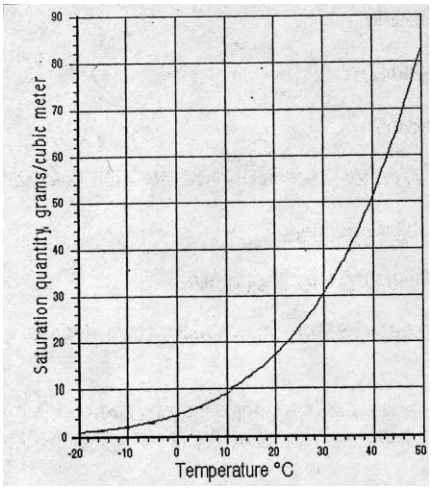
# Dew Point and Relative Humidity

Name _____ Date _____ Per. _____




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. **Relative humidity** compares the amount of water vapor that is actually in the air to the amount of water vapor the air can hold. The **dew point** is the temperature at which the air would be saturated with water vapor. When air cools below the dew point, water vapor in the air condenses, and the relative humidity of the air is 100%.

We have already learned in class that warm air can hold more water vapor than cold air. Therefore, the temperature of the air will always have the largest impact on relative humidity values. Consider the graph above. Notice how the capacity of the air to hold water increases with the temperature of the air.

## Procedures

In this activity, you will use two different methods to determine the relative humidity of the classroom or the lab.

### Method 1—The Dew Point Method

- Use a thermometer to measure the classroom air temperature. Record the temperature in the Dew Point Method data table.
- Use the Water Vapor Capacity of Air table to find the capacity of air to hold water vapor for the temperature in your classroom. Record the capacity.
- Fill a beaker halfway with water. Place a thermometer in the water. Add a small amount of ice. Stir the water slowly with the thermometer.
- Watch for the first appearance of dew on the outside of the beaker. At the instant you see dew, record the dew point temperature.
- Confirm the accuracy of your dew point reading by repeating the previous two steps. Average your two dew point values and record the average.
- Use the Water Vapor Capacity of Air table to find the capacity of air to hold water vapor for the average dew point temperature. Your value for air capacity at the dew point equals the specific humidity of the air. Record this value in the Dew Point Method data table.
- Use your values and the formula in the data table to compute and record the relative humidity of the classroom air as a percentage.

**Method 2—Psychrometer (wet-bulb) Method**

- Measure the classroom air temperature again. In the Psychrometer Method data table, record the dry-bulb temperature.
- Construct a wet-bulb thermometer by wrapping a cloth around the bulb of your thermometer and securing it with a rubber band. Soak the cloth end of the thermometer in room-temperature water. Fan the thermometer in the air until the temperature stabilizes. Once the temperature remains constant, read the wet-bulb temperature and record this value in the data table.
- Subtract the wet-bulb temperature from the dry-bulb temperature and record this value in the data table.
- Look at the Wet-bulb RH chart and your thermometer readings to determine the relative humidity. Record this value in the Psychrometer Method data table.

## Data Tables

| **Dew Point Method** | |
|---|---|
| Air temp of classroom (C) | |
| Water vapor capacity of air at classroom temperature (g/kg) | |
| Dew point from trial 1 (C) | |
| Dew point from trial 2 (C) | |
| Average dew point (C) | |
| Specific humidity—water vapor capacity at the dew point (g/kg) | |
| Relative Humidity = $\frac{\text{Specific humidity}}{\text{Room temp capacity}}$ (x 100) | |

| **Psychrometer Method** | |
|---|---|
| Dry-bulb temperature of classroom air (C) | |
| Wet-bulb temperature of classroom air (C) | |
| Difference between dry-bulb and wet-bulb temperatures | |
| Relative humidity from the Wet-Bulb RH chart | |

## Analysis and Conclusion

1. What is the relationship between the air's capacity to hold water vapor and the air temperature?

2. Compare the two relative humidity values for the classroom air from the two data tables. Are the two values the same of different? If the values differ, which value do you think will be more accurate? Explain.

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

4. Imagine that, early one cool morning, you discover that the wet-bulb and dry-bulb temperatures are the same. What conclusion can you draw about evaporation from the wet-bulb thermometer in this case? What conclusion can you draw about the relative humidity in this case? Would this be a good day to hang your clothes out to dry? Explain.