BAL BHARATI PUBLIC SCHOOL, PITAMPURA, DELHI– 110034
Class- 8
Chemistry

Topic - METALS AND NON - METALS

Week : 5th October to 9th October **No. of blocks- 1 or 2**

Guidelines

Dear Students

- Refer to the Science NCERT book before you begin to answer the questions.
- The assignment is to be done in the Chemistry notebook.
- Link to the chapter
https://ncert.nic.in/ncerts/l/hesc104.pdf

Sub-Topics

i) Physical properties of metals and non-metals
ii) Chemical properties of metals and non-metals
(a) Reaction of metals and non-metals with oxygen
iii) Activities
iv) Assignment

Instructional Aids /Resources:

- Class 8 Science NCERT textbook.
- YouTube video
https://www.youtube.com/watch?v=M95rTLomCIU

ACTIVITY

i) To prove that metals are good conductors of electricity.
ii) To test the nature of rust.
iii) To test the nature of Sulphur dioxide

Learning Outcomes

Each student will be able to:
(i) Understand what elements are and their classification into metals and non-metals.
(ii) Differentiate between metal and non-metals on the basis of their physical properties.
(iii) Get aware about the reaction of metals and non-metals with oxygen and water.
(iv) Interpret the nature of metallic oxide and non-metallic oxide.

Lesson Development

What is an Element?

- In Chemistry, an **element** is a pure substance which cannot be broken down by chemical means.
- Elements consist of only one type of **atom**.
- An atom is the smallest particle of an element that shows all the properties of that element.
- Most elements are **metals**, which are **shiny and conduct electricity well**. Metals include gold, aluminium and iron which are all solid at room temperature. Mercury is the only metal that is liquid at room temperature.
- Some elements are **non-metals**. Most non-metals are **gases** at room temperature and **do not conduct electricity.** Non-metal elements with these properties include oxygen, hydrogen and chlorine. A few non-metals, such as carbon and sulphur, are in a **solid state** at room temperature.

Physical Properties of Metals

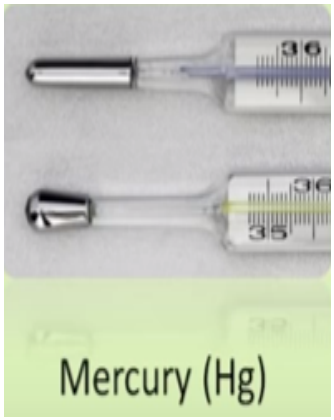
1) CONDUCTIVITY: Metals (such as iron or copper) are good conductors of heat and electricity.
2) DUCTILITY: Metals (such as aluminum and copper) are ductile, which means that they can be drawn into wires.
3) HARDNESS: All metals are hard though there are some exceptions. Sodium and potassium are soft and can be cut with a knife.
4) LUSTRE: Metals (such as gold, silver and copper) are lustrous, which means that they reflect light from their surface and are shiny.

5) MALLEABLE: Metals (such as silver and aluminium) are malleable, which means that they can be beaten into thin sheets.

6) PHYSICAL STATE: Most metals remain solid at room temperature, except mercury which is liquid at room temperature.

7) SONOROUS: Metals produce ringing sound when they are struck and hence, they are sonorous, except Mercury which is liquid in nature.

8) EXAMPLES: Iron, copper, aluminium, calcium, magnesium, etc.



Activity1 : To prove that metals are good conductors of electricity

https://www.youtube.com/watch?v=MjK3PU_77Ks

Physical Properties of Non-metals

1) CONDUCTIVITY: Non-metals (such as coal or Sulphur) are poor conductors of heat and electricity. Graphite is an exception as it is a good conductor of electricity.

2) DUCTILITY: Non-metals are brittle (break down when struck) and hence they cannot be drawn into wires.

3) HARDNESS: Most non-metals are soft. Diamonds are exceptions as they are the hardest material found on earth. However, they are also very brittle and break when struck with a hammer.

