

Class: 8

SCIENCE

Chapter – 4

Materials: Metals and Non Metals

GENERAL INSTRUCTIONS:

1. Read the text thoroughly.
2. Youtube links for the explanation of the chapter are as follows:

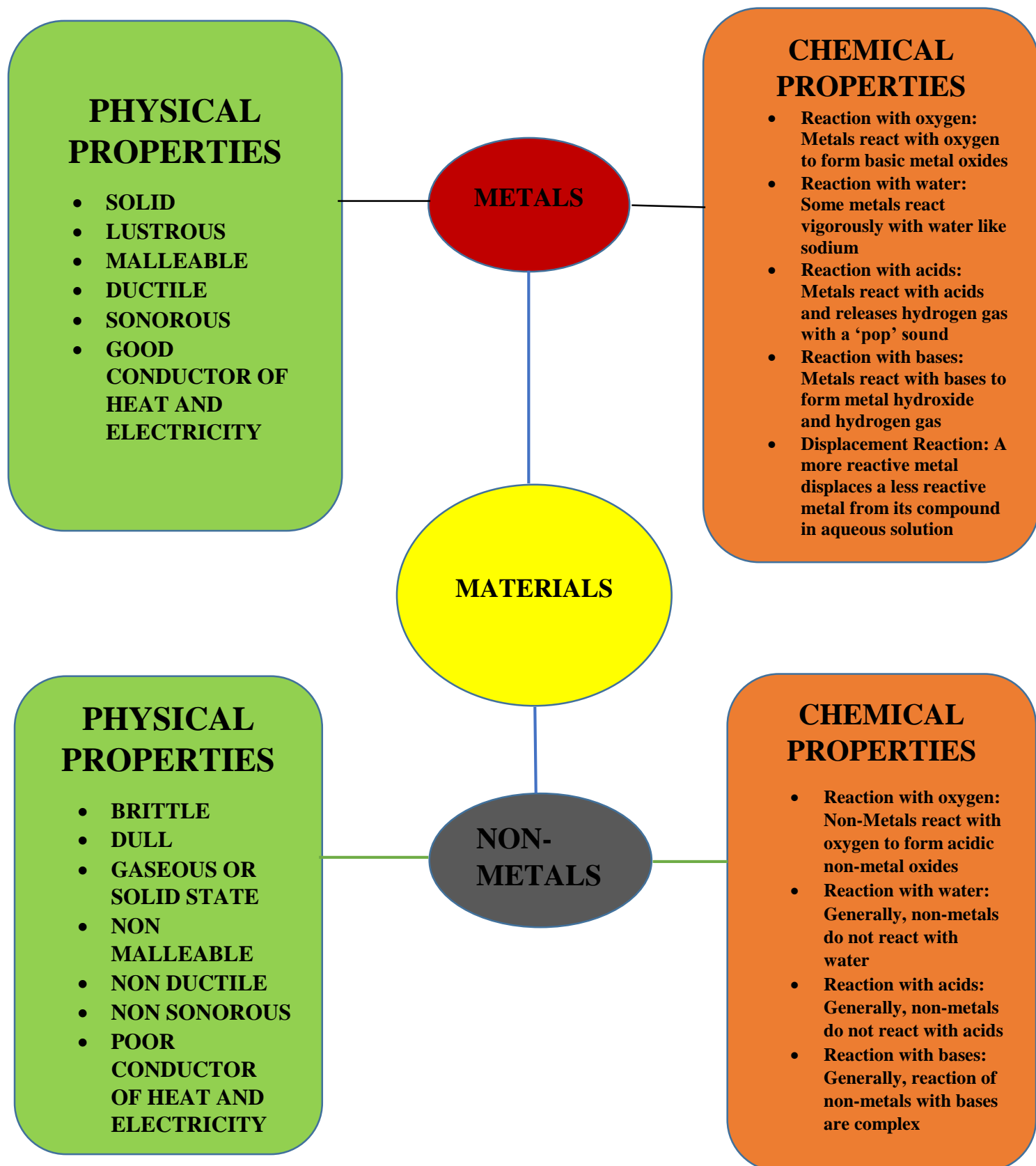
<https://www.youtube.com/watch?v=rl0IciM3db0>

<https://www.youtube.com/watch?v=0Izh1q5Dd-Q>

INTRODUCTION:

- Everything around us is categorized into either metals or non-metals.
- Metals can be distinguished from non-metals on the basis of their physical and chemical properties.
- More reactive metals displace less reactive metals from their compounds in aqueous solution.
- Metals and non-metals are used widely in everyday life.

MIND MAP



EXPLANATION

Elements can be classified into the following two groups depending on their physical and chemical properties:

- Metals
- Non-metals

Metals:

Those materials which possess the characteristic of being hard, shiny, malleable, ductile, etc. are termed as metals. Few examples of metals are iron, gold, silver, aluminium, copper, etc.

Physical Properties of Metals:

- ❖ **Solid:** Metals are solids at room temperature, except mercury, which is liquid at room temperature.
They are generally hard and strong but sodium and potassium are soft solids and can be cut with a knife.
- ❖ **Lustrous:**
It is that property of metals which makes them shine and their structures are capable of reflecting incident light. Metals such as gold, silver and copper all have lustre, that is they have an ability to shine and reflect light. Therefore they are lustrous.



