

Subject :- Science  
Grade :- 08  
Term :- 02  
Unit :- 08 - Changes of matter

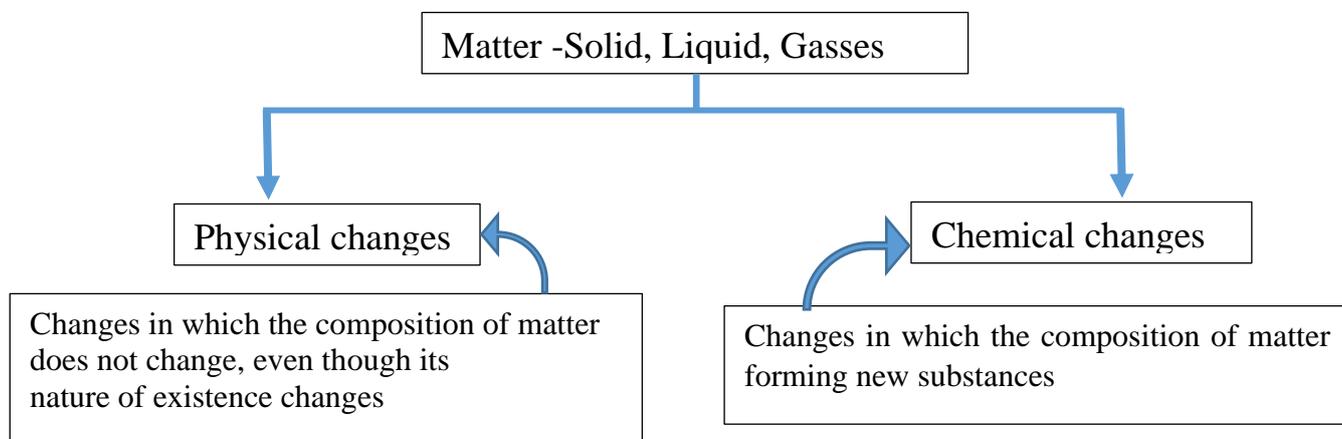
Learning outcomes :-

Student :

- ✓ Conduct simple activities to demonstrate the changes of matter
- ✓ State that matter can be changed by transferring energy
- ✓ Categorize the given changes depending on the fact composition of substance that remains changed or unchanged
- ✓ State that a physical change is a one where the composition of a substance remains unchanged
- ✓ A chemical change always involves formation of new substances with different composition.
- ✓ Design and conduct simple activities to demonstrate the physical changes associated with change of state
- ✓ Give evidence for the occurrence of chemical changes by simple activities
- ✓ Identify the reactants and products of a given chemical change
- ✓ Describe an open system and a closed system using simple activities'
- ✓ State the law of conservation of mass using the results of the activities performed.
- ✓ Describe combustion as a chemical reaction between a combustible substance and a supporter of combustion
- ✓ Describe fire triangle and requirement of reaching the ignition point for breaking out a fire.
- ✓ State that carbon dioxide and water are produced during combustion
- ✓ Distinguish complete and incomplete combustion
- ✓ Name the zones of the flames of a candle and the Bunsen burner
- ✓ State that tarnishing of metals and rusting of iron are chemical changes
- ✓ Conduct simple experiments to demonstrate the requirements for rusting of iron
- ✓ State methods that can be used to prevent rusting of iron
- ✓ Accept that rusting of iron is an enormous economic damage and taking preventive measures is very important

# Changes in matter

We could see that changes are taking place and have taken place in the natural environment as well as in our body. We can see how some changes are happening and we can understand that some changes have happened when we see the results. Everything in the world is made out of matter and energy. Matter exists as solids, liquids and gasses and they undergo changes as follows.



Let's do a small experiment

Activity 01 :-

- Take a piece of paper and tear it to get two equal pieces.
- Tear one piece into more smaller pieces as you can.
- Burn the other piece completely.

**01. Now, you have subjected a matter to a change. How can you explain it whether a chemical or physical change?**

- When a paper is torn into smaller particles, the size of the paper changes. But the composition does not change. That means, only a physical change take place during this instance.
- When the paper is burnt, ash is formed. That is, a chemical change has taken place.

