Name: _____ **Earth Science**
Lab 22: Dew Point and Cloud Formation **Date:** _____

Introduction: Cumulus clouds are our "puffy" fair weather clouds. They are often flat on the bottom and round on top. The distance from Earth's surface to the bottom of these clouds is often the same for a large group of them. **Clouds can only form if a specific temperature, called the dew point, is reached**. Since the air temperature decreases with height above Earth's surface, clouds may form if the air temperature is cold enough to be at the dew point at some altitude.

Objective: In this lab you will study how air temperature decreases with altitude. You will also study the relationship between the dew point temperature and the height above Earth's surface at which clouds form.

Vocabulary:
Dew Point Temperature –

Psychrometer –

Wet-bulb Temperature –

Dry-bulb Temperature –

Cloud Base –

Dry Adiabatic Rate –

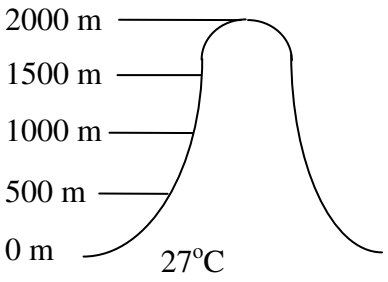
Moist Adiabatic Rate –

Relative Humidity –

Procedure A: Use the given rates below to determine the temperature at the location specified.

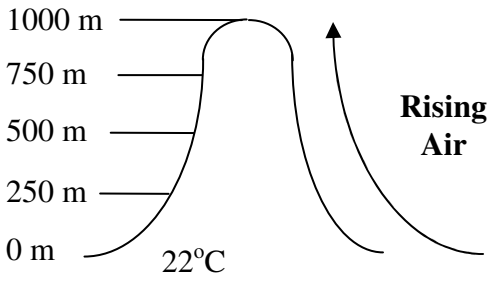
The normal lapse rate for non-rising air is 6.25 ^{o}C/1000 meters.
The dry adiabatic lapse rate is 10 ^{o}C/1000 meters.
The moist adiabatic lapse rate is 6 ^{o}C/1000 meters.

1. If a body of air were not rising, what would be the temperature at the top of the mountain?



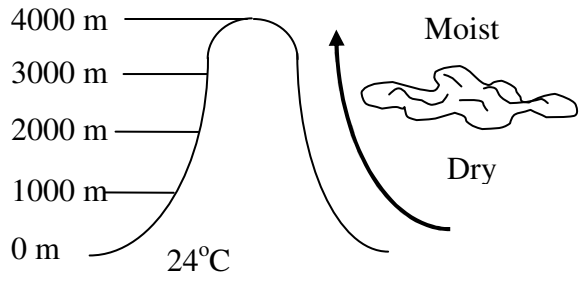
Temperature at 2000 m is _____

2. If a body of air was rising, what would be the temperature at the top of the mountain?



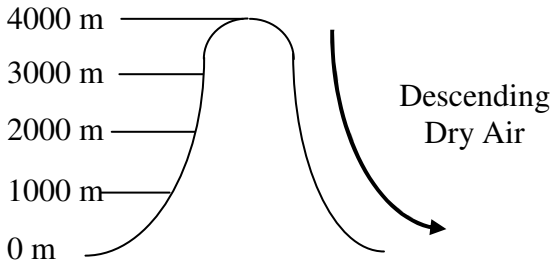
Temperature at 1000 m is _____

3. If at 1000 meters condensation began in the rising air, what would be the temperature at the top of the mountain?



Temperature at 4000 m is _____

4. If the moving air slid down the backside of the mountain, what would be the temperature at the bottom of the mountain? (Use answer to 3 for temperature at the top of the mountain.)



Temperature at 0 m is _____

Procedure B: Refer to the Dew Point Temperature Chart in the Earth Science Reference Tables to answer questions 1-3.

1. What is the wet-bulb depression if the dry-bulb temperature is 20°C and the wet-bulb is 17°C? _____

2. What is the dew point temperature if the dry-bulb is 16°C and the wet-bulb depression is 5°C? _____

3. What is the dew point temperature if the dry-bulb temperature is 26°C and the wet-bulb temperature is 20°C? _____

Procedure C: Refer to the Lapse Rate graph on the following page to answer questions 1-5.