- ❖ **Malleability:**

It is that property of metals which allows them to be beaten into thin sheets.



Due to presence of this property, the shape of iron nail and aluminium wire can be changed on beating. The silver foils used for decorating sweets and the aluminium foil used for wrapping food are possible because of malleability property of metals.

❖ **Conductivity:**

It is that property of metals which allows the current and heat to pass through them easily.

Example: Metals like iron rod, nail, copper wire, etc. are good conductors of electricity.

❖ **Ductility:**

It is that property of metals which allows them to be drawn into the wires. Example: Metals like aluminium and copper wires are used in electrical connection.



❖ **Sonorous:**

It is that property of metals which produces ringing sound on hitting.



Non-metals

The elements which are brittle, dull cannot be beaten into sheets or drawn into wires and are poor conductors of heat and electricity are termed as non-metals.

Few examples of non-metals are phosphorus, sulphur, carbon, oxygen etc.

Physical properties of Non-metals:

- ❖ Non-metals are gases or solids at room temperature, except bromine which is liquid at room temperature. Solid non-metals are soft and dull. They break down into a powdery mass on tapping with a hammer. For example, coal and sulphur.
- ❖ Non-metals do not have lustre except iodine and graphite.
- ❖ They are bad conductor of heat and electricity.
- ❖ Non-metals are brittle that is they are neither malleable nor ductile.
- ❖ Non-metals are non-sonorous.

Chemical Properties of Metals & Non-Metals:

▪ Reaction with Oxygen

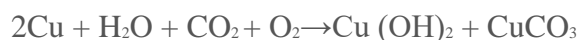
For Metals:

Generally, when metals are reacted with oxygen they will form metallic oxides. And these **metallic oxides are basic in nature**.

Example: Rusting of Iron. Following is the reaction to express it:



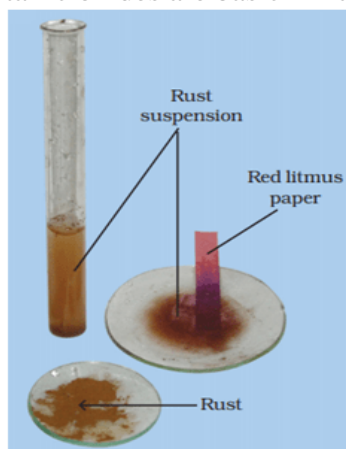
Example: If a copper vessel is left open in the presence of moist air, then, a dull green coating will be observed on it. The green material is a mixture of copper hydroxide (Cu(OH)_2) and copper carbonate (CuCO_3). Following is the reaction to express it:



ACTIVITY:

Testing of nature of Rusting:

- (i) Collect a spoonful of rust and dissolve it in a very little amount of water.
 - (ii) The rust remains suspended in water. Shake the suspension well.
 - (iii) Test the solution with red and blue litmus papers. The red litmus turns blue.
- So, generally metallic oxides are basic in nature.



For Non-metals:

Generally, non-metals also produce oxides when reacted with oxygen. But, in contrast to metals, **non-metal oxides are acidic in nature**.

Testing the nature of non-metal:

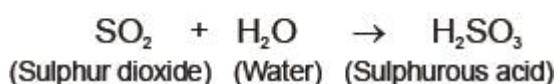
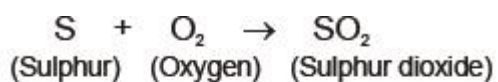
- (i) Take a small amount of powdered sulphur in a deflagrating spoon and then heat it.
- (ii) As soon as sulphur starts burning, introduce the spoon into a gas jar/ glass tumbler.
- (iii) Cover the tumbler with a lid to ensure that the gas produced does not escape.



- (iv) After some time remove the spoon. Add a small quantity of water into the tumbler and quickly replace the lid. Shake the tumbler well. Check the solution with red and blue litmus papers.




- (v) The name of the product formed in the reaction of sulphur and oxygen is sulphur dioxide gas. When sulphur dioxide is dissolved in water, sulphurous acid is formed. Following is the reaction to express it:



- (vi) The sulphurous acid turns blue litmus paper red.
Generally, **oxides of non-metals are acidic in nature.**

Reactivity Series

The below table illustrates the reactivity of metals from high order to low order:

K	Potassium		Most reactive	
Na	Sodium			
Ca	Calcium			
Mg	Magnesium			
Al	Aluminium			
Zn	Zinc			
Fe	Iron			
Pb	Lead			
H	Hydrogen			
Cu	Copper			
Hg	Mercury			
Ag	Silver			
Au	Gold			
				Least reactive
				Reactivity decreases

Uses of metals:

- Copper and aluminium are used to make wires for carrying electric current.
- Zinc is used for galvanising iron to protect iron from rusting.
- Silver, gold and platinum are used to make jewellery.
- Iron, copper and aluminium metals are used to make utensils for cooking and for manufacturing machines parts.
- Mercury is used in thermometer.
- Lead is mainly used for making electrodes for automobile batteries and for making alloys.

