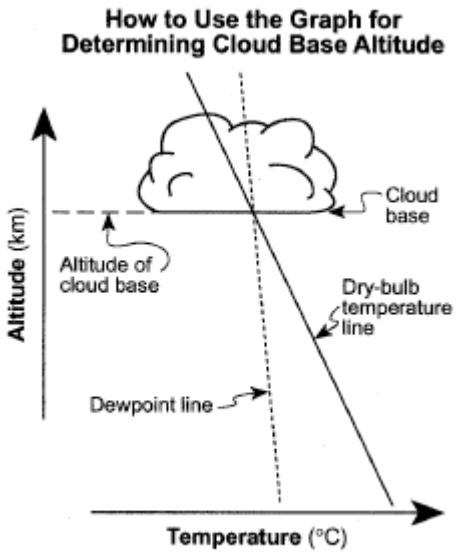
Name:_____ Period:_____

Lab: Measuring Dew point and Relative Humidity to Determine Cloud Formation

If the temperature of air decreases while the **absolute humidity** remains the same, the temperature will eventually reach a point at which the absolute humidity reaches full capacity (air becomes saturated with water vapor). At this temperature the **relative humidity** will be 100%. This temperature is called the **dew point temperature**, or the temperature at which air cools to become 100% saturated with water vapor. If the air temperature cools to (or below) the dew point, water vapor in air will condense to for liquid water. In the atmosphere, air cools, because as it rises it expands (because P ↓). *As air rises, the air temperature decreases more quickly than the dew point*. Depending upon the altitude where air temperature and dew point temperature equal one another, condensation will occur and either fog, dew, frost, or clouds will form. If the dew point and air temperature cool to the same point at high altitudes, this is known as **cloud base altitude** (altitude at which the base of a cloud forms) Clouds that form on or just above earth's surface are called **fog**. In order for dew to form on something, it needs a surface to "cling" on to. In the atmosphere, clouds must "cling" on to things called **Condensation Nuclei.** These are primarily dust partials, bacteria, volcanic ash, and other pollutants called **aerosols.** Without aerosols, clouds can not form no matter how humid and cool the air becomes.



The altitude at which clouds form (cloud base) can be determined using the generalized chart on the last page of this lab. The diagram to the left shows the dry adiabatic lapse rate and dew point lapse rate.

Pre-Lab Questions Use the generalized graph and the reading above to answer the questions

1. Define: (use the graph above and if needed internet to help you define your answers)
   a. Dry Adiabatic Lapse Rate-

   b. Dew Point Lapse Rate-

2. What change in temperature occurs in the dew point line as altitude increases?

3. What change occurs in air temperature as increasing altitude?

4. Which variable changes at a faster rate with increasing altitude?

5. When fog or clouds form, what must that mean regarding the temperature of both the dry air temperature and the dew point temperature?

6. What is the relative humidity outside if fog has formed?

7. Describe the **relative** difference (higher/lower) between the dewpoint temperature of **dry air** vs. **humid air**

8. What are condensation nuclei and why are they important to cloud formation?

Part II: Use the data provided below and generalized graph for determining cloud base altitude

Dry temp	Wet temp	Dewpoint	Rel Hum	Cloud Base Alt.
20	19			
20	17			
20	13			
16	13			
6	0			

Part III: Using a sling psychrometer, we will calculate the conditions above for our classroom and outside, completing two trials for each (each person in a group of 2 takes the data once)

Data	**Inside trial 1**	**Inside Trial 2**	**Outside Trial 1**	**Outside Trial 2**
Dry Bulb				
Wet Bulb				
Difference				
Dew Point				
Relative Humidity				
Cloud Base Altitude				

Part IV: Conclusion Questions

9. Why do the types of clouds (due to the cloud base) change each day? (You must use the terms temperature, dew point and humidity in your answer)

10. What would happen to the height of the cloud base if the dew point temperature were *lower?*

11. Is it possible to have a day without clouds? **WHY**

12. What happens to air temperature in a descending (sinking) mass of air?

13. What happens to dew point temperature in a descending mass of air?

14. How does the relative humidity change in a descending mass of air if the dew point and air temperature are moving further from one another as they both increase?

15. List step by step, how a cloud is formed.

I.

II.

III.

IV.

Generalized Graph for Determining Cloud Base Altitude