

# AP Biology

2017-2018

## Teacher Information

## Materials

**Mrs. Rakers**  
**Room C103**  
**Phone Number: 636-443-4243**  
**E-Mail: anrakers@stcharlessd.org**  
**Website: www.rakersscw.weebly.com**  
**Plan periods:**  
**A days-1st block (7:20-8:40)**  
**B days-8th block (1:00-2:20)**

Neil A. Campbell and Jane B. Reece's  
*Biology AP Edition*(2014)  
*AP Biology Lab Manual for Students*  
An account on [www.campbellbiology.com](http://www.campbellbiology.com)  
CD that comes with the book

Each student is required to keep both a **3-Ring Class Binder** (I suggest a 3-4 inch binder) with tabbed dividers (I suggest the ones with pockets). Each binder should have the following tabs: Notes, Handouts, Labs, Quizzes and Tests.

Composition Notebook (for lab notebook)

Students also need to access to YouTube and other video websites on a daily basis.

## Classroom Information

**Course Description:** This course will prepare students for the AP Biology exam. If they pass the exam they can earn college credit. Life traits and functions will be studied at the cellular and molecular level which underscores the unity at the base of diversity. Units include: 1) Cell chemistry, energetics, and types; 2) heredity at cellular and molecular levels, and as agent of Evolution at micro and macro levels; and 3) diversity and interactions within and between populations and extending to the biosphere.

By structuring the course around the four big ideas, enduring understandings, and science practices students will develop an appreciation for the study of life and help them identify and understand unifying principles within a diversified biological world.

What we know today about biology is a result of inquiry. Science is a way of knowing. Therefore, the process of inquiry in science and developing critical thinking skills is the most important part of this course.

**Course Goals:** The *objectives of the course are that each student shall:*

- demonstrate skills in using various types of biological instrumentation and scientific methodologies
- learn how to read and critique papers written by scientists in the field of biology
- practice finding and using patterns in collected data to solve scientific problems
- exhibit mastery of the major principles of biology
- apply biological knowledge and critical thinking to environmental and social concerns

**Attendance/Tardy Policy:** In order for students to get the most out of their education, it is imperative that they be in school each day. Students are expected to be present and punctual for all of their classes throughout the year. Students should review the *Student Code of Conduct* for specific details on attendance procedures and tardy consequences.

**Homework Policy:** Most of the homework assigned will be to watch videos or animations prior to discussion, read chapters and fill out a reading guide or completing lab write-ups. There may also be worksheets and supplemental work to help topic comprehension, but most of this will be done in class. Guided readings for (most) chapters will be available to you through my website as I can get them updated- otherwise please ask and I will get you a hard copy. These are ***highly encouraged*** since you get to use them to help you break down the chapter material. *It is up to you to keep up with the reading!* Reading quizzes may be given throughout each unit, and these will be a good indicator of your completion and understanding of the material.

**Grading System:** AP Biology is a weighted course. The grading scale is as follows:

Grading Scale:	A=	100%-90%
	B=	89.9%-80%
	C=	79.9%-70%
	D=	69.9%-65%
	F=	<65%

### **Academic Integrity**

Students are expected to complete their own work, respect the work of others, and acknowledge information received from other sources. All instances of academic dishonesty are addressed with consequences according to the Student Code of Conduct. Academic dishonesty includes copying of homework, cheating on tests/final exams, plagiarizing written reports, copying lab reports, computer programs, sharing of answers, allowing someone else to do your work, using cheat sheets, electronic photocopies, etc. All work should reflect student work. Students will be held accountable for completing the original assignments.

### Technology Proficiency Requirements and Resources

In order to be successful in the course, students are expected to:

- Check gmail account at least daily (and other apps that might be applicable to your course)
- Have access to a computer and/or electronic device with an internet connection
- Have basic web search and browsing skills
- Have basic file management skills
- Understand different file formats and be able to follow instructions on the type of file preferred by your teacher
- Search for and obtain articles from online databases
- Be able to use software appropriate to the course to create documents, spreadsheets, or presentations, edit them, save them, convert them to other formats as needed, print them, and email them as attachments, or upload to specific location as instructed by your teacher
- Use cell phone and other electronic devices as defined by your teacher
- Ability to access my website and YouTube videos and other video sites online

### Student Learning Standards

Students and parents can locate proficiency scales by accessing the following website: Go to <https://sites.google.com/a/stcharlessd.org/sbg/proficiency-scales/high-proficiency-scales>

