

Instructions for Growing Your Own Snow Crystals

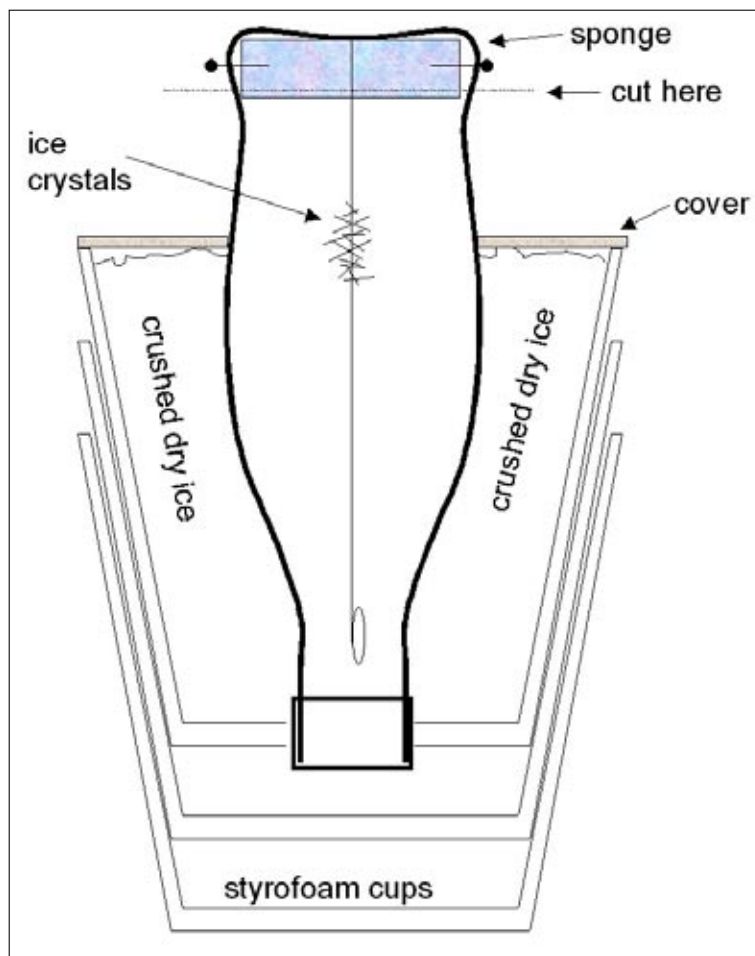
It is simple, inexpensive, and fun to grow your own snow crystals using little more than some dry ice, a plastic soda bottle, and some polystyrene foam cups. This page describes how to set up this experiment, and what you can expect to see.

The Apparatus

Materials:

- One used, 20-oz plastic soda bottle (prepared with a small hinge)
- Three large-diameter polystyrene foam cups
- Small kitchen sponge (1/2 inch thick)
- Short length of nylon fishing line (thinner is better; one-pound test is good)
- Strong sewing needle
- Pushpin
- Four straight pins
- Paper clip
- Paper towels

Step 1: Get a soda bottle that has been prepared with a hinge about 1/2 inch above the bottom. Poke a hole in the center of the bottom of the bottle using the pushpin, and also poke four holes in the side of the bottom. Make a small round sponge to fit inside the bottom of the bottle, and hold the sponge in place by putting the four straight pins into the side holes you made (see figure).



Step 2: Thread the fishing line through the sewing needle. Push the needle through the hole in the bottom of the bottle and through the sponge. Attach the fishing line to the bottom of the bottle with a piece of tape, and tie a knot in the other end to hold the paper clip. When the soda bottle is inverted and reassembled, the string should swing freely inside the bottle, as shown in the figure.

