

**PRE-LAB DISCUSSION**

You will use two different solvents, water and alcohol, in testing the solubility of four substances. In general, solubility of solids in water increases with increasing temperature. Copper sulfate is a suitable solid to show this dependence.

A solution, which contains more solute than a saturated solution can normally hold, is called a super saturated solution. When a small crystal of a supersaturated solute is added to the solution crystal growth begins immediately and spreads throughout the entire solution.

The aqueous solutions that contain positive and negative ions are mixed and the ionic compound that is insoluble in water precipitates. This process is called precipitation reaction.

**PURPOSE**

To investigate the solubility of some substances in water and alcohol; to show the effect of temperature on the solubility of copper sulfate; to prepare a supersaturated solution of sodium acetate; to study the precipitation reaction.

**EQUIPMENT**

8 test tubes	test tube holder	burner
stirring rod	10 mL graduated cylinder	

**MATERIALS**

sugar	iodine	alcohol
distilled water	sodium chloride, NaCl	sodium sulfate, Na <sub>2</sub> SO <sub>4</sub>
lead nitrate solution, Pb(NO <sub>3</sub> ) <sub>2</sub>		potassium iodide solution, KI
sodium acetate tri hydrate, CH <sub>3</sub> COONa.3 H <sub>2</sub> O		

## PROCEDURE

### PART A: Nature of Solute and Solvent

Test the solubility of the following substances in water and in alcohol.

1. Sugar,  $C_{12}H_{22}O_{11}$
2. Sodium chloride, NaCl
3. Iodine,  $I_2$
4. Sodium sulfate,  $Na_2SO_4$

### PART B: Effect of Temperature on Solubility

1. Place two crystals of copper sulfate,  $CuSO_4$  of equal size in separate test tubes.
2. Add 8-10mL of cold water to one and equal volume of hot water to other. Record your observations.

### PART C: Super Saturation

3. Fill a clean, dry flask with solid sodium acetate tri hydrate,  $CH_3COONa \cdot 3 H_2O$ . Slowly heat the flask on a hot plate until the material completely liquefies.
4. Heat for a few minutes but do not boil. Remove the flask from the heater and carefully insert a stopper and cool it down.
5. Carefully remove the stopper from the flask and add one tiny crystal of solid sodium acetate tri hydrate.
6. Stopper the flask again and observe as the liquid in the top part of the flask begins to crystallize.
7. Note that the flask has become warmer.

## PART D: Formation of a Precipitate

1. Obtain 1mL of lead (II) nitrate,  $\text{Pb}(\text{NO}_3)_2$  and 1mL of KI solutions. Pour the solution in two different test tubes.
2. Mix the two solutions in one of the test tubes and observe the precipitate

## OBSERVATIONS AND DATA

	Substance	Solubility in water	Solubility in alcohol
PART A	Sugar		
	Sodium chloride		
	Iodine		
	Sodium sulfate		
PART B	Observations:		
PART C	Observations:		

## QUESTIONS

1. Why do some of the solutes dissolve in certain solvents?
2. Write the balanced equation for the precipitation of lead (II) iodide,  $\text{PbI}_2$ , for part D.
3. Describe the reaction of supersaturated solution and give information about the heat.