

AP BIOLOGY Syllabus

Course Overview

My AP Biology course is a required course for our school's Medical Magnet students and taken *concurrently* with Honors Human Anatomy and Physiology. Our school's Medical Magnet Program is designed for students with interest in pursuing a career in health, science, and/or research. This course conforms to the AP Biology standards set forth by the College Board and covers all of the topics in the AP Biology course description plus additional materials in human anatomy and physiology. Our school has an eight-period per day schedule at 45-minute each period. I meet these students two periods per day, one for AP Biology and one for Anatomy and Physiology. I can choose to meet them twice for AP Biology if we are doing a lab exercise and make up the following day for Anatomy and Physiology. I enjoy teaching these classes as I can be flexible with our schedule. This flexibility also allows me to relate structure to function in the Anatomy/Physiology class along with cellular and molecular evidences learned in the AP Biology class thereby stressing evolution as the unifying theme in Biology.

Students are required to use the same textbook for both classes. We are currently using Biology by Campbell and Reece, 7th edition. Chapters 1-39 are discussed in AP Biology class and chapters 40- 55 are discussed in Honors Human Anatomy and Physiology. I am thrilled that because of these division, I can complete more than the 12 required labs recommended by the College Board and thus, labs take up more than the 25% of instructional time. This is the second year that our school has instituted the combined courses and there is ample time to complete all of eight major themes from the AP Biology Curriculum Requirements. Last school year, I completed the course prior to spring break and gave the students enough time to review for the AP Examination. Every student who completed both courses successfully was required to take the AP Biology examination in May.

Teaching Strategies

I have been teaching AP Biology since 2000 and I feel that I have refined much of my techniques. I try to instill the appreciation of science, the excitement about the different topics they learn, and the application of this knowledge in their real world. My classes are interactive and students are encouraged to ask questions, make comments and give examples. My main goal being- the complete understanding of the different concepts and their relevance to real life and the society.

Our school has a diverse student body with different learning styles. I recognize that I have to be flexible to make sure that I can meet the needs of the students. I have high-achieving students in my class who are enrolled in multiple AP and Honors classes. I require reading pages every night and give the students guided notes to help them. I advise students that they need to examine and be able to explain diagrams presented in the book because that is how I gauge how much understanding they have of their reading. Rarely do they have writing assignments, but they do have reading quizzes the first 5

minutes of class time. There are times that I choose to give the quiz at the last 5 minutes of class time to reinforce their listening skills during lecture. I find this technique very helpful, as they are driven to ask more questions in order to fully understand the topic prior to their short quiz.

I provide students with their weekly schedule every Monday morning, with the assigned reading pages, scheduled quizzes, tests, projects, etc. They are also provided with a *blog site* where they can check their weekly schedule and announcements.

Because I meet with the students at double periods everyday, I am able to plan one or two labs that reinforce each topic learned in class. I call these labs '*reinforcement labs*' and are very helpful in reviewing each topic. I believe that hands-on exercises are the way science should be taught. We use *Vernier lab sensors* for most of our labs in both classes, thus we spend less time in setting up the labs and spend more time collecting and analyzing our data. Using these sensors also allow us to change variables for the experiments and each lab group collecting their data based on differing variables and present their data to their classmates during our post lab discussions.

I also encourage student discussions in the lab particularly in designing their own experiments, in writing essays, in solving critical analysis problems, in creating rubrics for essays, constructing an outline from a given essay, in analyzing journal articles and movies that relate to our topics. The more students are involved in the discussions, the more they are learning and remembering.

A variety of strategies are used to review materials and prepare them for the AP examination in May. Students are given tests patterned from the AP Exam format. For a 45-minute test, 25-30 multiple choice AP-style questions and one free-response essay are given. I incorporate 4-6 questions from previous topics and I use essays from previous AP examinations. I correct their essays based on the rubric set by College Board. Students are also required to write a 'design-your own experiment' essay at the end of each lab performed. I find that this method is effective when students are paired and can potentially initiate a lot of intelligent discussions and creative designs. Students are also encouraged to prepare their own jeopardy squares (from a template) on various topics to serve as a review material for their classmates for the AP exam.

