A.P. Biology Syllabus 2012-2013 Text: Biology, 8th Edition, N. Campbell, 2005
Lab Manuals:, A.P. Biology Laboratory Manual Edition E, More Biology in the Laboratory D. Helms, et al.
Note that not all the activities will be completed each year for each unit. An inquiry lab will be required per unit.

MOLECULES, CELLS AND ENERGY: BIG IDEAS 1,2,3 & 4 (CR2)			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
A. MOLECULES Big idea 4 Polarity of water & its importance to biological systems Carbon's role in the molecular diversity of life Monomers, polymers & reactions involved in building & breaking them down considering polar/ nonpolar interactions Various levels of structures in protein & carbohydrates Enzyme structure as a special protein Cohesion, adhesion, specific heat of water & its importance to biological systems Acids, bases, and buffers Identifying macro-molecules in our foods Supplements & Add--ons: Cohesion/ adhesion in nature Various macro- molecules in our foods Cycling of chemical elements in ecosystem	Chemistry of Life Chapters 2--5 from textbook Portion of Chapter 55k	Using kits to build macro-molecule models [CR4a] (SP 1) Exercises: protein folding software [CR4b] Acid/base/buffer lab activity [CR6] (SP 2) Adhesion/ cohesion lab Students do variations by adding different macro-molecules to solution to see effects adhesion etc. (EU4.A connects to BI 1) [CR3d] (SP 4) Given specific heat equation, in groups students try to come up with a way to deter- mine specific heat of water- 15min (EU 4.C connects to BI 1) [CR3d], [CR4a] & [CR4b] (SP 3) LAB: Using and under- standing how different indicators are used to identify proteins, lipids, carbohydrates (incl. reducing sugars analysis) using Biuret, Benedict's, Sudan etc. [CR6] (SP 6) Research exploring how animals use water's properties for survival (comparing specific heat) (EU 4.C connects to BI 1) [CR3d] Students make posters of different element cycles including relative amts. of transfer [CR4b], [CR4d] & [CR8]	Student generated concept maps Reading quizzes Unit test with free response practice Written lab reports [CR8] Students compose chart comparing structural differences & how indicators physically work Students use chart to predict contents of unknown samples Students share one example they have found how animals use water's properties for survival. Student generated short PowerPoints on macromolecules and nutrition. (Ex. Butter vs margarine vs oil OR summariz- ing different artificial sweeteners)
B. HISTORY OF LIFE Big idea 1 Theories of how macro-molecules joined to support origin of life Was RNA 1st genetic material? Age of earth	Text chapter 25 outline notes guided reading	Clay catalyzed RNA polymerization activity with role playingfocus on theories, redevelopment of theories over time (EU 1.B connects to BI 3) [CR3a] & [CR4c] (SP 6, 7) Discussion of journal article	Concept maps Reflection on the development and reformulation of scientific theories (extra) model or cartoon explaining the theories of origin of life [CR4a]
C. CELLS (structure & function) Big idea 1 & 2 Explain similarities, differences & evolutionary relationships between prokaryotic & eukaryotic cells Cell membrane structure & function Cell communication	Text chapters 6,7,11 Outline notes Guided reading questions	Mini poster/ models comparing structures of cells from 3 different cell types from 3 different kingdoms (EU 1.A connects to BI 3) [CR3a], [CR4a], [CR4c] & [CR8] LAB: Normal vs Plasmo- lyzed Cells using Plant cells (teacher generated) [CR6] Eduweblabs: Osmosis & diffusion prelabs 1 & 2 [CR4b], [CR4c] & [CR6]	Student generated concept maps Reading quizzes Mini poster comparing structures of cells from 3 different kingdoms Unit test with Free Response practice Written lab reports [CR8] Eduweblabs graph & calculations

