

AP Biology Summer Assignment 2014-15

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 (also known as “Big Ideas”) are:

BIG IDEA 1: The process of evolution drives the diversity and unity of life.

BIG IDEA 2: Biological systems utilize energy and molecular building blocks to grow, to reproduce, and to maintain 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 interactions possess complex properties.

To successfully complete the course and meet all of the required objectives, you will be expected 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 Biochemistry 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 7th 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 periodically post notes and the calendar of assignments and topics we cover each class period on the class website, so internet access is critical. Also, if you would rather type the assignment, you can find an electronic version on the class website.

If you have any questions regarding any part of the summer assignment, do not hesitate to e-mail me. My e-mail is pedgerton@gsgis.k12.va.us

There are two parts to this assignment:

1. Fill out the second page of this packet (Student Information Sheet) and turn it into me by the last day of school, Friday, June 13th. 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.
2. Answer to questions for Chapters 1-5 will be due the first day of class for the school year (**NOT Early AP Week**)

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

Student Information Sheet

Name: _____

Grade Level (for the 2010-11 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 you plan to major in when you get to college?
6. Do you plan on taking the AP exam (highly recommended)? Why or why not?
7. How many AP courses are you enrolled in? (Please list).

Chapter 1- Introduction: Themes in the Study of Life

1. Read the chapter **thoroughly**, and BE FAMILIAR with the following terms.

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.

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

b. **A Case Study in Scientific Inquiry** You are an ecologist in an African game preserve that includes elephants. You want to discover the precise migratory habits of the elephants so that they can encounter humans less frequently and thus have better chances to survive.

i. **Identify** 3-5 sources you might reference in order to review all available observations?

ii. **State** a hypothesis you might try to test.

iii. **List** some tools might you use in testing your hypothesis.

iv. **Name** three variables that might affect the migratory movements of elephants.

v. How could you isolate each of these variables and study the effects of just one variable at a time so as to **deduce** its effect on elephant migratory behavior?

3. Fill out the following chart to **summarize** the seven major biological 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. Below are listed four "Big Ideas" on which we will be basing our study of biology this year. How can they be reconciled with the themes identified above?

BIG IDEA 1: The process of evolution drives the diversity and unity of life.

BIG IDEA 2: Biological systems utilize energy and molecular building blocks to grow, to reproduce, and to maintain 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 interactions possess complex properties.

5. In your own words, **describe** the four points 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 BE FAMILIAR with the following terms.

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 2.5 Research Method - Radioactive Tracers

- Question:

- Hypothesis:

- Control Group:

- Experimental Group:

- Independent Variable:

- Dependent Variable:

- Summary of Data/Conclusions:

3a. It has been observed that all living systems require a constant input of free energy. **Describe** how that observation relates to the fact that electrons in an atom can have potential energy.

b. **Describe** how an electron with excess energy can lose that energy.

4. **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			

5. What is the role of *electronegativity* in forming chemical bonds?

6. **Describe** the relationship between molecular structure (shape) and function.

7. What is a *molecular mimic*? (Review the example of endorphins and morphine).

Chapter 3 - Water and the Fitness of the Environment

1. Read the chapter **thoroughly**, and BE FAMILIAR with the following terms.

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 in** the following chart with information regarding water's emergent properties:

Emergent Property	Description-why does this property occur?	Example and Importance to 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		

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

5. "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 BE FAMILIAR with the following terms.

Essential Vocabulary

Enantiomer

Geometric Isomer

Organic Chemistry

Functional Group

Hydrocarbon

Structural Isomer

2. It is often said that Carbon is a versatile element. **Discuss** why can it form so many different structures and molecules.

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

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

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

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

Functional Group	Formula/Structure	Compounds that contain them	Properties
Amino			
Carbonyl			
Carboxyl			
Hydroxyl			
Methyl			
Phosphate			
Sulfhydryl			

Chapter 5 - The Structure and Function of Large Biological Molecules

1. Read the chapter **thoroughly**, and BE FAMILIAR with the following terms.

Essential Vocabulary

Alpha (α) Helix

Amino Acid

Antiparallel (DNA)

Beta (β) Pleated Sheet

Carbohydrate

Catalyst

Cellulose

Chitin

Cholesterol

Condensation Reaction

Dehydration Reaction

DNA

Disulfide Bridge

Double Helix

Enzyme

Fatty Acid (Un/saturated)

Gene

Glycosodic Linkage

Hydrolysis

Insulin

Lipid

Monomer

Monosaccharide

Nucleic Acid

Nucleotide

Peptide Bond

Phospholipid

Trans Fat

Polymer

Polypeptide

Polysaccharide

Protein Structure

- Primary
- Secondary
- Tertiary
- Quaternary

Purine

Pyrimidine

RNA

Starch

Steroid

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

b. What is a macromolecule?

3. Carbohydrates:

a. **Name** and **give the formula** for the most common monosaccharide.

b. What is the function of a monosaccharide?

c. **Compare** the structures of the polysaccharides: glycogen, starch and cellulose. Why is it they have different functions?

4. Lipids

a. 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).

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

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

5. Proteins

a. What are the building blocks of proteins?

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

c. **Name** five protein types and briefly **describe** their functions.

d. **Summarize** the results of the research method in Figure 5.24.

6. Nucleic Acids

a. What are the building blocks of nucleic acids?

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

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

d. **Identify** 4 differences between DNA and RNA.

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