AP Biology Summer Assignment

Monsignor Edward Pace High School

Mr. Giberson

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Introduction:

Welcome to AP Biology! This summer assignment will guide you with all of the topics we will go over during the school year. This is intended to help you get accustomed to the content that I will be teaching you in this course. These assignments must be ***hand written*** neatly and organized on paper, and you will be given a test grade for all of your work. This will be the first grade that you will receive for the first quarter!

The following is a list of the four ***Big Ideas*** that will be discussed throughout this course:

- ***Big Idea 1***: Evolution drives the diversity and unity of life.
- ***Big Idea 2***: Biological systems make use of free energy and molecular building blocks in order to grow, reproduce, and maintain a dynamic homeostasis.
- ***Big Idea 3***: Living systems respond, retrieve, store, and transmit information that is essential to all life processes.
- ***Big Idea 4***: Biological systems interact, and these systems and their interactions contain complex properties.

If you have any questions, feel free to E-mail me at the URL address listed above. If you are working with someone who is in the class, make sure that your answers are in your own words and not copied from a partner. **NO PLAGIARISM** is allowed on this summer packet!

NOTE:

This assignment will be collected on the first day of class. Because you have had all summer to work on this, no late summer assignments will be accepted for students who were listed on my roster in May.

Monsignor Edward Pace High School Honor Code:

We, the members of the Monsignor Edward Pace community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity. On all work submitted for credit by students at Monsignor Edward Pace High School, the following pledge is either required or implied:

"On my honor, I have neither given nor received unauthorized aid, in doing this assignment."

Prerequisite Basic Science Knowledge and Skills:

AP Biology is a college level course that combines content area from biology, chemistry, and even physics. As students of my class, you are expected to have a good understanding of basic scientific and mathematical concepts and skills, as well as strong reading and writing abilities. Even though I will be assisting you in developing these skills throughout the school year, your success in the class also depends on what you bring to it at the onset. One goal of this summer assignment is help you brush up on these skills and concepts. Over the summer, you should be reviewing these scientific concepts.

Textbook Materials (Unit 1: The Chemistry of Life)

Instructions:

I have sent you the **PowerPoint Slides** and **Instructor's Notes** for **Chapters 1 – 5** in your textbook. These items should be familiar to you since you have already taken Biology and Chemistry in high school. For each of these chapters, you must **read** and **study** the materials I have sent you, as well as answer questions that are listed on pages 3 – 5.

NOTE:

- Make sure to be familiar with all the terms and concepts presented in each of the chapters!
- The questions and their answers must be hand written on a loose leaf sheet of paper! Make sure to read and study the materials before answering the questions.
- You will be tested on these first five chapters in the first week of school (not the first day of class).
- Do not assume that you will only be tested on the questions listed below. You will be tested on all materials from Chapters 1 – 5, so make sure to **read** and **study** the **PowerPoint Notes** and **Instructor's Notes**!

Questions for Unit One – The Chemistry of Life (Chapters 1 - 5)

A. *Chapter 1 – Introduction: Themes in the Study of Life*

1. List and describe seven unifying themes of biology.
2. What are the levels of biological organization?
3. What is systems biology?
4. Describe the dynamics of an ecosystem.
5. Explain how the structure and function of organisms are closely related.
6. What is the central dogma in biology?
7. What is the difference between positive and negative feedback?
8. What are the three Domains of Life and describe each one's characteristics.
9. Describe each of the eukaryotic kingdoms.
10. What is taxonomy, and how is it important to the classification of organisms?
11. What are the observations on which Charles Darwin's Theory of Natural Selection is based upon?
12. Distinguish between the following pairs of terms: discovery science and hypothesis-based science, quantitative and qualitative data, inductive and deductive reasoning, science and technology.
13. Why is the study of evolution an important aspect of biology?
14. Why is natural selection a theory?

B. *Chapter 2 – The Chemical Context of Life*

1. Name the four most abundant elements in living things.
2. Explain how table salt has emergent properties.
3. Is a trace element an essential element? Explain.
4. Know the basic atomic structure. Draw a shell diagram of a carbon and oxygen atom.
5. For oxygen, sulfur, and calcium, list the atomic number, atomic weight, and number or protons, neutrons, and electrons.
6. The three isotopes of hydrogen have atomic weights of 1, 2, and 3. Draw an electron shell diagram of each of these three isotopes.
7. How many electrons does fluorine have? How many electron shells does it contain and name the orbitals that are occupied.
8. How many electrons are needed to fill the valence shell?
9. Describe chemical bonding, both ionic and covalent. Predict the number of covalent bonds that the following atoms will form: C, H, O, N.
10. Describe hydrogen bonds and Van der Waals interactions. Why are they considered to be "weak" bonds?

