1. HUMIDITY AND DEW POINT

What is dew point and how does air temperature and humidity influence the chance for rain?

In meteorology, an air mass is a large body of air having nearly uniform conditions of temperature and humidity at any given level of altitude. As air masses move they directly influence the weather in the regions in which they pass. Weather is the state of the atmosphere at a particular place during a short period of time. It involves atmospheric phenomena such as temperature, humidity, precipitation, air pressure, and wind.

Absolute humidity is the measure of water vapor, or moisture, in the air regardless of temperature. It is expressed as grams of moisture per cubic meter of air (g/m^3). Relative humidity also measures water vapor but relative to the temperature of the air. The humidex, short for humidity index, is based on a calculation of heat and humidity by using the current air temperature and dew point. It was designed to describe how hot or humid weather feels to the average person and is an expressed value, not as an actual temperature.

Range of humidex: Scale of comfort:

- 20 to 29: Little to no discomfort
- 30 to 39: Some discomfort
- 40 to 45: Great discomfort; avoid exertion
- Above 45: Dangerous; heat stroke possible

Dew point is the atmospheric temperature below which water droplets begin to condense and dew can form. Dew point varies according to pressure and humidity. During warm seasons, the dew point temperature can be a good indicator of how humid the outside air feels, as well as how likely it is to rain or storm.

In this investigation your focus will be on weather conditions including absolute humidity, relative humidity, humidex, and dew point over three different temperatures of water.

Materials and Equipment

- Data collection system
- Weather sensor
- Beakers (3), 250-mL
- Hot plate
- Water and ice

Safety

Follow these important safety precautions in addition to your regular classroom procedures:

- Use caution when using the hot plate and be aware of hot surfaces.
- Use tongs when handling hot beakers.

Procedure

1. Prepare 3 beakers with different temperatures of water. Prepare beaker 1 with 200 mL of room temperature water. Prepare beaker 2 with 200 mL of an ice and water mixture. In beaker 3 prepare 200 mL of hot/warm water. A hot plate may be necessary to prepare the hot/warm water.
2. Select Sensor Data in SPARKvue.
3. Connect the Weather sensor to your device.

   NOTE: *Do not allow the sensor to contact water.*

4. Choose the Weather Dashboard template.

5. Place the weather sensor on top of beaker 1 (room temperature) as shown in Figure 1.

Figure 1. Weather sensor placement

6. Select Start to begin collecting data. Observe and record the temperature, humidex, relative humidity, absolute humidity, and dew point in Table 1.
7. Stop collecting data. Move the weather sensor to beaker 2 (ice water) and repeat step 6.
8. Stop collecting data. Move the weather sensor to beaker 3 (hot/warm water) and repeat step 6.
9. Stop collecting data.

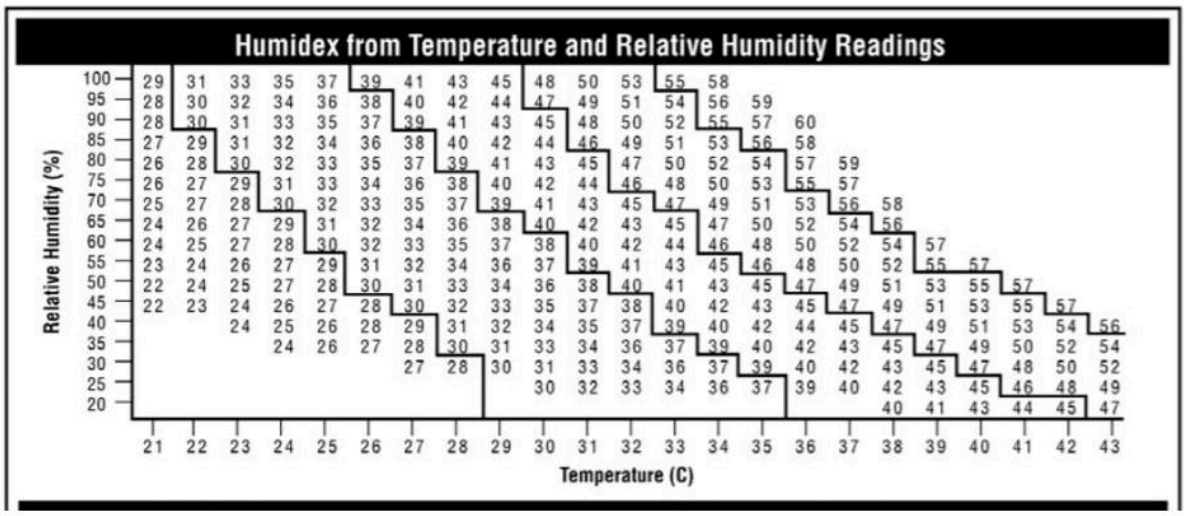
Data Collection

Table 1. Temperature, Humidity, Humidex and Dew Point

	Beaker 1 room temp.	**Beaker 2 cold/ice**	**Beaker 3 hot water**
Air Temperature (°C)			
Humidex			
Relative Humidity (%)			
Absolute Humidity (g/m^3)			
Dew Point (°C)			

Questions and Analysis

1. The humidex, short for humidity index, is based on a calculation of heat and humidity by using the current air temperature and dew point. Is was designed to describe how hot or humid weather feels to the average person.



Humidex Range	Degree of Comfort
Less than 29	No discomfort
30 – 39	Some discomfort
40 – 45	Great discomfort, avoid exertion
Above 45	Dangerous
Above 54	Heat stroke imminent

What would the humidex be with a temperature of 30 °C and relative humidity at 60%?

2. What is the difference between relative humidity and absolute humidity? Using evidence from your data, how did absolute humidity change as relative humidity increased?

3. The amount of water vapor in the air is called absolute humidity. The amount of water vapor in the air as compared with the amount of water that the air could hold is called relative humidity. Compare the absolute humidity for the three different beaker temperatures. What conclusions can you draw about the moisture in the air over each beaker?

4. Dew point is the temperature in which the moisture in the air will condense to form droplets and possible precipitation (fog, rain, snow). Based on your observations, what is the relationship between dew point and relative humidity?

5. In which of your measurements would precipitation be most likely?

6. How can knowing the temperature and relative humidity be useful in predicting weather conditions?