

**Advanced Placement Biology**  
**Whitehall High School**  
**Mr. Mahan**  
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### **Course Description**

This AP Biology course is year long course that meets for 71 minutes a day, 5 days a week. The course is designed to closely resemble a college level freshman biology course. The topics and themes that are covered in this class are closely linked to the AP Biology course description. The specific topics that are covered in this class are Ecology, Animal Behavior, The Cell, The Gene, Mechanisms of Evolution, Organism Structure and Function, and The Diversity of Organisms. Chemistry and Biology are prerequisites for enrollment in this course.

### **What you can expect when you get here**

Anyone can listen to an instructor, take notes, and pass a test. I want students to immerse themselves in all of Biology. Through weekly Vocabulary, you will learn the nomenclature that is used in the Scientific and Biological community throughout education. Discussion will be based on up to date research and topics that relate classroom topics to real world scenarios. Assignments will force you to correlate topics and create conclusions based on research, experimentation, and study. Weekly Interactive Questions and discussions will keep you on top the subjects, and aid you in review of topics covered in your Biology and Chemistry classroom. Finally, the class will prepare to take the AP Biology test, learning the strategies that will aid them on this test, and many collegiate tests to come.

### **Pre-Requisites**

The major prerequisites for this class are Biology and Chemistry. Many of the topics covered in this class are in-depth extensions of the material covered in these classes. Without this material, you will be a step behind, and that is not a great place to be in an Advanced Placement Biology Class. Material and Laboratories already covered in the prerequisites that you will be expected to remember *and* understand:

- Osmosis, Diffusion, Active Transport
- Mitosis and Meiosis
- Basic Cellular Structures
- Photosynthesis and Respiration (The Electron Flow in Organisms)
- Chromosomal and Gene Mutations
- Chemical Bonding, Valence Electrons, Ions

### **The Book**

The textbook that is used is Biology, by Campbell, Reece, and Mitchell, 5<sup>th</sup> Edition by Addison Wesley Publishers.

## The Tests

For those of you who thought the Biology and Chemistry tests were fun, you are going to love these! Each test is a combination of Multiple Choice and Essay. The Multiple Choice and Essay questions are styled after the AP Test, and will require some new study and answer strategies. During the first trimester, the focus will be on Essay Multiple Choice test strategies. From time management to guessing strategies, all aspects of preparation will be covered. Tips for writing AP style essays, creating grading rubrics to assist in studying, and group correction are a first trimester focus. By the time the AP test rolls around in May, you should be ready for the test.....Now you just have to STUDY!!!!

## The Laboratory Experience

The Lab experience is a very important aspect of AP Biology. Approximately one day every week will be devoted to laboratory experience. The labs are complex, and will require you to use all the techniques you have experienced and learned in Biology and Chemistry. For each Lab, you will be required to create a report/project or hand in Data tables and discussion questions. These projects vary, and include creating your own Grant Proposal, creating a Health Magazine article, a PowerPoint Presentation to a Medical Conference, and a typical Lab Report.

## Your Grade

This class is graded on a total point scale. There are no weighted grades. Every point counts. The scale is as follows

A: 100-89.5	Excellent Work
B: 89.4-79.5	Above Average
C: 79.4-69.5	Average
D: 69.4-59.5	Not, not good
F: 59.4-0	Never leaving the house, again.

## The Website

AP Biology has a fantastic website that has every assignment, PowerPoint, web link, vocabulary list, Interactive Question, and classroom rule. This is a must use tool for the AP Biology student. Very seldom will I hand out paper copy of assignments; it is the student's responsibility to access the school website, and my teacher page to retrieve the information. All information is in PDF format, Word Files, and regular web pages available for cutting and pasting. If you are unable to access the web from home, please see me and we will arrange school time, or I can get you copies.

Visit: [www.whitehall.k12.mi.us](http://www.whitehall.k12.mi.us), follow the teacher page, till you get to the AP home!

