

Making Litmus Solution and Paper

Student Worksheet

Name _____

Overview Today you'll get the lowdown on acids and bases and make your very own magical litmus paper.

What to Learn After today, you should understand what makes an acid an acid, what makes a base a base, and how to use litmus paper to tell the difference between the two.

Materials

- Test tube rack
- 2 Test tubes
- Test tube stopper
- Bottle with cap for litmus solution
- Distilled water
- Ruler
- Litmus powder ([MSDS](#))
- Measuring spoon
- Denatured alcohol ([MSDS](#))
- Pipette
- Sodium carbonate (Na_2CO_3) ([MSDS](#))
- Sodium hydrogen sulfate (NaHSO_4) ([MSDS](#)) **Sodium hydrogen sulfate is very toxic. Respect it, handle it carefully and responsibly. Do not take it for granted.**
- Scissors
- Filter paper (or paper towel or coffee filter)
- Impervious surface

Lab Time

1. Part 1: Making Litmus Solution
 - a. Put 3 cm water in a test tube (Notice the meniscus, the curve in the surface of the water. Measure from the bottom of the meniscus).
 - b. Put 3 small spoonfuls of litmus powder into the test tube. It should be a dark blue/black color.
 - c. Cap the test tube, put thumb over the top and shake away from your face.
 - d. Let sit 24 hours.
2. Part 2: Making Litmus Solution
 - a. Pour liquid into bottle, keeping the solids in the test tube (It is hard to see the difference between the liquids and solids, so go slow). This is your litmus solution. Dispose of the sludge in the trash.
 - b. Add $\frac{1}{2}$ pipette of denatured alcohol to improve the shelf life of your litmus solution. When measuring, the alcohol should come halfway into the bulb section. Cap alcohol and put out of reach.
 - c. Add the following to test tube #1: 5 cm distilled water + 1 spoon tip ($\frac{1}{2}$ of the small spoon) sodium carbonate (Na_2CO_3). Cap chemical and put aside. Cap test tube and shake to mix. Now, add 5 drops litmus solution. Cap and shake. You should see a blue/purple color, which indicates a base.
 - d. Add the following to test tube #2: 1 small spoonful sodium hydrogen sulfate (NaHSO_4).

- e. Uncap test tube #1, and pour contents into test tube #2. You should see a red color, which indicates an acid.
- f. Use your litmus solution to test other liquids. Add solution to liquids such as vinegar, lemon juice, orange juice, water + baking soda, baking soda + vinegar, and any other items you can think of to test!
- g. To clean up, flush liquids down the sink with plenty of water. Wash test tubes as thoroughly as possible.

3. Part 3: Making Litmus Paper Using Litmus Solution

- a. Cut filter paper (or thick paper towel or coffee filter) into small strips.
- b. Put on impervious surface such as pan, plastic surface, etc. because liquid will soak through.
- c. Saturate filters with 2-5 drops litmus solution. Let dry completely. This is your blue litmus paper.
- d. In a test tube, put a spoon tip of sodium hydrogen sulfate (NaHSO_4). Add 5 cm water. Cap chemical. Cap test tube and mix. Once dissolved, drop 2-3 drops on the dry, blue litmus paper. The entire paper should turn a red/pink color. Rinse in running water, and let dry. Blot to dry faster. This is your red litmus paper.

Cleanup: Clean everything thoroughly after you are finished with 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 all chemicals, cleaned tools, and glassware in their respective storage places.

Disposal: Dispose of all solid waste in the garbage. Liquids can be washed down the drain with running water. Let the water run awhile to ensure that they have been diluted and sent downstream.

Optional Experiment #1: What household items are acidic or basic? Test various liquids to see. You may be surprised. Liquids you should be sure to test are vinegar, lemon or orange juice, baking soda, and cola. Use a dropper to place drops onto the paper instead of dunking the strip into your entire carton of orange juice. Litmus flavored orange juice is not my first choice in the morning.

Optional Experiment #2: Collect soil samples from various places. Note the types of plants growing in the immediate area you are sampling from. Place about an inch of dirt in the bottom of a test tube. Fill the test tube near the top with water. Use distilled water if you have it for more accuracy. Stopper the tube and shake vigorously. Use your pipette to place drops of the water on your litmus paper and see if the soil is acidic or basic. Is there a correlation between the acidity of the soil and the plants that grow there?

Making Litmus Solution and Paper Data Table

Item/Object	Color	Acid or Base?
Sodium carbonate (NaCO_3)		
Sodium hydrogen sulfate (NaHSO_4)		

Exercises Answer the questions below:

1. Name three things you know about acids.
2. Name three things you know about bases.
3. Explain what pH stands for and what it tells us.
4. A drop of liquid was placed on blue litmus paper, and it turned red. Was the liquid an acid or a base?

Exercises

1. Name three things you know about acids. (Answers may vary but may include the following: fruits contain acids; distilled white vinegar is a weak form of acetic acid; carbonic acid is found in sodas; buttermilk contains lactic acid; acids are sour in taste; change litmus paper from blue to red; react with metals to produce a metal salt and hydrogen; react with bases to produce a salt and water; conduct electricity.)
2. Name three things you know about bases. (Answers may vary but may include the following: bases taste bitter; feel slippery; can turn red litmus paper or solution back to blue; conduct electricity when in a solution; react with acids to form salts and water; soaps and detergents are usually bases, along with house cleaning products like ammonia.)
3. Explain what pH stands for and what it tells us. (It stands for power of hydrogen, and tells if something is an acid, base, or neutral).
4. A drop of liquid was placed on blue litmus paper, and it turned red. Was the liquid an acid or a base? (acid)

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.