Name: _____ Water in the Atmosphere Notes

I. Water can change between solid, liquid, and gaseous states of matter freely at normal Earth temperatures.

A. Solid to liquid: _____
_____

1. The heat required to melt ice is _____ (Joules per gram).

2. Heat used to melt ice is called _____, (hidden), since the heat energy is used to simply melt the ice...and does not raise the temperature until all the ice has melted.

3. The freezing of liquid water to ice is the opposite, and will release _____ _____ of energy for every gram of water frozen.

B. Liquid to Gas: _____

1. It takes _____ of energy to vaporize _____ of water

2. _____ takes heat away from surroundings (2260 J/g) to vaporize the water, so it is called a "cooling" process!

3. _____ is the opposite process, where water is changed from gas to liquid water droplets called clouds or fog. Condensation will release 2260 Joules of heat energy for every gram of liquid water formed.

C. Solid to Gas: _____
_____

II. Humidity is the amount of water vapor in the air

A. Saturation occurs when _____
_____

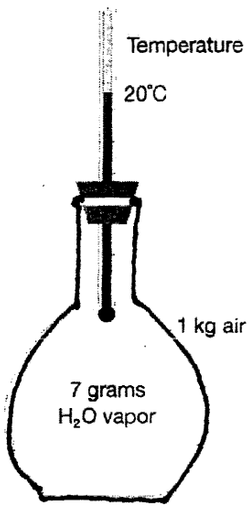
B. The amount of water vapor required for saturation depends upon _____
_____

C. _____ *is the ratio of the air's actual water vapor content compared to the amount of water vapor air can hold at that temperature and pressure.*

