

Activity Instructions

Part I - Making Soap

CAUTION - SODIUM HYDROXIDE IS VERY CAUSTIC

Before beginning this activity, make sure that everyone who is handling the sodium hydroxide is wearing gloves, a lab coat and a pair of safety goggles. For safety, the water and sodium hydroxide can be mixed beforehand by the teacher or a lab technician. For instructions on preparing the sodium hydroxide solution ahead of time, see *Prep Instructions*.

The following items will be needed for this part of the activity:

per group:

- two 500 mL beakers
- access to a microwave or hot plate
- thermometer
- access to an analytical balance
- 50 mL graduated cylinder
- stirring rod or spoon
- clear plastic wrap
- soap moulds (optional)
- vegetable shortening
- sodium hydroxide solution (see *Prep Instructions*)
- essential oils (optional)

Step 1

Weigh out 112 g of vegetable shortening and place it in a large bowl or beaker.

Step 2

Melt the vegetable shortening either in a microwave or on a hot plate. Check the temperature to see if the vegetable shortening is at 60 °C. If not, heat it until it reaches that temperature.

Saponification - Activity Instructions

Step 3

Using a 50 mL graduated cylinder, measure out 28 mL of the sodium hydroxide solution and add it to the other bowl or beaker.

Step 4

Check the temperature of the sodium hydroxide solution to make sure it is at least 40 °C. If not, heat this solution until it reaches the desired temperature.

Step 5

When the solutions are at the right temperature, carefully pour the sodium hydroxide solution into the vegetable shortening, while stirring (**Figure 1**).



Figure 1

Step 6

Mix the two solutions until the mixture thickens. Use a stirring rod or spoon and stir continuously. When the solution thickens, it will stay on top of the surface when some of the solution is dripped from a spoon. Be sure not to stir it for too long after it begins to thicken since then the mixture will not pour (**Figure 2**).



Figure 2

Step 7

Once the solution begins to thicken, add the essential oils if desired and mix them in. The essential oils will add a scent to the soap.

Step 8

Pour the soap into the mould.

Step 9

To prevent white ash from forming on the surface of the soap, cover the top with plastic wrap.

Step 10

Wait at least three weeks for the soap to cure before using it. While waiting for the soap to cure, its pH can be tested periodically using pH paper. The pH will decrease as all of the sodium hydroxide reacts with the fats. When the soap has cured, its pH will be between 7 and 10. The closer the pH is to 7, the safer it is to use.

Part II - Testing the Soap

The following items will be needed for this part of the activity:

per group:

- cured soap (see Part I)
- two beakers
- water
- ketchup
- 2 scraps of fabric

Step 1

Take the soap out of the moulds (**Figure 3**).

Step 2

Fill two beakers with water.

Step 3

Take the two dish rags or fabric scraps. Squeeze a quarter-sized amount of ketchup on each piece of fabric (**Figure 4**).



Figure 3



Figure 4

Step 4

Place each of the pieces of fabric in one of the beakers of water.

Step 5

Using the water, attempt to scrub the ketchup off both pieces of fabric.

Step 6

Rub some soap on one of the pieces of fabric and then attempt to scrub the ketchup off (**Figure 5**).



Figure 5



Figure 6

Step 7

Compare the efficiency of cleaning the fabric with soap to cleaning it with only water (**Figure 6**).