

AP Biology Summer Assignment 2009

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

(http://apcentral.collegeboard.com/repository/ap03_cd_biology_0405f_4312.pdf)

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 I 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 8th edition of *Biology* by Campbell and Reece.

It is necessary for each student to have access to the Internet and a **personal e-mail address** either through a public library or at home. Additionally, you can use the school computers during the school year. I will be e-mailing you notes/assignments and information about class throughout the year, so choose or create an e-mail that you do not mind me having, and make sure to **check it regularly!** You will also want to check my website (<http://teacherweb.com/MD/SevernaParkHighSchool/APBiology/>) to view the course syllabus and chapter PowerPoints (notes). Also, if you would rather type the assignment, you can find an electronic version on the school's website or my website.

If you have **any** questions regarding any part of the summer assignment, do not hesitate to e-mail me. My e-mail is LMossa@aacps.org.

There are two parts to this assignment:

1. Fill out the second page of this packet and hand it in to me by the last day of school: **Wednesday, June 10th**. This is a general survey for me to learn a little about you and your schedule. You need to hand this to me, in person, so that I can give you a textbook. I am in room E124.
2. Chapters 1- 5 will be due **the first day of class**. (You may e-mail it to me if you wish to turn it in early.)

Expect a test on this material in the second week of school!

Part I - Student Information Sheet

Name: _____

Grade (for the 2009-2010 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 I- Introduction: Themes in the Study of Life

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

Essential Vocabulary

Archaea	Eukarya	Kingdom
Controlled Experiment	Eukaryotic Cell	Negative Feedback
Control	Evolution	Positive Feedback
Deductive Reasoning	Genome	Prokaryotic Cell
Domain	Independent + Dependent Variables	Species
Emergent Properties	Inductive Reasoning	Systems Biology

2. Scientific Inquiry.

Describe the difference between *qualitative* and *quantitative* data. How can scientists decide which type of data they should collect?

Describe the difference between *inductive* and *deductive* reasoning. Why are hypotheses *only* used in deductive reasoning?

A Case Study in Scientific Inquiry: Investigating Mimicry in Snake Populations (p.20-21)

For this experiment, identify:

Question:

Hypothesis:

Control Group:

Experimental Group:

Independent Variable:

Dependent Variable:

Summary of Data/Conclusions:

Answer the “what if” question at the bottom of figure I.27.

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

Theme	Description
Evolution.	
New properties emerge at each level in the biological hierarchy.	
Organisms interact with their environments, exchanging matter and energy.	
Structure and function are correlated at all levels of biological organization.	
Cells are an organism's basic unit of structure and function.	
The continuity of life is based on heritable information in the form of DNA.	
Feedback mechanisms regulate biological systems.	

4. Why is it important that we study themes in Biology? How can it improve our understanding of biological concepts?

5. 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?

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:

<http://www.studygs.net/mapping/> and http://www.mindtools.com/pages/article/newISS_01.htm

*I have also made a sample map using the terms from chapter one, which can be found on my website.

Essential Vocabulary

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

2. Figure 2.2 Inquiry. “What creates ‘devil’s gardens’ in the rain forest?”

Control:

Independent Variable:

Dependent Variable:

Answer the “what if” question at the bottom of the figure.

3. Name the four most important elements found in living things.

4. Describe how the electrons in an atom can have potential energy.

4b. 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	Relative Strength (strong or weak)
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 the example of endorphins and morphine).

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

Chapter 3 - Water and the Fitness of the Environment

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

Essential Vocabulary

Acid	Evaporative Cooling	Kinetic Energy
Adhesion	Heat of Vaporization	Molarity (Mole)
Aqueous Solution	Hydronium Ion	pH
Base	Hydrophilic	Polarity
Buffer	Hydrophobic	Solution (Solute/Solvent)
Calorie/Kilocalorie	Hydroxide Ion	Specific Heat
Cohesion	Joule (J)	Surface Tension

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

3a. 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
Cohesive 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		

3b. 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 hydronium 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?
6. Describe what a buffer is and give an example (not from the book) of how they are important for the survival of certain organisms.
7. What is acid precipitation, and what causes it? How does it affect the environment?
8. Answer the “what if” question at the bottom of figure 3.11.
9. “The surface of the planet Mars has many landscape features reminiscent of those formed by flowing water on Earth, including what appear to be meandering channels and outwash areas. Ice exists at the Martian poles today, and some scientists suspect a great deal more water may be present beneath the Martian surface. Why has there been so much interest in the presence of water on Mars? Does the presence of water make it more likely that life arose there? What other physical factors might also be important?”

Chapter 4- Carbon and the Molecular Diversity of Life

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

Essential Vocabulary

Enantiomer

Geometric Isomer

Organic Chemistry

Functional Group

Hydrocarbon

Structural Isomer

2. What makes a molecule organic?

3. What is *vitalism*, and how was it “disproved”? Summarize the results of the experiment used to disprove it.

4. Answer the “what if” question at the bottom of figure 4.2.

5. It is often said that Carbon is a *versatile element*. Why can it form so many different structures and molecules?

6. Compare and contrast structural isomers, geometric isomers and enantiomers. Give an example of each (NOT including those used in the text).

7. What are functional groups, and why are they important?

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

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

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

Chapter 5- The Structure and Function of Large Biological Molecules

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

Essential Vocabulary

Alpha (α) Helix	Enzyme	Polymer
Amino Acid	Fatty Acid (Un/saturated)	Polypeptide
Antiparallel (DNA)	Gene	Polysaccharide
Beta (β) Pleated Sheet	Glycosodic Linkage	Protein Structure
Carbohydrate	Hydrolysis	<ul style="list-style-type: none">• Primary• Secondary• Tertiary• Quaternary
Catalyst	Insulin	Purine
Cellulose	Lipid	Pyrimidine
Chaperonin	Monomer	RNA
Chitin	Monosaccharide	Starch
Cholesterol	Nucleic Acid	Steroid
Condensation Reaction	Nucleotide	Trans Fat
Dehydration Reaction	Peptide Bond	
DNA	Phospholipid	
Disulfide Bridge		
Double Helix		

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

2b. What is a macromolecule?

3. 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. Why is it that they have different functions?

4. 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.

5. 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.

Answer the “what if” question at the bottom of Figure 5.25

6. 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.

Analogies are often made, comparing DNA to tape measures or “molecular clocks”- describe why this is so. What do these analogies mean?