**WATER TREATMENT (incomplete)**

Disinfection:

* Chlorination is most common method
* Effectiveness of chlorine is dependent on:
  + Water pH
  + Temperature
  + Contact time
  + Water clarity
* 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.**