Tutorials and help classes are available to students by appointment after the last period of each day. A students coming to tutorial must have read the lesson and have specific questions. A student is expected to bring his notes and text to the session. Tutorials may also be available during my free periods or at lunch. After school, the students have my home e-mail address to contact me for any questions they may have.

Course Timeline and Planner

Below is my course timeline and planner for the school year 2006-2007. I typically assign the first chapters as summer homework. Our school year typically ends around the 2nd or 3rd week of June, so I work with the students in compiling their 'design their own experiments' in different units in preparation for their senior biology class.

<i>Date</i>	<i>AP Biology</i>	<i>Anatomy/Physiology</i>
8/28	Orientation	Orientation
8/29	Chapters 1 and 2 Review	Chapters 1 and 2 Review
8/30	TEST: Chapters 1 and 2	Chapters 3 and 4 Review
8/31	Chapters 3 and 4 Review	Lab- Properties of Water
9/01	TEST: Chapter 3 and 4	Post lab discussion
9/5	Chapter 5	Chapter 40
9/6	Chapter 5	Chapter 40
9/7	Lab- Identifying Macromolecules	Histology Lab- day 1
9/8	Lab- Macromolecules/Review	Histology Lab- day 2
9/11	TEST: Chapter 5	Chapter 41
9/12	Chapter 6	Chap 41
9/13	Chapter 6	Lab: Digestive System Enzymes
9/14	Chapter 7	Lab: Digestive System Enzymes
9/15	Chapter 7	TEST: Chapters 40 and 41
9/18	Pre-lab to Lab 1	Lab- Nutrient Analysis, BMR, BMI
9/19	Lab 1- Diffusion and Osmosis	Chapter 42
9/20	Lab 1	Chapter 42
9/21	Post Lab discussion to Lab 1	Chapter 42
9/22	TEST: Chapter 6/7 and Lab 1	Pre-lab to Lab 10
9/25	Chapter 8	Lab 10- Physiology of Circulatory System
9/26	Chapter 8	Lab 10
9/27	Chapter 8/Pre-lab to Lab 2	Post lab to Lab 10
9/28	Lab 2- Enzyme catalysis	TEST: Chapter 42 and Lab 10
9/29	Lab 2	Chapter 43
10/2	Post Lab to Lab 2/review	Chapter 43
10/3	TEST: Chapter 8/Lab 2	Chapter 43
10/4	Chapter 9	HIV Speaker- Red Cross Club
10/5	Chapter 9	Chapter 44
10/9	Chapter 9/Pre-lab to Lab 5	Chapter 44
10/10	Lab 5- Cellular Respiration	Chapter 44
10/11	Post Lab to Lab 5	Simulation of Glomerular Filtration
10/23	Chapter 10	Post lab discussion
10/24	Chapter 10	TEST: Chapters 43 and 44
10/25	Chapter 10/Pre-lab to Lab 4	Chapter 45
10/26	Lab 4- Chromatography	Chapter 45
10/27	Lab 4- Photosynthesis	Chapter 45
10/30	Review	Project on Diabetes- Article Analysis
10/31	TEST: Chapter 9/10 and Lab 4/5	Project on Diabetes- Article Analysis