You may have seen burning of a Magnesium strip in the laboratory. It burns with a bright flame leaving a white-coloured residue. That is, composition of the magnesium metal has changed to form the oxide.



## Activity 02

Materials :- a table spoon/ metallic spoon, a cup, a candle, a small quantity of table salt (sodium chloride), water

- Fill 1/4 of a cup with water.
- Add three tea spoons of salt to it and dissolve it well.

### 02. What type of a change has occurred in water and salt?

- Light the candle and fix it on a suitable place.
- Take a small amount from salt solution that you have prepared and hold it over the candle flame.

- Roll out a sheet of paper and make a cylinder with about 4cm in diameter. (Roughly equal to the height of the candle)
- Remove a portion of size of Rs.5 coin from the edge of one end.
- Now keep the cylinder so that the open end will be at the bottom. Cover the lit candle using this cylinder.
- You will be able to gain a flame similar to the flame in bunsen burner.

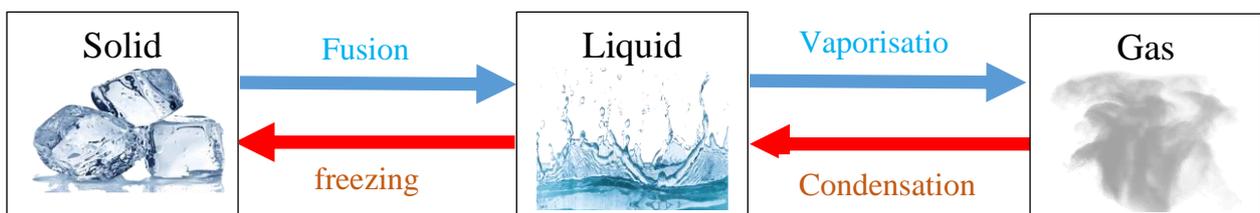
- When it is heated water evaporates and a white colour powder will remain on the spoon.
- The white colour powder is the sodium chloride or the table salt that you have dissolved earlier.



Solid crystalline salt has turned into liquid.

That is solid matter has changed into liquid matter. It is a physical change.

Change of state of any matter in to solid, liquid, gas is a physical change.

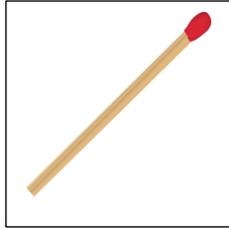


Activity 03:

- ❖ Put a few drops of lime/bilimbi juice on a cement floor and observe.

Evolution of milky colour bubbles and a grey colour spot could be observed.

Activity 04:- Light a matchstick and observe carefully for a while.



You:-

- could be able to see light
- could be able see a smoke or emission of a gas
- Could be able to feel hotness/heat
- A certain odour is inhaled
- The appearance of the matchstick has completely changed

**03.** What type of a change has taken place in the matchstick?

- Can we convert the matchstick to the previous form using any method?  
No, Matchstick has undergone a chemical change

Activity 03 :-

- Take a smaller amount of caustic soda from a nearby hardware store and add it to 200ml of water/ Dissolve it well.
- Put a few pieces of aluminium into the bottle. (Cover used to seal the biscuit tins or sealing membrane of different bottles).
- Fix a balloon to the lid of the bottle and leave it for few hours.
- Observe the setup.
- Inflation of the balloon and dissolution of the aluminium pieces could be observed. When it is tied and released it will move upward.

**04. How did the balloon inflate?**

It is a result of some reaction.



### 05. What type of a change is it?

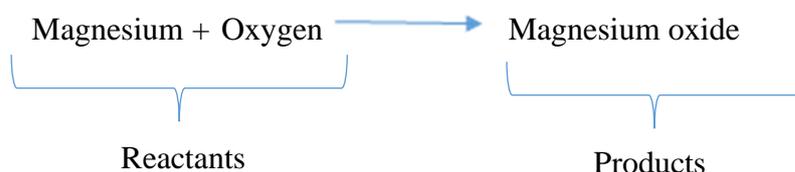
A chemical change

Let's recall the activities that we have done earlier.