(signals, receptors, responses hormones) Methods of transport across membranes	Journal articles on organelle based health issues [CR5]	Cell size lab teacher generated Mini Poster Presentations comparing 3 feedback mechanisms [CR8] Inquiry lab # 4 Diffusion and Osmosis [CR6] (SP 3, 4) LAB: Microscope techniques for observing & measuring different types of cells.	Cell Size lab calculations Formal Lab Writeup for Inquiry lab Diffusion & Osmosis [CR8] Microscope drawings & calculation Analyze & Discuss chart comparing different types of cells & their functions in the human body Discussion of the endosymbiont hypotheses of the evolution of eukaryotic cells [CR3b]
D. IMMUNITY Bigidea 2&3 Innate vs Acquired Response Humoral responses B cells vs T cells Self vs non--self Field Trip to Pharmaceutical Company	Text chpt. 43 Background information on immuno- assays from the company.	LAB: Immunoassays: Antibody purification Dot Blot (1 full day at BTI Pharmaceutical company where students completely perform both labs) [CR6] (SP 5)	Student generated concept maps Flow chart for immunoassay labs Post-fieldtrip quiz
E. CELL ENERGY ATP structure & function Redox reactions in relation to cellular respiration Enzyme catalysis Activation energy & specificity Cellular respiration glycolysis, citric acid cycle, electron transport chain & chemios-mosis Mitochondria form & function Photosynthesis mechanisms; light/ dark Compare/contrast to respiration Alternative mechanisms Understanding light energy & the nano scale (the size of small things inside cells)	Text chpts 8, 9, 10 Outline notes Guided reading questions	Eduweblabs: Prelab "Enzyme Catalysis" Investigative lab #13: Enzyme Activity (EU 4.A connects to BI 2) [CR3d] & [CR6] Prelab: Toothpickase Investigative Lab: Enzymes: Factors affecting the rate of activity [CR6] (SP 2, 5) Eduweblab: Respiration [CR4b] Investigative Lab #6 Cellular Respiration [CR6] (SP 2) Fermentation inYeast Lab (Flynn kit) student generated variations required Eduweblabs: Prelab Plant pigments [CR4b] Eduweblabs: Prelab Photosynthesis [CR4b] Investigative Lab #5 Photosynthesis [CR6] Internet activity comparing different wavelengths of light in relation to photosynthesis (teacher generated) Discussion on nanotechnology & implications of our smaller world [CR5]	Student generated concept maps Reading quizzes Unit test with free response practice Eduweblab graphs Toothpickase graphs & questions Presentation of stu- dents group lab results to class [CR8] Eduweblabs graphs & calculations Presentations of lab data and results [CR8] Graphs & discussion onYeast Lab with variations [CR8] Eduweblabs chroma- tography calculations, graphs Presentations on lab results Lab writeup and analysis [CR8] Students make a chart comparing sizes of cellular parts & larger items to evaluate range of metric dis- tance measurements down to the nano scale [CR4b]

HEREDITY, GENETICS AND EVOLUTION BIG IDEAS 1 and 3 (CR2)			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
A. MOLECULAR BASIS OF INHERITANCE DNA structure & replication RNA structure Protein Synthesis transcription & translation	Text chapters 16, 17 Journal Article Reading Watson and Crick's original Nature paper from 1953	DNA extraction Comparing DNA & pro- tein sequences from an internet based computer database in discussing evolutionary implications of mutations (SP 7)	Student generated concept maps Reading quizzes Journal article discussions Unit test with Free Response practice Bioinformatics results

Mutations - basis for natural selection			
B. MITOSIS & MEOSIS Cell Cycle mechanism & control Chromosomes Sexual vs asexual reproduction & evolutionary advantages Stages of meiosis Genetic variation in offspring, mecha- nisms & impact on evolution Investigating genetics: environ- mental influences	Text chapters 12, 13	Eduweblabs: Prelab Crossing Over Lab Investigative Lab #7: Mitosis and Meiosis (EU 3.A connects to BI 1) [CR3c] & [CR6] Karyotyping exercise (teacher generated-- students will have to do this on their own time) [CR4c]	Student generated concept maps Reading quizzes Unit test with Free Response practice Eduweblabs results Investigative LAB Analyses Karyotyping results Students choose & research controversial topics and the argu- ments supporting their genetic and/or environmental basis. Ex. Obesity, alcohol- ism, etc. [CR5]
C. MENDELIAN GENETICS MENDEL'S LAWS Patterns of inheri- tance Predicting genetic outcomes genetic counseling Gene linkage & mapping Mutations revisited	Text chapters 14, 15 Scientific American Article Reading	Prelab activity: Looking at corn crosses & analyzing results Eduweblabs: Prelab Population Genetics Eduweblabs: Prelab Fruit fly genetics	Student generated concept maps Reading quizzes Journal article discussions Unit test with free response practice Eduweblabs prelab report
D. MOLECULAR GENETICS Regulation of gene expression Viruses Gene expression in bacteria Biotechnology DNA Technology, Recombinant DNA, PCR, Gel electrophoresis Applications of DNA technology Use of bioinfor- matics to analyze genomes Comparing & discussing genomic sequenc- es in relation to evolution	Text chapters 18--21 Journal Article Read- ing Article by Kary Mullis on PCR.	Eduweblabs: Prelab Bacterial transformation Eduweblabs: Prelab DNA Electrophoresis Investigative lab #9: Bio- technology I and Biotech- nology II. BacterialTrans- formation and Restriction Enzyme Analysis of DNA [CR6] Field trip to Promega in Wisconsin will expose students to these techniques in industry	Student generated concept maps Reading quizzes Journal article discussions Unit test with free response practice Eduweblabs results for both transforma- tion & electrophore- sis labs Analysis and group presentation of Inves- tigative lab Post field trip test Report on Bioinfor- matics activity
E. EVOLUTIONARY BIOLOGY Darwin's explora- tions and theory of descent with modification & natural selection Galapagos Islands Overview Evidence for evolution (molecular analy- ses & morphologi- cal analyses Phylogeny & systematics Evolution of populations Hardy-Weinberg Law	ext chapters 22-25 Journal Article Read- ing Beak of the Finch by Jonathan Weiner	Activity: Genetics Survey Project analyzing traits of those around us Lab Investigation "2 Mathematical Modeling: Hardy-Weinberg [CR6] (SP2, 4, 5, 7) Activity: Students create Geologic timeline Activity: Hands on fossil analysis (obtained from nearby college) [CR4a] (SP 6, 7)	Student generated concept maps Reading quizzes Book discussions Unit test with Free Response practice

