Advanced Placement Biology

Curricular Requirements
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 understandings within the Big Idea 1 to at least one other Big Idea.
CR3b Students connect the enduring understandings within the Big Idea 2 to at least one other Big Idea.
CR3c Students connect the enduring understandings within the Big Idea 3 to at least one other Big Idea.
CR3d Students connect the enduring understandings within the 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 social 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 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 the 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.

Quarter 1 Units:	Quarter 2 Units:	Quarter 3 Units:	Quarter 4 Units:
1. Chemistry & Biology Review 2. Biochemistry 3. Cell Biology	1. Cell Biology 2. Genetics & Biotechnology 3. Evolution	1. Evolution 2. Anatomy 3. Botany	1. Botany 2. Ecology 3. Review

Course Overview and Teaching Strategies

The AP Biology curriculum I teach is diverse and kinesthetic to stimulate and captivate young learners. It's also fast-paced and requires in-depth coverage of the material so that the students receive a university-quality biology education. The course starts out with a tight, teacher-driven structure that demands student interaction and establishes the expectations that will be made throughout the year. As the year progresses, the structure gradually becomes student-driven—class and homework assignments are turned over to the students so that they take more and more responsibility for their education.

The four Big Ideas provide a framework for all content and skills taught during the AP Biology course and it is upon these ideas that all content is explored and connected. The foundation concepts of the Big Ideas—evolution, cellular processes, inheritance and interdependence—are touched upon in each class period as student recognize what they already understand about their world then weave in details, depth and specific examples through class activities and experiences. My students are reminded of the Big Ideas in daily warm-up exercises, weekly essay writing practice and through the Socratic discussions and reflection questions which are a part of each class period. **[CR2]**

The role of a teacher is to open the world up to students and help them decipher it as they explore it. Translated into daily teaching, this means that I help students interpret their textbook, explore and experience the topics of study, draw connections to other topics and resolve any misconceptions. I do not outline the textbook material for the students, nor do I cover every concept in class. Instead, the students take on that responsibility. Class time is best spent accomplishing things the students have not yet been trained to perform on their own and engaging in activities that require specialized equipment or group interactions. Typical activities during class include laboratory experiences, games, simulations, building of dynamic or static models, debates, group discussions, scavenger hunts, exploration of concepts through experimentation, integrating the material with the students' daily life and experiences, applying concepts to other areas of science, and utilizing outside resources to schedule field trips and visits from guest speakers. Eighty to ninety per cent of class time is spent with students involved in hands-on explorations in which they are at the center of the learning experience, and the remaining time is spent doing traditional seated work (for example, taking a multiple-choice test, writing down notes, etc.). **[CR5, CR6, CR7, CR8]**

One valuable technique I use extensively to foster student-driven learning is the Socratic method of teaching. Socratic discussions are question-and-answer sessions in which the teacher leads the students to discover the overall concepts or the underlying principles of a topic through deductive reasoning. The discussion starts with a familiar idea that is built upon slowly and methodically, until all of the pieces are in place for understanding of a new and more developed concept to take place. This method takes the place of a traditional lecture and

demonstrates science as a process that is aided by the application of thought rather than an accumulation of facts that must be memorized and stored for timely retrieval. Socratic discussions are integrated throughout the class period into kinesthetic activities as a device by which students share personal experiences, articulate what they understand, connect what they are discovering to the Big Ideas and transfer concepts across scales and between content areas. After a Socratic discussion, as a form of assessment, I often ask students to summarize what they have learned. **[CR8]**

A second technique that I employ is use of a wide variation in teaching modalities. Even though it may seem more efficient to present facts to students through direct means such as a lecture, having students transcribe and memorize dictated information is much less effective and profitable than allowing the students to create their own memories through personal experience using critical thinking activities. Open exploration and personal encounters with science allow higher level thinking to occur as the students struggle with the material and are able to formulate their own conclusions regarding processes, interactions and scientific theories. For example, a certain proportion of students will easily be able to memorize the anaerobic pathways for breaking down glucose if the information is presented to them directly in notes, text or lecture. However, if my students are given an opportunity to vary the species of yeast, the source of carbon chains, the temperature, pH and concentrations of solutions, I can guarantee that all my students will formulate much broader connections between this topic and other experiences. Furthermore, each student's unique experience, when shared with the larger group, contributes to everyone's greater understanding of the concepts that were explored. **[CR7, CR8]**

My curriculum also incorporates a number of techniques that help keep the students motivated, so that they maintain the stamina needed to cover the depth and breadth of this course. Many of these techniques remove the teacher from the spotlight, so that the students are pressed to perform. For instance, while studying a process (such as meiosis, photosynthesis, cell signaling, the specific immune response, etc.), students are often split into groups and asked to create an accurate simulation of the process with appropriate props and full narration that includes the necessary scientific terms. Techniques such as these push students to develop verbal skills using the language of science while presenting detailed examples of cellular or molecular phenomena. **[CR8, SP1]**

In an ongoing effort to teach study skills, students are asked to each take a turn going to the board to be the class note-taker for a day, so that I can monitor and correct their note-taking skills. Students are taught how to use primary literature and how to evaluate reputable sources while investigating social interest topics. For research projects as well as laboratory investigations, students must report their findings back to their peers (or the larger school community) throughout the school year using different formats. **[CR5, CR8]**

Although it is not required, I try to expose students to the work scientists perform on a day-to-day basis so that they understand the contributions of science as well as the perspective scientists share as a community. I take the entire class on several field trips during the year to integrate themes or reinforce specific topics and to explore career opportunities in the diverse field of biology and I bring in guest speakers to discuss topics and propose career paths in science. Each year I invite a range of different science professionals (a botanist, an entomologist, an endocrinologist, a pathologist, a neurologist, an immunologist, an STD educator, a midwife and others) to come answer questions on their specialty and to teach students about their daily work and the route they took to obtain their job.

Time Spent on Task

My AP Biology class has a class period of 60 minutes five times per week. My class has an additional 30 minutes of class time (creating 90 minute periods) once every three weeks for an entire week. These extended weeks occur about 13 times prior to the AP test. We meet for a total of 300 minutes each week for 34 weeks per school year prior to the AP Biology Exam (with an additional 150 minutes per week every third week). Homework, including Free Response easy writing practice, textbook reading assignments and weekly audio-visual assignments are handled outside of class time.

Textbook, Course Materials and Resources

Student resources that are required for this class include:

Reece, Jane, et al., *Campbell Biology*, 8th Edition, Pearson Benjamin Cummings, 2008. **[CR1]**

AP Biology Investigative Labs: An Inquiry-Based Approach, The College Board, 2012. **[CR6]**

Pechenik, Jan, *A Short Guide to Writing About Biology*, Harper Collins College Publishers, 2009.

Teaching resources I use to support my daily instruction and planning:

AP Biology Daily Lesson Plans* curriculum, Kristen Daniels Dotti, Catalyst Learning Curricula, LLC, 2005, 2008, 2012.

www.campbellbiology.com Web site for animations, audio-visual support to enhance instruction.

www.pbs.org for full-length videos, clips and other audio-visual support to enhance instruction.

Unit Information

There are four Big Ideas required by the AP College Board that are the framework of modern biology:

Big Idea 1: The process of evolution drives the diversity and unity of life.

Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.

Big Idea 3: Living systems store, retrieve, transmit and respond to information essential to life processes.

Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

Under each of these Big Ideas, certain enduring understandings, essential knowledge, learning objectives and science skills have been delineated as information or skills necessary for scientific literacy. The Big Ideas are covered both directly and indirectly in every unit of the curriculum using textbook reading, Socratic and group discussions, guest speakers, laboratory and field experimentation, debates, Free Response essay questions, model building, games, simulations of processes, research projects and other student-centered activities. **[CR2]** Because these Big Ideas unify all the areas of science, they are used as a platform to help the students relate new information with what they have already experienced in life. Below is a summary of the major activities, labs, projects and strategies used during the study of each topic focused on these themes. Enduring Understandings (EU) that are associated with a particular Essential Knowledge requirement are given after the description of each activity. Because it is important for students to recognize the concepts, theories and processes that unite all life, each of the Big Ideas are connected to at least two other Big Ideas at multiple points during each unit of study so students can clearly see how these concepts are interrelated. **[CR3a, CR3b, CR3c, CR3d]**

Lab Component

We begin the year with several modeling and wet lab experiments that are structured with a concrete procedure dictated to the students and then students are encouraged to use a similar procedure to explore further with guidance. With these first experiments students learn to write a hypothesis and a null hypothesis, graph and analyze data, and draw conclusions based on data and scientific knowledge. Students move between structured and guided lab experiments through the early part of the fall semester as they explore processes and phenomena in biochemistry, cell biology and genetics and then use these experiences to extend the investigations into an experiment of their own design. Gradually students begin to write more and more of the investigatory procedure learning to utilize controls and maximize sample size while staying within the limits of time and equipment availability. By the spring semester students are completely in charge of formulating a question, hypothesis, and procedure for investigations of their choosing for the majority of the experimentation performed in physiology, botany and ecology. At least eight of the *AP Biology Investigative Labs: An Inquiry-Based Approach* experiments are performed as well as many additional lab experiments that cover other topics using open inquiry-based methods of learning, technology, and the resources at hand and in the local environment. **[CR6]** More than 25% of class time is spent on laboratory investigations and the development of the seven Scientific Practices (see [CR6] designations above). **[CR7]** At least two laboratory investigations will be used to address each of the four Big Ideas. **[CR6]** I have access to all of the equipment, chemicals and materials needed for my students to perform the required laboratory investigations that I have included in my syllabus.

Dry labs or activities that involve modeling of processes and scientific phenomena are listed above under the “Major Assignments” of each unit and are not included in the list of “wet” labs below. The “wet” labs below are those inquiry-based investigations that require the use of live organisms and/or chemicals and traditional field and/or laboratory equipment. For a

detailed description of each wet lab, please see the listing under the “Major Assignments” heading for the appropriate unit.

Science Practice: **[CR6, CR7]**	Big Idea	1: Use representation and models to communicate and solve scientific problems	2: Use mathematics appropriately	3: Engage in scientific questioning to extend thinking or to guide investigations	4: Plan and implement appropriate data collection strategies	5: Perform data analysis and evaluation of evidence	6: Work with scientific explanations and theories	7: Connect and relate to knowledge across various scales, concepts and representation in and across domains
Lab on Bond Properties	4					X	X	
Lab on Macromolecules	4			X	X	X	X	X
Lab 13 Enzymes	4	X	X	X	X	X	X	X
Lab 4 Diffusion and Osmosis	2	X	X	X		X	X	X
Lab 6 Cell Respiration	2	X	X	X	X	X	X	X
Lab on Pigment Absorption Spectrum	4	X	X			X	X	
Lab 5 Photosynthesis	2	X	X	X	X	X	X	X
Lab 7 Mitosis and Meiosis	3	X	X	X	X	X	X	X
Lab1 Artificial Selection	3	X	X	X	X	X	X	X
Lab 8 Bacterial Transformation	3	X	X			X	X	
Lab on Extracting DNA	3	X					X	X
Lab 9 Restriction Enzyme Analysis	3		X	X	X	X	X	X
Lab 2 Hardy-Weinberg	1	X	X			X		
Lab on Skull Comparisons	1	X	X	X	X	X	X	X
(Enhanced version of Lab 3) Sequence Comparisons	1	X		X	X	X	X	X
Lab on Fertilization-Development	2	X	X	X	X	X	X	X
Lab on Digestive Enzymes	4	X	X	X	X	X	X	
Lab on Respir and Cardio Systems	2	X	X	X	X	X	X	
Lab on Comparative Anatomy	2					X	X	X
Lab 11 Transpiration in Plants	4	X	X	X	X	X	X	X
Lab on Soil Chemistry	4					X	X	
Lab on Plant Stress Factors	4	X	X	X	X	X	X	X
Lab on Plant Hormones	2	X	X	X	X	X	X	X
Lab on Diversity and Abundance	4		X	X	X	X	X	X
Lab 10 Energy Flow	4	X	X	X	X	X	X	X
Lab 12 Habitat Selection	4	X		X	X	X	X	X

Student Communication and Assessment

All students are responsible for taking notes while they read each chapter, finishing all homework and labs and activities and watching assigned videos outside of class. Often, students will be asked to create compare-and-contrast charts, graphs of class data, oral or written summaries and supporting arguments for topics covered in class. Each oral, kinesthetic and written assignment is given a particular point value according to the intensity, time commitment and critical thinking required and included in the student's overall grade.

In an effort to help students relate content across domains and to allow them to see the relationships between disparate concepts by realizing their connection to the Big Ideas, students practice summarizing what they understand using Free Response essays. **[CR8]** Students write 1-5 practice Free Response essays each week on a topic that either relates directly to the chapter of study or a review of a previous topic (using released AP Biology Exam questions). Students grade their own essays using the official grading rubrics, trade and grade with a partner or grade the essays as a lab group so that they can read what other students, given the same learning opportunities, have written. I also grade these essays after they have been peer-evaluated to ensure that the students are upholding the standards presented in the published rubric. Past AP Biology Exam Free Response essays are used as often as possible so that students are challenged to integrate concepts from all four Big Ideas and so they begin to understand how and when points are awarded on the actual exam.

Students perform at least two major research projects each year so they can learn how to assess the accuracy and reliability of a source, how to properly cite a source and how to present a literature summary in the style consistent with college-level surveys. Upon completion of any student-designed laboratory investigation, students must report back to the class the final conclusions of the experiment they conducted using a poster-size presentation of their graph and statistics to support their conclusions. This exercise helps students to develop the ability to synthesize, summarize and communicate what they have learned while the rest of the class benefits from their experiences. In addition to verbal presentations, students are required to write at least two full-length lab reports for two of the student-designed investigations, using the requirements and parameters suggested in *A Short Guide to Writing About Biology* by Jan Pechenik. Lab investigations that are guided (rather than student-designed) will be presented in a partial lab report that focuses on the graph, statistical analysis and conclusions. A variety of formats will be used for the final draft of each full-length or partial lab report (i.e., written paper, a brochure, a poster presentation, infomercial or a Power Point presentation) to allow students to master additional study and technology skills. **[CR8]**

Frequent quizzes are used to check whether students are being diligent in their out-of-class reading and to encourage students to come to class ready to perform. Pre-lab quizzes check to see if the students are prepared to interpret what they are about to experience. Tests with a multiple-choice format cover several chapters at a time so that students become accustomed to the style and rigor they will experience on the AP Exam. Timing and topics covered in each test are noted on the above unit summary.

Unit Name: Biochemistry **Time Frame:** 15 class days

Big Ideas: 1, 2, 3, 4

Connected to Enduring Understandings (EU):

Big Idea 1: A., B., C., D.
Big Idea 2: A., C., D., E.
Big Idea 3: A.
Big Idea 4: A., B., C.

Specific Science Practices (SP) and Essential Knowledge requirements associated with each Enduring Understanding (EU) are detailed after each major assignment description listed below.

