

CBSE Class 10 Science
Revision Notes
CHAPTER – 3
METALS AND NON-METALS

- About 118 elements are known today. There are more than 90 metals, 22 non metals and a few metalloids.
- Sodium (Na), potassium (K), magnesium (Mg), aluminium (Al), calcium (Ca), Iron (Fe), Barium (Ba) are some metals.
- Oxygen (O), hydrogen (H), nitrogen (N), sulphur (S), phosphorus (P), fluorine (F), chlorine (Cl), bromine (Br), iodine (I) are some non-metals.

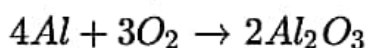
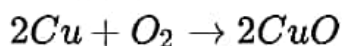
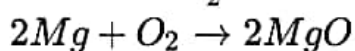
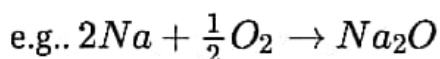
| | Metals | | Non-metals |
|----|---|----|--|
| 1. | Generally solid except Hg (present in liquid form). | 1. | Can be solid, liquid or gases e.g., C is solid, Br (liq), H ₂ (gas) |
| 2. | Ductile, Malleable (drawn into wires) (beaten into sheets) | 2. | Non-ductile, non-Malleable |
| 3. | Sonorous (produces sound) | 3. | Non-sonorous |
| 4. | Lustrous (have natural shine) | 4. | Non-lustrous except Iodine. |
| 5. | High Melting Point except Ce and Ga | 5. | Lower M.P. than metals. |
| 6. | Generally good conductors of heat and electricity except Pb and Hg. | 6. | Bad conductors of heat and electricity except Graphite (form of C) |
| 7. | High density except Na and K | 7. | Low densities except Diamond (form of C) |
| 8. | Reactive | 8. | Not very reactive. |
| 9. | Ionic bonding is present, | 9. | Covalent/Hydrogen bonding is present |

- Metals form basic oxides e.g., Magnesium oxide (MgO), while non-metals form acidic oxides e.g., SO₂, CO₂ .

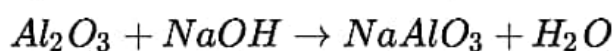
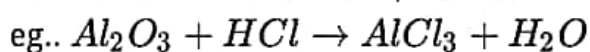
- Ag and Cu are best conductors of electricity.
- Metals and Non-metals can be distinguished on the basis of their physical and chemical properties.
- Some elements show the properties of both metals and non-metals and are called metalloids.

Chemical Properties of Metals Reaction with air : Different metals show different reactivities towards oxygen present in air. $Metal + oxygen \rightarrow Metal\ Oxide$

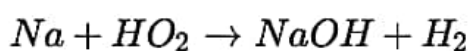
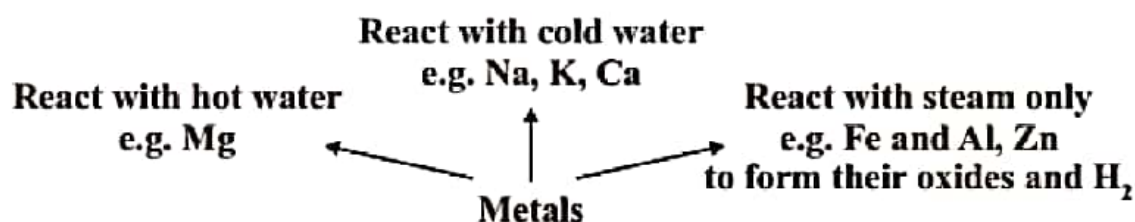
- Some metals like Na and K are kept immersed in kerosene oil as they react vigorously with air and catch fire.
- Some metals like Mg, Al, Zn, Pb react slowly with air and form a protective layer.
- Mg can also burn in air with a white dazzling light to form its oxide
- Fe and Cu don't burn in air but combine with oxygen to form oxide. Iron filings burn when sprinkled over flame.
- Metals like silver, platinum and gold don't burn or react with air.

