

1. WATER QUALITY CHARACTERISTICS

* QUALITY CHARACTERISTICS OF WATER:

Water quality characteristics of water are broadly classified

as:

a) Physical Characteristics

- Turbidity, Suspended solid, Colour, Taste and Odor, temperature

b) Chemical Characteristics

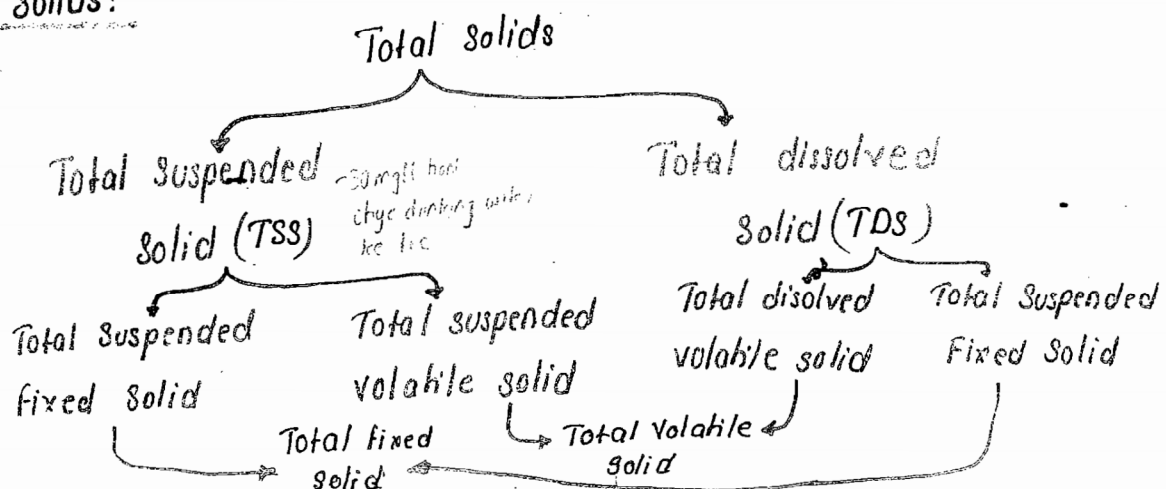
- Total dissolved solids (T.D.S), Alkalinity, pH, Hardness,
chloride content, nitrogen content, phosphorous content,
iron content, and other metals and non-metals.

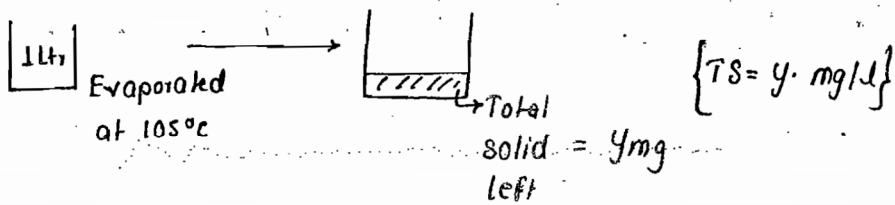
c) Biological Characteristics:

- Bacteria, Virus, Protozoa, Fungi, Algae, etc..

* PHYSICAL WATER QUALITY CHARACTERISTICS:

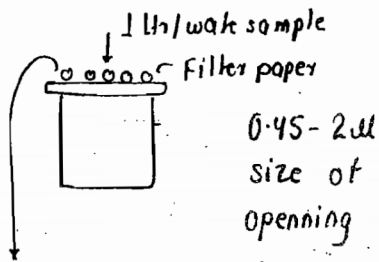
1. Solids:





$$\therefore \{ \text{Total dissolved solids} = (y - x) \text{mg/l} \}$$

Solids:



Solids caught
on filter paper = $x \cdot \text{mg}$

$$\therefore \{ TSS = x \cdot \text{mg/l} \}$$

* NOTE:-

• If α mg of solid is burnt in muffle furnace at $550^\circ\text{C} - 660^\circ\text{C}$
the solid residue = β mg

• Fixed solid = β mg
Volatile solid = $\alpha - \beta$ mg

* Settleable Solid:

- It is determined using Imhoff cone, this solid will settle out due to their own weight.

• Colloidal solids generally do not settle due to their own weight due to Brownian motion.

- $< 10^{-3} \mu \rightarrow$ Dissolved Solids

- $10^{-3} \mu$ to $1/2 \mu \rightarrow$ Collidal Solids

- $> 2 \mu \rightarrow$ Suspended Solids

- Solids passing through the filter paper are called filterable solids and solids retain on the filter paper are called non-filterable solids.

- Filterable solids corresponds to dissolved solids and non-filterable solids corresponds to suspended solid.

* TURBIDITY:-

- Origin :- Suspended and collidal sediments such as silt, clay or finely divided organic matter like algae, flankton and decaying material.

- Turbidity of water is based on the amount of light absorbed or scattered by particles in the water (Tyndal effect).

