AP Biology

Gibbs High School

Ms. Amy Davis

Course Overview:

AP Biology 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, students will develop an appreciation for the study of life and be able to identify and comprehend the unifying principles within the diversified biological world. In order to facilitate comprehension, students will experience science as a process and not just learn a collection of unrelated facts. This investigative process is an essential component of this course. What we known today about biology is a result of years of scientific investigations. Promoting inquiry and the development of critical thinking skills are the most important aspects of this course. Through all these experiences, students will become knowledgeable and hopefully responsible citizens in handling biological issues that could potentially impact their lives.

Contact Information:

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AP Biology Exam: Monday, May 14th 8:00AM (Mark your calendar)

Prerequisites:

Students must complete Biology I (Honors or CP) and Chemistry I (Honors or CP). This is a year-long course. Students will complete Honors Biology II in the fall and AP Biology in the spring. Students may not drop the course after the guidance office determined time period (normally 2 weeks) into the fall semester. After that period, students will remain in the course until the end of the year.

Fee: $30.00 per term ($60.00 for the entire course)

Due to the College Board lab requirements and the expense of lab kits and materials, a fee is expected from every AP biology student each term. Lab activities will also be referenced on the AP Biology Exam at the conclusion of the course. The quality and quantity of lab activities will be determined by the amount of money collect. Students with a fee waiver should notify the teacher.

Materials Needed:

1. 3 Ring Binder (3 inch) - color determined by class period
2. Set of 5 dividers
3. Spiral notebook (for note-taking only) - needs to be large enough to last the entire year
4. Graph Paper
5. Loose leaf paper (for assignments)
6. Agenda Book (to be filled out daily)
7. Plastic Page Protectors (small set)
8. Zipper Pencil Bag
9. 2 Pencils

10. 2 Pens (blue or black ink only)
11. 2 Red Pens
12. Black Sharpie Pen
13. Highlighter (any color)
14. Coloring Pencils (small set)
15. 1 set white index cards
16. 1 set colored index cards (5 colors if possible)
17. Signed Lab Safety Contract (Flinn Scientific)
18. Lab Notebook (Hayden-McNeil) $12.00 to be ordered by teacher (pay separately from fee)

Instructional Resources:

Campbell: Biology in Focus (2nd Edition), Copyright 2017 **[CR1]**

Holtzclaw, Fred and Theresa Knapp. *Campbell Biology 8th Edition Active Reading Guide*. Copyright 2008.

AP Biology Investigative Labs: An Inquiry Based Approach. The College Board Advanced Placement Program, 2012.

Campbell, Neil. *Practicing Biology: A Student Workbook*, 3rd edition.

sciencecases.lib.buffalo.edu/ This website provides case studies that apply to topics discussed in class.

Lab Bench Virtual Labs (to be used for pre-lab instruction)

http://www.bozemanscience.com (collection of videos on most AP Biology concepts

Audio Visuals:

All programs shown in this class have academic value and are approved for educational viewing. If you do not approve of a specific resource, please make your request to me in writing and an alternative assignment and/or materials will be provided. The request should include your name, the student's name, the specific activity/materials in which you do not want your child to participate or to which you do not want them exposed, and the nature of your objection.

Course Organization:

This course is structured around four underlying principals called "Big Ideas". These Big Ideas encompass the core scientific principles, theories and processes governing living organisms and biological systems. The Big Ideas are interrelated and will not be taught in isolation. Each Big Idea **[BI]** will include "Enduring Understandings" **[EU]** which are identified in the course requirements **[CR2].** These are the core concepts that students should retain from the learning experience. Each Enduring Understanding is followed by statements called Essential Knowledge **[EK].** The Essential Knowledge statements will be taught and may be included in the AP Biology Exam. The Big Ideas, Enduring Understandings, and Essential Knowledge will be posted in the classroom. Essential Knowledge/Learning Objectives will also be listed and discussed at the beginning of power point lecture notes. In addition, students will be engaged in investigative laboratory work where required Science Practices **[SP]** will be taught and reinforced. **[CR7] Course Big (Overlapping) Ideas:**

Big Idea 1: Evolution

The process of evolution drives the diversity and unity of life.

Big Idea 2: Cellular Processes, Energy and Matter

Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.

Big Idea 3: Genetics and Information Transfer

Living systems store, retrieve, transmit and respond to information essential to life processes.

Big Idea 4: Interactions/Ecology

Biological systems interact, and these systems and their interactions possess complex properties

The Investigative Laboratory Component: (CR8)

The course is structured around inquiry in the lab and the use of the seven science practices. Students are given the opportunity to engage in student-directed laboratory investigations throughout the course for a minimum of 25% of instructional time. **[CR7]** Students will conduct a minimum of eight inquiry-based investigations, two per Big Idea. **[CR6]** These eight labs must be selected from the *AP Biology Investigative Lab Manual* (2012) (See list below). Additional laboratory activities will be conducted to deepen students' conceptual understanding and to reinforce the application of science practices within a hands-on, discovery based environment. All levels of inquiry as well as all seven science practice skills will be used by students on a regular basis in formal labs as well as activities outside of the lab experience. The course will provide opportunities for students to develop, record, and communicate the results of all laboratory investigations. Lab results will be communicated to others during group presentations, poster sessions and written reports. Lab experiences will provide opportunities for collaboration, reflection (self and group) and articulation**.** This course is structured around inquiry in the lab and the use of seven science practices.