ORGANISMS AND POPULATIONS: BIG IDEAS 1,3 AND 4 (CR2)			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
A. BIOLOGICAL DIVERSITY & MICROBIOLOGY Early life on earth Evolution of prokaryotes & eukaryotes	Text chapters 25, 26, 27 Text 29, 30	Students are to find an article involving genetic recombination using prokaryotes and present to class [CR5] Investigative LAB # 3: Analyzing Genes with BLAST (EU 1.B connects to BI 4) [CR3a] & [CR6]	Article presentation to class Student generated concept map Section test
B. PLANTS & THEIR DIVERSITY How plants colonized land Evolution of seed plants Structure, growth & development Plants responses to internal & external stimuli Plant nutrition Angiosperm Reproduction	Text 35, 36 Text 37,, 38, 39	Eduweblabs: Prelab Transpiration Investigative LAB # 11: Transpiration (EU 1.B connects to BI 4) [CR3a] & [CR6] (SP 2, 3, 5) LAB: Flower dissection LAB: Students conduct a long term (exp't) lab investigation plant growth from seeds under various conditions in our green- house. [CR6] (SP 3.5, 6, 7)	Practical Test specimen identification & placing on phylogenetic tree Student generated concept map Section test Eduweblab transpiration results Investigative labs analysis Flower dissection practical Formal writeup for students' own plant lab [CR8]
C. ANIMAL DIVERSITY Characteristics (body plans & systems) of invertebrates as you go up the phylogenetic tree Basic anatomy principles Analysis of structure & function of body systems Digestive, Circulatory, Respiratory,	Text chapters 32-34 and 40-49	Survey of animal phyla in concept map/chart form generated by students (Practical with actual animal specimens) Eduweblabs - Daphnea heart rate Eduweblabs - Cardiac Physiology Human Biology: Circulation and	Student generated concept maps (one for each system & animal diversity examination) Reading quizzes Unit test with Free Response practice

Excretory, Endocrine, Nervous, Muscular Systems		Blood Pressure Lab: Examining circulation of the goldfish [CR6] (SP 7) Lab: Dissection - either fetal pig or cat	Eduweblab reports Practical quiz observing various specimens and classifying them using students' own made chart of animal phyla Practical test with dissection specimen
D. ECOLOGY Ecological interactions- biotic vs abiotic Behavioral ecology- natural selection involvement Population dynamics- growth & its regulations Communities & Ecosystems energy levels & flows, cycles, symbiosis & impact on evolution Human influences positive & negative	Text chapters 50-55	Eduweblabs: Prelab Animal Behavior Investigative LAB #12: Fruit fly behavior [CR6] (SP 3, 4) Animal Behavior: Taxis, Kinesis, and Agonistic Behavior [CR6] (SP 3, 4, 6) LAB: Termite Behavior (WARD'S) Wolbachia Project- PCR In conjunction with the Marine Biology Institute in Boston, students will conduct research looking at the presence of symbiotic relationship in insects with Wolbachia (EU 4.A connects to BI 1) [CR3d] & [CR4d] (SP 3, 4, 5) Eduweblabs- Primary Productivity LAB: Dissolved Oxygen & Aquatic Primary Productivity (EU 4.A connects to BI 1) [CR3d], [CR5] & [CR6] (SP 2, 3, 4, 5, 6, 7) LAB: Local Burpee museum field trip where students perform water quality surveys includ- ing benthic macroinver- tebrate survey (EU 4.C connects to BI 1) [CR3d] & [CR6] Activity – "My footprint" (EU 4.A connects to BI 1) [CR3d] & [CR4d]	Student generated concept maps Reading quizzes Unit test with Free Response practice Eduweblab reports Investigative Lab #11 report [CR8] Termite lab questions, analysls and presentation [CR8] Eduweblab report on primary productivity Presentation: Students present lab results to class with ways to improve water quality of their local river [CR5] Personal Project: Students complete "My Footprint" on- line and write a paper discussing their individual impact on Earth [CR5]