Major Assignments:

The Study of Life

- Activity/Dry Lab – What is alive? (EU 1.B.1., 1.C., 1.C.1., 1.C.2., 1.C.3., 1.D., 1.D.1., 1.D.2., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.C.2., 2.D., 2.E., 3.A.1., 4.A., 4.A.1., 4.A.2., 4.A.6., 4.B.1., 4.B.2., SP 6, SP 7).
- Goal Setting – Study skills, time management and planning for the course.
- Activity/Dry Lab – Critiquing Scientific Experiments (SP 3, SP 6).
- FR Essay Practice – which students are introduced to writing Free Response essays comparing Kingdoms (EU 1.A., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.1., 3.A.).
- FR Essay Practice –, in which students design a scientific experiment to evaluate the biodiversity and abundance of a species (EU 4.C., 4.C.3., 4.C.4., SP 4).
- Audio/Visual/Website – Education.Berkeley.edu, Evolution 101 origin of life information.

The Chemical Content of Life

- Activity/Dry Lab – Atoms and Bonding Lab (EU 4.A., 4.A.1., 4.A.2., 4.B.1., 4.C., 4.C.1., SP 1).
- Activity/Dry Lab – 3-D Model Building Activity (EU 4.A., 4.A.1., 4.A.2., 4.A.6., 4.B.1., 4.C., 4.C.1., SP 1).
- FR Essay Practice – Radioisotope Essay (EU 4.A., 4.A.1., 4.A.6., 4.B.1., 4.B.2.) **[CR5]**

Water and the Fitness of the Environment

- Lab – Comparing Bond Properties (EU 1.D.1., 2.A., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.B.1., 4.C., 4.C.1., SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Scientific Thinking and Defense of a Concept (EU 1.D., 1.D.1., 1.D.2., 2.A., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.A.6., 4.B.1., 4.B.2., 4.C.1., SP 6, SP 7).
- Lab – Students prepare sucrose solutions for AP Biology Lab 4 to review molarity, concentration, solutes and solvents (SP 2, SP 4).
- Visual/Website pH simulation – students manipulate various variables to study the factors influencing pH http://phet.colorado.edu/en/simulation/ph-scale

Carbon and the Molecular Structure of Life and the Structure and Function of Macromolecules

- Activity/Dry Lab – Organic Molecule Pattern Matching Activity (EU 2.A., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.B.1., 4.C., 4.C.1., SP 1).
- Project – Functional Groups (EU 2.A., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.B.1., 4.C., 4.C.1., SP 1).

- Audio/Visual/Website – students use the website to explore the building blocks of living things and use quizzes to check for understanding http://mw.concord.org/modeler1.3/mirror/biology/treeoflife.html
- Activity/Dry Lab – Macromolecule Monomer/Polymer Building (EU 4.A.1., 4.A., 4.A.2., 4.A.2., 4.A.4., 4.A.6., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 1).
- Lab – protein, lipids, carbohydrates and nucleic acid (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.A.4., 4.A.6., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 4, SP 5, SP 6). **[CR6, CR7]**
- Study skills –compare and contrast chart for macromolecules (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.A.4., 4.A.6., 4.C., 4.C.1.).
- Activity/Dry Lab –create a dichotomous key to identify macromolecules (EU 2.A., 4.A.1., 4.A.2., 4.A.4., 4.C., 4.C.1.).
- FR Essay Practice –where students describe the chemical bonds used to create a functional protein (EU 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B.1., 4.B.2., 4.C.1.).
- Audio/Visual/Website – SumanasInc.com watch “Heat Changes Protein Structure video.
- Audio/Visual/Website – Fold.It/portal/ use the rules of R-group interactions to fold real protein chains.

An Introduction to Metabolism

- Discussion on energy, the transfer of energy from one chemical to another, and endothermic and exothermic reactions (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.A.4., 4.A.6., 4.B.1., 4.B.2.).
- Modeling – Models of proteins (EU 2.D., 2.D.1., 2.D.3., 3.C., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 1). **[CR3d.]**
- FR Essay Practice – Students make supported hypotheses on the reaction rates of enzymes with differing substrate concentrations, temperature, pH, activators and inhibitors (EU 4.A., 4.A.1., 4.A.2., 4.A.4., 4.A.6., 4.B.1., 4.B.2., 4.C., 4.C.1.).
- FR Essay Practice –students analyze a laboratory experiment using protein enzymes (EU 2.A.3., 4.A., 4.A.1., 4.A.2., 4.A.6., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 5).
- AP Lab 13 – Student-designed enzyme reaction experiments (EU 2.A.3., 4.A., 4.A.1., 4.A.2., 4.A.4., 4.A.6., 4.B.1., 4.B.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6]**

Students must read chapters 1-5 from their textbook and take notes which will be turned in for a grade.

Quizzes are given for each chapter.

Test on these topics contain multiple-choice and short-answer questions and one released Free Response Essay question from the College Board archive of released exam questions.

Unit Name: Cell Biology **Time Frame:** 42 class days

Big Ideas: 1, 2, 3, 4

Connected to Enduring Understandings (EU):

Big Idea 1: A., B., C., D.
Big Idea 2: A., B., C., D., E.
Big Idea 3: A., B., C., D., E.
Big Idea 4: A., B., C.

Specific Science Practices (SP) and Essential Knowledge requirements associated with each Enduring Understanding (EU) are detailed after each major assignment description listed below.

Major Assignments:

A Tour of the Cell

- Lab – Introduction to cells and microscope use (EU SP 2, SP 4).
- Activity/Dry Lab – Model of a prokaryotic cell (EU 1.B., 1.B.1., 2.B., 3.A.1., 4.A., 4.A.2., 4.A.4., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 1).
- Activity/Dry Lab – Students build a model of a eukaryotic cell (EU 1.B., 1.B.1., 2.B., 2.B.3., 3.A.1., 4.A., 4.A.2., 4.A.4., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 1).
- Activity/Dry Lab – Cytoskeleton Activity (EU 1.B.1., 2.B.2., 4.A., 4.A.1., 4.A.2., 4.A.4., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 1).
- FR Essay Practice – Students write a practice essay on the topic of cell size and how form can limit the function and function can limit the form (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 4.A.2., 4.A.6., 4.B.1., 4.B.2.).
- FR Essay Practice –comparing and contrasting prokaryotic and eukaryotic cells (EU 1.A.4., 1.B., 1.B.1., 2.B., 2.B.1., 2.B.2., 2.B.3, 4.A., 4.A.2., 4.A.4., 4.B.1., 4.B.2., 4.C., 4.C.1.).
- FR Essay Practice – describing and defending the endosymbiont theory (EU 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.1., 1.C.2., 1.D., 1.D.1., 1.D.2., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.3, 4.A., 4.A.2., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 6, SP 7).
- Prokaryotic vs. Eukaryotic Cells Comparison (EU 1.A.2., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.1., 1.D., 1.D.1., 1.D.2., 2.B., 2.B.1., 2.B.2., 2.B.3, 3.A., 3.A.1., 4.A.1., 4.A.2., 4.B., 4.C., 4.C.1., 4.C.2.).
- Audio/Visual/Website – University of Utah, Learn Genetics, Size and Magnification interactive Website.

