# AP Biology Course Syllabus

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Room– 53

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## Course Overview

This Biology course is designed to offer students a solid foundation in introductory college-level biology. By structuring the course around the four Big Ideas, Enduring Understandings and Science Practices, the students will be assisted in developing an appreciation for the study of life and helped to identify and understand unifying principles within a diversified biological world.

Science is a way of knowing. Therefore, knowing about Biology requires that students learn the process of inquiry and develop critical thinking skills. The course will focus not only on knowing science content, but also learning skills to analyze and interpret data, and to communicate information in a meaningful way to others.

At the end of the course, students will have an awareness of the integration of other sciences into the study of Biology, understand how our own species is similar, yet different from other species, and become knowledgeable and responsible citizens in understanding biological issues that could potentially impact their lives.

***AP biology students need to understand and accept the fact that AP biology will make unusually heavy demands on their time and energy. THIS IS A VERY FAST PACED, INTENSE COURSE. Students report spending and average of 7-10 hours of study time outside of class each week.***

***AP biology labs take at least 25% of the course hours***. The lab times do not always conform to a ringing school bell. Please understand that some labs will require the students to prep between 7:30 to 8:00 am, continue unfinished labs at lunch, and sometimes stay after school between 3:00 to 3:30 pm on the day of longer labs. Responsible conduct is a must. I cannot get through all of the material and lab content if I have to deal with problems. This is a college level class.

## Instructional Context

This course in Biology will be taught to juniors and seniors at a school that follows a semester schedule. Students will meet every other day for 90 minutes of combined lecture laboratory period. Computer and internet access is required for the course as the materials will be posted to Schoology or require the use of other internet sites.

Students should have completed one year of biology and one of chemistry if possible prior to enrolling in Biology and have received an 80% or higher in both courses. However, students without the suggested pre-requisites may be admitted by instructor permission. The most important pre-requisite for this course is the student taking enough TIME to keep up with the work. The usual ratio is one hour of outside work for each hour of class.

## Instructional Resources

1. Campbell, Reece et al., *Biology* 10th ed., AP 2014. Pearson Benjamin Cummings.

ISBN – 978-0-13-344700-2.
2. Heitz and Giffen, *Practicing Biology: A Student Workbook* 5th ed., Pearson Benjamin Cummings. ISBN- 978-0-321-87705-5
3. *AP Biology Investigative Labs: an Inquiry Based Approach* – this is the new lab manual for AP Biology. Many of our labs will be taken or modified from this source. All lab materials will be posted through My Big Campus and the Mastering Biology website so a hard copy of the lab manual is NOT required.

Content

This course in Biology is structured around the four Big Ideas, the Enduring Understandings within the big Ideas, and the Essential Knowledge within the Enduring Understandings.

**The Big Ideas:**

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

**Big Idea 2**: Biological systems utilize fee 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 posses complex properties.

The Investigative Laboratory Component

The course is structured around inquiry in the lab and the use of seven science practices throughout the course. Students will be given the opportunity to engage in student-directed laboratory investigations throughout the course of a minimum of 25% of instructional time. Students will conduct a minimum of eight inquiry-based investigations (two per big idea) throughout the course as described in *AP Biology Investigative Labs: an Inquiry Based Approach.* The science practices covered by each lab are listed in this document. These practices are:

The Seven Science Practices

1. The student can use representations and models to communicate scientific phenomena and solve scientific problems.
2. The student can use mathematics appropriately.
3. The student can engage in scientific questioning to extend thinking or to guide investigations within the context 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 is able to connect and relate knowledge across various scales, concepts and representations in and across domains.

Units of Instruction

The course content has been divided into eight instructional units over the two semesters. An attempt has been made to "chunk" chapters into related units. Four units will be presented each semester. The Four Big Ideas will be interwoven within the units.