1. What change occurs in the dew point as altitude increases? (Look at the dashed lines) _____

2. How does the dry-bulb temperature change as altitude increases? (Look at the solid lines) _____

3. Which changes more rapidly as altitude increases, the dew point or air temperature? _____

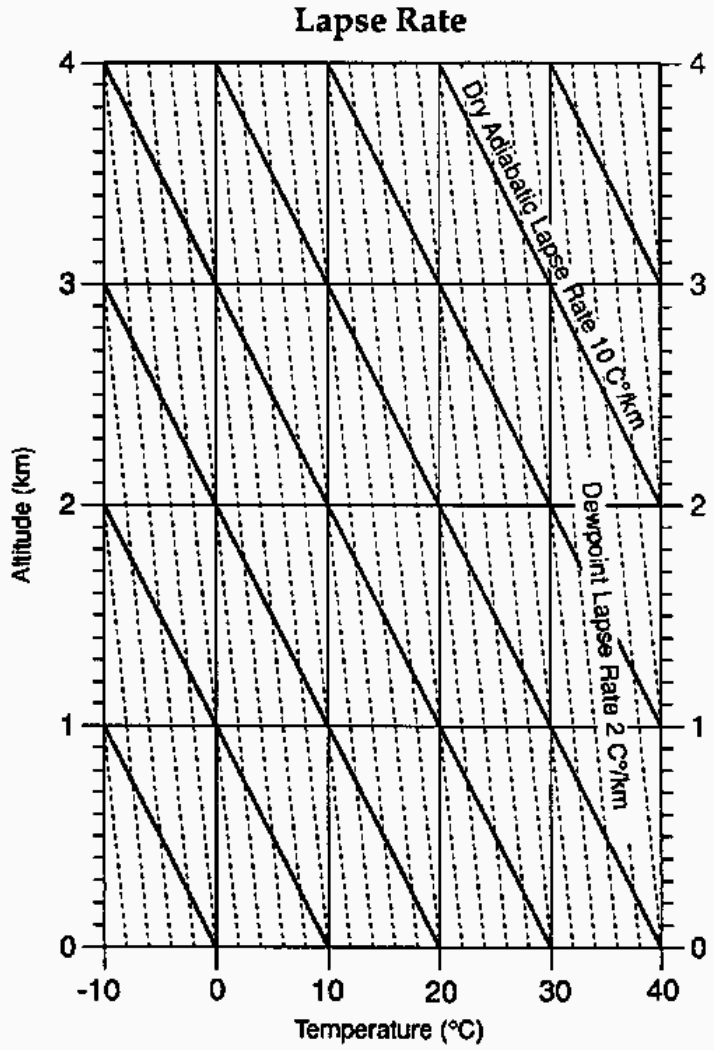
4. At what altitude do the dew point and dry-bulb temperature become the same if the surface air temperature is 20°C and the dew point at the surface is 0°C? _____

5. What would be the altitude of the bottom of a cloud mass if the surface temperature is 10°C and the surface dew point is -4°C? _____

Procedure D: Use the information given on Report Sheet 1 to determine the dew point temperature and cloud base altitude.

Report Sheet 1

	A	B	C
Dry-Bulb Temp.	24°C	4°C	24°C
Wet-Bulb Temp.	12°C	0°C	18°C
Wet-Bulb Depression			
Dew pt. Temp.			
Cloud Base			



Procedure E:

1. Go outside and use a sling psychrometer to measure the wet and dry-bulb temperatures. Record the data on Report Sheet 2.

2. Complete Report Sheet 2 by determining and entering the wet-bulb depression and the dew point temperature.

3. Using the dry-bulb and dew point temperatures determined above, use the Lapse Rate Graph to find the cloud base altitude for this day. Record this altitude on Report Sheet 2. Be sure to draw lines on the Lapse Rate Graph showing the air temperature and the dew point temperature coming together.

4. On the Lapse Rate Graph, draw in a cloud picture with the cloud base at the correct altitude.

Report Sheet 2

Dry-Bulb Temp. _____

Wet-Bulb Temp. _____

Wet-Bulb Depression _____

Dew Point Temp. _____

Cloud Base Altitude _____

Questions:

1. Why does the height of a cloud base change from day to day? _____

   _____

   _____

2. What would happen to the cloud base if the dew point temperature were lower? _____

   _____

   _____

3. How would it be possible to have a day without any clouds? _____

   _____

   _____

4. What relationship would you expect to find between the air temperature and dew point temperature at ground level if the area is covered by fog? _____

   _____

5. What happens to the air temperature of a descending mass of air? _____

   Why? _____

   _____

6. What happens to the dew point temperature of a descending mass of air? _____

7. Explain why a descending mass of air would tend to become drier. _____

   _____

   _____

8. What information do you need to determine the altitude of a cloud base? _____

   _____

   _____