DEW POINT AND RELATIVE HUMIDITY LAB

BACKGROUND: 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 the chances of precipitation

Dew point is the temperature at which the 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 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 **observer** dew formation and **compute** relative humidity, using the dew point method
- To **compute** relative humidity using the psychrometer method
- To **compare** the methods for finding relative humidity

FIGURE 1
Capacity of Air at 1000mb pressure

Temp. ^{o}C	Capacity g/kg
3	4.8
4	5.1
5	5.5
6	5.9
7	6.3
8	6.8
9	7.3
10	7.8
11	8.3
12	8.9
13	9.5
14	10.1
15	10.8
16	11.6
17	12.3
18	13.2
19	14
20	15
21	15.9
22	17.0
23	18.1
24	19.2
25	20.4
26	21.7
27	23.1
28	24.6
29	26.1
30	27.7
31	29.4
32	31.2

MATERIALS

shiny, metal cans	stirring rod	ice cubes
celsius thermometer	water	sling psychrometer
textbook		

PROCEDURE

PART A – Dew Point Method

1. Use a thermometer to measure the classroom air temperature in Celsius. Record this in data table A, #1.
2. Look at Figure 1 to the right. Find the capacity of air to hold water vapor for the temperature in the classroom. Record the capacity in data table A, #2.
3. Fill the metal can halfway with water and place thermometer in the water.
4. Add a handful of ice and use a stirring rod to stir the water slowly.
5. Watch for the first appearance of dew on the outside of the container. KEEP YOUR THERMOMETER OFF THE GLASS. At the instant you see dew, record the dew point temperature in Data Table A, #3. DO NOT TAKE THE THERMOMETER OUT OF THE WATER.
6. To confirm the accuracy of your first dew point reading, repeat steps 3 through 5 one more time and record in data table A, #4.
7. Average your two dew point values and record the average in #5.
8. Use the capacity chart (Figure 1) to determine the air capacity to hold water vapor for your average dew point temperature. Your value for capacity at the dew point equals the specific humidity of the air. Record this value in Data Table A, #6.
9. Use your values and the formula in Data Table to compute the relative humidity of air at room temperature for #7. (Divide your answer from #6 by your answer for #2 then multiple by 100)

PART B – Psychrometer Method

1. Read the air temperature in the class room again. In Data Table B, record this value as your dry-bulb temperature for #1.
2. One person in the class will be chosen to sling the psychrometer to determine the wet-bulb temperature for the classroom. Record this value data table B, #2.
3. Subtract the wet-bulb temperature from the dry-bulb and record that in data table B, #3.
4. Turn to the relative humidity table on page 501 to determine the answer for #4.
5. Answer the analysis and conclusions question.

DATA

DATA TABLE A ~ DEW POINT METHOD	
1. Temperature of class room air	^{o}C
2. Capacity of air at classroom air temperature	g/kg
3. Dew point from trial one	^{o}C
4. Dew point from trial two	^{o}C
5. Average dew point	^{o}C
6. Specific humidity (capacity at dew point)	g/kg
7. Relative humidity = specific humidity/air's capacity * 100	%

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(To solve #7, divide your answer for #6 by your answer for #2 then multiply by 100)

DATA TABLE B ~ PSYCHROMETER METHOD	
1. Temperature of classroom air (dry-bulb temperature)	^{o}C
2. Wet-bulb temperature	^{o}C
3. Difference between dry- and wet-bulb temperature	^{o}C
4. Relative humidity	%

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ANALYSIS AND CONCLUSIONS- write the answers in complete sentences

1. Compare the two relative humidity values for the classroom air from Data Tables A and B. Are the two values the same or different? If the values differ, which value do you think will be more accurate? Explain your answer.

2. Suppose you are looking at clouds that have just formed on a summer afternoon. What do you know about the relative humidity of the air at the bottom of the cloud?

3. Imagine that, early one cool morning, you use a psychrometer outdoors and discover that the wet-bulb and dry-bulb values are the same.
    a. What conclusions can you draw about evaporations from the wet-bulb thermometer in this case?
    b. What conclusion can you draw about the relative humidity in this case?
    c. From this knowledge of relative humidity, would this be a good or bad day for hanging the laundry to dry? Explain your answer.