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.

Students will be given the opportunity to engage in student-directed laboratory investigations throughout the course for a minimum of 25% of instructional time. Students will conduct a minimum of 8 inquiry-based investigations. There will be at least 2 investigations per Big Idea. These 8 labs will be selected from the *AP Biology Investigative Lab Manual* (2012). Additional laboratory activities will be conducted to deepen students' conceptual understanding and to reinforce the application of the science practices within a hands-on, discovery-based environment. All levels of inquiry, as well as all 7 science practice skills, will be used by students on a regular basis informal labs as well as activities outside of the lab experience. The course will provide opportunities for students to develop, record, and communicate the results of all laboratory investigations. Lab results will be communicated to others during group presentations, poster sessions, and written reports. Lab experiences will provide opportunities for collaboration, reflection (self and group) and articulation.

The following lab activities are highly suggested, fee-determined and could be addressed on the AP Exam.: **(CR6)**

Big Idea 1: Evolution

1. BLAST Activity
2. Hardy-Weinberg Genetic Equilibrium
3. Artificial Selection (using Carolina Fast Plants)

Big Idea 2: Cellular Processes, Energy and Matter

1. Cellular Respiration in Peas
2. Photosynthesis
3. Diffusion/Osmosis

Big Idea 3: Genetics and Information Transfer

1. Cell Division: Mitosis and Meiosis
2. Bacterial Transformation

3. Restriction Enzyme Analysis

Big Idea 4: Ecology

1. Energy Dynamics
2. Fruit Fly Behavior (alternative animals may be used instead of fruit flies)
3. Transpiration in Plants
4. Enzyme Catalysis

Course Requirements: (Abbreviated CR):

CR1

Students and teachers use a recently published (within the last 10 years) college-level biology textbook.

CR2

The course is structured around the enduring understandings within the big ideas as described in the AP Biology Curriculum Framework.

CR3a

Students connect the enduring understanding within Big Idea 1 to at least one other big idea.

CR3b

Students connect the enduring understandings within Big Idea 2 to at least one other big idea.

CR3c

Students connect the enduring understandings within Big Idea 3 to at least one other big idea.

CR3d
Students connect the enduring understandings within Big Idea 4 to at least one other big idea.

CR4a
The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 1.

CR4b
The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 2.

CR4c
The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 3.

CR4d
The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 4.

CR5
The course provides students with opportunities to connect their biological and scientific knowledge to major issues (e.g., concerns, technological advances, innovations) to help them become scientifically literate citizens.

CR6
The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and include at least two lab experiences in each of the four big ideas.

CR7
Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25 percent of instructional time.

CR8
The course provides opportunities for students to develop and record evidence of their verbal, written and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written or graphic presentations.

Social and Ethical Concerns: (CR5)

It is vitally important that students connect their classroom knowledge to socially important issues. The course will allow students to learn about and discuss many issues in a variety of formats. Issues will be discussed in a class setting and students may research and report on a current topic that has social or ethical issues associated with it. Since the goal will be to discuss a timely event, the list below should be seen as illustrative as new issues continually appear.

- Stem Cell Research and HeLa Cells **[BI3]**
- Global Warming and Ozone Depletion **[BI4]**
- Antibiotic Resistance and the Problems with Improper Antibiotic Use **[BI1]**
- Use and Consumption of Genetically Modified Organisms and Products **[BI3]**
- The Use of Genetic Information: Potential Discrimination **[BI3]**

Behavior Expectations:

Students must be…

1. In the classroom headed for your assigned seat BEFORE the bell rings.
2. Prepared for class. (Textbook, notebook, & supplies must be brought to class daily)
3. Respectful to the teacher, peers and guests. (No behavior that is disruptive to my instruction or the learning of others will be tolerated)
4. Followers of all school rules and policies

Topics and Timelines:

This course will be taught for two terms on a block schedule. Classes will meet 5 days per week for 85 minutes each. Each term will have 90 instructional days. An allowance of 10 days has been made for interruptions such as assemblies, snow days and abbreviated schedule, as well as to review for the AP Biology Exam.

Units of Instruction and Tentative Pacing

Units of Instruction (8)

Unit 1: Overview of Biology and Using Statistics in Biology [CR2] (13 days)

Big ideas: 1, 2

Enduring Understandings:

1A. Change in the genetic makeup of a population over time is evolution.
2A. Growth, reproduction and maintenance of the organization of living systems require free energy and matter.

Lecture and Discussion Topics:

1. Characteristics of Living Things (Unity of Life)
2. Charles Darwin: Introduction to the Theory of Evolution (Diversity of Life)
3. Inquiry as a way to learn science
4. T-test (mean, median, mode, standard deviation, etc), Chi Square Analysis, Null Hypothesis

Chapter:

Chapter 1: Introduction to Biology

Topics Covered	Lab Activities	Case Studies	Active Reading Guide	Practicing Biology
Data Representation and Graphing	Animal Behavior (Pill Bugs) and/or Goldfish Temperature vs Respiratory Rate	"Lady Tasting Coffee: A Case Study in Experimental Design" (Statistical Analysis and the Null Hypothesis)	Chapter 51	51.1 "What determines behavior?"

