AP Biology Summer Assignment - Review of Essential Topics
To answer the below questions, refer to:
● OpenStax AP Bio text provided by Rice University to answer most of the questions. Information provided to answer questions must be given in-text citation from the textbook. Any remaining questions can be answered using additional resources, but these must be cited as well:
https://openstax.org/details/books/biology-ap-courses

● You may answer these questions either directly on this document or on a separate sheet of paper. Answers in YOUR OWN WORDS (hand-written preferred). Pay attention to what the prompt asks you to do (ex- 'describe' is not the same as 'explain'). It's never too early to start preparing for the College Board FRQs! Here's a link to the task verbs you must master:
https://apstudents.collegeboard.org/courses/ap-biology/exam-tips
There will be NO credit given for answering questions using the wrong task verb!

● You are creating a Study Guide for the Unit 1 Test by doing this summer assignment, so be thoughtful & thorough regarding your responses. We will **NOT** spend substantial time going over these concepts in detail while in class.

1. **Compare and contrast** a prokaryotic and eukaryotic cell.

2. **Define** the term 'genome'.

3. **Distinguish** between positive and negative feedback, including an example of each. *Relate these concepts to homeostasis.

4. **Identify** the core theme of biology that accounts for the unity and diversity of life.

5. **Compare/Contrast** the 3 Domains of Life.

6. **Explain** the process of natural selection, including the term adaptation in your response.

7. **State** what Darwin meant by “descent with modification”.

8. **Differentiate:** inductive reasoning vs deductive reasoning. Give an example of each.

9. **Differentiate:** invalid hypothesis vs falsified hypothesis.

10. **List** the 4 elements make up > 95% of living organisms.

11. **Explain** how table salt has emergent properties.

12. Recall atomic structure, including proton, neutron, electron, mass number and orbital. **Describe** what is meant by electrons in an "excited state" vs those in a "ground state", in terms of energy.

13. **Define**: isotope. **Explain** two important physical properties of radioactive isotopes that make them useful in biological research.

14. **Compare/contrast**: C-12 and C-14.

15. Recall- ionic bond. Given: $CaSO_4$.
A- **State** which is the cation and which is the anion.
B- **Describe** why this bond is ionic, rather than covalent, in terms of electronegativity.
C- Would this substance dissociate in water? _____ If so, **explain** WHY and **indicate** how many 'particles' it would dissociate into.
D- If glucose ($C_6H_{12}O_6$) was the solute, would it dissociate in water? **Explain** (and include if disassociation means the same as solubility).

16. Does a valence e- in Carbon have higher or lower chemical (potential) bond energy than a valence e- of Sulfur?

17. **Distinguish** between a polar and nonpolar covalent bond. BE SPECIFIC! Give an example of each.

18. **Diagram** 2 water molecules and **indicate** the Hydrogen bond(s) present between them using labeled dashed lines.

19. Give an example of any BIOLOGICAL (organic) molecule that forms H bonds with water. **Diagram** your example, showing the positive and negative attractions, as were done above. **Predict** at least one 'consequence' if the bond was either covalent or ionic.

20. Does a chemical reaction in dynamic equilibrium mean that the concentration of reactants and products is equal? **Explain.**

21. A- **Define** what is meant by pH.
B- **Describe** how the pH scale works (in terms of H^+ and OH^- concentrations)
C- **Explain** how buffers resist changes in pH (refer to carbonic acid/bicarbonate for an example)

22. Water is essential for life on earth.
A- **List** at least 5 properties of water.
B- **Explain** why water is a good solvent (include the terms polar and hydrophilic)
C- **Explain** how the high surface tension of water affects evaporation.
D- **Compare & contrast** cohesion and adhesion. Give an example of each as it relates to a living organism (ex- root uptake of a tree)
E- **Explain** water in terms of specific heat. Compare with a substance that has a 'contrasting' specific heat, such as a metal.

23. A- **Describe** an example of how acid precipitation affects life on earth.
B- CO_2 is the main product of fossil fuel combustion. Although the majority stays in the atmosphere, contributing to the greenhouse effect, about 30% is absorbed in the oceans. **Explain** what happens when CO_2 dissolves in seawater.

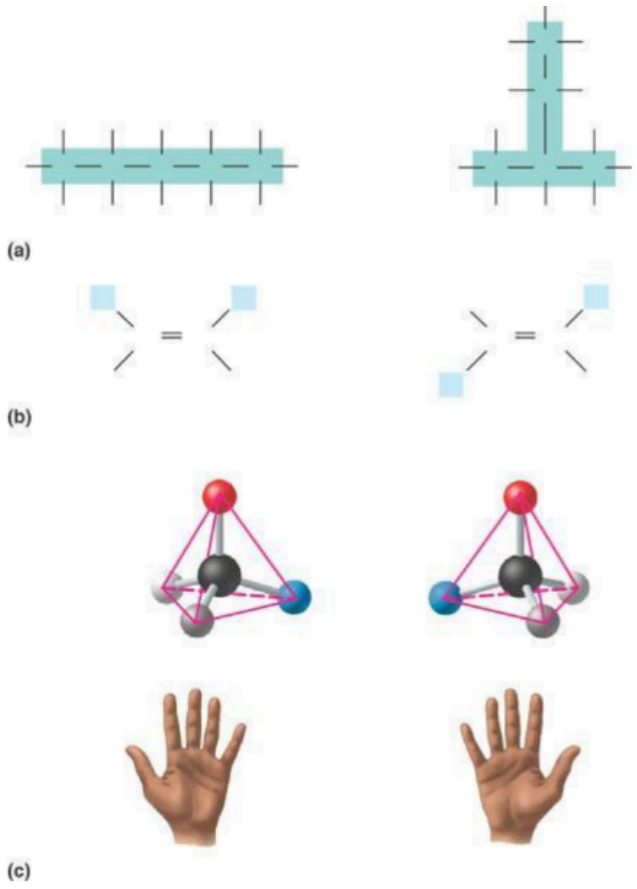
24. *Review: Molarity/Concentration from chemistry. You must apply the formula $M_1V_1 = M_2V_2$. *Refer to AP Bio Formula Sheet.
Given: Your teacher tells you to prepare 0.5L of [1X] TAE solution for an electrophoresis experiment, but he gives you a bottle of [50X] TAE. **Describe** the procedure for doing this (*include showing your work, using the equation).

25. Why is organic chemistry so important in the study of biology?

26. Why was the Urey-Miller experiment significant?

27. What is unique about carbon that makes it the central atom in the chemistry of life?

28. Use the diagram below & **label** the three types of isomers. Both examples from (c) are the same type



28. Be very familiar with the following functional groups, as their properties are most important in the processes of life. Create a table (either below, or on the back of this page or on a separate sheet). After each functional group, **draw** the structure, **name** the compound, **state** an example & **note** the functional properties of each.

a. Hydroxyl

b. Carbonyl- aldehyde

c. Carbonyl- ketone

d. Carboxyl

e. Amino

f. Sulfhydryl

g- Methyl

h. Phosphate

*There are 2 other concepts we will go over in class that may not have been completely addressed in a previous course, but absolutely **WILL BE** on the AP Exam. Get a head start & look these up. Be prepared to share in class:
1) Positive Control vs Negative Control
2) Null Hypothesis vs Alternative Hypothesis

Final Assignment
Carefully read and outline Chapters 2 and 3 of the AP Biology OpenStax text. Ensure that you provide a detailed summary of each of the sections in each chapter, and provide definitions for all key terms that you believe to be relevant.
This assignment is to be hand-written, and should be submitted through email.