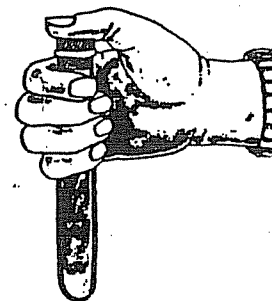


Solubility

Making Solutions

Purpose: In this lab, you will prepare unsaturated, saturated, and saturated solutions and identify these solutions by their properties.



Part A:

1. In this part, you will be using potassium nitrate. This material is used in making fertilizers, fireworks, and gunpowder. Place about 3 cm of potassium nitrate into a large test tube. Add cold water until the test tube is about half full. Put a stopper in the test tube and shake it strongly for about a minute. Put the test tube in the rack. Write down what happened when you shook the test tube.

Question 1: Is the solution saturated or unsaturated? _____
Explain.

2. Remove the stopper from the test tube. Fill a 250 mL beaker about half full of water. Set up a wire gauze and iron ring on a ring stand over a burner. Do not light the burner yet. Place the beaker of water on the wire gauze. Use a clamp to attach the test tube of potassium nitrate solution to the ring stand. Using the clamp, lower the test tube into the water in the beaker until the tube almost touches the bottom of the beaker.
3. Light the burner. Heat the beaker until the water boils. Use a stirring rod to stir the solution. Write down what happens after several minutes of boiling.
4. Drop 3 or 4 small crystals of solid potassium nitrate into the test tube containing the hot solution. Stir a moment and write down what happens.

Question 2: Is the solution saturated or unsaturated? _____
How can you tell?

5. Use the clamp as a handle. Remove the test tube from the hot water. Hold it under cold running water for 20 - 30 seconds while stirring gently. Write down what happens.

Question 3: Is the solution saturated? _____
Give a reason for your answer.

Solubility Curve of KNO_3

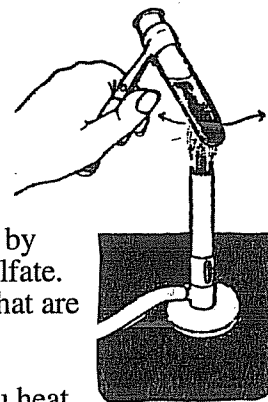
Using graphical analysis, graph the following data showing **saturated** solutions of KNO_3 and use the solubility curve produced to answer the questions:

<u>Temperature ($^{\circ}\text{C}$)</u>	<u>Grams KNO_3 dissolved in 100g H_2O</u>
0	13
20	25
40	56
60	103
80	173
100	250

Questions:

1. Define solubility:
2. What does it mean for a solution to be saturated? Use one of the data points on the curve.
3. As the temperature increases, what happens to the solubility of KNO_3 ?
4. How many grams of KNO_3 will dissolve in 100g of water at 55°C ? _____
5. At 50°C , 20g of KNO_3 is dissolved in 100g of water. The solution is (saturated, unsaturated, supersaturated) _____
6. How many grams of KNO_3 will dissolve in 50g of water at 30°C ? _____
7. If 103g are dissolved in 100g of water at 60°C , how many grams will recrystallize if the temperature is decreased to 50°C ? _____
8. What would the solubility curve of a gas look like? Does the solubility of the gas increase or decrease as the temperature is increased?

Part B:



- Place approximately 1 mL of "hypo" crystals into a test tube. Hypo is used by photographers when they develop film. Its chemical name is sodium thiosulfate. The crystals contain a large amount of water even though they look dry. What are these compounds called?
- Using a wire test tube holder, heat the test tube containing the hypo. As you heat the hypo, the water will come out of the crystals. Then the rest of the substance will dissolve in the water. Heat the hypo until all of it dissolves. When the solution begins to boil, heat it gently so it will not squirt out of the test tube. Boil the solution for a few seconds to rinse any remaining crystals from the upper part of the test tube. Turn off the burner.
- Assume that the hypo solution is saturated or almost saturated. Hold the test tube of hot liquid under cold running water. Do not shake or stir the hypo. Cool the liquid for several minutes. Then remove the test tube from the running water. Wait about ten seconds. If the test tube still feels warm, continue to cool under water a little longer. Write what happened to the solution.

Question 4: What did you expect to happen when the hot hypo solution cooled? Did you expect it to stay clear, or did you think solid crystals might form?

- Take your test tube of cool liquid to a window or near a good light. Drop a single crystal of solid hypo into the liquid. Write down what happens to the solution during the next several minutes.

Actually, the cooled solution contained more solid than it should have at that temperature. A solution like this is said to be supersaturated. A supersaturated solution is made by cooling a saturated solution rapidly and carefully. It will not stay supersaturated very long. It can be easily changed by dropping in a crystal of the solid.

Question 5: Beakers A, B, and C shown below contain solutions made by dissolving the same substance in water. The drawing shows what happens when a crystal of this substance is dropped into each beaker. Describe each of the original solutions as unsaturated, saturated, or supersaturated.

