

7. Temperature

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

- * Define **TEMPERATURE**
- * Read a thermometer in **CELSIUS** or **FAHRENHEIT**
- * Explain temperature's role in the **WATER CYCLE** (Grades 4-8)

TEACHER BACKGROUND: (Grades 1-8)

Of all of the measurements we will be taking in this unit, temperature is the most familiar. This is because we are most sensitive to how hot or cold we are on a given day. **TEMPERATURE** is the degree of how hot or cold a substance is. Grades 4-8 students who are familiar with the molecular make-up of substances can understand that temperature is a measure of the average speed of molecules. As the heat within a substance increases, molecules within that substance move faster and the temperature increases. If heat is removed, the molecules move slower and the temperature decreases.

A **THERMOMETER** is an instrument, usually including mercury or red-colored alcohol, that measures temperature. The temperature can be read on either the Celsius or Fahrenheit scales. (See appendix.) As the temperature increases, liquid within the thermometer tube expands and rises. As the temperature decreases, the liquid contracts and moves down the tube.

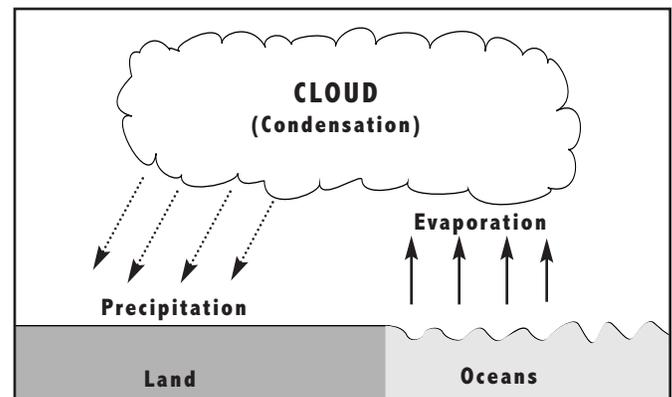
Additional notes for grades 4-8:

When water is heated, its molecules reach a high speed and break away from the liquid surface to enter the atmosphere. This is *evaporation*. **EVAPORATION** is when liquid water changes to vapor. **CONDENSATION** is the process in reverse. **CONDENSATION** occurs when water vapor changes to the liquid state. Vapor becomes liquid as the vapor cools and the movement of its molecules slows.

Temperature plays a major role in the operation of a continuous cycle on Earth. The sun's heat evaporates liquid water from the oceans into vapor. The vapor cools and condenses into clouds which produce precipitation such as rain or snow. This is known as the water cycle.

The **WATER CYCLE** is the constant exchange of water among the earth, atmosphere and oceans.

Although the figure represents the main components of the cycle, it is important to keep in mind that there are other components of the cycle. For instance, the figure does not represent the countless number of lakes,



streams and rivers on the surface of the earth or the role that tremendous amounts of vegetation play in the cycle's operation. Most of the water evaporated into the atmosphere comes from the oceans. If all of the water vapor in the atmosphere fell to Earth as rain, the globe would be covered with only about 2.5 cm (1") of water. Yet, the water cycle circulates enough water for most areas by efficiently moving water between the earth, atmosphere and oceans. This would not be possible without temperature changes that produce evaporation and condensation.

Temperature Activity

GRADES 1-3

INTRODUCTORY: THERMOMETER

Present a thermometer in class and discuss its uses. Have each student read the thermometer at different times and locations. (See appendix for conversion table.) Place the thermometer in the sun, in the shade, in a bucket of water and on a blacktop surface. Which readings are warmer and cooler? Why?

ADVANCED: TEMPERATURE GRAPH

Construct a wall chart with days of the month or school year across the bottom and the temperature scale top to bottom along the left margin. Following temperature readings taken at the same time each day, have students place a bar graph representing today's temperature. Compare the bar graphs over a period of one week, one month, one season.

GRADES 4-8

INTRODUCTORY: THERMOGRAPH

Ask students to construct a paper graph. Write the days of the week across the bottom and the temperature scale top to bottom along the left margin. (See appendix for conversion table.) Read the thermometer daily and place a point on the graph representing the temperature. Connect points for the weekly temperature trend.

ADVANCED: TEMPERATURE EXTREMES

Take temperature readings in several substances including a mixture of water and crushed ice, water at room temperature and a boiling pot of water. What are the freezing and boiling points of water? How does molecular movement differ between solid ice and vigorously boiling water? How does the movement of the molecules in these substances correspond to the temperature?

MAKE A "THERMOMETER TOWER" (Time: 30-45 minutes) GRADES 4-8

Materials: At least 3 thermometers and 3 paper towel tubes to hold the thermometers, aluminum foil, tape, a broom handle or a 2" x 2" board five feet or longer, tacks

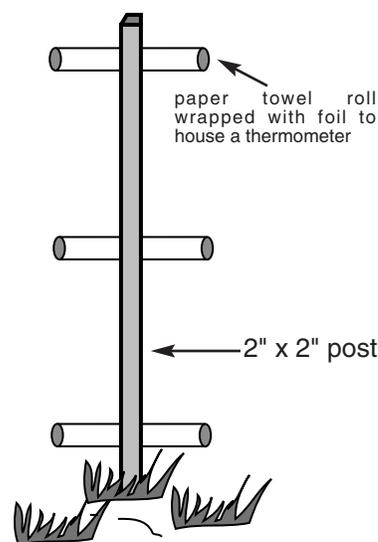
Preparation: Wrap each paper towel tube with the foil, shiny side out. Stand the board vertically (or place in the ground). Place a piece of tape around the center of the roll, leaving an extra tape tab to "hang" the roll on the post. Mount the tubes horizontally at different levels by tacking the tape tab of each tube to the post. Place a thermometer in each of the tubes.

Procedure: Regularly record the temperature at each level.

Evaluation: Does the temperature vary with height? Why or why not? Do clouds or the wind affect the temperatures?

Excursions: Place your thermometer tower over other types of ground cover (concrete, sand or water). Are there any changes in the temperature pattern?

Computers: Students should take daily temperature readings, load them into the computer program and record them on their observation sheets.



WEATHERSCHOOL QUESTION:

The hottest U.S. temperature was recorded in: A. Arizona B. California C. Florida
Obtain the answer tonight on your Weatherschool television channel!