

CLEANING UP YOUR ACT

PRE-LAB DISCUSSION

All soap is made from fats and alkaline solutions. There are many kinds of fats, both animal and vegetable. Animal fats are usually solid at room temperature, but many vegetable fats are liquid at room temperature. Liquid cooking oils are made from vegetable fats extracted from corn, peanuts, olives, soybeans, and many other plants. When it comes to making soap, however, all different types of fats (anything from lard to exotic tropical plant oils) can be used!

Basic (alkaline) solutions all contain a metal and a hydroxide ion. The most common bases are those produced by the reaction of a group I metal plus water. These are highly water-soluble and can be used to make very strong solutions. Lye and drain cleaner are the most common alkali compounds used in every day life.

Up until the early 1900's, many people made their own soap from household waste products. They used the solid animal fats that were left over from cooking and a potash solution from wood ashes.

Making soap was a long and arduous process. First the fat had to be *rendered*, that is melted and filtered to remove any non-fat solids. Then the potash solution was added to the hot fat. Since water and oil do not mix, this mixture had to be continuously stirred and heated sufficiently to keep the fat melted. Slowly a chemical reaction called *soaponfication* would take place between the fat and the hydroxide which resulted in a liquid soap. When the fat and water no longer separated, the mixture was allowed to cool. At this point salt [sodium chloride] was added to separate the soap from the excess water. The soap came to the top, was skimmed off, and placed in wooden molds to cure. It was often aged many months to allow the reaction between the fat and hydroxide to run to completion. Poorly made soap could contain excess alkali and could dry and chap people's skin. Today laundry soaps such as "Fels Napha" soap are much like the home made soaps made by early Americans.

Today soap is made in basically the same way, but we can use a few tricks of chemistry to accelerate the process. We will start with a liquid vegetable fat [cooking or salad oil] and use alcohol to speed the process of mixing oil and a water-based solution of sodium hydroxide.

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LAB OBJECTIVE: To make a useable soap.

CHEMICALS/EQUIPMENT: Ring, ring stand, screen, Bunsen burner, stirring rod, beaker, fat [cooking oil, linseed oil, shortening], ethyl alcohol, 6M sodium hydroxide solution [lye], saturated salt solution.

PROCEDURE.

1. Place 10 ml of cooking oil, linseed oil, or melted vegetable shortening in the beaker
2. Add 10 ml of alcohol to the beaker
3. Add 5 ml of sodium hydroxide solution to the beaker
4. Heat **GENTLY** with constant stirring. If flame is too high, the alcohol vapors will ignite, followed by the cooking oil.
5. Continue heating until you can see no more oil droplets on the surface. The mixture froths easily. If this happens, stir the foam to break up the bubbles so that it does not overflow. The heating process usually takes about 10 minutes.
6. Allow the mixture to cool. The substance will be semi-solid.
7. After the mixture has cooled, add 20 ml of hot water to the beaker and stir to dissolve the substance.
8. Now add 25 ml of salt solution. Do not stir. If it does not seem to mix, swirl it gently once or twice.
9. Let the beaker stand for 5 minutes. The soap should float to the surface.

10. Skim the curds of soap from the top of the liquid and place on a paper towel. Press and form this in to a block of soap.

OBSERVATIONS

You may make observations now or allow the soap to dry and harden overnight and then make observations.

Does it smell like any soap that you may have used in the past?

Wash your hands with a small piece of your soap. Does it lather?

Does it clean your hands as well as your regular soap? Explain.

Now rinse your hands thoroughly just in case your soap contains any unreacted lye.

THINKING SCIENTIFICALLY

1. What could you add to your soap formula to make soap that would look and smell like the soaps that you buy in the stores?

2. Do you think that the type of fat used will make a difference in the produce? Why or why not?

3. Go to the store and read the ingredients label on the soaps. List the type of fat used in several different brands of soaps and/or shampoos.