

Announcements

Monday 9/9

- Prof. Higgins is assigning a lab prep, check the “Lab 2” folder on Moodle.
- Blog response (shorter than a post) due on Friday by 11:59pm
- Quizz Prep Doc, due as extra credit hw by Wednesday 9/11 5pm
- Problem Set 2 posted; due Wed 9/18 in class—**it’s long!**
- Exam blueprint (*partial*) for Midterm-1 posted. Note I will add to doc as we cover material. Will be finalized one week before exam.

Chapter 1 (course notes)

Characteristics of Water

I. Physical

II. Chemical

III. Biological



Physical Characteristics of Water (in your notes)

1. Turbidity
2. Solids or Particles
3. Color
4. Taste and odor
5. Temperature

Physical Characteristics

1. Turbidity

- Optical clarity of water, resulting from light scattering by particles (high turbidity = “cloudy” or “hazy” water)
- Reported in units of nephelometric turbidity units (NTU)
- Good indicator of presence of harmful microorganisms
- WHO standard < 5 NTU
- U.S. standard < 0.3 NTU 95% of the time, never higher than 1 NTU

2. Particles or Solids

- **Total Solids TS**

- Sample dried at 103-105 °C

$$TS = \frac{\text{wt dry sample}}{\text{vol sample}}, \text{ often expressed in units of mg/L}$$

- **Total Suspended Solids TSS**

- sample filtered, sample retained on filter dried

$$TSS = \frac{\text{wt dry sample retained on filter}}{\text{vol sample}}, \text{ mg/L}$$

- **Total Dissolved Solids TDS**

- sample filtered, filtrate dried

$$TDS = \frac{\text{wt dry filtered sample}}{\text{vol sample}}, \text{ mg/L}$$

Total Solids = Fixed Solids + Volatile Solids

- Dried solids are combusted at 550 °C:
 - Fixed Solids FS (inorganic, ash)

$$FS = \frac{\text{wt sample remaining after combustion at } 550^{\circ}\text{C}}{\text{vol sample}}, \text{ mg/L}$$

- Volatile Solids VS (organic)

$$VS = TS - FS, \text{ mg/L}$$

$$\text{TSS} = \text{FSS} + \text{VSS}$$

- Dried solids retained on filter are combusted at 550 °C:
 - Fixed Suspended Solids FSS (inorganic, ash)

$$\text{FSS} = \frac{\text{wt sample on filter after combustion at } 550^{\circ}\text{C}}{\text{vol sample}}, \text{ mg/L}$$

- Volatile Suspended Solids VSS (organic)

$$\text{VSS} = \text{TSS} - \text{FSS}, \text{ mg/L}$$

$$\text{TDS} = \text{FDS} + \text{VDS}$$

- Dried solids that passed through filter are combusted at 550 °C
 - Fixed Dissolved Solids FDS (inorganic, ash)

$$\text{FDS} = \frac{\text{wt sample on filter after combustion at } 550^{\circ}\text{C}}{\text{vol sample}}, \text{ mg/L}$$

- Volatile Dissolved Solids VDS (organic)

$$\text{VDS} = \text{TDS} - \text{FDS}, \text{ mg/L}$$

I. Physical Characteristics

3. Color: Dissolved organic matter, metal ions (e.g. Fe and Mn), and turbidity

4. Taste and Odor: Dissolved organic and inorganic matter, microorganisms, water treatment process

5. Temperature: important because controls rates of reactions. In winter: 0.5 to 3 °C; in summer: 2 to 25 °C

II. Chemical Characteristics

1. Inorganic (Table 10.4, p. 402; Table 10.8, p. 408):

- calcium and magnesium in surface water,
- chloride from saltwater intrusion,
- fluoride, NO_3^{2-} , iron, manganese, and sulfur in surface water and groundwater

2. Organic (Table 10.8, p. 407):

- Synthetic, or man-made, organics—e.g fuels, cleaning solvents, pesticides
- Emerging chemicals of concern: personal care products & pharmaceuticals

III. Biological Characteristics

- Pathogens \equiv microorganisms that cause disease.
 - viruses, bacteria, protozoa, helminth (round worm)
 - EPA monitors for indicator organisms—coliforms—that are not pathogens, but are present in mammals and easy to detect and measure.
 - U.S. EPA standard < 1 coliform per 100 mL