11. Which types of chemical reactions occur faster at equilibrium: the formation of products from reactants, or reactants from products?
12. Write an equation that uses the products of photosynthesis as reactants and uses the reactants as products. Add energy as another product. This new equation describes a process that occurs in your cells. Describe this equation in words. How does this equation relate to breathing?

C. *Chapter 3 – Water and the Fitness of the Environment*

1. Explain the polar covalent bonds of water. Also, describe hydrogen bonding between water molecules. Which are stronger, hydrogen bonds or covalent bonds?
2. Explain the difference between polar covalent and nonpolar covalent bonds. Give examples and use diagrams wherever necessary.
3. What is electronegativity, and how does it affect interactions between water molecules?
4. What would be the effect on the properties of the water molecule if oxygen and hydrogen had equal electronegativity?
5. Explain the following properties of water and their important to life on Earth. Use a diagram if necessary.
    - adhesion
    - cohesion
    - density of ice compared to liquid water
    - high heat of vaporization
    - high specific heat
    - surface tension
6. Explain the difference between hydrophilic and hydrophobic molecules and the differences in how they behave in water.
7. Explain the disassociation of water and the pH scale.
8. How great a difference is there in the hydrogen ion concentration between a pH of 6 and a pH of 8?
9. What pH values are acidic or basic?
10. Explain why pH is important in biological systems.
11. How does a buffer work? Use the carbonic acid-bicarbonate system as an example.
12. Why is buffering important in biological systems?

D. *Chapter 4 – Carbon and the Molecular Diversity of Life*

1. What is organic chemistry?
2. What conclusion did Stanley Miller draw when he found amino acids in the products of his experiment?

3. Can organic molecules form under conditions believed to simulate those on early Earth?
4. Explain how carbon's electron configuration explains its ability to form large, complex, diverse organic molecules.
5. What are hydrocarbons and give a few examples.
6. Describe the role of hydrocarbons in fats.
7. How are gasoline and fat chemical similar?
8. Distinguish among the three types of isomers: structural, geometric, and enantiomer.
9. Name the major functional groups found in organic molecules. Describe the basic structure of each functional group and outline the chemical properties of the organic molecules in which they occur.
10. What does the term amino acid signify about the structure of such a molecule?
11. What chemical change occurs when ATP reacts with water and releases energy?
12. Explain how ATP functions as the primary energy transfer molecule in living cells.

E. *Chapter 5 – The Structure and Function of Large Biological Molecules*

1. What are the four main classes of large biological molecules?
2. What is the difference between a monomer and a polymer?
3. What is a condensation reaction?
4. Distinguish between monosaccharides, disaccharides, and polysaccharides. Give examples of each.
5. Explain lipids in general. Distinguish between saturated and unsaturated fats. Describe phospholipids and steroids.
6. Compare the structure of a fat (triglyceride) with that of a phospholipid.
7. Why are human sex hormones considered lipids?
8. Explain the four levels of protein structure.
9. Why does a denatured protein no longer function?
10. What parts of a polypeptide chain participate in the bonds that hold together secondary structure? What parts participate in tertiary structure?
11. What are the differences between DNA and RNA in terms of structure and function?
12. Distinguish between the following:
    - pyrimidine and purine
    - nucleotide and nucleoside
    - ribose and deoxyribose
    - the 5′ end and 3′ end of a nucleotide
13. What does the term antiparallel mean?

Additional Notes and Reminders:

- All answers must be hand written on loose leaf paper
- Make sure to be specific when answering each question
- Refer to Chapters 1 – 5 PowerPoint notes, Lecture outlines, and reliable Internet sources for answers and solutions
- Refer to this website: http://www.bozemanscience.com/ap-biology for help on this packet. I will be using the podcasts posted on this website for many of our class lectures. I highly recommend viewing the videos, which are excellent resources for the AP Biology National Exam!
- Make sure to purchase an AP Biology prep book; I suggest a prep book that is dated 2013 or higher because the AP Biology National Exam has changed! I highly recommend both the "***Cliff's Notes AP Biology***" and "***Barron's AP Biology***" prep books.
- This assignment will be due the first day of class; late work is not acceptable!
- You will be tested on **all** the materials presented in this packet this first week of school. Make sure that you review all the items presented in this packet, as well as your notes I gave you!
- If you have any questions, feel free to E-mail me at **sgiberson@pacehs.com**.
- I look forward working with you and ensuring your success on the AP Biology exam!