

AP Biology Syllabus 2017-2018

INTRODUCTION

AP Biology is the equivalent of a two-semester, laboratory-based, introductory biology course taken at the college level. Its objectives are designed to provide in-depth knowledge on topics that will prepare you for success in collegiate studies. The coursework for AP Biology requires you to be organized, focused, and committed to learning the course material. A passing score on the Advanced Placement Biology exam is often accepted at many higher learning institutions for college credit. As your instructor, I will provide meaningful learning experiences that focus on developing laboratory skills, reasoning skills, and a working body of knowledge for biological science. The course will cover essential concepts of four big ideas of biology that will provide an enduring understanding of the topic.

COURSE OVERVIEW

AP Biology conforms to the standards set forth by the College Board. The following four big ideas and their respective concepts will be covered in this course:

- 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 interactions possess complex properties.

AP Biology also emphasizes the use of science skills with seven science practices that will be utilized throughout the course. These science practices are

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

TEXTBOOK

The textbook used for this course is the 13th edition of *Biology: The Unity and Diversity of Life* (2013) by Starr and Taggart (2013). 6th Students are expected to complete all reading assignments provided in the course outline well in advance of the lecture covering that reading material and bring textbooks with them to class every day.

TEACHING STRATEGIES

A variety of teaching methods will be used in this course, including lecture, demonstrations, discussions, and laboratories. A minimum of 25% of the course is lab-based, with inquiry-based labs and activities incorporated when appropriate. Outside readings and science articles will be included as a means for exploring the major topics of biology in current research. Additionally, students are **required** to complete an independent research project.

STUDENT ASSESSMENT AND EVALUATION

Students will be evaluated through a variety of formal and informal assessments. All graded tasks will be given a point value based on length, time spent, and objectives assessed. Quarter grades are calculated by adding the student's earned points and dividing by the total points possible.

Category	Appx. Weight
Unit Tests	70%
Quizzes	15%
Labs	10%
Quick Checks	5%

Assessments – At the conclusion of each unit of study, students will be assessed on their knowledge with a combination of multiple-choice and free-response questions. To monitor student learning, both announced and unannounced quizzes will be given during class time. These quizzes will be based on material covered during class and in the readings. Some lab activities will have an associated practicum, or an assessment, in which student mastery of laboratory objectives will be evaluated. Lab practicums are given to emphasize the importance of laboratory exercises as a learning tool.

Lab Activities – Laboratory experiences are crucial to understanding biological concepts. There are 13 laboratory activities that students will complete during this course that are related to the four big ideas, and several other supplemental laboratory exercises. Some labs will require detailed lab reports; however, not all laboratory experiences require an in-depth analysis on the scale of a full lab report. Rather, some laboratory activities are designed to provide an opportunity for engaging in science and exploring biological concepts. These activities are incorporated into the course to assist students in understanding the material.

Notebook – The notebook will comprise of notes either provided in class or written by students using provided materials. This includes the student's video journal.

Practice Work – Handouts and worksheets will be given to students in class to provide, reinforce and remediate course material

Independent Research Project – There are alternate ways of assessing student mastery of the objectives for this course besides pen and paper exams and quizzes. As such, students will be asked to complete an independent research project that will require students to show mastery of the big ideas and enduring understandings outlined in the AP Biology Curriculum and Framework. The required non-fiction reading falls under this category.

GRADING POLICIES

The following policies will be maintained in this course:

- **NO extra credit work will be provided for this class.** If you are willing to put forth effort for an extra credit assignment, then you should be more than willing to put forth that same effort into regular course work that will improve your knowledge and understanding of class topics.
- **Late work is not accepted.** You will be given one late assignment pass per quarter that can be used for assignment. It provides you **one week** to hand in the assignment without penalty. Afterwards it is marked a zero.
- **Pre-Laboratory assignments must be completed in order to participate in a lab.** Students who fail to do the assigned pre-lab will not participate in lab activities in class as this is their ticket into the lab. Make up of the lab will be required.

ABSENCES

Please refer to the makeup work policy in the student handbook for assignments missed during excused absences.