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|---|---|
| **Unit 1 – Introduction and Biochemistry**<br>1 – Introduction to Biology<br>2 – Chemistry of Life (self-study and recap in class)<br>3 – Water<br>4 – Carbon and Molecular Diversity<br>5 - Macromolecules | **Suggested Labs**<br>Introduction to Inquiry Labs, Graphing<br>Plant inquiry<br>Fruit Fly inquiry<br>Macromolecules – testing and model making<br>Essay Writing, Rubric Setting and Practice Grading |
| **Unit 2 – Cells and Cell Cycle**<br>7 – Membrane Structure and Function<br>6 – Tour of a Cell<br>12 – Cell Cycle<br>44 – Osmoregulation and Excretion (self-study) | **Suggested Labs**<br>Cell observations with a Microscope<br>Osmosis – dialysis tubing, potatoes<br>Mitosis |
| **Unit 3 – Cellular Energy**<br>8 – Introduction to Metabolism<br>9 – Cellular Respiration<br>10 – Photosynthesis | **Suggested Labs**<br>Enzymes – spectrophotometer lab<br>Respiration – pea respiration<br>Photosynthesis – chad's lab/productivity lab |
| **Unit 4 – Organism Form and Function**<br>11 – Cell Communication<br>45 – Hormones and the Endocrine System<br>48 – Neurons, Synapses and Signaling<br>43 – Immune System<br>40 – Basic Principles of Animal Form and Function (self-study) | **Suggested Labs**<br>Cell Communication – simulation or website investigation<br>Hormones – project (Endocrine diseases)<br>Nerve signaling – simulation or website Investigation- rats |
| **Unit 5 – Genetic Basis of Life**<br>13 – Meiosis and Sexual Life Cycles<br>14 – Mendel and the Gene Idea<br>15 – Chromosome Basis of Inheritance<br>21 – Genomes and their Evolution | **Suggested Labs**<br>Meiosis simulation<br>Fast Plant – who's the daddy?<br>Fruit Fly Genetics simulation, Chi Square test on Genetic Corn<br>Human Genetic Diseases – project |
| **Unit 6 – Gene Activity and Biotechnology**<br>16 – Molecular Basis of Heredity<br>17 – From Gene to Protein<br>18 – Regulation of Gene Expression<br>20 – Biotechnology<br>19 – Viruses (self-study) | **Suggested Labs**<br>DNA Isolation<br>Transformation using pGLO<br>Restriction Enzymes and Gel Electrophoresis |
| **Unit 7 – Evolution and Phylogeny**<br>22 – Descent with Modification: Darwin<br>23 – Evolution of Populations<br>24 – Origin of Species<br>25 – History of Life on Earth<br>26 – Phylogeny and the Tree of Life | **Suggested Labs**<br>Population Genetics- predator prey simulation<br>Evo-Devo – videos from HHMI<br>Blast Lab |

| Unit 8 – Ecology | Suggested Labs |
|---|---|
| 52 – Introduction to Ecology<br>53 – Population Ecology<br>54 – Community Ecology<br>55 – Ecosystems<br>56 – Conservation Biology<br>51 – Animal Behavior (self-study) | Animal Behavior – red worms or pillbugs<br>Transpiration – whole plant method<br>Aquatic Production – ecosystem simulation with probes<br>Conservation of a species – project- if time |

Lab Schedule – by Big Idea and Content Unit

Below is a table that correlates the labs by each Big Idea and Content Unit. It is hoped that all labs listed per Big Idea can be covered, but at least a minimum of two will be covered in Inquiry format. The science practices covered in each lab are listed in *AP Biology Investigative Labs: an Inquiry Based Approach.* A separate document will be posted giving the specific lab schedule each semester.

| **Big Idea 1: Evolution** | **Content Unit** |
|---|---|
| Lab – Artificial Selection – predator/prey simulation | Unit 1 |
| Lab – Population Genetics | Unit 7 |
| Lab – DNA Comparisons by BLAST | Unit 7 |
| **Big Idea 2: Cellular Processes** | **Content Unit** |
| Lab – Diffusion & Osmosis | Unit 2 |
| Lab - Photosynthesis – chad's and productivity | Unit 3 |
| Lab – Cellular Respiration | Unit 3 |
| **Big Idea 3: Genetics and Information Transfer** | **Content Unit** |
| Lab – Cell Division: Mitosis and Meiosis | Unit 2 and Unit 5 |
| Lab - Bacterial Transformation | Unit 6 |
| Lab – Restriction Enzyme Analysis of DNA | Unit 6 |
| **Big Idea 4: Interactions** | **Content Unit** |
| Lab – Energy Dynamics – aquatic ecosystems | Unit 8 |
| Lab – Whole Plant Transpiration | Unit 8 |
| Lab – Behavior – red worms or pillbugs | Unit 8 |
| Lab – Enzymes – spectrophotometer | Unit 3 |

Additional labs will be conducted to deepen students' conceptual understanding and to reinforce the application of science practices within a hands-on, discoverer based environment. Directed Inquiry will be the most common method of lab instruction used. The course will provide opportunities for students to develop, record, and communicate the results of their laboratory investigations. Lab report format will vary and may include the following: formal lab report, PowerPoint presentation, poster board presentation, oral presentation, response to directed questions on the lab or other format.

**Students will be required to maintain a portfolio of their lab activities on a flash drive or in an organized binder to take with them to college.**

Suggested Note-taking Methods

The instructor will provide a powerpoint and list of learning objectives for each chapter covered in class. The powerpoint and list of learning objectives will provide the goals for the chapter and a framework of how it will be presented. The information on the PowerPoint slides are in a condensed format and do not represent the entire coverage of the topic. Additional information will be given orally by the instructor to "flesh out" the framework, or will be developed through classroom discussions. An *Understanding by Design* format has been

used to develop the class presentations and handouts. Students should recognize that content will be presented in three levels:

Level 1 – must know items – this material will definitely be on the homework and tests
Level 2 – nice to know items – these are background or connecting information and may be on the homework and tests.
Level 3 – for your information only items – this material will not be on the homework or tests, but can be used by student choice as examples to illustrate other topics. Science News items or other current events will fall into this category.