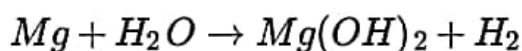
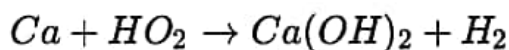
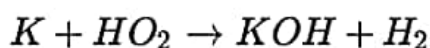


Usually metal oxides are basic in nature, but some metal oxides show both acidic and basic nature. Amphoteric Oxides : metal oxides which react with both acids as well as bases to form salt and water e.g. Al_2O_3, ZnO .

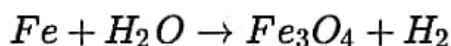
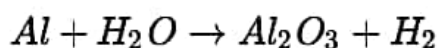


REACTION WITH WATER : Metal oxides on reaction with water form alkalis.

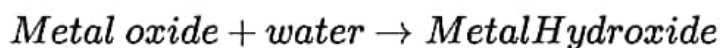




In case of Ca and Mg, the metal starts floating due to bubbles of hydrogen gas sticking to its surface.



Inert metals like Au and Ag do not react with water.

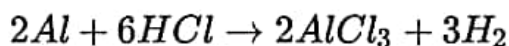
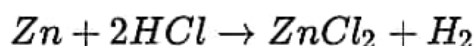
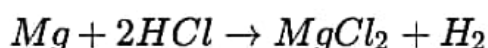
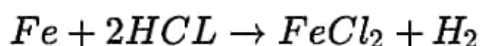


Note: Try Balancing the above Chemical equations yourself

REACTION WITH ACIDS

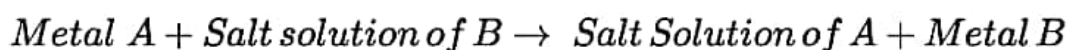
Metal + dilute acid \rightarrow Salt + Hydrogen gas

metals react with dilute hydrochloric acid and dilute sulphuric acid to form chlorides.

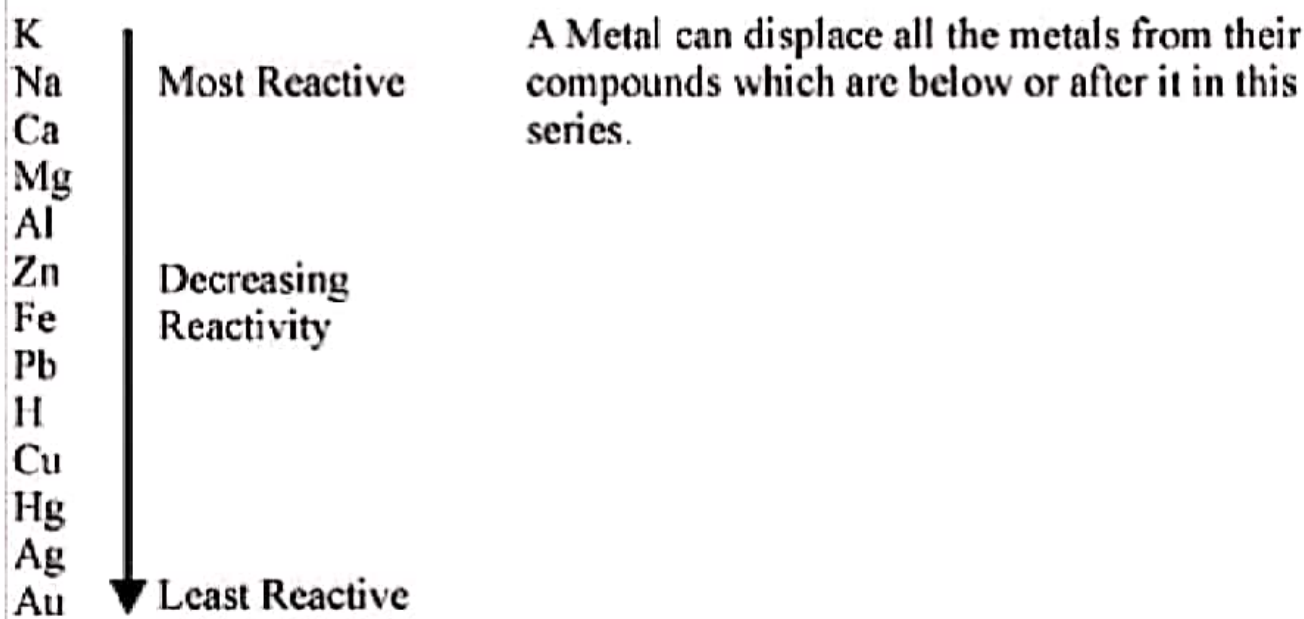


Note : Copper, mercury and silver don't react with dilute acids.

