3. *Precipitation*

OBJECTIVES: After completing this lesson, a student should be able to:

* **Define METEOROLOGY and METEOROLOGIST**
* **Differentiate PRECIPITATION TYPES**
* **Distinguish WARM and COLD clouds (Grades 4-8)**

TEACHER BACKGROUND: *(Grades 1-8)*

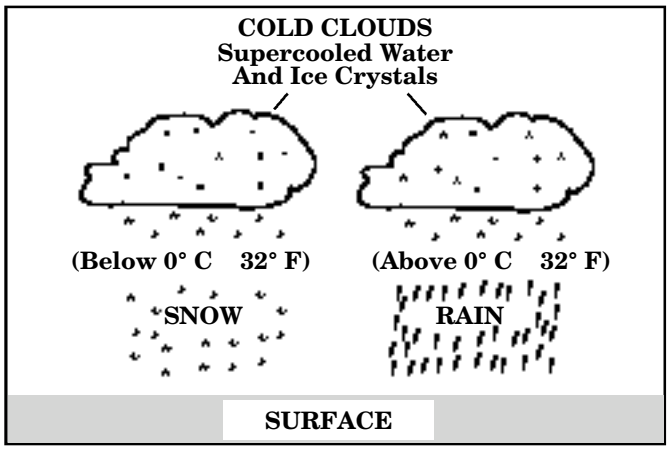
Have you ever wondered how **METEOROLOGY, the study of the atmosphere and weather** got its name? Around the year 340 B.C., the Greek philosopher, Aristotle, wrote a book called *Meteorlogica*. In it, Aristotle labeled all objects falling from the sky, such as rain, snow and hail, as *meteors*. Today, we use the word **PRECIPITATION to mean solid or liquid moisture falling from the sky.** Rain, snow, sleet, freezing rain and hail are all types of precipitation. Most clouds do not produce precipitation because a combination of unique circumstances must occur in order for precipitation to fall.

RAIN occurs when water droplets within a cloud grow too large and too heavy to remain suspended in the cloud and fall to the ground. SNOW forms when ice crystals grow at the expense of water droplets and become heavy enough to fall to earth. If the crystals fall into freezing air temperatures, the crystals hit the earth as snow. If the crystals fall into warm air that is above freezing, the crystals melt and hit the earth as rain.

A German **METEOROLOGIST, a scientist who studies the atmosphere and weather,** discovered COLD CLOUDS. Within cold clouds, water droplets AND ice crystals exist together. (When water and ice exist together in a cloud, we call the cloud "supercooled.") The discovery found that when water and ice coexist, the water is attracted to the ice and, at certain temperatures, snow is formed.

Additional notes for grades 4-8:

Clouds are divided into two categories. WARM CLOUDS exist at temperatures above the freezing point and COLD CLOUDS exist at or below freezing. As discussed in lesson 1, a cloud results when moisture forms on tiny particles suspended in air. In WARM clouds, water droplets that become large and heavy begin to fall. These droplets collide with smaller droplets to form a large raindrop.



As the figure above indicates, however, rain or snow can fall from a COLD CLOUD. Even in summer, a COLD cumulonimbus cloud (thunderstorm) can have snow at the top! The frozen precipitation melts into rain as it falls into warmer air. **SLEET is rain that freezes as it falls though a layer of freezing temperatures on the way down.** Sleet makes a familiar rattle as it hits nearby windows, doors and cars. **FREEZING RAIN is rain that freezes only after it hits a frozen surface such as cars, trees, wires and roads.**

Precipitation

GRADES 1-3

INTRODUCTORY: *PRECIPITATION*

Tell your class that you want to make a list on the board of all objects that fall from the sky. See how soon they can name all types of precipitation and only label those as such. Ask if they can explain the differences in types. Discuss the crucial point of freezing by proceeding to the next ADVANCED exercise.

ADVANCED: *WATER CYCLE*

Assemble one glass jar filled with tap water, one filled with ice cubes and a third (oven-proof) glass jar filled with boiling water on a portable burner. Be sure the boiling water is releasing steam. Ask students to name each form of moisture. What are the differences and similarities? Name examples of each form in the atmosphere. (water = rain, ice = snow and hail, steam = clouds and fog)

GRADES 4-8

INTRODUCTORY: *DUSTY RAIN*

Applying concepts of precipitation formation with moisture, dust, salt particles, volcanic ash or pollution, ask students to look at a U.S. map and identify areas that might experience the heaviest amounts of precipitation. Can they name those cities or states? Give reasons why those areas might have more precipitation.

ADVANCED: *MAKING RAINDROPS*

Fill a METAL can (students can bring their own) with water at room temperature. Making sure the outside of the can is dry, drop ice in the water. (Adding salt lowers the temperature quicker.) Observe the outside of the can. What atmospheric substance is the can playing? (dust) If salt is used, ask in what product might salt be used for production. (making ice cream)

MAKE A CLASSROOM RAIN SHOWER (Time: 20-30 minutes) **GRADES 1-8**

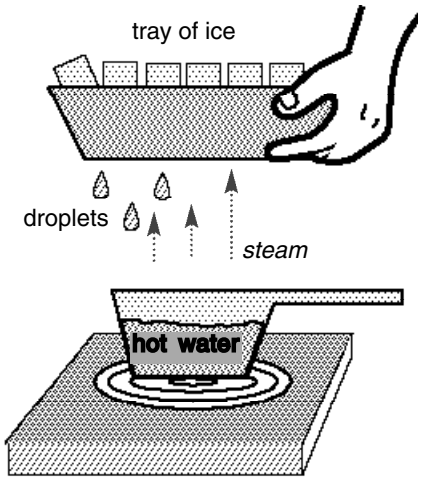
Materials: A portable burner, pan of water, a clear glass or plastic tray at least 30 by 30 cm (12" by 12") and ice to cover the tray

Preparation: While bringing the pan of water to a boil, cover at least half of the plastic tray with ice. *WARNING: Only the teacher should handle the burner and boiling water.*

Procedure: With plenty of steam rising, hold the tray of ice above the pan so rising steam hits the tray of ice. What happens to the tray? Continue holding the tray until large droplets form and fall. It's a rain shower!

Evaluation: Describe the steps in the precipitation process. How are they duplicated in this experiment? (Primary students can review the three states of water in this experiment.)

Excursion: What would happen if it was freezing in the room? (Frozen drops would result.)



WEATHERSCHOOL QUESTION:
Obtain the question and correct answer from your local Weatherschool TV channel!