



Course: Advanced Placement Biology

Instructor: Dr. Patrycja Anna Krakowiak

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Office Hours: 1st period

Phone: 622-5120

Classroom: 2411

Help Sessions: 3:45-4:30 M/W

Class Meeting Times

2nd period: M (9:00-9:55), Tu (9:20-10:35), Th (9:35-11:05)

Format (Location)

Lecture (2411) and Laboratory (2210) Course

Textbooks

“Biology” by N. A. Campbell, J. B. Reece, and Lawrence G. Mitchell; Fifth Edition; Benjamin/Cummings; 1999.
“Biology: Lab Manual” by the College Board, AP Advanced Placement Program; Revised 2001.

Instructor’s Website

www.ASMSA.com (academics/science department/Dr. Patrycja Krakowiak)

Contains syllabus, unit schedules, all homework assignments, and notes (print out before each class).

Course Description

AP Biology is designed as an introductory university level biology course. It is a very broad course meant to prepare students for more in-depth courses in biology and extend their awareness of how life is organized. The functions of living organisms as individuals and as part of populations are emphasized. The cellular, genetic, and tissue components of organisms are also a main focus of this course. The eight major themes of biology apply to each unit and are integrated throughout the course. They include, science as a process, evolution, energy transfer, continuity and change, relationship of structure and function, regulation, interdependence in nature, and the relationship between science, technology, and society. In addition, current topics in life sciences are incorporated into the curriculum by examining recent scientific literature.

Goals/Objectives

1. Understand basic principles of chemistry; describe organic molecules and their properties; identify macromolecules necessary for life and their subunits.
2. Understand cellular components and functions, including major organelles and processes of signal transduction, DNA replication, transcription regulation, protein synthesis and mitosis/meiosis.
3. Understand the underlying principles of Mendelian and molecular genetics including classical inheritance patterns and technological advances in examining DNA and proteins.
4. Understand the evolutionary processes/timeline and how life is organized/categorized.
5. Identify plant structure, growth, transport and development.
6. Identify similarities and differences of major organ systems between major animal groups.
7. Understand the principles of ecology and conservation biology.
8. Know how to review and prepare critiques of scientific publications and reviews.
9. Learn how to search scientific databases such as PubMed for recent advances.

Tentative Course Outline and Reading Assignments

SEMESTER 1

CHEMISTRY	Week 1 (Aug. 14-18): Introduction to Course	Pre-TEST # 1		
	Ch. 1: Introduction	(pgs. 1-19)	20	
	Week 2 (Aug. 21-25) <i>also read: "Image Guided Surgery" or "Leonardo da Vinci, Neuroscientist"</i>			
	Ch. 2: The Chemical Context of Life	(pgs. 20-36)	17	
	Ch. 3: Water and the Fitness of the Environment	(pgs. 37-47)	11	LAB 1
	Week 3 (Aug. 28-Sept.1)	quiz		
	Ch. 4: Carbon and the Molecular Diversity of Life	(pgs. 48-57)	10	
	Ch. 5: Structure and Function of Macromolecules	(pgs. 58-82)	25	
	Week 4 (Sept. 5-8; short week, starts Tue.)	quiz		
	Ch. 6: Introduction to Metabolism	(pgs. 83-99)	17	LAB 2
	Week 5 (Sept. 11-15)	TEST # 2		
	Ch. 7: Tour of the Cell	(pgs. 100-129)	30	
	Ch. 8: Membrane Structure and Function	(pgs. 130-146)	17	
CELL	Week 6 (Sept. 18-22) <i>also read: "A Mother of All Cells" or "A Patchwork of Laws"</i>			
	Ch. 9: Cellular Respiration: Harvesting Chemical Energy	(pgs. 147-167)	21	LAB 5
	Week 7 (Sept. 25-29)	quiz		
	Ch. 10: Photosynthesis	(pgs. 168-187)	20	LAB 4
	Week 8 (Oct. 2-6)			
	Ch. 11: Cell Communication	(pgs. 188-205)	18	
	Week 9 (Oct. 9-13)	TEST # 3		
	Ch. 12: Cell Cycle	(pgs. 206-223)	18	
	Ch. 13: Meiosis and Sexual Life Cycles	(pgs. 224-238)	15	LAB 3
	Week 10 (Oct. 16-19; short week, ends Thurs.)			
	Ch. 14: Mendel and the Gene Idea	(pgs. 239-260)	22	
GENETICS	Week 11 (Oct. 24-27; short week, starts Tue.)	quiz		
	Ch. 15: Chromosomal Basis of Inheritance	(pgs. 261-277)	17	
	Ch. 16: Molecular Basis of Inheritance	(pgs. 278-293)	16	LAB 7
	Week 12 (Oct. 30-Nov.3) <i>also read: "The Unseen Genome" or "Nature Genetics Review"</i>			
	Ch. 17: From Gene to Protein	(pgs. 294-318)	25	
	Ch. 18: Microbial Models: Genetics of Viruses and Bacteria	(pgs. 319-343)	25	
	Week 13 (Nov. 6-10)	quiz		
	Ch. 19: Organization and Control of Eukaryotic Genomes	(pgs. 344-363)	20	
	Ch. 20: DNA Technology	(pgs. 364-387)	24	LAB 6
	Week 14 (Nov. 13-17)	TEST # 4 (counts for 4th quarter)		
	Ch. 21: Genetic Basis of Development	(pgs. 388-411)	24	
	Ch. 22: Descent with Modification	(pgs. 412-427)	16	
EVOLUTION	Week 15 (Nov. 20-21; short week, Mon-Tue only)			
	Ch. 23: Evolution of Populations	(pgs. 428-444)	17	
	Week 16 (Nov. 27-Dec. 1)	quiz		
	Ch. 24: The Origin of Species	(pgs. 445-463)	19	
	Ch. 25: Tracing Phylogeny	(pgs. 464-487)	24	
	Week 17 (Dec. 4-8) <i>also read: "Uprooting tree of life"</i>			
	Ch. 26: Early Earth and Origin of Life	(pgs. 488-501)	14	
	Ch. 27: Prokaryotes and Origins of Metabolic Diversity	(pgs. 502-519)	18	
	Week 18 (Dec. 11-13) Review Manuscripts Due Dec. 11	REVIEW		

