Name: ___________________________________

Date: ______________________________

Partner: ____________________________________

Preparation of Soap

1. **Introduction:**
   Soap has been used to clean clothes and people for at least 4000 years. First mentioned in Babylonia about 2200 BC, it has been used on and off, in various places throughout the world, ever since. By the late 19^{th} century it was universally used in all the industrial nations of the world.

   Ordinary soap is made by the reaction of a strong base, such as NaOH or KOH, with any fat or oil. This process is called saponification. In more recent times other processes have also been developed, but the ages old method is still widely used commercially. In today's lab we will use this traditional method to make a small sample of soap and then perform a few tests on our soap sample.

   Soaps work by allowing the oils of our skin, where much dirt and grease settle, to mix with water and thus allowing the dirt to be rinsed away. This process is called emulsification. This process works because soap is a long molecule, with an ionic end which mixes readily with water, and a non-polar hydrocarbon end which mixes readily with the oils. Essentially soap acts as a sort of bridge connecting the oil (containing the dirt) with the water. The whole mixture can then be rinsed away with water.

   Water tends to bead up into small drops when placed on clean surfaces. This is because of a property called surface tension. Surface tension is why small, light insects can "walk on water". Soap is a *surfactant*, which lowers surface tension.

2. **Procedure:**
   1. **Wear goggles throughout the experiment and wear gloves. You will be handling a strong base that can cause severe burns to your skin.**

   2. Measure out 4 g of the vegetable oil provided by your instructor and place in a 100 mL beaker (or alternatively, measure 4 g of solid fat and melt it in a 100 mL beaker on a hot plate at a low setting). If using the vegetable oil, then heat this on a hot plate at a low setting.

3. Measure out 6 mL of 8.0 M NaOH and 10 mL of ethanol and place in a small beaker and mix thoroughly.

4. Add the NaOH-ethanol mixture slowly to the warm liquid fat and stir continuously while continuing to heat the mixture at a low setting. Keep the temperature low enough that the mixture does **not** boil.

5. Keep heating until all the liquid has evaporated and only the soft, white or slightly yellow soap remains. Take the beaker off the hot plate and allow it to cool for 5-10 minutes.

6. Rinse your soap with 60 mL of 1 M acetic acid, by simply pouring the acetic acid over the soap. Stir thoroughly and then decant the liquid through a Buchner funnel into a waste beaker. Scrape the soap back into the beaker.

7. Rinse your soap with 80 mL of ice cold distilled water (dissolve a small amount of ice in the water in a small beaker and then add this to your soap. Stir thoroughly and then decant the water into the waste beaker. Try to get all the water out, even if you lose a little soap. Do not remove your gloves.

3. Observations:

1. Take a small piece of your soap and place on a watch glass. Add a few drops of distilled water and stir them together. Stick a piece of red litmus paper into the mixture. Then stick a piece of blue litmus paper into the mixture. What colors did you get? Is the soap acidic or basic?

____

____

____

2. While still wearing your gloves, take a small sample of your soap in your fingers and describe its feel. Now try to wash with a little bit of water. Did your soap lather? Do you think your soap would clean your hands?

____

____

____

____

____

3. Place a few mL of distilled water in a small test tube. Add a very small piece of your soap to this water. Stir until the soap dissolves, but **<u>don't</u>** stir hard enough to produce a lather. Now, take 2 small pieces of parafilm. Using an eye-dropper, place 2 drops of distilled water on one piece and 2 drops of your soap mixture, from the test tube, on the second piece of parafilm. Compare the appearance of the drops on the 2 pieces of parafilm and describe below. Did your soap act as a surfactant? Explain.

____

____

____

____

____

____

4. Before you leave, hand this into your instructor.