Section I: Earth Systems & Resources AP Tips

- *Sustainability*- don't deplete resources faster than they can naturally regenerate
- *Scientific Method/Experimental Design*
    - Hypothesis: IF _____THEN _____statement
        - Keep it simple. Ex. If nitrates increase then crop yield will increase.
    - Control group vs. experimental group
        - Ex. control group (no N); experimental group (N)
    - Collecting data/results (feel free to draw a graph on a FRQ)
- pH
    - measures acidity/alkalinity of a solution
    - neutralize acids with lime(stone)
    - logarithmic scale. A pH of 7 is 100 times greater than a pH of 5
- *1st Law of Thermodynamics*
    - Energy is not created or destroyed, just transformed from one form to another
- *2nd Law of Thermodynamics*
    - no such thing as a 100% transformation of energy. ENTROPY. Disorder. Randomness.
        - Ex. only 10% of energy passed on from one trophic level to the next
- *Positive Feedback Cycle*
    - Initial change is magnified
        - Ex. Population increase → more births → higher pop → more births → higher pop
        - Ex. melting of arctic sea ice
- *Negative Feedback Cycle*
    - Initial change is reversed
        - Ex. evaporation from lake → volume decreases → rain → volume increases → evaporation etc, …
        - Ex. Thermostat- maintains temp around a set-point
- Earth Science
    - Core- hot; Fe (iron)
    - Crust- O2
    - *Tectonic Plates* (→←convergent, ←→divergent, & ↑↓transform plates)
        - Volcanoes & earthquakes @ plate boundaries
            - Effects of Volcanoes:
                - Ash/soot: decreases visibility; aggravates bronchitis & asthma
                - $SO_2 + H_2O$ → sulfuric acid → acid rain
                - Weathering of lava = fertile soil
        - Hot spot- intraplate ex. Hawaii

- **Soil**
  - Soil Horizons
    - O = leaf litter
    - A = humus/topsoil
  - *Chemical Properties/Tests*
    - NPK (nitrATES, phosphATES, potassium)
      - Soil fertility
    - pH
      - lime(stone) neutralizes acidic soil
    - Salinity
      - Measures salt content
      - Salinization caused by: (solution- flush w/ water to leach out salts)
        - Salt runoff (in cold climates- salt roads to prevent ice)
        - Irrigation
  - *Physical Properties/Tests*
    - Texture (sand, silt, clay)
      - Soil Sieve
      - Ribbon Test
      - Porosity/Infiltration (ability of water to enter)
        - Clay- highest water holding capacity; Sand- increases drainage (lowest water holding *capacity)*
  - *Soil Conservation*
    - No/minimum Till (don't mess with the soil)
    - Mulch (reduces water loss from evaporation; adds to compost)
    - Polyculture NOT monoculture (monoculture does have economic advantages)
    - PERMACULTURE – work with nature for crop yields & environmental advantages
    - Preventing wind EROSION
      - Windbreaks
      - Alleycropping
    - Preventing water EROSION
      - Terracing
      - Controur planting; strip cropping
    - Apply compost/organic matter
  - *Climate*
    - Average <u>temperature</u> & <u>precipitation</u> over a long period (ex. 30 yrs)
  - Albedo
    - Higher on light surfaces, lower on dark surfaces (= more heat absorption)
  - Convection Currents (Hadley Cell's in atmosphere)

        - Warm, moist air rises = rain (@ 0 & 60 degrees latitude)
            - Ex. equator- tropical rain forests; temperate rainforests
        - Cool, dense, dry air descends (@ 30 & 90 degrees latitude)
            - Ex. deserts & tundra
    - Seasons = tilt + axis
    - *El Nino* (Tropical [east] Pacific)
        - Tradewinds weaken = winds & ocean currents go W to E (rather than E to W)
        - Thermocline is depressed = suppresses upwelling
        - Disrupts food webs (fisheries) off coast of Peru
        - Environmental effects:
            - Floods in south America
                - Bacterial diseases/sanitation problems such as cholera
                - Mosquitoes = vectors for diseases such as west nile & malaria
                - Habitat destruction → disrupts food webs → decreases biodiversity
                - Fires in Australia
        - Economic effects:
            - Decreased fisheries off of Peru – fishermen can't sell fish
            - Human health effects from poor sanitation
    - Greenhouse Effect
        - Natural warming of Earth's atmosphere (troposphere) = GOOD
        - Greenhouse gases [absorb outgoing IR radiation]:
            - H_2O (water vapor is most nonanthropogenic GHG)
            - CO_2
            - CH_4
            - N_2O (nitrous oxide)
    - *Water*
        - 97% salt 3% fresh <1% accessible freshwater
        - Hydrologic/Water cycle
            - Evaporation, transpiration (evaporation from leaves), infiltration/percolation, run-off
            - Human effect: urbanization paves over recharge areas
            - Watershed – area of land that delivers run-off
                - Filters toxins/nutrients; protect riparian habitats!
        - Dams/Reservoirs
            - Advantages
                - Recreation (ex. boating, fishing, swimming); hydropower (turbine→electricity), reduces downstream flooding, irrigation for cropland
            - Disadvantages

        - Habitat destruction/displaces human settlements when damming river to make a reservoir, disrupts migration/spawning of fish (solution = fish ladders), silt/nutrients get stuck in dam → farmers downstream apply fertilizers → nitrates run-off into aquatic systems = eutrophication
- Solutions!
    - Agriculture: drip irrigation; mulch; hydro/aquaponics
    - Homes: low flow toilets & showerheads; turn off water when brushing teeth/shaving