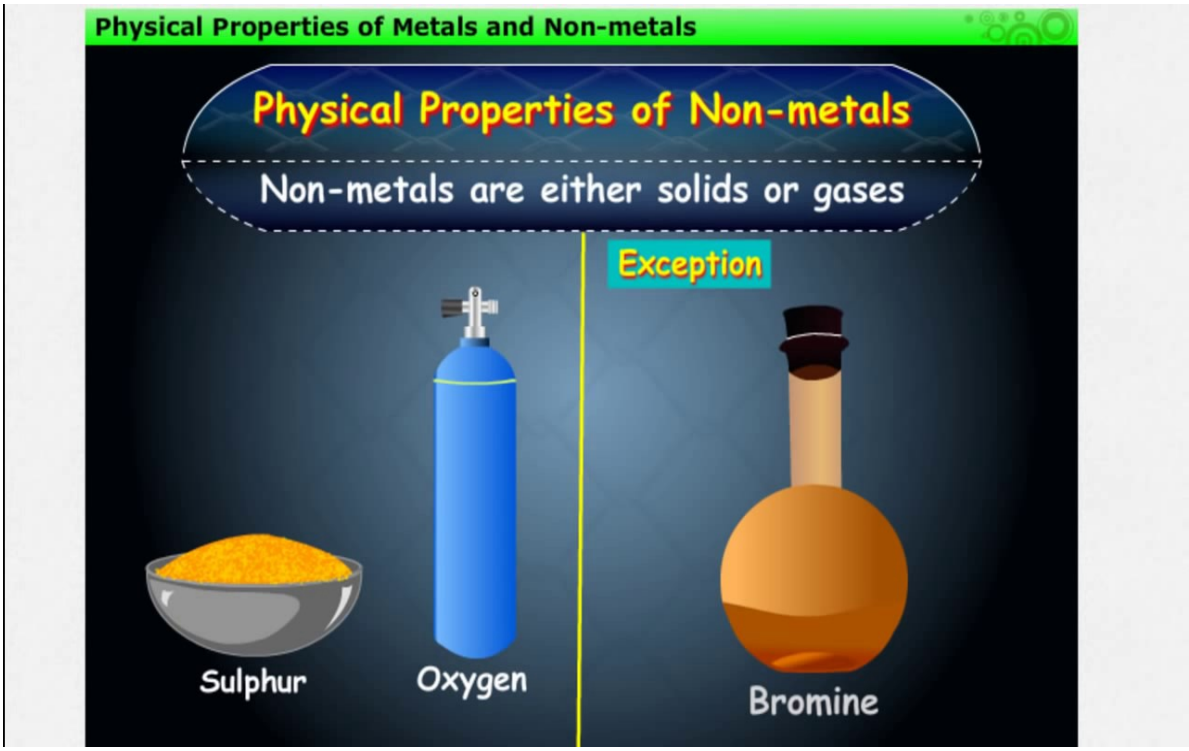
4) LUSTRE: Non-metals (such as coal) are generally dull and do not reflect light. Hence, they lack metallic luster.

5) MALLEABLE: Non-metals break easily, so they cannot be pounded into sheets.

6) PHYSICAL STATE: Most non-metals exist as solids or gases at room temperature: Gases (such as oxygen), and Solids (such as carbon). **Bromine is the only liquid non-metal.**

7) SONOROUS: Non-metals are non-sonorous and do not produce the typical metallic sound when they are struck.

8) EXAMPLES: Sulphur, carbon, oxygen, phosphorus etc.



Chemical Properties of Metals & Non-Metals

1. Reaction with Oxygen

(a) For Metals

Generally, when metals react with oxygen they form metallic oxides. These metallic oxides are basic in nature.

Example 1 - Rusting of Iron. Following is the reaction to express it.

Iron (Fe) + Oxygen (O_2) + Water (H_2O) → Iron Oxide (Fe_2O_3)

Example 2 - If a copper vessel is left open in the presence of the 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 ($CuCO_3$).

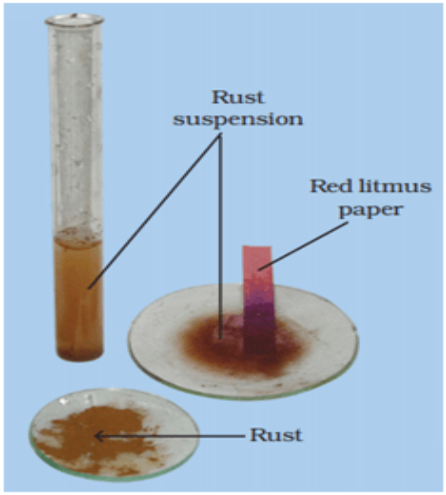
Following is the reaction to express it:

$2Cu + H_2O + CO_2 + O_2 \rightarrow Cu(OH)_2 + CuCO_3$

Activity2 : To test the nature of rust

https://www.youtube.com/watch?v=kl40gfBNBHI

(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.



Testing Nature of Rust

(b) For Non-metals

Generally, non-metals also produce oxides when reacted with oxygen. In contrast to metals, these oxides are acidic in nature.

$C + O2 \rightarrow CO2$ (carbon dioxide, which is an acidic oxide)

When sulphur reacts with oxygen, we get sulphur dioxide.

$S + O2 \rightarrow SO2$

Activity3: To test the nature of non-metallic oxide

https://www.youtube.com/watch?v=SJUX6sJMCG0

(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.

Burning of Sulphur Powder

Testing of Solution with Litmus paper

(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:
Sulphur dioxide (SO_2) + Water (H_2O) $\rightarrow$ Sulphurous acid (H_2SO_3)
(vi) The sulphurous acid turns blue litmus paper red.
Generally, oxides of non-metals are acidic in nature.

ASSIGNMENT

Q1. Which of the following can be beaten into thin sheets?

(a) Zinc (b) Phosphorus (c) Sulphur (d) Oxygen

Q2. Which of the following statements is correct?

(a) All metals are ductile.

(b) All non-metals are ductile.

(c) Generally, metals are ductile.

(d) Some non-metals are ductile.

Q3. Fill in the blanks.

(a) Phosphorus is very _____ non-metal.

(b) Metals are _____ conductors of heat and _____.

Q4. 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.

Q 5. Why do copper vessels develop a greenish layer when exposed to moist air?

Q6. Write the difference between metal oxides and non-metal oxides.