Water Quality

QUALITY OF WATER

- Free from bacteria which may cause disease
- Colourless and Spalding.
- Tasty, odour-free and cool.
- Free from all objectionable matter.
- Should have Dissolved oxygen.

IMPURITIES IN WATER

SUSPENDED IMPURITIES

- **Clay, Algae, Fungi, Organic & Inorganic matter, Mineral matter.**
- **Removed by Filtration.**
- **Measured by its Turbidity and Colour.**

COLLOIDAL IMPURITIES

- These particles are so small.
- Can not be removed by ordinary filters.
- These are electrically charged.
- Remains in continuous motion, removal is very difficult.
- If associated with organic matter containing bacteria's.
- Chief source of epidemics.
- Colour of the water is due to colloidal impurities.
- Size 1 micron (=0.001 mm) to 1 milli micron (0.000001mm (10^{-6} m to 10^{-9} m)

DISSOLVED IMPURITIES

- Rocks, soil, solids, salts.
- Carbonate & Bicarbonate – Cause Alkalinity and Hardness.
- Sulphate – Cause Hardness.
- Fluorides – Cause Mottled Enamel of Teeth.
- Chloride – Taste.
- Manganese – Colour (Black or Brown).
- Iron oxide – Taste, Colour & Corrosiveness.
- Lead & Arsenic – Poisoning .
- H_2S, O_2, CO_2 – Acidity, Odour.

EXAMINATION OF WATER

COLLECTION OF WATER SAMPLES

- **Tap –**
  - **Sufficient quantity of water should be allowed to pass to eliminate the stagnant water.**
- **Surface (Stream or River) –**
  - **Collect from about 40 – 50 cm below.**
- **Under Ground –**
  - **Collect after pumping out sufficient water.**

METHOD OF COLLECTION

➢ PHYSICAL EXAMINATION :

- Fully cleared buckets or plastic Jaricans.

➢ CHEMICAL EXANINATION :

- Glass bottles
- >2 litres of Water

➢ BACTERIOLOGICAL EXANINATION :

- Person should be free from any disease.
- Bottle should be cleaned with H_2SO_4 then distilled water & finally sterilization is done.

WATER ANALYSIS

a) Physical test
b) Chemical test
c) Biological test

Parameters

(Range as per IS 10500; follow BIS guideline)

Physical Properties:

S. No.	Parameters	Desirable Limit	Permissible Limit
1.	Temperature	30°C	No Relaxation
2.	Colour	5 Hz	25 Hz
3.	Odour	Agreeable	Agreeable
4.	Turbidity	2 NTU	5 NTU
5.	Electrical Conductivity	100 µS	2000 µS

1. Temperature :

- Essential for all environmental studies, controls many ecological processes including chemical reactions.
- Temperature of surface water varies from space and time.
- Temperature of groundwater varies not only with reference to space and time but also with reference to depth.
- The temperature of Surface water is influenced by the atmospheric conditions.
- The temperature of groundwater is controlled by the thermal characteristics of bedrocks and the depth.

2. Colour :

- The colour of water is due to suspended particles and organic matter.
- Ranges form light to dark brown.
- Brownish colour in water comes due to the presence of iron.
- Greenish colour in pond water is seen due to the presence of organic substances including algae.

3. Odour :

- Pure water is odourless.
- When water dissolves other substances, the odour is determined by them.
- Mostly decayed organic substances give fouling smell.
- Inorganic substances give earthy smell.

4. Turbidity :

- Muddiness in water .
- It Comes due to suspended particles from clay, silt and organic matter.
- It Controls the transparency of water.
- Transparency is measured using Secchi Disc.
- Water Turbidity is measured using Nephelometer.

5.Electrical Conductivity (EC) :

- Ability of a substance to conduct an electrical current.
- The presence of charged ionic species makes water conductive.
- It is measured using EC meters.
- Directly related to temperature of water.
- Pure water is less conductive.