Uses of Non - Metals:

- The oxygen necessary for all living beings to survive is a non-metal.
- Phosphorus is used in the manufacture of fertilisers to enhance the growth of plants.
- Chlorine is used for disinfecting drinking water.
- Iodine is used as an antiseptic.
- Sulphur is used in crackers.
- Hydrogen is used in manufacture of ammonia, industrial chemicals.

Note: Do the following work in Science Notebook

QUESTION-ANSWERS:

Q1. Some properties are listed in the following Table. Distinguish between metals and non-metals on the basis of these properties.

Properties	Metals	Non-metals
1. Appearance		
2. Hardness		
3. Malleability		
4. Ductility		
5. Heat Conduction		
6. Conduction of Electricity		

A1.

Properties	Metals	Non-metals
1. Appearance	Lustrous	Dull
2. Hardness	Hard	Soft
3. Malleability	Can be beaten into thin sheet	Cannot be beaten into thin sheets
4. Ductility	Can be drawn into wires	Cannot be drawn into wires
5. Heat conduction	Good conductors of heat	Poor conductors of heat
6. Conduction of electricity	Good conductors of electricity	Poor conductors of electricity

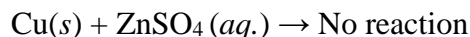
Q2. Give reasons for the following:

- (a) Aluminium foils are used to wrap food items.
- (b) Immersion rods for heating liquids are made up of metallic substances.
- (c) Copper cannot displace zinc from its salt solution.
- (d) Sodium and potassium are stored in kerosene.

A2. (a) Aluminium foils are used to wrap food items because aluminium metal is malleable. Therefore, it can be beaten into thin foils.

(b) Metals are good conductors of heat and electricity. Therefore, immersion rods for heating liquids are made of metallic substances.

(c) A more reactive metal can displace a less reactive metal from its compound in aqueous solution. Zinc is more reactive than copper. Therefore, copper cannot displace zinc from its salt solution.



(d) Sodium and potassium are stored in kerosene because they are highly reactive elements. They can easily catch fire even when in contact with air.

Q3. Can you store lemon pickle in an aluminium utensil? Explain.

A3. Lemon pickle cannot be stored in an aluminium utensil because lemon pickle contains acid, which can react with aluminium (metal) liberating hydrogen gas. This can lead to the spoiling of the pickle.

Q4. What happens when:

(a) Dilute sulphuric acid is poured on a copper plate?

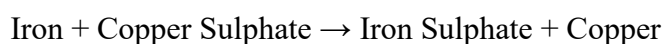
(b) Iron nails are placed in copper sulphate solution?

Write word equations of the reactions involved.

A4. (a) When dilute sulphuric acid is poured on a copper plate, bubbles appear on the surface of plate. This happens because sulphuric acid reacts with copper to produce hydrogen gas. This can be shown by following equation:



(b) Iron being more reactive, displaces copper from copper sulphate solution. In this reaction, the blue colour of copper sulphate fades and there is deposition of copper on the iron nail.



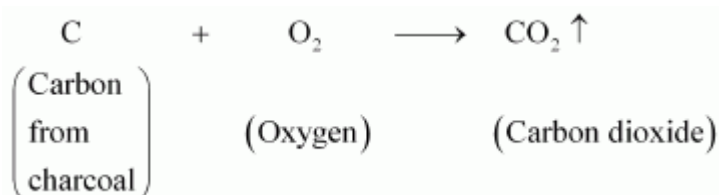
Q5. Saloni took a piece of burning charcoal and collected the gas evolved in a test tube.

(a) How will she find the nature of the gas?

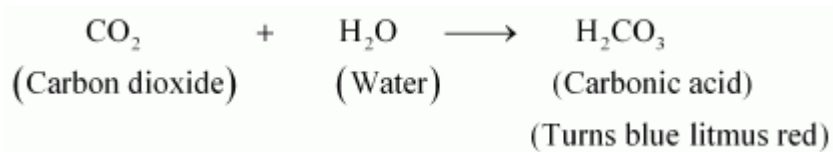
(b) Write down word equations of all the reactions taking place in this process.

A5. (a) Add a few drops of water in the test tube containing gas. Now, cover the test tube and shake it well. After shaking, test the solution with blue litmus and red litmus. It will turn blue litmus red. Thus, the gas is acidic in nature.

(b) Charcoal reacts with oxygen to form carbon dioxide gas.



Carbon dioxide reacts with water to form carbonic acid, which turns blue litmus paper red.



- Q6.** One day Reeta went to a jeweller's shop with her mother. Her mother gave an old gold jewellery to the goldsmith to polish. Next day when they brought the jewellery back, they found that there was a slight loss in its weight. Can you suggest a reason for the loss in weight?
- A6.** To polish a gold ornament, it is dipped in a liquid called aqua regia (a mixture of hydrochloric acid and nitric acid). On getting the environment of aqua regia, the outer layer of gold dissolves and the inner shiny layer appears. The dissolving of the layer causes a reduction in the weight of the jewellery.