

## **AP Biology Summer Packet 2022-2023**

**Ms. Perello**

Welcome to AP Biology! I am looking forward to an engaging and exciting school year! I hope that your experience in this course is both challenging and rewarding. In order to prepare you for the rigorous year ahead, I have created a packet of information, assignments, and suggested readings. You will be using an older textbook and online resources to complete the attached assignments.

AP Central, run by the College Board, has a vast amount of information regarding all AP classes, not only biology. Go to this website: <https://apstudent.collegeboard.org/apcourse/ap-biology>

There you can find the BIG IDEAS and topics covered in the course, examples of labs, sample AP questions, exam information, etc. Familiarize yourself with this information to learn what to expect from the course and the exam.

The two main goals of AP Biology are to help you develop a conceptual framework for modern biology and to gain a deeper appreciation of science as a process (rather than an accumulation of facts). The AP Biology Curriculum centers around the four Big Ideas and you will not only need to know but understand how they all relate:

**Big Idea 1:** The process of evolution drives the diversity and unity of life.

**Big Idea 2:** Biological systems utilize free energy and molecular building blocks to reproduce and to maintain dynamic homeostasis.

**Big Idea 3:** Living systems store, retrieve, transmit and respond to information essential to life processes.

**Big Idea 4:** Biological systems interact, and these systems and their interactions possess complex properties.

AP Biology is a COLLEGE LEVEL course that moves at a rapid pace. To sufficiently understand the course content you must read and study independently, utilizing the qualities of organization, focus, and resilience. This course builds upon knowledge from your freshman biology class, therefore within this packet is a list of topics that you should have learned freshman year and should review over the summer. These are topics that will NOT be re-taught in detail, but are instead a necessary foundation to the rest of the course. In order to cover all of the material in the AP Biology curriculum, you are responsible for reviewing some of the material on your own over the summer.

Good luck, and have a great summer!

**Topics you SHOULD HAVE LEARNED freshman year-** I do not expect that you know everything about all of these topics, but most of it should be familiar to you!

Here are some links/files to help refresh if needed:

[CP Online Textbook](#)

<http://www.glencoe.com/sites/florida/student/science/assets/pdfs/FLBDOLReSE.pdf>

<b>Topic</b>	<b>Chapter- In Glencoe Science Biology Textbook</b>
Basics of Biology	1
Basic Chemistry (atoms, bonding, properties of water, pH)	6
Basics of Organic Chemistry	6
Cell Structure and Function	7
Cell Membranes (structure, diffusion, osmosis, active and passive transport)	7
Metabolism: (ATP function, energy flow, enzyme function)	8
Basics of photosynthesis	8
Basics of cellular respiration	8
Mitosis	9
Meiosis	10
Mendelian genetics	10
Chromosomes and human genetics	11
DNA structure, function and replication	12
DNA transcription and translation	12
Evolution	14-6
Ecology	2-5

Name \_\_\_\_\_  
AP Biology

Date \_\_\_\_\_  
Ms. Perello

## Summer Assignments

### Assignments:

1. Attached are questions to help you with your reading and note-taking. You should complete these, and you may also take your own notes on the topics. Work should be done *neatly* and *thoroughly*. You will receive a completion grade for the notes and you will have a test on these topics during the first full week of school.
2. Complete the review assignments once you have completed your notes to practice the material.
  - a. [Bozeman Video Review Questions](#) - Properties of Life
  - b. [Bozeman Video Review Questions](#) - Biological Molecules
  - c. [Chemistry Review Google Form](#)
  - d. [Organic Macromolecule Review Google Form](#)

**THESE ASSIGNMENTS ARE DUE ON THE FIRST DAY OF SCHOOL!!!**

## Part 1: Unit 1 Notes

You are going to read and take notes on the textbook chapters of Chapter 1: Introduction to Biology and Unit 1: The Chemistry of Life. Please use the textbook, provided video resources, and any **reputable** online source to research the topics and answer the questions below. Make sure that you understand the notes you are writing and can clearly state the answers in your own words. There is also a list of objectives that you should be able to explain on the topics (use these objectives as self-check to test your understanding)

- Introduction to Biology
- Chemicals of Life and Chemical Bonding
- Properties of Water
- Biomolecules

Sample different note-taking strategies. Go to this website for examples:

<https://www.gvsu.edu/sasc/note-taking-and-concept-mapping-117.htm>

Name \_\_\_\_\_ Date \_\_\_\_\_

**AP Biology**

**Directions:** use the textbook and reputable online resources to answer the following questions.

**Chapter 1: Introduction to Biological Concepts and Research**

**Levels of Organization**

1. Life is organized on many scales. Create a flowchart of the levels of life from the most simple to complex. Provide an example of each.

