Earth Science
LAB: Dew Point and Relative Humidity

Name_____
Date_____Pd_____#____

Introduction:
Even above the hottest desert areas on Earth, there is water vapor in the air. Water vapor is the source of moisture for clouds and rain. Meteorologists measure both dew point and relative humidity to determine how much water vapor is in the air and to predict changes of precipitation.

Dew point is the temperature at which air is filled or saturated with water vapor. Relative humidity is the extent to which air is saturated with water vapor. When air cools below the dew point, water vapor in the air condenses. In this lab, you will determine both the dew point and relative humidity by using a capacity chart. You will then make and use a psychrometer to find relative humidity.

Lab Skills and Objectives:
- To **observe** dew formation, and **compare** relative humidity, using dew point method.
- To **compare** relative humidity using psychrometer method.
- To **compare** the methods for finding relative humidity.

Materials:
- Shiny metal cans
- Stirring rod or coffee stirrer
- Ice cubes or crushed ice
- Celsius thermometer
- Cloth strip, 2.5 cm x 10 cm
- Small rubber bands or string
- Spoon
- Piece of paper
- Water at room temperature

Procedures:
Part A – Measuring Specific Humidity by using the Dew Point Method
1. Record the air temperature inside the classroom and record in Table A.
2. Fill the metal can halfway with room temperature water. Place a thermometer in the water. Add a small amount of ice.
3. Carefully use the thermometer to stir the water slowly. **CAUTION: Thermometers are fragile.**
4. Continue to add small amounts of ice until the first appearance of dew appears on the outside of the container. At the instant you see dew, record the dew point temperature in Table A.
5. To confirm the accuracy of your first dew point reading, repeat steps 1 through 3 and record your second value in Table A.
6. Average your two dew point values. Record your average in Table A.
7. Use the capacity chart to determine specific humidity and relative humidity inside the classroom.
8. Repeat the above steps to determine the dew point, specific humidity and the relative humidity.

Classroom		**Outside**	
Air Temperature (ºC)		Air Temperature (ºC)	
Capacity of air to hold water vapor (g/kg)		Capacity of air to hold water vapor (g/kg)	
Dew Point for Trial 1 (ºC)		Dew Point for Trial 1 (ºC)	
Dew Point for Trial 2 (ºC)		Dew Point for Trial 2 (ºC)	
Average Dew Point (ºC)		Average Dew Point (ºC)	
Specific Humidity (g/kg)		Specific Humidity (g/kg)	
Relative Humidity (%)		Relative Humidity (%)	

Part B – Psychrometer Method

1. Record the air temperature of the classroom in Table B, record this value as your dry-bulb temperature.
2. Construct a paper fan by folding accordion pleats into a piece of paper.
3. Wrap a strip of cloth around the bulb of the thermometer and fasten the cloth with a rubber band or string.
4. Dip the cloth-covered end of the thermometer into room-temperature water. This is now a wet-bulb thermometer.
5. Fan the wet-bulb thermometer briskly with the paper fan. The temperature will drop, and then remain constant. Once the temperature becomes constant, read and record the wet-bulb temperature in Table B.
6. Subtract the wet-bulb temperature from the dry-bulb temperature and record this value in Table B.
7. Use the Relative Humidity table on p. 525 in your book to determine the relative humidity in the classroom. Record the relative humidity in Table B.
8. After you determined the relative humidity, use the other table to determine the specific humidity inside the classroom.
9. Repeat steps 1-8 to determine the relative humidity and specific humidity outside.

Table B

Classroom		**Outside**	
Temperature of Classroom Air (dry-bulb temperature) (ºC)		Temperature of Classroom Air (dry-bulb temperature) (ºC)	
Wet-bulb temperature (ºC)		Wet-bulb temperature (ºC)	
Difference between dry and wet-bulb temperatures (ºC)		Difference between dry and wet-bulb temperatures (ºC)	
Relative humidity (%)		Relative humidity (%)	
Specific Humidity (g/kg)		Specific Humidity (g/kg)	

Conclusion Questions (Separate Sheet of Paper)

1. Compare the two specific humidity values for the dew point method and the psychrometer method. Are the two values the same or different? If the values are different, which do you think is more accurate? Explain your answer.
2. Are the specific and relative humidities inside and outside the classroom different or the same. Why or why not.
3. Imagine that, early one cool morning, you use a psychrometer outdoors and find that the wet-bulb and dry-bulb values are the same.
    a. What conclusion can you draw about evaporation from the wet-bulb thermometer in this case?
    b. What conclusion can you draw about the relative humidity in this case?
    c. From your knowledge of relative humidity, would this be a good or bad day for hanging the laundry outdoors to dry? Explain your answer.
4. Would you expect the relative humidity in a cool basement to be higher or lower than the air outside on a warm and sunny day? Explain.