

AP Biology Summer Assignment 2023-24
Mrs. Anderson

Hello and welcome to AP Biology! This course is designed to be the equivalent of a two-semester introductory biology course usually taken in the first year of college. Throughout the course, you will become familiar with major recurring themes that persist throughout all topics and material.

The major themes are:

- I. Science as a Process
- II. Evolution
- III. Energy Transfer
- IV. Continuity and Change
- V. Relationship of Structure and Function
- VI. Regulation
- VII. Interdependence in Nature
- VIII. Science, Technology and Society

To successfully complete the course and meet all of the required objectives, you are required to do independent work both during the summer and throughout the school year. The major themes will be reviewed in Chapter 1 of your text. I also chose Chemistry for you to cover over the summer because it will serve as a review of what you should know from having already taken Chemistry, and will allow us to get right into Biological Processes at the beginning of the year. For your summer assignment, as well as for the year, you will be using the 10th edition of *Biology* by Campbell and Reece.

Please let me know if you have any questions regarding any part of the summer assignment, do not hesitate to e-mail me. My e-mail is aanderson@oxfordasd.org.

There are three parts to this summer assignment:

1. Fill out the second page of this packet and email it to me. This is a general survey for me to learn a little about you.

2. Chapters 1- 5 will be due **the first day of class**.

Expect a test on this material within the first week of school!

Part I - Student Information Sheet

Name: _____

Grade (for the 2023-24 school year): _____

E-mail: _____

1. Why did you sign up to take AP Biology?

2. What are your personal strengths when it comes to learning new material?

3. What causes you to struggle in a course?

4. What is the most effective way for you to prepare for a test?

5. What do plan to major in when you get to college?

6. Do you plan on taking the AP exam (**highly recommended**)?

7. How many AP courses are you enrolled in? (Please list).

Part 2

Chapter 1- Evolution, the Themes of Biology, and Scientific Inquiry

Essential Vocabulary

1. Read the chapter thoroughly, and then define the ten most important bold face words in the chapter IN YOUR OWN WORDS.

2. Fill out the following chart to summarize the seven major themes identified by the textbook:

Theme	Description
Organization	
Information	
Energy and Matter	
Interactions	
Evolution	

3. Why is it important that we study themes in Biology? How can it improve our understanding of biological concepts?
4. In your own words, describe the four steps of Darwin's Theory of Natural Selection. Why is evolution considered the most important theme in Biology?

Scientific Inquiry.

5. Describe the difference between *qualitative* and *quantitative* data. How can scientists decide which type of data they should collect?
6. Describe the difference between *inductive* and *deductive* reasoning. Why are hypotheses *only* used in deductive reasoning?
7. A Case Study in Scientific Inquiry: Investigating Coat Coloration in Mouse Population(p.19-21)
For this experiment, identify:

Question:

Hypothesis:

Control Group:

Experimental Group:

Summary of Data/Conclusions:

Chapter 2- The Chemical Context of Life

1. Read the chapter thoroughly, and then use the following terms to create a concept map (a.k.a. mind map). Use these resources to help you create the map online (<https://creately.com/lp/concept-map-maker/>) or by hand.

Essential Vocabulary

Anion	Electronegativity	Molecule
Atom	Element	Potential Energy
Cation	Energy	Product
Chemical Bond	Hydrogen Bond	Proton (H ⁺)
Chemical Reaction	Ion	Reactant
Compound	Ionic Bond	Structural/Molecular Formula
Covalent Bond (Non-polar/Polar)	Isotope	Valence Electron/Shell
Double Bond	Matter	van der Waals Interactions
Electron (e ⁻)		

2. Name the four most important elements found in living things.
3. Describe how the electrons in an atom can have potential energy.
4. Describe how an electron with excess energy can lose that energy.
5. What are valence electrons? What is their role in forming compounds?
6. What are radioactive isotopes? Name two ways they can be used in biology.

