

KAP Biology Syllabus 2012

Developed by Justin L Seibert - Jun 17 2012 (adapted from Goodman-Brown, Maringer, McCain, Edwards, South, Roth, Gillen)

Prerequisites - as set forth by Kenyon College (KEN) and Ridgewood High School/Justin Seibert (RDG):

Completion of Honors Physical Science (9th grade) -RDG

Completion of Honors Biology* (10th grade) –RDG

Completion of Chemistry or taking in tandem – KEN

*Students with C+ or lower in Honors Biology and/or C or lower in math or chemistry will be admitted on a conditional basis (KEN)

^Students with C or lower in several courses or a D in Honors Biology will not be admitted. (KEN)

Entry into the KAP program is based on overall academic performance and work ethic. The ultimate decision on entry into the program lies with Dr. Kathryn Edwards, KAP coordinator at Kenyon College.

Special Note: Due to the pace of the course, students **MUST** be enrolled within the first two weeks of class and **MAY NOT** enroll during any other time during the year.

Course Description:

KAP Biology is an entry-level college course offered to high school juniors and/or seniors. During the yearlong course, students will earn both high school and college credit. The course is adapted from two semester long courses taught at Kenyon College, BIOL115 and BIOL116. The focus for the course will be 1) energy in living systems and 2) information in living systems. The former will help guide the latter. One of the main focuses throughout the course will be the reading and interpretation of primary literature. A college level text (Biological Science 3rd Edition – Freeman), readings and study material will accompany the course.

Broad topics such as ‘energy’ will be distilled down to more specific components such as glycolysis and the light reactions present in photosynthesis.

The course will focus on discussion as a format for learning in order to increase articulation and logical support of scientific ideas and questions.

Over the course of the year students will develop critical thinking and problem solving skills along with scientific writing and computing skills that will better prepare them for a career or further education in the sciences.

KAP Biology is a lab science and students will meet at least once per week for a ‘laboratory’ period in which inquiry-based, hands-on experimentation will occur.

Ultimately, students will use acquired knowledge to develop an independent study project near the end of the year.

Text:

Freeman S (2008). **Biological Science**. (3rd Edition). Pearson/Cummings, New York, NY ISBN: 0-13-224950-2

The most recent, 4th edition is acceptable, although the page numbers and chapter readings may differ slightly, the information will be the same.

Additional primary and secondary literature readings will be provided in class by handout

Goals & Objectives:***1st and 2nd 9 Weeks – Energy in Living Systems***

1. Understand how energy flows through biological systems
2. Begin to understand some of the basic principles of biology that provide the foundation for future college-level courses
3. Develop critical thinking skills and be able to apply these skills to scientific discussion
4. Develop an understanding of the scientific method focusing on hypothesis testing, experimental design, statistical analysis, and data interpretation

3rd and 4th 9 Weeks – Information in Living Systems

1. Understand how information is generated, transmitted, stored, and maintained in biological systems
2. Examine the mechanisms of heredity, the replication and expression of genetic information, and the function of genes in the process of evolution
3. Understand the mechanisms of evolution and how it has caused organisms to develop morphological differences to adapt to their environment

Attendance:

You are wholly responsible for the material presented in the class. Although attendance cannot and will not directly impact your grade, excessive absences will end up hurting your grade substantially. The course will be fast paced and lab materials may only be available for a short time.

By enrolling in this course, you have made the decision to invest the time, energy and resources necessary to succeed.

Make a point to be in class. Although I'm more than willing to help with any material, it's unlikely that I'll be able to 'go over' all of the material that has been covered in a class with you in a personal one-on-one setting.

I suggest finding a reliable friend that can provide any notes, readings, etc. that you may miss during an absence.

Materials Needed For Class:

- Binder (you'll probably want dividers too)
- Color pencils/markers
- Calculator
- Ruler
- Sharpie (or other permanent marker)
- *Other materials will be needed later in the year. This will be announced when the time arrives

Lab:

Lab will meet every week (either Monday or Tuesday) during enrichment. Lab is mandatory. Arrangements can be made to make up missed labs due to excused absences either before or after school. Unexcused absences (for instance, 'forgetting about lab') cannot be made up. Labs will require extra writing and reading outside of class to be successful. The lab portion of the course will constitute 20% of your 9-week grade.

Exams:

There will be two exams each nine weeks making up a total of 50% of your final grade. The dates of these exams (subject to change – but only by a day or two) are listed in your lecture schedule. You will be provided with old exams prior to the 1st exam so you'll have an idea of what to expect.

Quizzes:

Quizzes will be short and take place weekly. Quizzes may or may not be announced and will cover information from the previous lecture(s) or information from the reading that was assigned from the night before. The quizzes, totaled, will comprise 20% of your final 9-week grade.

Grade:

KAP Biology will be based off of the 'college' grading scale below. As per Kenyon College's grading practices, grades will be rounded up at '0.50.' For instance: 79.49 = C; and 79.50 = B.