(Range as per IS 10500; follow BIS guideline)

Chemical Properties:

Sl. No	Parameters	Desirable Limit	Permissible Limit
1.	pH	6.5 to 8.5	No relaxation
2.	Total Dissolved Solids (TDS)	500 mg/L	2000 mg/L
3.	Hardness	200 mg/L	600 mg/L
4.	Salinity	0.5 ppt	No relaxation
5.	Alkalinity	200 mg/L	600 mg/L
6.	Dissolved Oxygen (DO)	6.5 mg/L	8 mg/L
7.	Biochemical Oxygen Demand (BOD)	2 mg/L	No relaxation

1. pH :

- It refers to effective concentration of hydrogen ions in water
- It ranges from 0 to 14
- Water is said to be acidic(less than 7) or alkaline (above 7) depending on the relative concentration of hydrogen ions from the neutral value which is 7

2. Total Dissolved Solids (TDS) :

- Concentration of non-volatile substances present in colloidal or molecular state
- Total of all ions present in water, expressed in ppm or mg/L
- Increases due to dissolution of more mineral substances by water on its path
- It determines suitability of water for use & consumption.

a) Based on Concentrations:

Major Ions (> 10 mg/L) - Mostly Bicarbonate, Calcium, Magnesium, Chloride, Sodium, Sulphate & Silicon.

- **Minor Ions (0.1-10 mg/L) -** Mostly Carbonate, Fluoride, Nitrate, Potassium, Iron, Strontium, Boron.
- **Trace Elements (< 0.1 mg/L) -** Mostly Aluminium, Arsenic, Barium, Bromide, Cadmium, Chromium, Cobalt, Copper, Lead, Zinc, Nickel, Phosphate, Silver, Tin and Vanadium.

b) Based on Ionic Charges:

- **Major Cations -** Calcium, Magnesium, Sodium, Potassium.
- **Major Anions -** Bicarbonate, Carbonate, Chloride, Sulphate, Nitrate, Phosphate.

3. Hardness :

- Hardness of water is defined as its content of metallic ions which react with sodium soaps to produce a residue.
- Expressed as total concentration of Calcium and Magnesium in ppm.
- Softwater (Temporary) and Hardwater (permanent).

4. Salinity :

- Comes due to Sodium & Chloride.
- Sea water contains 35,000 ppm or mg/L of dissolved salts.

5. Alkalinity :

- Combined effect of Bicarbonates and Carbonates with calcium ions; Carbonates will be noticeable for water having a pH of more than 8.2

6. Dissolved Oxygen (DO):

- It is related to the solubility of air in water at 0°C.
- Solubility of oxygen in water decreases with high temp.
- Important property for aquatic organisms.
- Surface water bodies should have enough DO.
- If DO depletes, it will be difficult to many aquatic organisms for their survival.

7. Biochemical Oxygen Demand (BOD):

- It is a measure of the biodegradable material.
- It is determined by incubating a water sample and measuring the decrease in dissolved oxygen as bacteria decompose these materials.

Biological Properties:

- **Microorganisms - Bacterial counts**
  - (i) Total coliform (D.L.- Absent/100 ml; P.L.- Absent/100 ml)
  - (ii) E. Coli (D.L.- Absent; P.L.- Absent)
- **Algae** (Blue green algae, brown algae, green algae found in water)
- **Viruses** (Rotaviruses, and Norwalk virus)
- **Protozoa** (Entamoeba, Giardia, and Cryptosporidium found in water)

S.No.	Parameters	Methods/Instruments
1.	pH	Electronic pH meter
2.	TDS and Conductivity	TDS/ Conductivity meter
3.	Hardness	EDTA Titrimetric Method
4.	Chloride	Titration Method
5.	Dissolve Oxygen (DO)	Winkler Method
6.	Alkalinity	Titrimetric Method
7.	Sulphate, Nitrate, Phosphate	UV Visible Spectrophotometric Method
8.	Turbidity	Turbidity Method
9.	Minerals	ICP-OES Instrumental Method
10.	Sodium, Potassium	Calibration/ Flame Photometer

