NAME_____ **PERIOD**_____ **DATE** _____

LAB PARTNERS_____ **LAB # 32**

CLOUD IN A BOTTLE

INTRODUCTION

You have probably heard people say "hot air rises", after all isn't that why hot air balloons rise? Well, if this were the case shouldn't we be sun bathing instead of skiing on the mountaintops? What happened to all that hot air? There must be more to this story. In this laboratory you will be investigating how pressure affects the temperature of air and how this relates to the formation of clouds in the troposphere. You will form a cloud in a bottle, find the dew point and relative humidity of air at different places in the school and use a chart to estimate how high that air would have to rise to form a cloud.

OBJECTIVES

After completing this investigation you will be able to:

1. Determine the process involved in cloud formation.
2. Determine the dew point, relative humidity, and cloud base height.

MATERIALS

Empty 2 – liter pop bottle
Fizz keeper pressure pump
Thermometers (plastic fish tank or skinny enough to fit through soda bottle top)
Rubbing alcohol
Sling psychrometer

APPROXIMATE TIME 2 periods

PART 1
CREATING A CLOUD IN A BOTTLE

PROCEDURE

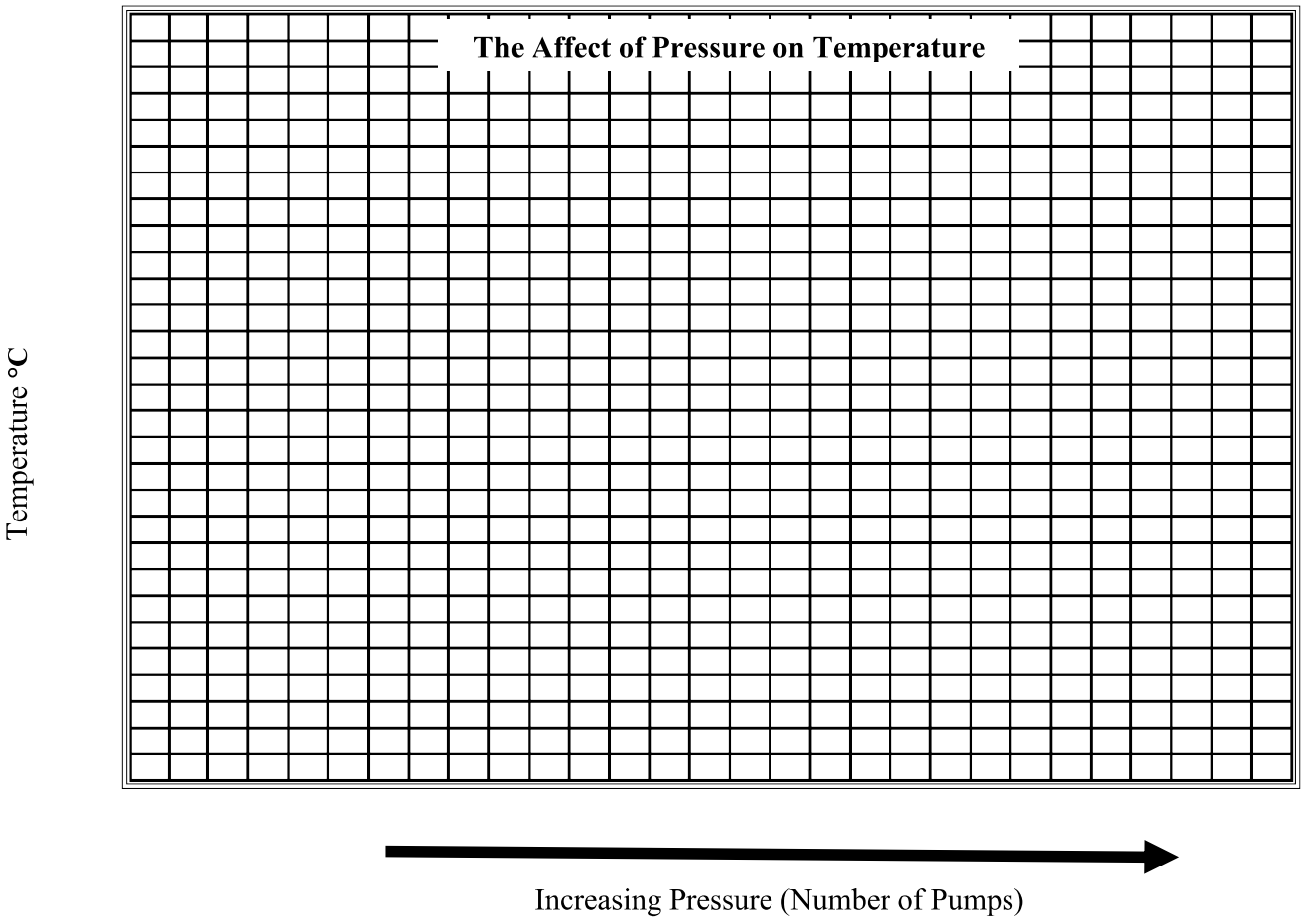
1. Attach a pressure pump to a two-liter bottle.
2. Add a little bit of alcohol and shake with the cap sealed.
3. Pump 20 times. Record temperature for each 20 pumps.
4. Repeat step #3 until you have reached 120 pumps.
5. Carefully release the pressure and QUICKLY re-cap the bottle. Do you observe a cloud?