Topics Covered	Lab Activities	Case Studies	Active Reading Guide	Practicing Biology
Chi Square and the Null Hypothesis	Applying Chi Square and Null Hypothesis to a Coin Toss	"Experimental Design and Statistical Analysis Bt Corn, Lignin and ANOVAs"	Chapter 1 (TBD)	
Mean, Median and Mode	Applying Chi Square and the Null Hypothesis to a bag/box of Candy **[BI 3)] [SP 2, 3, 4, 5] [CR 4c]**			
Standard Deviation	Applying Chi Square and the Null Hypothesis to Sample Experimental Data			
Lab Safety Review	Palm Width in Males and Females			
Mini Posters for Lab Assessment and Presentation **[CR8] [SP1]**				
Behavior of Pill Bugs (Part I) - "Experimental Design"				
Introduction to Biology				

<u>Unit 2</u>: Biochemistry and Introduction to the Cell [CR2] (18 days)

Big ideas: 1, 2, 3, 4

Enduring Understandings:

1D. The origin of living systems is explained by natural processes.

2A. Growth, reproduction and maintenance of the organization of living systems require free energy and matter.

2B. Growth, reproduction and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments
3A. Heritable information provides for continuity of life.
4A. Interactions within biological systems lead to complex properties.
4B. Competition and cooperation are important aspects of biological systems.
4C. Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Lecture and Discussion Topics:

1. Structure of atoms
2. Emergent Properties of Water
3. The impact of carbon as the "backbone of life"
4. How monomers build polymers, including the roles of nucleic acids
5. Examples of organelles that are membrane bound to compartmentalize their functions
6. Membrane structure and function

Chapters:

Chapter 2: The Chemical Context of Life
Chapter 3: Carbon and the Molecular Diversity of Life
Chapter 4: A Tour of the Cell
Chapter 5: Membrane Transport

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology Activities	Active Reading Guides
Ball and Stick Models of Carbon Compounds **[CR4a] [SP1]**	"Face the Fats" (Understanding the Biochemistry of Lipids)	4.1/5.1 "How can you identify organic molecules?"	Chapter 2
pH Lab	"A Curious Mission: An Analysis of Martian Molecules" (Biochemistry)	4.2/5.2 "What predictions can you make about the behavior of organic macromolecules	Chapter 3

Lab Activities	Case Studies	Practicing Biology Activities	Active Reading Guides
Protein Chemistry: Fun with Milk and Eggs **[CR6] [SP6&8]**	"Fat Facts: Comparing the Structure and Function of Lipids"		Chapter 4
Milk Analysis	"Oh What a Difference a Carbon Can Make" (Enzymes)	2.1 "Quick Review of Elements and Compounds"	Chapter 5
		3.1 "A Quick Review of the Properties of Water"	

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Observing Plant and Animal Cells	"Agony and Ecstasy" (Cell Membrane Structure and Function)	6.1 "What makes a cell a living organisms?"		Research an organelle-related disease or health issue **[CR5]**
Surface Area to Volume Using Agar Cubes	"Osmosis is a Serious Business"	7.1 "What controls the movement of materials into and out of the cell?"		Henrietta Lacks Article (excerpt from *The Immortal Life of Henrietta Lacks*)
Osmosis and Diffusion (Dialysis Tubes, Carrots and or Celery Sticks and Mystery Solutions) **[SP 1, 2, 3, 4, 5, 6, 8] [CR3b, 4b, 4c, & 6]**	"Take Two and Call Me in the Morning" (Cell Structure and Function)	7.2 "How is the structure of a cell membrane related to its function?"		
Observing Osmosis in Living Cells (Elodea and/or Red Onion)	"The Secret of Popcorn Popping" (Water Power at the Cellular Level)			
Water Potential Calculations				

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Build a Membrane http:// learn.genetics.utah.edu/				
Evolution of the Cell http:/ learn.genetics.utah.edu				

Unit 3: Cellular Energy and Related Processes [CR2] (15 days)

Big ideas: 1, 2, 4

Enduring Understandings:

1A. Change in the genetic makeup of a population over time is evolution.
1D. The origin of living systems is explained by natural processes.
2B. Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
4A. Interactions within biological systems lead to complex properties.
4B. Competition and cooperation are important biological systems.