## Trimester 1

### Science as a Process (Chapter 1)(1 week)

- The Scientific Method
- How to study Organisms (holistic vs. reductionism)
- A review of Taxonomy Principles
- Introduction to Cladistics
- Science and Technology: Functions of society
- Activities and Assessments
  - Save the World: Find a problem plaguing the world (biology related), research it, experiment on it, and fix it. A scientific method exercise
  - Lake Hypo Activity: a scientific method based laboratory where the students are given an unknown and must create the method based procedure to solve the problem
  - Interactive Questions: A weekly collection of questions that are comprised of previous AP essays related to this topic, questions from the Biology Workbook, questions from the AP Cliff notes reference, and teacher generated questions
  - Vocabulary: Weekly vocabulary words that the students define in relation to the current topics, these words come from the text, the AP Cliff notes

### Biochemistry (Chapters 2-6)(2 weeks)

- Water and the Chemistry of Life
- Carbon and Macromolecules (An introduction to Organic Chemistry)
- Metabolism and Enzymes
- Activities and Assessments
  - AP Enzyme Lab 2: Enzyme Catalysis
  - Enzymes of Digestion and Food Preservative Laboratory
  - Interactive Questions
  - Vocabulary
  - Biochemistry Test: Multiple Choice and Essay test based on PowerPoint Lecture, Vocabulary, and Essay Interactive Questions
  - Laboratory Report on AP Lab 2
  - Biochemistry Test

### The Cell (Chapters 7-11) (9 weeks)

- A tour of cell (3 weeks)
  - Review of Osmosis and Diffusion
  - Cell, Plasma Membrane Structure, and cellular components
  - Photosynthesis and Respiration- ATP at the Molecular Level
  - Activities and Assessments
    - AP Lab 5: Cell Respiration
    - Interactive Questions
    - Vocabulary
    - Gram Stain Lab

- Cell Cycle (Chapters 12-13) (6 Weeks)
  - Review of AP lab 3 completed in Sophomore Biology Class
  - Review of Chromosome Structure
  - The structure of DNA and RNA
  - Chromosomes and Genetic Variation
  - Regulation of the Cell Cycle
  - Activities and Assessments
    - A.P. Lab 6: Transformation
    - Mitosis and Meiosis Flip Book
    - Interactive Questions
    - Vocabulary
    - Cell division Lab: hands on modeling lab kits
- Test over The Cell, Cell Cycle, and Regulations of the Cell Cycle

## Trimester 2

### Genetics (Chapter 14-21) (3 Weeks)

- Chromosomal and Molecular Inheritance (Mendelian Genetics)
- Protein Synthesis and Genetic and Cellular Variation
- Genetics of Viruses and Bacteria
- Cancer
- Activities and Assessments
  - Karyotyping Activity at [www.nobelprize.org](http://www.nobelprize.org)
  - Karyotyping Lab
  - A.P. Lab 7: Genetics of Organisms
  - Cell Division hands-on modeling Labs and Activities (DNA Structure, Protein Synthesis)
  - Fruit Smoothie DNA extraction lab
  - Online Activity: The Fruit Fly Lab.....(so clean, no bugs in the lab!)
    - <http://bioweb.wku.edu/courses/Biol114/Vfly1.asp>
  - Genetic Disorder Paper: A paper on any genetic disorder that includes the gene location, inheritance, characteristics of disorder, treatments/cures, and current research.
  - Debate: Genetics Engineering and Human Reproduction
  - Interactive Questions
  - Vocabulary
  - Laboratory Report: A PowerPoint Presentation based on your finding in AP Lab 7
  - Genetics Test

### Structure and Function of Animals (Chapters 32, 34, 40-49) (7 Weeks)

- Basic Animal Evolution and Diversity (Phylogeny and Hypothesis of diversification)
- Chordate Evolution and basic Characteristics
- Vertebrate Diversity (Agnatha vs Gnathostomata)
- Levels of Organization in Animals (including tissue types, organ systems)

