

Solubility Curves

PROBLEM

How is the solubility of potassium nitrate measured?

INTRODUCTION

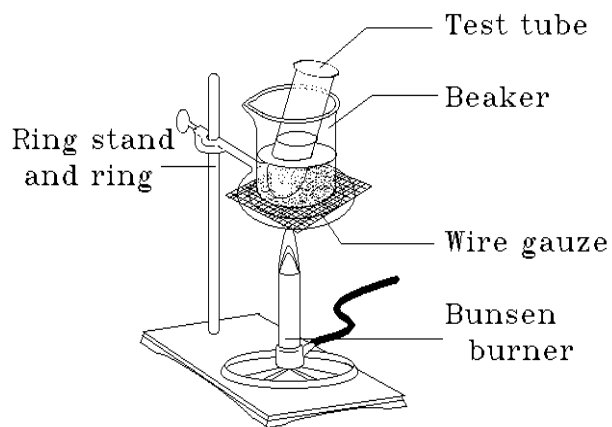
One of the *Reference Tables for Chemistry*, Table G, shows the solubility curves for several substances. In this laboratory investigation, you will determine the solubility curve for potassium nitrate by determining the minimum temperature at which premeasured amounts of the salt can dissolve in 5 mL of water.

MATERIALS (per group)

Balance; 400 mL beaker; Bunsen burner; glass marking pen; graduated cylinder; graph paper; potassium nitrate; ring stand; safety goggles; scoop; stirring rod; test tube holder; test tubes; test tube rack; thermometer; weighing paper

PROCEDURE

1. Set up a water bath like the one shown to the right. Fill the beaker about half way with water. (Don't put the test tube in the beaker until step 5 of the procedure.)
2. Put on safety goggles. Light your Bunsen burner.
3. Place a piece of weighing paper on a balance and measure out a 2 g sample of potassium nitrate. Place the sample of potassium nitrate in a test tube and label it with a glass marking pen.
4. Using a graduated cylinder, measure out 5 mL of water and add it to the test tube of potassium nitrate.
5. Put the test tube in the hot water bath and dissolve the potassium nitrate crystals with the help of a stirring rod.
6. After the crystals dissolve, remove the test tube from the water bath with the aid of a test tube holder. Allow the test tube to cool while stirring constantly with a thermometer.
7. As the test tube cools, watch for signs of crystal formation. As soon as crystals begin to form, record the temperature in the appropriate place in your data table on the next page.
8. Do a second trial by repeating steps 5-7.
9. Measure the temperature at which different masses of potassium nitrate dissolve by repeating steps 3-8 using the following masses of potassium nitrate: 3 g; 4 g; 5 g; 6 g; and 7 g.
10. On a separate sheet of graph paper, prepare a graph showing the solubility of potassium nitrate in 100 g (100 mL) of water with temperature on the X-axis and grams of dissolved solute on the Y-axis. Remember your measurements were made in 5 mL of water. Since 100 g of water can dissolve 20 times as much solute at each temperature, multiply the masses of the dissolved solute by 20 before plotting your points. Draw the best curve through the points.



OBSERVATIONS

Dissolved Solute (per 5 mL of water)	Dissolved Solute (per 100 g of water)	Temperature	
		Trial 1	Trial 2
2 g			
3 g			
4 g			
5 g			
6 g			
7 g			

CONCLUSIONS

1. What happened to the solubility of potassium nitrate as the temperature of the water increased? _____
2. Based on the solubility curve you drew, how much potassium nitrate can dissolve in 100 g of water at 60°C? _____
3. Based on the solubility curve in Table G, how much potassium nitrate can dissolve in 100 g of water at 60°C? _____
4. Compare several points on the curve that you drew to the curve for potassium nitrate on Table G. How does the curve that you drew compare to the one shown on Table G? What are some possible sources of error that might explain the differences? _____

5. Describe the procedure used to determine the solubility of potassium nitrate. _____