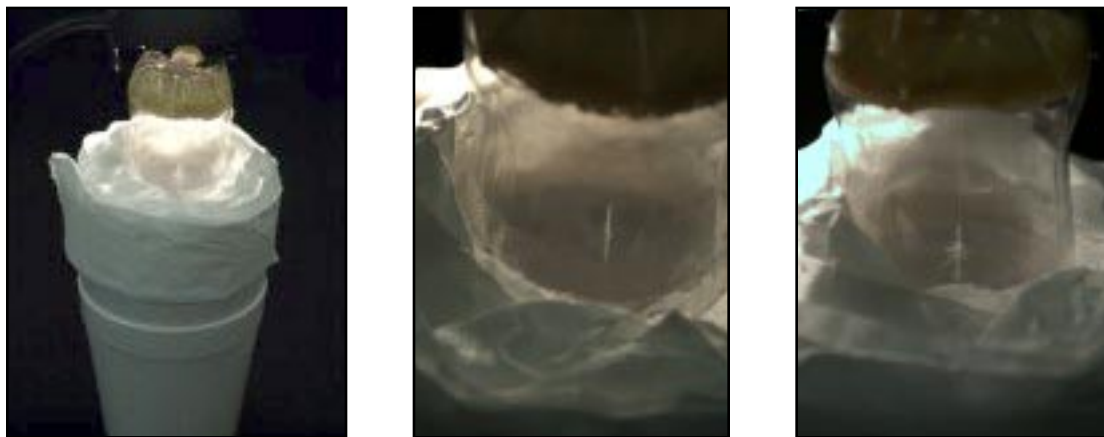
Step 3: Place the inverted soda bottle inside the three polystyrene foam cups, as shown, so that the bottom of the soda label is at the same height as the top of the cups (see figure). There should be about one inch of clear space between the sides of the soda bottle and the top edge of the polystyrene foam cups. Your snow crystal growth chamber, which should now look like the one shown in the figure, is ready to grow some snow crystals.

A Source of Cold

- Step 4. To cool down the apparatus, you will use crushed dry ice. To begin, pull the top off the chamber (the bottom of the bottle and the sponge), wet the sponge with tap water, and then replace it.
- Step 5. Ask your teacher to fill your polystyrene foam cups to the top with crushed dry ice. Cover the cups with a piece of cardboard cut to fit the cup opening, or with some paper towel strips. It's also a good idea to wrap some paper towels around the top of the polystyrene foam cups to keep them from "sweating." Be sure to add as much dry ice as you can to the cups, and then add more dry ice every so often. If the experiment doesn't work, it's probably because the dry ice level is too low.
- Step 6. Observe! Small ice crystals should begin forming on the string after 5 to 10 minutes. After 20 minutes, you should have a pretty good bunch of crystals. A magnifying glass is useful but not essential for crystal viewing. When things get crowded, you can pull the top off the chamber, wipe the string clear with your fingers, and try again. You should also knock the crystals off the walls of the chamber—swinging the paper clip around accomplishes this nicely. The dry ice in your cups will last about six hours, and more can be added as needed.

What You Will See

Here are some images of what you can expect:



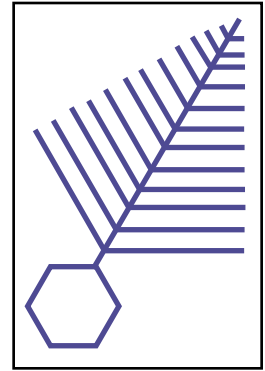
The first image shows the whole apparatus, lit from behind to give it a nice glow. The second image shows a growth of ice crystals four minutes after the string was inserted into the chamber. The third shows the same collection of crystals seven minutes later.

Fishbones and Dendrites

If you look closely, you can observe both needle-like and plate-like growth in your growth chamber. The easiest forms to identify are the dendrites that form at -15°C , especially if you let the crystals grow to a large size. Above those will be the fishbones, which are a type of needle growth that grows at -5°C .

Dendrites

This schematic diagram on the right shows what a -15°C dendrite should look like. It has a distinctive fern-like character, and the angles between the branches and the stem are nearly exactly 60 degrees. The hexagonal plate in the sketch shows you the crystal orientation.



Fishbones

The -5°C fishbones are harder to recognize, since they don't exhibit the nice 60° angles like the dendrites. The crystals have a feather-like appearance, and each of the individual branches is a needle-like crystal growing along the a-axis. The photo below shows a particularly good fishbone example grown in a soda-bottle growth chamber.

