Title	**Roxbury High School AP Biology**
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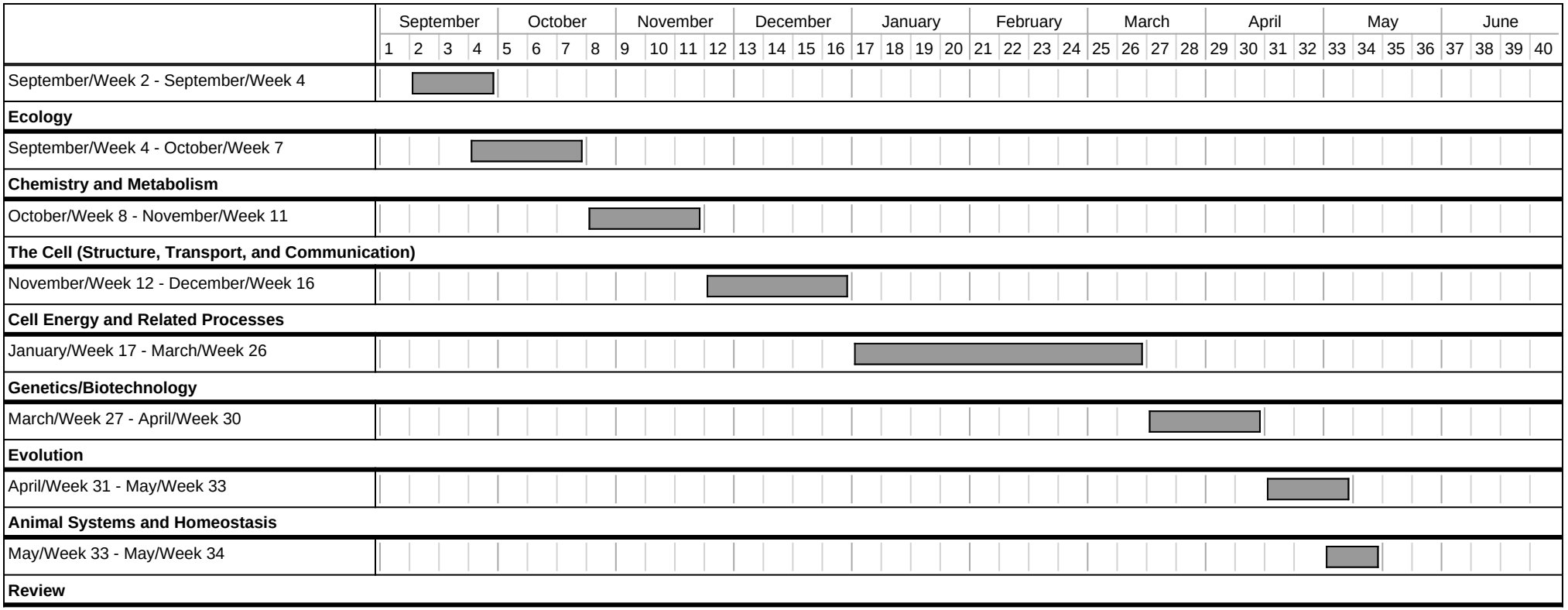
Subject	Science
Course	AP Biology
Grade(s)	11 , 12
Location	Roxbury High School
Curriculum Writing History	
Notes	
Attachments	