Lecture and Discussion Topics:

1. Metabolic pathways
2. Laws of Energy Transformation
3. How ATP powers cellular work
4. Enzyme structure and function
5. Examples of Functional Units in Animals (villi of small intestine)
6. Energy Allocation and Use in Animals
7. Harvesting chemical energy: glycolysis, citric acid cycle, oxidative phosphorylation
8. Light reactions and the Calvin cycle
9. Evolution of alternative mechanism of carbon fixation

Chapters:

Chapter 6: Introduction to Metabolism (ATP and Enzymes)
Chapter 7: Cellular Respiration and Fermentation
Chapter 8: Photosynthesis

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Cell Respiration in Plants and Animals **[BI 2] [SP 2, 3, 4, 5] [CR6 & CR8]**	"A Diet to Die For" (Exploration of Oxidative Phosphorylation)	9.1 "A Quick Review of Energy Transformations"	Chapter 6	
Fermentation and Sour Dough Bread **[SP 2] [CR6]**	"The Mystery of the Seven Deaths" (Cellular Respiration)	9.2 "Modeling Cellular Respiration: How can cells convert the energy in glucose to ATP?"	Chapter 7	
Leaf Floating Discs **[BI 2] [SP 2, 3, 4] [CR6 & 8]**		10.1 "Modeling Photosynthesis: How can cells use the sun's energy to convert carbon dioxide and water into glucose?"	Chapter 8	
Plant Growth and Environmental Conditions **[CR7] [SP 5& 6]**		10.2 "How do C3, C4 and CAM photosynthesis compare?"		
Stomata Peels and Analysis		Activity 8.1 "What Factors Affect Chemical Reactions in Cells?		

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Plant Pigment Chromatography **[SP2,5] [CR6]**		Activity 8.2 "How can Changes in Experimental Conditions Affect Enzyme-mediated Reactions?		
Paperose/Toothpickase Enzyme Simulation				
Enzyme Lab (Catalase) **[BI 2] [EU 4a] [SP 2, 3, 4, 5] [CR 3d & 6]**				
Plant Transpiration Lab **[EU 1B] [CR3a & 6] [SP 2, 3, 5]**				

<u>Unit 4</u>: Cellular Reproduction (9 Days) [CR2]

Big ideas: 1, 2, 3

Enduring Understandings:

2E. Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination

3A. Heritable information provides for continuity of life

3B. Expression of genetic information involves cellular and molecular mechanisms.

Lecture and Discussion Topics:

1. How mitosis produces genetically identical daughter cells
2. Evolution of Mitosis
3. How the eukaryotic cell cycle is regulated by a molecular control system
4. Genes are passed from parents to offspring by the inheritance of chromosomes
5. How meiosis reduces the number of chromosomes from diploid to haploid
6. Evolutionary significance of genetic variation that results from sexual life cycles

Chapters:

Chapter 9: The Cell Cycle (Mitosis)
Chapter 10: Meiosis
Chapter 36: Reproduction and Development (gametogenesis)

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Pipe Cleaner Mitosis and Meiosis Simulation **[SP 1] [CR4b]**	"The Case of the Dividing Cell: Mitosis and Meiosis in the Cellular Court"	18.4 "What controls the cell cycle?"	Chapter 9	Research how stem cells are being researched for possible uses in brain and spinal cord injuries
Cross-sections of Onion Root Tip and Ascaris Worm Observation **[SP 5] [CR4b)**		12.1 "What is mitosis?"	Chapter 10	
Mitosis Observation Cards **[SP 5] [CR4b)**		13.1 "What is meiosis?"	Chapter 36	
Meiosis in Sordaria **[EU3A] [SP5] [CR4b]**		13.2 "How do mitosis and meiosis differ?"		
		46.1 "How does the production of male and female gametes differ in human males and females?"		
		14.2 Modeling Meiosis: How can diploid organisms produce haploid gametes?"		

<u>Unit 5</u>: Genetic Basis of Life (25 Days) [CR2]

Big ideas: 1, 3, 4

Enduring Understandings:

1A. Change in the genetic makeup of a population over time is evolution.

3A. Heritable information provides for continuity of life.

3C. The processing of genetic information is imperfect and is a source of genetic variation.

4C. Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Chapters:

Chapter 11: Mendelian Genetics
Chapter 12: Chromosomal Basis of Inheritance

Lecture and Discussion Topics:

1. Genes are passed from parents to offspring by the inheritance of chromosomes
2. Evolutionary significance of genetic variation that results from sexual life cycles
3. Concepts of Mendelian genetics (laws of probability, inheritance patterns)
4. Genes are located along chromosomes (concepts of gene linkage, mapping, distance between genes, causes of genetic disorders) **[CR5]**

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Karyotype Construction and Analysis **[SP1 & 5] [CR4c]**	"A Sickening Sweet Baby Boy" (Maple Syrup Urine Disease/Inherited Diseases)	14.1 "A Genetics Vocabulary Review"	Chapter 11	Research a genetic disorder/disease and report your findings to the class as if you have a child with this disorder/disease **[CR 5, 8]**
Solving Genetics Problems for Different Inheritance Patterns	"Mendel Dreams" (The Beginning of Genetics)		Chapter 12	
Pedigree Analysis **[CR 4a, b, c] [SP 1, 2, 5, 7]**	"The Death of Baby Pierre" (A Genetic Mystery)	14.3 "A Quick Guide to Solving Genetics Problems"		
Genetics of Fast Plants **[SP 2 & 5] [CR6]**	"You are not the Mother of Your Children"	14.4 "How can you determine all the possible types of gametes?"		
	"It's All Green to Me: Genetics Edition" (Pedigrees and Punnett Squares)	15.1 "Solving Problems When the Genetics are Known"		
	"Those Old Kentucky Blues" (Kentucky Blue People)	15.2 "Solving Problems When the Genetics are Unknown"		
		15.3 "How can the mode of inheritance be determined experimentally?"		