FINAL EXAM: December 14, 2006 (1:00-3:00pm)

SEMESTER 2

PLANTS

Week 1 (Jan. 8-12)			
Ch. 28: The Origins of Eukaryotic Diversity	(pgs. 520-545)	26	LAB 8
Ch. 31: Fungi	(pgs. 574-588)	15	
Week 2 (Jan. 16-19; short week, starts Tue.)	quiz		
Ch. 29: Plant I: Colonization of Land	(pgs. 546-560)	16	
Ch. 30: Plant II: Evolution of Seed Plants	(pgs. 561-573)	13	
Week 3 (Jan. 22-26)	quiz		
	<i>also read: "Ethnobotany and drug discovery"</i>		
Ch. 35: Plant Structure and Growth	(pgs. 668-694)	27	
Week 4 (Jan. 29-Feb. 2)	TEST # 5		
Ch. 36: Transport in Plants	(pgs. 695-713)	19	LAB 9
Ch. 37: Plant Nutrition	(pgs. 714-729)	16	
Week 5 (Feb. 5-9; short week, no class Tue.)	Presentations of Review Manuscripts		
Ch. 38: Plant Reproduction and Development	(pgs. 730-750)	21	
Week 6 (Feb. 12-15; short week, ends Thurs.)	Presentations of Review Manuscripts		
Ch. 39: Control Systems in Plants	(pgs. 751-775)	25	

ANIMALS

Week 7 (Feb. 19-23)	quiz		
	<i>read: "Once we were not alone" or "Morning of Modern Mind"</i>		
Ch. 32: Introduction to Animal Evolution	(pgs. 589-598)	10	
Ch. 33: Invertebrates Phylogeny	(pgs. 599-629)	31	
Week 8 (Feb. 26-27; short week, Mon-Tue only; Sci. Fair)			
Ch. 34: Vertebrate Phylogeny	(pgs.630-667)	38	
Week 9 (Mar. 5-9)	TEST # 6		
Ch. 40: Introduction to Animal Structure and Function	(pgs. 776-791)	16	
Ch. 41: Animal Nutrition	(pgs. 792-810)	19	
Week 10 (Mar. 12-15; short week; no Mon schedule; Tests)	quiz		
	<i>read: "Food for thought" or "Birth of Modern Diet"</i>		
Ch. 42: Circulation and Gas Exchange	(pgs. 811-839)	29	LAB 10
Ch. 43: Body's Defenses	(pgs. 840-864)	25	
Week 12 (Mar. 19-23)	quiz		
Ch. 44: Controlling the Internal Environment	(pgs. 865-892)	28	
Ch. 45: Chemical Signals in Animals	(pgs. 893-912)	20	
Week 11 (Mar. 26-30: <u>Spring Break-NO CLASSES</u>)			
Week 13 (Apr. 2-6)	TEST # 7		
Ch. 46: Animal Reproduction	(pgs. 913-935)	23	
Ch. 47: Animal Development	(pgs. 936-959)	24	
Week 14 (Apr. 10-13; short week; starts Tue.)	<i>read: "New Movements in Parkinsons" or "Unleashing Creativity"</i>		
Ch. 48: Nervous System	(pgs. 960-991)	32	
Week 15 (Apr. 16-20)	quiz		
Ch. 49: Sensory and Motor Mechanisms	(pgs. 992-1023)	32	