Title : Roxbury High School AP Biology
Type : Consensus



Title : Roxbury High School AP Biology
Type : Consensus

Duration: September/Week 2 - September/Week 4					
UNIT NAME: Ecology					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
1A) Change in the genetic makeup of a population over time is evolution. 1C) Life continues to evolve within a changing environment. 2A) Growth, reproduction and maintenance of the organization of living systems require free energy and matter. 2D) Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment. 3E) Transmission of non-heritable information results in changes within and between biological systems. 4A) Interactions within biological systems lead to complex properties. 4B) Competition and cooperation are important aspects of biological systems. 4C) Naturally occurring diversity among and	How are matter and energy transformed/ transferred in biological systems? How do changes in the environment influence the growth and dynamic equilibrium of a biological system? How are biological systems dependent on each other? How are the materials vital to life recycled through the ecosystems?		Predict how changes in free energy availability affect organisms, populations and ecosystems. Use representations to pose scientific questions about what mechanisms and structural features allow organisms to capture, store and use free energy. Represent graphically or model quantitatively the exchange of molecules between an organism and its environment. Refine scientific models and questions about the effect of complex biotic and abiotic interactions on all biological systems, from cells to ecosystems. Design a plan for collecting data to show that all biological systems are affected by complex biotic and abiotic interactions. Justify the selection of the kind of data needed to answer scientific questions		HS.LS1.5.CCC.1-Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.CCC.1-Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.7.CCC.1-Energy cannot be created or destroy ed—it only moves between one place and another place, between objects and/or fields, or between systems.(HS-LS1-7),(HS-LS2-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.3.DCI.LS2.B.1-Photosynthesis and cellular respiration (including anaerobic

between components within biological systems affects interactions with the environment.			about the interactions of populations within communities. Predict the effects of a change in the community's populations on the community. Apply mathematical formulas to describe interactions among living systems and their environment, which result in the movement of matter and energy. Predict the effects of a change of matter or energy availability on communities. Use data analysis to refine observations and measurements regarding the effect of population interactions on patterns of species distribution and abundance. Predict consequences of human actions on both local and global ecosystems. Explain how species diversity within an ecosystem influences ecosystem stability. **Suggested Activities:**		processes) provide most of the energy for life processes. (HSLS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.3.CCC.1-Energy drives the cycling of matter within and between systems. (HS-LS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.4-Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.4.SEP.1-Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.4.DCI.LS2.B.1-Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in

			Animal Behavior Lab Dissolved Oxygen Lab Lake Washington Case Study Primary Productivity Calculations Nitrogen Cycle Game		cellular respiration at the higher level. Given this inefficiency , there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.4.CCC.1-Energy cannot be created or destroy ed—it only moves between one place and another place, between objects and/or fields, or between systems.(HS-LS1-7),(HS-LS2-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.5-Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere,

					atmosphere, hydrosphere, and geosphere. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.5.DCI.LS2.B.1-Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.5.CCC.1-Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions — including energy , matter, and information flows—within and between systems at different scales. (HS-LS2-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.1-Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (09-12)

					[Regional:Next Generation Science Standards (NGSS)] HS.LS2.1.SEP.1-Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HSLS2-1) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.1.CCC.1-The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.2-Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.2.DCI.LS2.A.1-Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as

					the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1), (HS-LS2-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.2.DCI.LS2.C.2-A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and

					habitat availability . (HS-LS2-2),(HS-LS2-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.6-Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.6.SEP.1-Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.7-Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.7.SEP.1-Design, evaluate, and refine a solution to a complex real-

					world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.7.DCI.ETS1.B.3- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability , and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HSLS2-7),(secondary to HS-LS4-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.7.DCI.LS4.D.2- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HS-LS2-7) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.8.DCI.LS2.D.1- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-

					LS2-8) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.6-Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS4.6.DCI.LS4.D.2-Humans depend on the living world for the resources and other benefits provided by biodiversity . But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary to HS-LS2-7), (HS-LS4-6) (09-12) [Regional:Next Generation Science Standards (NGSS)]

					HS.LS4.5.DCI.LS4.C.1-Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5) (09-12) [Regional:Next Generation Science Standards (NGSS)]

