

# Wisdom Education Academy

Head Branch : Dilshad colony delhi 110095.

First Branch: Shalimar garden UP 201006. And Second Branch : Jawahar park UP 201006

Contact No. 8750387081, 8700970941

## Metals and Non-metals

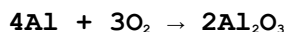
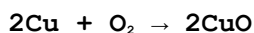
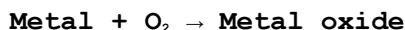
Elements are classified as metals and non-metals based on different properties. The properties of metals and non-metals are given in the form of table below-

Metals	Non-metals
Metals are lustrous, that is, they have a property to shine.	They are not lustrous, that is, they do not have shining surface. except, graphite and iodine
All metals exist as solids except mercury which is liquid at room temperature.	They are generally soft, except diamond.
They can be drawn into wires, this is known as <b>Ductility</b> .	They are non-ductile.
Metals can be converted into sheets, this is known as <b>Malleability</b> , except mercury	They are non-malleable
They are good conductors of electricity and heat. Except Lead and mercury.	They are poor conductors of electricity and heat. Exception-graphite is good conductor of electricity
They have high density and high melting point. Exception-sodium and potassium have low melting points	They have low density compared to metals and low melting point except Diamond which has high melting point

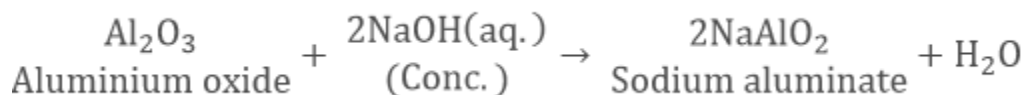
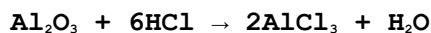
## Chemical Properties of Metals

- Metals react with air or oxygen to form metal oxide.

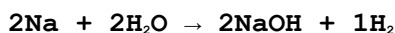
**For Example,** Copper reacts with oxygen to form copper oxide.

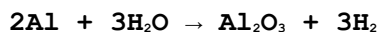


- Oxides of metals can react with both acids and bases to produce salt and water. Such oxides are known as **Amphoteric Oxides**.

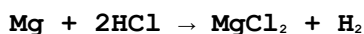


- Metals also reacts with water to form metal oxide. Metal oxide in turn can react with water to form metal hydroxide. **For Example**



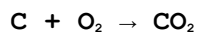
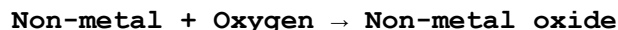


- Metals also reacts with dilute acids to form salt and hydrogen. **For example**, magnesium reacts with dilute hydrochloric acid to form magnesium chloride and hydrogen.

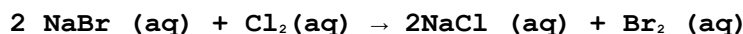


## Chemical Properties of Non-metals

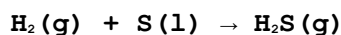
- Non-metals reacts with oxygen to form non-metal oxide.



- Non-metals do not react with water and acids to evolve hydrogen gas.
- Non-metals can react with salt solution; more reactive element will displace the less reactive non-metal.



- Non-metals can also react with hydrogen to form hydrides.



## Reactivity Series

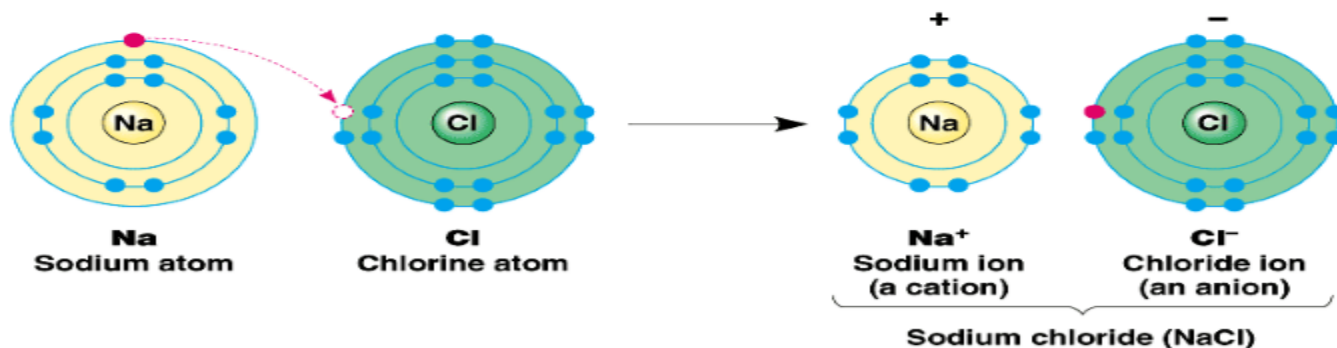
The series in which metals are arranged in the decreasing order of reactivity, it is known as **Reactivity Series**.

