

Using Acid-Base Indicators to Test Unknown Substances

Pre-Lab Discussion

The science laboratory is not the only place where acids and bases are found. Many items commonly found at home are acids or bases. For example, many of the foods you eat contain acids. Many commonly used cleaning products owe their effectiveness to the fact that they are alkaline, or contain bases.

Indicators are special chemicals that can show whether a given substance is an acid, a base, or neither. Indicators usually react with an acid or a base to form a slightly different chemical with a different color. Two examples of indicators are litmus paper (blue and red) and pH paper. Blue litmus paper turns red in an acid and stays blue in a base. Red litmus paper turns blue in a base and stays red in an acid. One type of pH paper turns a different color at each of several pH values ranging from 2 to 10.

In this investigation, you will test a number of substances using litmus paper and pH paper.

Problem

How can you determine whether a substance is an acid or a base?

Materials (per group)

5 drops of each test liquid

Glass stirring rod
Vials of red and blue litmus paper
Vial of pH paper
Distilled water

Safety

Put on a laboratory apron if one is available. Put on safety goggles. Handle all glassware carefully. Always use special caution when working with laboratory chemicals, as they may irritate the skin or cause staining of the skin or clothing. Never touch or taste any chemical unless instructed to do so. Note all safety alert symbols next to the steps in the Procedure and review the meanings of each symbol by referring to the symbol guide on page 10.

* BEFORE YOU BEGIN, MAKE A LIST OF NUMBERS
 + WRITE NAME OF LIQUID NEXT TO IT.
 Procedure THIS SHOULD CORRESPOND WITH YOUR MICROPLATE,

1. Place 5 drops of distilled water into one of the depression.
2. Dip the glass stirring rod into the depression containing the distilled water and then touch it to a piece of red litmus paper. Get a bit more on the stirring rod and touch it to a piece of blue litmus paper. Get a bit more on the rod and touch it to a piece of pH paper. Record your observations in the Data Table.
3. Based on the color change you observe in the pH paper, approximate the pH of the distilled water. Record this value in the Data Table.
4. Taking care to rinse and dry the stirring rod and graduated cylinder thoroughly, repeat steps 1 through 3 with the other substances provided by your teacher. Be sure to write the names of the substances in the Data Table.

Observations

Data Table

Substance	Color of Indicator			Approximate pH of Substance (NUMBER)	IS Substance Acid OR Base
	Blue Litmus (COLOR)	Red Litmus (COLOR)	pH Paper (COLOR)		
Distilled Water					

Analysis and Conclusions

1. Which substances are acids? _____
2. Which substances are bases? _____

Name _____ Class _____ Date _____

3. Which substances are neutral? _____

4. Which substance is probably the strongest acid? Explain your conclusion.

5. Which substance is probably the strongest base? Explain your conclusion.

6. Is litmus paper useful in determining the exact pH of a substance? Explain your answer.

Critical Thinking and Application

1. Describe three situations in which acid-base indicators might be useful in everyday life.

2. Suppose you are manufacturing a certain type of cosmetic. You know that it can be slightly acidic, but it should not be strongly acidic. Which of the indicators you have just studied will help you determine the degree of acidity? Explain your answer.

3. You may have found that the results you obtained were different from those of other groups.

What variables might have affected your results? _____

4. Design an experiment in which you could investigate which of two antacids is more effective in neutralizing stomach acid. _____

Going Further

~~DO NOT DO~~

- ~~1. Test the pH of the substances used in this investigation with different indicators: phenolphthalein, phenol red, methyl orange, bromthymol blue, red cabbage juice, and grape juice, for example.~~
- ~~2. Using indicators, test the acidity of various soils near your home or school. Find out which kinds of plants grow well in acidic soil.~~