- Bioenergetics and Thermoregulation of Animals
- The Body Systems:
  - Digestive, Circulation and Gas Exchange, Immune, Nervous, Reproductive, Endocrine
- Animal Behavior: The March of the Penguins
- Activities and Assessments
  - Interactive Questions
  - Vocabulary
  - Amylase Lab: the enzymes of digestion
  - AP lab 10: Physiology of the Circulatory System
  - Laboratory Report: The *Health Magazine* Article
  - Cow Eye Dissection: A journey back to the 2<sup>nd</sup> grade to show the little ones all that you know about the eye....
  - Senses Lab: a study of the nervous system structure, pain, vision, hearing
  - Taxonomy Project: Each student does a small presentation on one of the major phyla of the animal kingdom
  - March of the Penguins Paper: The assignment for the movie is an examination of animal behavior based on the principles of social behavior, communication, foraging, movement, and basic animal behaviors
  - Animal Test

The Plants - A Quick Journey through Form and Function! (Chapters 29, 35-39)(2 Weeks)

- Plant Origin and Evolution, Vascular and Nonvascular
- A Closer Look at Seed Plants: Tissues, the Seed, Germination and Development
- Plant Morphology:
  - Roots and Stems
  - Secondary Roots and Stems
  - The Leaf
  - Hormones
- More Plant Functions
  - Transport of Water
  - The Stomata
  - Transport of Sugar
  - Irritability: Plant Responses
- Activities and Assessments:
  - AP Lab 4: Plant Pigments and Photosynthesis
  - Interactive Questions
  - Vocabulary:
  - Plant Test

### Trimester 3

Finish Plant Unit: (Approximately 1 Week)

- AP lab 9: Transpiration
- Observing Tropisms Lab

Evolution and Biodiversity (Chapters 22-31) (4 weeks)

- The Evolutionary History of Biological Diversity
  - Archaibacteria/Eubacteria, Taxonomy and Cladistics...again, Protists, Fungi, all the way to you and me!
- Mechanisms of Evolution
  - Darwinian view of life
  - How does this all happen? Microevolution and Macroevolution
  - The Evolution of Population and Species
    - The world according to Hardy-Weinberg
- Activities and Assessments
  - To Be A College Professor: Students working in small groups will enter the wonderful world of higher education creating an online lesson to tie in the major concepts of evolution with activities and reading available from the myriad of sources available on the net.
  - AP Lab 8: Population Genetics
  - Interactive Questions
  - Vocabulary
  - Evolution Test

Ecology (Chapters 50-54)(3 weeks)

- The Scope of Ecology
- The Environment of the Organism: Abiotic vs. Biotic Factors
- Biomes: an overview of all, a specific look at aquatic!
- The Human factor.....
- Activities
  - An Inconvenient Truth: The research, the real numbers, and what this means to *YOU!!!*.
  - AP Lab 12: Dissolved Oxygen and Primary Productivity
  - The Viking Pond Lab: A journey into Macro-Invertebrates and emerging populations
  - Interactive Questions
  - Vocabulary

AP Exam Review (2 Days)

- Review of Testing Strategies
- How the AP test is graded: Multiple Choice and Essay
- Your preparation for the test!

The Survival Game: (2 weeks)(The Entire Book.....)

- You get sent to a planet, you have to set up the animal food webs, bacterial cultures, how and where you are going to live.....You get to be king.....

### Other stuff you can expect to see and do

### Weekly Interactive Questions and Vocabulary

- Each week, students will be responsible for defining vocabulary that is integral for the understanding of the topics discussed in lecture and studied in lab. A sample of vocabulary from the Biochemistry Unit:
  1. Unsaturated
  2. Phospholipids
  3. Peptide bond
  4. Peptide
  5. Primary structure
  6. Secondary structure
  7. Quaternary structure
  8. Activation energy
  9. Catalyst
  10. Metabolism
  11. Chemical equilibrium
  12. Enzymes
  13. Induced fit model
  14. Denatured
- This is a sample of weekly Interactive Questions from the Biochemistry Unit:
  1. Interactive Questions Chapter 5-6
    1. Why would a change in pH cause a protein to denature?
    2. Why would transfer to a nonpolar organic solvent (such as ether) cause denaturation?
    3. A denatured protein may re-form to its functional shape when returned to its normal environment. What does that indicate about a protein's conformation?
    4. Show the flow of genetic information in a cell.
    5. Draw and label the three parts of a Purine and a Pyrimidine. Indicate with an arrow where the phosphate group of the next nucleotide would attach to build a polynucleotide.
    6. Complete the table to show how the free energy of a system or reaction relates to its stability, tendency for spontaneous change, equilibrium, and capacity to do work.
 

