

TSAAPT

Texas Section of the American Association of Physics Teachers

Connecting physics teachers in the state of Texas

Cloud in a Bottle

What to do?

Spray a small amount of air freshener into the two liter bottle containing a small amount of water. Immediately screw the cap with the valve stem tightly onto the bottle and mix the water and air freshener. Use the bicycle pump to pump the bottle up to a gauge pressure of about 2 atm and swirl the bottle again. Allow the bottle to cool to room temperature. Quickly release the pressure in the container. A cloud should form.

What's going on?

Clouds form when air becomes supersaturated with water vapor and there are condensation nuclei to start drop formation. Pumping the air heats the bottle increasing the vapor pressure of the water. Releasing the pressure cools the air and it becomes supersaturated. The air freshener provides condensation nuclei.

How do I build it?

Materials: Two liter soda bottle (It is a good idea to remove the ring that was originally used to seal the cap), valve stem (can be obtained at an auto parts store), bicycle pump with built in pressure gauge, air freshener (informed opinion is that Glade Powder Fresh works best)

Tools: You will need a drill to attach the valve stem to the cap and possibly wrenches, pliers, and Teflon tape depending on the type of valve stem you get.

Assembly: Attach the valve stem to the cap according to the directions that come with the valve stem.

Enrichment

You can observe convection currents in the cloud and a bright source behind will produce a rainbow