Membrane Structure and Function

- Demonstration – diffusion
- Lab – Students perform AP Biology Lab 4 using various student-directed experiments to explore the properties and rates of diffusion and osmosis with various substances (EU 1.B.1., 2.A., 2.A.3., 2.B., 2.B.1, 2.B.2, 2.B.3, 2.D., 4.A., 4.A.4., 4.A.6., 4.B.1., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Lab – Egg Lab (EU 2.A., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C.2., 2.D.1., 4.A., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 2, SP 3, SP 4, SP 5, SP 7). **[CR6, CR7]**

- Activity/Dry Lab – Cell Membrane (EU 1.B.1., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D.1., 3.B.1., 4.A., 4.A.1., 4.A.2., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., SP 1).
- Calculations – Water Potential (EU 2.A., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.2., 4.A.6., 2.D., 2.D.1., 4.A.4., 4.A.6., 4.B.1., 4.B.2., SP 2, SP 3, SP 5, SP 7).
- FR Essay Practice –relating concentration and diffusion rates (EU 2.A., 2.A.3., 2.B., 2.B.1, 2.B.2, 2.D. 4.A.6., 4.B.1., 4.B.2., SP 2).
- FR Essay Practice – defining and describing protein chemistry (EU 1.A.2., 1.B.1, 4.A.1., 4.A.2., 4.A.4., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1.).
- Activity/Dry Lab – Properties of Water, Diffusion & Solutions (EU 2.A., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C.2., 2.D.1., 4.A., 4.A.2., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., SP 1, SP 7). **[CR4b]**
- Audio/Visual/Website – students explore cell structures and processes.

Cellular Respiration

- Oxidation and Reduction Acitivity (EU 1.B.1., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B.2., 2.E., 2.E.1., 2.E.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 1, SP 6, SP 7).
- Glycolysis and Krebs Cycle and oxidative phosphorylation Activity (EU 2.B.3, 2.C., 2.C.1., 2.C.2., 4.A.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 1, SP 6, SP 7).
- Activity/Dry Lab – Cellular Respiration (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D.1., 2.E., 2.E.1., 2.E.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 1, SP 6, SP 7).
- Calculations –energy efficiency (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A.6., 4.B.2., SP 2)
- Lab – Student-directed AP Biology Lab 6, cell respiration (EU 1.B.1., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 4.A., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Lab – Fermentation Lab (EU 1.B.1., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D.1., 2.D., 4.A., 4.A.2., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice – analyzing an experiment on cellular respiration (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 4.A., 4.A.2., 4.A.6., 4.B.2., SP 2, SP 5).
- Audio/Visual/Website – www.JohnKyrk.com which gives a detailed graphic of each step in the processes of cell respiration and photosynthesis with energy use or release tabulated.

Photosynthesis

- Light Reactions Lesson (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B., 4.B.2., 4.C.1., SP 1, SP 6, SP 7).
- Lab – Leaves & Photosynthesis (EU 1.B., 1.B.1., 1.A.1., 1.A.2., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.D., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.4., 4.B., 4.B.1., 4.B.2., 4.C.1., 4.C.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Lab – Plant Pigment Absorption Spectra (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C.1., 4.C.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**

- Activity/Dry Lab – Photosynthesis (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 1, SP 6, SP 7).
- Lab – AP Biology Lab 5 exploring plant pigment chromatography and photosynthesis comparisons using the leaf punch method (EU 1.B., 1.B.1., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C.1., 4.C.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Debate – Photosynthesis Adaptations (EU 1.A., 1.A.2., 1.B., 1.B.1., 1.C., 1.C.1., 1.C.2., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D.3., 2.E., 2.E.1., 2.E.2., 2.E.3., 2.D.2., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 6, SP 7)
- FR Essay Practice – Students write a response to a question comparing CAM and C_4 photosynthesis and photorespiration rates to those of C_3 plants (EU 1.A.1., 1.A.2., 1.B., 1.B.1., 1.C., 1.C.1., 1.C.2., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.2., 2.C.3., 2.D.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- FR Essay Practice – critiquing and analyzing results of a lab experiment on photosynthesis (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 4.A., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 5)
- FR Essay Practice –analyzing data from a laboratory experiment on pigment chromatography (EU 2.A., 2.A.1., 2.A.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C.1., 4.C.2., SP 5).
- Audio/Visual/Website – The Biology Place Lab Bench which has quizzes, animations and interactive lectures covering common cell processes experiments.

Cell Communication Part I (this topic will be revisited in Anatomy and Physiology)

- Activity/Dry Lab – Cell Signaling (EU 1.B., 1.B.1., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., SP 1, SP 6, SP 7).
- Audio/Visual: Watch Bonnie Bassler's TED talk on bacterial cell signals at www.TED.org and use the Dropping Signals game at University of Utah, Learn Genetics Website.

The Cell Cycle, Meiosis and Sexual Life Cycles

- Activity/Dry Lab – mitosis and meiosis (EU 1.B.1., 2.C., 2.C.1., 2.C.2., 2.D., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.C., 3.C.2., 4.A., 4.A.2., 4.A.3., 4.A.6., 4.B.1., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 1, SP 6, SP 7).
- Cancer and the cell cycle (EU 2.C., 2.C.1., 2.C.2., 2.D., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 3.A., 3.C., 3.C.1., 3.C.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 4.A., 4.A.2., 4.A.3., 4.A.6., 4.B.1.).
- Activity/Dry Lab – Haploid and diploid l (EU 1.A.3., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.A., 3.A.2., 3.A.3., 3.C.1., 3.C.2., 4.A., 4.A.2., 4.A.3., 4.A.5., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 7).
- Activity/Dry Lab – asexual vs. sexual reproduction comparison (EU 1.B.1., 2.C., 2.C.1., 2.C.2., 2.D.2., 2.E.1., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.A.2., 3.A.3., 3.C.2., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 6).
- Lab – AP Biology Lab 7, exploring cell division, mitosis and meiosis using student-directed experimentation (EU 1.B.1., 2.E., 2.E.1., 2.E.2., 3.D., 3.D.1., 3.D.2., 3.D.3.,

3.D.4., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.6., 4.B.1., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**

- FR Essay Practice –covering the evolutionary basis of meiosis (EU 1.A.1., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.2., 1.C.3., 2.C., 2.C.1., 2.D., 2.E., 2.E.1., 2.E.2., 3.A., 3.A.2., 3.A.3., 3.C.1., 3.C.2., 4.A., 4.B.3., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- FR Essay Practice – which discusses the cell cycle and regulation of the process of growth, division and death (EU 1.B.1., 2.A., 2.C., 2.C.1., 2.D., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 3.A., 3.A.2., 3.A.3., 3.C.1., 3.C.2., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 4.A., 4.A.3., 4.B.1., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Audio/Visual – Watch *Part I: What Females Want* and *Part II: What Males Will Do* at www.PBS.org.
- Audio/Visual/Website – Play the Control the Cell Cycle Game at the NobelPrize.org Website and interact with Neurofibromin at the University of Utah, Learn Genetics Website.

Students must read chapters 6-12 from their textbook and take notes which will be turned in for a grade.

Quizzes are given for each chapter.

Test on these topics contains multiple-choice and short-answer questions with one released Free Response Essay question from the College Board archive of released exam questions.

Unit Name: Genetics and Biotechnology **Time Frame:** 29 class days

Big Ideas: 1, 2, 3, 4

Connected to Enduring Understandings (EU):

Big Idea 1: A., B., C., D.
Big Idea 2: B., C., D., E.
Big Idea 3: A., B., C., D., E.
Big Idea 4: A., B., C.

Specific Science Practices (SP) and Essential Knowledge requirements associated with each Enduring Understanding (EU) are detailed after each major assignment description listed below.

Major Assignments:

Mendel and the Gene Idea

- Calculations – Mono and dihybrid crosses, Punnett Squares, probability and Mendel's Laws (EU 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., SP 2).
- Lab - AP Biology Lab 1, student-designed experiments using artificial selection in plants to track the phenotypic frequency of a particular trait (EU 1.A., 1.A.1., 1.A.2., 1.A.4., 1.C., 1.C.2., 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., 4.A.2., 4.A.4., 4.C., 4.C.2., 4.C.3., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Audio/Visual/Website – Explore the DNA From the Beginning Website to learn about the origins of nucleic acids and the RNA World.

