

Exercise #5a Lab Activity

Name: BRIAN

Moisture

Lab Section: _____

Please show your work. If necessary please use additional paper to show work.

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Table 5.1 Capacity Table (Saturation Mixing Ratio) (at Sea-Level Pressure)

Temperature	°C	(°F)	Capacity (Saturation Mixing Ratio g/kg)
	-40	(-40)	0.1
	-30	(-22)	0.3
	-20	(-4)	0.75
	-10	(14)	2
	0	(32)	3.5
	5	(41)	5
	10	(50)	7
	15	(59)	10
	20	(68)	14
	25	(77)	20
	30	(86)	26.5
	35	(95)	35
	40	(104)	47

1. Based on Table 5.1, what is the Capacity (Saturation Mixing Ratio) of:

- a. -30 °C air mass 0.3
- b. 5 °C air mass 5
- c. 40 °C air mass 47

2. What pattern do you notice with the Capacity as air temperature rises?

As Air temps rise, Capacity increases

3. If a parcel of air at 20°C contains 5 grams of water vapor per kilogram of air, what is its relative humidity?

$$RH\% = \frac{\text{Actual}}{\text{Capacity} \leftarrow \text{Temp}} \quad RH\% = \frac{5g}{14g} \leftarrow 20^\circ = \frac{5g}{14g} = 35.7\%$$

4. If a parcel of air at 30°C contains 5 grams of water vapor per kilogram of air, what is its relative humidity?

$$RH\% = \frac{\text{Act}}{\text{Cap} \leftarrow \text{Temp}} \quad \frac{5g}{26.5g} \leftarrow 30^\circ = \frac{5g}{26.5g} = 18.8\%$$

5. If the same parcel of air (30°C) dropped in temperature to 5°C, how would the relative humidity change?

$$RH = \frac{A}{C} \leftarrow T \quad \frac{5g}{5g} \leftarrow 5^\circ = \frac{5g}{5g} = 100\%$$

RH WILL INCREASE

6. If a parcel of air at 15°C contains 10 grams of water vapor per kilogram of air, what is its relative humidity?

$$\frac{10}{10} = 100\% \text{ RH}$$

7. What is the actual water vapor amount in 20°C air when the relative humidity is 50%?

$$\frac{x}{14} = 50\% \text{ RH} \quad x = 7$$

8. If a 25°C air mass is saturated, what is the actual water vapor amount?

$$\frac{x}{20} = 100\% \text{ RH} \quad x = 20$$

9. What is the dew point of a 25°C parcel of air containing 14 grams of water vapor per kg of air?

$$\frac{14}{20} = 70\% \text{ RH}$$

10. On a cold day in December the relative humidity measures 20% and on a hot day in August, the relative humidity also measures 20%. Does this indicate the same water vapor presence on both days? Explain your answer.

NO! SINCE HOT AIR CAN HOLD MORE WATER VAPOR, THE SAME RH WOULD MEAN HIGHER AMOUNTS OF WATER VAPOR.

11. During the winter months, cold air is brought into homes and heated. Explain how this process changes the relative humidity in the house. In order to compensate for this phenomenon many homes utilize an appliance to keep their surroundings comfortable, what might this be?

COLD AIR CAN'T HOLD VERY MUCH WATER, EVEN IF SATURATED. WHEN THIS AIR IS HEATED THE ACTUAL WATER VAPOR IS VERY LOW. THIS MAKES IT VERY DRY. A HUMIDIFIER MAY HELP!

12. An air mass with a temperature of 5°C is saturated. If this air is brought into a house and heated up to 25°C, what is the relative humidity of this air in the house?

$$\frac{x}{5} = 100\% \quad x = 5 \rightarrow$$

$$\frac{5}{20} = 25\% \text{ RH}$$

13. Cold, continental polar air is often described as being dry even when its relative humidity is very high. Why is this so?

COLD AIR HOLDS LESS MOISTURE, SO EVEN IF SATURATED IT WILL CONTAIN LITTLE ACTUAL WATER VAPOR

Exercise # 5b Lab Activity

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Lab Section:

Please show your work. If necessary please use additional paper to show work.

Using Tables 5.2 and 5.3 answer the following questions.

1. With a sling psychrometer, you measure an air temperature of 60° F (dry bulb temperature) and a wet-bulb temperature of 55° F.

a. What is the wet-bulb depression?

$$60 - 55 = 5$$

b. What is the dew point temperature?

$$51^\circ$$

c. What is the relative humidity of the air?

$$73\%$$

2. An air mass has a temperature of 80° F and a depression of 13 degrees, what is:

a. What is the wet bulb temperature?

$$67^\circ$$

b. The wet-bulb depression?

$$13$$

c. The relative humidity of the air?

$$50\%$$

d. The dew point temperature of the air?

$$60^\circ$$

3. If the relative humidity of an air mass is 70% and the temperature of the air is 20° F

a. what is the wet bulb temperature?

$$18^\circ$$

$$(20 - 2)$$

b. what is the dew point temperature of the air?

$$12^\circ$$

4. If the amount of water vapor in the air decreases (new air mass arrives) and the temperature of the air stays constant, will the dew point temperature increase, decrease, or stay the same and why?

DEW PT. DECREASES. THE DEW PT. IS DETERMINED BY THE ACTUAL AMOUNT OF WATER VAPOR. LESS WATER VAPOR = LOWER DEW PT.

5. If the amount of water vapor in the air stays constant and the temperature of the air decreases, will the RH increase, decrease, or stay the same and why?

RH INCREASES. THE CAPACITY OF THE AIR GOES DOWN WITH LOWER TEMPERATURES. COOLER AIR = LESS CAPACITY. THUS THE SAME AMOUNT OF WATER VAPOR RESULTS IN A RELATIVELY LARGER AMOUNT (HIGHER RH)