2. Define *emergent properties*:

3. List and describe the characteristics of living things.

## Energy in Ecosystems

1. Define and give examples of the following:
  - a. *Energy*:
  - b. *Producer*:
  - c. *Consumer*:
2. How are chemical nutrients cycled within an ecosystem?
3. Transfer of energy through an ecosystem: how much energy is passed on to the next trophic level and what is the rest lost as?

## Cells

1. What is a *cell*?
2. Compare and contrast *prokaryotic* and *eukaryotic* cells.

## Evolution

1. Define *evolution*:
2. Explain Darwin's observations and inferences about natural selection.
3. Define and provide an example of *Artificial Selection*:

## Biodiversity and the Tree of Life

1. Define *species*:
  
2. Describe each of the three domains.
  - a. *Bacteria*:
  
  - b. *Archaea*:
  
  - c. *Eukarya*:
  
3. Describe each of the five kingdoms.
  - a. *Animalia*:
  
  - b. *Plantae*:
  
  - c. *Fungi*:
  
  - d. *Protista*:
  
  - e. *Monera*:

## Biological Research

1. Describe the two types of research.
  
2. What is *data*? What are the two types of data? Provide examples.
  
3. Explain the steps of the scientific process:

4. Explain the *null hypothesis*.
  
5. What is a *controlled experiment*?
  
6. What is a *theory*?
  
7. Define the following:
  - a. *Independent Variables*:
  
  - b. *Dependent Variables*:
  
  - c. *Constants*:
  
  - d. *Control Group*:
  
  - e. *Experimental Groups*:

## Chapter 2: Life, Chemistry, Water

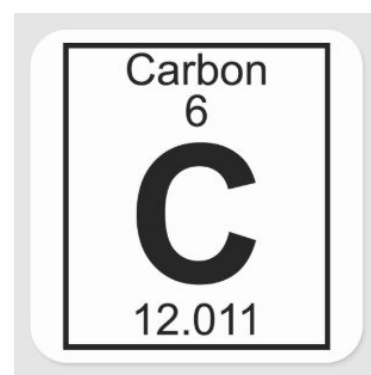
### The Organization of Matter

1. Define the following terms and provide an example of each:
  - a. *matter*:
  
  - b. *element*:
  
  - c. *atom*:
  
  - d. *neutron*:
  
  - e. *proton*:
  
  - f. *electron*:
  
  - g. *atomic mass*:
  
  - h. *atomic number*:
  
2. What four elements make up 96% of living matter?



3. What is the difference between an *essential element* and a *trace element*? Provide an example of each.
  
4. Sketch a model of a helium atom. Include each subatomic particle (protons, neutrons, and electrons).
  - a. Sketch:

5. Look at the picture of carbon from the periodic table:
  - a. What is the atomic number?
  - b. What is the atomic mass?
  - c. How many protons?
  - d. How many neutrons?
  - e. How many electrons?



### Isotopes

1. What are *isotopes*? Use carbon as an example in your explanation.
  
  
  
  
  
  
  
  
  
  
2. Explain *radioactive isotopes* and their uses.

### Chemical Bonds

1. Which subatomic particle is directly involved in chemical bonds between atoms?
  
  
  
  
  
  
  
  
  
  
2. Which subatomic particle determines the chemical behavior of an atom?

3. Differentiate between a *compound* and a *molecule*. Provide an example of each.
4. Explain each type of chemical bond and draw an example of each. Rank the bonds from strongest (1) to weakest (4).
  - a. *Ionic Bond*:
  - b. *Polar Covalent Bond*:
  - c. *Non-Polar Covalent Bond*:
  - d. *Hydrogen Bond*:

### **Properties of Water**

1. Draw a water molecule. Label the partially positively and partially negatively charged particles.
2. Explain why water is a *polar molecule*. Refer to your drawing to explain.

3. Define *electronegativity* and relate to the chemical structure of water.
  
4. Explain *van der Waals interactions / forces*.
  
5. Explain each property of water and provide an example of how the property is important to living things.
  - a. *Cohesion*
    - i. *Surface tension:*
  
    - b. *Adhesion*
      - i. *Capillary action:*
  
      - c. *Moderation of temperature:*
        - i. *Specific heat:*
  
        - ii. Explain how hydrogen bonding contributes to water's high specific heat.
  
    - d. *Heat of vaporization:*

e. *Density:*

- i. Why does ice float? What would happen in nature if ice did not float?

f. *Universal solvent:*

- i. Explain why water and oil do not mix. Use the terms *hydrophilic* and *hydrophobic*.