ECOLOGY

Week 16 (Apr. 23-27)			
Ch. 50: Introduction to Ecology and Biosphere	(pgs. 1024-1052)	29	
Ch. 51: Behavioral Biology			LAB 11
Week 17 (Apr. 30-May 4)	Post TEST # 8 (AP scoring)		
Ch. 52: Population Ecology			LAB 12
Ch. 53: Community Ecology			
Week 18 (May 7-11) Late night review session (May 8)			
Ch. 54: Ecosystems			
Ch. 55: Conservation Biology	(pgs. 1154-1174)	21	
Week 19 (May 14-18; AP test week)			

FINAL EXAM: TBA

Laboratories Included in Course*

	Laboratory title	Lab objective	Time
1	Diffusion and osmosis	1) measure water potential of a solution 2) determine osmotic concentration of living tissue 3) relate effects of water loss and gain in plant and animal cells	3.5 hrs
2	Enzyme catalysis	1) measure effects of changes in pH, temperature, enzyme/substrate concentrations on reaction rates of enzyme-catalyzed reactions 2) explain how environmental factors affect rates of enzyme-catalyzed reactions	2 hrs
3	Mitosis and meiosis	1) recognize stages of mitosis and calculate duration of each in cell cycle 2) demonstrate Meiosis I and II indicating independent assortment and crossing over, explain how these processes relate to Mendel's laws of segregation and independent assortment, and how they contribute to genetic diversity 3) compare mitosis/meiosis in plant vs. animal cells using microscope slides	2 hrs
4	Plant pigments and photosynthesis	1) use chromatography to separate plant pigments and calculate R _f values 2) compare how and understand why photosynthetic rates vary at different light intensities and wavelengths	1.5 hrs
5	Cell respiration	1) calculate rate of cell respiration from experimental data using gas production and usage as a measure of respiration 2) test rate of respiration using germinating vs. nongerminated seeds and observe effects of changing temperature on this rate	1.5 hrs
6	Molecular biology	1) transform bacteria with plasmids containing various antibiotic resistance and reporter genes and calculate transformation efficiencies 2) use restriction digests and agarose gel electrophoresis to demonstrate the principals of DNA fingerprinting and sizing of DNA fragments	2.5 hrs
7	Genetics of organisms	1) analyze the independent assortment of two genes and determine if they are autosomal or sex-linked using a multigenerational experiment 2) determine statistical significance of the performed experiment using chi-square analyses	4 hrs
8	Population genetics and evolution	1) calculate frequencies of alleles and genotypes in a gene pool of a population using Hardy-Weinberg formula based on a random mating card activity 2) model and observe natural selection and other causes of microevolution as deviations from the conditions required to maintain Hardy-Weinberg equilibrium	1.5 hrs
9	Transpiration	1) test effect of environmental variables on rates of transpiration using a controlled experiment 2) observe and investigate microscope slides of xylem and phloem cells and relate the structure of these vascular tissues to their functions	3 hrs
10	Physiology of the circulatory system	1) measure heart rate and blood pressure of a person and analyze the effect of changing body position and exercise on these measurements 2) determine a human's fitness index 3) observe the effect of changing temperature on the heart rate of <i>Daphnia</i>	2 hrs
11	Animal behavior	1) observe behavioral changes in a group of pill bugs 2) document the adaptive behaviors with changing environmental conditions	1.5 hrs
12	Dissolved oxygen / aquatic primary productivity	1) measure primary productivity based on changes in dissolved oxygen 2) analyze the effects of changing light intensity on primary productivity	2 hrs

