Lesson 4 - Rain Formation

How Rain Forms

Estimated Lesson Time: 20 minutes

Introduction

In order for precipitation to form, particularly over a large area, several ingredients are necessary. First there must be a source of moisture. The primary moisture sources in the U.S. are the Atlantic Ocean, Pacific Ocean and the Gulf of Mexico. Winds around high and low pressure systems transport this moisture inland.

Once the moisture is in place, clouds still need to form. The most effective way this occurs is when air is lifted. This can be accomplished when air is forced to rise near fronts and low pressure areas. Air rises through evaporation.

Cloud droplets and/or ice crystals are too small and too light to fall to the ground as precipitation. So there must be a process for the cloud water, or ice, to grow large enough to fall as precipitation. This occurs by condensation.

One process is called the “warm rain process”. In this process, collisions occur between cloud droplets of varying sizes, and they stick together, forming larger drops. When the drops become too large to be suspended in the air, they fall to the ground as rain.

The other process is the “ice crystal process”. This occurs in colder clouds when both ice crystals and water droplets are present. In this situation, it is “easier” for water vapor to deposit directly onto ice crystals so they grow at the expense of the water droplets. The crystals eventually become heavy enough to fall. If it is cold near the surface it may snow, otherwise the snowflakes melt to become raindrops. Remember: Evaporation, Condensation, Precipitation.

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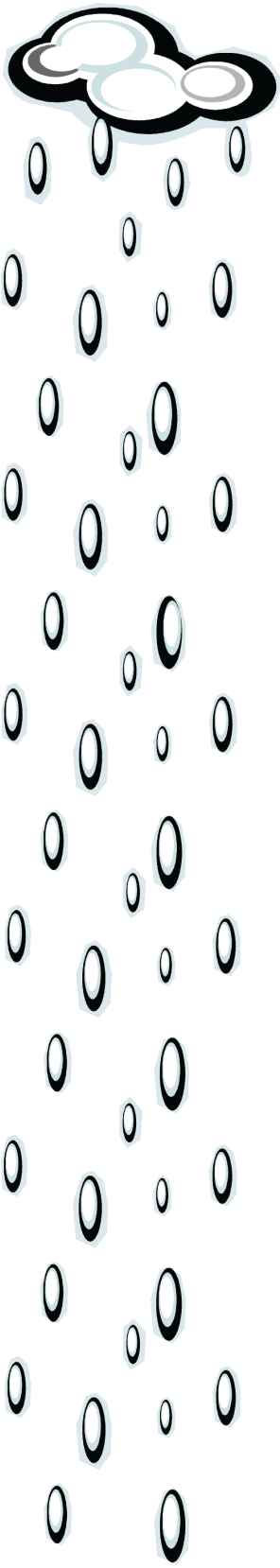
Activity - The Rain Man



Materials

Mayonnaise size glass jars/canning jars
Resealable sandwich bags
Ice cubes, enough to fill each sandwich bag about halfway

Objective and Overview

Demonstrate the concept of precipitation. The students will see the hydrologic cycle in action as the water evaporates and condenses to form rain.

Construction

1. Add about two inches of hot tap water to your glass jar.
2. Add the ice cubes to the sandwich bag and seal the bag.
3. Place the sealed sandwich bag over the mouth of the jar, allowing one end of the bag to form a tip inside of the jar, like the picture on the right. This will allow the condensed water to collect at one location.
4. After a few minutes, the water (rain) will begin to drip from the sandwich bag, returning to the water in the jar, like rainfall.

Discussion

Only about 0.3% of all water on the earth is found in the atmosphere, and only a small fraction of that is seen as rain. Most of the water in the atmosphere is in the gas state called water vapor. While the hydrologic cylcle is essential for life due to the water it brings, the vast amount of water in the cycle is found in the oceans, lakes and ground water.

Fast Facts

One inch of rain equals...
5.6 gallons of water per square yard (weighing 46.8 lbs)

27,104 gallons of water per acre (weighing as much as 226 horses!)

17.4 million gallons of water per square mile (weighing more than some cruise ships!)