11/01	Chapter 12	TEST: Chapter 45
11/2	Chapter 12	Chapter 46
11/3	Chapter 13	Chapter 46
11/6	Chapter 13	Video- Miracle of life, day 1
11/7	Pre-lab to Lab 3	Video- Miracle of Life, day 2
11/8	Lab 3- Mitosis	Chapter 47
11/13	Lab 3- Meiosis – Sordaria cards	Chapter 47
11/14	Review- Chap 12, 13 and labs	Lab- Animal development slides
11/15	TEST: Chapters 12/13 and Lab 3	Lab- Animal development slides
11/16	Chapter 14	Review Chapters 46 and 47
11/17	Chapter 14	TEST: Chap 46 and 47
11/20	Chapter 14	Chapter 48
11/21	Chapter 15	Chapter 48
11/22	Chapter 15	Chapter 48
11/27	Chapter 15/Pre-lab to Lab 7	Reflex Lab
11/28	Lab 7- Virtual fly lab	Video- Lorenzo’s Oil- day 1
11/29	Lab 7- Virtual fly lab	Video- Lorenzo’s Oil- day 2
11/30	TEST: Chapters 14/15 and Lab 7	Video- Lorenzo’s Oil- day 3
12/01	Chapter 16	Chapter 49
12/4	Chapter 16	Chapter 49
12/5	Chapter 17	Chapter 49
12/6	Chapter 17	Chapter 49
12/7	Chapter 17	Chapter 49
12/8	TEST: Chapters 17/18	Sensory System lab- pain, touch and temp.
12/11	Chapter 18	Sensory system lab- taste and smell
12/12	Chapter 18	Sensory system lab- vision and hearing
12/13	Chapter 19	Review Chapter 48 and 49
12/14	Chapter 20	TEST: Chapter 48 and 49
12/15	Chapter 20	Rest
1/2	Pre-lab to lab 6	Create-a-Creature Project- graded as final exam
1/3	Lab 6- Bacterial Transformation	Project
1/4	Lab 6	Project
1/5	Trip to Orange County Sheriffs Dept., Forensic Division	Project
1/8	Post-trip discussion	Project
1/9	Review Chapters 18/19/20 and Lab 6	Project, due today
1/10	Evolution	Evolution
1/11	Evolution	Evolution
1/12	Evolution	Evolution
1/15	Lab 8- Population Genetics intro and	Lab 8- Population Genetics- cases II

	case I	and III
1/16	Lab 8- Case IV	Lab 8- Post lab discussion
1/17	Review for finals	Review for finals
1/18	Review for finals	Review for finals
1/19	Review for final	Create-a-creature Project due during finals week
1/29	5-kingdom Survey- Phylogeny/Syst.	Chapter 50
1/30	Dichotomous Key lab	Chapter 50
1/31	5-kingdom Survey-prokaryotes	Chapter 51
2/1	5-kingdom Survey-protists	Chapter 51
2/5	5-kingdom Survey-protists	Chapter 51
2/6	5-kingdom Survey-fungi	Pre-lab to Lab 11- design experiment on behavior
2/7	5-kingdom Survey-fungi	Lab 11
2/8	5-kingdom Survey-plant	Lab 11
2/9	5-kingdom Survey-plant	Lab 11
2/12	5-kingdom Survey-plant	TEST: Chapters 50/51 and Lab 11
2/13	5-kingdom Survey-animal	Chapter 52
2/14	5-kingdom Survey-animal	Chapter 52
2/15	5-kingdom Survey-animal	Lab- Population/community ecology-simulations
2/16	LAB: 5-kingdom Survey	Post lab discussion
2/20	TEST- 5-kingdom Survey	Chapter 53
2/21	Chapter 35	Chapter 53
2/22	Chapter 35	TEST: Chapters 52 and 53
2/23	Chapter 36	Chapter 54
2/26	Chapter 36	Chapter 54
2/27	Pre-lab to Lab 9	Chapter 54
2/28	Lab 9- Transpiration	Pre-lab to Lab 12
3/1	Lab 9	Lab 12- Dissolved Oxygen and Aquatic Primary Productivity
3/2	TEST: Chapters 35/36/Lab 9	Lab 12
3/5	Chapter 37	Lab 12
3/6	Chapter 37	Chapter 55
3/7	Chapter 39	Chapter 55
3/8	Chapter 39	TEST: Chapter 54/55 and Lab 12
3/9	Chapter 39	Ecology Project- due 3/30
3/12	TEST: Chapters 37 and 39	
3/13	Plant project- due 3/30	
4/14, Sat	MOCK EXAM	MOCK EXAM
4/16-5/7	AP Review	AP Review
5/8	AP Bio Exam	AP Bio Exam

After 5/8 Post-AP Project- Design your experiments for senior biology

Post- AP project- Design your experiments for senior biology

Laboratory Component:

For each laboratory exercise, I allot one period to discuss the goals/objectives of the lab, including clarifying all procedures. Students are given pre-lab questions to make sure that they are prepared for the lab and are confident in performing the lab during the actual lab day. After each lab has been performed and data collected and analyzed, I spend one period for a post lab discussion/presentation. Students who are unclear about their results ask questions, students who are confident about their results help explain and clarify. The following are the labs we perform in both classes and additional lab may be added to reinforce learning of topics discussed inside the classroom.

