Acid in the Eye

Safety Demonstration

Introduction

Demonstrate the immediate and irreversible destructive action of strong acids using egg whites as simulated eyes.

Concepts

- Goggle safety
- Reactivity of strong acids and bases

Materials

Hydrochloric, sulfuric or nitric acid, 6 M or stronger	Petri dish
Sodium bicarbonate solution, 1 M (optional)	Beral-type pipets
Sodium hydroxide, 6 M or stronger (optional)	Overhead projector or document camera
Raw eggs or egg whites	Permanent marker

Safety Precautions

Hydrochloric, nitric, and sulfuric acids as well as sodium hydroxide are all corrosive solutions that cause severe skin burns and eye damage. Nitric acid is also toxic by inhalation and shoud be used in a fume hood. Remember that any food items brought into a laboratory setting are considered chemicals and should not be ingested thereafter. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Please review current Safety Data Sheets for additional safety, handling, and disposal information.

Preparation

1. Draw a large eye on the bottom of a Petri dish using a permanent marker.
2. Gently crack open an egg and separate the egg white from the egg yolk. Place the egg white in the Petri dish.
3. Place the Petri dish on the overhead projector stage or under a document camera.

Demonstration

1. Briefly discuss the similarities between an egg white and a human eye (see *Discussion* section).
2. Using a Beral-type pipet, place several drops of acid on the egg white. It will immediately become opaque.
3. Try to "undo" the damage by gently rinsing the egg white with water or dilute sodium bicarbonate solution. The egg white cannot be made transparent again.
4. Place the cover on the Petri dish and pass it around for the students to see that the egg white/human eye is permanently damaged. Ask the students what effect this would have on their vision.
5. Repeat the experiment with other acids or sodium hydroxide solution. Concentrated nitric acid turns the egg white brilliant yellow, almost like an egg yolk. Strong solutions of sodium hydroxide do not discolor the egg whites but do solidify them. Acid solutions less than 6 M will work, but the effects are not as dramatic.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. The egg whites may be rinsed with water and then placed in the trash according to Flinn Suggested Disposal Method #26a. Any excess acid may be stored in an acid cabinet for future demonstrations.

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Discussion

Egg whites and human eyes contain an abundance of proteins. Proteins are natural polymers (also called polypeptides) formed by linking amino acids together. When subjected to strong acids, proteins undergo a process called denaturation in which they lose their native three-dimensional structures. The acid can further break down the proteins to amino acids via hydrolysis reactions. Proteins need very specific three-dimensional structures to perform their biochemical functions—denaturing or destruction of the protein structure changes the properties of a protein and is frequently irreversible.

This demonstration should convince your students of the importance of wearing chemical splash goggles anytime chemicals, heat or glassware are used. During the school year, a gentle reminder of "remember the egg white" should bring back vivid memories of this safety demonstration and the importance of wearing goggles.

Acknowledgment

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Materials for *Acid in the Eye—Safety Chemical Demonstration* are available from Flinn Scientific, Inc.

Catalog No.	Description
H0033	Hydrochloric Acid, 6 M, 500 mL
N0016	Nitric Acid, Reagent, 500 mL
S0143	Sulfuric Acid, Reagent, 500 mL
S0242	Sodium Hydroxide Solution, 6 M, 500 mL
AP3306	Standard Vented Chemical Splash Goggles
AP8739	Instructor's Chemical Splash Goggles
AP8955	Economy Choice Chemical Splash Goggles

Consult the Flinn Scientific website for current prices.