1. Given the same amount of water vapor, _____
_____

Example of Relative Humidity Based on Temperature

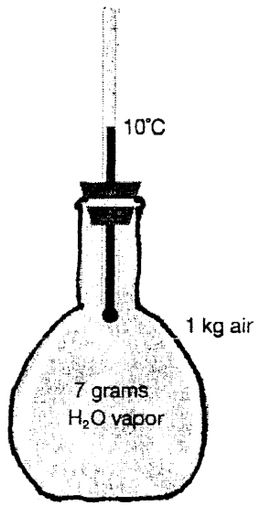
Initial condition



1. Water vapor needed for saturation at 20° C = 14 grams
2. H_2O vapor content = 7 grams
3. Calculate Relative Humidity:

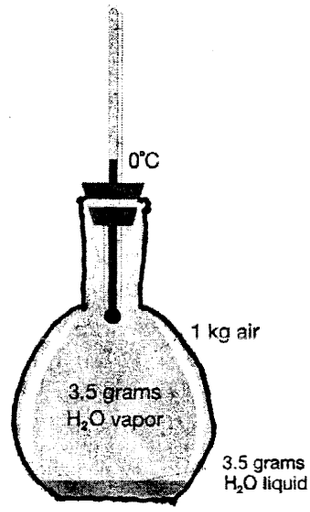
RH =

Cooled to 10°C



1. Water vapor needed for saturation at 10° C = 7 grams
2. H_2O vapor content = 7 grams
3. Relative humidity =

Cooled to 0°C



1. Water vapor needed for saturation at 0° C = 3.5 grams
2. H_2O vapor content = 3.5 grams
3. Relative humidity =

NAME: _____ **Earth's Water Cycle and Relative Humidity**

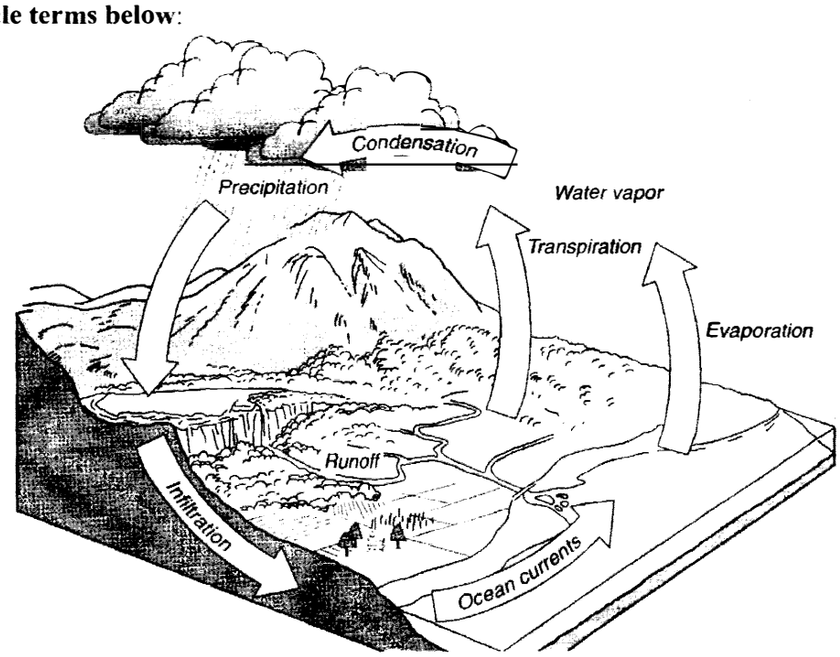
Background Information:

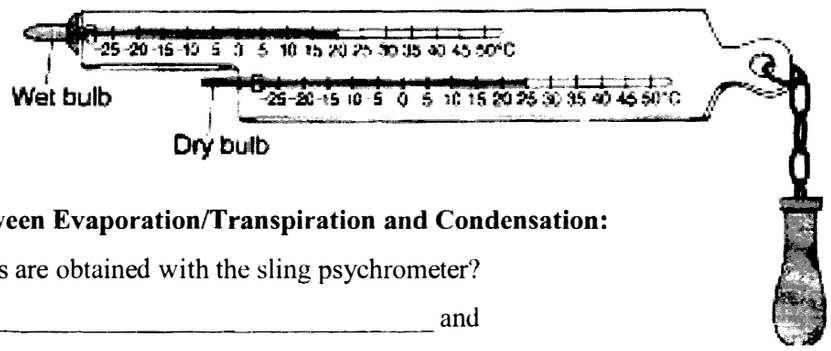
I. All of Earth's weather occurs it the _____ section of Earth's atmosphere. Changes in air masses occur because the _____ heats Earth's surface differently at different locations, leading to differences in _____, which create differences in _____ _____. This will cause air masses to move, and bring changes in weather to any location. So, all of Earth's "weather" is really powered by energy from the _____!

II. Parts of the Water Cycle

- **Precipitation** = water falling to Earth as rain, snow, sleet, hail, freezing rain, etc.
- **Infiltration** = water that soaks into the ground through pores in soil and rock to become groundwater
  - Groundwater = water that remains in the ground, flowing slowly after infiltration has occurred
- **Runoff** = the precipitation which cannot enter the ground due to impermeable surfaces (asphalt, clay, shale) simply flows down slope into surface waters (streams, rivers), and eventually returns to the oceans.
- **Evaporation** = _____ _____
- **Transpiration** = _____ _____
- **Condensation** = water vapor cools and condenses on tiny dust particles called _____ _____ to form liquid water droplets (clouds). This occurs because as air rises in the troposphere, it _____, and condensation of water vapor may occur to form clouds. The reverse process may occur as some of the liquid water in clouds _____.

Complete the water cycle terms below:





III. Relationship between Evaporation/Transpiration and Condensation:

- What two values are obtained with the sling psychrometer?
  _____ and
  _____.
- Evaporation is a _____ process, and therefore evaporation from the wet bulb thermometer of a sling psychrometer will _____ _____ the temperature reading in that thermometer.
- On the sling psychrometer above, the dry bulb temperature is _____°C and the wet bulb temperature is _____°C. Therefore, the DIFFERENCE between these two values is _____ (which indicates the correct column to use in the ESRT's.)
- Now turn to page 12 of the Earth Science Reference tables, and use the values to determine the dew point temperature: _____°C, and the relative humidity: _____%.
- In general, if there is less evaporation from the wet bulb, there will be less difference between the wet bulb and dry bulb temperatures, which would yield a _____ dew point temperature, and a _____ relative humidity %.
- Clouds form whenever the air temperature decreases to the _____ temperature. Using the example above, show how this process occurs with rising, moist air, on the grid below.

13°C_____

15°C_____

17°C_____

19°C_____

21°C_____

23°C_____

25°C_____ ground level