Honors Chemistry Hour\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Dr. Wexler  
Lab: Hard and Soft Water  
Date:

**Objectives:**   
Compare different types of water   
Learn what is meant by “hard water”  
 **Special Materials:**3 large test tubes with stoppers  
distilled water (D)  
tap (lake) water (T)  
sea water (S)  
Dr. Bronner’s Castile Soap  
Ruler

**Procedure:**  
**Part I. Compare distilled, tap (lake) and sea waters for soap suds formation**A. Label 3 large test tubes D, T, and S  
B. Pipet 10mL of the corresponding liquid into each of the three tubes. Rinse the pipette in between to prevent cross-contamination of your stocks.  
C. Add exactly **2** small drops of soap to each tube using a transfer pipet. Note: do not add more than 2 drops. Stopper.  
D. Shake the test tubes ten times together, pressing lightly on the stoppers with one hand while shaking to keep them from accidentally slipping out and causing a mess.  
E. Immediately measure the height of the suds in each tube. Record your results (in cm) by filling in the data table below.  
F. Record any other observations in the second column.  
  
**Results:**

|  |  |  |
| --- | --- | --- |
| **Sample** | **Height of suds (cm)** | **Other observations** |
| D (distilled water) |  |  |
| T (tap water) |  |  |
| S (sea water) |  |  |

**Part II. Compare the density of distilled water, tap water, and sea water.**  
A. Zero an empty plastic cup on a digital scale. Make sure it reads grams.  
B. Pipet 10mL of distilled water into the cup.  
C. Record its mass in grams in the data table below.  
D. Do the same for tap water and sea water.  
E. Calculate the density of each type of water (use the formula d = m/V). Since V = 10mL, simply divide the mass by 10.

**Results:**

|  |  |  |
| --- | --- | --- |
| **Sample** | **Mass (g)** | **Density (g/mL)** |
| Distilled water |  |  |
| Tap water |  |  |
| Sea water |  |  |

**Questions:**1. Which sample had the greatest density?

2. Which sample(s) had the lowest density?

3. Which sample had the most sudsing?

4. Which sample(s) had the least sudsing?

5. What do we mean by the term hard water?

6. Which two samples represented hard water? How do we know based on sudsing?

7. Which sample was the hardest based on the amount of sudsing ?

8. What other observations did you make that were unusual when you added soap to tap water or sea water, but did not happen with distilled water? Do you think this a physical or a chemical reaction and why?

9. Based on your results, what do you think is the cause of bath tub ring? Would you see a ring if you used distilled water for your bath?