### 06. What are the observations that supported the fact that a chemical reaction has taken place in the above activities?

- Evolution of gasses
- Change in colour
- Change in temperature (exchange heat)
- Formation of precipitates
- Production of sound/ light
- Production of an odour

The substances that get subjected to change during a chemical reaction are called reactants and the new substances formed by a chemical reaction are referred to as products.



Magnesium reacts chemically with oxygen in the atmosphere and produces a white colour powder, magnesium oxide.

Substances that get subjected to chemical reaction are known as reactants. Accordingly, reactants of the above reaction are magnesium and oxygen. The new substances formed by a chemical reaction are known as products. Magnesium oxide is the product of above reaction.

Chemical reactions also take place in our body.

### 07. Classify the given reactions as physical or chemical changes.

Put a  if it is a physical change and put  if it is a chemical change.

01. Melting of the solid wax	
02. Evaporation of water	
03. Combustion of firewood	
04. Rusting of metals	
05. Burning of camphor	
06. Melting of ice	

07. Breaking of granite into pieces	
08. Explosion of a fire cracker	
09. Decomposition of organic matter	
10. Ripening of fruits	

## Law of conservation of mass

During a chemical reaction total mass does not change. That means mass is conserved.

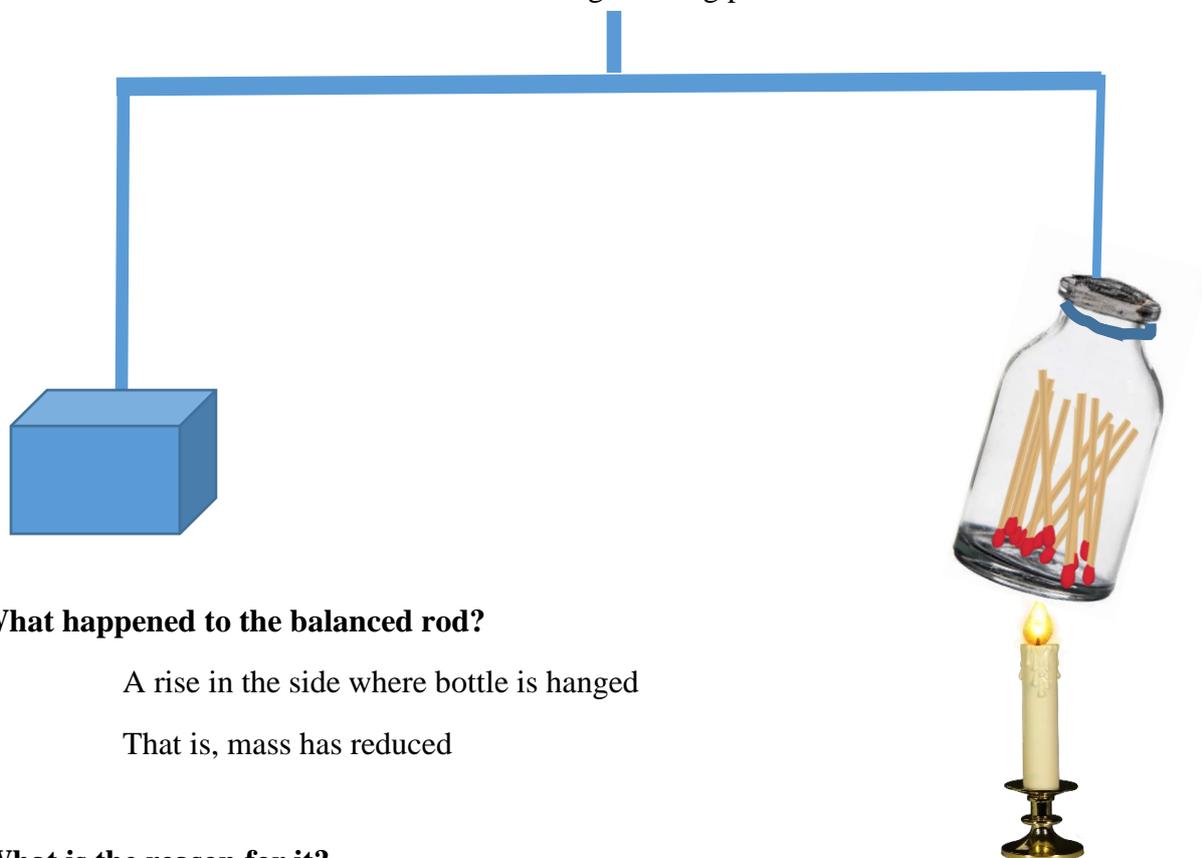
Antonie Lavoisier(1743 - 1794)