		1.A.2 Natural selection acts phenotypic variations in populations. 1.C.1 Speciation and extin have occurred throughout th earth's history. 2.A.1 All living systems req constant input of free energy 2.A.2 Organisms capture a store free energy for use in biological processes. 2.A.3 Organisms must exchange matter with the environment to grow, reproc and maintain organization. 2.D.1 All biological system from cells to ecosystems are affected by complex biotic a abiotic interactions involving exchange of matter and free energy. 2.D.3 Biological systems a affected by disruptions to th dynamic homeostasis. 3.E.3 Individuals can act o information and communica to others. 4.A.5 Communities are composed of populations of organisms that interact in complex ways. 4.A.6 Interactions among systems and with their		

		environment result in the movement of matter and en 4.B.3 Interactions betwee within populations influence patterns of species distributi and abundance. 4.B.4 Distribution of local a global ecosystems changes time. 4.C.4 The diversity of spe within an ecosystem may influence the stability of the ecosystem.			
Plans:					

Title : Roxbury High School AP Biology
Type : Consensus

Duration: September/Week 4 - October/Week 7					
UNIT NAME: Chemistry and Metabolism					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
2A) Growth, reproduction and maintenance of the organization of living systems require free energy and matter. 2C) Organisms use feedback mechanisms to regulate growth and maintain homeostasis. 4A) Interactions within biological systems lead to complex properties. 4B) Competition and cooperation are important aspects of biological systems. 4C) Naturally occurring diversity among and between components within biological systems affects interactions with the environment.	How are matter and energy transferred/ transformed in living systems? How does structure relate to function in biological systems at the molecular/ cellular level? How does the structure of water dictate its physical properties which in turn makes life possible on Earth?		Explain how biological systems use free energy based on empirical data that all organisms require constant energy input to maintain organization, to grow and to reproduce. Construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy. Explain the connection between the sequence of the subcomponents of a biological polymer and its properties. Predict and justify that the changes in the structure of a polymer affect its function. Explain and model the interactions of subcellular organelles. Explain how molecular interactions affect structure and function. Explain how variation in molecular units provides the cell with a wider range		HS.LS1.1-Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.1.DCI.LS1.A.2-All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary C ore Idea is also addressed by HS-LS3-1.) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.3-Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (09-12)[Regional:Next Generation Science Standards (NGSS)]

		2.A.1 All living systems req constant input of free energy 2.A.2 Organisms capture a store free energy for use in biological processes. 2.C.1. Positive feedback mechanisms amplify respon and processes in biological organisms. 2.C.2. Organisms use nega feedback mechanisms to maintain their internal environments and respond t external environmental char 2.C.3. Organisms constantl respond to changes in their external environments. 4.A.1 The subcomponents biological molecules and the sequence determine the properties of that molecule. 4.A.2 The structure and fur of subcellular components, a their interactions, provide essential cellular processes. 4.B.1 Interactions between molecules affect their structu and function. 4.C.1 Variation in molecula units provides cells with a w range of functions.	of functions. **Suggested Activities:** Macromolecules Lab Enzyme Lab Organic Compounds Concept Map		HS.LS1.3.CCC.1-Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6-Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.DCI.LS1.C.1-The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS -LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.DCI.LS1.C.2-As matter and energy flow through different organizational levels of

					living systems, chemical elements are recombined in different way s to form different products. (HS-LS1-6),(HS-LS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.CCC.1-Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.7-Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.7.DCI.LS1.C.1-As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different way s to form different products. (HS-LS1-6),(HS-LS1-7) (09-12) [Regional:Next Generation

					Science Standards (NGSS)] HS.LS1.7.DCI.LS1.C.2-As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another and release energy to the surrounding environment and to maintain body temperature. Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. (HS-LS1-7) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.4.CCC.1-Energy cannot be created or destroy ed—it only moves between one place and another place, between objects and/or fields, or between systems.(HS-LS1-7),(HS-LS2-4) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School AP Biology
Type : Consensus

