

**AP Biology Summer Assignment:****Dr Park cell phone: (614) 560-4342 email: [cpark@torahacademy.org](mailto:cpark@torahacademy.org)**

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. We are all in this together and we will be successful together. Please contact me any time with questions, concerns, or requests for clarification or help. The College Board completely revised AP Biology for 2019/2020. Anatomy & Physiology is now a component of AP Biology and they have also added a section on computational biology (in genetics).

The Summer Assignment will require between 10-20 hours of work (depending on your pace) and must be completed by the first day of CTA classes to stay in the AP Biology course. It must be turned in at the start of our first class and should clearly have your name and your cell phone contact number (for texting). Please note: The assignment is due on the first day of school, even if you are not in school.

Requirements for the AP Biology Summer Assignment: (Please note that **all of these requirements** must be met to earn credit for the summer assignment.)

- 1) The assignment needs to be hand-written in a Composition Book dedicated to your summer assignment. The composition book can be lined or in graph paper format. The assignment can not be typed, cut and pasted, or printed or copied from another source. It must be in your own neat and clear hand-writing. Drawings and flow charts need to be hand drawn and labeled. If a topic includes a chart, recreate the chart in your composition notebook and complete it. The use of colored pens or pencils is highly encouraged. Organization and planning out your answers is a key to success.
- 2) Your assignment must be organized, clear and easy to read. Unreadable or disorganized answers will lose points.
- 3) To start each question **topic**, watch the Bozeman video on the topic and take detailed, complete notes **in your composition book**. These notes need to be specific and include the vocabulary covered in the video. This will provide a solid review of each topic and help you remember the necessary foundation material. (If you need a more basic review then start with the Amoeba Sisters videos or Prof Dave videos. Use any resources you may need to review a topic. Remember: You must always watch the Bozeman video and take detailed notes on that video. If you need help with how to do this, contact me and I will help you and provide examples of what I want.
- 4) After your video notes, define each vocabulary word listed for each Topic and write out each Topic question and answer them using detailed, specific answers. Labeled drawings, charts and graphs are all acceptable as answers.

If you are spending more time than suggested on a topic please contact me and I will help you to figure out how to shorten the amount of time spent on each topic. I am here to help you succeed with the summer assignment. I am willing to give you feedback and suggestions on your work. If you are struggling with a topic, contact me and I will help you. I am looking forward to a great AP Biology class and I know each of you are capable of doing high quality AP work. So take a deep breath – you CAN do this.

**The major themes of AP Biology are:**

\*Energy; Biochemistry; Homeostasis

- Cell structure
- Cell membrane properties
- Biological systems and reactions
- Cell respiration
- Photosynthesis
- Homeostasis
- Molecular biology
- Immune system

\*Molecular Biology/ Genetics/ Viruses/ Body Systems involved in information

- Genes & Mutations
- DNA/RNA
- Cell Cycle
- Genetics
- Viruses
- Endocrine System
- Nervous System
- Immune System

\*Interactions in Biological Systems

- Enzymes
- Circulatory System
- Digestive System
- Musculoskeletal System

\*Ecological Principles

\*The process of Evolution / Diversity of Life

- Natural Selection
- Hardy-Weinberg (computational biology)
- Biodiversity & Classification

Please let me know if you have any questions regarding any part of the summer assignment, do not hesitate to e-mail, text or call me. My e-mail is [cpark@torahacademy.org](mailto:cpark@torahacademy.org) and my cell phone number is (614) 560-4342

I will be available all summer for help and questions. Starting on August 19, I will be less available for help etc. because I will be at CTA participating in Teacher In-Service.

Expect a test on the material covered in Topics 1-5 in the first week of school!

You must score a B or higher on this assessment to remain in AP Biology.