7. Fill in the following chart with information on different bond types:

Bond Type	Description	Example of a molecule with this bond type
Covalent		
-Non polar Covalent		
-Polar Covalent		
Ionic		
Hydrogen		
van der Waals		

8. What is the role of electronegativity in forming bonds?

9. What is the relationship between molecular structure (shape) and function?

10. What is a *molecular mimic*? (Review Figure 2.16 for the example of endorphin and morphine).

11. Describe what a chemical reaction is in terms of reactants, products and equilibrium.

Chapter 3 - Water and the Life

1. Read the chapter thoroughly, and then use the following terms to create a concept map.

Essential Vocabulary

Acid	Evaporative Cooling	pH
Adhesion	Heat of Vaporization	Polarity
Aqueous Solution	Hydrogen Ion	Solution (Solute/Solvent)
Base	Hydrophilic	Specific Heat
Buffer	Hydrophobic	Surface tension
Cohesion	Hydroxide Ion	

2. Draw 4 water molecules. Label their charges and show how they would connect through hydrogen bonding.

3. Fill out the following chart with information regarding water's emergent properties:

Emergent Property	Description – Why does this property occur?	Example and Importance to Living Organisms
Cohesion Properties <ul style="list-style-type: none">• Cohesion• Adhesion• Surface Tension		
Moderation of Temperature <ul style="list-style-type: none">• High Specific Heat• Evaporative Cooling• Ice as an Insulator		
Universal Solvent		

3. ALL of water's emergent properties are a result of _____.

4. Define pH. Draw the pH scale and label: strong and weak acids AND strong and weak bases.

5a. What is a hydrogen ion? Is it acidic, basic or neutral?

5b. What is a hydroxide ion? Is it acidic, basic or neutral?

5c. Why is pure water neutral?

8. Describe what a buffer is and give an example (not from the book) of how they are important for the survival of certain organisms.

9. What is acid precipitation, and what causes it? How does it affect the environment?

Chapter 4- Carbon and the Molecular Diversity of Life

1. Read the chapter thoroughly, and define the following vocabulary IN YOUR OWN WORDS.

Essential Vocabulary

Cis-trans isomer

Enantiomer

Functional Group

Geometric Isomer

Hydrocarbon

Isomer

Organic Chemistry

Structural Isomer

2. Explain the significance of the Miller-Urey experiment (Figure 4.2).
3. What makes a molecule organic?
4. It is often said that Carbon is a *versatile element*. Why can it form so many different structures and molecules?
5. Compare and contrast structural isomers, geometric isomers and enantiomers. Give an example of each.
6. What are functional groups, and why are they important?

7. Fill in the following chart with information on the functional groups:

Functional Group	Formula/Structure	Compounds they are contained in	Properties
Hydroxyl			
Carbonyl			
Carboxyl			
Amino			
Sulfhydryl			
Phosphate			
Methyl			

8. Which functional group do you think is most important for life? Explain why.

Chapter 5- The Structure and Function of Large Biological Molecules

I. Read the chapter thoroughly, and then use the following terms to create a concept map.

Essential Vocabulary

Amino Acid	Enzyme	Polymer
Antiparallel (DNA)	Fatty Acid (Un/saturated)	Polypeptide
Carbohydrate	Gene	Polysaccharide
Catalyst	Hydrolysis	Protein Structure
Cellulose	Insulin	Purine
Chitin	Lipid	Pyrimidine
Cholesterol	Monomer	RNA
Dehydration Reaction	Monosaccharide	Starch
Dissaccharide	Nucleic Acid	Steroid
DNA	Nucleotide	Trans Fat
Double Helix	Phospholipid	

2. Describe figure 5.2, using the terms: monomer, polymer, dehydration reaction and hydrolysis.

3. What is a macromolecule?

4. Carbohydrates:

Name and give the formula for the most common monosaccharide.

What is the function of a monosaccharide?

Compare the functions of the polysaccharides: glycogen, starch and cellulose.

5. Lipids

The most common fats are triglycerides, which store energy in organisms. Compare the structure of the three different types of triglycerides (saturated, unsaturated and trans fats).

Draw a phospholipid and describe how it helps make up a cell membrane.

Draw a steroid and describe two functions of steroids in animals.

6. Proteins

What are the building blocks of proteins?

Describe the formation of a protein from primary through quaternary structure.

Name five protein types and briefly describe their functions.

7. Nucleic Acids

What are the building blocks of nucleic acids?

Why is it (in DNA) that A MUST always pair with T, and G always pairs with C?

Describe the structure of DNA using the terms: antiparallel, 3' (prime), 5', double helix, and complimentary.

Name 4 differences between DNA and RNA.