1. Properties of Water- Each group will investigate the different properties of water with simple experiments (i.e. drop test, boiling water, freezing water, needle float, etc.) and present their results in class.
2. Identifying Macromolecules- Each group will identify macromolecules such as proteins, disaccharides, starch, lipids.
3. Histology lab- Students work in pairs and identify different tissue types under the microscope, draw and label each type, relate function to structure and location in the human body.
4. Digestive Enzyme lab- Investigate the action of salivary amylase on starch and other carbohydrates, change pH and temperature variables.
5. Nutrient Analysis, BMR and BMI- analyze 3-day diet and activities and translate calories lost/gained into weight gained/lost
6. Diffusion and Osmosis- To investigate diffusion and osmosis using dialysis membrane; to investigate the effect of solute potential on water potential
7. Physiology of the Circulatory System- AP Biology Lab 10, For the Daphnia lab, students investigate the effect of different chemicals on Daphnia heart rate (i.e. caffeine, epinephrine, etc); They also investigate the Daphnia heart rates at different temperatures of water. Students use the Vernier Lab sensors for blood pressure and pulse rate measurements under different conditions
8. Enzyme Catalysis- to investigate the conversion of hydrogen peroxide to water and oxygen gas by catalase enzyme; students use the Vernier oxygen sensor to investigate the amount of oxygen generated and calculate rate of enzyme-catalyzed reaction using hydrogen peroxide and catalase enzyme.
9. Cellular Respiration- Students use the Vernier carbon dioxide to measure germinating pea cell respiration at various temperatures and compare also to non-germinating peas at various temperature
10. Simulation of Glomerular Filtration- Students use a similar method to Lab 1, using dialysis membrane and dye to simulate the nonselective process except for red blood cells
11. Urinalysis lab- to test presence of chemicals found in simulated urine in certain diseases or due to particular diets

12. Photosynthesis- Students perform the chromatography experiment from the AP lab manual and use Vernier colorimeter for the photosynthesis part (measure transmittance percent)
13. Mitosis and meiosis- students use simulated mitosis and meiosis cards to investigate the two processes and Sordaria cards to investigate recombination frequencies. We also use a virtual software (Neo Science) as a pre-lab tool
14. Animal Development- students investigate slides that show the different stages of frog and chick development
15. Genetics of organisms- students perform virtual fly crosses (Neo-Science Software) and perform a statistical analysis.
16. Reflex Lab- Student investigate the various common reflexes of the human body using the reflex hammer
17. Sensory System labs- Students investigate the different senses including pain, touch, temperature, taste, smell, vision, and hearing
18. Molecular biology- Students perform a simple gel electrophoresis lab and create a forensic story given a murder story prompt; bacterial transformation lab is performed using P-glo (Ward)
19. Population genetics- Students learn about the Hardy Weinberg Law; investigate the relationship between evolution and changes in allelic frequencies by using the class as a sample population. We also use a Virtual software (Neo Science) as a pre-lab tool.
20. Dichotomous key lab- students create a dichotomous key to classify using the students in the class as sample organisms to be classified
21. 5-Kingdom survey Lab- Students are instructed to work in pairs and are allotted 2-3 minutes in each station. Each station has a particular organism or related organisms and they identify them, classify them, and answer questions on the physiology and evolution of that particular organism.
22. Transpiration lab- students measure transpiration rate under different simulated environmental conditions; student perform this experiment using Vernier gas sensors; We also use virtual software (Neo Science) as a pre-lab tool in the examination of the organization of plant stem and leaf.
23. Behavior lab- Students perform the first part of the experiments in the lab manual to observe and investigate pillbugs under different environmental conditions. Students then design their own experiment on pillbug behavior with different environmental variables (color, music, white noise effect, black light effect on pillbug behavior).
24. Ecology simulations- students investigate different simulated ecosystems they set up and observe various biotic and abiotic factors within their set-up and report their results to the class.
25. Dissolved oxygen and Aquatic primary productivity- students use Vernier dissolved oxygen sensors to measure and analyze the dissolved oxygen concentration in water samples at various temperatures. Second part is performed using screens to simulate decrease of light with increasing depth, still using the Vernier gas sensors to measure dissolved oxygen.

