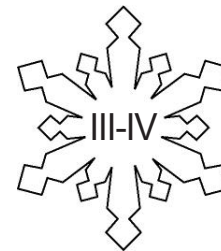


Measuring Humidity

Levels



Grades 5-8

Overview:

During this activity, students will use a psychrometer to measure humidity in the classroom.

Objectives:

The student will measure classroom humidity using a psychrometer.

GLEs Addressed:

Science

- [5-8] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [6] SD3.1 The student demonstrates an understanding of cycles influences by energy from the sun and by Earth's position and motion in our solar system by connecting the water cycle to weather phenomena.

Materials:

- Psychrometer (1 per group)
- Cardstock or heavy paper (1 per group)
- STUDENT LAB PACKET: "Measuring Humidity"

Activity Procedure:

1. Divide students into groups and distribute the psychrometers students built previously. Remind students that psychrometers are used to measure relative humidity. Relative humidity is a measure of the amount of moisture in the air relative to the amount of moisture air can hold. Psychrometers have two bulb thermometers: one bulb is wet and the other is dry. The wet bulb temperature is compared to the dry bulb temperature to determine the relative humidity of the air.
2. Ask students what feels colder: a bare dry hand or a bare wet hand. Explain that the wet hand is colder because the water is using the hand's heat energy to change from a liquid to a gas. As the water evaporates, and the heat energy is sapped, the hand cools. This cooling effect is the reason a psychrometer works.
3. Distribute the STUDENT LAB PACKETS: "Measuring Humidity" and cardstock. Explain that during this activity students will use the psychrometers they built to measure the humidity of the classroom.
4. Explain that when water is a gas suspended in the air, it is called water vapor. Clouds are made of water vapor that has cooled and condensed to become liquid or ice. When the condensed water or ice in a cloud becomes too heavy to float in the air, it drops to the ground as rain or snow (precipitation). Discuss noticeable signs of dry and moist air (dry skin and static-filled hair vs. shiny hair and healthy skin).
5. Discuss the testable question and background information. Ask students to complete the hypothesis portion of the lab packet, then follow the instructions in the packet to measure the humidity of the classroom.
6. When students have recorded wet and dry bulb temperatures, demonstrate how to use the difference between the temperatures and the dry bulb temperature to find the relative humidity using the Relative Humidity Table (see directions in lab packet).

7. Discuss student conclusions. Groups may have reached different conclusions. If so, find the average of the data sets.
8. Ask students to complete the Further Questions portion of the lab packet.

Teacher Note: If the humidity were 100%, both bulbs would be the same temperature.

Answers to Student Lab Packets:

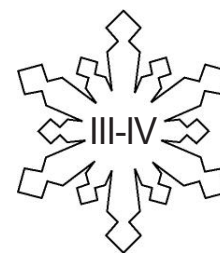
- 1.-5. Answers will vary. All questions should be completed.
6. The wet thermometer registered a cooler temperature because the water evaporated off the fabric wrapped around the bulb, which caused a cooling effect.
7. 100%
8. Psychrometer

Name: _____

Measuring Humidity

Student Lab Packet (page 1 of 3)

Levels



Testable Question:

What is the relative humidity of this room?

Background Information:

Relative humidity is a measure of the amount of moisture in the air relative to the amount of moisture air can hold, and is expressed as a percent. Air at 50% relative humidity is holding half the moisture it can hold. Relative humidity can range from 0%, or very dry air, to 100%, or fully saturated air. When air becomes fully saturated, it rains, snows or gets foggy. Warm air can hold more water vapor (moisture) than cold air.

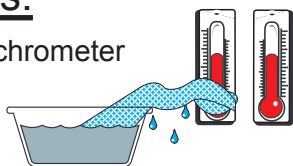
People's bodies respond to the amount of moisture in the air. When the air is dry, people often experience bloody noses, static-filled hair, dry skin and chapped lips. When the air is moist, people experience smooth, shiny hair and healthy skin without using lotion. A psychrometer is used to precisely measure relative humidity.

Hypothesis:

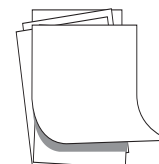
I predict that the relative humidity of the room is _____ percent.

Materials:

- Psychrometer



- Piece of heavy paper for fanning



Procedure:

1. Lay the two thermometers side by side on the table. Allow the water to wick up to the bulb of the muslin-wrapped thermometer. This will take about five minutes.
2. Begin fanning the thermometers with a piece of heavy paper. Watch the temperature readings on both thermometers.
2. When the wet-bulb temperature is steady (after about 5 minutes of fanning) write both temperature readings in degrees Fahrenheit in the "Data" section below.

Data:

1. Dry bulb temperature in degrees Fahrenheit. (a) _____ ° F

2. Wet bulb temperature in degrees Fahrenheit. (b) _____ ° F

Name: _____

Measuring Humidity

Student Lab Packet (page 2 of 3)

Analysis of Data:

3. Subtract the wet bulb temperature from the dry bulb temperature.

$$(a) - (b) = (c) \text{ _____ } ^\circ \text{ F}$$

Find the Relative Humidity by following these steps:

Step 1: Find the dry bulb minus wet bulb temperature in the first column of the Relative Humidity Table that matches your answer to question #3. Place a finger on this number.

Step 2: Find the dry bulb temperature in the second column of the Relative Humidity Table that matches your answer to question #1. Place another finger on this number.

Step 3: Trace your fingers from left to right and top to bottom until they meet. Put an "x" on this spot in the chart. Determine if your "x" is in a black or gray ribbon on the chart.

Step 4: Follow the ribbon that contains your "x" to the "relative humidity in percent" column.

Relative Humidity Table

Column I	Column II							Column III	
DRY-BULB MINUS WET-BULB TEMPERATURE	DRY-BULB TEMPERATURE							RELATIVE HUMIDITY IN PERCENT	
	30	40	50	60	70	80	90	100	
0								100	
1								90	
2								80	
3								70	
4								60	
5								50	
6								40	
7								30	
8								20	
9								10	
10								5	
12								0	
14									
16									
18									
20									
25									
30									
35									
40									
45									

Name: _____

Measuring Humidity

Student Lab Packet (page 3 of 3)

Conclusion:

4. What is the relative humidity of the air in the room? _____
5. Was your hypothesis proved or disproved? Explain how you came to this conclusion.

6. Why did the wet bulb thermometer register a cooler temperature than the dry bulb thermometer?

Further Questions:

7. What would the relative humidity be if the wet-bulb and dry-bulb temperatures were the same?

8. What is the name of an instrument that measures humidity?