   _____
6. With the bottle recapped and the cloud in the bottle, pump 60 times and record what happens to the cloud.

   _____
7. Connect your data points for temperature on the attached graph.

Data Table 1

Number of Pumps	Temperature(°C)
0	
20	
40	
60	
80	
100	
120	
Release	



LABORATORY QUESTIONS

1. What is the relationship between temperature and pressure according to the graph?

2. What happened to the temperature of the air when you released the pressure? Why?

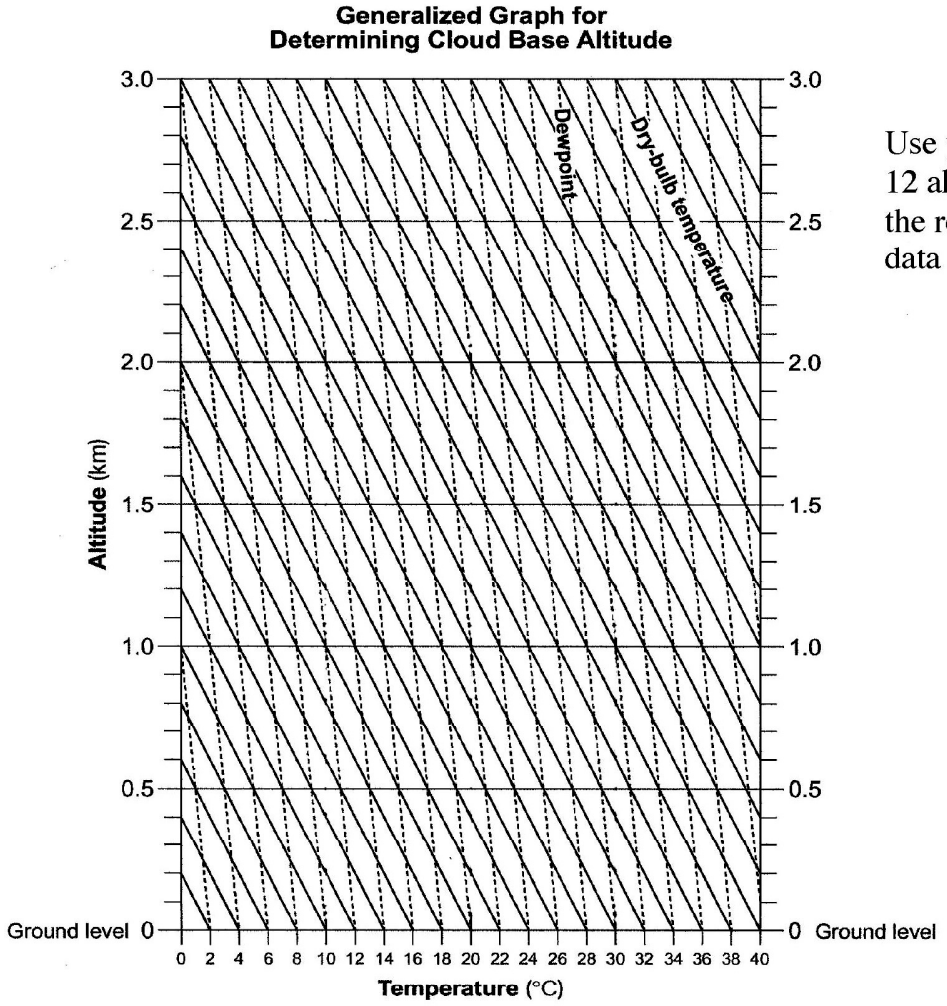
3. Describe the process of cloud formation.

4. Give two examples of condensation nuclei and why are they needed for cloud formation?

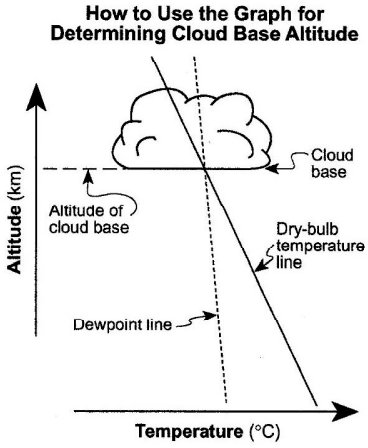
5. What layer in the atmosphere does all weather occur and why?

6. Why did we use rubbing alcohol instead of water in this lab?

PART 2
INVESTIGATING ATMOSPHERIC MOISTURE



Use your reference tables on page 12 along with this graph to fill out the rest of the information in your data table.



1. As a lab group, read the dry bulb and wet bulb thermometers on a psychrometer at different locations specified on data table 2.
2. Using the ESRT and diagram above find the dew point, relative humidity, and cloud base height.
3. Complete data table 2 below with the data gathered in step #2.
4. Answer the laboratory questions.

Data Table 2

Location	Dry Bulb	Wet Bulb	Difference	Dew Point	Relative Humidity	Cloud Base Height
1. Back of Room						
2. Front of Room						
3. Hallway						

LABORATORY QUESTIONS

1. What is the cloud base for air with a dry-bulb temperature of 32ºC and dew point of 22ºC?

   _____

2. If the surface dew point temperature is 18ºC and the clouds in the sky have a base elevation of 2 km, what is the dry-bulb surface temperature? _____

3. What is the cloud height when the dry-bulb temperature is equal to the dew point temperature on the ground? _____

   a. What name do we give that type of cloud? _____

4. What happens to the relative humidity as the wet bulb and the dry bulb temperatures become closer together? Further apart?

5. Why do clouds have flat bottoms?

6. What happens to relative humidity when the dew point temperature lowers but the air temperature remains the same?

7. If the relative humidity is 74% and the dry bulb temperature is 20°C, what is the dew point temperature?

8. How is it possible to have a day with no clouds? What atmospheric conditions would be necessary?