CLASS 10- SCIENCE

CHAPTER 3- METALS AND NON-METALS

PART 4- CHEMICAL PROPERTIES OF NON-METALS

1) REACTION OF NON-METALS WITH OXYGEN

★ Non-metals react with oxygen to form non-metallic oxides.

★ The non-metallic oxides are acidic oxides as they turn blue litmus solution to red.

Non-metal + Oxygen ⟶ Non-metallic oxide

★ Examples-

i) $C\,(s) + O_2\,(g) \longrightarrow CO_2\,(g)$

Carbon Oxygen Carbon dioxide (acidic oxide)

ii) $S\,(s) + O_2\,(g) \longrightarrow SO_2\,(g)$

Sulphur Oxygen Sulphur dioxide (acidic oxide)

★ Some non-metal oxides are neutral i.e. they are neither acidic nor basic in nature.

★ <u>Examples-</u>

i) When carbon burns in an insufficient supply of oxygen, it forms carbon monoxide which is neutral in nature, but very toxic.

$2\ C\ (s) + O_2\ (g) \longrightarrow 2\ CO\ (g)$

Carbon + Oxygen → Carbon monoxide (Neutral oxide)

ii) When hydrogen combines with oxygen, it forms water which is neutral.

$2\ H_2\ (g) + O_2\ (g) \longrightarrow 2\ H_2O\ (l)$

Hydrogen + Oxygen → Water (neutral oxide)

2) REACTION OF NON-METALS WITH WATER

★ Non-metals do not react with water or steam to evolve hydrogen gas.

Non-metals + water ⟶ No reaction

★ Such reactions do not take place as non-metals cannot donate electrons to reduce the hydrogen ions of water into hydrogen gas.

★ Non-metal oxides can react with water to form acids.

★ Examples-

i) Carbon dioxide dissolves in water to form carbonic acid.

CO_2 (g) + H_2O (l) ⟶ H_2CO_3 (aq)

Carbon dioxide Water Carbonic acid (An acid)

ii) Sulphur dioxide dissolves in water to form sulphurous acid.

SO_2 (g) + H_2O (l) ⟶ H_2SO_3 (aq)

Sulphur dioxide Water Sulphurous acid (An acid)

3) REACTION OF NON-METALS WITH DILUTE ACIDS

★ Generally, non-metals do not react with dilute acids.

Non-metal + Dilute acid ⟶ No reaction

★ Non-metals themselves are acceptors of electrons and so cannot donate electrons to the hydrogen ion of the acid.

★ Exceptions- Some concentrated acids like sulphuric acid and nitric acid, which are strong oxidising agents, can oxidise non-metals like sulphur, phosphorus, carbon etc.

★ Examples-

i) $C + Conc.H_2SO_4 \longrightarrow CO_2 + H_2O + SO_2$

ii) $S + Conc.6\ HNO_3 \longrightarrow H_2SO_4 + 6\ NO_2 + 2\ H_2O$

4) REACTION OF NON-METALS WITH SALT SOLUTIONS

★ When a non-metal reacts with a salt solution, then the more reactive non-metal displaces the less reactive non-metal from its salt solution.

★ Example- The passing of chlorine in a solution of sodium bromide gives sodium chloride and bromine, as chlorine is more reactive than bromine.

$$2NaBr\ (aq) + Cl_2\ (g) \longrightarrow 2NaCl\ (aq) + Br_2\ (aq)$$

Sodium bromide — Chlorine — Sodium chloride — Bromine

★ The order of reactivity of non-metals (in decreasing order):

Fluorine > Chlorine > Oxygen > Bromine > Iodine > Sulphur > Phosphorus

THANK YOU