## SUMMER ASSIGNMENT

### Topic I - The Chemical Context of Life

#### Essential Vocabulary

Anion	Electronegativity	Molecule
Atom	Element	Potential Energy
Cation	Energy	Product
Chemical Bond	Hydrogen Bond	Proton (H <sup>+</sup> )
Chemical Reaction	Ion	Reactant
Compound	Ionic Bond	Structural/Molecular Formula
Covalent Bond (Non-polar/Polar)	Isotope	Valence Electron/Shell
Double Bond	Matter	Solution (Solute/Solvent)
Electron (e <sup>-</sup> )		

1. Name the four most important elements found in living things.
2. What are valence electrons? What is their role in forming compounds?
3. What are ions? Give an example of a cation and an anion.
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			

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

## Topic 2 – Water and pH

### Essential Vocabulary

Acid	Evaporative Cooling	Kinetic Energy
Adhesion	Heat of Vaporization	Molarity (Mole)
Aqueous Solution	Hydrogen Ion	pH
Base	Hydrophilic	Polarity
Buffer	Hydrophobic	Surface Tension
Cohesion	Hydroxide Ion	Specific Heat

1. How important is water for living things? Why?
2. Draw a water molecule. Draw multiple water molecules and how they interact with each other (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"><li>• Cohesion</li><li>• Adhesion</li><li>• Surface Tension</li></ul>		
Moderation of Temperature <ul style="list-style-type: none"><li>• High Specific Heat</li><li>• Evaporative Cooling</li><li>• Ice as an Insulator</li></ul>		
Universal Solvent		

3. Define pH. Draw and label the pH scale. How is pH related to the Hydrogen Ion concentration and the Hydroxyl Ion concentration?

4. Why is pure water neutral in pH? Answer this in terms of the ionization of water.

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? "

## Topic 3 - Carbon and the Molecular Diversity of Life

### Essential Vocabulary

Carbon

Hydrocarbon

Functional Group

Organic Chemistry

Structural Isomer

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1. What makes a molecule organic?
  2. It is often said that Carbon is a *versatile element*. Why can it form so many different structures and molecules?  
Hint: Bonding
  3. What are functional groups, and why are they important  
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			

## Topic 4- The Structure and Function of Large Biological Molecules

### Essential Vocabulary

Alpha ( $\alpha$ ) Helix	Enzyme	Polymer
Amino Acid	Fatty Acid (Un/saturated)	Polypeptide
Antiparallel (DNA)	Fatty Acid (saturated)	Polysaccharide
Beta ( $\beta$ ) Pleated Sheet	Gene	Protein Structure
Carbohydrate	Glycosidic Linkage	-Primary
Catalyst	Hydrolysis	-Secondary
Cellulose	Lipid	-Tertiary
Chitin	Monomer	-Quaternary
Cholesterol	Monosaccharide	Purine
Dehydration Reaction	Nucleic Acid	Pyrimidine
Disaccharide	Nucleotide	RNA
DNA	Peptide Bond	Starch
Disulfide Bridge	Phospholipid	Steroid
Double Helix		Trans Fat

1. What is a macromolecule? What are the 4 major macromolecule groups?

2. In Biochemistry, what is a monomer? Polymer?

3. Carbohydrates:

Name and give the formula for the most common monosaccharide. Why is this molecule important in biological organisms?

4. Compare the structures and 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, mono and poly unsaturated and trans fats).

6. Draw a phospholipid bilayer and describe how it helps make up a cell membrane. Label the hydrophobic and hydrophilic areas.

7. Proteins

What are the building blocks of proteins? Draw the general structure of this monomer of proteins.

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

9. Name five examples of protein types and briefly describe their functions.

10. Nucleic Acids: What are the building blocks of nucleic acids (monomers)?

## Topic 5- Natural Selection

Natural selection	Overpopulation	Pollutant
Predator	Diversity	Camouflage
Adaptation	Reproduce	Resource
Disease	Prey	Mutation
Environment	Offspring	Biodiversity
Species	Competition	Survival of the Fittest
Variation	Evolution	Analogous structure
Homologous	Vestigial	Embryology

1. What are the main tenants of natural selection?
2. Describe the classic example of natural selection: The peppered moth. Describe how this illustrates all the tenants of natural selection. Describe the evolution of the peppered moth throughout history.
3. How is natural selection different from the inheritance of acquired characteristics? Use examples to illustrate each concept. Which concept is accepted today as a mechanism of evolution?
4. What is a Cladogram? Give a few labeled examples of cladograms in biology.