

PURPOSE

To prepare a supersaturated solution of a salt and observe the effect of adding a small seed crystal to it.

BACKGROUND

Perhaps you've made rock candy by placing a string in a sugar solution and letting the sugar crystallize on the string. But did you know this candy-making method will work only with a particular kind of sugar solution? Under certain conditions, a solution may contain more solute than is normally contained in a saturated solution at the same temperature. This type of solution is unstable and is called *supersaturated*. The addition of a single crystal of solute often causes the excess solute to crystallize. You must use a supersaturated solution when making rock candy. The addition of a string disturbs the unstable solution and begins the crystallization.

The solubility of most substances decreases as temperature decreases. This fact sometimes leads to the formation of supersaturated solutions. As the solution cools, the excess solute may or may not crystallize out. If the excess solute remains in the solution, the solution becomes supersaturated.

In this experiment, you will make a supersaturated solution and observe the effect of adding a seed crystal to it.

MATERIALS (PER PAIR)

safety goggles	1 gas burner
1 medium test tube	centigram balance
1 test-tube rack	sodium sulfate decahydrate,
1 test-tube holder	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
1 100-mL beaker	ice
1 10-mL graduated cylinder	distilled water

SAFETY FIRST!

In this lab, observe all precautions, especially the ones listed below. If you see a safety icon beside a step in the procedure, refer to the list below for its meaning.



Caution: Wear your safety goggles. (All steps.)



Caution: Do not touch hot equipment. (Step 2.)



Caution: Exercise care when working with an open flame. Tie back hair and loose clothing. Do not use burner near flammable materials. (Step 2.)



Caution: Never heat only the bottom of a test tube. Make sure to warm the bottom and sides of the tube evenly. (Step 2.)



Note: Return or dispose of all materials according to the instructions of your teacher. (Step 5.)

PROCEDURE

As you perform the experiment, record your observations in Data Table 1.

1. Place 5 g of Na_2SO_4 in a clean large test tube. Add 10 ml of distilled water.
2. Hold the test tube in a test-tube holder and heat it in a burner flame, agitating the mixture gently until the solid has dissolved. **CAUTION:** *When heating a test tube, never point the mouth of the tube at yourself or anyone else.* If after several minutes the solid does not completely dissolve, allow the solid to settle and decant the liquid while hot.
3. Place the test tube in a test tube rack. Add one more crystal of Na_2SO_4 to the warmed solution and gently agitate it. Record your observations in Table 1.
4. Allow the solution to cool slowly undisturbed for 20 minutes. Keep an eye on the solution. If crystals start to form you will need to reheat and cool the tube again.
5. Place the test tube in a beaker of ice. When the solution is cold, add one crystal of Na_2SO_4 . Describe what you see. Touch the bottom of the tube to the palm of your hand. Record your observations in Table 1.

OBSERVATIONS

DATA TABLE 1: OBSERVATIONS	
Step	Observations
3	
5	

ANALYSES AND CONCLUSIONS

1. Why is it necessary to heat the mixture in Step 2 of the procedure?

2. Is the solution unsaturated, saturated, or supersaturated at the end of Step 3? Explain.

3. Is the solution unsaturated, saturated, or supersaturated at the end of Step 4? Give evidence for your answer.

