

# CHEMISTRY STUDY MATERIALS FOR CLASS 10

## (NCERT Based Revision of Chapter -03)

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### METALS AND NON-METALS

#### REACTION OF METALS WITH WATER:

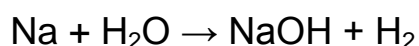
Metals form respective metal hydroxide and hydrogen gas when react with water.



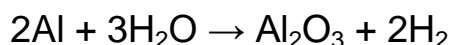
Most of the metals do not react with water. However, alkali metals react vigorously with water.

#### Examples:

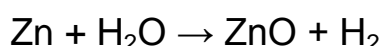
- Reaction of sodium metal with water: Sodium metal forms sodium hydroxide and liberates hydrogen gas along with lot of heat when reacts with water.



- Reaction of aluminium metal with water: Reaction of aluminium metal with cold water is too slow to come into notice. But when steam is passed over aluminium metal; aluminium oxide and hydrogen gas are produced.

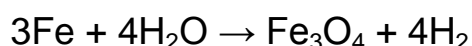


- Reaction of zinc metal with water: Zinc metal produces zinc oxide and hydrogen gas when steam is passed over it. Zinc does not react with cold water.

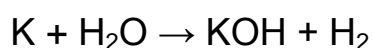


- Reaction of Iron with water: Reaction of iron with cold water is very slow and come into notice after a long time. Iron forms rust (iron oxide) when reacts with moisture present in atmosphere.

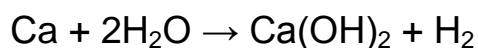
Iron oxide and hydrogen gas are formed by passing of steam over iron metal.



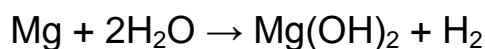
- Reaction of potassium metal with water: Potassium metal forms potassium hydroxide and liberates hydrogen gas along with lot of heat when reacts with water.



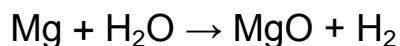
- Reaction of calcium metal with water: Calcium forms calcium hydroxide along with hydrogen gas and heat when reacts with water.



- Reaction of magnesium metal with water: Magnesium metal reacts with water slowly and forms magnesium hydroxide and hydrogen gas.



- When steam is passed over magnesium metal, magnesium oxide and hydrogen gas are formed.



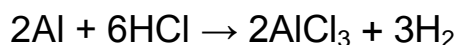
## REACTION OF METALS WITH DILUTE ACID:

Metals form respective salts when react with dilute acid.

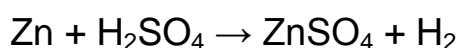


### Examples:

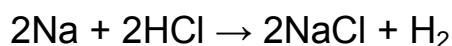
- Reaction of aluminium with dilute hydrochloric acid: Aluminium chloride and hydrogen gas are formed.



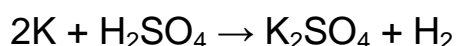
- Reaction of zinc with dilute sulphuric acid: Zinc sulphate and hydrogen gas are formed when zinc reacts with dilute sulphuric acid. This method is used in laboratory to produce hydrogen gas.



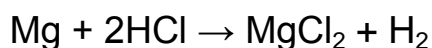
- Reaction of sodium metal with dilute acid: Sodium metal gives sodium chloride and hydrogen gas when react with dilute hydrochloric acid.



- Reaction of potassium with dilute sulphuric acid: Potassium sulphate and hydrogen gas are formed when potassium reacts with dilute sulphuric acid.



- Reaction of magnesium metal with dilute hydrochloric acid: Magnesium chloride and hydrogen gas are formed when magnesium reacts with dilute hydrochloric acid.



Copper, gold and silver are known as noble metals. These do not react with water or dilute acids.

		Metal	Symbol	Reaction with AIR	Reaction with WATER	Reaction with ACIDS
<b>WEIGHT</b> (Light) ↓ (Heavy)	Potassium	K	Burn vigorously to form metal oxides	React with <b>cold water</b> $H_2O(l)$ to form $H_2(g)$ and $(metal)OH_{(aq)}$	Strong reaction with <b>diluted acid (aq)</b> to form $H_2(g)$ . Metal replaces H in compound to form a salt.	
	Sodium	Na				
	Calcium	Ca	Burn with decreasing vigour down the series to form metal oxides	Only reacts with <b>steam</b> $H_2O(g)$ to form $H_2(g)$ and metal oxide		
	Magnesium	Mg				
	Aluminium	Al				
	Zinc	Zn				
	Iron	Fe	React slowly (when heated) to form an oxide layer	No reaction	React with <b>concentrated acid (l)</b> . Metal replaces H to make a salt. Some of the acid decomposes into $NO_2(g)$ and $H_2O(l)$ .	
	Lead	Pb				
	Copper	Cu				
	Mercury	Hg	No reaction	No reaction	No reaction	
	Silver	Ag				
	Gold	Au				

### METAL OXIDES: CHEMICAL PROPERTIES

Metal oxides are basic in nature. Aqueous solution of metal oxides turns red litmus blue.

### REACTION OF METAL OXIDES WITH WATER:

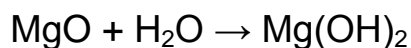
Most of the metal oxides are insoluble in water. Alkali metal oxides are soluble in water. Alkali metal oxides give strong base when dissolved in water.

### Examples:

- Reaction of sodium oxide with water: Sodium oxide gives sodium hydroxide when reacts with water.



- Reaction of magnesium oxide with water: Magnesium oxide gives magnesium hydroxide with water.

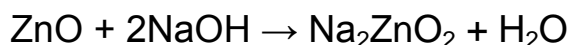


- Reaction of potassium oxide with water: Potassium oxide gives potassium hydroxide when reacts with water.

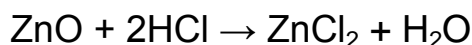


- Reaction of zinc oxide and aluminium oxide: Aluminium oxide and zinc oxide are insoluble in water. Aluminium oxide and zinc oxide are amphoteric in nature. An amphoteric substance shows both acidic and basic character. It reacts with base like acid and reacts with acid like a base.

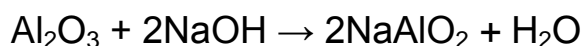
When zinc oxide reacts with sodium hydroxide, it behaves like an acid. In this reaction, sodium zincate and water are formed.



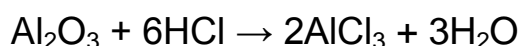
- Zinc oxide behaves like a base when reacts with acid. Zinc oxide gives zinc chloride and water on reaction with hydrochloric acid.



- In similar way aluminium oxide behaves like a base when reacts with an acid and behaves like an acid when reacts with a base.
- Aluminium oxide gives sodium aluminate along with water when reacts with sodium hydroxide.



- Aluminium oxide gives aluminium chloride along with water when it reacts with hydrochloric acid.



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