**Making Soap**

**Background**

Soap and aspirin share in common the fact that both are familiar household items. The chemical reactions involved in their syntheses also share much in common. Aspirin is synthesized through an esterification reaction while soap is formed through the opposite reaction, the hydrolysis of an ester. Soap is formed when fat or oil, which consists of a tri-ester or triglyceride, is hydrolyzed into three carboxylate salts and a triol (glycerol).



The soap molecule is the sodium salt of a carboxylic acid. This salt functions as a good emulsifying agent (enabling oil and water to mix) because it has a long oily chain (R group) and an ionic tail (the carboxylate salt) so that one end of it dissolves the dirt or oil while the other end is water soluble.

**Procedure**

Work with a partner and setup the following reaction under the hood.

Setup a hot water bath on a hot plate under the hood.

Obtain 2 ml of cottonseed oil and place it in a 25 ml round bottomed flask. Add 2 ml of 95% EtOH, 2 ml of 6M NaOH and a magnetic stir bar. Attach a water cooled condenser and heat the mixture to reflux in your water bath. Maintain the reflux for 30 minutes.

Transfer the reaction mixture to a 50 ml Erlenmeyer flask and add 20 ml of saturated NaCl solution (to help precipitate the soap). Cool the mixture in ice and collect the soap precipitate by vacuum filtration. Rinse it with 8 ml of ice water.

Compare the effectiveness of your soap in soft and hard water as follows: Place a small piece of soap in a small test tube along with a few ml of distilled water. Shake the test tube and note the amount of suds that form. Add a pellet of calcium chloride and shake the solution again. Note any change in the amount or appearance of the suds.

Weigh your soap.

**Waste Disposal**

All filtrates and soapy solutions should be disposed of with liquid organic waste.