CHAPTER 3

LAB ACTIVITY

Growing Crystals

For additional activities, see Laboratory Investigations booklet.

If you left a glass of distilled water and a glass of sea water to evaporate, you would obtain quite different results. The glass that held the sea water would contain evidence of previously dissolved salts and minerals.

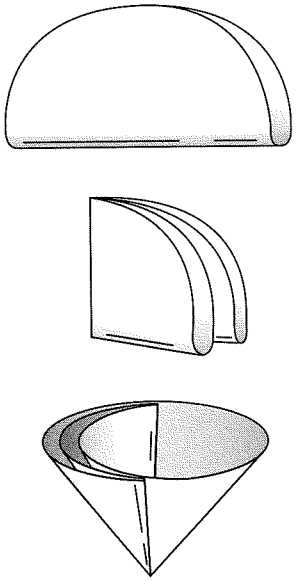
When solutions containing dissolved solids, such as salt water or sea water, are allowed to evaporate, a solid will slowly come out of solution. The solid that forms often is called a *crystal* and has a definite shape. In this activity, you will observe the formation of a crystal from a simple solution.

Lab Skills and Objectives

- To **observe** the formation of a crystal
- To **identify** variables that affect crystal growth
- To **evaluate** the shape of crystals

Materials

- safety goggles
- lab apron
- two 250-mL beakers
- 150-mL distilled water
- 20 g ammonium alum
- 10 cm of thread
- wood splint
- stirring rod
- balance
- hot plate
- 250-mL graduated cylinder
- wax pencil
- seed crystals of ammonium alum
- funnel, 75 mm diameter
- filter paper for 75 mm funnel
- paper towel
- scissors
- graph paper
- masking tape



3.18 Folding filter paper.

Procedure

Part A

1. **Put on your safety goggles and laboratory apron.**
2. Write your name on one of the 250-mL beakers with a wax pencil. Set this beaker aside until Step 7.
3. Place the other 250-mL beaker on the balance. Determine the mass of the empty beaker.
4. Add 20 grams to the mass of the empty beaker by setting the riders on the balance to that mass. Carefully add ammonium alum to the empty beaker until the balance is zeroed again. Remove the beaker from the balance.
5. Measure 150-mL of distilled water into a graduated cylinder. Carefully pour the distilled water into the beaker with the ammonium alum.
6. Place the beaker with the ammonium alum on a hot plate. Set the heat on *low*. Use a stirring rod to stir the solution until it is clear and no ammonium alum remains on the bottom of the beaker. *Do not* try to hurry the process by turning up the hot plate. The ammonium alum must dissolve slowly.

CAUTION: Do not touch the hot plate while heating the solution.

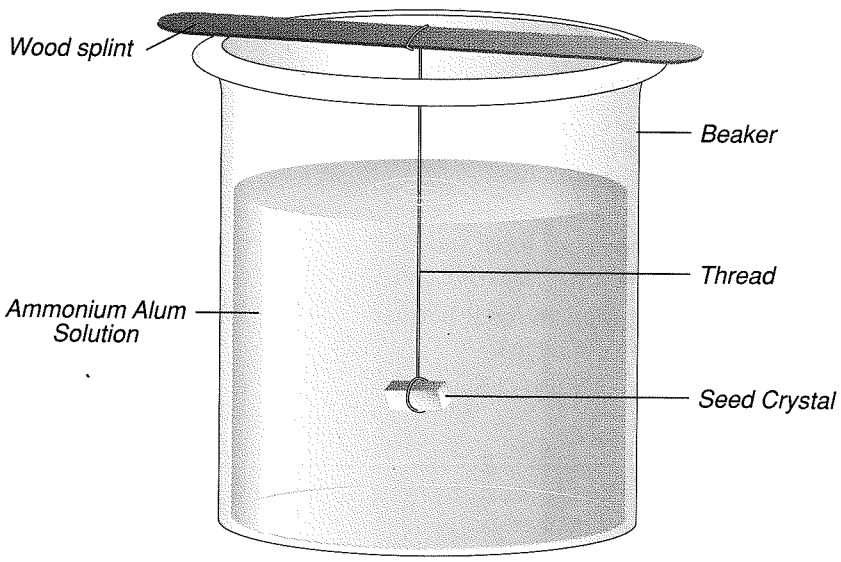
7. Fold the filter paper and arrange it in a funnel as shown in Figure 3.18. Place the funnel and filter paper in the 250-mL beaker with your name on it.
8. Set this beaker on the hot plate to warm. Carefully pour the solution of ammonium alum into the funnel.
9. Once filtering is completed, remove the beaker from the hot plate and set it in the area designated by your teacher.
10. Use scissors to cut a square of paper towel large enough to cover the top of the beaker. Gently lay the cut towel on the beaker.
11. Use scissors to cut out 1/4 sheet of graph paper. Place the graph paper behind the beaker so that the grid on the paper can be seen through the liquid in the beaker. Tape the graph paper to the beaker.
12. Tie a 10-cm piece of thread around a seed crystal of ammonium alum. Be sure it is tied securely.
13. Tie the other end of the thread to the middle of a wood splint. Be careful to adjust the length of your thread so that when the wood splint is placed on top of the beaker, the crystal will be suspended in the center of the solution. *Do not place your seed crystal in the solution yet.*
14. Set the seed crystal beside your beaker. Do not put it in the beaker until Day 2.

Part B

1. After waiting one day for the solution to reach room temperature, carefully lift the paper towel from the top of the beaker. Lay the wood splint on top of the beaker, suspending the seed crystal in the solution.
2. Observe the suspended crystal each day for 7 class days. Make a sketch of what you see. Use the graph paper grid behind the beaker to help you draw the size and shape of the crystal correctly. Label each sketch with the day of the observation, for example, *Day 1, Day 2,* and so on.
3. After day 7, remove your crystal and clean up all materials.
4. Answer the questions in *Analysis and Conclusions.*

Analysis and Conclusions

1. Why was the piece of paper towel placed over the beaker? Identify at least two functions that it served.
2. What would have happened to the seed crystal if it had been placed in the warm solution the first day?
3. What was the source of material for the crystal?
4. A cube is a six-sided figure in which each of the sides are squares. As your crystal grew, did it resemble a cube on any day?
5. An octahedron is an eight-sided figure in which each side is a triangle. How closely did your final crystal resemble an octahedron?
6. Seed crystals grown in the bottom of a beaker are often only the top half of a crystal. Why wouldn't the other half grow?



3.19 Equipment setup for Part B.