WATER TREATMENT (incomplete)

Disinfection:

- Chlorination is most common method
- Effectiveness of chlorine is dependent on:
  - Water pH
  - Temperature
  - Contact time
  - Water clarity
  - Absence of interfering substances (e.g, **turbidity < 1 NTU**)
- pH should be 8.0 or less
- Average monthly MPN of coliform bacteria should be less than 50/100
- Recommended field tests for residual chlorine are the DPD colorimetric and SNORT methods
  - High concentrations of iron and manganese and dirty glassware can cause interference with residual chlorine readings
- **Chemical coagulation of water or of wastewater that has received biological treatment can remove 99% of viruses**
- **Diatomaceous earth filtration can remove 98% of viruses**, especially if water is pretreated
- Activated carbon is NOT suitable for virus removal
- Minimum free chlorine residual at distant points in the distribution system should be 0.2–0.5 mg/l
- Presence of ammonia, organic matter, and other chlorine-consuming materials requires a higher dosage of chlorine = high chlorine demand

Plain sedimentation is the settling or storage of water, such as would take place in a reservoir, lake, or basin, without the aid of chemicals, **preferably for a month or longer**, particularly if the source water is a sewage-polluted river water.

Coagulation, flocculation, and settling:

- **Coagulants (e.g., alum) permits particles to come together and results in formation of floc and attract materials in settling out**
- It is recommended that mixing tanks and settling basins be at least 2 in number to permit cleaning and repairs w/out interrupting treatment

Filtration:

- Primary purpose is to remove suspended materials
- **Slow sand filters are recommended for use in small communities**
- Diatomaceous earth filters are commonly used for industrial water and swimming pool water and NOT recommended for drinking water

Water treatment plant wastewater and sludge:

- Required by Clean Air Act to be adequately treated prior to discharge to a surface water course

- Common treatment processes include:
  - Drying beds
  - Lagoons
  - Freezing and thawing (natural)
  - Dewatering (chemical and/or mechanical)
- May be disposed of by:
  - Lagooning
  - Discharge to wastewater treatment plant
  - Mechanical dewatering and landfilling

- During free residual chlorination, trihalomethanes (THMs) may be formed, which are suspected of being carcinogenic.

Granular activated carbon filters:
- Used for treating water for soft drinks and bottled drinking water
- Works via adsorption
- Used in reservoirs and settling basins to exclude sunlight causing growth of algae (a.k.a., **blackout treatment**)
- Good for odor and taste removal from drinking water

Reservoir management, intake control, and stratification
- Classifications:
  - Eutrophic (productive)
  - Oligotrophic (unproductive)
- Temperature fluctuations (winter and spring when 39.2 degrees F is reached) can cause “turnover”
- Stratification into 3 layers:
  - Epilimnion
    - Top mixed zone
    - High in oxygen and algae
    - Contains **euphotic zone** and **trophogenic region**
  - **Metalimnion**
    - Middle transition zone
    - **Often the source of the best water**
  - Hypolimnion
    - Bottom zone of stagnation
    - Often deficient in oxygen
    - Contains tropholytic region

- **Pumps should be of capacity to deliver average daily water demand to the storage tank in 6–12 hrs.**

Pumping stations should be at least 3 ft above the 100-yr flood plain of the highest know level, whichever is higher.

It is recommended that water storage equal not less than 1/2 the total daily consumption, with at least 1/2 the storage in elevated tanks.