- Work not handed in because of an absence is required to be turned in the class period you return; work assigned during your absence is due the **next class period**. After this it will require a late pass.
- If you are absent the day of an exam or quiz, you are responsible for taking that exam or quiz on the day of your return to the class as you will have had advance notice of the date of the assessment, unless other arrangements have been made with your teacher.
- Students with excused absences **ONLY** will be able to make up exams; students with unexcused absences on exam day will be given a zero; Make-up exams may be a different version and/or format of the exam administered in class.
- Labs can be made up after-school on Tuesday or Thursday afternoons from 2-2:30 PM or by appointment. Due to the nature of some laboratory activities, students will submit a 3-page essay on the topic of the lab in lieu of making up the lab activity.
- You are expected to check the course Web page on days you are absent to see what you have missed.

CLASSROOM EXPECTATIONS AND RESPONSIBILITIES

- **Be on time.** The BHS tardy policy will be followed. You will need to obtain a tardy pass from attendance to be allowed in the classroom after the bell has rung.
- **Minimize absences.** There is a direct correlation between success in this course and class attendance.
- **Use the restroom before class begins.** If you must use the restroom during class, it cannot be during the first or last ten minutes of class per school's policy, and it must be during an appropriate time. For extenuating circumstances, see your instructor.
- **Be respectful and courteous of others and their property.**
- **Dress appropriately for school.**
- **Keep all electronic devices (except for calculators) out of sight and sound during class unless otherwise approved.** I do not allow the use of cell phones, mp3 players, video game players, etc. during class time. I will take these items from you, and your parents will need to come and get them from the front office if I have not approved of their use during class time.
- **Bring your class materials with you.**
- **Observe all science lab safety rules.** Proper lab safety rules will be discussed before each lab, and failure to observe these rules will result in dismissal from the lab.

"OFFICE" HOURS

I have designated Tuesday and Thursday afternoons from 2:00 to 2:30 as the days I will make myself available for after-school assistance. Any other times must be scheduled in advance with me.

LAB EQUIPMENT

Students who damage/break science equipment due to vandalism/negligence will be required to pay the replacement/repair cost.

CLASS MATERIALS

You will need a 2" three-ring binder, Mead 5-Star 5 subject notebook, dividers (minimum of 8), a quad-ruled composition notebook that will be your laboratory notebook, colored pencils, black pens, and a box of tissues.

TIPS FOR SUCCESS

To be successful in AP Biology, it is important to keep the following tips in mind:

- Spend approximately 2 hours studying the material for every 1 hour you spend in class.
- Form study groups with other members of the class.
- Make flash cards from the unit vocabulary, and review them often.
- Ask questions and seek clarification on concepts that seem confusing.
- Take advantage of my after school hours.
- Participate in all AP review activities.
- Read ahead and be prepared so that lecture is designed more as a review than as a means for introducing new material.
- Use an AP Biology preparation guide to regularly review the unit material.
- Frequently access the online tools and resources posted on School Messenger.

REQUIRED NON-FICTION READING

This course also provides students with opportunities to connect their biological and scientific knowledge to major social issues to help them become scientifically literate citizens. Students will be required to read four science related non-fiction books during the course of the school year (1 per quarter) that relate to the four Big Ideas. Students will be tasked with keeping a reading log in addition to other assignments related to the readings:

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| Big Idea 1: | <i>Survival of the Sickest</i> by Dr. Sharon Moalem |
| Big Idea 2: | <i>The Immortal Life of Henrietta Lacks</i> by Rebecca Skloot. |
| Big Idea 3: | <i>The Fever: How Malaria Has Ruled Humankind for 500,000 Years</i> by Sonia Shah. |
| Big Idea 4: | TBD |