• High Free Energy	Low Free Energy
Stability	
Spontaneous	
Equilibrium	
Work Capacity	

7. Develop a concept map on free energy and DeltaG.
8. Draw and label the three parts of an ATP molecule. Circle the unstable region and show the bond which is most likely to break. Why is energy released?
9. Discuss each of the following
  - a) The structure of an enzyme
  - b) How enzymes function
  - c) How enzymes are regulated
10. Describe why water is an ideal medium for living things
11. When you hard-boil an egg, the clear liquid part surrounding the yolk becomes white and solid. Discuss why this happens.

<b><u>Lecture Outlines:</u></b>
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- In correlation to PowerPoints for each topic, lecture outlines are available online for you to download and use. These are available in Adobe format, or as Word files, whatever you feel works for you. The following is an small excerpt from introductory lecture on Plants outline:
  - Basic Characteristics:  
Multicellular Eukaryotes, photosynthetic autotrophs, cell walls contain cellulose, food reserve that is starch stored in plastids, chloroplasts with photosynthetic pigments (chlorophyll a, b, and carotenoids), gas exchange via stomata, waxy cuticle to prevent desiccation
  - Overview of Groups
- **Nonvascular Plants:** (Bryophytes) haploid gametophytes is dominant generation, gametangia protect developing gametes, lack woody tissue
 

Division Bryophyta	Mosses
Division Hepatophyta	Liverworts
Division Anthocerophyta	Hornworts
- **Vascular Plants:**
  - Seedless Vascular Plants: sporophyte (diploid) dominated life cycle, is the familiar leafy part of the plant, small gametophytes that grow beneath surface of soil, formed the coal forests of the carbiniferous period
 

Division Lycophyta	Lycophytes, club mosses, ground pines
Division Sphenophyta	Horsetails
Division Pterophyta	Ferns
  - Seed Plants: seeds replaced the spore as the main means of dispersing offspring; pollen is vesicle for sperm cells
    - Gymnosperms:* lack enclosed chambers (ovaries) in which seeds develop
 

Division Coniferophyta	Conifers
Division Cycadophyta	Cycads
Division Ginkgophyta	Ginkgo
Division Gnetophyta	Gnetae
    - Angiosperms:* most widespread and diverse, 250,000 species, refined vascular tissue, flowers, fruit

Division Anthophyta	Flowering Plants
Dicotyledons	2 cotyledons (storage tissue), netted leaf veins, flower parts in multiples of 4 or 5, circled vascular bundle, taproot
Monocotyledons	1 cotyledon, parallel veins, flower parts in multiples of 3, scattered vascular bundles, fibrous root system

- **Origin and Evolution**

- Evolved from green algae
- Alternation of generations in plants may have originated by delayed meiosis
- Adaptation to shallow water pre-adapted plants for living on land (waxy cuticles, protection of gametes, and protection of embryos)
- Eventually, accumulated adaptations (regional specialization of plant body (roots and plant body), structural support, vascular system, pollen, seeds) allowed terrestrial plants to live above water line on dry land which opened new adaptive zone with:
  - Sunlight unfiltered by water and algae
  - Soil rich in minerals
  - Absence of terrestrial herbivores

<b><u>Book Reports and Research Papers:</u></b>
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- Each Trimester, the student will read a book and write a report that is related to a current theme in science, science technology, and society. The book topics range from evolution and theory, biotechnology and the genome application, emerging viruses and disease, population effects on the environment, or a current topic of interest in the science field.