*Students should focus on:*
1. Knowing the Level 1 items for each chapter or unit.
2. Add notes to the PowerPoint slides based on the instructor's oral presentation which will identify the "levels" of the bullet points on the slides.
3. Students should be able to construct their own study guides by converting the PowerPoint slides to an outline text format and adding in the relevant orally presented information.

Homework

A selection of short answer questions may be assigned for each chapter along with multiple choice questions from the textbook. About 80% of the questions will be drill or practice on the Level 1 items to help students reinforce and master these concepts. Students should focus on the **task words** (shown in bold font text) in the questions such as **discuss**, **justify and explain**, **identify**, **compare and contrast** etc. when answering these questions. These same bold font task words will be used in essay questions on exams.

The remaining questions will be extensions, applications or speculation questions. The answers for these questions will require students to reflect, think, speculate and apply their knowledge. The answers for these questions will NOT be found in the textbook. In some cases, a definitive answer is not the point of the question, but rather that the student state and defend their ideas supported by their evidence or reasoning. Students should not focus on what is the "right answer" on these types of questions.

Late Work

**All assignments are expected on the date announced in class**

Late assignments will NOT be accepted! In order for me to give you feedback on your performance in a timely manner, I cannot accept late work. If something VERY and I mean VERY disastrous happens and there is absolutely no way you can turn in an assignment, come see me ASAP.
Make-up work for pre-arranged absences should be negotiated with Mrs. Richardson in advance.

The instructor reserves the right to accept or not accept make-up work for unexcused absences as directed by the Centerville High School Student Handbook Policy.

Academic Dishonesty

Students in Biology are encouraged to form study groups and to assist each other. However, students are expected **to complete their own work** for homework and lab reports. **Do NOT share files with each other.** Academic dishonesty, as described in the student handbook will not be tolerated. Students who commit Academic dishonesty will be prosecuted and penalized. If you are unclear on what is permissible collaboration, please talk to Mrs. Richardson.

Laptop Computer Use

1. If you use a laptop in class, please boot up your computer as soon as you arrive so that you will be ready to go to work as soon as class starts.
2. You are responsible for maintaining the power of your computer.
3. The volume on your laptop should be turned all the way down during class. Your laptops should be silent except for the clicking of the keyboard.
4. You may not read or send e-mail, play music or games, message, participate in chat rooms, or download music or audio files during class.
5. You are encouraged to take notes using your laptop, but you also need to be prepared to use pen and paper as drawings are part of the curriculum in this course.
6. You are responsible for maintaining your computer. Please make sure your computer is working before coming to class. If your computer is not working or is not able to connect to the wireless server, you should go to the media center before class to get a loaner laptop.
7. The Internet is a wonderful source of information when used properly. When using sources from the Internet, you must evaluate the credibility of the information. All materials found on the Internet must be properly documented like any other source of information to avoid plagiarism which is a form of Academic Dishonesty. If you are unsure how to cite this information, please see Mrs.Richardson.
8. Remember to save your work frequently. Loss of a file by accident is not an acceptable excuse.
9. Close your lid/screen half way when requested by Mrs.Richardson.
10. Do not hide toolbars. Keep all items you are working on visible on the screen and available for inspection.
11. Messaging or e-mailing during a test or quiz is strictly forbidden and will result in a zero on the assessment.

Tests in Biology

At least four tests will be given each semester. Each test will consist of a 40 – 60 question multiple-choice questions and/or grid-in questions. The essay exam will consist of about one to two long essays and about 1-3 short essays. One essay question on each exam will be based on any of the "recommended" Biology labs. Each exam is expected to take one and a half hours for both parts and will be administered during class. A reading period will be used with the essay exam before the students will be permitted to write as with the AP Biology Exam. Keys and grading standards will be made available after each exam.

Multiple choice take-home exams or practice essay questions will be given for the self-study chapters at periodic intervals.

Grading

Course grades will be based on the following items and percentages:

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|---|---|
| Exams - | 60% |
| Homework and Projects - | 15% |
| Labs - | 25% |
| | 100% |

Letter grades will be determined according to the following grade scale:

| | |
|---|---|
| A+ > 99% | C = 73-76% |
| A = 93-97% | C- = 72- 70% |
| A- = 90-92% | D+ = 67- 69% |
| B+ = 87-89% | D = 63- 66% |
| B = 83-86% | D- = 62- 60% |
| B- = 80-82% | F = < 59% |

C+ = 77-79%

**Note** – The assessments in this class are very challenging. I will curve tests at my discretion throughout the semester. Extra credit opportunities will be rarely available. I expect to have your best work the first time on each and every grading opportunity.

The most important thing for students in Biology is to advocate your needs! I cannot help you if I don't know what you need. NEVER hesitate to ask questions or seek help!!