Name _____ Class _____ Date _____

Skills Practice Lab

DATASHEET A

Relative Humidity

Earth's atmosphere acts as a holding tank for water that evaporates from Earth's surface. However, how much water vapor the atmosphere can hold depends on how the rate of condensation compares with the rate of evaporation. When the rate of condensation is greater than the rate of evaporation, water droplets begin to form in the air or on nearby surfaces. The point at which the condensation rate equals the evaporation rate is called the *dew point*. The dew point depends on the temperature of the air and on the atmospheric pressure. When these rates are equal, the air is "saturated."

Air that is saturated has a relative humidity of 100%. Relative humidity is the ratio of how much water vapor is in the air to how much water vapor is needed for the air to be saturated. Most of the time this ratio is given as a percentage. In this lab, you will find the relative humidity of the air in your classroom. You will do this by using wet-bulb and dry-bulb thermometer readings.

OBJECTIVES

Measure humidity in the classroom.

Determine relative humidity.

MATERIALS

- cloth, cotton, at least 8 cm × 8 cm
- container, plastic
- piece of paper
- ring stand with ring
- rubber band
- string
- thermometer, Celsius, 2
- water

SAFETY

PROCEDURE

1. Hang two thermometers from a ring stand such that one of the thermometers is suspended over a plastic container filled with water.
2. Using a rubber band, put a piece of cotton cloth around the bulb of one thermometer.
   - Change the length of the string so that only the cloth, not the thermometer bulb, is in the water.
   - By using this setup, you can measure both the air temperature and the cooling effect of evaporation.

3. Predict whether the two thermometers will have the same reading.
   - If you think that the readings will not be the same, predict which thermometer will have the lower reading.

4. Use a piece of paper to fan both thermometers rapidly.
   - Keep fanning until the reading on the wet-bulb thermometer stops changing.
   - Read the temperature on each thermometer. (Hint: Make sure to look at the thermometer at eye level when you read the temperature.)

   a. What is the temperature on the dry-bulb thermometer?

   b. What is the temperature on the wet-bulb thermometer?

   c. Subtract the lower temperature from the higher temperature. What is the difference in the two temperature readings?

5. Look at the table entitled "Relative Humidity" in the Reference Tables section of the Appendix in your textbook. Follow the steps below to find the relative humidity based on your temperature readings in step 4.
   - Look at the left-hand column labeled "Dry-Bulb Temperature."
   - Find the temperature you recorded in step 4a.
   - Then, find the difference in temperature that you recorded in step 4c along the top row of the table.
   - Find the intersection of the row and column you have identified.
   - Write this number as a percentage. This is the relative humidity.
   - What is the relative humidity of the air in your classroom?

ANALYSIS

1. **Drawing Conclusions** Look at the relative humidity you found. Is the air in your classroom close to or far from the dew point? Explain your answer.

2. **Applying Conclusions** If you put water on the back of your hand in your classroom, would the water evaporate and cool your skin? (Hint: Is the air saturated? If it is not, then can the atmosphere hold more water vapor?)

EXTENSION

1. **Making Inferences** Suppose that you exercise in a room in which the relative humidity is 100%.
   a. Would the sweat on your skin evaporate easily? (Hint: What does the relative humidity tell you about the amount of water vapor in the atmosphere?)

   b. Would you be able to cool off easily? Explain your answer.

2. **Applying Ideas** Suppose that you have just stepped out of a swimming pool. The relative humidity is low, about 30%. Would you feel warm or cool? Explain your answer.