All experiments contain both positive and negative controls which allow for appropriate scientific analyses;

*most laboratories will be performed on designated Thursdays (9:35-11:05) and Fridays (1:15-2:30)

Grading/Evaluation

(1000 points possible per semester)

1. Please **purchase** the following materials needed for class: 1 lined composition notebook (for essays); 1 graphing paper composition notebook (laboratory notebook); a 2-inch binder (for notes and homework); a 1-inch binder (for tests and quizzes)
2. All writing assignments except lab write-ups should be **typed**. The required format (called **LST**—let's save trees) includes a single-line heading that contains only your last name and first name initial, class period, teacher's name, and date when assignment is turned in. Assignment title or Chapter # should be indicated just above your homework. Font size and spacing should be Times New Roman 11 pt, single line spacing for homework, 1.5 line spacing for critical reviews and the review manuscript, and 0.5 inch margins.

Class Participation and Notebook (50 points per semester, 5%)

The class notebook (a 2-inch binder) should be composed of several sections marked by tabs labeled: 1) index, 2) lecture notes, 3) homework, 4) critical reviews, 5) extra readings 6) review manuscript, 7) review notes (2nd semester). In addition each student will have a smaller binder in class with all tests and quizzes. This binder **cannot** be removed from the classroom except when checked out from the teacher for study or test correction purposes. These notebooks will be collected once per quarter and graded based on completeness and neatness for a maximum of **10 points** each time. Participation will be worth up to **15 points** each quarter and will be graded based on the number and quality of questions posed by students and answers to instructor's questions.

Laboratory Participation and Reports (150 points per semester, 15%)

To earn full credit each report in a Laboratory Notebooks must follow a specific format as discussed in class: Title, Date, Purpose (objectives); Materials and Samples; Protocol (procedure); Results (data tables); and Conclusions (graphs, calculations, answers to questions in lab manual). The first 5 sections and empty data tables must be completed and will be checked and **graded before the lab begins for 10 pts** (leave about the same amount of space for answering each of the questions as in the lab manual). Please use the same labels for each of the sections within a given lab, as well as table and graph designations as in the manual (this makes them much easier to grade). You need to have an index on the first page of your lab notebook and each page should be numbered (front and back). You must always use a pen, cross out any large unused spaces and errors (do not scribble over or white them out). If I cannot read your writing or you are not neat and organized then you will receive only partial credit. Each of the 6 reports per semester is worth a **total of 25 points**. Labs cannot be dropped; they must be made up.

****You must wear long pants and closed-toed shoes on announced lab days for safety reasons. Anyone not meeting this dress code at the beginning of class will be sent to their room to change and will not be readmitted to class without a tardy slip from the registrar.****

Quizzes (60 points per semester, 6%)

Short quizzes will be given on assigned reading material for the given week, including materials assigned that are not from the textbook. For example, most quizzes will be given on Mondays over material assigned for that week. Material from the previous week may also be included. So please do not get behind on your reading! Although quizzes are scheduled as indicated on the quarterly schedules, the instructor reserves the right to give unannounced quizzes as well. Each of **six** quizzes per semester is worth **15 points**. One lowest quiz will be dropped at the end of each quarter.

Homework (200 points per semester, 20%)

Specific assignment handouts will be available for most chapters. They will include main objectives, concepts, and problem solving. Each of six homework assignments per quarter is worth **20 points**; one lowest will be dropped per quarter.

Critical Reviews (40 points, 4%)

Four publications concerning recent medical and scientific breakthroughs will be assigned during each semester. A critical review of each will be worth **10 pts**. The summary should be 1-2 pages typed and should include two **labeled** sections: a short **summary** (no more than ½ page) and a **discussion**, which should include 1) what was most interesting or surprising to the student and 2) what further questions can be posed by the student based on the material.