potassium	most reactive	K
sodium	↑ ↓	Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
copper		Cu
silver		Ag
gold		Au
platinum		least reactive

Fig.1. Reactivity Series

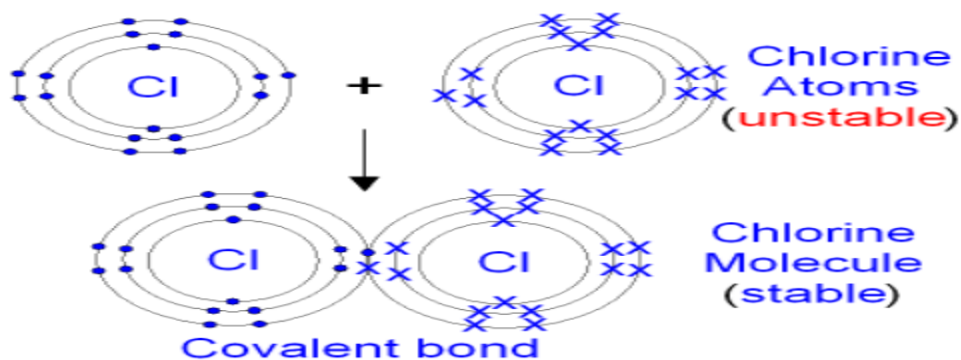
## Ionic Compounds

Compounds formed due to the transfer of electrons from a metal to a non-metal are known as **Ionic Compounds**.



## Covalent Bond

Bond formed by sharing of electrons between the two atoms. They share their valence electrons to gain stability.

