Welcome to AP Biology!

This year we will covering the following eight units:

- Unit 1 - Chemistry of Life
- Unit 2 - Cell Structure and Function
- Unit 3 - Cell Energetics
- Unit 4 - Cell Communication & Cell Cycle
- Unit 5 - Heredity
- Unit 6 - Gene Expression & Regulation
- Unit 7 - Natural Selection
- Unit 8 - Ecology

For your summer assignment I would like you to use evolution, one of the themes of biology, to renew, research, and connect these eight units. Please complete the following activities and questions. Please use your textbook as a resource as well as the internet. Please use your own words instead of just cutting & pasting.

1. Create a timescaled timeline beginning with the creation of the planet detailing the evolution of life on it. Your timeline must include a scale - how many MYA (million years ago) per cm. Your timeline must include the following milestones:
    a. Origin of Earth
    b. H_2O forms ancient oceans
    c. First Prokaryotes
    d. Photosynthesis Evolves
    e. Oxidizing Atmosphere
    f. First Eukaryotes
    g. Sexual Reproduction
    h. Multicellular Algae
    i. Land Life
    j. Amphibians
    k. Reptiles
    l. Mammals
    m. Flowering Plants
2. Unit 1 - Chemistry of Life
    a. Fossil evidence indicates that life arose in the sea (primordial ocean). Why is water so important to life?
    b. Why is H_2O polar?
    c. What are hydrogen bonds?
    d. How does the polarity and hydrogen bonding of water lead to the unique properties of water that make life possible?
    e. Why do we believe that the early atmosphere was more conducive to abiotic synthesis (spontaneous generation) than today's atmosphere?
    f. What inorganic precursors may have been used to create organic molecules?
    g. How are monomers bonded together to create polymers?
    h. How are macromolecules broken apart back into monomers?
    i. Explain how organic molecules may have formed in the ancient oceans.
3. Unit 2 - Cell Structure and Function
    a. The first cells were prokaryotic. What is a prokaryotic cell?

    b. How do we think prokaryotic cells evolved?
    c. What are the 4 components every cell has and why is each component essential?
    d. What is an eukaryotic cell?
    e. How do we think eukaryotic cells evolved from prokaryotic cells?
    f. Include a sketch of the evolution of the eukaryotic cell.
    g. What advantages do eukaryotic cells have over prokaryotic cells?
    h. In the 3 Domain system of classification what distinguishes Bacteria, Archaea, and Eukarya?
4. Unit 3 - Cell Energetics
    a. Every organism needs a source of carbon and energy. What do we think the first prokaryotes used for energy?
    b. What is an autotroph?
    c. What is a heterotroph?
    d. What is the overall formula for photosynthesis?
    e. What is the overall formula for cellular respiration?
    f. How do these 2 pathways, photosynthesis & cellular respiration, complete a circle of life?
    g. How did Earth's atmosphere change from reducing to oxidizing?
5. Unit 4 - Cell Communication & Cell Cycle
    a. Explain how bacteria divide by binary fission.
    b. What evidence is there that mitosis evolved from binary fission?
    c. Why is it important that the process of cell division be tightly controlled?
    d. Why is it important that cells be able to communicate with each other in multicellular organisms?
6. Unit 5 - Heredity
    a. Why does every form of cell division begin with the copying of the DNA?
    b. What does meiosis make?
    c. Why is the chromosome referred to as the unit of inheritance?
    d. Name 3 ways that human sexual reproduction increases genetic diversity.
7. Unit 6 - Gene Expression & Regulation
    a. What is the central dogma?
    b. Why is it said that proteins do all of the work and DNA gets all of the credit?
    c. Why is it important to regulate protein synthesis?
    d. How is it possible for four nucleotides to create the incredible diversity of life found on this planet?
8. Unit 7 - Natural Selection
    a. How does nature select which populations of organisms are successful?
    b. It is estimated that over 99% percent of the species that ever lived on Earth are now extinct, why?
    c. How do species undergo speciation (form new species)?
    d. Look at your timeline, why did the rate of evolution of life on Earth increase over time?
9. Unit 8 - Ecology
    a. Why is biodiversity a good thing?
    b. As a result of human actions, how do you expect the rates of speciation & extinction to change in the coming years?
10. Final Question - Why are you taking AP Biology?