Class/Non-Lab Projects and Exercises:

These exercises also reinforce learning and understanding of lesson learned.

Students work in pairs in majority of them and student discussions are encouraged.

1. In-class essays completed after each major lab performed- students work in pairs
2. HIV Speakers- Students who are members of the Red Cross Club who completed training regarding speaking about HIV and AIDS speak to the class.
3. Diabetes project- Students find articles on recent development on Diabetes research and present a summary of the article in class.
4. Video- Miracle of Life- students watch this educational video to serve as a review of the reproductive system.
5. Video-Lorenzo's Oil- students watch this movie to learn about a genetic nervous system disorder (they would have finished genetics in AP Biology and Nervous system in Anatomy/Physiology)
6. Create-a-Creature- Each group create a creature that would better adapt to our environment, modifying each of the organ system in humans and produce a paper describing their creature and build a model of their creature. This serves as review of all the organ system we have learned in class and stress evolution as the unifying theme of biology.
7. Field trip to the Forensic Division of the Orange County Sheriff Department- this serves as our culmination activity of our molecular biology topic.
8. Plant project- Each student chooses a particular plant and research all information on structure and physiology of the plant.
9. Ecology project- Biome project; students choose a particular biome and research all information regarding the biotic and abiotic components of chosen biome, including social issues that relate to their chosen biome.

Required Materials:

1. Lecture Text:
Campbell and Reece, AP Edition Biology, 7th edition, Pearson, 2005
2. Lab Manual:
The College Board, AP Biology Lab Manual, 2001
3. Additional Lab handouts:
Masterman and Redding, Biology with Computers, Vernier Software, 2003
4. Suggested Review Material:
Pack, Philip, AP Biology Preparation Guide, 2nd edition, Cliffs AP
5. Pre-lab Notebook
6. Lecture Notebook (I suggest a binder to organize handouts given in class)

Student Evaluation

Students are tested after every 2-4 chapters. Quizzes are given everyday. Pre-lab handouts, and lab reports are completed and submitted on due dates. Projects are assigned during the year and are collected during due dates. Their final grade is determined based on the percentage below:

Tests- 30%

Lab- 40%

Quizzes and Non-lab projects- 30%

Our school goes by two quarters per semester. Each quarter grade is 40% of a student's total semester grade and the final examination at the end of the semester is 20% of their total semester grade. During the first semester final examination, I give separate cumulative examination on all the topics we have covered in *each* class. During the second semester final examination, I only give *one final cumulative examination for both* classes scheduled prior to the AP Examination in May. All topics learned during the year are included in the second semester final examination and will serve as a practice (mock) AP exam.

The following grade translation is used for each letter grade:

“A”: Student attends to class, pays attention and participate daily. Consistently exceeds expectations on exams and quizzes. Turns in work on time and complete exemplary assignments, projects, and laboratory reports.

“B”: Student participates daily. Receives good marks in all quizzes and exams. Complete work on time with maximum effort and projects/reports that show effort and learning.

“C”: Student participates regularly. Shows basic knowledge and comprehension of general college introductory biology. Complete most work, projects, and laboratory reports to minimum expectations.

“D” Minimum participation. Shows little comprehension of general college introductory biology. Misses deadlines, turns in incomplete homework, projects, and laboratory reports. Student will not be recommended for next level of honor science class (Note: “D” is not recognized by universities for college credit)

“F”: Student participates little and attends class irregularly. Shows poor attitude and misses most deadlines. This student needs to re-take the course.