





**NOTE:** To view other Earth Science-Related videos, go to [www.TeacherTube.com](http://www.TeacherTube.com) and type “Rod Benson” into the search box.

This inquiry-based lab takes about 30 minutes for my ninth grade Earth Science students to complete. We do the lab after the students have learned about humidity, relative humidity and the dew point. It goes well if the students work in pairs.

#### **A DEMONSTRATION TO DO BEFORE THE LAB**

To learn how to do an impressive cloud demonstration, go to RODNEY’S HOMEPAGE For Earth Science teachers at <http://formontana.net/home.html>

A video of this demonstration is posted on the **Teacher Tube web site**. Type the name “Rod Benson” into the search box to find this, as well as several other Earth Science videos.

**ANSWERS TO THE PRE-LAB QUESTIONS:** Do these together, or give the students a few minutes to do them, and then go over them before doing the lab.

1. The air above a lake with very warm water will have more vapor in it.
2. Dew point
3. Warmer . . . You can demonstrate this by placing an aquarium (strip-type) thermometer in a 2 liter bottle, putting the lid on, and squeezing. The compression should cause the temperature to rise.
4. It cools.
5. Particles that provide a surface for water molecules to condense on as they change from vapor to liquid.

#### **BEFORE THEY BEGIN THE LAB:**

1. Demonstrate the technique used to get smoke into the bottle. Read over Trial #1 and #2. Tilt the bottle as much as you can without spilling the water. Holding the match at the opening of the bottle, blow the match out, and then hold it in the opening of the bottle for a couple seconds.

2. Also, tell the students to hold the bottle between their face and a light source for best viewing as they begin squeezing and releasing.

3. On trials 3 and 4, if students have a problem with condensation making it difficult to see inside the bottle, they can simply roll the bottle gently, allowing the water to rinse away the condensation on the inside of the bottle.

4. Provide funnels for students to use for pouring. This will help to minimize spillage.

5. I provide two stations where students can get water for the lab. One is a cooler of ice water, and at the other I set several beakers of hot water near a microwave. If you have really hot tap water this will work also.

#### **EXPECTED RESULTS**

Trial #1: a cloud should not form here

Trial #2: a very faint cloud may form here

Trial #3: a faint cloud may form here

Trial #4: students should see a fairly good cloud here

#### **ANSWERS TO FOLLOW-UP QUESTIONS**

1. trial #4

2. yes

3. low pressure (by releasing)

4. hot water

5. vapor + condensation nuclei (smoke) + cooling (pressure decrease) = cloud

6. smoke

7. The air was warmed above its dew point, so the cloud droplets evaporated.
8. water droplets, ice crystals
9. cools it
10. A, D, F, H, I (The key here is to look for any mention of air rising and/or low pressure.) The tough one is “I” because there is no mention of rising air or low pressure. If they get stuck, ask them what happens to the warmer air along a cold front.

**A DEMONSTRATION TO DO AFTER THE LAB (the next day)**

Fill a large plastic juice bottle with very hot water. Let it set for about 5-10 minutes. Pour most of the water out. (Leave a little water in the bottle in case you need to rinse condensation away.) Use a match to put some smoke into the container. Put the lid on tightly. Turn off the lights in the room and turn on an overhead projector. Holding the bottle over the projector, squeeze for several seconds and then release to cause a cloud to form. Doing it over the projector makes it much more impressive.

Next move the lid and squeeze puffs of air into the lighted area above the projector (where you usually set transparencies). You will see clouds form as the room air cools the warmer, humid air. This is similar to what happens in the winter when you can “see your breath” as you exhale.

For more ideas go to

**RODNEY’S HOMEPAGE For Earth Science Teachers**

[www.formontana.net/home.html](http://www.formontana.net/home.html)