Unit I: Earth's Systems and Resources (10-15%)

1. Geologic time scale
   a. Rock layers (strata) are laid down in succession with each strata representing a period of time
   b. The principle of superposition – any given stratum is probably older than those above it and younger than those below it
2. Earth structure
   a. Crust
      i. Composed of (in order): Oxygen, Silicon, Aluminum, Iron, etc.
      ii. Two types
         1. Continental
         2. Oceanic
   b. Moho
      i. Boundary between crust and mantly
   c. Mantle
      i. Majority of mass of Earth
      ii. Upper third (asthenosphere) is plastic-like
   d. Core
      i. Iron (mostly) and nickel
      ii. So hot that the outer core is liquid while inner core is under such pressure as to be solid
3. Tectonics
   a. Plate boundaries
      i. Convergent
      ii. Divergent
      iii. Transform
   b. plate boundaries among oceanic and continental plates vary depending on boundary type
      i. subduction, etc.
4. Earthquakes
   a. Sudden movement of crust
   b. Measured on logarithmic Richter scale
   c. Waves
      i. Body waves
         1. P-waves (compressional)
         2. S-waves (shear)
      ii. Surface waves
5. Seasons, solar intensity and latitude
6. Soil
   a. OABCR
   b. Sand, Silt, Clay
   c. Loam – equal parts sand, silt, clay (very good nutrients and water holding without becoming water logged)
   d. Desertification
      i. Productive potential of arid or semi-arid land falls by at least 10% due to human activity or climate change
   e. Salinization
      i. Water that is not absorbed into the soil and evaporates leaves behind dissolved salts in topsoil
   f. soil degradation by type
      i. water erosion (56%)
      ii. wind erosion (28%)

        iii. chemical degradation (12%)

        iv. physical degradation (4%)

7. Rock Cycle
8. Atmosphere
   a. Comp.
      i. N – 78%
      ii. O – 21%
      iii. H_2O – 0-4%
      iv. CO_2 – <<1%
      v. CH_4 (greenhouse gas)
      vi. N_2O (greenhouse gas)
      vii. O_3 (97% in stratosphere)
   b. Layers (They Say My Time Is Ending)
9. Weather and Climate
   a. Air masses (tropical, maritime, etc.)
   b. Air pressure
   c. Albedo (Latin for "White") – measured in 0-1
   d. mountain ranges
   e. landmasses
   f. etc.

10. Atmospheric circulation and the Coriolis Effect
    a. Hadley, Ferrel, Polar Cells (Hey Fat Puppy)
    b. Monsoons

11. Earth's Water Resources and Use
    a. 97% saline
    b. 3% fresh
       i. 30% ground
       ii. 68.7% icecaps/glaciers
       iii. surface 0.3%
          1. 87% lakes
          2. 11% swamps
          3. 2% rivers
    c. lake zonation
       i. Horizontal
          1. littoral zone (shore)
          2. limnetic zone (open water)
       ii. Vertical
          1. Euphotic zone (with light)
          2. Benthic zone (aphotic depths)
    d. Ocean circulation
       i. Thermohaline current
          1. Sinking north of England
          2. Rising in Indian Ocean and south of Aleutian Range
       ii. Ekman Spiral (transport)
          1. Results in 45^0 transport of surface water in relation to wind direction
          2. Results in coastal upwelling

Unit II: The Living World (10-15%)

1. Ecosystems
    a. Community characteristics
        i. Diversity (number of different species)
        ii. Abundance (number of individuals of each species)
    b. Species interactions
        i. Amensalism (bad/neutral – black walnut tree emits chemical that kills neighboring plants)
        ii. Commensalisms (good/neutral – remora on shark)
        iii. Competition (good/bad)
        iv. Mutualism (good/good – bees pollinating flowers)
        v. Parasitism (good/bad – tapeworms, etc.)
        vi. Predation (good/bad)
        vii. Saprotrophism (good/neutral – obtain nutrients from dead or decaying plants or animals)
    c. Keystone species
    d. Edge effects – how the local environment changes along some type of boundary or edge
        i. Some species do well in edge environments ("Edge species") while others do not
    e. Biomes
2. Energy flow
    a. Food chains/webs
    b. Trophic levels
3. Natural selection
    a. Stabilizing selection
    b. Directional selection
    c. Disruptive selection
4. Succession
    a. Primary (bare rocks)
    b. Secondary (disturbed area but topsoil still remains)
5. Strategists
    a. r-strategists (mature rapidly/short-lived species/niche generalists) [raccoon]
    b. k-strategists (mature slowly/long-lived/niche specialists) [koala]
6. Survivorship curves
    a. Type I – (man) low mortality and long lifespan
    b. Type II – (birds) moderate both
    c. Type III – (oysters) high mortality
7. Biogeochemical Cycles
    a. Carbon Cycle
        i. Photosynthesis:
            1. $6CO_2 + 6H_2O + sunlight \rightarrow C_6H_{12}O_6 + 6O_2$
        ii. Respiration:
            1. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + energy$
        iii. Major reservoirs:
            1. Atmosphere - 750 Gt
            2. Biosphere – 575 Gt
            3. Geosphere – 1,500 Gt
            4. Hydrosphere – 36,000 Gt

          5. Carbon being released from the fifth and far more ancient fossil sedimentreservoir is suspected as a primary cause of global warming

b. Nitrogen cycle
    i. Fixation – N_2 to NH_3
    ii. Nitrification – ammonia is then nitrified by bacteria in the soil to form first nitrite (NO_2-) and then nitrate (NO_3-) ions
    iii. Assimilation – Nitrate (largely) is absorbed by the roots of plants, where it enters the biological reservoir
    iv. Decomposition – Take nitrates and nitrites in organic structures and break them down into ammonia
    v. Denitrification – Take nitrates break down into atmospheric nitrogen (N_2)

c. Phosphorus Cycle
    i. Phosphorus is extremely limited in the atmosphere.
    ii. The largest quantities of phosphorus occur in mineral deposits, largely as marine sedimentary rocks
    iii. The phosphorus from rocks is slowly released to terrestrial and aquatic ecosystems through the gradual weathering of rocks.
    iv. It is then absorbed by plants and slowly recycled in ecosystems.