

Handout -1/6

Class –X

Subject – Science

CHAPTER – 3

METALS AND NON-METALS

Introduction

Metals –

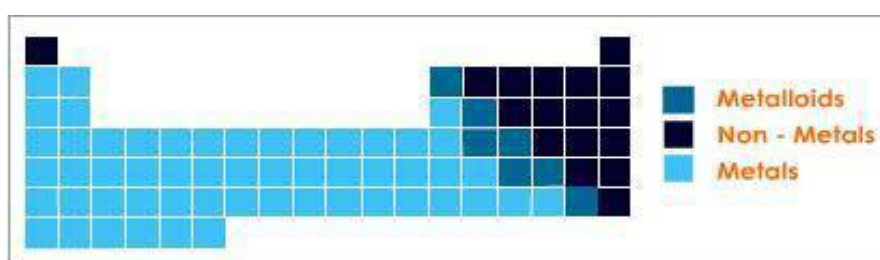
Metal are those elements which has tendency to lose electron and form electropositive ion (except hydrogen), are called metals.

Ex – Sodium, calcium, Magnesium, Aluminium, Iron, Gold, etc.

Non- Metals –

Non-metal are those elements which has tendency to gain electron and form electronegative ion, are called non-metals.

Ex – Hydrogen, carbon, Nitrogen, Oxygen, Chlorine, etc.



There are 118 elements present in the periodic table, 92 of which are naturally occurring. Metals and non-metals are characterized by distinctly different physical and chemical properties.

Metals occupy the bulk of the periodic table, while non-metallic elements can only be found on the right-hand-side of the Periodic Table. A diagonal line, drawn from boron (B) to polonium (Po),

separates the metals from the non-metals. Most elements on this line are metalloids, sometimes called semiconductors. This is because these elements exhibit electrical properties intermediate to both, conductors and insulators. Elements to the lower left of this division – line are called metals, while elements to the upper right of the division - line are called non-metals.

PHYSICAL PROPERTIES OF METALS:

Physical state–

Metals are solids at room temperature e.g. sodium, aluminium, potassium, magnesium.

Exceptions - Mercury metals in liquid state at room temperature.

Lustre–

Metals have a shining surface called lustre in its pure state. They have a quality of reflecting light from their surface and they can be polished e.g. metals like gold, silver, copper show this property.

Malleability–

Metals can be beaten into thin sheets. This property is called malleability.

Due to this property, metals can be rolled into sheets e.g. aluminium, copper, zinc can be beaten into sheets.

Ductility–

Metals can be drawn into thin wires. This property is called ductility. For

A wire of about 2 km length can be drawn from one gram of gold.

It is because of their malleability and ductility that metals can be given different shapes according to our needs.

Hardness –

Metals are generally hard e.g. iron, cobalt, nickel.

There are few exceptions to this. Sodium and potassium are soft and

they can be cut with a knife.

Sound-

Metals produce ringing sound, so, metals are called sonorous. Sound of metals is also known as metallic sound. This is the cause that metal wires are used in making musical instruments.

Conduction-

Generally, metals are good conductors of heat and electricity because they have free electrons.

The best conductors of heat are silver and copper.

Lead and mercury are comparatively poor conductors of heat.

Density-

Metals generally have high density and they are heavy. Iridium and osmium have the highest densities while lithium has the lowest density.

Melting and boiling point -

Metals usually have high melting point and boiling point. For example, iron, cobalt and nickel have high melting and boiling point. Tungsten has the highest melting point. There are some exceptions - gallium and caesium have very low melting points. These two metals will melt if you keep them on your palm.

Tensile Strength-

Most of the metals are strong and have high tensile strength. Because of this big structures are made using metals, such as copper and iron.

PHYSICAL PROPERTIES OF NON-METALS

Physical state -

Non-metals can exist in solid or liquid or gaseous state at room temperature.

For example, carbon, sulphur, phosphorus, iodine are in solid state. Bromine is in liquid state while oxygen, nitrogen, chlorine are in gaseous state at room temperature.

Lustre–

Non-metals do not have lustre. They do not reflect light from their surface. Non-metals have dull appearance. For example, sulphur, phosphorus and carbon show this property. (exception – diamond and iodine)

Malleability–

Non-metals are non-malleable. If solids, they are brittle i.e. they break or shatter on hammering. For example, coal, sulphur, phosphorus is brittle.

Ductility –

Non-metals cannot be drawn into thin wires. So they are non-ductile.

Hardness –

Non-metals are usually not hard. They are soft. For example, coal, sulphur and phosphorus are soft. Diamond is exception to this. It is the hardest substance known.

Sonority-

Non-metals are not sonorous, i.e. they do not produce a typical sound on being hit.

Conduction–

Non-metals are usually poor conductors of heat and electricity. However, carbon in the form of graphite is good conductor of electricity.

Density –

Non- metals which are gases have low density. Solid non-metals have low to moderate density.

However, diamond has high density which is about 3.5.

Melting and boiling point –

Non-metals usually have low melting and boiling points.

However, carbon(diamond), possess very high melting and boiling points.

Tensile strength –

Non-metals have low tensile strength i.e. they have no tenacity.

Note for exceptions -

i) Carbon is a non-metal that can exist in different forms. Each form is called an allotrope. Diamond, an allotrope of carbon, is the hardest natural substance known and has a very high melting and boiling point. Graphite, another allotrope of carbon, is a conductor of electricity.

ii) Alkali metals (lithium, sodium, potassium) are so soft that they can be cut with a knife. They have low densities and low melting points.

Elements can be more clearly classified as metals and non-metals on the basis of their chemical properties.