



WATER PURIFICATION AND TREATMENT

Chapter 1D (p. 67- 78)

NATURAL WATER PURIFICATION (1D.1)

- The hydrologic cycle is also known as the water cycle
- Three basic processes...
 - Evaporation – water changing from a liquid to a gas (reverse process also happens...condensation)
 - Bacterial action – dissolved organic compounds converted to simple compounds by bacteria in water
 - Filtration – removal of larger suspended particles by sand and gravel



HARD WATER

- If the water is acidic (below pH of 7) at the end of the water cycle it is more likely to dissolve ions from the ground (Mg^{+2} , Fe^{+3} , and Ca^{+2})
- Having an excessive amount of any of these ions in water makes it what is known as HARD WATER.



PROBLEMS WITH HARD WATER

- Interferes with soap's ability to clean
 - Leaves soap scum (precipitate formed from hard water ions and soap together)
- Decreases ability to form suds
- Leaves deposits on pipes and appliances
 - Calcium carbonate from hard water builds up and blocks pipes/heating elements



WATER SOFTENING

- Removes hard water ions from water and minimizes problems associated with hard water
- Common ways to soften water:
 - Ion exchange resins – swap Na^{+1} ions for Ca^{+2} ions and water becomes less hard or soft
 - Na_2CO_3 added to water and same ions switch...forms a solid CaCO_3 precipitate



WATER SOFTENING LAB

- We will test 4 techniques to soften the water
- Included are:
 - Running water through filter paper
 - Running water through filter paper with sand in it
 - Running water through filter paper with Calgon in it
 - Running water through filter paper with an ion-exchange resin in it



TESTING THE WATER

- After the water is “Softened” with each technique we will test the hardness of the water by:
 - ***Precipitate test***...you will add Na_2CO_3 and then looking for a precipitate to form (if it turns cloudy
 - If a precipitate forms that means there are still Ca^{+2} ions in the water and it is NOT softened
 - ***Lather test***...you will add soap to the water, shake it up and measure the height of the suds formed
 - The more suds that form the softer the water is



MUNICIPAL WATER TREATMENT

- In addition to nature “cleaning” our water many communities have ways of helping nature to provide clean water to the residents
- This requires two cleaning steps:
 - Water must be cleaned **BEFORE** it is used
 - Water must be cleaned **AFTER** it is used (before it is dumped back into nature)



WATER TREATMENT STEPS

1. Screening...
2. Pre-chlorination...
3. Flocculation...
4. Settling...
5. Sand filtration...
6. Post-chlorination...
7. Optional treatments...
8. Aeration...
9. pH adjustments...
10. Fluoridation...



READ ABOUT EACH OF THE ABOVE AND
COMPLETE NOTE SHEET 1D.4

- Complete #1 – 4 (front side of the worksheet)