### Acids and Bases

1. Define:

a. *Acid:*

b. *Base:*

2. What two ions form when water *dissociates*?

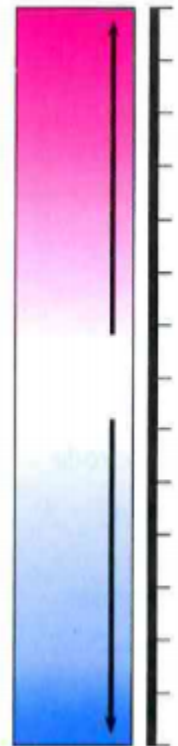
3. The pH scale is a logarithmic scale, meaning that each change in pH represents a 10 times change in ion concentration.

a. How many more times acidic is a pH of 3 compared to a pH of 5?

b. How many more times basic is a pH of 12 compared to a pH of 8?

c. Explain the difference between a pH of 8 and a pH of 12 in terms of H<sup>+</sup> concentration.

4. On the pH chart, label pH 1-14. Label neutral, acid, and base. Indicate the locations of pure water, urine, gastric juice, and bleach.



5. Even the slightest change in pH can be harmful. How do *buffers* moderate pH change?

## Chemical Reactions

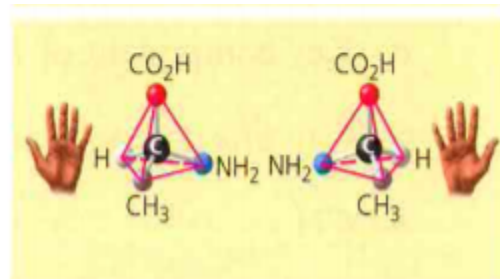
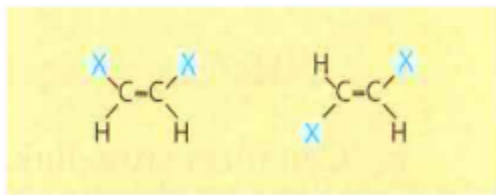
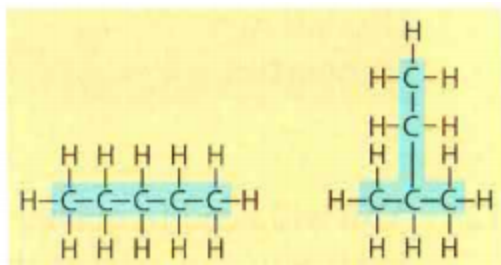
1. Define *chemical reactions*.
  
2. Write a chemical reaction and label the reactants and products.

## Chapter 3: Biological Molecules

### Molecules of Life - Structure and Function

1. What is the difference between *organic molecules* and *inorganic molecules*?
  
2. Define *hydrocarbon*.
  
3. Carbon:
  - a. How many electrons does carbon have in its outer shell (AKA valence electrons)?
  - b. How many bonds can carbon form?
  - c. What types of bonds can carbon form?
  
4. Carbon chains can form skeletons. List the types of skeletons that can be formed.

5. Define *isomer*. What are the three types of isomers? Determine which type of isomer each image depicts.



6. Define *functional group*.

7. Complete the following chart:

	Hydroxyl	Carbonyl	Carboxyl	Amino	Sulfhydryl	Phosphate	Methyl
<b>Structure</b>							
<b>Functional Properties</b>							
<b>Example</b>							

8. Define the following terms:
  - a. *macromolecule*:
  - b. *polymer*:
  - c. *monomer*:
9. Explain a *dehydration reaction*.
  
10. Explain a *hydrolysis reaction*.

**Carbohydrates:**

1. What is the monomer of carbohydrates? Provide three examples.
  
2. What is a *disaccharide*? What two monomers make up the disaccharides below?
  - a. Lactose:
  - b. Sucrose:
  
3. What is an *oligosaccharide*?
  
4. What is the difference between a *simple sugar* and a *complex carbohydrate*?
  
5. Explain the function of each polysaccharide and determine where it can be found:
  - a. *Cellulose*:
  - b. *Starch*:
  - c. *Glycogen*:
  - d. *Chitin*:

## **Lipids:**

1. Define and describe *lipids*:
2. What are *fats* composed of?
3. What are *triglycerides* composed of?
4. Explain the structure and function of each lipid:
  - a. *Phospholipids*:
  - b. *Waxes*:
  - c. *Sterols*:

## **Proteins:**

1. What is the monomer of protein? What is this monomer composed of?
2. Explain how a *peptide bond* forms.
3. What is a *polypeptide chain*?
4. Describe each level of protein structure.
  - a. *Primary structure*:
  - b. *Secondary structure*:
  - c. *Tertiary structure*:
  - d. *Quaternary structure*:



5. Explain how protein structure is related to function. What happens when protein structure is altered?
6. What are some examples of important proteins and their functions in the body?

**Nucleic Acids:**

1. What is the monomer of nucleic acids? What makes up this monomer?
2. Compare and contrast DNA and RNA.