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SUBJECT:- WATER SUPPLY ENGINEERING

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FINAL TERM PAPER.

Q1):- Briefly describe Coagulation and Flocculation and their purposes? What Coagulants are normally used for water treatment?

Ans. **Coagulation:-**

Coagulation is the chemical water treatment process used to remove solids from water, by manipulating electrostatic charges of particles suspended in water. This process introduces small, highly charged molecules into water to destabilize the charges on particles, colloids or oily materials in suspension.

Process of Coagulation:.

Coagulation is a process used to neutralize charges and form a gelatinous mass to trap (or bridge) particles thus forming a mass large enough to settle or be trapped in the filter.

Flocculation:.

A process wherein colloids come out of suspension in the form of floc, either spontaneously or due to the addition of a clarifying agent. It is used in applications like water purification, sewage treatment, cheese production and brewing.

Purpose of Flocculation:-

Flocculants, flocculating agents (also known as flocking agents), are chemicals that promote flocculation by causing colloids and other suspended particles in liquids to aggregate, forming a floc. Flocculants are used in water treatment processes to improve the sedimentation or filterability of small particles.

Coagulant Used For water Treatment:-

Two Types of Coagulants used in water Treatment.

1) Organic Coagulants
2) Inorganic Coagulants.

1). **Organic Coagulants:-**

Organic Coagulants are generally used for solid and liquid separation and sludge generation. Organic are Coagulants.

2). **Inorganic Coagulants:-**

Inorganic Coagulants are both cost-effective and applicable for a broad variety of water and wastwater. Inorganic coagulants are particularly effective on low water with low turbidity and will often treat this type of water when organic coagulants cannot.

Q No: 2):. What are the main purpose of Water Treatment? Briefly describe difference between Slow Sand Filter and Rapid Sand filter?

Ans:. Purpose of Water Treatment :-

Water Treatment is the process of removing or reducing the concentration of particles matter, including suspended particles, parasites, bacteria, algae, viruses and fungi as well as other undesirable chemical and biological contaminants from contaminated water to produce safe and clean water for a specific purpose such as drinking, medical and pharmaceutical applications.

* Difference:.

1). Slow Sand Filters:.. (S.S.F):.

i):- Suited for rural areas because:-

2):. Simple Operation.

2):- Requires considerable space.

Characteristics:-

* Slow filtration Rate (0.1 to 0.4$m^3/m^2/hr$.)
* Bacterial Removal.
* No back Washing.
* Easy cleaning (scrapping surface layer of sand)

→ Essential Parts:.

1):. Enclosure Tank.
2):. Under drainage System.
3):. Base Material
4):. Filter media of Sand.
5):. Arrangements inside the filter.

* Working of Slow Sand Filters (S.S.F):-

→ Water from sedimentation tank is allowed to enter S.S.F through inlet chamber.

→ Descends through filter media and purified.

→ Water is then collected in the central drain of under drainage system and then to outlet chamber then to the clear water storage tank.

→ All the suspended solids are trapped in sand layers.

2). Rapid Sand Filters:(R.S.F).

→ The Disadvantage of Slow Sand filters (S.S.F) is that they require large area and the rate of filtration in low. (R.F).

→ R.F can be increased by:-

i). Increasing size of Sand (By R.S.F)

ii). By using water under pressure (By pressure filter).

Essential Parts:.

1):- Enclosure Tank.

2):- Under drainage System.

3):- Base Material.

4):- Filter Media of Sand.

5):- Appurtenances.

Q No: 3):- Why water disinfection is undertaken and what methods are normally employed for water disinfection?

Ans:- **Purpose of Disinfection:-**

Water disinfection means the removal, deactivation or killing of Pathogenic microorganisms. Microorganisms are destroyed or deactivated, resulting in termination of growth and reproduction. When microorganisms are not removed from drinking water, drinking water usage will cause people to fall ill.

Methods For Water Disinfection:-

Following are the methods for disinfection of water.

1):- Physical Method.
2):- Chemical Method
3):- Mechanical Method.

2). Physical Method:-

i):- Based on heating or boiling water at 100°C then bacteria is killed.

ii):- Ultraviolet rays are very efficient in killing all types of bacteria.

2): Chemical Method:-

Chemical Method is most commonly used compounds are chlorine and it's compounds.

3): Mechanical Method:-

i):- Method of Sedimentation in which water is allowed to stay for some time in Sedimentation Tank.

ii):- Bacteria attached to suspended particles and settle in sedimentation tank.

Q4):. Enlist various drinking water quality parameters and write down health impacts of any 5 water quality parameters if their concentrations exceed National Quality Standards?

Ans: Following are the parameters for drinking water quality.

→ Free from pathogenic (harmful bacteria).
→ Colourless and aesthetically good.
→ Non-corrosive to pipes.
→ Sufficient DO and MO and Carbonic Acid.

* **Health Impacts:**

1) → **Fluorides (F):-**

WHO Guideline = 1.5 mg/l

* F > 3 mg/l → water is polluted.
* F < 1.5 mg/l → dental carries (8-10 yr old child)
* F > 1.5 mg/l → tooth mottling (brittle) and dark.

2):- **Chlorides (Cl):-**

WHO Guideline = 250 mg/l.

It shows contamination with sewage, if (Cl > 1000 mg/l)

3):- **SO_4:-**

* WHO Guideline = 400 mg/l, It impacts laxative effects (diarrhea) It causes corrosion of sewers.

4):- **Nitrates (NO_3):-**

WHO Guideline = 45 mg/l as NO_3, 10 mg/l as N.

* If it is more than 45 mg/l causes methemoglobina. (Blue baby disease infants of 2 months old).

5):- **Lead (Pb):-**

WHO Guideline = 0.01 mg/l.

→ It causes accumulative poisoning and death.