<u>Unit 6</u>: Gene Activity and Biotechnology (15 Days) [CR2]

Big ideas: 1, 2, 3, 4

Enduring Understandings:

1.A Change in the genetic makeup of a population over time is evolution

2.C Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.

2.E Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.

3.A Heritable information provides for continuity of life.

3.B Expression of genetic information involves cellular and molecular mechanisms.

3.C The processing of genetic information is imperfect and is a source of genetic variation.

4.A Interactions within biological systems lead to complex properties.

Chapters:

Chapter 13: DNA: The Molecular Basis of Inheritance
Chapter 14: Gene Expression: From Gene to Protein
Chapter 15: Regulation of Gene Expression
Chapter 17: Viruses (including Bacteria)
Chapter 18: Genomes and Their Evolution

Lecture and Discussion Topics:

1. DNA is the genetic material (historical experiments, DNA structure and function, DNA replication)
2. Flow of genetic information (genetic code, role of other polymers, transcription, translation)
3. Mutations
4. Gene expression (operon systems in prokaryotes, eukaryotic gene expression)
5. Restriction enzymes, plasmids, transformation
6. DNA technology (how gel electrophoresis works and applications of this technology) **[CR5]**

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
DNA Necklace **[BI3]**	"The Transforming Principle: Identifying the Molecule of Inheritance" (Classic Experiments in Molecular Biology)	16.1 "Is the hereditary material DNA or protein?"	Chapter 13	Read Watson and Crick's original Nature article from 1953 **[CR8]**
DNA and Histone Model/ Heredity and Telomeres http:// learn.genetics.utah.edu		16.2 "How does DNA replicate?"	Chapter 14	Rosalind Franklin Journal Articles "Light on a Dark Lady" and "Mystery Woman: The Dark Lady of DNA"**[CR8]**
Candy DNA Model **[BI3] [CR 4c] [SP1]**	"From Cow Juice to a Billion Dollar Drug with Some Breakthroughs in Between" (Biotechnology of Human Insulin)	17.1 "Modeling transcription and translation: what processes produce RNA from DNA and protein from mRNA" **[SP 1, 3, 4, 5, 6] [CR4c]**	Chapter 15	"Super Protein" Poster **[BI3] [CR4c]**
Biotechnology Lab 1: Bacterial Transformation **[BI 3] [SP 2, 3, 4, 5, 6] [CR6 & 8]**	"The Case of the Tainted Taco Shells: Advanced Edition (Genetically Modified Plants)	18.3 "How is gene activity controlled in eukaryotes?"	Chapter 17	Supplemental Journal Article: Watson and Crick's original Nature paper from 1953 **[CR8]**

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Biotechnology Lab 2: Gel Electrophoresis and Forensics (Simulation and Experimentation) **[BI 3] [SP 2, 3, 4, 5, 6]**	Tougher Plants: Beating Stress by Protecting Photosynthesis in Genetically Modified Plants"	18.1 Gene expression in bacteria"	Chapter 18	Supplemental Magazine "Human Genome Project"
Lab: BLAST (**CR 4A)**		18.2 "Modeling the lac and trp operation systems: How can gene expression be controlled in prokaryotes?" **[SP 1, 6]**		"Bacteria Wanted Poster" **[CR4a and 8]**
Gel Electrophoresis Virtual Lab http:// learn.genetics.utah.edu/		20.2 "How can PCR be Used to Amplify Specific Genes"		"PCR" Article by Kary Mullis
Lab Activities	**Case Studies**	**Practicing Biology**	**Active Reading Guides**	**Project**
		20.1 "How and why are genes cloned into recombinant DNA vectors?"		
		21.1 "How can we discover the sequence of an organism's DNA?"		

<u>Unit 7</u>: Evolution and Phylogeny (20 days) [CR2]

Big ideas: 1, 3, 4

Enduring Understandings:

1A. Change in the genetic makeup of a population over time is evolution.
1B. Organisms are linked by lines of descent from common ancestry.
1C. Life continues to evolve within a changing environment.
1D. The origin of living systems is explained by natural processes.
3A. Heritable information provides for continuity of life.
3C. The processing of genetic information is imperfect and is a source of genetic variation.
4C. Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Chapters:

Chapter 19: Descent with Modification
Chapter 20: Phylogeny
Chapter 21: The Evolution of Populations
Chapter 22: The Origin of Species
Chapter 23: Broad Patterns of Evolution
Chapter 24: Early Life and the Diversification of Prokaryotes
Chapter 25: The Origin and Diversification of Eukaryotes

Lecture and Discussion Topics:

1. How natural selection serves as a mechanism for evolution
2. Scientific evidence supporting evolution
3. Hardy-Weinberg concept
4. How allele frequencies can be altered in a population
5. Concepts of speciation
6. Origin of Life and Fossil Records
7. Events in the "history of life" (origin of single-celled and multicellular organisms; mass extinctions; adaptive radiations)
8. Bacterial and Viral Structure and Activity

