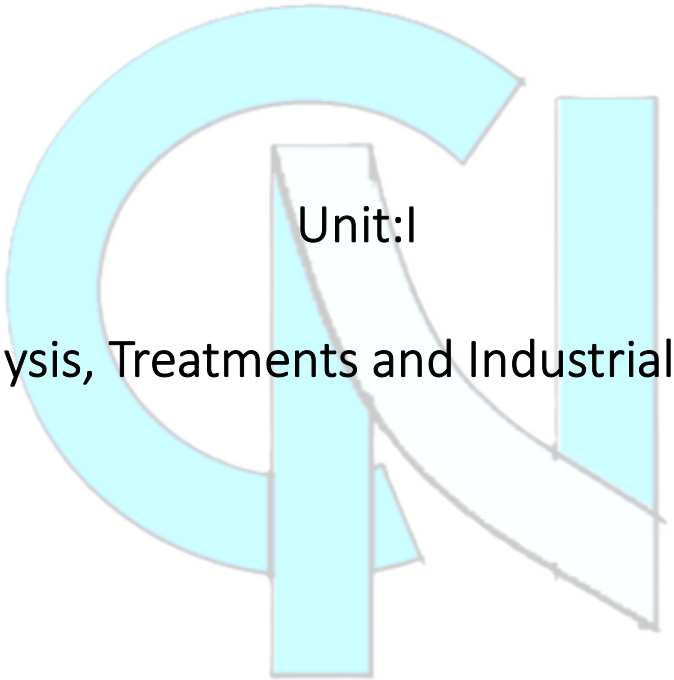
# Engineering Chemistry



## Unit:I

## Water Analysis, Treatments and Industrial Applications

Water is essential for all living beings, water is very crucial. Almost all human activities domestic, agricultural and industrial use water. Although water is nature's most wonderful and abundant compound but only less than 1% of the world's water resources is available for ready use. Hence, water has to be used carefully and economically. As an engineering tool water is mainly used for steam generation and it is also used as a coolant although different uses of water demand different specifications –

→ Textile industry needs frequent dying of clothes and the water used by this industry should be soft and free from organic matter. Hard water decreases the solubility of acidic dyes.

→ Laundries require soft water, free from colour, Mn and Fe, because hardness increases consumption of soaps, salts of Fe and Mn impart a grey or yellow shade to thefabric.

→ For boilers water should be free from hardness otherwise efficient heat transfers is prevented by scale formation. Untreated water can lead to corrosion of boiler material.

→ Paper industry requires water free from SiO2 as it produces cracks in paper; turbidity as it can affect brightness and colour of paper; alkalinity as it consumes more alum; hardness as it increases the ash content of the paper.

→ Sugar industry requires water free from hardness because hard water causes difficulty in the crystallization of sugar.

→ Dairies and pharmaceutical industry require ultra pure water, which should be colorless, tasteless, odorless and free from pathogenic organisms.

Therefore water needs to be treated to remove undesirable impurities.

"Water treatment" is the process by which all types of undesirable impurities are removed from water and making it fit for domestic or industrial purposes. Impurities present in Water can be categorized as;

• Physical may be Suspended or Colloidal

• Chemical like Dissolved gases, Dissolved organic Salts, Dissolved inorganic Salts
• Biological like Bacteria, Fungi, Algae Sources of Water:

• Rain Water

• Surface Water Flowing Water like Streams, Rivers Still Water like Lakes, Reservoirs, Ponds

• Underground Water like Springs, Tube wells, Wells

• Sea Water River water contains dissolved minerals like chlorides, sulphates, bicarbonates of sodium, magnesium, calcium and iron.

Its composition is not constant. Lake water has high quantity of organic matter present in it. Its chemical composition is also constant. Rain water, is the purest form of natural water. When it comes down, it dissolves organic and inorganic suspended particles and some amount of industrial gases. Underground water is free from organic impurities and is clearer in appearance due to filtering action of the soil. It has large amount of dissolved salts. Sea water is very impure due to continuous evaporation and impurity thrown by rivers as they join sea