Review Manuscript (100 points per semester, 10%)

It is critical for a physician or scientist to be able to gather, evaluate, and summarize information about various topics of interest. Therefore, we will be learning how to utilize some of the most complete databases of medical and scientific journals such as PubMed. You will learn how to perform a search using this database and 1) select a well-focused topic (10 points); 2) prepare a list of 30-60 references of a refined search (20 points); 3) reduce the list to 5-10 sources with abstracts (20 points); 4) complete a detailed 3-page outline of the review paper (10 points); 5) write a draft of the paper (30 points); 6) peer review a colleague's paper (10) and edit your own to its final 10 pages (50 points); and 7) present your findings during a 5 minute PowerPoint presentation (50 points). The preparation assignments 1-3 will be scored for the 1st quarter for a total of 50 points; scores from assignments 4-5 will be used for the 2nd quarter; score from assignment 6 will be used for the 3rd quarter; and score from assignment 7 will be used for the 4th quarter. When turning in your manuscript on the date indicated, please include the draft version with peer review comments also. This project is worth a total of **200 points** during the **entire** year.

Tests (400 points per semester, 40%)

Four multiple choice/essay tests will be given each semester (one each term), each worth **100 points**. They will not only include the material for each unit, but also all information covered in class prior to the exam; therefore each test is a cumulative final of all of the information taught up to that point. Both a pre-test (1st week of class) and a post-test (last week of class) will be administered to show students their progress. The post-test will be given at the end of the year before the AP exam and the students will have the opportunity to have it graded in a traditional and AP fashion (where students can indicate which questions they do not want scored, since for each incorrect answer a ¼ of a point is subtracted from the total score).

Grading Scale

A	90-100	4 points	B	80-89	3 points	C	70-79	2 points
D	60-69	1 point	F	≤59	0 points	I	Incomplete Work	

Each quarter will count as 40% of the semester grade. Final exams at the end of each semester will count as 20% of the final semester grade. The official semester grade on the transcript will be computed from the two quarter grades plus the final exam for each semester (weighted 40/40/20).

Policies

Attendance

Students are expected to attend every class unless they are excused by the Principal due to illness or participation in special school events. If any student is more than 5 minutes late to class, a deduction from the participation score will be noted and if the student is more than 10 minutes late, the Principal's office will be notified. Please come prepared to class. If you forget anything from your room or need to leave for any non-emergency reason, you must obtain a tardy slip from the registrar in order to be readmitted to class.

Homework

All homework assignments will be indicated on a tentative schedule. The instructor will update the students on any changes, otherwise the homework is due when indicated; no exceptions. Because lowest scores of some types of assignments (as indicated above) can be dropped, the student has the option of not turning in this work.

Late Work

All assignments are expected to be turned in on time. Work turned in late will receive a reduced grade: 1 day late=15% reduction of earned grade, 2 days late=30% reduction, 3 days late=50% reduction, and work received 4 or more days late will not be accepted.

Makeup Work

Any student having three or more scheduled tests on the same day may request rescheduling of one test. The request form is available in the Academic Affairs Office. The student must complete the form and return it to the Academic Affairs Office no later than one class day prior to the scheduled tests. Rescheduling date and time shall be at the discretion of the instructor. Any other makeup work will also have to be discussed with the instructor but in most cases the late work policy will apply.

Academic Honesty Policy

Academic honesty and integrity are principles upon which an academic community is based. Students are expected to do their own work and give credit to the originator of the ideas when using the thought or work of others. Students should understand what style of assignment is acceptable to teachers and should be aware of the conditions under which collaboration is allowed.

By virtue of being accepted into ASMSA and by having signed the Handbook/Honor Code Acceptance Form, every student agrees to abide by the Honor Code. Examples of Honor Code violations include, but are not limited to, plagiarism, stealing (academic or otherwise) property belonging to the school or another student, cheating, and failing to present the truth when asked by a staff member.

A teacher or staff member who suspects a student of academic dishonesty will discuss the situation with the student and the Dean of Academic Affairs. A decision will be made based upon the discussion and the evidence as to whether academic dishonesty has occurred. Disciplinary action for violations of the academic honesty policy can be found on page 44 of the Student Handbook.

Additional Course Resources

1. "Biology: the Unity and Diversity of Life" by Cecie Starr, Ralph Taggart; Eleventh Edition; Thomson Brooks/Cole; 2006.
2. "Inquiry into Life" by Sylvia S. Mader; Eleventh Edition; McGraw Hill; 2006.
3. "Genes VII" by Benjamin Lewin; Oxford University Press; 2000.
4. Selected readings of current scientific and medical findings from journals such as the Scientific American.
5. The instructor has numerous additional textbooks, articles, and journals that may be checked out from her office.
6. A great number of websites are available for further reading and explanations. Instructor will provide links according to topics throughout the year.