CHEMISTRY LAB: SOLIDS – CRYSTAL GROWTH

WHAT TO TURN IN: Hypothesis, Data Table #1, Data Table #2, Calculations (N/A), Error Analysis, Conclusion, Questions #1-6

INTRODUCTION

Solubility is defined as the maximum amount of a *solute* (substance being dissolved) which will dissolve in a given amount of *solvent* (substance doing the dissolving). At any given temperature, a particular solvent can normally dissolve a specific maximum quantity of a specific solute. If more than the maximum amount is added, the additional solute will not dissolve. The solution is said to be *saturated*. A solution with less than the maximum amount of dissolved solute is *unsaturated* (it has not yet been saturated).

It is possible, under certain conditions, for a solution to contain more solute that is normally contained in a saturated solution at the same temperature. This *supersaturated* solution is not stable and can be made to crystallize by adding *seed crystals* to the cold solution. Growth of new crystals can be observed.

OBJECTIVES

- To observe the growth of new layers of crystals around a "seed."
- To differentiate between unsaturated, saturated, and supersaturated solutions.

MATERIALS, PER GROUP:

Beakers (2)
Beaker tongs
Ceramic tile
Distilled water
Hotplate
Scoopula
Sodium sulfate decahydrate
Stirring rod
Test tube
Test tube rack
Weigh boat

PROCEDURE

Due to time limitations, some chemical prep work may have been done beforehand.

1) *NOTE: The distilled water may be portioned for you already. Check to see if there are pre-filled test tubes.* If not, add 10 mL of distilled water to a test tube.
2) *NOTE: The solid may be portioned out for you already. Check to see if there are weigh boats prepared.* If not, place 4.00 g of granular sodium sulfate in a clean test tube.
2) *NOTE: The boiling water bath may be set up.* Turn the hotplate on high. Using the largest beaker you have, set up a boiling water bath with tap water.
3) Using a test tube holder, gently lower the test tube into the boiling water bath. Carefully stir until all solids have dissolved. This will take some time.

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4) Remove the test tube from the boiling water bath and place in a wood or metal test tube rack.
5) Add a small portion of the seed crystals if available, or add a few grains of the original granular powder. Observe what happens; record observations in Data Table #1. (Nothing should happen to the warm solution. Ask yourself why.)
6) Prepare an ice water bath in another beaker. Place the test tube in the ice Water bath. Do not disturb for 15 minutes.
7) When the tube of solution is cold, gently remove it from the ice water bath and place in the test tube rack again, or hold it gently. Carefully add a small portion of the seed crystals, if available, or the original powder. Observe what happens; record observations in Data Table #1.
8) If you wish, you may scoop the crystals out with the stirring rod onto a paper towel and observe.
9) All solids and solutions may be rinsed down the sink.

DATA TABLE #1

Observations, step 5:
Observations, step 7:

DATA TABLE #2
Please check the appropriate column for each of the three solutions.

	SATURATED	**SUPERSATURATED**	**UNSATURATED**
Step 1 solution	_____	_____	_____
Step 3 solution	_____	_____	_____
Step 5 solution	_____	_____	_____

QUESTIONS

1) Why are supersaturated solutions so unstable?
2) Why may a supersaturated solution crystallize if handled too roughly?
3) How does this part of the lab apply to making "rock candy"?
4) Describe a simple test to determine if a solution is unsaturated, saturated, or supersaturated.
5) Give the chemical formula for sodium sulfate decahydrate.
6) Does this lab involve physical changes or chemical changes? Explain.