

Comparing Acids and Bases

PROBLEM

What are the identifying characteristics of acids and bases?

INTRODUCTION

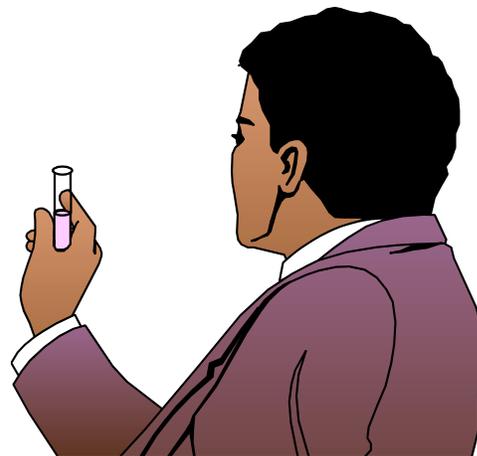
A test tube containing an acid and a test tube containing a base look the same. Scientists use indicators, substances that change color, to distinguish between acids and bases. You have probably heard that acids corrode metals. What happens if you drop a piece of metal into a test tube of acid and a piece of metal into a test tube of base? How do the pH's of acids and bases compare? In this laboratory investigation, you will examine some acids and bases and compare them with respect to several characteristics. Then you will examine an unknown substance to determine if it is an acid or a base.

MATERIALS (per group)

Acids: hydrochloric acid, sulfuric acid, nitric acid, acetic acid; Bases: sodium hydroxide, potassium hydroxide, ammonium hydroxide; forceps; graduated cylinder; hydrion paper; litmus paper; medicine dropper; methanol; phenolphthalein; test tube racks (2); test tubes (9); zinc

PROCEDURE

1. Set up two test tube racks with nine test tubes. Using a graduated cylinder, transfer about 5 mL of each of the following into separate test tubes: hydrochloric acid, sulfuric acid, nitric acid, acetic acid, sodium hydroxide, potassium hydroxide, ammonium hydroxide, methanol, and the unknown.
2. Using forceps dip a piece of red litmus into the test tube of hydrochloric acid. Then dip a piece of blue litmus into the test tube. Record your observations in the data table on the next page. If neither color changes write NO CHANGE. If both pieces of litmus are blue after the test write BLUE. If both pieces of litmus are red after the test, write RED. Repeat this procedure using fresh paper for the remaining test tubes.
3. Using forceps dip a piece of hydrion (pH) paper into the test tube of hydrochloric acid. Compare the color of the paper to the scale on the side of the container. Write the pH of the acid in the data table on the next page. Repeat this procedure using fresh paper for the remaining test tubes.
4. Using a medicine dropper, put two drops of phenolphthalein into each of the test tubes. Note the color. Record your observations in the data table on the next page.
5. Drop some mossy zinc into each of the test tubes. Look for the presence of bubbles. Note how vigorously each test tube bubbles. Record your observations on the next page.



OBSERVATIONS

Name		Formula	Litmus Test	pH (Hydrion Paper)	Phenolphthalein	Reaction with Zinc
ACID	Hydrochloric Acid	HCl				
	Sulfuric Acid	H ₂ SO ₄				
	Nitric Acid	HNO ₃				
	Acetic Acid	CH ₃ COOH				
BASE	Sodium Hydroxide	NaOH				
	Potassium Hydroxide	KOH				
	Ammonium hydroxide	NH ₄ OH				
Methanol		CH ₃ OH				
Unknown		?				

CONCLUSIONS

- Based on their formulas, what do all acids have in common? What do bases have in common? _____

- How do acids and bases compare with respect to the litmus test? _____

- How do acids and bases compare with respect to pH? _____

- What color is phenolphthalein in acid? in base? _____
- How do acids and bases compare with respect to their reaction with zinc? Why do you think this is so? _____

- Based on the reaction with zinc, how does the strength of an acid relate to pH? _____

- Methanol has a formula that is similar to a base. Is it a base? How do you know? _____

- Is the unknown an acid or a base? How do you know? _____
