**Water Quality**

1. **Details**

* 75% of Earth is water
  + 97.3 of the water is in our oceans, 2.7% is fresh water
* 75% of our fresh water is ice, 20% is ground water, and the rest is in our lakes and rivers… very little when you think about it…

1. **Fresh Water from Salt Water**

* Two processes may be used to obtain fresh water from salt water:
  + **Distillation** – way to costly (lots of NRG)
  + **Reverse Osmosis** – uses pressure to reverse the flow of water
    - salt water is on one side of a membrane and fresh water on the other
    - high pressure is applied to the salt water side to force the water across the membrane which traps the salt ions

1. **How Water Becomes Polluted**

* Water dissolves everything, including bad things like bacteria and viruses.
* Water that is suitable for some uses may not be suitable for others.
* See Table 6.3 in handout

1. **The Treatment of Drinking Water**
   1. **Chlorination** – it remains in the water supply and protects for a long time, can react with some ions in water
      1. They measure coliform count to detect the proper levels of Cl2
   2. **Ozonation** – it is a better treatment than chlorine but is very expensive, and does not last long
      1. **It’s an ideal treatment**: O3 for bacteria, and small amounts of Cl2 until water is consumed
   3. **Chlorine Dioxide** – ClO2, penetrates cell walls and reacts with cytoplasm in bacteria, and is left as a chlorite ion, ClO-, which is harmless

**The Quality of Water Depends on the following factors**

1. **Oxygen Demanding Wastes :** phosphate containing compounds that lead to excessive algae growth
2. **Disease Causing Pathogens:** enter water supply from sewage of animal or humans (Escherichia coli)
3. **Suspended solids**: causes cloudiness in the water
4. **Toxic Pollutants**: leak into water systems due to faulty landfill sites (pesticides, herbicides, mercury)
5. **Dissolved Salts**: road salt and fertilizer that run off
6. **Oil and Gas Contamination:** leaky tanks and improper disposal
7. **Thermal Pollution**: dumping hot water into rivers and lakes unbalancing natural ecosystems

**Pollutants & Sewage Treatment**

1. **Pollutants**
   1. MACs (maximum acceptable concentrations) are used to determine the harmfulness of pollutants
   2. See Table 6.3
   3. DDT – (dichlorodiphenyltrichloroethane) biologically magnifies in food chains
   4. Ammonium nitrate (NH4NO3) is a fertilizer that puts nitrates into water
      1. Nitrates get converted to nitrites in humans by bacteria
      2. Nitrates and phosphates produce algae in the water
2. **Sewage Treatments**
   1. Sewage can be more than 99.9% pure water
   2. Sewage can contain bacteria and heavy metal ions
   3. Sewage treatment removes hazardous materials and kills bacteria

**Primary Sewage Treatment**

* Screens filter large debris
* Wastewater then enters settling tanks to remove rocks and stones
* Sedimentation tanks have aluminum sulphate added to attach to particles in the water and cause flocs (sludge) to settle on the bottom of the tanks (flocculation)

**Secondary Sewage Treatment**

* Air is bubbled through sewage using blowers
* Aerobic bacteria break down most organic matter
* Biological sludge is removed in another sedimentation tank
* Some sludge is recycled, the rest is disposed of
* Chlorine and ozone are added to kill bacteria in the water before it is released

**Tertiary Sewage Treatment**

* Removes remaining organic materials, nutrients, and substances
* Carbon beds, reverse osmosis, chemical precipitation, electrodialysis, and ion exchange are used
* Carbon bed uses activated carbon to absorb organic chemicals

Read 8.2 and add the summary to your notes.

Complete Question 1 a to j on page 381.