AP Biology
Ms. Klug
sklug8174@gmail.com

The Course:

The AP Biology course is designed to enable you to develop advanced inquiry and reasoning skills, such as designing a plan for collecting data, analyzing data, applying mathematical routines, and connecting concepts in and across domains. The result will be readiness for the study of advanced topics in subsequent college courses—a goal of every AP course. This AP Biology course is equivalent to a two-semester college introductory biology course and has been endorsed enthusiastically by higher education officials.

Colossians 3:23- Whatever you do, work at it with all your heart, as working for the Lord, not for human masters

This class will come with a lot of supplementary material that I will go through on videos. It is your responsibility to complete these independently. In addition, writing out notes by hand on paper is recommended over typing them as I lecture. The brain processes the information better that way. Each one of the materials serves the ultimate goal of learning the material to pass the exam.

Suggested materials needed for this class:

- Pen/Pencil
- 2 in. Binder with Pocket plastic dividers with tabs and College Ruled loose leaf paper.
- AP Biology Princeton Review- this is not required however if you intend to take the AP exam it is highly recommended and the best study guide for this exam.

Grading:

60% Attendance
40% Final Exam

Scope and Sequence

The course is based on four Big Ideas as set forth by the College Board, which encompass core scientific principles, theories, and processes that cut across traditional boundaries and provide a broad way of thinking about living organisms and biological systems. These include:

- **Big Idea 1:** The process of evolution explains 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.

In addition, students establish lines of evidence through the Science Practices and use them to develop and refine testable explanations and predictions of natural phenomena. Focusing on these disciplinary practices enables teachers to use the principles of scientific inquiry to promote a more engaging and rigorous experience for AP Biology students. The seven **Science Practices** require that students:

- Use representations and models to communicate scientific phenomena and solve scientific problems
- Use mathematics appropriately
- Engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course
- Plan and implement data collection strategies in relation to a particular scientific question
- Perform data analysis and evaluation of evidence
- Work with scientific explanations and theories
- Connect and relate knowledge across various scales, concepts, and representations in and across Big Ideas.

Enduring Understandings with Their Alignment to the Four Big Ideas

We will not go in this order. We will start with the smallest (Chemistry and Cells) to largest (Ecosystem). Please see the document AP Biology Course at a Glance for further information.

The list below will further explain the specific College Board content that this course is structured around. Each 'Big Idea' has Enduring Understandings (EU) and sub points for each EU. Although the outline does not go into detail on each sub point, it will help you to know what the important understandings are for each section.

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

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

1. Natural selection is a major mechanism of evolution

2. Natural selections acts on phenotypic variations in populations

3. Evolutionary change is also driven by random processes

4. Biological evolution is supported by scientific evidence from many disciplines, including mathematics

EU 1B – Organisms are linked by lines of descent from common ancestry

1. Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today

2. Phylogenic trees and cladograms are graphical representations of evolutionary history that can be tested

EU 1C – Life continues to evolve within a changing environment

1. Speciation and extinction have occurred through the Earth's history

2. Speciation may occur when two populations become reproductively isolated from each other

3. Populations of organisms continue to evolve

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

1. There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence

2. Scientific evidence from many different disciplines supports models of the origin of life

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

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

1. All living system require constant input of free energy

2. Organisms capture and store free energy for use in biological processes

3. Organisms must exchange matter with the environment to grow, reproduce, and maintain organization

EU 2B – Growth, reproduction and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environment

1. Cell membranes are selectively permeable due to their structure

2. Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes

3. Eukaryotic cells maintain internal membranes that partition the cell into specialized regions

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

1. Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes

2. Organisms respond to changes in their external environments

EU 2D – Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment

1. All biological systems from cells and organisms to populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy

2. Homeostatic mechanisms reflect both common ancestry and divergence due to adaptation in different environments

3. Biological systems are affected by disruptions to their dynamic homeostasis

4. Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis

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

1. Timing and coordination of specific events are necessary for the normal development of an organism, and these events are regulated by a variety of mechanisms

2. Timing and coordination of physiological events are regulated by multiple mechanisms

3. Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection

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

EU 3A – Heritable information provides for continuity of life

1. DNA and in some cases RNA, is the primary source of heritable information

2. In eukaryotes, heritable information is passed to the next generation in processes that include the cell cycle and mitosis or meiosis plus fertilization

3. The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring

4. The inheritance pattern of many traits cannot be explained by simple Mendelian genetics

EU 3B – Expression of genetic information involves cellular and molecular mechanisms

1. Gene regulation results in differential gene expression, leading to cell specialization

2. A variety of intercellular and intracellular signal transmissions mediate gene expression

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

1. Changes in genotype can result in changes in phenotype

2. Biological systems have multiple processes that increase genetic variation

3. Viral replication results in genetic variation and viral infection can introduce genetic variation into the hosts

EU 3D – Cells communicate by generating, transmitting, and receiving chemical signals

1. Cell communication processes share common features that reflect a shared evolutionary history

2. Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling

3. Signal transduction pathways link signal reception with cellular response

4. Changes in signal transduction pathways can alter cellular response

EU 3E – Transmission of information results in changes within and between biological systems

1. Individuals can act on information and communicate it to others

2. Animals have nervous systems that detect external and internal signals, transmit and

integrate information, and produce responses

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

EU 4A – Interactions with biological systems lead to complex properties

1. The subcomponents of biological molecules and their sequence determine the properties of that molecule

2. The structure and function of subcellular components and their interactions provide essential cellular processes

3. Interactions between external stimuli and regulated gene expression result in specialization of cell, tissues, and organs

4. Organisms exhibit complex properties due to interactions between their constituent parts

5. Communities are composed of populations of organisms that interact in complex ways

6. Interactions among living systems and with their environment result in the movement of matter and energy

EU 4B – Competition and cooperation are important aspects of biological systems

1. Interactions between molecules affect their structure and function

2. Cooperative interactions within organisms promote efficiency in the use of energy and matter

3. Interactions between and within populations influence patterns of species distribution and abundance

4. Distribution of local and global ecosystems changes over time

EU 4C – Naturally occurring diversity among and between components within biological

systems affects interactions with the environment

1. Variation in molecular unites provides cells with a wider range of functions

2. Environmental factors influence the expression of the genotype in an organism

3. The level of variation in a population affects population dynamics

4. The diversity of species within an ecosystem may influence the stability of the ecosystem