Duration: October/Week 8 - November/Week 11					
UNIT NAME: The Cell (Structure, Transport, and Communication)					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
2A) Growth, reproduction and maintenance of the organization of living systems require free energy and matter. 2B) Growth, reproduction and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments. 2C) Organisms use feedback mechanisms to regulate growth and maintain homeostasis. 2D) Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment. 3B) Expression of genetic information involves cellular and molecular mechanisms. 3D) Cells communicate by generating, transmitting and receiving chemical signals.	How do organelles vary in composition and function and how does this relate to a cell's ability to maintain homeostasis? How does the structure of the plasma membrane maintain allow it to maintain a state of dynamic equilibrium within the cell? How do cells transport nutrients and wastes in and out of cells and distribute them within cells? How do cells communicate with each other? How are signal transduction pathways utilized for cell communication? How are positive and negative feedback mechanisms involved in cell communication?	2.A.3 Organisms must exchange matter with the environment to grow, reproduce and maintain organization 2.B.1 Cell membranes are selectively permeable due to their structure. 2.B.2 Growth and dynamic homeostasis are maintained by the constant movement of molecules across the membrane. 2.B.3 Eukaryotic cells maintain internal membranes that partition the cell into specialized regions. 2.C.1. Positive feedback mechanisms amplify responses and processes in biological organisms. 2.C.2. Organisms use negative feedback mechanisms to maintain their internal environments and respond to external environmental changes. 2.C.3. Organisms constantly respond to	Use calculated surface area-to-volume ratios to predict which cell(s) might eliminate wastes or procure nutrients faster via diffusion. Name the types of molecules that an animal, plant or bacterium will take up as necessary building blocks and excrete as waste products. Represent graphically or model quantitatively the exchange of molecules between an organism and its environment. Use representations and models to pose scientific questions about the properties of cell membranes and selective permeabillity based on molecular structure. Design an investigation to determine whether dynamic homeostasis is partly maintained by the active movement of molecules across membranes. Explain how internal		HS.LS1.1-Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.1.DCI.LS1.A.1-Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.1.CCC.1-Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.2-Develop and

		changes in their external environments. 2.D.2 Homeostatic mechanisms reflect both common ancestry and divergence due to adaptation in different environments. 2.D.3. Biological systems are affected by disruptions to their homeostasis. 3.B.2 A variety of intercellular and intracellular signal transmissions mediate gene expression. 3.D.1 Cell communication processes share common features that reflect a shared evolutionary history. 3.D.2 Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling. 3.D.3 Signal transduction pathways link signal reception with cellular response. 3.D.4 Changes in signal transduction pathways can alter cellular responses.	membranes and organelles contribute to cell functions. Use a graphic organizer to describe the differences in prokaryotic and eukaryotic cells. Connect differences in the environment with the evolution of homeostatic mechanisms. Explain how signal pathways mediate gene expression. Use representations or models to describe mechanisms of the regulation of gene expression. Describe basic chemical processes for cell communication shared across evolutionary lines of descent. Use models to describe features of a cell signaling pathway. Interpret illustrations which depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling. Describe a model that		use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.2.DCI.LS1.A.1-Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.3-Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.3.DCI.LS1.A.1-Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through

			expresses the key elements of signal transduction pathways by which a signal is converted to a cellular response. **Suggested Activities:** Cell Races Lab Diffusion and Osmosis Lab Yeast Cell Communication Lab Cell Signaling Disease Research Assignment		positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.3.CCC.1-Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6-Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.DCI.LS1.C.1-The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new

					cells. (HS -LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.DCI.LS1.C.2-A s matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different way s to form different products. (HS-LS1-6),(HS-LS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.7.DCI.LS1.C.2-As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another and release energy to the surrounding environment and to maintain body temperature. Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. (HS-LS1-7) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.4.DCI.LS1.B.1-In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby

					allowing the organism to grow. The organism begins as a single cell (fertilized egg) that div ides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS3.1.DCI.LS1.A.1-All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. (secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS -LS1-1.) (09-12)[Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School AP Biology
Type : Consensus

