

INVESTIGATING ACIDS AND BASES

MATERIALS

HCl	red a blue litmus paper
HC ₂ H ₃ O ₂	pH paper
NH ₄ OH	spot plate
NaOH	pippettes
Congo Red	phenolphthalein
Mg filings	conductivity apparatus
Universal Indicator	

Record all results in a data table. All solutions can be disposed of down the sink with running water. All tests are to be done on all reagents.

PART 1: CHEMICAL FORMULAS

1. In this lab you will be using HCl and HC₂H₃O₂ as acids. Other common laboratory acids include H₂SO₄ and HNO₃. What is similar about the formulas of these substances that may account for their classification as acids?
2. In this lab you will be using NaOH and NH₄OH as bases. Other common laboratory bases include KOH and Ca(OH)₂. What is similar about the formulas of these substances that may account for their classification as bases?

QUESTIONS

1. The formula for water could be written as HOH. In which group should water be placed? Explain your answer.
2. Refer to your textbook. What is the chemical definition of an acid and a base?

PART 2: INDICATORS

1. Place a drop of hydrochloric acid solution on
 - a. a strip of red litmus paper
 - b. a strip of blue litmus paper
 - c. pH paper
2. Record the results in your data table.
3. Repeat step #1 with the other three reagents. Record your results.
4. Place 20 drops of each reagent in separate wells of the spotplate.
5. Add 1-2 drops of phenolphthalein indicator to each well. Shake the tray to mix or use a stirring rod. Record the results.
6. Place 20 drops of each reagent in separate wells of the spotplate.
7. Add 1-2 drops of Congo Red indicator to each well. Mix. Record the results.

QUESTIONS

1. Based on your results, explain why litmus paper, pH paper, phenolphthalein, and Congo Red are referred to as indicators.
2. An unknown substance turns litmus paper blue. What would you expect to happen when phenolphthalein is added to a sample of the unknown? Is the unknown an acid or a base?

PART 3: ADDITIONAL PROPERTIES OF ACIDS AND BASES

1. Rub a small amount of NaOH between your thumb and forefinger. Describe what it feels like. Record the result in your data table. Wash and dry your fingers thoroughly.
2. Repeat step #1 with the other three reagents. Record your results.
3. Add enough of each reagent to separate wells so that each well is half full. Add a pea-size sample of magnesium filings to each well. Record the results. Make sure not to dump the magnesium filings down the sink!
4. Add fresh samples of each reagent to separate wells so each well is half-full. Use your conductivity apparatus to test each sample. Place the wires of the conductivity apparatus in each solution and record the current. Make sure not to let the wires touch. Immediately remove and clean the wires with water and wipe them dry.

QUESTIONS

1. Based on your results from Parts 1 & 2, list the general properties of acids in one column and the general properties of bases in another column.
2. What gas was produced in step #2? What test would you carry out to confirm your answer?
3. Why do acids and bases conduct electricity?
4. Is there any difference in conductivity between the various acids and bases? Explain.
5. An unknown substance conducts electricity and feels slippery. How would you expect it to react with metal? Is it an acid or a base?

PART 4: DILUTION

1. Add 20 drops of 1 M HCl to a clean well. We will call this well #1.
2. Remove 2 drops of acid from well #1 and place them into another well. Add 18 drops of water to this well. This will be well #2. What concentration of acid is now in this second well?
3. Remove 2 drops of acid from well #2 and place them into a third well. Add 18 drops of water to this well. What concentration is now in this third well?
4. Continue this process until you have a total of five wells. What is the concentration of acid in wells #4 and #5?
5. Add a drop of universal indicator to each well. Mix. Record the results.
6. Test each solution with the conductivity meter. Record the results.
7. Repeat steps 1-6 with the other three reagents.

8. Place 20 drops of 1M HCl into a clean well. Insert the wires from the conductivity apparatus and record your results.
9. Add 2 drops of 1 M NaOH to the same well. Mix. Record the new conductivity reading.
10. Repeat step #9 until 30 drops of NaOH have been added, two drops at a time. Record the reading on the conductivity apparatus in each case.

QUESTIONS

1. According to the universal indicator, what happens to the pH when acids are diluted?
2. According to the universal indicator, what happens to the pH of bases when they are diluted?
3. What happens when NaOH is added to HCl? Write the chemical reaction. What are the products?

PART 5: CLASSIFYING COMMON SUBSTANCES

1. Your instructor will provide you with four common household substances. Test these samples and classify each as an acid or a base. Record the test(s) used and the results.
2. Is water an acid or a base? Test the tap water and the distilled water. Record your results.

QUESTIONS

1. What test(s) did you use to identify the household substances? Why?
2. Is tap water an acid, base, or neutral?
3. Is distilled water an acid, base, or neutral?