The Chromosomal Basis of Inheritance

- Activity/Dry Lab – Pedigrees and the inheritance patterns (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., 4.A.2., 4.A.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 5)
- Gene linkage and sex-linkage (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., 4.A.2., 4.A.4., 4.B.1.).
- On-line lab – Karyotyping (EU 1.A.1, 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 3.C., 3.C.1., 3.C.2., 4.B.1., SP 1, SP 5, SP 6).
- Project – Genetic disorder (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 2.D., 2.D.2., 2.D.3., 2.D.4., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 3.B., 3.B.1., 3.B.2., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.2., 4.A.4., 4.B.1., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Calculations – genetic problems (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 2).
- FR Essay Practice – the structure and function of a chromosome (EU 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., 4.A.2., 4.A.4., 4.B.1.).
- FR Essay Practice – analysis of a monohybrid cross with linkage (EU 1.A.4., 1.C., 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., 4.A.2., 4.A.4., SP 2, SP 5)
- Audio/Visual – Watch the movie *Gattaca* and discuss or debate the ethics of genetics testing prior to conception and prior to birth. **[CR5]**

The Molecular Basis of Inheritance

- Calculations – Chi-squared calculations (EU 1.A.4., 1.C., 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., SP 2, SP 5, SP 6).
- Lecture – Genetics History (EU 1.A., 1.A.4., 1.C., 1.C.3., 1.D., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., 4.A.2., 4.A.4.)
- Activity/Dry Lab – DNA and DNA replication (EU 2.B., 2.B.3., 2.E., 2.E.1., 2.E.2., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.C., 3.C.2., 4.A., 4.A.1., 4.A.2., 4.A.4., 4.B., 4.B.1., 4.B.2., SP 1).
- FR Essay Practice – analyzing fruit fly recombination data (EU 1.A.4., 1.C., 1.C.3., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 4.A., 4.A.2., 4.A.4., SP 2, SP 5, SP 6).
- Audio/Visual/Website – Play DNA Games at the NobelPrize.org Website.

From Gene to Protein

- Activity/Dry Lab –Transcription and translation. (EU 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., SP 1, SP 6, SP 7).
- Activity/Dry Lab – Transcription Translation Analogy (EU 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., SP 1, SP 6, SP 7). **[CR4c]**
- FR Essay Practice – potential for continuity and change in the structure of DNA (EU 1.A.3., 1.C., 3.A., 3.A.1., 3.A.2., 3.A.3., 3.A.4., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., 4.C.4.).
- FR Essay Practice –monomer and polymer structure of nucleic acids (EU 1.C., 3.A., 3.A.1., 3.A.2., 3.A.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- FR Essay Practice – analyzing the effect of point mutations on protein products (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 3.A., 3.A.1., 3.C., 3.C.1., 3.C.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., SP 5, SP 7).
- Project –transcription and translation (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- Audio/Visual/Website – Use the Genetic Disorders Library at the University of Utah, Learn Genetics Website and use karyotyping exercises at The Biology Project Website.
- Audio/Visual/Website – Watch “One Wrong Letter” about Tay-Sachs http://www.teachersdomain.org/resource/tdc02.sci.life.gen.onewrong/

Microbial Models: The Genetics of Viruses and Bacteria

- Activity/Dry Lab – viruses (EU 1.A.3., 1.C., 1.C.1., 1.C.2., 1.C.3., 3.A., 3.A.1., 3.B., 3.B.2., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.2., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 1, SP 7).
- Bacterial life cycles and methods of reproduction (EU 1.C., 1.C.3., 2.C., 2.C.1., 2.C.2., 3.A., 3.A.1., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Project – viral and bacterial pathogens (EU 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Activity/Dry Lab – Operons. (EU 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 1, SP 6, SP 7)
- Lab – AP Biology Lab 8, student-directed experiments using bacterial transformation to encourage the inclusion of a gene or set of genes for expression by a host organism (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 2.B., 2.B.1., 2.B.2., 2.E., 2.E.1., 3.A., 3.A.1., 3.A.4., 3.C., 3.C.1., 3.C.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.C., 4.C.1., 4.C.2., 4.C.3., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice – Central Dogma (transcription and translation) and how this process compares the way viruses make proteins (EU 1.B.1., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).

- FR Essay Practice –comparing and contrasting the life cycles of lysogenic and lytic viruses (EU 1.B.1., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.3., 3.A., 3.A.1., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Audio/Visual/Website – Watch Cracking the Code at www.PBS.org.
- Audio/Visual/Website – watch animations regarding lac and trp operons http://bcs.whfreeman.com/thelifewire/content/chp13/1302002.html http://vcell.ndsu.nodak.edu/animations/lacOperon/index.htm

The Organization and Control of Eukaryotic Genomes

- Activity/Dry Lab – gene regulation mechanisms (EU 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- FR Essay Practice – comparing the organization and transfer of genetic material in prokaryotes and eukaryotes, how they replicate, transcribe and translate their genome (EU 1.B., 1.B.1., 1.C., 1.C.3., 2.B., 2.B.3., 2.E., 2.E.1., 2.E.2., 3.A., 3.A.1., 3.A.2., 3.B., 3.B.1., 3.B.2., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3.).
- FR Essay Practice – students must explain the role of several different gene regulation mechanisms (EU 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- Book - Moalem, Sharon and Jonathan Prince, Survival of the Sickest: A Medical Maverick Discovers Why We Need Disease - Read chapter “Methyl Madness”
- Audio/Visual/Website – Use the Epigenetics activities at the University of Utah, Learn Genetics Website.
- Audio/Visual – Watch the video *Ghost in Your Genes* by NOVA at www.PBS.org.

DNA Technology and Genomics

- Lab – DNA from living plant tissue (EU 2.B., 3.A., 3.A.1., 4.A., 4.A.1., 4.A.2., SP 1, SP 3, SP 4, SP 6). **[CR6, CR7]**
- Lab – AP Biology Lab 9, student-directed experiments using restriction enzymes to cut DNA and compare banding patterns between individuals (EU 4.A., 4.A.1., 4.A.2., 4.B., 4.B.1., 4.B.2., 4.B.3.). **[CR6, CR7]**
- Activity/Dry Lab – cancer patient (EU 1.A.3., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.A., 3.A.1., 3.B., 3.B.1., 3.B.2., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.1., 4.A.4., 4.A.6., SP 1, SP 6, SP 7). This activity connects Big Idea 3 to Big Ideas 2 and 4; see specific Enduring Understandings listed above. **[CR3c.]**
- Debate on government regulation (EU 1.A.3., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.A., 3.A.1., 3.B., 3.B.1., 3.B.2., 3.C., 3.C.1., 3.C.2., 3.C.3., 4.A., 4.A.1., 4.A.4., 4.A.6., SP 6, SP 7). **[CR5]**
- FR Essay Practice – defending the roll of apoptosis in an organism (EU 2.C., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- FR Essay Practice – explaining different biotechnology procedures that can be used as research tools (EU 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3.).
- FR Essay Practice – which asks students to explain the process and the application of a bacterial transformation procedure (EU 1.A.2., 1.A.3., 1.C., 1.C.3., 2.B., 3.C., 3.C.1., 3.C.2., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.2., 4.B.3.).
- Audio/Visual/Website – Use the Microarray activity and the Pus Popping Frogs game at the University of Utah, Learn Genetics Website. Use the NobelPrize.org Website to teach PCR and other biotechnology techniques.

- Audio/Visual – Watch the video *Secrets of Life* at www.PBS.org.

Students must read chapters 13-21 from their textbook and take notes which will be turned in for a grade.

Quizzes are given for each chapter.