Duration: November/Week 12 - December/Week 16					
UNIT NAME: Cell Energy and Related Processes					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
2A) Growth, reproduction and maintenance of the organization of living systems require free energy and matter. 2D) Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment. 4A) Interactions within complex systems lead to complex properties. 4B) Competition and cooperation are important aspects of biological systems.	How are energy and matter transferred/ transformed in living systems? How do plants convert light energy into chemical energy? How do all eukaryotic organisms break down organic compounds to release energy? How does the structure of a molecule or organelle affect its function in cellular processes? How are cellular respiration and photosynthesis related to each other?	2.A.1 All living systems require constant input of free energy. 2.A.2 Organisms capture and store free energy for use in biological processes. 2.A.3 Organisms must exchange matter with the environment to grow, reproduce and maintain organization. 2.D.1 All biological systems from cells to ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy. 2.D.2 Homeostatic mechanisms reflect both common ancestry and divergence due to adaptation in different environments. 4.A.2 The structure and function of subcellular components, and their interactions, provide essential cellular processes.	Justify a scientific claim that free energy is required for living systems to maintain organization, to grow or reproduce, but that multiple strategies exist in different living systems. Explain the exchange of molecules between an organism and its environment, and the subsequent use of these molecules to build new molecules that facilitate dynamic homeostasis, growth and reproduction. Analyze data to identify phylogenetic patterns or relationships, showing that cellular mechanisms reflect both continuity due to common ancestry and change due to evolution in different environments. Explain how interactions of subcellular structures provide essential functions. Understand how cooperative interactions within organisms promote efficiency in the use of		HS.LS1.5-Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.5.DCI.LS1.C.1-The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.5.CCC.1-Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.DCI.LS1.C.1-The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to

		4.B.1. Interactions between molecules affect their structure and function. 4.B.2 Cooperative interactions within organisms promote efficiency in the use of energy and matter.	energy and matter. **Suggested Activities:** Respiration Lab Photosynthesis Lab Transpiration Lab Calvin Cycle Model Activity		make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS -LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.DCI.LS1.C.2-As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different way s to form different products. (HS-LS1-6),(HS-LS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.6.CCC.1-Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.7-Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are

					formed resulting in a net transfer of energy. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.7.DCI.LS1.C.1-As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different way s to form different products. (HS-LS1-6),(HS-LS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.7.DCI.LS1.C.2-As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another and release energy to the surrounding environment and to maintain body temperature. Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. (HS-LS1-7) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.7.CCC.1-Energy cannot be created or destroy ed—it only moves between one place and

					another place, between objects and/or fields, or between systems.(HS-LS1-7),(HS-LS2-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.3-Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.3.DCI.LS2.B.1-Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HSLS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.3.CCC.1-Energy drives the cycling of matter within and between systems. (HS-LS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.5-Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (09-12) [Regional:Next Generation

					Science Standards (NGSS)] HS.LS2.5.DCI.PS3.D.2-The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. (secondary to HS-LS2-5) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS2.5.CCC.1-Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions — including energy , matter, and information flows—within and between systems at different scales. (HS-LS2-5) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School AP Biology
Type : Consensus

Duration: January/Week 17 - March/Week 26					
UNIT NAME: Genetics/Biotechnology					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
1B) Organisms are linked by lines of descent from common ancestry. 2A) Growth, reproduction, and maintaining organization of living systems require energy and matter. 2B) Growth, reproduction, and homeostasis require that cells create and maintain internal environments that are different from their external environments. 2C) Organisms use feedback mechanisms to regulate growth and reproduction,and to maintain dynamic homeostasis. 2D) Growth and homeostasis of a biological system are influenced by changes in the system's environment. 2E) Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination. 3A) Heritable information provides for continuity of life.	How is genetic information stored and transferred through the generations? What are the mechanisms responsible for genetic variation? How can genetic material be altered by artificial means? What is the impact of current and emerging technologies on our understanding of inherited human characteristics? What biochemical evidence supports the theory that all life arose from a common ancestor?		Justify the claim that human manipulate heritable informa by identifying at least two commonly used technologie Evaluate evidence provided data sets to support the clai that heritable information is passed from generation to another generation through mitosis, meiosis followed by fertilization. Pose questions about ethic social or medical issues surrounding human genetic disorders. Explain how the regulation gene expression is essentia the processes and structure support efficient cell functior Predict how changes in the subcomponents of a molecu affect the function of that molecule. **Suggested Activities:** DNA Model Kits Mitosis and Meiosis Lab Chi Square Lab Fruit Fly Lab Animal Development Lab Gel Electrophoresis Lab		HS.LS1.1-Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.1.DCI.LS1.A.2-All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary C ore Idea is also addressed by HS-LS3-1.) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.1.DCI.LS3.A.2-Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA . The instructions for

