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SDS Inquiry Challenge

Teaching Safety to Students

Introduction

Verify your class can accurately use a Safety Data Sheet with this inquiry-based activity where students must correctly identify a mystery chemical.

Concepts

- Safety Data Sheets
- Laboratory safety
- Chemical properties

Materials

Hexane, C_6H_{14}, 2 mL*
Water, tap
Beral pipet, graduated
Butane safety lighter
Erlenmeyer flask, 500-mL, and stopper to fit
Safety Data Sheets
Watch glass

*Provided as "hexanes," a mixture of isomeric C_6H_{14} hydrocarbons.

Safety Precautions

The hexanes mixture is a flammable liquid and a dangerous fire risk. It may cause drowsiness or dizziness and is classified as a possible reproductive hazard. Carry out this demonstration in a hood or well-ventilated lab and avoid breathing the vapor. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Wash hands thoroughly with soap and water before leaving the laboratory. Follow all laboratory safety guidelines. Please review current Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Before students arrive in class, add 2 mL of a "mystery chemical" (hexanes) to a clean 500-mL Erlenmeyer flask using a Beral pipet. Stopper the flask.
2. When students arrive, fill the flask containing the mystery chemical with tap water.
3. Using a butane safety lighter, light the aqueous mixture on fire. Explain to students that there is another chemical that was added to the water.
4. Place a watch glass over the top of the Erlenmeyer flask to extinguish the flame.
5. Distribute Safety Data Sheets (SDS) for the following chemicals— ethylene dichloride, hexanes, and isopropyl alcohol.
6. Ask students to use the information on the SDS to determine the identity of the mystery chemical and to justify their answer in writing.

Tip

- Safety Data Sheets for all Flinn chemicals may be downloaded from the Flinn Scientific website http://www.flinnsci.com/msds-search.aspx

Discussion

Understanding where to find information in a Safety Data Sheet is an important skill for all chemistry students. In this activity, students are given Safety Data Sheets for ethylene dichloride, hexanes, and isopropyl alcohol. An ideal category to begin searching for information needed to identify the mystery chemical is in the *Hazards Identification* section under flammability. All three chemicals are classified as Category 2 flammable liquids.

Chemical Name	Flammability	Specific Gravity	Solubility in Water
Ethylene dichloride	Highly flammable	1.3	Slightly soluble
Hexanes	Highly flammable	0.66	Insoluble
Isopropyl alcohol	Highly flammable	0.79	Soluble

Students know that the water added to the flask is not flammable. Therefore, any mystery chemical present in the water or flask must be flammable and must have a lower specific gravity than water, since the mixure burns at the top of the Erlenmeyer flask. Water has a specific gravity of 1.0. The mystery chemical could not be ethylene dichloride as its specific gravity is 1.3 and the chemical would be at the bottom of the flask.

Hexanes and isopropyl alcohol are both highly flammable and have lower specific gravity values than water. Since the presence of two layers near the top of the flask may not be visible, students may think that the mystery chemical is soluble in water. However, if the mystery chemical were soluble in water there would have been 2 mL of a flammable chemical mixed with 500 mL of nonflammable water. This concentration would be much too low to cause the water to catch fire at the top of the flask. Therefore the mystery chemical must be hexanes. It is a flammable liquid, has a lower specific gravity than water, and is insoluble in water. The "mystery chemical" therefore remains at the top of the water mixture and is able to be ignited.

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 9–12
Content Standard A: Science as Inquiry
Content Standard B: Physical Science, chemical reactions

Materials for the *SDS Inquiry Challenge* are available from Flinn Scientific, Inc.

Catalog No.	Description
H0046	Hexanes, 100 mL

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