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology	Active Reading Guide	Project
Grebe Grebe Mating **(CR4A)**	"As the Worm Turns" (Speciation and the Apple maggot fly)	22.1 "How did Darwin view evolution via natural selection?	Chapter 19	NOVA PBS video series on Evolution: "Darwin's Dangerous Idea", "Great Transformations", "Extinction", "Why Sex?", "The Mind's Big Bang", "What About God?", and "The Evolutionary Arms Race" **[BI 1] [EU 3C] [CR3c, 4a & 5]**
Hardy-Weinberg Population Genetics Lab **[SP 2, 4, 5 & 7] [CR4a, 6]**	"Darwin's Finches and Natural Selection"	23.1 "A Quick Review of Hardy-Weinberg Population Genetics"	Chapter 20	HHMI DVD "Evolution" - followed by class discussion **[CR8]**
Allele and Phenotype Frequencies in Rock Pocket Mouse Populations **[SP 2, 4, 5 & 7] [CR4a, 6]**	"Exaggerated Traits and Breeding Success in Widow birds" (Sexual Selection and Evolution)	23.2 "What effects can selection have on populations?"	Chapter 21	Grey Fossil Museum **[CR4a] [SP6 & 7]**
Cladogram Analysis **[BI 1] [SP 1, 3, 4, 5] [CR6 & 8]**	"I'm Looking Over a White Striped Clover" (Natural Selection)	26.1 "How are phylogenies constructed?"	Chapter 22	Journal Article "Beak of the Finch" - Jonathan Weiner

Lab Activities	Case Studies	Practicing Biology	Active Reading Guide	Project
Constructing a Phylogenetic Tree Using DNA Sequence Data Simulation http://www.accessexcellence.org/AE/ **[SP 1, 4, 5] [CR4a]**	"My Brother's Keeper" (Evolutionary Biology and Animal Behavior)	25.2 "How do we determine the age of fossils and rocks?"	Chapter 23	
Evolutionary Time: The Geologic Time String <http://www.accessexcellence.org/AE> **[SP 7] [CR4a]**		26.1 "How are phylogenies constructed?"	Chapter 24	
Geologic Time Scale Construction **[CR4a]**		26.2 "What is parsimony analysis?"	Chapter 25	
Bacterial Morphology: Microscope Lab				

<u>Unit 8</u> :Diversity in the Biological World: Organism Form and Function (45 days) [CR2]

Big ideas: 1, 2, 3, 4

Enduring Understandings:

1A. Change in the genetic makeup of a population over time is evolution.
1B. Organisms are linked by lines of descent from common ancestry.
2A. Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
2C. Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.
2D. Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment.
2E. Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.
3D Cells communicate by generating, transmitting and receiving chemical signals.
3E. Transmission of information results in changes within and between biological systems.
4A. Interactions within biological systems lead to complex properties.
4B. Competition and cooperation are important aspects of biological systems.

Chapters:

Chapter 5: Cell Signaling
Chapter 32: The Internal Environment of Animals: Organization and Regulation and the Endocrine System
Chapter 35: The Immune System
Chapter 37: Neurons, Synapses and Signaling
Chapter 38: Nervous and Sensory Systems
Chapter 26: The Colonization of Land
Chapter 29: Resource Acquisition, Nutrition, and Transport in Vascular Plants
Chapter 30: Reproduction and Domestication of Flowering Plants
Chapter 31: Plant Responses to Internal and External Signals

Lecture and Discussion Topics:

1. Evolutionary trends (endosymbiosis, adaptations that allowed plants to move from water to land, reproductive adaptations of angiosperms, environmental roles of fungi, animal body plans, progressively complex derived characters in animal groups)
2. Unique features of the angiosperm life cycles
3. Evolution of cell signaling
4. Reception, transduction, and response

5. Apoptosis
6. Origin of cell communication
7. Structure and function of the endocrine system
8. Signal transduction pathways (plant and animal hormones)
9. Hormones and Tropisms in plants
10. Feedback control loops in animals
11. Thermoregulation in animals
12. Structure and function of the human nervous system (neurons, resting potential, action potential, synapses) and immune system

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Glands and Hormones Card Sort	"Diabetes and Insulin Signaling" (Cell Signaling)	11.1 "How are chemical signals translated into cellular responses?" **[CR4c]**	Chapter 5	Research: Can stem cell-based therapy be used in brain and spinal cord injuries? Students will prepare presentations of their findings and responses to questions such as: Should embryonic stem cell research continue to be permitted? Should it be supported by government funding? Do the origins of embryonic stem cell lines make a difference? **[SP 3] [CR4c & 5]**
Virtual Rat Physiology Lab	"It Was a Hot August Afternoon…" (Anatomy and Physiology of the Central Nervous System)	48.1 "How do ion concentrations affect neuron function?"	Chapter 32	Research the Tuskegee Syphilis Experiment and watch "*Miss Ever's Boys"*
Pathways with Friends http:// learn.genetics.utah.edu		48.2 "How do neurons function to transmit information?"	Chapter 35	

