



Try This at Home Science:

Cloud in a Bottle

Activity Overview:

Make your own cloud inside of a bottle

Materials:

- Empty single-use bottle with screw cap
- Small amount of warm-hot water
- Match
- Adult assistance

Try this!

1. Open the empty water bottle and add a splash of hot water into the bottom of the bottle.
2. Add about 1" of warm-hot water into the bottle.
3. With an adult's assistance, light a match and drop it into the bottle.
4. Quickly screw the cap back on, keeping as much smoke in the bottle as possible.
5. Squeeze the bottle repeatedly until condensation forms inside the bottle.
6. Observe and enjoy your cloud in a bottle.
7. Rinse out and recycle your bottle.

What's happening?

The warm-hot water in the bottle is already in an excited state, creating water vapor. This means that once we add a match and put the contents under pressure by squeezing the bottle, we can excite the molecules further. Once the pressure is released the molecules cool slightly and condense, forming a cloud.

The smoke from the match acts as something called the condensation nuclei, a particle which gives water vapor a place to attach to within the clouds. These particles can include smoke, dust, pollution, or even ice crystals. When the contents are under pressure from squeezing, the smoke molecules interact with the excited water vapor molecules. Friction is created as the molecules bump against each other and increases the temperature within the bottle. Additionally, the increase in pressure and temperature causes more of the water in the bottle of the bottle to evaporate.

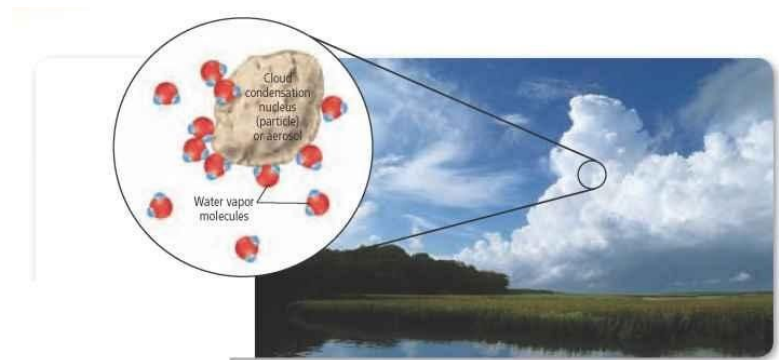


Once the pressure is released, or the bottle is not being squeezed, the molecules slow down and are not as excited. The temperature in the bottle decreases enough for condensation to occur. Water droplets on the side of the bottle may be observed, but once the squeezing process has been repeated enough times a cloud will form in the middle of the bottle. This is because enough of the water vapor molecules have attached to the smoke molecules or the condensation nuclei for observation.

How does this relate to how clouds actually form?

When the Sun warms collections of water on Earth, like ponds, lakes, puddles and oceans, the temperature of the water increases, causing the molecules to become excited and evaporate into water vapor. As the water molecules are warmer than the Earth's surface, they will rise into the atmosphere until they reach cooler temperatures.

At this point, if there are condensation nuclei (dust particles, ice crystals, pollutions, etc.) present, the water vapor will attach to the nuclei which form clouds. Once the nuclei have had enough water vapor condense on it, the mass becomes too great to continue to be held up by the cloud,



and the process of precipitation begins. Precipitation can come in many forms including rain, sleet, snow, freezing rain, and hail and what we observe on the surface of Earth is determined by the air temperatures between the clouds and the ground.

Now try...

- Use cold water in the bottom of the bottle and repeat the experiment. What did you notice?
- Use hot water in the bottom of the bottle and repeat the experiment wearing oven mitts for safety. What did you notice?
- Repeat the original experiment, but change the number of matches used to create the condensation nuclei. Did you notice a difference?

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