3B) Expression of genetic information involves cellular and molecular mechanisms. 3C) The processing of genetic information is imperfect and is a source of genetic variation. 4A) Interactions within biological systems lead to complex properties. 4C) Naturally occurring diversity among and between components within biological systems affects interactions with the environment.			Lac Operon Lab Bacterial Transformation Lab		forming species' characteristics are carried in DNA . All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-y t known function. (HS-LS3-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.1.CCC.1-Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1),(HS-LS3-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.2-Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (09-12)[Regional:Next

					Generation Science Standards (NGSS)] HS.LS3.2.DCI.LS3.B.1-In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.2.DCI.LS3.B.2-Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.3.SEP.1-Apply

					concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS - LS3-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.3.CNS.1- Technological advances have influenced the progress of science and science has influenced advances in technology . (HSLS3-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.3.CNS.2-Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS3.3.DCI.LS3.B.1- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental

					factors. (HS-LS3-2),(HS-LS3-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.1.SEP.1-Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally , graphically , textually, and mathematically). (HS-LS4-1) (09-12) [Regional:Next Generation Science Standards (NGSS)]

		1.B.1 Organisms share may conserved core processes a features that evolved and ar widely distributed among organisms today. 1.B.3 Non-eukaryotes can transfer genetic information laterally through the mechan of transformation, transductic and conjugation; most eukary do not transfer information laterally. 2.A.4. Programmed cell dea (apoptosis) plays a role in development and differentiat allows molecules to be reuse and helps maintain homeosta within a biological system. 2.B.2. Growth and homeosta maintained by the constant movement of molecules acro membranes. 2.C.2. Organisms use negat feedback mechanisms to ma their internal environments a respond to external environm changes. 2.D.2. Homeostatic mechan reflect both continuity due to common ancestry and diverg due to adaptation in different environments. 2.E.1 Timing and coordinat of specific events are neces for the normal development			

		organism, and these events regulated by a variety of mechanisms. 2.E.2. Timing and coordinat of physiological events are regulated by multiple mecha 3.A.1 DNA, and in some ca RNA, is the primary source heritable information. 3.A.2 In eukaryotes, herital information is passed to the generation via processes th include the cell cycle and mi or meiosis plus fertilization. 3.A.3 The chromosomal ba of inheritance provides an understanding of the patter passage (transmission) of g from parent to offspring. 3.A.4 The inheritance patte many traits cannot be explai by simple Mendelian genetis 3.B.1 Gene regulation resu differential gene expression leading to cell specialization 3.B.2 A variety of intercellu and intracellular signal transmissions mediate gene expression. 3.C.1 Changes in genotype result in changes in phenoty 3.C.2 Biological systems h			

		multiple processes that incre genetic variation. 3.C.3 Viral replication resu genetic variation, and viral infection can introduce gene variation into the hosts. 4.A.1 The subcomponents biological molecules and the sequence determine the properties of that molecule. 4.A.2 The structure and fun of subcellular components, a their interactions, provide essential cellular processes. 4.A.3 Interactions between external stimuli and regulate gene expression result in specialization of cells, tissue and organs. 4.C.2 Environmental factor influence the expression of t genotype of an organism. 4.C.3 The level of variation population affects populatio dynamics.			
Plans:					