- Absorption and scattering of light is influenced by the size and surface characteristics of the solids.

- Only suspended and collidal particles are considered to contribute to

4
cause turbidity.

- Dissolved solids particles causing opacity in water is measured under colour. $Fe^{2+} \xrightarrow{O_2} Fe^{3+} \downarrow \text{Precipitate}$
- Increase in turbidity leads to decrease in photosynthesis which leads to lesser production of oxygen and hence various organic and inorganic impurities which could have been oxydised remains in water.
- Disinfection of water / turbid water is difficult.

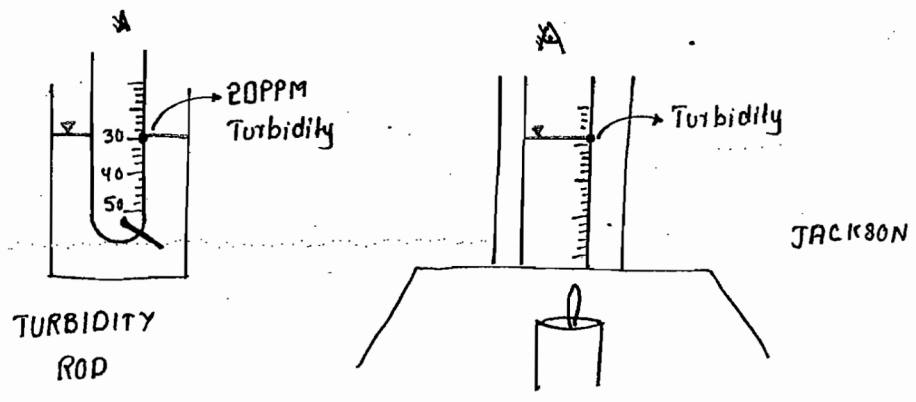
* Turbidity is measured using:

1. Turbidity Rod
 2. Jackson turbidity meter
- } Not used for drinking water

- Use for measuring turbidity of natural source of water.

3. Baylis turbidity meter :- Based on absorption principle

4. Nephelometer - Based on scattering principle and it is recommended by IS Code for measuring turbidity of drinking water.



- For measuring the turbidity of natural sources we may use unit based on silica unit in which one unit of turbidity corresponds to turbidity produced by 1mg of finely divided silica in 1ltr. of distilled water.
- This unit will be called as 1ppm or 1mg/l
- Natural sources of water has a turbidity in range of 25 to 50ppm.
- In nephelometer the intensity of light is measured at right angle to the incident light and using colour matching technique turbidity is measured.
- Greater in the intensity of scatter light the greater in the turbidity.

- The turbidity standard are made using formazine but if the equipment is based on scattering principle the unit is made as NTU (Nephelometer turbidity unit) instead of FTU (Formazine turbidity unit)
- Acceptable limit for turbidity for drinking water is 1NTU and cause for rejection is 5-NTU.

* **COLOUR :-** Tintometer is used for measuring colour.

- Colour can be caused by suspended or dissolved solids.
- Suspended matter has been removed by centrifugation the colour obtained is called true colour.
- Natural water has yellowish brown colour which is due to dissolve organic matter matter from decaying vegetation.

* **NOTE :-**

Water may have other colours but that would be due to industrial waste or other inorganic or organic compounds. e.g: Iron oxides gives reddish colour, manganese give colour brown or blackish colour.

- For colour measurement we used true colour unit where 1 TCU is equivalent to colour produced by 1 mg/l of platinum in the form of chloro-platinic ion with 0.5 mg/l of metallic cobalt.

- The colour produce is yellowish brown.

- TCU is also called Hazen Unit or Platinum cobalt unit.

* NOTE:-

• For colour other than yellowish brown we use spectrophotometric unit / technique.

Nessler are colour comparison tubes.

→ Organic compound causing colour may exert chlorine demand enhance reduces the effectiveness of chlorine as disinfectant.

- Some colour causing compounds can be carcinogenic

- Acceptable limit is 5 TCU and cause for rejection is 15 TCU

* TASTE & ODOUR :-

- Taste and odour in surface water is usually due to organic compounds or algal growth or agricultural

chemical, etc.

- In ground water dissolved gases like: H_2S causes bad smell. (H_2S has rotten eggs like odour).
- Objection of taste and odour is that the dissolve organic may carcinogenic and may exert chlorine demand during dis-infection.
- Taste and odour measured by using osmoscopic.
- Intensity of taste and odour represented by TON (Threshold Odour Number).

$$TON = \frac{A+B}{A}$$

A \rightarrow Vol. of odours water.

B \rightarrow Vol. of odour free water required to produce a mix in which the taste and odouring hardly defective.

\rightarrow Acceptable limit for TON (1-3 TON) as per old code and new code it said to be agreeable.

* TEMPERATURE:-

\rightarrow Acceptable limit is $\{10^{\circ}-25^{\circ}C\}$ and cause for rejection should be $> 25^{\circ}C$