

# **WATER AND ITS IMPURITIES**

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# IMPORTANCE OF WATER

- ❖ Almost 75 % of earth is covered with water in the form of oceans, rivers, lakes etc.
- ❖ But very less amount of water is potable i.e. fit for human consumption like for drinking, cooking, bathing etc.
- ❖ Water is the universal solvent and in nature, it is never totally pure. No matter how isolated it is from sources of contamination, it will always have some chemicals.
- ❖ Gases or minerals in the air, soil, or rock are dissolved by the water. Some dissolved materials give water its characteristic taste, and “pure water” is generally considered to be flat and tasteless.
- ❖ Minerals can cause hardness (calcium or magnesium), color (iron), contamination), and radioactivity in the water. Humans can cause contamination through the improper use of pesticides or fertilizers and through the disposal of waste. These impurities can dissolve in the water, causing it to be contaminated.

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- ❖ Minerals and impurities are normally present in very small concentrations, and are measured in parts per million (ppm) (how many parts of impurities in a million parts of water) or milligrams per liter (mg/l). The terms are equivalent and are used interchangeably in water and wastewater.
  - ❖ Some contaminants can also be measured in parts per billion (ppb) or micrograms per liter ( $\mu\text{g/l}$ ), which are also essentially equivalent.

# WATER IMPURITIES

- ❖ The substances that pollute water are called 'Water Impurities'.
- ❖ Water is being polluted by throwing wastes into rivers, oil leakage by water transport etc.





# TYPES OF IMPURITIES

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# SOLUBLE IMPURITIES

- ❖ Impurities that can be dissolved in water are called Soluble Impurities.
- ❖ Examples are-Salt,any other chemical.



# INSOLUBLE IMPURITIES

- ❖ Impurities that cannot be dissolved in water are called Insoluble Impurities.
- ❖ Examples- Sand,Mud.



# TYPES OF IMPURITIES

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Depending upon nature impurities can be classified as

- Physical impurities:
- Chemical impurities:
- Biological impurities
- Physical impurities causes following impurities.
- (1) Turbidity
- (2) Color
- (3) Taste
- (4) Odor
- (5) Temperature
- (6) Radio active substances



# PHYSICAL IMPURITIES

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**(1) Turbidity:** Turbidity in the water indicates presence of suspended or colloidal insoluble matter including coarse particles (mud, sediment, sand, clay, silt etc.) that settle rapidly on standing.

- ❖ In some cases salts of different also impart turbidity in water. The colloidal substance and salts may be injurious to health.
- ❖ The turbidity of feed water should not exceed 5 ppm. These materials can be removed by settling, coagulation and filtration. Their presence is undesirable because heating or evaporation produces hard stony scale deposits on the heating surface & clog fluid system.
- ❖ **(2) Color:** The water gets color from discharge of industries like chemical, textile, paper etc. Yellowish color indicates the presence of chromium and appreciable amount of organic matter. Yellowish red color indicates the presence of iron, while red brown color indicates the presence of peaty matter.

# PHYSICAL IMPURITIES

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**(3)Taste:** It is due to the presence of dissolved mineral in water produces taste, but not odor.

- ❖ Bitter taste can be due to the presence of iron, aluminum, manganese, sulphate or excess of lime.
- ❖ Soapy taste can be due to the presence of large amount of sodium bicarbonate.
- ❖ Brackish (slightly salty, unpalatable) taste is due to the presence of unusual amount of salts.
- ❖ Palatable (acceptable taste) Taste is due to the presence of dissolved gases and minerals like nitrates in water.

# PHYSICAL IMPURITIES

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- (4) **Odor:** waste products discharge from industries. Some industries components such as trades contain strong smelling compounds which impart odor and taste. Generally smelling compounds are chlorine, hydrogen, sulphide etc.
- (5) **Temperature:** Temperature is an important factor to consider when assessing water quality. In addition to its own effects, temperature influences several other parameters and can alter the physical and chemical properties of water.
- ❖ Water is most dense at 4 degrees Celsius, or 39 degrees Fahrenheit, and is less dense at either higher or lower temperatures.
- (6) **Radio active substances:** The discharge from nuclear power plant or research center discharge radioactive substances which can seriously affect human health and life.

# CHEMICAL IMPURITIES IN WATER:

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Followings are chemical impurities.

**(1) Acids:** the waste products of some industries such as battery factories , explosive factories contain acids. If these waste products are directly discharged into river then it will be harmful to life, and will destroy self purification property of water.

**(2) inorganic compounds:** The waste products of industries like fertilization industry, oven industry contain certain inorganic compounds. These compounds mainly consist of sulphide, ammonia etc which are harmful to life.





# CHEMICAL IMPURITIES IN WATER:

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## (3) organic compounds:

- (a) Organic compounds may exist in the water due to presence of fats, protein and carbohydrates.
- (b) The suspended organic compounds may develop due to decayed fruits and dead animals.
- Organic compounds contain different dangerous elements which are harmful for life.