Title : Roxbury High School AP Biology
Type : Consensus

Duration: March/Week 27 - April/Week 30					
UNIT NAME: Evolution					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
1A) Change in the genetic mak of a population over time is evo 1B) Organisms are linked by l of descent from common ances 1C) Life continues to evolve w a changing environment. 1D) The origin of living system explained by natural processes 2D) Growth and homeostas a biological system are influe by changes in the system's environment.	What is the role of natural selection in evolution? What is the evidence which supports the theory of evolution? What conditions dirupt genetic equilibrium? How do new species form? How has the Earth changed over time? How can evolutionary relationships be graphically illustrated?	1.A.1 Natural selection is a major mechanism of evolution. 1.A.2 Natural selection acts on phenotypic variations in populations. 1.A.3 Evolutionary change is also driven by random processes. 1.A.4 Biological evolution is supported by scientific evidence from many disciplines, including mathematics. 1.B.1 Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today. 1.B.2 Phylogenic trees and cladograms are graphical representations (models) of evolutionary history that can be tested. 1.C.1 Speciation and extinction have occurred	Convert a data set from a table of numbers that reflect a change in the genetic makeup of a population over time and apply mathematical methods and conceptual understandings to investigate the cause(s) and effect(s) of this change. Apply mathematical methods to data from a real or simulated population to predict what will happen to the population in the future. Evaluate data-based evidence that describes evolutionary changes in the genetic makeup of a population over time. Connect evolutionary changes in a population over time to a change in the environment. Use Hardy-Weinberg equilibrium to analyze genetic drift and effects of selection in the evolution of specific populations. Make predictions about		HS.LS3.2.DCI.LS3.B.1-In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.2-Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited

		throughout the Earth's history. 1.C.2 Speciation may occur when two populations become reproductively isolated from each other. 1.C.3 Populations of organisms continue to evolve. 1.D.1 There are several hypothesis about the natural origin of life on Earth, each with supporting scientific evidence. 1.D.2 Scientific evidence from many different disciplines supports models of the origin of life. 2.D.2. Homeostatic mechanisms reflect both continuity due to common ancestry and divergence due to adaptation in different environments.	the effects of genetic drift, migration and artificial selection on the genetic makeup of a population. Evaluate evidence from many scientific disciplines that support biological evolution. Construct and/or justify mathematical models, diagrams or simulations that represent processes of biological evolution. Pose scientific questions that correctly identify essential properties of shared, core life processes that provide insights into the history of life on Earth. Evaluate evidence provide by a data set in conjunction with a phylogenetic tree or a simple cladogram to determine evolutionary history. Analyze data related to questions of speciation and extinction throughout Earth's history. Use data to predict what will happen to a population in the future. Describe speciation in an		resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.1.CCC.1-Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HSLS4-1), (HS-LS4-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.2.DCI.LS4.B.1-Natural selection occurs only if there is both (1)variation in the genetic information between organisms in a population and (2)variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.2.DCI.LS4.C.2-Evolution is a consequence of the interaction of four factors: (1) the potential for a

			isolated population and connect it to change in gene frequency, change in environment, natural selection and/or genetic drift. Describe a model or evaluate data sets that illustrate evolution as an ongoing process. Describe a scientific hypothesis about the origin of life on Earth. State reasons for the revisions to scientific hypothesis for the origin of life on Earth. State the geological, physical and chemical data which reveal the early Earth conditions. **Suggested Activities:** Evidence For Evolution Lab Natural selection Lab Origin of life Lab Hominoid Skulls Lab Fossils Activity		species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to surviv e and reproduce in that environment. (HS-LS4-2) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS4.3-Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.3.DCI.LS4.B.1-Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-