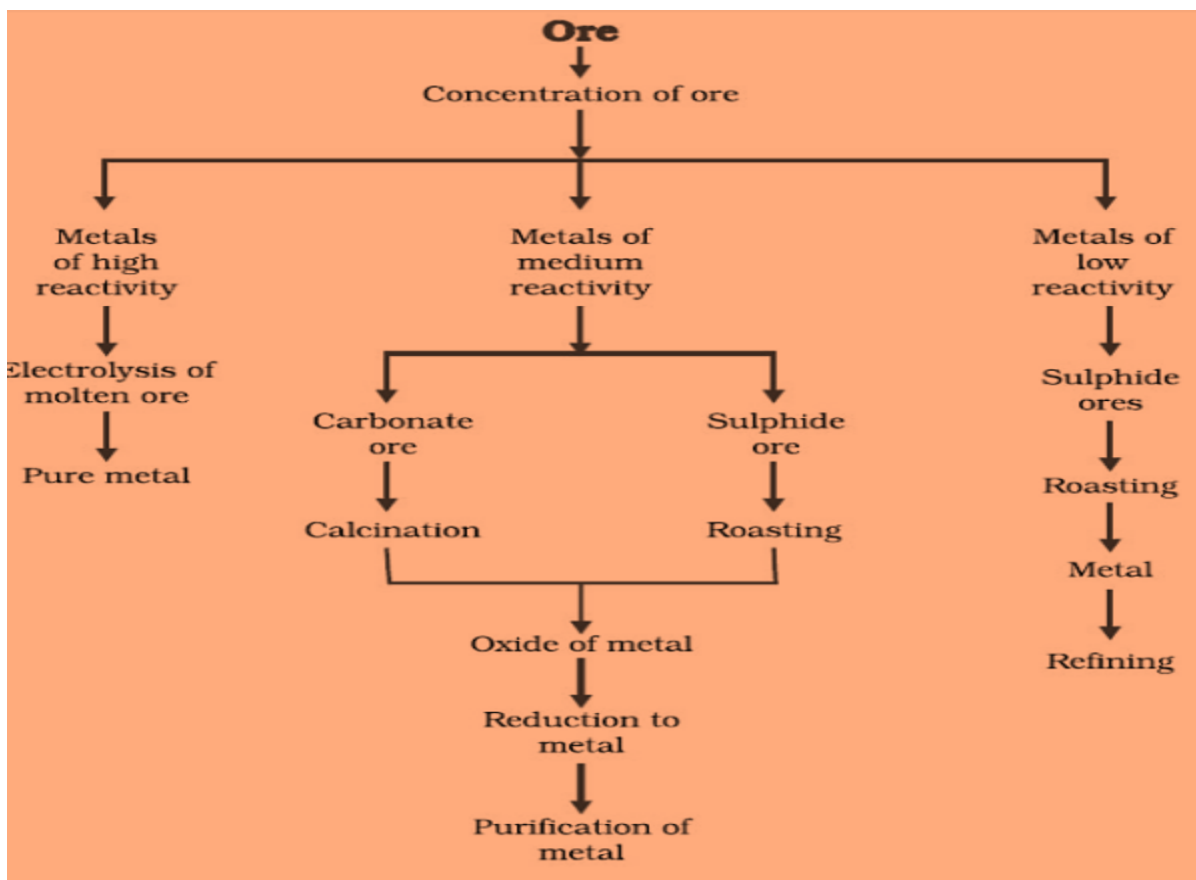


## Properties of Ionic Compounds

- They are generally hard and solid.
- They have a high melting and boiling point.
- They are soluble in water but insoluble in inorganic solvents such as ether etc.
- They are conductors of electricity in molten and solution state.

## Occurrence of Metals

Elements or compounds which occurs naturally in earth crust are known as **Minerals**. Minerals from which pure metals can be extracted are known as **Mineral Ores**.



## Extraction of pure metals from its ores/steps for extraction of metals from its ore

- The first step is enrichment of the ore.
- Second step includes extraction of metals
- Third steps involve refining of metal

**Gangue** - Ores contain different impurities in it such as sand, soil etc. These impurities are known as **Gangue**.

### Extracting Metals which are low in activity series

Metals which are low in activity series are unreactive. The oxides of such metals can be reduced to metals by heating alone. **For Example**, Cinnabar (HgS)



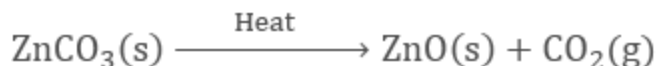
### Extracting Metals in the middle of the Activity Series

These metals are moderately reactive. They exist as sulphides or carbonates in nature. Before reduction, metal sulphides and carbonates must be converted into metal oxides. Sulphide ores are converted into oxides by heating strongly in presence of excess air, this is known as **Roasting**. Carbonate ores are converted into oxides by heating in limited air. This is known as **Calcination**.

#### **Roasting**



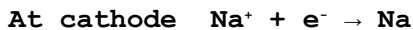
#### **Calcination**



Reduction-metal oxides can be reduced to metals using reducing agent such as **Carbon**.

### Extracting metals towards the top of the activity series

The metals are highly reactive. They cannot be obtained by heating. **For Example**, Sodium, magnesium and calcium are obtained by the electrolysis of their molten chlorides.



## **Refining of Metals**

Refining of impure metal is done using electrolytic refining. Impure copper is used as anode and strip of pure copper is used as **Cathode**. Acidified copper sulphate is used as electrolyte. When electric current is passed through this, impure metal from the anode gets deposited in the electrolyte solution, whereas pure metal from the electrolyte is deposited at cathode.

Deposition of insoluble residue formed from the dissolution of anode during commercial electrolysis.

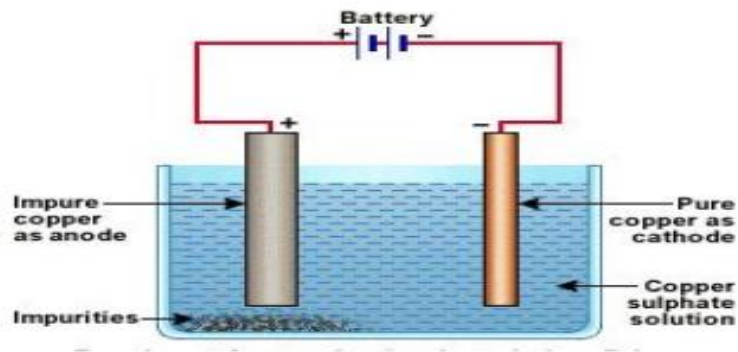
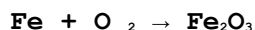
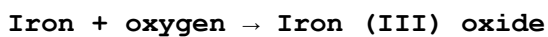


Fig.2. Electrolytic refining

## Corrosion

Metals when exposed to moist air for a long period of time, they become corroded. This is known as **Corrosion**. For **Example**, Silver reacts with moist air and becomes black in colour due to silver sulphide coating.



## Prevention of Corrosion

- Rusting of iron can be prevented by oiling, galvanizing, painting, greasing etc.
- To protect steel and iron from rusting, a thin layer of zinc are coated on them, this is known as **Galvanization**.

## Alloy

Mixture of two or more metals or metal and non-metal is known as **Alloy**. For **Example**,

- Brass is an alloy of copper and zinc.
- Bronze in an alloy of copper and tin.
- Solder is an alloy of lead and tin.
- Amalgam is one metal is mercury.

# Thank You

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**Wisdom Education Academy Mob: 8750387081**