**(4) pH :** It is a value that determines if a substance is acid, neutral or basic, calculated from the number of hydrogen ions present. The initials pH stand for "Potential of Hydrogen". It is measured on a scale from 0 to 14, on which 7 means the substance is neutral. pH values below 7 indicate that the substance is acidic and pH values above 7 indicate that it is basic or alkaline. Pure water has a pH of 7 which means that it is neutral.



# BIOLOGICAL IMPURITIES IN WATER:

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- ❖ Biological contamination of water is caused by the presence of living organisms like algae, bacteria, protozoa, pathogens, microbes, Viruses, Parasites and their eggs (cysts), etc. known collectively known as microorganisms and commonly called 'germs'.
- ❖ The development of pathogenic bacteria , fungus, viruses etc in water is caused due to dead bodies and due to unhygienic discharge of sewage into river without treatment, and are responsible for water borne disease.
- ❖ The health effects of drinking water contaminated with germs may be severe, but easily curable with modern day medicine. These minute living organisms in water are the causes of diseases from dirty water like typhoid fever, dysentery, cholera, gastroenteritis, etc.

# BIOLOGICAL IMPURITIES IN WATER

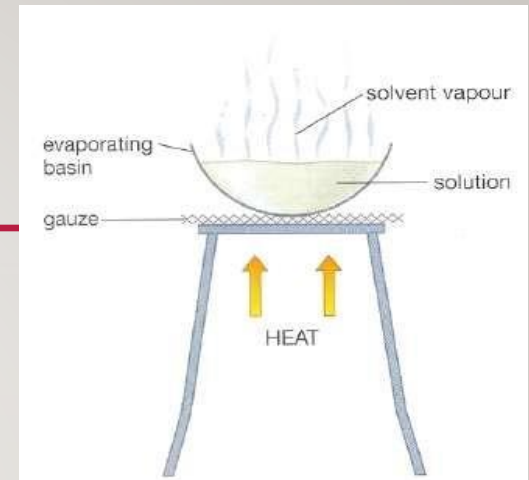
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- ❖ Water tanks can sometimes be a breeding ground for microbes in water. In the usual test for microorganisms, only one group of bacteria known as Coliform or e-coli is tested for, this is because it is the most common species, and the first microorganism to infect water. Membrane purification of water actually filters out all bacteria from water unlike UV water purifier which kill bacteria in water but leaves their bodies in the drinking water.

# REMOVING SOLUBLE IMPURITIES IN WATER

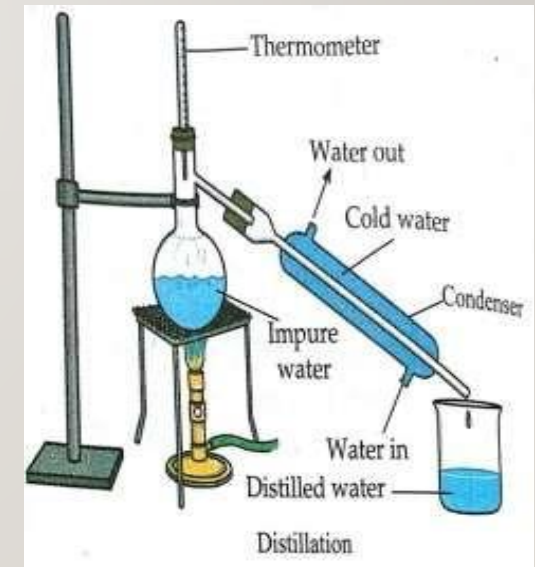
## ❖ Evaporation

It is the process of turning Water into vapours.