In a chemical reaction the mass of reactants is equal to the mass of products.

Activity 01 :-

Required materials :- a straight rod, a small glass bottle, box of matches, a balloon, threads, thin wires

- ❖ Hang the rod so that it will be balanced.
- ❖ Put 10 matches into the bottle so that head of the matchsticks will be directed downwards.
- ❖ Hang the bottle on one end of the rod using threads or wires.
- ❖ Hang a piece of stone to the other end to make it balance.
- ❖ Once the rod is balanced, heat the bottle with matchsticks.
- ❖ Write the observation of the changes taking place inside the bottle



**01. What happened to the balanced rod?**

A rise in the side where bottle is hanged

That is, mass has reduced

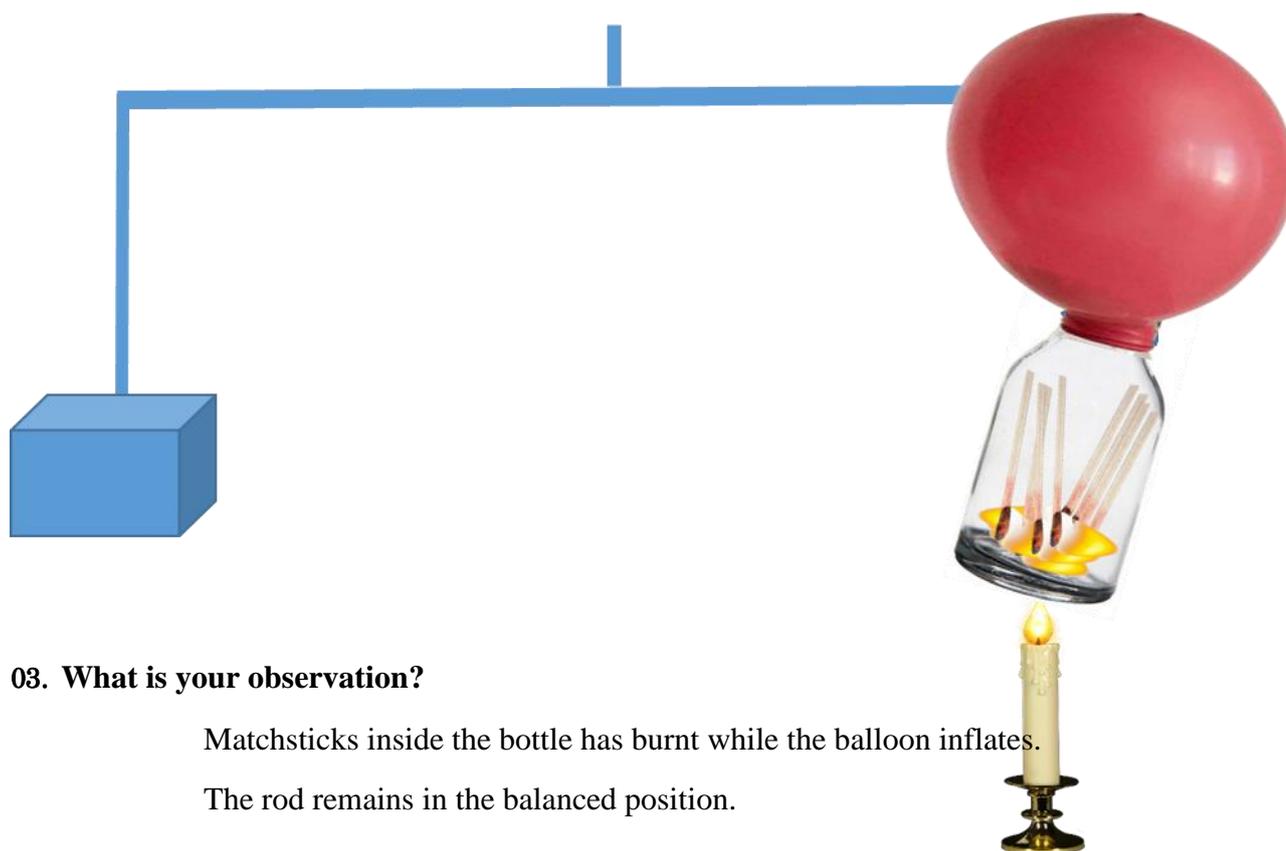
**02. What is the reason for it?**

Release of the products formed due to the combustion of the matchsticks in the bottle

Let's do the above activity again with some slight changes.

- ❖ Again, insert 10 matchsticks into the bottle as earlier.
- ❖ Fix a balloon to the lid of the bottle.

- ❖ Balance the rod as earlier.
- ❖ Once the rod is balanced heat the bottle with matchsticks.
- ❖ Observe the changes.



### 03. What is your observation?

Matchsticks inside the bottle has burnt while the balloon inflates.

The rod remains in the balanced position.

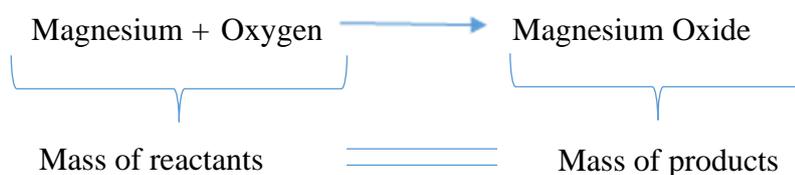
Let us think critically on the two activities that we have done and their observations.

- ❖ During the 1<sup>st</sup> instances products were released from the system and the mass decreased.
