Exercise # 5a Lab Activity Name: _____

Moisture Lab Section: _____

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

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?

Higher Temp = higher Capacity

3 If a parcel of air at 20°C contains 7 grams of water vapor per kilogram of air, what is its relative humidity?

$RH = \frac{7g}{14g} \sim 20° = 50\%$

4. If a parcel of air at 30°C contains 7 grams of water vapor per kilogram of air, what is its relative humidity?

$RH = \frac{7g}{26.5g} \sim 30° = 26.4\%$

5. If the same parcel of air from question # 4 above (30°C) dropped in temperature to 10°C, how would the relative humidity change, and what would the relative humidity be?

$RH = \frac{7g}{7g} \sim 10° = 100\%$ Saturated!

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

$RH = \frac{10g}{10g} \sim 15° = 100\%$

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

$50\% = \frac{x}{14g} \sim 20°$ $\frac{x}{14} = 50\%$ $x = 7g$

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

$100\% = \frac{x}{20g} \sim 25°$ $\frac{x}{20g} = 100\%$ $x = 20g$

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

$100\% = \frac{14g}{Cap_{dp}} \sim T_{dp}$ $100\% = \frac{14g}{14g}$ $14g$ cap $\rightsquigarrow$ 20° dp

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! They have different capacities and thus are 20% full with different 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 much water vapor. When brought inside the air warms, increasing capacity which Lower Relative Humidity. A HUMIDIFIER will help to add moisture to the air.

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?

$100\% = \frac{x}{5g} \sim 5°$ $\frac{x}{5} = 100$ $x = 5g$

$RH = \frac{5g}{20g} \sim 25°$ $\frac{5}{20} = 25\%$

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

Because it can hold so little water vapor it is not enough to be considered "MOIST" even if 100% RH

Exercise # 5b Lab Activity Name: _____

Moisture 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°

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? 80 - X = 13 X = 67°

b. The wet-bulb depression? 13°

c. The relative humidity of the air? 50%

d. The dew point temperature of the air? 60°

3. If the relative humidity of an air mass is 70% and the temperature of the air is 20°F, use chart... wet bulb dep = 2

a. what is the wet bulb temperature? 20 - X = 2 X = 18°

b. what is the dew point temperature of the air? 12°

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?

$\frac{5}{X}$ $x=5$ → $\frac{3}{X}$ $x=3$

Dew pt. temp will DECREASE because Capacity, and this temp, will decrease as well.

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?

$\frac{5}{10} = 50\%$ → $\frac{5}{7} = 71.4\%$

RH will INCREASE because temperature decrease = Lower capacity with the same water vapor