

What you need to do:

Part A. Minerals in water.

1. Clean two watch glasses.
2. To one of the clean watch glasses add about 1 mL of distilled water and to the other add about 1 mL of tap water.
3. Carefully heat the watch glasses on a hot plate at low temperature until the water evaporates. Report the appearance of each glass. What do the results signify?
4. Rinse 4 test tubes with distilled water.
5. Add about 5 mL of each type of water (Distilled, Tap, Well and Hard) to separate tubes, labeling each tube.
6. To each tube add 10 drops of BaCl_2 solution. A cloudy appearance indicates $(\text{SO}_4)^{-2}$ [sulfate ion] is present. Record the results. Write the equation for the reaction in your notebook.
7. Repeat steps 4-6, using 10 drops of AgNO_3 . A cloudy appearance indicates Cl^{-1} [chloride ion]. Record the results. Write the equation for the reaction in your notebook.
8. Repeat Steps 4-6, using 10 drops of $(\text{NH}_4)_2\text{C}_2\text{O}_4$, ammonium oxalate. A cloudy appearance indicates $(\text{Ca})^{+2}$ [calcium ion]. Record the results. Write the equation for the reaction in your notebook.

Part B. Foaming reaction with soap and detergent.

1. Add about 10 mL of distilled water and tap water to separate tubes, labeling each tube.
2. To each tube add 10 drops of soap solution. Shake well. A persistent foam is one that lasts a minute or more. If there is no persistent foam, then add 10 more drops of soap solution and shake again. Repeat (up to a maximum of 60 drops) until you get a persistent foam. Record how many milliliters of soap solution were needed. [10 drops = 0.5 mL]
3. Repeat this test, using a detergent solution instead of soap. Record how many milliliters of detergent solution were needed to give a persistent foam.

Part C. Softening hard water.

1. Create tubes of 10 mL samples of distilled water, tap water and artificial hard water, labeling each tube. To each of these, add a very small amount (half a pea) of washing soda (Na_2CO_3). Shake well to dissolve. This dissolves to form ions of Na^+ and ions of CO_3^{-2} . Then add soap solution until there is a persistent foam. How do the results compare with Part B1?
2. Repeat Step 1, using borax ($\text{Na}_2\text{B}_4\text{O}_7$) instead of washing soda. Borax will dissolve to form ions of Na^+ and ions of $\text{B}_4\text{O}_7^{-2}$. Which is more effective as a water softener, washing soda or borax?