Nmae_____date_____per_____

Lab #_____ Dew Point and cloud formation

INTRODUCTION: Cumulus clouds are our "puffy" fair weather clouds. They are often flat on the bottom and rounded on top. The distance from the 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 the 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 the relationship between the dew point temperature and the height above the earth's surface at which clouds form.

VOCABULARY:

dew point temperature:

psychrometer:

wet-bulb depression:

cloud base:

PROCEDURE A:

Refer to the Dew Point Temperature Chart in the Earth Science Reference Tables to answer questions 1 through 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 15°C and the wet-bulb depression is 5°C? _____

3. What is the dew point temperature if the dry-bulb temperature is 25°C and the wet-bulb temperature is 20°C? _____

PROCEDURE B:

Refer to Chart #1 which shows decreasing temperature with changing altitude and answer questions 1 through 5 below.

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

_____

2. How does the air temperature (dry-bulb temp.) change with increasing altitude? (Look at the dashed lines.)

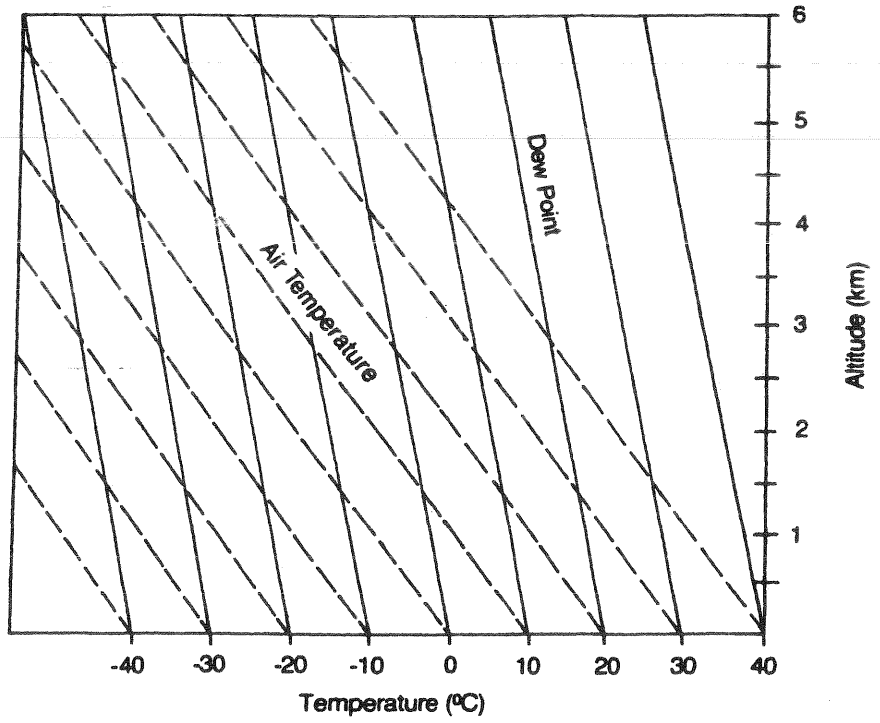
_____

3. Which changes more rapidly with increasing altitude, air temperature or dew point temperature?

_____

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

5. What would be the altitude of the bottom of a cloud mass if the surface temperature is 30°C and the surface dew point temp. is −10°C? _____



PROCEDURE C:

Use the information given on Report Sheet 1 to determine the dew point temperatures and cloud base altitudes. Use the Chart#1

REPORT SHEET #1

	(1)	(2)	(3)
DRY-BULB TEMPERATURE	24°C	4°C	25.00°C
WET-BULB TEMPERATURE	12°C	−2°C	18.75°C
WET-BULB DEPRESSION			
DEW POINT TEMPERATURE			
CLOUD BASE ALTITUDE			

PROCEDURE D:

1. Go outside and use a sling psychrometer to measure the wet and dry bulb temperatures. Record these data on the 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 Chart #1 to find the cloud base altitude for this day. Record this altitude on Report Sheet 2. Be sure to draw lines on Chart #1 showing the air Temperature and the dew point temperature coming together.
4. On Chart #1, draw in a cloud picture with the cloud base at the correct altitude.

REPORT SHEET #2

DRY-BULB TEMPERATURE: _____ °C

WET-BULB TEMPERATURE: _____ °C

WET-BULB DEPRESSION: _____ °C

DEW POINT TEMPERATURE: _____ °C

CLOUD BASE ALTITUDE: _____ km

DISCUSSION QUESTIONS: *(Answer in Complete Sentences)*

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

2. What would happen to the height of 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?

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.

CONCLUSION: Describe, step by step, how you can determine the base altitude at which clouds form?

Cloud Formation Questions

1. Condensation of water vapor in the atmosphere is most likely to occur when a condensation surface is available and:
a. a strong wind is blowing b. the temperature of the air is below 0°C c. the air is saturated with water vapor d. air-pressure is rising

2. As a sample of very moist air rises from sea level to a higher altitude, the probability of condensation occurring in that air sample will:
a. decrease b. increase c. remain the same

3. People sometimes release substances into the atmosphere to increase the probability of rain by:
a. raising the air temperature within the clouds b. providing condensation nuclei c. lowering the relative humidity within the clouds

4. Which process must directly result in cloud formation?
a. condensation b. transpiration c. precipitation d. radiation

5. As a parcel of air moves up a mountainside and expands, the temperature of the air will:
a. decrease b. increase c. remain the same

6. Why do clouds usually form at the leading edge of a cold-air mass?
a. Cold air flows over warm air, causing the warm air to descend and cool. b. Cold air flows under warm air, causing the warm air to rise and cool.
c. Cold air contains more dust than warm air does. d. Cold air contains more water vapor than warm air does.

7. The base of a cumulus cloud was determined to be 500meters above Earth's surface. This is the altitude at which;
a. cumulus clouds always form b. no dust is present in the air c. air temperature drops below 0°C d. air temperature equals the dew point temperature

8. Clouds usually form when moist air rises because:
a. the air pressure increases b. the dew point decreases c. the air is cooled to its dew point d. additional water vapor is added to the air

9. Which event will most likely occur in rising air?
a. clearing skies b. cloud formation c. decreasing relative humidity d. increasing temperature