					LS4-2),(HS-LS4-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.3.DCI.LS4.B.2- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.3.DCI.LS4.C.3- dominated by organisms that are anatomically , behaviorally , and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS4.3.DCI.LS4.C.4- Adaptation also means that the distribution of traits in a population can change when conditions

					change. (HS-LS4-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS4.3.CCC.1-Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HSLS4-1), (HS-LS4-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.4-Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS4.4.DCI.LS4.C.1-Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally , and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future

					generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS4.5.DCI.LS4.C.1- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction– of some species. (HS-LS4-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.5.DCI.LS4.C.2- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School AP Biology
Type : Consensus

Title : Roxbury High School AP Biology
Type : Consensus

Duration: April/Week 31 - May/Week 33					
UNIT NAME: Animal Systems and Homeostasis					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
1B) Organisms are linked by lines of descent from common ancestry. 2C) Organisms use feedback mechanisms to regulate growth and reproduction,and to maintain dynamic homeostasis. 2D) Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment. 2E) Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination. 3E) Transmission of information results in changes within and between biological systems. 4A) Interactions within biological systems lead to complex properties. 4B) Competition and cooperation are important aspects of biological systems.	What is the evidence to support the theory of common ancestry among organisms? How do the systems of the human body coordinate and regulate the internal environment?	1.B.1 Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today. 2.C.1 Organisms use feedback mechanisms to maintain their internal environments and respond to external environment changes. 2.C.2 Organisms respond to changes in their external environments. 2.C.3. Organisms constantly respond to changes in their external environments. 2.D.3. Biological systems are affected by disruptions to their homeostasis. 2.D.4 Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.	Describe specific examples of conserved core biological processes and features shared by all domains or within one domain of life, and how these shared, conserved core processes and features support the concept of common ancestry for all organisms. Make predictions about how organisms use negative feedback mechanisms to maintain their internal environments. Make predictions about how positive feedback mechanisms amplify activities and processes in organisms based on scientific theories and models. Explain the mechanisms used by organisms to respond to changes in the external environment. Create representations or models to describe immune responses/ defenses in plants and animals.		HS.LS1.1.DCI.LS1.A.1-Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.1.CCC.1-Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.2-Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.2.SEP.1-Develop and use a model based on evidence to illustrate the

		2.E.1. Timing and coordination of several events are necessary for the normal development of an organism, and these events require regulation by multiple mechanisms. 2.E.2 Timing and coordination of physiological events are regulated by multiple mechanisms. 3.E.2 Animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses. 4.A.3. Interactions between external stimuli and gene expression result in specialization of cells, tissues, and organs. 4.A.4 Organisms exhibit complex properties due to interactions between their constituent parts. 4.B.2. Interactions between cells affect the fitness of the organism. 4.B.3. Cooperative interactions within organisms increase efficiency in the use of	Explain how timing and coordination of physiological events involve regulation. Justify scientific claims, using evidence, to describe how timing and coordination of behavioral events in organisms are regulated by several mechanisms. Connect concepts in and across domains to predict how environmental factors affect responses to information and change behavior. Analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior. Explain how nervous systems detect external and internal signals, transmit and integrate information. Evaluate scientific questions concerning organisms that exhibit complex properties due to the interaction of their constituent parts. Predict the effects of a		relationships between systems or between components of a system. (HS-LS1-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.2.DCI.LS1.A.1-Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS1.3-Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.3.DCI.LS1.A.1-Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative

		energy and matter.	change in a component of a biological system on the functionality of an organism. **Suggested Activities:** Animal Systems Presentations		feedback) what is going on inside the living system. (HS-LS1-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS1.4.DCI.LS1.B.1-In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that div ides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4) (09-12)[Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School AP Biology
Type : Consensus

Duration: May/Week 33 - May/Week 34					
UNIT NAME: Review					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Review the four Big Ideas, all of the Enduring Understanding an Essential Knowledge concepts and all of the course learning objectives for preparation for the AP Biology Exam.					
Plans:					