- ❖ During the 2<sup>nd</sup> instance products were not released from the system and mass remained constant.

That is,

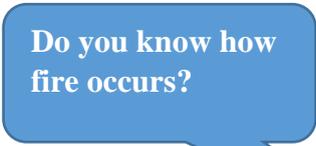
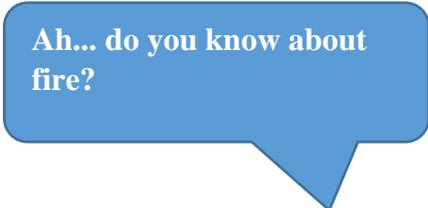
Mass of reactants and products are equal in a closed system.

“ Mass is conserved. ” - The law of conservation of mass can be proved.

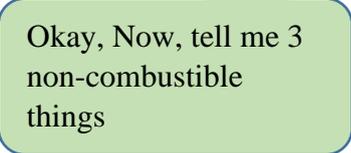


# Combustion

Think that you are newly recruited firefighter.



1.....  
2.....  
3.....  
4.....  
5.....



1.....  
2.....  
3.....

Wow. You are answering the questions well

Tell me the terms used for substances that can be burnt and cannot be burnt.

You have more knowledge than I thought

The process of burning something is called combustion. Substance that can be burnt are known as combustible substances. The substances that cannot be burnt are known as non-combustible substances.

Yes, I can remember

There are three main factors essential for combustion. Do you know about them?

01. Presence of a combustible substances
02. Having access to a supporter of combustion.
03. Heating the combustible substance to its ignition temperature

We will do an activity

**ක්‍රියාකාරකම 01.**

- ✚ Take two identical strips of paper.
- ✚ Immerse one strip of paper into a bowl of water at once and take out immediately.
- ✚ Hold both strips of paper over a lighted candle.
- ✚ Focus on the time it takes to catch fire the paper strips
- ✚ The wet paper strip takes longer to catch fire than the dry strip of paper.



