**Atmospheric Science**

# Relative Humidity Lab

## Introduction

Relative humidity is the amount of water vapor in the air compared to the maximum amount it can hold. The maximum amount of water vapor that air can hold varies depending in its temperature. Warm air can hold more water vapor than cold air.

One way to measure relative humidity is by observing how easily water evaporates. The drier the air, the faster water will evaporate. Have you ever noticed that you feel cooler when you have just stepped out of the shower? This is because as water evaporates, it cools the surface from which it evaporates. If we measured, for example, how much a temperature probe cooled as water evaporates off of it, we can calculate the rate of evaporation and therefore, the relative humidity.

Dew point, though, is the temperature to which a given parcel of air must be cooled, at constant barometric pressure, for water vapor to condense into liquid water. The condensed water is called dew. Because the air is saturated at the dew point, the dew point is also referred to as the saturation point.

The dew point is associated with relative humidity. A higher relative humidity indicates that the dew point is closer to the current air temperature. Relative humidity of 100% indicates the dew point is equal to the current temperature and the air is maximally saturated with water vapor.

## Investigation Question

What relationship exists between air temperature, relative humidity and dew point?

## Materials

LabQuest
Temperature Probe
Relative Humidity Sensor

## Procedure

1. Connect the relative humidity sensor and temperature probe to the LabQuest.
2. At your first location, hold each probe in the air so that there is good airflow around them. Do not place either probe on the floor or the table.
3. Wait for the temperature and relative humidity to stabilize.
4. Record the air temperature and relative humidity for the specific location in the data table.
5. Move to the next location and record the air temperature and relative humidity.

## Data Table

| Location | Air Temp (C) | RH (%) | Dew point (C) |
|---|---|---|---|
| **Gymnasium** | | | |
| **1027 Cluster** | | | |
| **C201/C221** | | | |
| **Outside C101** | | | |
| **1027 Lobby** | | | |
| **Alumnae Parlor** | | | |
| **Butler Library** | | | |
| **Outside Library** | | | |
| **Outside Chapel** | | | |
| **1026 Lobby** | | | |
| **1026 Vestibule** | | | |
| **Outside 1026** | | | |
| **Pit** | | | |
| **Courtyard** | | | |
| **Teahouse East** | | | |
| **Teahouse West** | | | |

**Data Analysis**

1. Use the converter to determine the dew point at each location.

2. Link: https://www.calculator.net/dew-point-calculator.html

**Analysis Questions**

Recall the following before you answer the analysis questions.

- Relative humidity is the ratio between the amount of atmospheric moisture in the air (not temperature dependent) and the maximum amount of moisture the air can hold at that temperature (temperature dependent).
- Relative humidity is temperature dependent. If the amount of atmospheric moisture stays the same, the relative humidity will decrease as the air temperature increases.
- Dew point is not temperature dependent. The dew point represents the amount of atmospheric moisture.

**Questions**

1. In Google Sheets, create a graph with temperature on the x-axis and relative humidity on the y-axis. Insert your graph into your lab report.
2. From your data, does there appear to be a direct, inverse or non-relationship between air temperature and relative humidity? Justify your answer.
3. In Google Sheets, create a graph with dew point on the x-axis and relative humidity on the y-axis. Insert your graph into your lab report.
4. From your data, does there appear to be a direct, inverse or non-relationship between air dew point and relative humidity? Justify your answer.
5. In Google Sheets, create a graph with temperature on the x-axis and dew point on the y-axis. Insert your graph into your lab report.
6. From your data, does there appear to be a direct, inverse or non-relationship between air temperature and dew point? Justify your answer.
7. Based on your daily experiences, do the locations with the highest relative humidity often seem the most humid?