

Indoor Rain Clouds

Overview: Today you get to vaporize liquid oceans of molecules and make it rain when the rising cloud decks hit the coldness of space. Sound like fun?

What to Learn: The movement of atmospheres on different planets is affected by the temperature of the planet and the molecules in the atmosphere.

Materials

- Glass of ice water
- Glass of hot water
- Towel
- Ruler

Experiment

1. Please be careful with this lab! The hot water can burn you!
2. Take two clear glasses that fit snugly together when stacked. (Cylindrical glasses with straight sides work well.)
3. Fill one glass half-full with ice water and the other half-full with very hot water (definitely an adult job – and take care not to shatter the glass with the hot water!). Be sure to leave enough air space for the clouds to form in the hot glass.
4. Place the cold glass directly on top of the hot glass and wait several minutes. If the seal holds between the glasses, a rain cloud will form just below the bottom of the cold glass, and it actually rains inside the glass! (You can use a damp towel around the rim to help make a better seal if needed.)
5. Complete the data table. Measure the water height carefully with your ruler. If you have 2” of water in the hot water glass, then write 2”. Please be careful when measuring hot water!

Indoor Rain Clouds Data Table

Hot Water Height	Ice Water Height	How well did it rain?

Reading

This experiment demonstrates state changes of matter. When hot vapor rises (like from the hot core of a gaseous planet) and hits a cold front (like the coldness of outer space in the upper atmosphere), the vapor condenses into liquid drops and rains, or can even freeze solid into ice chunks. Neptune and Uranus both have methane ice in their upper atmospheres. Both Jupiter and Saturn have upper cloud decks of water vapor and clouds of ammonia. The water vapor clouds are right at the freezing temperature of water.

Questions to Answer

1. Which combination made it rain the best? Why did this work?
2. Draw your experimental diagram, labeling the different components:
3. Add in labels for the different phases of matter. Can you identify all three states of matter in your experiment?

Answers to Exercises: Indoor Rain Clouds

1. Which combination made it rain the best? Why did this work? (The greater the temperature difference, the better this experiment will work. The more water you have, the less the temperature will fluctuate for each glass, thus making it able to rain for longer periods of time.)
2. Draw your experimental diagram here, labeling the different components:
3. Add in labels for the different phases of matter. Can you identify all three states of matter in your experiment? (Ice = solid; water = liquid, gas between two glasses is water vapor, nitrogen, and oxygen.)