A = 89.50 - 100
B = 79.50 - 89.49
C = 69.50 - 79.49
D = 59.50 - 69.49
F - <59.49

Grade Composition (per 9 Weeks)

2 Exams - 50%
7-9 Quizzes - 20%
Lab - 20%
Participation - 10%

Lecture Schedule

Section 1: Energy in Living Systems

Date		Topic	Readings
Aug.	22	Introduction to the class	
	23+24	What is Life?	
	27+28	Tree of Life: Prokaryote Structure and Diversity	Ch.1, 28.1-28.3, Bioskills 3
	29+30	Energy	Ch. 2, 9.1
Sept.	31+4	Chemical Bonds, Atoms, Water	Ch.2, Bioskills 6
	5+6	Amino Acids; Protein Structure and Function	Ch. 3
	7+10	Enzymes and Catalysis	Ch. 3
	11+12	Nucleic Acids and the RNA World	Ch. 4
	13+14	Lipids and Membranes	Ch. 6
	17+18	Cell Structure	Ch. 7
	19+20	Cellular Transport	Ch. 7
SEPT	21	EXAM #1	
	24+25	Multicellularity; Cellular Specialization; Protist Diversity	Ch. 8.2, 29.3
	26+27	Carbohydrates; ATP	Ch. 5
Oct.	28+3	Overview of Energetics: Glycolysis	Ch. 9
	4+5	Glycolysis; The Krebs Cycle	Ch. 9
	8+9	Oxidative Phosphorylation	Ch. 9
	10+11	Photosynthesis: The Light Reactions	Ch. 10
	12+15	Photosynthesis: Calvin Cycle; C3 vs. C4 Plants	Ch. 10
	16+17	Plant Nutrition and Nitrogen Fixation	Ch. 38
	18+19	Plant Structure and Diversity	Ch. 30, 36.1
	22-25	Catch Up/Review	
OCT	26	EXAM #2 (END OF 1st NINE WEEKS)	
	29+30	Sugar and Water Transport in Plants	Ch. 37
Nov.	31+1	Tissues and Organs; Structure and Function in Animals	Ch. 32.1, 41.2
	2+5	Animal Diversity: Protostomes	Ch. 32.3, 33.1, 33.2, 33.4
	6+7	Animal Diversity: Deuterostomes	Ch. 34.1-34.3, 34.5-34.6
	8+9	Homeostasis and Physiological Ecology	Ch. 41.3-41.5
	12+13	Salt and Water Balance in Animals	Ch. 42.1-42.3
	14+15	Gas Exchange	Ch. 44.3-44.5
	16+19	Neurons and the Nervous System	Ch. 6.4, 45.1-45.3
	20+21	Sensory Systems	Ch. 46.1-46.2, 46.5
	26+27	Cellular Coordination: Signaling and Hormones	Ch. 8.2-8.3; 47.3, 47.4

	28+29	Behavioral Ecology	Ch. 50,51
NOV	30	EXAM # 1	
Dec.	3+4	Demography; Population Growth	Ch. 52.1; Bioskills 7
	5+6	Limits to Populations, Population Dynamics	Ch.52.2-52.4
	7+10	Species Interactions; Community Structure	Ch. 53.1-53.2
	11+12	Community Dynamics	Ch. 53.3-53.4
	13+14	Energy Flow in Ecosystems	Ch. 54.1
	17+18	Global Biogeochemical Cycles	Ch. 54.2
	19+20	Human Impacts on Global Ecosystems	Ch. 54.3
Jan.	2+3	Biodiversity	Ch. 55.1-55.2
	4+7	Human Impacts on Global Diversity: Extinction and Species Conservation	Ch. 55.3-55.4
	8-10	Catch Up and Completion of Section #1	
JAN	11	EXAM #2 (END OF 2nd NINE WEEKS)	

Section 2: Information in Living Systems

	14+15	Introduction to Information in Living Systems	
	16+17	Darwin and Natural Selection	4-6, 481-489
	18+22	Evidence for Evolution	422-432
	23+24	Systematics	544-553
	25+28	DNA as Hereditary Material / The Central Dogma	133-134, 295-299, 319-322
	29+30	DNA Structure	68-75, Bioskills 8
Feb.	31+1	DNA Replication	299-310
	4+5	Chromosome Structure	372-374, 223-224, 120-121, 124
	6+7	Cellular Inheritance: Mitosis	222-241
	8+11	Cellular Inheritance: Meiosis	243-263
	12+13	Mendelian Inheritance	265-276
	14	Catchup/Review	
FEB	15	EXAM #1	
	19+20	Gene Interactions, Beyond Mendel	281-286
	21+22	Sex Linked Traits, Recombination	276-281
	25+26	Gene Mapping, Pedigree Analysis	286-289, 401-405
	27+28	How Genes Work	316-327
	1+4	mRNA Synthesis; Transcription	76-77, 329-333
	5+6	Protein Synthesis: Translation	295-304
	7+8	Eukaryotic Transcription and Splicing	333-337, 426-427
	11+12	DNA Mutation and Repair	260-262, 310-313, 347-350
	13+14	Experimental Approaches: PCR and DNA Sequencing	389-390, 395-401, 415-427
MAR	15	EXAM #2 (END OF 3rd NINE WEEKS)	

	18+19	Natural Selection Revisited	
	20+21	Evolutionary Processes	4-6, 481-489
	22+25	Evolutionary Processes	490-500
	26+31	Evolutionary Processes	503-511
Apr.	2+3	Speciation	526-533
	4+5	Speciation	533-541
	8+9	Phylogenies	6-11, 543-553, Bioskills 2
	10+11	Phylogenies	424-425, 554-564
	12+15	Catchup/Review	
APR	16	EXAM #1	
	17+18	Prokaryotic Gene Expression: Operons	352-367
	19+22	Prokaryotic Gene Expression: Operon Analysis, regulons, and promoters	
	23+24	Eukaryotic Gene Expression: Transcriptional Activation and Differential Gene Expression	370-374, 438-440
	25+26	Eukaryotic Gene Expression: Transcription Factors and Regulatory Motifs	375-380
	29+30	Evo-Devo and Morphological Innovations	434-435, 440-448, 703
May	1+2	Evo-Devo and Morphological Innovations	
	3+6	Evo-Devo and Morphological Innovations	
	7-16	Yearly Catchup, Review	
MAY	17	EXAM #2	