A combustible substance has to be heated to a certain temperature for combustion. This temperature is known as the ignition temperature (ignition point).



**Activity 02**

An empty jam bottle, newspaper, a metal lid, a wick with oil

Burn the newspaper and fill the jam bottle with the smoke from it.

Light the wick and keep it on the metal lid. Then, close it with the smoke filled jam bottle.

**01. What are your observations?**

The reason for it is, the absence of oxygen which is the supporter of combustion.

What do you know about the fire triangle as a firefighter?

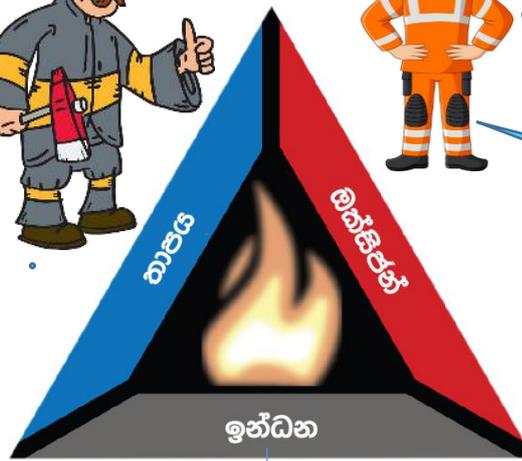
It shows the relationship among the factors required to create a fire. Isn't it?

Yes, You an intellignet kid.  
If we could remove any factor, we could extinguish any fire.

Hmm

Can you teach me about the fuels?

Good..



What do you expect from burning a fuel?

To obtain energies such as heat and light

Yes, you are absolutely right.  
Substances used to generate heat and light energy by combustion are known as fuels.  
It can be divided into three types as solids, liquids and gases

Yes, I can

Can you tell me examples for each type of fuel, solid, liquid & gaseous?

Soild fuels	Liquid fuels	Gaseous fuels
.....	.....	.....
.....	.....	.....
.....	.....	.....

Do you know that we could see complete and incomplete combustion when burning something?

Complete combustion occurs when an adequate oxygen gas is supplied for combustion.

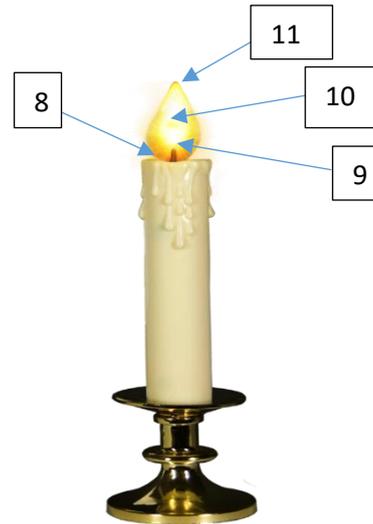
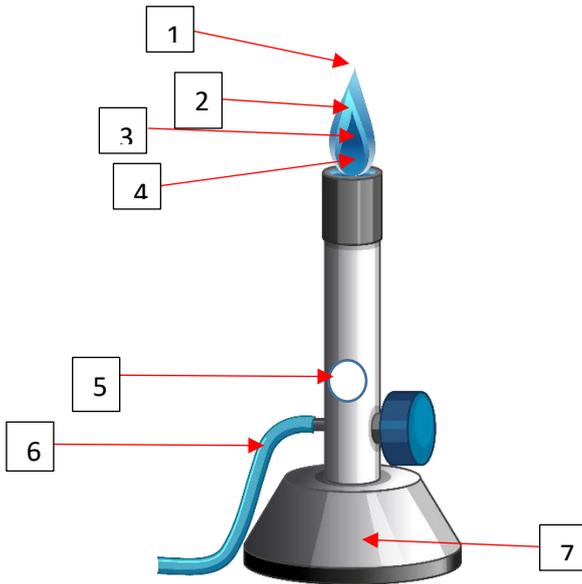
The combustion occurs in inadequate supply of oxygen is called incomplete combustion.

Let's observe the flame in those two instances

You have to label the parts of it.