NAME OF INSTRUMENT FOR WATER ANALYSIS

SPECTROPHOTOMETER

TDS METER

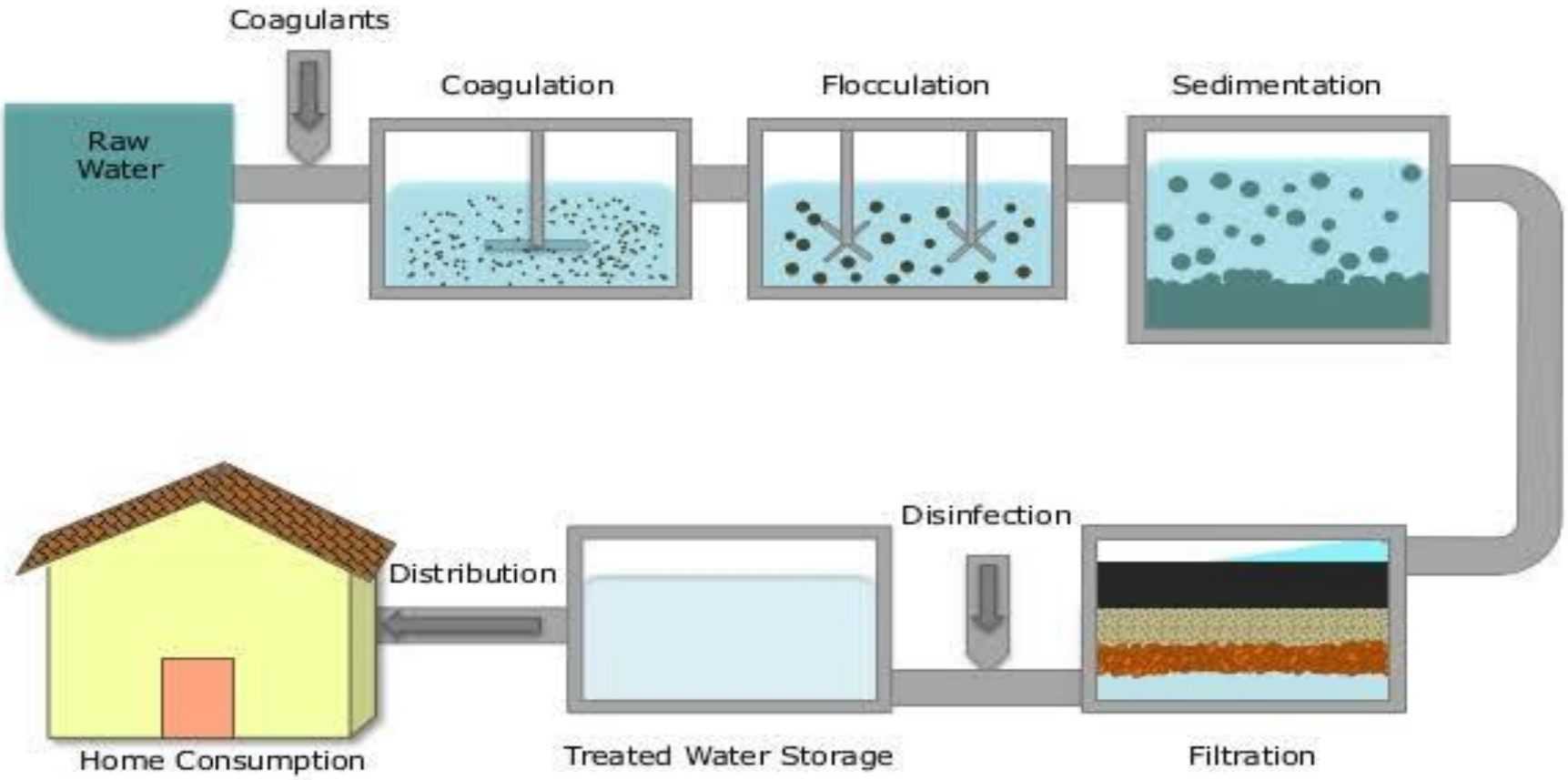
PH METER

TURBIDITY METER

Treatment Technique of Contaminated Water

1. Coagulation and Flocculation
2. Sedimentation
3. Filtration
4. Disinfection
5. Water Softeners
6. Distillation Systems

Water Treatment Process



WATER

COMPOSES 75% OF YOUR BRAIN

REGULATES YOUR BODY TEMPERATURE

MAKES UP 83% OF YOUR BLOOD

REMOVES WASTE

COMPOSES 22% OF YOUR BONES

CUSHIONS YOUR JOINTS

HELPS CARRY NUTRIENTS AND OXYGEN TO YOUR CELLS

MOISTENS OXYGEN FOR BREATHING

HELPS CONVERT FOOD TO ENERGY

PROTECTS AND CUSHIONS YOUR VITAL ORGANS

HELPS YOUR BODY ABSORB NUTRIENTS

MAKES UP 75% OF YOUR MUSCLES


Many Thanks