Hydrogen gas produced is oxidised to water. This happens because HNO_3 is a strong oxidising agent when metals react with nitric acid (HNO_3). But Mg and Mn, react with very dilute nitric acid to evolve hydrogen gas. 4. Reaction of metals with other metal salts :



All metals are not equally reactive. Reactive metals can displace less reactive metals from their compounds in solution. This forms the basis of reactivity series of metals. Reactivity series is a list of metals arranged in order of their decreasing activities.



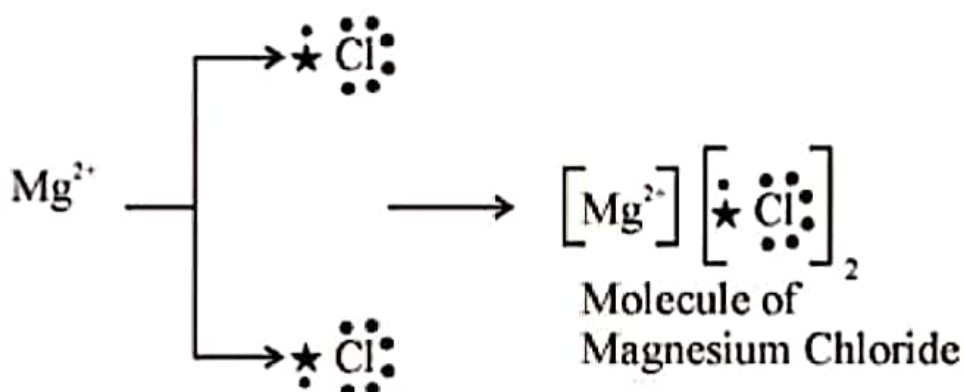
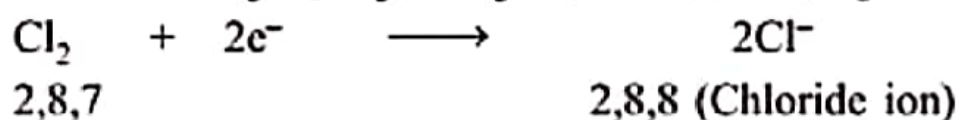
$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$ $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ REACTION OF NON-METALS :

| | |
|------------------------------|---|
| reaction with oxygen | non-metals form acidic oxides Eg; $C+O_2 \rightarrow CO_2$ |
| reaction with water | non-metals do not react with water because they cannot release electrons. |
| reaction with dilute acids | no reaction |
| reaction with salt solutions | a more reactive non-metal will displace less reactive non-metal from its salt solution. |
| reaction with chlorine | chloride is formed. Eg; $H_2(g)+Cl_2 \rightarrow 2HCl$ |
| reactions with hydrogen | hydrides are formed. $H_2 + S(l) \rightarrow H_2S$ |

Reaction between Metals and Non-Metals

- Reactivity of elements can be understood as a tendency to attain a completely filled valence shell.
- Atom of metals can lose electrons from valence shells to form cations(+ve ions).
- Atom of non-metals gain electrons in valence shell to form anions (-ve ions).
- Oppositely charged ions attract each other and are held by strong electrostatic forces of attraction forming ionic compounds.

Formation of $MgCl_2$ $Mg \rightarrow Mg^{2+} + 2e^-$ 2,8, 22,8 (Magnesium ion)



Compounds

- Are solid and mostly brittle.
- Have high melting and boiling points. More energy is required to break the strong inter-ionic attraction.
- Generally soluble in water and insoluble in kerosene, petrol.
- Conduct electricity in solution and in molten state. In both cases, free ions are formed and conduct electricity.