I. Air Temperature and perception

A. perspiration cools the body if it can evaporate.

1. If air is humid it cannot absorb much of the perspiration so the body does not cool
2. wind blows layer of warm air and heat loss accelerates. (Wind chill factor)
3. frostbite – skin freezes; hypothermia – body temperature lowers.

2. Water circulates through the air (hydrological cycle)

A. Water evaporates from bodies of water (largely the ocean which covers about 71% of the Earth's surface. (requires heat from sun)

B. water condenses and becomes cloud.

1. condensation may lead to precipitation and fall back to ocean.
2. cloud may move over land and precipitation falls on land
3. land becomes ground water, falls on vegetation, freezes on ice (glaciers), and so on; ultimately goes back to ocean
4. the cycle is very efficient

II. Water has 3 phases – vapor (gas), liquid (water) and solid (ice)

A. Water molecule movement is different in all phases – fast in gas, slower and more in a smaller area in water and in some six sided crystals as ice which is less dense than liquid and floats
As liquid water molecules become more energetic, they can move out of the liquid and go into the atmosphere. Some move from the water to the air, other from the air to the water. If more move from the water to the gas, there is evaporation. If more move from the air to the liquid, it is condensation. When equal number move in both directions the air is considered saturated – that is the air can hold no more water.

B. Wind and temperature. Temperature causes the air to expand allowing for the absorption of more water.

a. As temperature decreases, the
b. air can hold less water; as it increases the air can hold more.

III. Humidity – the amount of water in the air is measured in several different ways

A. Absolute humidity is the mass of water vapor per volume of air

$$\text{Absolute humidity} = \frac{\text{mass of water vapor}}{\text{volume of air}}$$

B. Absolute humidity varies with volume.

C. Specific humidity measures the mass of water relative to the mass of all the air in the parcel

$$\text{Specific humidity} = \frac{\text{mass of water vapor}}{\text{total mass of air}}$$

D. Mixing ration: this measures the mass of water to the mass of the dry air in the parcel This differs from the specific humidity only slightly

$$\text{Specific humidity} = \frac{\text{mass of water vapor}}{\text{total mass of air}}$$

E. Vapor Pressure

a. The partial pressure in a mixed gas is equal to the sum of the pressures of each gas. These are measured in millibars, pascals or some percentage of these. So the pressure of oxygen and nitrogen are constant, but the amount of water vapor varies so one can calculate what percentage of the total pressure is caused by the water vapor

b. Relative humidity: gives the percentage of how close the water vapor content is the saturation amount. A relative humidity of 50% means that the air is halfway to being saturated.

$$RH = \frac{\text{water vapor content}}{\text{water vapor capacity}}.$$

We can think of the actual vapor pressure as a measure of the air's actual water vapor content, and the saturation vapor pressure as a measure of air's total capacity for water vapor. Hence, the relative humidity can be expressed as

$$RH = \frac{\text{actual vapor pressure}}{\text{saturation vapor pressure}} \times 100 \text{ percent.}^*$$

RH can be changed by

1. changing the air's water vapor content
2. by changing the temperature

Relative humidity varies inversely with temperature.

IV DEW POINT – the point to which air has to be cooled to become saturated.

A. Good to predict dew, frost fog and even minimal night time temperature
   a. A dew point of about 65% is uncomfortable for most; 70-75% is oppressive
   b. Hot humid air is less dense that hot dry air

IV. Humidity is measured with hygrometer. One kind is a psychrometer with 2 thermometers one dry one wet bulb. The difference between the two is part of what is need to figure the humidity.
A hygrometer called a sling psychometer has the two thermometer on a handle which allows it to be swung in the air with the wet bulb temperature losing heat.
Another kind is a hair thermometer – either human or horse . The hair contracts and through a system of levers indicates the humidity.