Unit of Study	Topics	Lab Investigations and Activities	AP Biology Curriculum and Framework Alignment
Unit 1 Evolution, <i>Chapters 1, 16-20</i>	<ul style="list-style-type: none"> Theory of Evolution by Natural Selection Evidence for Evolution Genetic Variation in Populations Hardy-Weinberg Equilibrium Mechanisms of Natural Selection Speciation and Reproductive Isolation Origin of Life Development of Cells and Endosymbiosis Phylogeny and Domains, including Viruses 	<ul style="list-style-type: none"> Hardy Weinberg Lab BLAST Lab Artificial Selection Lab-FastPlants Cladistics Lab Case Study: Evolution of Human Skin Color EvolutionLab Simulation Rock Pocket Mouse Activity 	Big Ideas: 1, 2, 3, and 4 Enduring Understandings: 1.A, 1.B, 1.C, 1.D, 2.D, 3.C, 3.E, 4.A, 4.C Essential Knowledge: 1.A.1, 1.A.2, 1.A.3, 1.A.4, 1.B.1, 1.B.2, 1.C.1, 1.C.2, 1.C.3, 1.D.1, 1.D.2, 2.D.2, 3.C.1, 3.C.2, 3.C.3, 3.E.1, 4.A.6, 4.C.3, 4.C.4
Unit 2 Matter <i>Chapters 2-4</i>	<ul style="list-style-type: none"> Carbon Macromolecules (Lipids, Carbohydrates, Proteins, and Nucleic Acids) Properties of Water Surface Area to Volume Ratio Cell Transport, 	<ul style="list-style-type: none"> Molecular Modeling Activity “Can of Bull” Case Study AP Lab Investigation 4: Diffusion and Osmosis 	Big Ideas: 1, 2, 3, and 4 Enduring Understandings: 2.B, 2.C, 2.D, 2.E, 3.A, 3.B, 3.D, 4.A, 4.B, 4.C Essential Knowledge: 1.B.1, 2.B.1, 2.B.2, 2.B.3, 2.C.1, 2.C.2, 2.D.1, 2.E.1, 3.A.2, 3.B.2, 3.D.1, 3.D.2, 3.D.3, 3.D.4, 4.A.2, 4.B.2, 4.C.1
Unit 3 Energy <i>Chapters 5-7</i>	<ul style="list-style-type: none"> Free Energy Thermodynamics Enzymes Metabolism Photosynthesis Respiration 	<ul style="list-style-type: none"> AP Lab Investigation 6: Cellular Respiration AP Lab Investigation 5: Photosynthesis Leaf Disk Assay Photosynthesis and Respiration Jigsaw Activity AP Lab Investigation 13: Enzymes 	Big Ideas: 2 and 4 Enduring Understandings: 1.B, 2.A, 4.A, 4.B Essential Knowledge: 1.B.1, 2.A.1, 2.A.2, 2.A.3, 4.A.2, 4.B.1
Unit 4 Information <i>Chapters 11, 30</i>	<ul style="list-style-type: none"> Cell Structures Cell Cycle Meiosis Probability Mendelian Genetics Non-Mendelian Genetics 	<ul style="list-style-type: none"> AP Lab Investigation 7: Cell Division – Mitosis in Onion Cells, Puzzle of Life Activity Modeling Meiosis Genetics of Corn and Chi Square Lab 	Big Ideas: 1, 2, 3, and 4 Enduring Understandings: 1.A, 2.A, 2.E, 3.A, 3.B, 3.C, 4.A, 4.C
Unit 5 Regulation	<ul style="list-style-type: none"> Genetic Disorders Bioethics DNA Structure and Replication Gene Expression Gene Regulation Mutations DNA Technology Genetic Engineering 	<ul style="list-style-type: none"> Bacterial Transformation DNA electrophoresis lab Modeling Gene Regulation Activity Impact of Change in Genotype research poster project Case Study: Hemophilia – the Royal Disease 	Big Ideas: 1, 2, 3, and 4 Enduring Understandings: 1.A, 2.A, 2.E, 3.A, 3.B, 3.C, 4.A, 4.C Essential Knowledge: 1.A.2, 1.A.4, 2.A.1, 2.E.1, 3.A.1, 3.A.2, 3.A.3, 3.A.4, 3.B.1, 3.C.1, 3.C.2, 3.C.3, 4.A.1, 4.A.2, 4.C.1, 4.C.2, 4.C.3
Unit 6 Communication <i>Chapters 20-25, 27–34, 37, 40, 42-43</i>	<ul style="list-style-type: none"> Feedback Mechanisms Homeostasis Immune System Nervous System Endocrine System Animal Communication Animal Behavior Plant Responses Evolutionary Adaptations Among Physiological System 	<ul style="list-style-type: none"> AP Lab Investigation 11: Transpiration Pill Bug Behavior Lab Group Poster Project: What Happens Homeostasis if Disrupted? Homeostasis: It’s All a Matter of Balance Activity 	Big Ideas: 1, 2, 3, and 4 Enduring Understandings: 1.A, 1.B, 2.C, 2.D, 2.E, 3.E, 4.A Essential Knowledge: 1.A.4, 1.B.1, 1.B.2, 2.C.1, 2.C.2, 2.D.2, 2.D.3, 2.D.4, 2.E.2, 2.E.3, 3.E.1, 3.E.2, 4.A.4
Unit 7 Interactions <i>Chapters 44-48</i>	<ul style="list-style-type: none"> Biotic and Abiotic Factors Energy Flow and Primary Production Population Growth Biological Interactions and Diversity Species Distribution Ecological Disruptions 	<ul style="list-style-type: none"> Predator vs. Prey Simulation Mark-Recapture activity Dissolved Oxygen Lab PhET Simulation 	Big Ideas: 1, 2 and 4 Enduring Understandings: 1.A, 1.C, 2.A, 2.D, 2.E, 4.A, 4.B, 4.C Essential Knowledge: 1.A.2, 1.C.1, 2.A.1, 2.A.2, 2.A.3, 2.D.1, 2.D.3, 2.E.3, 4.A.5, 4.A.6, 4.B.3, 4.B.4, 4.C.3, 4.C.4

