Name: _____ Student ID Number _____

ESS55: Earth's Atmosphere / Homework #6 (due 5/21/2009)

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. If a glass of water were surrounded by saturated air:
   a. the level of the water in the glass would slowly decrease
   b. the water's temperature would slowly increase
   c. the level of the water in the glass would not change
   d. the water's temperature would slowly decrease

____ 2. When the air is saturated, which of the following statements is <u>not</u> correct?
   a. the air temperature equals the wet-bulb temperature
   b. the relative humidity is 100%
   c. the air temperature equals the dew point temperature
   d. an increase in temperature will cause condensation to occur.
   e. the wet bulb temperature equals the dew point temperature

____ 3. As the air temperature increases, the air's capacity for water vapor:
   a. increases
   b. decreases
   c. remains constant
   d. is unrelated to air temperature and can either increase or decrease

____ 4. Which of the following will increase in a rising parcel of air?
   a. saturation vapor pressure
   b. relative humidity
   c. mixing ratio
   d. air temperature
   e. none of the above

____ 5. The ratio of the mass of water vapor in a given volume (parcel) of air to the mass of the remaining dry air describes the:
   a. absolute humidity
   b. mixing ratio
   c. relative humidity
   d. dew point

____ 6. When the air temperature increases, the saturation vapor pressure will:
   a. increase
   b. decrease
   c. remain the same
   d. vary over an increasingly broad range of values

____ 7. If water vapor comprises 3.5% of an air parcel whose total pressure is 1000 mb, the water vapor pressure would be:
   a. 1035 mb
   b. 35 mb
   c. 350 mb
   d. 965 mb

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____ 8. A high water vapor pressure indicates:
   a. a relatively large number of water vapor molecules in the air
   b. a relatively small number of water vapor molecules in the air
   c. a relatively high rate of evaporation
   d. an abundant supply of condensation nuclei in the air

____ 9. If the air temperature increased, with no addition or removal of water vapor, the actual vapor pressure would:
   a. increase
   b. decrease
   c. stay the same
   d. become greater than the saturation vapor pressure

____ 10. If very cold air is brought indoors and warmed with no change in its moisture content, the saturation vapor pressure of this air will _____ and the relative humidity of this air will _____.
   a. increase, increase
   b. decrease, decrease
   c. increase, decrease
   d. decrease, increase

____ 11. Evaporative coolers are primarily used in climates where the summers are:
   a. hot and humid
   b. hot and dry
   c. cold and humid
   d. cold and dry

Weather Data

The following questions refer to the temperature and dew point data in the following cities:

City	Air Temperature (^{o}F)	Dew Point (^{o}F)
City A	95	76
City B	10	10
City C	30	21
City D	50	42

____ 12. Refer to Weather Data. Which city has the highest relative humidity?
   a. City A
   b. City B
   c. City C
   d. City D

____ 13. Refer to Weather Data. Which city has the least amount of water vapor in the air?
   a. City A
   b. City B
   c. City C
   d. City D

____ 14. Refer to Weather Data. Which city has the greatest amount of water vapor in the air?
   a. City A
   b. City B
   c. City C
   d. City D

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____ 15. Refer to Weather Data. Which city has the highest saturation vapor pressure?
   a. City A
   b. City B
   c. City C
   d. City D

____ 16. The percentage of water vapor present in the air compared to that required for saturation is the:
   a. mixing ratio
   b. absolute humidity
   c. dew point
   d. relative humidity
   e. specific humidity

____ 17. Suppose it is snowing outside and the air is saturated. The air temperature and dew point are both 15 ^{o}F, and the actual vapor pressure is 3 mb. If this air is brought indoors and warmed to 75 ^{o}F, what would the relative humidity of this air be, assuming that its moisture content does not change? (The saturation vapor pressure at 75 ^{o}F is 30 mb).
   a. 5 percent
   b. 10 percent
   c. 30 percent
   d. 50 percent
   e. 100 percent

____ 18. At what time of day is the relative humidity normally at a minimum?
   a. when the air temperature is highest
   b. just before sunrise
   c. about midnight
   d. when the air temperature is lowest

____ 19. The time of day when the relative humidity reaches a maximum value is usually:
   a. at the time when the air temperature is highest
   b. in the middle of the afternoon
   c. at the time when the air temperature is lowest
   d. just before sunrise
   e. about midnight

____ 20. The dew point temperature is a measure of the total amount of water vapor in the air.
   a. true
   b. false

____ 21. If the air temperature remains constant, evaporating water into the air will _____ the dew point and _____ the relative humidity.
   a. increase, increase
   b. increase, decrease
   c. decrease, increase
   d. decrease, decrease

____ 22. Suppose the dew point of cold outside air is the same as the dew point of the air indoors. If the door is opened and cold air replaces some of the warm air, then the new relative humidity indoors would be:
   a. lower than before
   b. higher than before
   c. the same as before
   d. impossible to tell from the information given

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____ 23. If the air temperature in a room is 70° F, the saturation vapor pressure is 25 mb, the dew point temperature is 45° F, and the actual vapor pressure is 10 mb, then the relative humidity must be near _____ percent.
a. 15
b. 20
c. 35
d. 40

____ 24. Suppose saturated polar air has an air temperature and dew point of -10° C, and unsaturated desert air has an air temperature of 35° C and a dew point of 10° C. The desert air contains _____ water vapor and has a _____ relative humidity than the polar air.
a. more, lower
b. more, higher
c. less, lower
d. less, higher

____ 25. As the difference between the air temperature and the dew point increases, the relative humidity:
a. increases
b. decreases
c. remains constant at a value less than 100%
d. remains constant and equal to 100%

____ 26. The temperature to which air must be cooled in order to become saturated is the:
a. minimum temperature
b. dew point temperature
c. wet-bulb temperature
d. freezing point

____ 27. As the air temperature increases, with no addition of water vapor to the air, the dew point will:
a. remain the same
b. increase
c. decrease
d. increase and become equal to the air temperature

____ 28. Which of the following is the <u>best</u> indicator of the actual amount of water vapor in the air?
a. air temperature
b. saturation vapor pressure
c. relative humidity
d. dew point temperature

____ 29. At 40° F, the atmosphere is saturated with water vapor. If the air temperature increases to 60° F, with no addition or removal of water vapor, one may conclude that the dew point is about:
a. 20° F
b. 40° F
c. 60° F
d. 100° F

____ 30. As the air temperature increases, with no addition of water vapor to the air, the relative humidity will:
a. remain the same
b. increase
c. decrease
d. increase until it becomes equal to the dew point temperature