

Class –X

Subject – Science

CHAPTER – 3

METALS AND NON-METALS

REACTION OF METALS WITH DILUTE ACID:

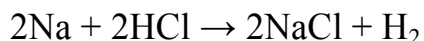
Metals react with dilute acid and produce respective metal salt and hydrogen gas.



Examples:

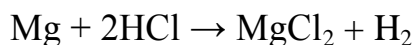
Reaction of sodium metal with dilute acid: Sodium metal gives sodium chloride and

hydrogen gas when react with dilute hydrochloric acid.

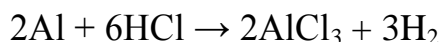


Reaction of magnesium metal with dilute hydrochloric acid:

Magnesium chloride and hydrogen gas are formed when magnesium reacts with dilute hydrochloric acid.

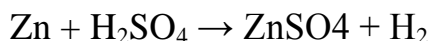


Reaction of aluminium with dilute hydrochloric acid: Aluminium chloride and hydrogen gas are formed.



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.



NOTE -

Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO_3 is a strong oxidising agent. It oxidises the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O , NO , NO_2).

But magnesium (Mg) and manganese (Mn) react with very dilute HNO_3 to evolve H_2 gas.

Aqua regia, (Latin for 'royal water') is a freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid in the ratio of 3:1. It can dissolve gold, even though neither of these acids can do so alone. *Aqua regia* is a highly corrosive, fuming liquid. It is one of the few reagents that is able to dissolve gold and platinum.

REACTIVITY SERIES OF METALS

The series of metals in decreasing order of reactivity is called reactivity or activity series of metals.

The metals at the top are most reactive whereas metals at the bottom are less reactive.

The metals above hydrogen are more reactive than hydrogen. They can displace hydrogen from dilute acids and water.


Metals below hydrogen are less reactive than hydrogen and cannot displace hydrogen from dilute acids and water.

Reason for difference in Reactivity of Metals.

We have observed with the help of experiments that some metals are less reactive whereas other metals are more reactive. Metals are those elements which can lose electrons easily. The reactivity of metal depends upon how easily metal can lose electrons and form positively charged ion. Metals have 1 to 3 electrons whereas non-metals have 4 to 8 electrons in the outermost shell. Hydrogen and helium have one and two electrons respectively but still they are

non-metals because they cannot lose electrons easily. Boron has three valence electrons but still it is a non-metal

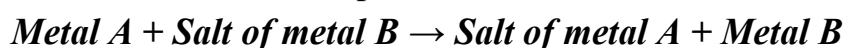
Table 3.2 Activity series : Relative reactivities of metals

| | | | |
|----|-----------|---|----------------------|
| K | Potassium |  | Most reactive |
| Na | Sodium | | |
| Ca | Calcium | | |
| Mg | Magnesium | | |
| Al | Aluminium | | |
| Zn | Zinc | | Reactivity decreases |
| Fe | Iron | | |
| Pb | Lead | | |
| H | Hydrogen | | |
| Cu | Copper | | |
| Hg | Mercury | | |
| Ag | Silver | | |
| Au | Gold | | Least reactive |

REACTION OF METALS WITH SOLUTION OF OTHER METAL SALTS:

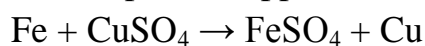
Reaction of metals with solution of other metal salt is displacement reaction. In this reaction

more reactive metal displaces the less reactive metal from its salt.

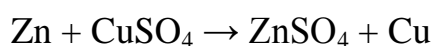
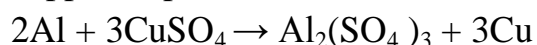


Examples:

Iron displaces copper from copper sulphate solution.



Similarly, aluminium and zinc displace copper from the solution of copper sulphate.



In all the above examples, iron, aluminium and zinc are more reactive than copper. That's why they displace copper from its salt solution.

USES OF METALS

Metals find number of applications. Some of them are given below.

1. Zinc metal is used for galvanizing iron, in anti corrosion material, in medicinal fields and in alloys.
2. Iron is used as a construction material in bridges, houses, ships etc. Iron, in the form of steel is used for making domestic utensils.
3. Tin is used for soldering, for preparing foils, for metal coatings to prevent chemical action and corrosion, for panel lighting etc.
4. Lead is used in making water pipes, in pigments, batteries, in alloys etc.
5. Titanium finds extensive use in aircraft industries
6. Pure metals, which display zero resistance to electrical currents, are called superconductors. Hg, Nb are examples of superconductors. They become superconductors below a critical temperature of 4.2 K and 9.2 K respectively. Superconductors have many applications in research and industry.
7. Mercury is used in thermometers.
8. Silver, gold and platinum are precious metals and they are used in making ornaments.
9. Radioactive metals like uranium and plutonium are used in nuclear power plants to produce atomic energy via nuclear fission.

USES OF NON - METALS

Non - metals find number of applications. Some of them are given below.

1. Sulphur is used in making compounds like sulphur drugs, sulphuric acid, in matches, in gunpowder, for vulcanization of rubber etc.
2. Boron, in the form of compound borax, is used in making skin ointments.
3. Phosphorus is used in making crackers.
4. Oxygen is used for respiration.
5. Chlorine, in the form of bleaching powder, is used for purification of water.

6. Carbon is used as a fuel, as electrodes (graphite), as a reducing agent in metallurgy.
7. Oxygen, hydrogen and nitrogen are used by all living things, they are the 'building blocks' of life.
8. Iodine is used to prevent thyroid problems.
9. Bromine is used in the preparation of dyes.
10. Some compounds of fluorine (such as sodium fluoride, stannous fluoride) are added to toothpastes to prevent dental decays or formation of cavities.