### Methods of Evaluation

Required assessments for this course:

- **Labs:** After completing my AP Biology class I expect my students to be able to design and perform a controlled experiment based upon observations made about a particular topic. In addition, students are also expected to be able to collect and analyze data, through basic statistical analysis, and draw conclusions based on their results. In order to be successful, students are required to keep a *laboratory journal* (composition notebook) in which they record their procedures, data/results, and write their conclusions for each laboratory they perform. You will be given a sample write-up that demonstrates my expectations. You will be required to write a report for every lab performed, which will be kept in your journals/notebook. In addition two formal reports will be required- students will be given a rubric and outline prior to the first due date. Statistical information should be included in the report. In many cases, software and Internet simulations are available to support the lab experience. Over the course of the year I cover various labs in the *AP Biology Lab Manual for Students* and other experiments or activities. This requires at least one day out of four devoted to lab work (roughly 25% of the year-long course).

- **Tests:** Tests will be multiple choice and short essay based on the format of the AP Biology exam given in the spring. Tests will include current content and connections to other previously studied units. Quizzes will be given over videos, reading material or key concepts and will count as a part of the test grade. These are meant to keep everyone on task and on time.

**Breakdown of how assessments will be graded:**

Tests and quizzes	50%
Labs	20%
Homework and classwork	10%
Semester final	20%

**Re-Assessment Policy:** Re-assessing is not a right, it is a privilege. Students must make a “good faith effort” on the summative (majority of questions are answered and it was obvious the student prepared for the test). To prepare for a retest, these will be considered between the student and myself.

- **Homework or other assignments, including the study guide for the summative**, must be given to me prior to being allowed to re-assess.
- Complete practice work assigned by the teacher as needed.
- Complete the re-assessment within 5 class periods from the date the summative assessment is returned
- Students can re-assess Tuesdays and Thursdays during AIP.
- Before/after school as arranged with teacher

Students will be allowed to re-assess one time within the two week time frame. The last opportunity to re-assess will be the final. It is **highly suggested** that students in the AP Biology class re-assess on tests that score below a 70%.

**Academic Support**

ST. CHARLES WEST provides assistance and support for all students. Students have 50 minutes every day during the Academic Intervention Period (AIP) to achieve their academic goals by using this time to get assistance from their teachers, arrange peer tutoring, complete homework, study, reassess on learning standards as needed, and use school resources such as the library and computer labs.

## Course Calendar

### **AP Biology Big Ideas**

Big Idea 1: The process of evolution drives the diversity and unity of life.

Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic 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 systems and their interaction processes complex properties.

### **Science Practices for AP Biology**

A practice is a way to coordinate knowledge and skills in order to accomplish a goal or task. The science practices enable students to establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena.

These practices capture important aspects of the work scientists engage in, at the level of competence expected at the AP level.

1. The student can use representations and models to communicate scientific phenomena and solve scientific problems.
2. The students can use mathematics appropriately.
3. The students can engage in scientific questioning to extend thinking or to guide investigations within the content of the AP course.
4. The student can plan and implement data collection strategies appropriate to a particular scientific question.
5. The student can perform data analysis and evaluation of evidence.
6. The student can work with scientific explanations and theories.
7. The student can connect and relate knowledge across various scales, concepts, and representations in and across domains.

### **Unit 1: Introduction**

#### **Big ideas: 1, 2**

#### **Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution.
- 2.A Growth, reproduction and maintenance of the organization of living systems require free energy and matter.

#### **Chapters:**

1. Introduction: Themes in the Study of Life
2. The Chemical Context of Life
3. Water and the Fitness of the Environment

## **Unit 1 Overview of Lecture and Discussion Topics:**

1. Darwin and the Theory of Natural Selection
2. Inquiry as a way to learn science
3. The impact of carbon as the “backbone of life”
4. How monomers build polymers, including the roles of nucleic acids

### **Labs:**

- \* Properties of Water Lab

*Unit 2: Ecology*

### **Big ideas: 1, 2, 3, 4**

#### **Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution.
- 1.C Life continues to evolve within a changing environment.
- 2.A Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
- 2.C Organisms use feedback mechanisms to regulate growth, reproduction and dynamic homeostasis.
- 2.D Growth and dynamic homeostasis of a biological system are influenced by changes in the system’s environment.
- 2.E Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.
- 3.E Transmission of information results in changes within and between biological systems.
- 4.A Interactions within biological systems lead to complex properties.
- 4.B Competition and cooperation are important aspects of biological systems.
- 4.C Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

