Cloud in a Jar Water Cycle Demo

Materials

- large clear glass jar - at least one gallon, preferably larger
- gallon-sized storage bag or plastic wrap
- large rubber band
- wooden match
- ice cubes
- very hot water

Overview and Explanation

Clouds are formed when rising moist air cools. The water molecules condense around particles of dust or smoke forming water droplets. In this demonstration, you will create a mini cloud in a glass jar using hot water, a lit match, and ice.

Teacher Notes

This is a teacher demonstration that involves hot water and requires you to light a match. Be sure to keep students a safe distance away from the demonstration until after you drop the match into the jar. Follow all safety precautions outlined by your school or district.

The specific directions will depend on the size of your jar and the availability of very hot water. If you can boil a few cups of water in a microwave to add just before you begin, you'll have much better results. Practice the demo at home so that you can tweak the directions for your specific materials.

Procedure

1. A few minutes before you begin the demo, warm the jar by partially filling it with hot water. Leave the water in the jar until right before you are ready to use it.
2. Put a handful of ice cubes into the plastic bag or a pouch made from plastic wrap. Keep the bag of ice handy so you can grab it during step 5 of the activity.
3. When you are ready to begin the demo, swirl the warm water around the sides of the jar to clear any condensation. Then pour out that water and pour several cups of very hot or boiling water back into the jar.
4. Light the match and drop it into the jar. The water will extinguish the flame and a small amount of smoke will rise from the surface of the water.
5. Quickly place the bag or plastic pouch with the ice cubes over the top of the jar so that it hangs down into the jar slightly. Pull the sides of the plastic bag down over the mouth of the jar and secure with a rubber band or the jar lid.

6. Allow students to move closer to the jar to observe the formation of the cloud. If you look closely, you'll see the warm moist air condensing and swirling in the area near the top of the jar where it comes in contact with the bag of ice. Watch the jar for several minutes and it will fill with a mini cloud.

7. If you wait long enough, you will also see precipitation inside the jar as the water droplets become so large that they drip from the bottom of the plastic bag. Remind students that the bag of ice isn't leaking; the dripping water is from the warm, moist air inside the jar cooling and condensing. Eventually the water droplets become so big and heavy that they are pulled down by gravity.

Follow-up Questions

- What does each part of the cloud in a jar system represent in the real water cycle? (Answer: Hot water in the bottom of the jar represents water on the earth's surface; ice cubes at the top of the jar represent cooler atmosphere at high elevations; smoke from match is the particles in the atmosphere from both natural and man-made sources: water dripping from the top is precipitation)
- How is the process of creating a mini cloud <u>similar</u> to the way real clouds are formed? (Answer: Rising moist air cools and condenses around particles in the air forming water droplets. Droplets collect and fall as precipitation.)
- How is the process of creating a mini cloud <u>different</u> from the way real clouds are formed? (Answer: Water sources on the earth are not hot, the sun provides the energy for the natural water cycle, there are no ice cubes in the atmosphere, particles in the air could be from dust, pollution, forest fires, etc.)
- Did you see any precipitation in the jar? If so, what caused it? (Water dripping from the bag forms when moist air rises, cools, and condenses into droplets. The droplets gather together and become heavy and then gravity pulls them down.)
- Where in the jar did evaporation, condensation, and precipitation occur? (Evaporation - water molecules escape from the surface of the hot water and become water vapor; condensation - cooling water vapor condenses into liquid water at the top of the jar where it's cool; precipitation - water dripping from the ice)

Science Journal Prompt

Draw and label the parts of the Mini Water Cycle demonstration. Then explain what caused the cloud to form inside the jar. Use the words condensation, evaporation, and precipitation in your explanation.