Yes, I like it



Complete combustion	Incomplete combustion
Evolve carbon dioxide	Evolve carbon dioxide
Water is removed from the engines	Release of carbon monoxide
A large amount of heat is generated	The heat generated is comparatively low
	Release of unburnt carbon particles

Remember that all fuels contain carbon and hydrogen.  
Tell me the steps that we should take to extinguish a fire

To extinguish a fire,

1. Prevent the supply of supporter of combustion
2. Prevent reaching to ignition temperature
3. Remove the combustible substances

- Spraying water to the burning material
- Putting sand on to the burning material
- Covering the burning material with a wet gunny bag



When a cloth catch fire you should roll over and over covering the body with a thick material

Now you know everything about fire.  
Let's go to extinguish fire

Use of suitable substances based on the nature of the fire



## Tarnishing of metals

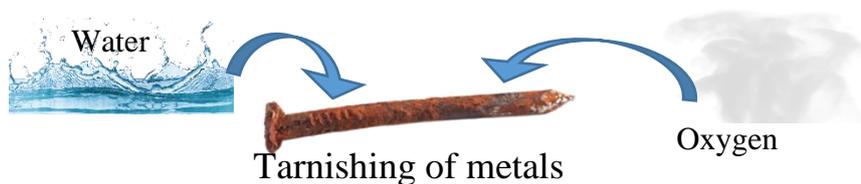
Find an old iron nail that you can find from the garden, a piece of metal or old tin. Take an iron nail and a piece of metal sheet from home and compare them with the things you found from the garden.



Fill the following table based on your observations. Use the terms “yes/no” to complete the table.

Features	New iron nail	Old iron nail
1. Metallic lustre		
2. A reddish brown colour on the surface of the nail	No	
3. The surface becomes rough		Yes
4. The iron nail gets rusted		

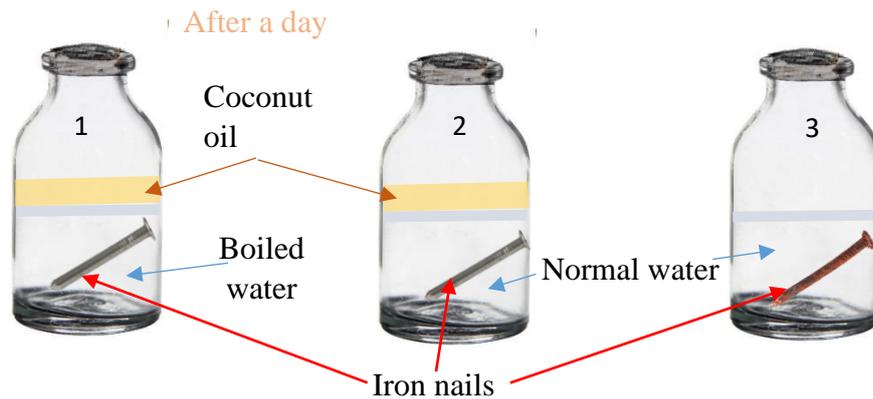
- When metals are exposed to air for a long period of time, that lustre disappears.
- The change in surface of metals like this is called tarnishing.
- Almost every metal tarnishes.
- Metals corrode due to rusting.
- Tarnishing of metals and rusting are chemical changes.



Activity 01:-

Find three empty small bottles, a few clean iron nails, coconut oil

- Label the three empty bottles as 1, 2, and 3.
- Add about  $\frac{1}{4}$  of boiled water to the bottle no. 1
- Add equal amounts of normal water to bottle no. 2 and 3.
- Put a clean iron nail to each of the three bottles.
- Add an oil layer to bottle no. 1 & 2 in equal amounts.
- Examine the system after a day.



State your observations.

01. The nail in the first bottle .....
02. The nail in the second bottle.....
03. The nail in the third bottle .....

The reason for this is the presence of oxygen in the bottles.

01. Write three methods to prevent metals from rusting.

- 01.....
- 02.....
- 03.....

02. Why the metallic equipment used by the people in the coastal areas subject to rusting quickly?

.....  
.....  
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Translated by: Nayomi Wijesooriya