Colorful Candy

A Chemical Demonstration

Introduction

Acids and bases play an important role in food chemistry and how food tastes. Warheads® hard candy is very popular due to its strong sour taste—what causes this intense sour taste?

Concepts

- Acids and bases
- pH indicators
- Consumer chemistry

Materials

Warheads candy

Sodium hydroxide solution, NaOH, 1 M, 6–10 drops

Universal indicator, 2 mL

Water, distilled or deionized, 200 mL

Beaker, 250-mL

Magnetic stir plate

Paper clip or stir bar

Safety Precautions

Sodium hydroxide is corrosive to body tissue. Universal indicator is an ethyl alcohol–based solution, toxic by ingestion and inhalation, and a skin irritant. It is also a flammable liquid. Use in a well-ventilated area and keep all sparks and flames away from it. Any food that is brought into a laboratory should be treated as a laboratory chemical and should not be consumed. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information. Wash hands thoroughly with soap and water before leaving the laboratory.

Procedure

1. Place 150–200 mL of distilled or deionized water into a 250-mL beaker.
2. Add 2 mL of universal indicator to the distilled or deionized water.
3. Add 1 M sodium hydroxide solution dropwise to the universal indicator solution until it just turns a bluish purple.
4. Place the beaker on a magnetic stirrer and add a metal paper clip or small stir bar to beaker and start the solution stirring slowly.
5. Carefully add one Warheads candy to the beaker and observe. The solution should begin to turn colors going from purple to blue to green to yellow-red.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. The remaining candy may be disposed of in the trash according to Flinn Suggested Disposal Method #26a. The solution can be disposed of down the drain according to Flinn Suggested Disposal Method #26b.

Tips

- If too much base is added to the universal indicator solution, the Warheads will not be able to change the pH of the solution enough to change the indicator color. A pH of around 9–10 is best—the universal indicator should be a bluish-purple color.
- This demonstration has only been tested using the Original Mega Warheads made by the Foreign Candy Company of Hull, IA and Flinn Scientific universal indicator. Other sour candies may or may not work. The formulation of the Warheads coating may also change—try the demonstration before presenting it to your class and adjust the

Publication No. 10399
061616

procedure as necessary.

- The demo can also be performed without stirring. The candy still dissolves and the solution becomes multi-colored as acid dissolves and begins to diffuse throughout the solution.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation
Content Standards: Grades 5–8
Content Standard B: Physical Science, properties and changes of properties in matter
Content Standards: Grades 9–12
Content Standard B: Physical Science, chemical reactions

Discussion

The sourness of the Warheads candy is due to a mixture of organic acids in the coating of the candy. Citric acid, malic acid, and ascorbic acid are all listed as ingredients. One characteristic of acids is their sour taste. Common examples of acidic foods are vinegar (acetic acid), lemons (citric acid) and sour milk (lactic acid).

The "explosion" of color in this demonstration is simply the dissolution of the water-soluble organic acids found in the Warheads coating. The acids lower the pH of the solution and change the color of the universal indicator. Organic acids are weak Bronstead acids and only partially dissociate in water.

Acknowledgment

Special thanks to Hope Benson, Steinert High School, Hamilton, NJ, for bringing this demonstration to our attention.

Materials for *Colorful Candy* are available from Flinn Scientific, Inc.

Catalog No.	Description
S0148	Sodium Hydroxide, 1 M, 500 mL
U0001	Universal Indicator, 100 mL
AP6067	Flinn Magnetic Stirrer

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.