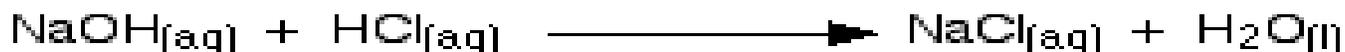


Ms. Randall

Regents Chemistry

Lab activity: Exploring Acids and Bases

**Background:** Acids and bases are encountered frequently both in chemistry and in everyday living. They have opposite properties and have the ability to cancel or neutralize each other. Acids and bases are carefully regulated in the body by the lungs, blood, and kidneys through equilibrium processes. Acids are substances which produce hydrogen ions in solution. Bases are substances which produce hydroxide ions in solution. Neutralization happens because hydrogen ions and hydroxide ions react to produce water and a neutral salt.



Both acids and bases have very distinct properties that can be used to identify them. In this activity, you will test three substances and classify them as an acid, base or neutral salt.

**Objective:** To determine if three unknown solutions are acidic, basic, or neutral using pH paper

**Pre-Lab:**

1. Calcium hydroxide is commonly known as agricultural lime and is used to adjust the soil pH. Before the lime was added to a field, the soil pH was 5. After the lime was added, the soil underwent a 100-fold decrease in hydrogen ion concentration. What is the new pH of the soil in the field?

2. A student accidentally spills an unknown chemical on her hand. She quickly washes it off, and notices that her skin feels slippery. She has an electrical conductivity tester at her lab station and tests the conductivity of the solution. It is a good conductor of electricity. She then places a strip of litmus paper in a sample of the liquid and it turns blue. She can conclude that the liquid is a

a) strong base

b) weak base

c) strong acid

d) weak acid

**Safety:** Goggles, aprons

**Materials:** spot plates, litmus paper (blue and red), pH paper, Mg ribbon, 3 unknown solutions

**Procedure:**

1. Using the materials provided determine which substance is an acid, base, salt. Create a data table to record your observations

**Analysis:**

1. If the pH of a lye solution is 8.5, what would be the color of these indicators in the lye? (Use reference Table M)

Bromcresol Green: \_\_\_\_\_ Methyl Orange: \_\_\_\_\_

2. If the pH of lemon juice is 2.0, what would be the color of these indicators in lemon juice? (Use reference Table M)

Thymol Blue: \_\_\_\_\_ Methyl Orange: \_\_\_\_\_

3. A truck carrying concentrated nitric acid overturns and spills its contents. The acid drains into a nearby pond. The pH of the pond water was 8.0 before the spill. After the spill, the pond water is 1,000 times more acidic.

- a. Name an ion in the pond water that has increased in concentration due to the spill.
- b. What is the new pH of the pond water after the spill?

4. A 0.01 M HCl solution is diluted with water to produce a thousand-fold decrease in  $H^+$  ion concentration.

- c. What is the original pH of the HCl solution?
- d. What is the new pH of the HCl solution?

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Lab conclusion: Exploring properties of Acids and Bases

1. Write a paragraph summarizing what you have learned about the scientific concept of the lab from doing the lab. Back up your statement with details from your lab experience.

2. Which solution will turn litmus from red to blue?

- A)  $\text{H}_2\text{S}(\text{aq})$                       B)  $\text{NH}_3(\text{aq})$   
C)  $\text{SO}_2(\text{aq})$                       D)  $\text{CO}_2(\text{aq})$

3. According to the Arrhenius Theory, the only negative ions in an aqueous solution of a base are

- a)  $\text{HS}^-$                       b)  $\text{H}^-$                       c)  $\text{HCO}_3^-$                       d)  $\text{OH}^-$

4. Acidic solutions are those that contain an excess of

- a)  $\text{H}_2$  molecules                      b)  $\text{H}_2\text{O}$  molecules                      c)  $\text{H}^+$  ions                      d)  $\text{OH}^-$  ions

5. A certain solution makes methyl orange turn yellow and bromothymol blue turn yellow. What are the upper and lower pH limits of the solution? (Use reference Table M)