Test on these topics contains multiple-choice and short-answer questions with one released Free Response Essay question from the College Board archive of released exam questions.

Unit Name: Evolution **Time Frame:** 15 class days

Big Ideas: 1, 2, 3, 4

Connected to Enduring Understandings (EU):

Big Idea 1: A., B., C., D.
Big Idea 2: B., C., E.
Big Idea 3: A., B., C.
Big Idea 4: A., B., C.

Specific Science Practices (SP) and Essential Knowledge requirements associated with each Enduring Understanding (EU) are detailed after each major assignment description listed below.

Major Assignments:

The Evolution of Populations

- Activity/Dry Lab – allelic frequencies (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 3.A., 4.A.5., 4.A.6., 4.B.3., 4.C.3., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR5]**
- Lab – AP Biology Lab 2, students use a computer spreadsheet to randomize allelic changes over multiple generations when Hardy-Weinberg variables are held constant or manipulated (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 3.A., 4.A.5., 4.A.6., 4.B.3., 4.C.3., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Evolution Questions Actvity (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.B.2., 1.C., 1.C.1., 1.C.2., 1.C.3., 1.D., 1.D.1., 1.D.2., 3.A., 3.A.1., 3.C., 3.C.1., 3.C.2., 4.A., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3, 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- FR Essay Practice – explaining the theory of evolution through natural selection and survival of the fittest as proposed by Darwin (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.C., 1.C.1., 1.C.2., 1.C.3., 3.A., 3.A.1., 3.C., 3.C.1., 3.C.2., 4.A., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3, 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 6, SP 7).
- FR Essay Practice –solving and explaining Hardy-Weinberg calculations using allelic frequency data (EU 1.C., 1.C.3., 3.A., 3.A.1., 4.B.3., 4.C.3., SP 2, SP 5, SP 6).
- FR Essay Practice – explain Darwin's contribution to modern evolutionary theory and discuss the additional supporting ideas of Hardy-Weinberg equilibrium, punctuated equilibrium and genetic engineering (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.1., 1.C.2., 1.C.3., 3.A., 3.A.1., 3.C., 3.C.1., 3.C.2., 4.A., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3, 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 6, SP 7)
- Audio/Visual/Website – Use the Rock Pocket Mice and other population genetics activities at the University of Utah, Learn Genetics Website.

Phylogeny and Systematics

- Lab – Cladistics. (EU 1.A., 1.A.2., 1.A.4., 1.B., 1.B.1., 1.B.2., 1.C., 1.C.3., 3.A., 4.A.3., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7] [CR4a]**
- Activity/Dry Lab – On-line Protein and DNA Databases Lab – students use online data bases GenBank (http://www.ncbi.nlm.nih.gov/Genbank/)and Swiss-Prot (http://expasy.org/sprot/**)** to find, compare and analyze (http://fasta.bioch.virginia.edu/fasta/lalign.htm) genetic information for taxonomic groups

that are paraphyletic, polyphyletic and monophyletic (http://www.americazoo.com/goto/index/mammals/classification.htm). This online lab exceeds the objectives covered in Lab 3 from the AP Biology Manual, but Lab 3 may be used in its place if desired (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.B.2., 1.C., 1.C.3., 3.A., 3.A.1., 3.C., 3.C.2., 4.A.1., 4.A.2., 4.B.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**

- FR Essay Practice –using homologous structures to explain evolutionary relationships between taxa from different phyla (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.B.2., 1.C., 1.C.3., 3.A., 3.A.1., 4.A.1., 4.A.2., SP 5, SP 6, SP 7).
- FR Essay Practice –analysis of a molecular data set of cytochrome c sequence data for five taxa (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.B.2. 1.C., 1.C.3., 3.A., 3.C., 3.C.2., 4.A.1., 4.A.2., 4.B.2., SP 5, SP 6, SP 7).
- Audio/Visual/Website – Use the Old Genes, New Tricks activity at the University of Utah, Learn Genetics Website.

Early Earth and the Origin of Life

- Debate – Evolution History (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.B.2., 1.C., 1.C.1., 1.C.2., 1.C.3., 1.D., 1.D.1., 1.D.2., 2.B., 2.B.1., 2.B.2., 2.B.3., 3.A., 3.A.1., 4.A., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3, 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 5, SP 6, SP 7). **[CR3a]**
- FR Essay Practice – explaining the adaptations and role of prokaryotes in the creation and modification of Earth's early environment and the ecological impact of this domain today (EU 1.C., 1.C.3., 1.D., 1.D.1., 1.D.2., 4.A., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.3, 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Audio/Visual/Website –Use the Evolution 101 interactive tutorial at the Education.Berkeley.edu website to explore changes in the early Earth.

Introduction to Animal Evolution

- Activity – Protist research (EU 4.A., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.2., 4.B.3, 4.B.4.).
- Model Building – Development (EU 1.A.4., 1.B., 1.B.1., 1.B.2., 2.E., 2.E.1., 2.E.2., 4.A.1., 4.B.1., 4.B.2., SP 1, SP 7).
- FR Essay Practice – in which student explain how the tissue layers development is determined by protostome or deuterostome lineages and each tissue layer gives rise to certain organ systems (EU 1.B., 1.B.1., 2.C.1., 2.E., 2.E.1., 2.E.2., 3.B.1., 4.A.1., 4.B., 4.B.1., 4.B.2.).
- Project – Phylogeny (EU 1.B., 1.B.1., 1.B.2., 1.C., 1.C.1., 1.C.2., 1.C.3., 4.B., 4.B.3., SP 1)
- Watch "Extinction" in the PBS series, Evolution.l

Students must read chapters 22-29 from their textbook and take notes which will be turned in for a grade.

Quizzes are given for each chapter.

Test on these topics contains multiple-choice and short-answer questions with one released Free Response Essay question from the College Board archive of released exam questions.

Unit Name: Anatomy and Physiology **Time Frame:** 20 class days

Big Ideas: 1, 2, 3, 4

Connected to Enduring Understandings (EU):

Big Idea 1: A., B., C.
Big Idea 2: A., B., C., D., E.
Big Idea 3: A., B., C., D., E.
Big Idea 4: A., B., C.

Specific Science Practices (SP) and Essential Knowledge requirements associated with each Enduring Understanding (EU) are detailed after each major assignment description listed below.

Major Assignments:

Nervous Systems

- Lab – Tissue Lab (EU 1.B.1., 2.B., 2.B.3., 3.B.1., 4.A.3., 4.A.4., 4.C., 4.C.1., SP 3, SP 5). **[CR6, CR7]**
- Activity/Dry Lab – Brain structures (EU 1.B., 1.B.1., 1.C., 1.C.3., 3.D., 3.E., 3.E.1., 3.E.3., 4.A.3., 4.A.6., 4.B.1., 4.C., SP 1).
- Neuron Function (EU 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., SP 7). **[CR5]**
- Project – senses (EU 1.A.4., 1.B.1., 1.C., 1.C.3., 2.A.3., 2.B., 2.C., 2.C.1., 2.C.2., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C.).
- FR Essay Practice – students explain how the reflex response works and why cephalization was an evolutionary advantage (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.2., 1.C.3., 2.A.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., 4.C.3.).
- Audio/Visual/Website –Use theSumanasInc.com tutorial on Human Embryonic Stem Cells. Use the Mouse Party game and the Addiction and the Brain videos at the University of Utah, Learn Genetics Website. Use the Howard Hughes Medical Institute Holiday Lecture Series videos, interviews and clips from Making Your Mind.