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
"Jumpin' the Gap" http://learn.genetics.utah.edu **[SP 1, 7] [CR4d]**		48.3 "What would happen if you modified a particular aspect of neuron function?"	Chapter 37	
Webquest "Action Potentials for Dummies" **[CR 4c]**		49.1 "How is our nervous system organized?"	Chapter 38	
Flowers for Freddy/ Flower Forensics **[SP1] [CR 7]**		Activity 29.1/30.1 "What Major Events Occurred in the Evolution of the Plant Kingdom?"	Chapter 26	
Seed, Leaf, and Fruit ID Labs **[SP1] [CR 7]**		Activity 29.3/30.3 "How are the Events in Plant Evolution Related?"	Chapter 29	
Dendrochronology Lab **[SP 1 & 5] [CR 7]**		Activity 40.1 "How does an Organism's Structure Help it Maintain Homeostasis?"	Chapter 30	
Autoimmune Diseases Web quest		Activity 43.1 How does the immune system keep the body free of pathogens?	Chapter 31	
Observations of Leaf, Stem and Root Cross-sections		40.1 "How does an organisms's structure help it maintain homeostasis?"		

<u>Unit 9</u>: Ecology (15 days) [CR2]

Big ideas: 1, 2, 3, 4

Enduring Understandings:

1A. Change in the genetic makeup of a population over time is evolution.
1C. Life continues to evolve within a changing environment.
2A. Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
2C. Organisms use feedback mechanisms to regulate growth, reproduction and dynamic homeostasis.
2D. Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment.
2E. Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.
3E. Transmission of information results in changes within and between biological systems.
4A. Interactions within biological systems lead to complex properties.
4B. Competition and cooperation are important aspects of biological systems.
4C. Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Chapters:

Chapter 40: Population Ecology and Distribution of Organisms
Chapter 54: Species Interactions
Chapter 42: Ecosystems and Energy
Chapter 43: Global Ecology and Conservation Biology
Chapter 39: Motor Mechanisms and Behavior

Lecture and Discussion Topics:

1. Aspects of animal behavior
2. Aspects of biomes
3. Models describing population growth
4. Regulation of population growth
5. Community interactions
6. Species diversity and composition
7. Community biodiversity
8. Energy flow and chemical cycling in ecosystems
9. Primary productivity
10. Energy transfer between trophic levels

11. Human activities that threaten biodiversity

Possible Activities and Labs:

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
Water Study: How Clean are creeks and streams in our area?	"Mutualism: A Textbook Case"	52.1 "What factors determine climate?"	Chapter 40	Native Wildflowers of the Eastern Forests Portfolio/ Photography Project **[CR 4d]**
Animated Investigation: "How Does the Fungus Pilobolus Succeed as a Decomposer? **[BI 4] [EU 1A] [SP 5, 6, 7] [CR4d]**	"The Wolf, the Moose, and the Fir Tree" (Trophic Interactions"	53.1 "What methods can you use to determine population density and distribution?"	Chapter 54	Most "Unwanted" Species Powerpoint Presentation
Animated Investigation: "How do Abiotic Factors Affect Distribution of Organisms?" **[BI 4] [EU 1A] [SP 5, 6, 7] [CR4d]**		53.2 "What models can you use to calculate how quickly a population can grow?"	Chapter 42	Article: "Invasive Plant Suppresses the Growth of Native Tree Seedlings by Disrupting Belowground Mutualisms", by Kristina Stinson and others. Students will explore the research-based study and analyze the data presented for its meaning. **[SP 5] [CR4d & 5]**

Lab Activities	Case Studies	Practicing Biology	Active Reading Guides	Project
My Ecological Footprint www.footprintnetwork.org **[CR5]**		54.1 "What do you need to consider when analyzing communities of organisms?"	Chapter 43	Class Discussion: In order to improve species richness and avoid eutrophication, how might you determine how much phosphate to add to a pond? **[SP 3, 4] [CR4d & 5]**
Oh Deer! (Competition Lab) **[CR4d]**		54.2 "What effect can a disturbance have on a community?"	Chapter 39	
Pill bug and Fruit Fly Behavior Lab **[BI 4] [SP 1, 2, 3, 4, 5, 6, 7] [CR6 & 8]**		54.3 "How can distance from the mainland and island size affect species richness?"		
Biome model to demonstrate biological processes and concepts across scales. **[BI 4] [EU 2.A] [SP 7] [CR3d & 4d]**		55.1 "What limits do available solar radiation and nutrients place on carrying capacity?"		
Dissolved Oxygen and Primary Productivity/How does temperature affect the dissolved oxygen concentration in samples of water? **[BI 4] [SP 1, 2, 3, 4, 5, 6, 7] [CR6]**				

AP Test Review (1 week) Review will take place during class and on a Saturday before the exam

Grading Procedure:

As you can see, there is a great deal of material covered in this class. There will be homework **EVERY NIGHT.** Students must work hard to keep up. Remember, this is a college-level course. I am available for homework assistance each morning from 7:30-8:00. A tutoring schedule may possibly be provided at a later date for after-school sessions. Student grades will be determined using a total points system. The final grade is NOT the average of each grading period. Assignments not completed by the end of each grading period will be given a "temporary" zero until they are made up. The corrected grade will be reflected on the *next* grade report. Parents are highly encouraged to monitor their student's progress online daily. I will update grades 2-3 times per week. Please feel free to contact me if you have concerns about a posted grade.

