting of iron	-	இரும்பு துருப்பிடித்தல்
Respiration	-	சுவாசம்
Respiratory system	-	சுவாச மண்டலம்
Secondary cell	-	துணை மின்கலன்
Series circuit	-	தொடர் மின் சுற்று
Solvent	-	கரைப்பான்
Solute	-	கரைபொருள்
Sublimation	-	பதங்கமாதல்
Skeletal system	-	எலும்பு மண்டலம்
Sense organs	-	உணர்வு உறுப்புகள்
Speaker	-	ஒலிப்பெருக்கி
Super Computer	-	மீக்கணினி
Scanner	-	வருடி
Temperature	-	வெப்பநிலை
Thermometer	-	வெப்பநிலைமானி
Thermal Equilibrium	-	வெப்பச் சமநிலை
Thermal Expansion	-	வெப்ப விரிவு
Vapourization	-	ஆவியாதல்
Vacuoles	-	குமிழ்கள்
Wind Mills	-	காற்றாலைகள்
Wi-Fi	-	அருகலை

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VI Std Science

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