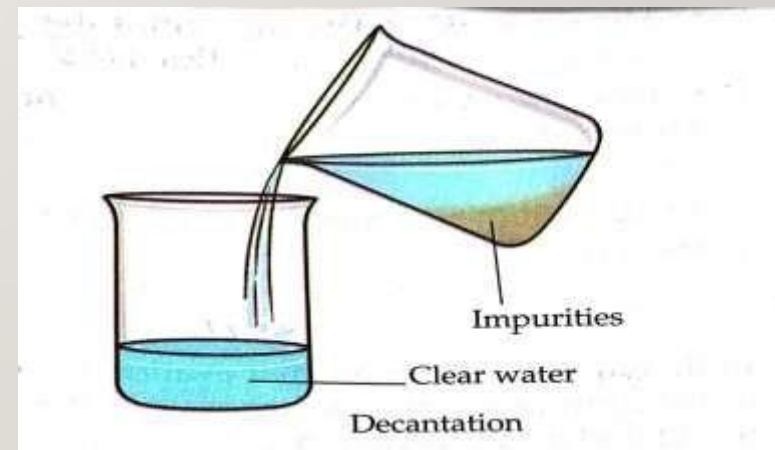
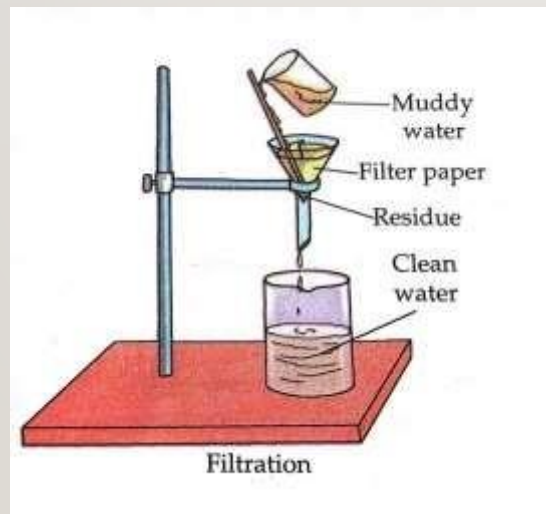
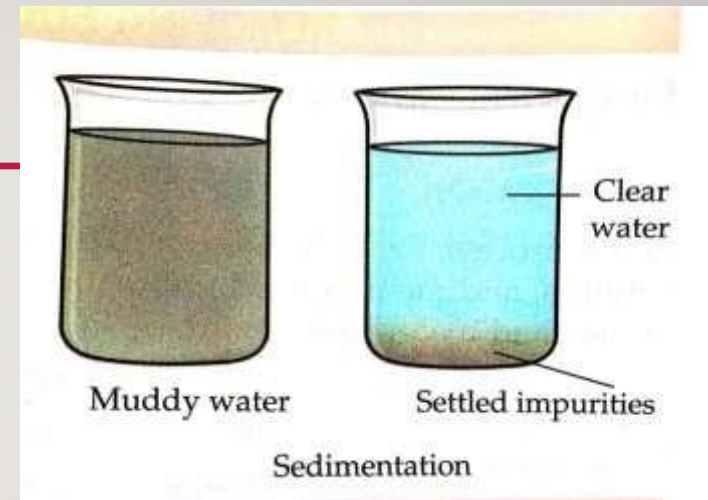
## ❖ Distillation

The process of purifying water by heating and cooling.



# REMOVING INSOLUBLE IMPURITIES IN WATER

- ❖ Sedimentation
- ❖ Decantation
- ❖ Filtration





# DEFINITIONS OF PROCESS OF REMOVING INSOLUBLE IMPURITIES IN WATER

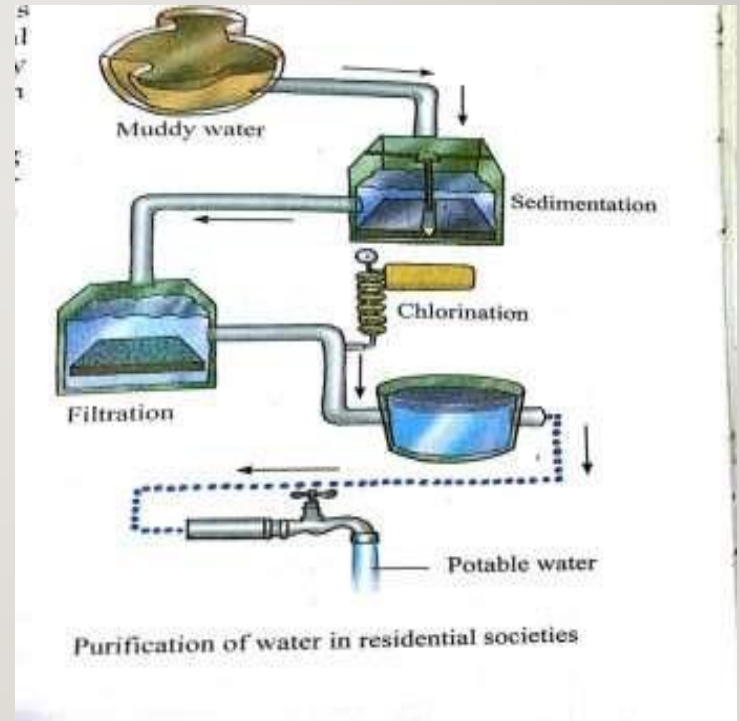
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- ❖ **Sedimentation**-The process of settling or being deposited as a sediment.
- ❖ **Decantation**-It is the process for the separation of mixtures, by removing a layer of liquid, generally one from which a precipitate has settled.
- ❖ **Filtration**-The process of removing something unwanted from a liquid by using a filter.



# PURIFYING DRINKING WATER

- ❖ After removing soluble and insoluble impurities, drinking water is purified by two process i.e. 'Boiling' and 'Chlorination'.



# THANK YOU

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