Content:	**Grade or Course:**	**Date Developed:**
Ife Science	AP Biology	10/9/2018

Overview:

AP Biology is a 1.5 credit elective course geared towards students who seek an advanced understanding of biological principles. The class has been designed to meet the content standards established by the College Board as described in the AP Biology Course Description. As such, the course covers a wide range of topics to include biochemistry, cell anatomy and physiology, Mendelian and molecular genetics, evolution, plant and animal systematics, animal physiology, and ecology. This class relies heavily on student participation in both lecture and laboratory class components. The laboratory section of the class mandates that students regularly interact with the collection of real data to apply towards the explanation of true biological problems. In all but special circumstances, this requirement restricts the course to senior students only. Most students have a strong interest in pursuing a post-secondary education in the fields of science or medicine. The syllabus for this course is based on the syllabus recommended by the AP College Board as amended for the 2012-2013 academic year.

Essential Questions:

There are four major questions that are woven into all of AP Biology:

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

Big Idea 2: How do biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.

Big Idea 3: How do living systems store, retrieve, transmit, and respond to information that is essential to life processes.

Big Idea 4: Ho do biological systems interact, and these systems and their interactions possess complex properties.

EO's addressed to proficiency level:

Students will understand, demonstrate, and be evaluated on the following Scientific Practices:

- P1: Asking Questions and Defining Problems
- P4: Analyzing and Interpreting Data
- P5: Using Math and Computational Thinking
- P6: Constructing Explanations
- P8: Obtaining, Evaluating, and Communicating Information

Standards:

Students will understand and use the following additional Scientific Practices:

- P2: Developing and Using Models
- P3: Planning and Carrying out Investigations
- P7: Engaging in Argument over Evidence

Students will understand and use the following Cross-Cutting Concepts:

- Systems and system models
- Energy and matter
- Stability and change
- Structure and Function

Students will understand, use, and be evaluated on the following Disciplinary Core Ideas:

1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins that carry out the essential functions of life through systems of specialized cells. HS-LS1-1
2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions in multicellular organisms. HS-LS1-3
3. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS1-4
4. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-5
5. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. HS-LS1-7
6. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. HS-LS2-1
7. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-4
8. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS2-5
9. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS3-1
10. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS-LS3-2
11. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-LS3-3
12. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. HS-LS4-1
13. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-2

14. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS4-3
15. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-4

Additionally, rigorous academic and intellectual goals for the class that include

- Exhibiting mastery of the major principles of biology
- Establishing connections among the governing themes of life sciences
- Applying evolution as the major unifying concept within biology
- Applying biological knowledge to a modern social context
- Acquiring proficiency in manipulating and interpreting data sets
- Acquiring proficiency in reading and analyzing technical writing
- Demonstrating proficiency in written, verbal, and visual presentation
- Developing high personal standards for quality of work
- Developing high personal standards for disciplined work habits

Units:

Unit 1: Natural Selection, Speciation, and the Diversity of Life
Unit 2: Metabolism
Unit 3: Exchange of Molecular Building blocks
Unit 4: Cellular Responses for Survival
Unit 5: Heredity
Unit 6: Gene Activity and Regulation
Unit 7: Exchanges of Information
Unit 8: Organismal and Environmental Interactions

EO Assessments:

- Natural Selection of Yeast Lab
- Evolution of Enzymes Lab
- Metabolism Lab
- Transpiration Lab
- Osmosis Lab
- Cell communication Lab
- Bacterial Transformation Lab
- Kinesis/Taxis Behavior Lab