		<ul style="list-style-type: none"> • Case Study: The Fish Kill Mystery 	
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THE INVESTIGATIVE LABORATORY COMPONENT

The course is also structured around inquiry in the lab and the use of the seven science practices throughout the course. Students will engage in investigative lab work for approximately 30% of the instructional time. There will be at least two labs addressing each main Big Idea, as well additional labs conducted to deepen students' conceptual understanding and to reinforce the application of science practices within a hands-on, discovery based environment. All levels of inquiry will be used and all seven of the **science practice skills** will be used by students on a regular basis in formal labs as well as activities outside of the lab experience. The course will provide opportunities for students to develop, record, and communicate the results of their laboratory investigations.

In addition to conducting inquiry-based experiments, the students must be able to communicate the information gained from these inquiries through the use of:

- Formal written lab reports, with emphasis on a testable hypothesis, organize collected data, and the ability to analyze and discuss results.
- Class presentation on the main components of the lab.
- Self-assessment group work using electronic messaging (Facebook, Google, etc.) This will allow the students to see the importance of collaboration with peers.

LABORATORY ACTIVITIES CONNECTING THE BIG IDEAS

Big Idea 1: Evolution Labs

- Hardy Weinberg Lab
- BLAST Lab
- Artificial Selection Lab- FastPlants
- Cladistics Lab

Big Idea 2: Cellular Process Labs

- Cellular Respiration Lab
- Photosynthesis Lab – Leaf Disk Assay
- Diffusion/Osmosis Lab
- Plant pigment chromatography
- Enzymes - Catalase

Big Idea 3: Genetics and Information Transfer Labs

- Cell Division – Mitosis in Onion Cells
- Bacterial Transformation
- DNA electrophoresis lab
- Transgenic Fruit Fly virtual lab

Big Idea 4: Ecology Labs

- Dissolved Oxygen Lab
- Transpiration
- Pill Bug Behavior

	SP1	SP2	SP3	SP4	SP5	SP6	SP7
BLAST Lab	x				x		
Hardy-Weinberg Lab	x	x			x		x
Artificial Selection Lab	x	x			x		x
Cladistics Lab	x		x	x	x	x	x
Cellular Respiration	x	x	x			x	x
Leaf Disk Assay Photosynthesis	x	x			x	x	x
Diffusion and Osmosis	x	x			x	x	x
Cell Division	x				x	x	x
Genetics of Corn and Chi Squared	x		x	x	x	x	x
Bacterial Transformation			x		x	x	x
DNA Electrophoresis	x		x			x	
Energy Dynamics Lab – Dissolved Oxygen,	x	x	x	x	x	x	x
Transpiration	x	x		x		x	x
Enzyme Activity Lab					x	x	x
Pill Bug Behavior	x		x	x	x		x