

Making Sodium Hydroxide

Student Worksheet

Name _____

Overview: Believe it or not, the same stuff found in soap also helps decompose road kill! It's a little molecule called sodium hydroxide, but it's a very powerful base.

What to Learn: After today, you should know some uses for sodium hydroxide and understand that in this experiment it was produced using a double displacement reaction.

Materials

- Erlenmeyer flask
- Alcohol burner
- Lighter
- Heating rod
- Sodium carbonate (Na_2CO_3) ([MSDS](#))
- Calcium hydroxide ($\text{Ca}(\text{OH})_2$) ([MSDS](#))
- Measuring spoon
- Measuring syringe
- Water
- Tripod stand
- Wire screen
- Chemistry stand
- Test tube holder
- Test tube rack
- Test tubes
- Filter paper
- Funnel
- Stock bottle for sodium hydroxide storage (NaOH) ([MSDS](#))

Lab Time

1. Into an Erlenmeyer flask, add the following then swirl to mix:
 - a. 2 level spoonfuls of sodium carbonate, Na_2CO_3 .
 - b. 4 level spoonfuls of calcium hydroxide, $\text{Ca}(\text{OH})_2$ (Note: be very careful NOT to inhale this dust!)
 - c. Use a measuring syringe to add 25 milliliters of water.
 - d. Put the heating rod into the mixture.
2. Set up your lab equipment:
 - a. Put a wire screen on the tripod stand.
 - b. Place the alcohol burner underneath the tripod stand.
 - c. Place the Erlenmeyer flask on the wire screen.
 - d. Attach a test tube holder to the chemistry stand.
 - e. Use the test tube holder to secure the Erlenmeyer flask.
3. With adult help, light the alcohol burner. Allow the solution to heat up.
4. While the solution is heating, prepare your funnel:

- a. Put a test tube into a test tube stand.
 - b. Fold a piece of filter paper in half. Fold it in half again.
 - c. Open the filter paper and place in the funnel. It will have a thickness of three on one side, and one on the other.
 - d. Put the funnel into the test tube.
5. When the mixture bubbles, place the lid on the alcohol burner to extinguish it, and let the apparatus cool a bit.
6. Remove the heating rod and place it on a clean paper towel away from other chemicals. Remember, it is a very strong base!
7. Using the test tube holder to clasp the top of the Erlenmeyer flask, pour the solution through the filter. The clear liquid in the test tube is the sodium hydroxide. The white sludge left in the bottom of the flask and the solids caught in the filter paper are both calcium carbonate.
8. Once the calcium carbonate has cooled down, throw it away in an outside trash can.
9. If you are saving your solution, put the clear sodium hydroxide in a blue bottle. Cap and label. Make sure to add "Warning: strong base" to your label.
10. Use litmus paper to test your sodium hydroxide. Measure a small amount into a test tube and dip in a piece of red litmus paper. Is it an acid or a base?
11. Try adding a small, measured amount of distilled white vinegar to the sodium hydroxide. Test with litmus paper. Increase the amount of vinegar added, filling out the data table as you go, until the mixture is slightly acidic. At this point the solution is safe to wash down the drain (see disposal information below).

Cleanup: We are going to clean everything thoroughly after we finish the lab. After cleaning with soap and water, rinse thoroughly. Chemists use the rule of "three" in cleaning glassware and tools. After washing, chemists rinse out all visible soap and then rinse three times more.

Storage: Place cleaned tools and glassware in their respective storage places.

Disposal: Sodium hydroxide solution must be neutralized with vinegar before washing it down the drain. *Check solution carefully with litmus paper to ensure it has been neutralized.* Solids are thrown in the trash.

Making Sodium Hydroxide Data Table

Amount of NaOH (mL)	Amount of vinegar (mL)	Is mixture an acid or base? <i>(use litmus paper)</i>

Exercises Answer the questions below:

1. What is the correct way to dispose of sodium hydroxide? Why is this so important?
2. Why is this experiment called a double displacement reaction? Use the chemical equation from this lab to explain.
3. What are three uses for sodium hydroxide?

Exercises

1. What is the correct way to dispose of sodium hydroxide? Why is this so important? (Sodium hydroxide is a strong base, so it must first be neutralized with an acid before washing it down the drain.)
2. Why is this experiment called a double displacement reaction? Use the chemical equation from this lab to explain. (The reaction was $\text{Ca}(\text{OH})_2 + \text{Na}_2\text{CO}_3 \rightarrow 2\text{NaOH} + \text{CaCO}_3$. Both the calcium ion and the sodium ion switch places, making it a double displacement reaction.)
3. What are three uses for sodium hydroxide? (Answers will vary.)

Closure: Before moving on, ask your students if they have any recommendations or unanswered questions that they can work out on their own. Brainstorming extension ideas is a great way to add more science studies to your class time.