Chemical Signals in Animals

- Lab – Endocrine Cycles (EU 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.3., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., SP 5, SP 6).
- Activity/Dry Lab – Mating Game (EU 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.E., 3.E.1., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3., 4.B.4., SP 1, SP 7).
- Lab – Sea Urchin Development (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.A., 3.A.1., 3.A.2., 3.B., 3.B.1., 3.B.2., 3.C., 3.C.1., 3.C.2., 4.A.2., 4.A.3., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.2., 4.C.3., 4.C.4., SP 3, SP 4, SP 5, SP 6, SP 7). **[CR3b, CR6, CR7]**

- FR Essay Practice –students explain how abiotic factors in the environment influence the cyclic activity of a group of organisms (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- FR Essay Practice – in which students must explain how blood glucose levels are maintained using feedback mechanisms based on cells' signals (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- FR Essay Practice – Students must explain what an endocrine disruptor is and how it might impact an individual or a population (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 6, SP 7). **[CR5]**
- Audio/Visual/Website – Use the anatomy and physiology games at the NobelPrize.org Website.

The Body's Defenses

- First and second lines of defense (EU 1.B.1., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Activity/Dry Lab –third line of specific immune defense (EU 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 1, SP 6, SP 7).
- FR Essay Practice –cell-to-cell communication in the human body (EU 1.B.1., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- FR Essay Practice –students explain how the nonspecific response occurs and how the specific immune response distinguishes self from non-self and is able to activate a response to original and repeat exposure (EU 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.1., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Guest speaker – Immunologist comes to speak to the class and answer questions about the immune system and the daily requirements of their job (EU 2.B., 2.D., 3.D., 4.A., 4.B., 4.B.1., 4.B.2., 4.B.3., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- Audio/Visual/Website – Play the Go, Go Stem Cells and Click and Clone games at the University of Utah, Learn Genetics Website.

Maintaining Homeostasis while Exchanging Matter and Energy with the Environment

- Field trip – Medical Facility. (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.B.2.).
- FR Essay Practice –in which students use data to explain the importance of homeostasis to maintain water potential in plant and animal cells (EU 1.B.1., 2.A., 2.A.1.,

2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., SP 5).

- Lab – Individual groups plan, carry out and analyze results of student-designed experiments, using digestive enzymes (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.E., 2.E.1., 2.E.2., 4.A., 4.A.2., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice –students compare and contrast intracellular and extracellular digestion and explain the necessity for the uptake of nutrients from the environment (EU 1.B.1., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.D., 2.D.1., 2.D.2., 2.D.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B.1., 4.B.2.).
- Lab – Student designed physiology lab (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.D., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.4., 4.A.6., 4.B.1., 4.B.2., SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice – students compare the anatomy and physiology to describe how different taxa exchange gases with their environment (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.E., 2.E.1., 2.E.2., 2.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- FR Essay Practice –students propose an experiment to measure the habitat choice of fish in different temperatures of water and explain the results on the basis of physiology (EU 2.C., 2.C.1., 2.C.2., 2.E., 2.E.2., 2.E.3., 3.D., 3.E., 3.E.2., 4.A., 4.A.6., 4.B.4., SP 5, SP 6, SP 7).
- Lab – Dissection (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B.1., 3.D., 3.E., 3.E.3., 4.A.3., 4.B., 4.B.1., 4.B.2., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4., SP 4, SP 6, SP 7).
- FR Essay Practice – students must explain how taxonomic groups deal with similar challenges of exchanging energy and matter with the environment using different adaptations (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B.1., 3.D., 3.E., 3.E.1., 4.A.3., 4.B., 4.B.1., 4.B.2., 4.B.4., 4.C., 4.C.1., 4.C.2., 4.C.3., 4.C.4.).
- FR Essay Practice –students explain how feedback mechanisms are crucial in maintaining homeostasis in an organism (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B., 3.B.1., 3.B.2., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B., 4.B.1., 4.B.2.).
- Audio/Visual – Watch *The Living Body* by National Geographic.

Students must read portions of chapters 40-50 from their textbook and take notes which will be turned in for a grade.

Quizzes are given for each chapter.

Test on these topics contains multiple-choice and short-answer questions with one released Free Response Essay questio from the College Board archive of released exam questions.

Unit Name: Botany **Time Frame:** 14 class days

Big Ideas: 1, 2, 3, 4

Connected to Enduring Understandings (EU):

Big Idea 1: A., B., C.
Big Idea 2: A., B., C., D., E.
Big Idea 3: A., B., D., E.
Big Idea 4: A., B., C.

Specific Science Practices (SP) and Essential Knowledge requirements associated with each Enduring Understanding (EU) are detailed after each major assignment description listed below.

Major Assignments:

Plant Evolutionary Diversity and Responses to Internal and External Signals

- Biology Scavenger Hunt (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.B.2., 1.C., 1.C.1., 1.C.2., 1.C.3., 2.C.2., 3.A., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.2.).
- FR Essay Practice – Essay on the evolutionary obstacles of land plants (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.B., 1.B.1., 1.C., 1.C.1., 1.C.2., 1.C.3., 1.D., 2.C.2., 3.A., 4.B., 4.B.3., 4.B.4., 4.C.2.).
- Modeling – Xylem & Phloem (EU 1.B., 1.B.1., 1.C., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.2., 3.B.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B.2., 4.C.2., SP 1, SP 6, SP 7).
- Lab – Stomata & Transpiration (EU 1.B.1., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.2., 3.B., 3.B.1, 3.B.2., 3.D., 3.D.2., 3.D.3., 3.E., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.C.2., SP 1, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice –students analyze transpiration rates for two different species of plants, discuss adaptations that impact transpiration rates, calculate water potential and identify variables that affect water potential (EU 1.B., 1.B.1., 1.C., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.2., 3.B., 3.E., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.C.2., SP 5, SP 6).
- Lab – AP Lab 11 – Students design experiments to test which environmental factors impact the rate of transpiration in plants. Data is analyzed and conclusions are reported back to the class (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.2., 3.B., 3.E., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.C.2., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice –students identify and explain how adaptations have allowed for the movement of water in plants and how this system is impacted by gas exchange and environmental conditions (EU 1.A.2., 1.A.3., 1.B.1., 1.C., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.2., 3.B., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.C.2.).
- Lab – Soil Chemistry – Students gather soil samples and measure the porosity and other abiotic and biotic properties (EU 4.B.1, 4.C.2., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**

- Plant Symbiotic Relationshiops – Can plants talk? (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B.1, 3.B.2., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.2., 4.C.2., SP 1).
- FR Essay Practice – Essay on the chemical signaling used between bacteria and fungi to establish a symbiotic relationship (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B.1, 3.B.2., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.2., 4.C.2.).
- Lab – Plant Stress – EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1, 3.B.2., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.6., 4.B.2., 4.C.2., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice –students must analyze and explain the data gathered from a transpiration experiment in upper-story and under-story trees (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.2., 4.B., 4.B.3., 4.B.4., 4.C.2., SP 5, SP 6).
- Lab – Plant Hormones (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1, 3.B.2., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B.1., 4.B.3., 4.C.2.).
- Lab – Plant Hormone Signals (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1, 3.B.2., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B.1., 4.B.3., 4.C.2.. SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- FR Essay Practice – students must explain how factors in the environment cause hormonal responses that result in physiological changes seen in plants and animals (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 3.B., 3.B.1, 3.B.2., 3.D., 3.D.2., 3.D.3., 3.E., 3.E.1., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B.1., 4.B.3., 4.C.2.).
- Audio/Visual – Watch the *Botany of Desire* at www.PBS.org.

Students must read portions of chapters 36, 37, 38 and 39 from their textbook and take notes which will be turned in for a grade.

Quizzes are given for each chapter.

Test on these topics contains multiple-choice and short-answer questions with one released Free Response Essay question from the College Board archive of released exam questions.

