

CHEMISTRY STUDY MATERIALS FOR CLASS 10

(NCERT Based notes of Chapter -03)

GANESH KUMAR

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METALS AND NON-METALS

PHYSICAL PROPERTIES OF NON-METALS

- **Physical state** – Non-metals can exist in solid or liquid or gaseous state at room temperature. . For example, carbon, sulphur, phosphorus, iodine are in solid state, bromine is in liquid state while oxygen, nitrogen, chlorine are in gaseous state at room temperature.
- **Luster** – Non-metals do not have luster. They do not reflect light from their surface. (exception – diamond and iodine) Non-metals have dull appearance. For example, sulphur, phosphorus and carbon show this property.
- **Malleability** - Non-metals are non-malleable. If solids, they are brittle i.e. they break or shatter on hammering. For example, coal, sulphur, phosphorus are brittle.
- **Ductility** – Non-metals cannot be drawn into thin wires. So they are not ductile.
- **Hardness** – Non-metals are usually not hard. They are soft. For example, coal, sulphur and phosphorus are soft. Diamond is exception to this. It is the hardest substance known.
- **Sonority**: Non-metals are not sonorous, i.e. they do not produce a typical sound on being hit.
- **Conduction** - Non- metals are usually poor conductors of heat and electricity. However, carbon in the form of gas carbon and graphite is exception to this. These forms of carbon are good conductors of electricity.

- **Density** – Non- metals which are gases have low density. Solid non-metals have low to moderate density. They are medium light. For example, sulphur, phosphorus and boron have densities 1.82, 2.07 and 2.34 respectively. . However, diamond has high density which is about 3.5.
- **Melting and boiling point** – Non-metals usually have low melting and boiling points. For example, phosphorus, sulphur, and iodine have melting points 440, 1150 and 1140 C respectively and boiling points 2800 , 4450 and 1840C respectively. . However, carbon, silicon and boron possess very high melting and boiling points.
- **Tensile strength** – Non-metals have low tensile strength i.e. they have no tenacity.
- **Color:** Non-metals are of many colors.

Physical Properties	Metals	Non-Metals
Malleability and Ductility	Metals are malleable. They can be beaten into thin sheets. They are also ductile and can be drawn into wire (except a few metals like Na, K etc.)	Non-metals are neither malleable nor ductile. For e.g. coal, (carbon) and sulphur
Metallic Lusture	All the metals show metallic lusture.	They do not show any metallic lusture.
Hardness	Metals are generally hard	Non-metals are soft in comparison to metals
Physical state	They exist in solid and liquid states	Non-metals exist in solid, liquid and gaseous states.
Sonorous	Metals are sonorous and produce characteristic metallic sound when struck (e.g school bell)	They are non sonorous
Density	High density	Low density
Electrical conductivity	Good conductor of electricity	Bad conductor of electricity

CHEMICAL PROPERTIES OF NON-METALS

REACTION OF NON-METALS WITH OXYGEN:

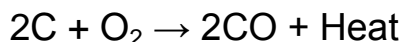
Non-metals form respective oxide when react with oxygen.



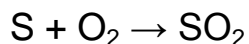
Examples:

- When carbon reacts with oxygen, carbon dioxide is formed along with production of heat. $\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{Heat}$

- When carbon is burnt in insufficient supply of air, it forms carbon monoxide. Carbon monoxide is a toxic substance. Inhaling of carbon monoxide may prove fatal.



- Sulphur gives sulphur dioxide when react with oxygen. Sulphur caught fire when exposed to air.



- When hydrogen reacts with oxygen it gives water. $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

NON-METAL OXIDE:

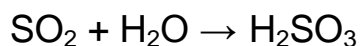
Non-metal oxides are acidic in nature. Solution of non-metal oxides turns blue litmus red.

Examples:

- Carbon dioxide gives carbonic acid when dissolved in water.



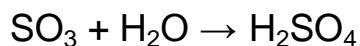
- Sulphur dioxide gives sulphurous acid when dissolved in water.



- Sulphur dioxide gives sulphur trioxide when it reacts with oxygen.

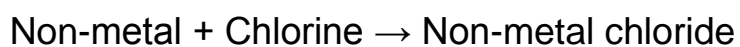


- Sulphur trioxide gives sulphuric acid when dissolved in water.



REACTION OF NON-METAL WITH CHLORINE:

Non metals give respective chloride when they react with chlorine gas.



Examples:

- Hydrogen gives hydrogen chloride and phosphorous gives phosphorous trichloride when react with chlorine.