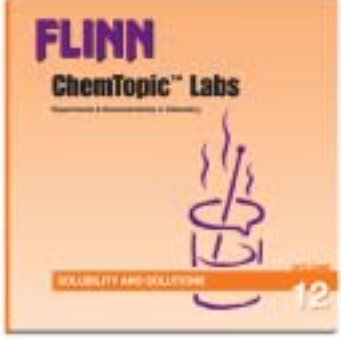
Solubility and Solutions—Experiment Summaries and Concepts



Factors Affecting Solution Formation—An Inquiry-Based Approach

Inquiry

Solutions of copper sulfate, an important agricultural chemical, are sprayed on grapes and wheat and many other plants to prevent fungus diseases. What factors will affect the rate at which copper sulfate dissolves in water? In this inquiry-based experiment, students must design a series of tests to investigate how changing the crystal size of the solute, the temperature of the solvent, or the mixing of the solution will affect the rate at which copper sulfate dissolves. The results help students understand how and why solutions form.

It's in Their Nature—Solute–Solvent Interactions

"Oil and water do not mix." This old saying is often used as a metaphor to explain why relationships between opposites are difficult or almost impossible. In this experiment, students trace this metaphor back to its source—the nature of oil and water, solutes and solvents, and the interactions between them. By studying the solubility patterns of ionic, polar, and nonpolar compounds in a variety of solvents, students learn to classify compounds and begin to understand the types of intermolecular attractive forces that exist between them.

Solubility and Temperature—A Solubility Curve

Microscale

Potassium nitrate is the classic solute used in solubility curve determinations—its solubility in water increases an incredible 1700% from 0–100 °C! The purpose of this microscale experiment is to construct a solubility curve for potassium nitrate in water by measuring saturation temperatures for six different solution concentrations. Graphical analysis of the data allows students to determine at a glance whether a solution is unsaturated, saturated or supersaturated.

Preparing and Diluting Solutions—Concentration and Absorbance

Technology

Solutions are an important part of chemistry. But how are accurate concentrations of solutions prepared? In this technology-based experiment, students practice analytical techniques as they prepare and dilute a series of copper sulfate solutions of known molarity. They then investigate the relationship between the concentration and absorbance of the solutions and use this information to determine the accuracy of their calculations and their technique.

Freezing Point Depression—How Low Can You Go?

People who live in northern states are familiar with winter and the snowy, icy roads that go with the season. Road crews spread salt and other deicing chemicals on the roads in order to lower the temperature at which freezing occurs. What solutes will have the greatest effect on the freezing point of a solution? Is it possible to cool an ice–water mixture to almost –20 °C using just sodium chloride? In this introduction to colligative properties, students measure the freezing point depression for four different solutes and learn how the concentration and number of dissolved solute particles affect the freezing point of water.

Concepts

- Solution
- Solubility
- Solute
- Solvent
- Solute and solvent
- Polar vs. nonpolar
- Intermolecular forces
- Miscibility of liquids
- Solubility
- Saturated solution
- Saturation temperature
- Solubility curve
- Concentration
- Molarity
- Dilution equation
- Absorbance
- Freezing point
- Freezing point depression
- Colligative property
- Molality

FLINN SCIENTIFIC INC. *Your Safer Source for Science Supplies*
P.O. Box 219, Batavia, IL 60510
1-800-452-1261 • Fax: (866) 452-1436
E-mail: flinn@flinnsci.com • Website: www.flinnsci.com