Unit Name: Ecology and Environmental Concerns **Time Frame:** 18 class days

Big Ideas: 1, 2, 3, 4

Connected to Enduring Understandings (EU):

Big Idea 1: A., B., C.
Big Idea 2: A., B., C., D., E.
Big Idea 3: B., D., E.
Big Idea 4: A., B., C.

Specific Science Practices (SP) and Essential Knowledge requirements associated with each Enduring Understanding (EU) are detailed after each major assignment description listed below.

Major Assignments:

An Introduction to Ecology and the Biosphere

- Earth's Environmental Conditions (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., SP 1, SP 6, SP 7).
- Project –biome (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4., SP 1, SP 6, SP 7).
- FR Essay Practice –students describe several abiotic factors in a desert environment and a desert food chain and interpret the carbon dioxide uptake of plants using CAM and C3/C4 photosysnthesis (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.B., 2.B.1., 2.B.2., 2.B.3., 2.C., 2.C.1., 2.C.2., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 2.E., 2.E.1., 2.E.2., 2.E.3., 4.A., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4., SP 5, SP 6).
- Watch "Desserts" from BBC's Planet Earth Series.

Behavior Biology

- Lab – AP Biology Lab 12 – Students carry out student-designed laboratory experiments to determine habitat preference, taxis or kinesis and analyze data and present conclusions to the class (EU 1.B.1., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**
- Activity – Animal Behaviors (EU 2.E., 2.E.1., 2.E.2., 2.E.3., 3.D., 3.D.1., 3.D.2., 3.D.3., 3.D.4., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.6., 4.B., 4.B.3., 4.B.4., SP 5, SP 6). **[CR5]**
- FR Essay Practice –students must describe innate and learned behaviors and explain their adaptive value then follow up by designing an experiment on mating behaviors (EU 1.A.2., 2.C., 2.C.1., 2.C.2., 2.E., 2.E.1., 2.E.2., 2.E.3., 3.B.2., 3.D., 3.E., 3.E.1., 4.A., 4.A.6., 4.B., 4.B.3., 4.B.4.).
- Audio/Visual – Watch *Lord of the Ants* at www.PBS.org.

Population Ecology

- Game – Population Dynamics (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 2.A., 2.A.1., 2.E., 2.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.3., 4.C.4., SP 1, SP 2, SP 5, SP 6, SP 7). **[CR4d]**
- Kaibab Deer Story –(EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 2.A., 2.A.1., 2.E., 2.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.3., 4.C.4., SP 5, SP 6, SP 7).

- FR Essay Practice – students explain the difference in logarithmic and exponential growth for r and K species types (EU 2.A., 2.A.3., 2.E., 2.E.3., 4.A., 4.A.6., 4.B., 4.B.3., 4.B.4.).
- Calculations – Population Dynamics (EU 2.A., 2.A.1., 2.A.3., 2.E., 2.E.3., 4.A., 4.A.6., 4.B., 4.B.3., 4.B.4., SP 1, SP 2, SP 5, SP 6, SP 7). **[CR5]**
- Audio/Visual – Watch the CNN video *People Bomb* on issues of over population.

Community Ecology

- Species Interaction Activity – (EU 2.A., 2.A.3., 2.C., 2.C.2., 2.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.4., SP 6).
- FR Essay Practice –students identify and describe several symbiotic relationships (EU 2.A., 2.A.3., 2.E.3., 3.D., 3.E., 3.E.1., 3.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.4.).
- Lab – Biodiversity Line Transects (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.1., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.C.2., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4., SP 3, SP 4, SP 5, SP 6). **[CR6, CR7]**
- FR Essay Practice –students must interpret data that shows changes in species diversity over time in different layers of the forest canopy and design a controlled experiment to measure the impact of plant diversity on herbivores (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.1., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4., SP 2, SP 3, SP 4, SP 5, SP 6).
- Activity – Food Web (EU 1.A.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.4., SP 1, SP 6, SP 7).
- FR Essay Practice –students must explain the population dynamics of three species of beetles over time when two species are native and the third is introduced (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.1., 1.C.3., 2.A., 2.A.1., 2.A.2., 2.A.3., 2.E., 2.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.3., 4.C.4., SP 5, SP 6).
- Audio/Visual – Watch “Jungles” in BBC’s Planet Earth Series.

Ecosystems

- Game – Species Diversity (EU 1.A.3., 1.A.4., 1.C., 1.C.1., 1.C.2., 1.C.3., 2.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4.. SP 1, SP 2, SP 5, SP 6, SP 7).
- Activity – Succession (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 2.E., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.3., 4.C.4.).
- FR Essay Practice –students explain the changes in abiotic factors and biodiversity during primary and secondary succession (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.3., 2.C.2., 2.E., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.3., 4.C.4.).
- 10% rule (EU 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.3., 4.C.4., SP 2, SP 5, SP 6).
- FR Essay Practice –students describe the role of bacteria as producers, parasites, decomposers and symbionts as well as their role in making genetically engineered products (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 3.B., 3.B.1., 3.B.2., 4.A., 4.A.2., 4.A.3., 4.A.4., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4.).
- Lab- AP Biology Lab 10 – Students design energy flow experiments using autotrophs and herbivores and collect data and analyze the results (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.E., 2.E.1., 2.E.2., 2.E.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C.3., 4.C.4., SP 1, SP 2, SP 3, SP 4, SP 5, SP 6, SP 7). **[CR6, CR7]**

- FR Essay Practice –students must explain how the flow of energy from producers to consumers is solar-powered using the laws of thermodynamics (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4.).
- FR Essay Practice –students must explain the difference between gross and net primary productivity and interpret net productivity of an aquatic environment at various depths (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.C.2., 4.A., 4.A.5., 4.A.6., 4.B.2.).
- Project –biogeochemical cycle (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.D., 2.D.1., 2.D.2., 2.D.3., 4.A., 4.A.5., 4.A.6., 4.B.1., 4.B.2.).
- FR Essay Practice –students describe the water cycle and the significance of water in several vital life processes (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.D., 2.D.1., 2.D.3., 4.A., 4.A.5., 4.A.6., 4.B.1., 4.B.2.).
- FR Essay Practice –role of carbon in several different biotic and abiotic processes in an ecosystem (EU 2.A., 2.A.1., 2.A.2., 2.A.3., 2.D., 2.D.1., 2.D.3., 4.A., 4.A.5., 4.A.6., 4.B.1., 4.B.2.).
- Audio/Visual – Watch “Jungles” in BBC’s Planet Earth Series.

Conservation Biology

- FR Essay Practice – Students are asked to translate the concepts of island biogeography into wildlife management practices and the designation of parks and refuges (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.1., 1.C.2., 1.C.3., 2.D., 2.D.1., 2.D.3., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4., SP 1, SP 6, SP 7). **[CR5]**
- FR Essay Practice –students must explain factors that impact the success of invasive species and methods of eradication (EU 1.A., 1.A.1., 1.A.2., 1.A.3., 1.A.4., 1.C., 1.C.1., 1.C.2., 1.C.3., 2.A., 2.A.1., 2.A.3., 2.D., 2.D.1., 2.D.2., 2.D.3., 2.D.4., 4.A., 4.A.5., 4.A.6., 4.B., 4.B.3., 4.B.4., 4.C., 4.C.2., 4.C.3., 4.C.4.). **[CR5]**
- Audio/Visual – Watch *Cane Toads: An Unnatural History* about the impact of invasive species.

Students must read chapters 51-56 from their textbook and take notes which will be turned in for a grade.

Quizzes are given for each chapter.

Test on these topics contains multiple-choice and short-answer questions with one released Free Response Essay question from the College Board archive of released exam questions.