

Science: Advanced Placement Biology

UNIT/Weeks	Timeline/Topics	Essential Questions
13	<p>Big Idea #2 Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis</p> <ul style="list-style-type: none"> • Essential knowledge 2.A.1: All living systems require constant input of free energy • Essential knowledge 2.A.2: Organisms capture and store free energy for use in biological processes • Essential knowledge 2.A.3: Organisms must exchange matter with the environment to grow, reproduce and maintain organization • Essential knowledge 2.B.1: Cell membranes are selectively permeable due to their structure • Essential knowledge 2.B.2: Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes • Essential knowledge 2.B.3: Eukaryotic cells maintain internal membranes that partition the cell into specialized regions. • Essential knowledge 2.C.1: Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes. • Essential knowledge 2.C.2: Organisms respond to changes in their external environments. • Essential knowledge 2.D.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 • Essential knowledge 2.D.2: Homeostatic mechanisms reflect both common ancestry and divergence due to adaptation in different environments. • Essential knowledge 2.D.3: Biological systems are affected by disruptions to their dynamic homeostasis • Essential knowledge 2.D.4: Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis • Essential knowledge 2.E.1: Timing and coordination of specific events are necessary for the normal development 	<ul style="list-style-type: none"> • How do organisms and the living systems they are involved in utilize energy to grow, reproduce, and maintain organization? • How do cell membranes allow for cell processes to occur and the regulation of particle flow? • How do organisms respond to external changes in their environments? • How do organisms respond to changes in order to maintain homeostasis? • How do organisms regulate the timing of critical life events?

	<p>of an organism, and these events are regulated by a variety of mechanisms</p> <ul style="list-style-type: none"> • Essential knowledge 2.E.2: Timing and coordination of physiological events are regulated by multiple mechanisms. • Essential knowledge 2.E.3: Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection. 	
10	<p><u>Big Idea # 3 Living systems store, retrieve, transmit and respond to information essential to life processes.</u></p> <ul style="list-style-type: none"> • Essential knowledge 3.A.1: DNA, and in some cases RNA, is the primary source of heritable information. • Essential knowledge 3.A.2: In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization • Essential knowledge 3.A.3: The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring. • Essential knowledge 3.A.4: The inheritance pattern of many traits cannot be explained by simple Mendelian genetics. • Essential knowledge 3.B.1: Gene regulation results in differential gene expression, leading to cell specialization. • Essential knowledge 3.B.2: A variety of intercellular and intracellular signal transmissions mediate gene expression. • Essential knowledge 3.C.1: Changes in genotype can result in changes in phenotype • Essential knowledge 3.C.2: Biological systems have multiple processes that increase genetic variation • Essential knowledge 3.C.3: Viral replication results in genetic variation, and viral infection can introduce genetic variation into the hosts • Essential knowledge 3.D.1: Cell communication processes share common features that reflect a shared evolutionary history. • Essential knowledge 3.D.2: Cells communicate with each other through 	<ul style="list-style-type: none"> • What is the cellular source of hereditary instructions and how are they transmitted? • How is gene expression accomplished? • What are possible avenues for genetic variation within a cell? • How do cells communicate?

	<p>direct contact with other cells or from a distance via chemical signaling</p> <ul style="list-style-type: none"> • Essential knowledge 3.D.3: Signal transduction pathways link signal reception with cellular response. • Essential knowledge 3.D.4: Changes in signal transduction pathways can alter cellular response. • Essential knowledge 3.E.1: Individuals can act on information and communicate it to others • Essential knowledge 3.E.2: Animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses 	
5	<p><u>Big Idea #4 Biological systems interact, and these systems and their interactions possess complex properties.</u></p> <ul style="list-style-type: none"> • Essential knowledge 4.A.1: The subcomponents of biological molecules and their sequence determine the properties of that molecule. • Essential knowledge 4.A.2: The structure and function of subcellular components, and their interactions, provide essential cellular processes. • Essential knowledge 4.A.3: Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues and organs. • Essential knowledge 4.A.4: Organisms exhibit complex properties due to interactions between their constituent parts • Essential knowledge 4.A.5: Communities are composed of populations of organisms that interact in complex ways. • Essential knowledge 4.A.6: Interactions among living systems and with their environment result in the movement of matter and energy. • Essential knowledge 4.B.1: Interactions between molecules affect their structure and function • Essential knowledge 4.B.2: Cooperative interactions within 	<ul style="list-style-type: none"> • How do interactions within biological systems result in complex properties? • How do competition and cooperation affect biological systems? • How do competition and cooperation affect biological systems? • How does naturally occurring diversity among and between components within biological systems affect their interactions with the environment?

	<p>organisms promote efficiency in the use of energy and matter</p> <ul style="list-style-type: none"> • Essential knowledge 4.B.3: Interactions between and within populations influence patterns of species distribution and abundance. • Essential knowledge 4.B.4: Distribution of local and global ecosystems changes over time. • Essential knowledge 4.C.1: Variation in molecular units provides cells with a wider range of functions. • Essential knowledge 4.C.2: Environmental factors influence the expression of the genotype in an organism. • Essential knowledge 4.C.3: The level of variation in a population affects population dynamics Essential knowledge. • 4.C.4: The diversity of species within an ecosystem may influence the stability of the ecosystem. 	
6	<p><u>Big Idea #1 The process of evolution drives the diversity and unity of life.</u></p> <ul style="list-style-type: none"> • Essential knowledge 1.A.1: Natural selection is a major mechanism of evolution. • Essential knowledge 1.A.2: Natural selection acts on phenotypic variations in populations. • Essential knowledge 1.A.3: Evolutionary change is also driven by random processes. • Essential knowledge 1.A.4: Biological evolution is supported by scientific evidence from many disciplines, including mathematics. • Essential knowledge 1.B.1: Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today. • Essential knowledge 1.B.2: Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested. • Essential knowledge 1.C.1: Speciation and extinction have occurred throughout the Earth's history. • Essential knowledge 1.C.2: Speciation may occur when two populations 	<ul style="list-style-type: none"> • What is evolution? • How are organisms linked? • How does life continue to evolve in a changing environment? • How do natural processes explain the origin of living systems?

	<p>become reproductively isolated from each other</p> <ul style="list-style-type: none"> • Essential knowledge 1.C.3: Populations of organisms continue to evolve. • Essential knowledge 1.D.1: There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence. • Essential knowledge 1.D.2: Scientific evidence from many different disciplines supports models of the origin of life. 	
2	<p><u>Review for AP Exam</u></p> <ul style="list-style-type: none"> • Various practice tests and activities to review the material from the whole curriculum in preparation for the college board exam. 	<ul style="list-style-type: none"> • How is all of biology integrated?