Points can be earned as follows:

1. Tests……..400 points

    To better prepare students for the comprehensive AP Biology Exam in the spring, students will not be taking chapter tests. A comprehensive test will be given at the end of each major unit of study.

2. End of Course Test……15% of grade

    Students will take an end of course test on the fall term final exam day. Students who take the AP Biology Exam will be exempt from the spring term final exam

NEW POLICY: Seniors who have 2 or fewer absences and maintain an average of 80% or above will be exempt from the fall EOC Test. This does NOT apply to the AP Biology Exam in the spring.

3. Quizzes…….minimum 100 points

    Quizzes will be announced in advance for student preparation

4. Homework Assignments……points vary

Assignments will be randomly collected and graded. Late papers will NOT be accepted except in the case of an excused absence.

5. Projects…….minimum 100 points

Most major units of study will have a group or individual project. Late projects will NOT be accepted except in the case of an excused absence.

6. Lab Reports/Mini Posters…….minimum 100 points

7. Extra Credit

Extra credit opportunities will be determined by the teacher and NOT by the student. Reports will NOT be considered for this purpose. Methods to earn extra credit include:

A. Miscellaneous Extra Credit…….maximum 100 points per term

Lab Setup/Cleanup (before or after school under the teacher's supervision) - points vary depending on the time on task

Providing Lab Supplies, Specimens, Water Samples, etc…….points vary depending on the item

B. Hall Pass Coupons……..maximum 30 points

Students will receive 3 hall pass coupons at the beginning of each term. These coupons will be kept in a notebook at my desk. They are to be used to leave the room for the restroom, locker, etc Coupons not used can be redeemed at the END of the term for points.

C. Lab Safety License……..maximum 30 points

After turning in a signed safety contract, students will receive a laboratory license. It must be kept in their notebook (pencil zipper bag) at all times. Students will lose a punch on the bottom of their lab license for violating lab safety

rules. The license is revoked after losing 3 punches and so are lab privileges. Students will turn in their license at the END of each term. Students will earn 10 points for each remaining punch.

8. Academic Bonus Points

At the completion of the 1st term (Honors Biology II), each student will receive a 3% bonus on their average.

NEW POLICY: Students will receive a 5% bonus at the end of the 2nd term ONLY if they TAKE the AP Exam

Makeup Work:

Students should try to be present and prepared for each class. Students are responsible for all makeup work. Failure to makeup work in a timely manner will result in a zero for that grade. Please check my website for lesson plans and assignments that you missed. Directions for making up assignments are as follows:

1. Homework Assignments and Projects - if it was assigned prior to your absence and you were aware it was due, you must turn it in the day that you return at the BEGINNING of class.

2. Tests/Quizzes - You have 3 days to setup a time to makeup the work before school (7:35AM) or after school (3:35PM). Failure to do so will result in a zero.

3. Worksheets and other Classroom Assignments - ask the teacher and complete these within 3 days of your absence

4. Lab Activities - NO MAKEUP! These points will NOT count against the student. Labs are vital to the understanding of classroom material and take a great deal of teacher preparation, therefore, please try to be be present for every lab activity. Remember questions from the lab activities will be addressed on the AP Biology Exam.

Behavior Expectations:

Students must be….

1. In the classroom headed for your assigned seat BEFORE the bell rings.

2. Prepared for class. (Textbook, binder, and supplies must be brought to class daily)

3. Respectful to the teacher, peers, and guests. (No behavior that is disruptive to my instruction or the learning of others will be tolerated)

4. Followers of all school rules and policies.

Plagiarism

According to Harbrace Handbook, 15th edition:

Plagiarism is defined as "presenting someone else's ideas, research, or opinion without proper documentation, even if it has been rephrased. It includes, but is not limited to the following:

1. Copying verbatim all or part of another's written work;

2. Using phrases, figures, or illustrations without citing the source;

3. Paraphrasing ideas, conclusions or research without citing the source;

4. Using all or part of a literary plot, poem or film without attributing the work to the source.

Consequences of Plagiarism:

Plagiarism is a form of stealing and academic fraud. On the first offense, students who are found guilty will receive a zero on the assignment. Parents will be notified. Second and subsequent offenses will be handled by the administration and parents notified again.

If you have further questions concerning the details outlined in these information sheets I will be glad to discuss them with you. In addition, if you do not approve of a specific resource listed on this syllabus, please make your request to me in writing and an alternative assignment and/or materials will be provided. The request must include your name, the student's name, the specific activity/materials in which you do not want your student to participate to which you do not want them exposed, and finally the nature of your objection.

I am looking forward to working with your student. I have a life-long passion for learning and working with children at this developmental age. I am honored to be a part of your child's education. Please support and encourage them at home.

Your signatures below indicate that you have read and understand the course information sheets.

STUDENT _____

PARENT/GUARDIAN _____