Unit 8: Ecology Summer Assignment	50-55	Book Review, Essay, CQ/STS	
8/27	1	Slime Mold Inquiry	Reading Quiz
9/4		Behavior A.P. Lab 11	Unit 8 Test
9/10 Unit 1: Chemistry of Life	2,3	Toothpickase, A.P. Lab 2: Enzymes	Reading Quiz
9/17	4,5, 6	Enzyme Lab Inquiry	Reading Quiz., Article Review #1
9/24 Unit 2:The Cell	7	Fantastic Voyage	Unit 1 Test/Chapter 1-6
10/1-10/8	8 - 9	Osmosis Lab, A.P. Lab 1, Inquiry	Reading Quiz
10/15	10	A.P. Lab 5: Cellular Resp.	Reading Quiz
10/22	11,12	Spectronic 20 Lab, A.P. Lab 4/Photosynthesis	Reading Quiz
10/29		A.P. Lab 12: Dissolved O2	Article Review #2
11/5 Unit 3A: DNA	16, 17	AP Lab 7 begin A.P. Lab 3, Mitosis only	Unit 2 Test Ch 7-12
11/14	17,20	DNA Extraction, Pop Beads Exercise : Micropipette Prac.	Reading Quiz
	18,19	Restriction Digest and Analysis and Mapping PCR	Reading Quiz, Article Review #3
11/26	21		Reading Quiz

12/3		PCR activity Bioethics	
12/11		AP Lab 7 wrap-up (Winter Break 12/21-1/6/08)	Unit 3A Test Ch 16-21, Article Review #4
1/7/08 Unit 3B: Genetics	13, 14, 15	A.P. Lab 3, Meiosis/ Sordaria Lab Human Genetics, Helms#14 Epistatic Genes,Jumping Genes, Corn Lab,	Reading Quiz Genetic Problems Quiz Quiz Unit 3B Test Ch 13-15
1/14: 2nd Semester Unit 4: Mechanisms of Evolution	22, 23, 24	A.P. Lab 8, Population Genetics	Article Review #5
Finals			
1/29	25, 34 (pgs656-665)	Molecular Evidence for Evolution- Fish ProteinLab Bioinformatics Phylogeny Activity	Reading Quiz Unit 4 Test Ch 22-25
2/4 :Unit 5A Evolutionary History of Diversity	26, 27	Helms Lab # 18/19	Reading Quiz
2/11	28, 31	Helm's 20	Unit 5A Test Ch 26-28, 31, Article Review #6
2/19 Unit 5B/6: Plants	29, 30	Lab # 24,25, Helms	Reading Quiz Take Home Test for unit
2/25	35, 36,	A.P. Lab 9: Transpiration	Reading Quiz
3/5	37,38,39	GMO PCR Lab	Unit 5B/6 Test Ch 29,30, 35-39, Article Review #7
Unit 5 C: Animals 3/11-3/18	32-34	Animal Survey Lab	Unit 5C Test
Unit 7 Animal Form and Function 3/31	40, 41	Helms Lab # 29: Tissues	Reading Quiz
Circulation/Immunity 4/7	42,43	Cardiovascular /A.P. Lab 10 Student Jig saw lessons/PPT	
4/15 Excretory, Endocrine, Repro.	44, 45,46		
Nervous, Development 4/22	47-49	Lab # 40: Nervous, Helms Lab # 42: Development, Helms	Reading Quiz and Unit 7 Test 40-49 Final Exam: Three Days, 1 day M/C, 2 days FRQ
4/29		Review	
5/6-5/16		Review #8	AP EXAM
5/20-6/6		Lab # 30-37 Fetal Pig	Personal Research Project & Present
6/10		Final Class	