### **Chapters:**

51. Animal Behavior
52. Interactions between organisms and the environment limit the distribution of species.
53. Population Ecology
54. Community Ecology
55. Ecosystems
56. Conservation Biology and Global Change

## **Unit 2 Overview of Lecture and Discussion Topics:**

1. Aspects of animal behavior
2. Aspects of biomes
3. Models describing population growth
4. Regulation of population growth
5. Community interactions
6. Species diversity and composition

### **Labs:**

- \* AP Lab : Behavior Lab
- \* AP Lab : Dissolved Oxygen and Primary Productivity

## **Unit 3: Chemistry and Biochemistry**

### **Big ideas: 1, 2, 3, 4**

#### **Connected to enduring understandings:**

- 1.D The origin of living systems is explained by natural processes.
- 2.A Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
- 2.B Growth, reproduction and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments.
- 3.A Heritable information provides for continuity of life.
- 4.A Interactions within biological systems lead to complex properties.
- 4.B Competition and cooperation are important aspects of biological systems.
- 4.C Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

### **Chapters:**

4. Carbon and the Molecular Diversity of Life
5. The Structure and Function of Large Biological Molecules

## **Unit 3 Overview of Lecture and Discussion topics:**

1. The impact of carbon as the backbone of life
2. How monomers build polymers, including the roles of nucleic acids

### **Labs:**

- \* AP Lab 13: Enzyme Function

## *Unit 4: Introduction to the Cell, Cellular Energy and Related Processes*

**Big ideas: 1, 2, 4**

**Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution.
- 1.D The origin of living systems is explained by natural processes.
- 2.B Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
- 4.A Interactions within biological systems lead to complex properties.
- 4.B Competition and cooperation are important biological systems.

**Chapters:**

- 6. A Tour of the Cell
- 7. Membrane Structure and Function
- 11. Cell Communication
- 48. Neurons, Synapses and Signaling

**Unit 4 Overview of Lecture and Discussion Topics:**

1. Examples of organelles that are membrane bound to compartmentalize their functions
2. Membrane structure and function
3. Evolution of cell signaling
4. Reception, transduction, response
5. Structure and function in nervous systems (neurons, resting potential, action potential, synapses)

**Labs:**

- \* Diffusion and Osmosis Lab

## *Unit 5: Cellular Energy and Related Processes*

**Big ideas: 1, 2, 4**

**Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution.
- 1.D The origin of living systems is explained by natural processes.
- 2.B Growth, reproduction and maintenance of the organization of living systems require free energy and matter.



- 4.A Interactions within biological systems lead to complex properties.
- 4.B Competition and cooperation are important biological systems.

**Chapters:**

- 8. An Introduction to Metabolism
- 9. Cellular Respiration
- 10. Photosynthesis

**Unit 5 Overview of Lecture and Discussion Topics:**

- 1. Metabolic pathways
- 2. Laws of Energy Transformation
- 3. How ATP powers cellular work
- 4. Enzyme structure and function
- 5. Harvesting chemical energy: glycolysis, citric acid cycle, oxidative phosphorylation
- 6. Light reactions and the Calvin cycle
- 7. Evolution of alternative mechanism of carbon fixation

**Labs:**

- \* Respiration Lab
- \* AP Lab : Photosynthesis Lab- *this will be completed as a formal lab write-up.*

**Unit 6: Cell Cycle**

**Big ideas: 1, 2, 3**

**Connected to enduring understandings:**

- 2.E Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination
- 3.A Heritable information provides for continuity of life
- 3.B Expression of genetic information involves cellular and molecular mechanisms.

**Chapters:**

- 12. The Cell Cycle

**Unit 6 Overview of Lecture and Discussion Topics:**

- 1. Apoptosis
- 2. How mitosis produces genetically identical daughter cells

3. Evolution of Mitosis
4. How the eukaryotic cell cycle is regulated by a molecular control system

**Labs:**

- \* Cell division and mitosis

**Unit 7: Genetic Basis of Life**

**Big ideas: 1, 3, 4**

**Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution.
- 3.A Heritable information provides for continuity of life.
- 3.C The processing of genetic information is imperfect and is a source of genetic variation.
- 4.C Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

