Ch 2 – Sect 1 … ***WATER IN THE AIR***

**Weather** = condition of atmosphere at a certain TIME and PLACE

= affected by the amount of water in the air

**Water Cycle**

* Earth’s water is continuously being recycled in all states; liquid, solid, & gas (vapor)
* Water is moving from Earth’s surface to the air and back down again  
  + Evaporation – liquid changes to vapor (gas)
  + Condensation – water vapor cools & changes to liquid (CLOUDS form)
  + Precipitation – rain, snow, sleet, or hail falls back to Earth
  + Runoff – water (mostly from precipitation) flows across land & collects in rivers, streams, and eventually oceans

**Humidity**

* Evaporated liquid water becomes invisible water vapor.
* The AMOUNT of water vapor in the air = *humidity*
* As air temperature ability to hold more water vapor

**Relative Humidity**

* Given as a percentage that shows HOW MUCH water vapor the air can hold AT A CERTAIN TEMPERATURE. (Remember the warmer the air, the more the air can hold.)
* If the air (at a given temperature) is 100% full, we said it is ***saturated*** = 100% relative humidity

**Factors Affecting Relative Humidity**

* AMOUNT OF WATER VAPOR … versus … TEMPERATURE  
    
  + If ***temperature*** and ***air pressure*** do not change, it’s simple …  
    - amount of water vapor in air …. relative humidity
  + If the amount of ***water vapor*** does not change but the temp. DOES change …

This is because warmer air can hold more water.

Cooler air cannot hold as much water.

100% relative humidity is when the air is saturated.

* + - temperature …. relative humidity
    - temperature …. relative humidity

**Measuring Relative Humidity**

* Psychrometer = instrument used to measure relative humidity  
  + 2 thermometers … 1 wet-bulb (end wrapped in damp cloth) & 1 dry-bulb
  + Difference in readings from both thermometers = amount of water vapor in air
  + Use the dry-bulb reading (measuring AIR TEMPERATURE) and the difference between the 2 readings (indicating WATER VAPOR), to find the relative humidity percentage on a table used by meteorologists.

**How a Wet-Bulb Thermometer Works**

* Water in cloth that is wrapped around bulb of thermometer evaporates and cloth cools  
  + If humidity is high *(a lot of moisture in air at given temp.)* = small amount of water evaporates = small change in temperature
  + If humidity is low *(small amount of moisture in air at given temp.)* = water will evaporate quickly = temperature will drop

**Condensation**

* Gases become liquids (e.g. water vapor = liquid water)
* Air must be saturated (100% relative humidity) BEFORE condensation occurs  
  + Condensation occurs when saturated air cools.
  + Water on outside glass of ice water = cool air right next to glass cooled to dew point
  + Must have a SURFACE for water vapor to condense on.

**Dew Point**

* TWO ways for air to become saturated (100% relative humidity)

1. when water vapor is added to air through evaporation
2. air cools to dew point (dew point = *temperature* when gas condenses to liquid)

**Cloud**

* Warm air rises & cools (*remember*: higher elevation in troposphere = lower temps.)  
  + Warm rising air becomes saturated at cooler higher elevations
* Water vapor condenses into either liquid (tiny water droplets) **OR** solid (tiny ice crystals) depending on the temperature of elevated air
* Water vapor condenses ON tiny particles floating in the air
* When millions of droplets or crystals collect, we see CLOUDS
* Clouds = classified by form and altitude

**Cumulus Clouds**

* Puffy, white clouds with mostly flat bottoms (forms: warm air rises)
* Indicate fair weather, but can grow big enough to make *cumulonimbus clouds* where thunderstorms are produced (“***nimbus***” or “***nimbo***” means rain)

**Stratus Clouds**

* Layered clouds cover large areas & block sun (forms: gentle lifting of large body of air)
* *Nimbostratus clouds* = light to heavy continuous rain
* *Fog* = stratus cloud near the ground

**Cirrus Clouds**

* Thin, feathery, white clouds at HIGH ALTITUDES (forms: strong wind)
* Indicate possible change of weather

**Clouds & Altitude**

* Cirro *–* HIGH altitude (e.g. cirrus, cirrocumulus, cirrostratus)
* *Alto –* MIDDLE altitudes (e.g. altostratus, altocumulus)

**Precipitation**

* Water (liquid OR solid) returns to Earth

**Rain**

* Most common form of precipitation = liquid
* Suspended water droplets in cloud becomes 100 times its original size before falling

**Sleet & Snow**

* SNOW = temps. SOOOO cold, water vapor changes directly to a solid
* SLEET = Liquid rain falls through layer of freezing air & falls as ice

**Hail**

* Forms in cumulonimbus clouds

1. Updrafts carry raindrops UP high in cloud where liquid raindrops freeze into ice
2. As they fall through cloud, another layer of liquid rain collects on ice ball
3. ANOTHER updraft freezes new layer into more ice
4. Eventually, hailstones become too heavy to be carried up by the updrafts & fall