**Chapters:**

13. Meiosis and Sexual Life Cycles
14. Mendel and the Gene Idea
15. The Chromosomal Basis of Inheritance

**Unit 7 Overview of Lecture and Discussion Topics:**

1. Genes are passed from parents to offspring by the inheritance of chromosomes
2. How meiosis reduces the number of chromosomes (diploid to haploid)
3. Evolutionary significance of genetic variation that results from sexual life cycles
4. Concepts of Mendelian genetics (laws of probability, inheritance patterns)
5. Genes are located along chromosomes (concepts of gene linkage, mapping)
6. distance between genes, causes of genetic disorders)

**Labs:**

- \* TBD

**Unit 8: Gene Activity and Biotechnology**

**Big ideas: 1, 2, 3, 4**

**Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution
- 2.C Organisms use feedback mechanisms to regulate growth and reproduction, and

to maintain dynamic homeostasis.

- 2.E Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.
- 3.A Heritable information provides for continuity of life.
- 3.B Expression of genetic information involves cellular and molecular mechanisms.
- 3.C The processing of genetic information is imperfect and is a source of genetic variation.
- 4.A Interactions within biological systems lead to complex properties.

**Chapters:**

16. The Molecular Basis of Inheritance
17. From Gene to Protein
18. Regulation of Gene Expression
19. Viruses
20. Biotechnology
21. Genomes and their Evolution

**Unit 8 Overview of Lecture and Discussion Topics:**

1. DNA is the genetic material (historical experiments, DNA structure and function, DNA replication)
2. Flow of genetic information (genetic code, role of other polymers, transcription, translation)
3. Mutations
4. Gene expression (operon systems in prokaryotes, eukaryotic gene expression)
5. Virus structure and activity
6. Restriction enzymes, plasmids, transformation
7. DNA technology (how gel electrophoresis works and applications of this technology)

**Labs:**

- \* Biotechnology Lab- Transformation

**Unit 9: Evolution and Phylogeny**

**Big ideas: 1, 3, 4**

**Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution.
- 1.B Organisms are linked by lines of descent from common ancestry.
- 1.C Life continues to evolve within a changing environment.

- 1.D The origin of living systems is explained by natural processes.
- 3.A Heritable information provides for continuity of life.
- 3.C The processing of genetic information is imperfect and is a source of genetic variation.
- 4.C Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

**Chapters:**

- 22. Descent with Modification: A Darwinian View of Life
- 23. The Evolution of Populations
- 24. The Origin of Species
- 25. The History of Life on Earth
- 26. Phylogeny and the Tree of Life
- 27. Bacteria and Archae

**Unit 9 Overview of Lecture and Discussion Topics:**

- 1. How natural selection serves as a mechanism for evolution
- 2. Scientific evidence supporting evolution
- 3. Hardy-Weinberg concept
- 4. How allele frequencies can be altered in a population
- 5. Concepts of speciation
- 6. Origin of Life; Fossil Records
- 7. Events in the “history of life” (origin of single-celled and multicellular organisms; mass extinctions; adaptive radiations)

**Labs:**

- \* TBD

**Unit 10 Diversity in the Biological World: Organism Form and Function**

**Big ideas: 1, 2, 3, 4**

**Connected to enduring understandings:**

- 1.A Change in the genetic makeup of a population over time is evolution.
- 1.B Organisms are linked by lines of descent from common ancestry.
- 2.A Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
- 2.C Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.

- 2.D Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment.
- 2.E Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.
- 3.E Transmission of information results in changes within and between biological systems.
- 4.A Interactions within biological systems lead to complex properties.
- 4.B Competition and cooperation are important aspects of biological systems.

**Chapters:**

40. Basic Principles of Animal Form and Function

43. The Immune System

49.2 The Vertebrate Brain

**Unit 10 Overview of Lecture and Discussion Topics:** This section covers a broad survey of the diversity of life; specific topics will connect big ideas and enduring understandings.

1. Evolutionary trends (endosymbiosis, adaptations that allowed plants to move from water to land, reproductive adaptations of angiosperms, environmental roles of fungi, animal body plans, progressively complex derived characters in animal groups)
2. Unique features of the angiosperm life cycles
3. Signal transduction pathways (plant and animal hormones)
4. Photoperiodism in plants
5. Feedback control loops in animals
6. Thermoregulation in animals
7. Energy allocation and use in animals
8. Examples of functioning units in mammal systems (alveoli in lungs, villi of small intestines, nephrons in kidneys)
9. Structure and function in immune systems
10. Structure and function of the human brain

**Labs:**

\* TBD