AP BIOLOGY-BIOCHEMISTRY

Missouri Grade-Level Expectations (or other standards)

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.
Essential knowledge 2.C.2: Organisms respond to changes in their external environments.
Essential knowledge 3.A.1: DNA, and in some cases RNA, is the primary source of heritable information.
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.B.1: Interactions between molecules affect their structure and function.
Essential knowledge 4.B.2: Cooperative interactions within organisms promote efficiency in the use of energy and matter.
Essential knowledge 4.C.1: Variation in molecular units provides cells with a wider range of functions.

Learning Goal

The student will be able to identify essential molecules for life and explain how they interact as well as their impact on living organisms.

The student will be able to use scientific evidence to explain the origin of life.

Proficiency Scales

4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- The student is able to justify the selection of geological, physical, and chemical data that reveal early Earth conditions.
- The student is able to describe the reasons for revisions of scientific hypotheses of the origin of life on Earth.

2: Student demonstrates he/she is nearing proficiency by:

- The student is able to evaluate the accuracy and legitimacy of data to answer scientific questions about the origin of life on Earth.
- The student is able to describe a scientific hypothesis about the origin of life on Earth.

1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-CELLS AND CELL COMMUNICATION

Missouri Grade-Level Expectations (or other standards)

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 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.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 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 direct contact with other cells or from a distance via chemical signaling.

Learning Goal

The student will be able to tell the similarities and differences between prokaryotic and eukaryotic cells.

The student will be able to explain how cells control their internal environment via different mechanisms and molecular properties.

Proficiency Scales

4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- The student can justify a claim made about the effect(s) on a biological system at the molecular, physiological or organismal level when given a scenario in which one or more components within a negative regulatory system is altered.
- The student is able to justify the scientific claim that organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.

2: Student demonstrates he/she is nearing proficiency by:

- The student is able to evaluate data that show the effect(s) of changes in concentrations of key molecules on negative feedback mechanisms.
- The student is able to describe specific examples of conserved core biological processes

	and features shared by all domains or within one domain of life. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-PHOTOSYNTHESIS AND RESPIRATION

Missouri Grade-Level Expectations (or other standards)

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.2: Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes.
Essential knowledge 2.C.1: Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.
Essential knowledge 4.A.2: The structure and function of subcellular components, and their interactions, provide essential cellular processes.
Essential knowledge 4.A.6: Interactions among living systems and with their environment result in the movement of matter and energy.
Essential knowledge 4.C.1: Variation in molecular units provides cells with a wider range of functions.

Learning Goal	Proficiency Scales
The student will be able to illustrate and describe the chemical reaction sequence of major cycles in photosynthesis and respiration. The student will be able to use data and graphs to support claims of human impact on global warming via respiration.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy. ● The student is able to apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy. 2: Student demonstrates he/she is nearing proficiency by:

	● The student is able to 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. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-DNA AND CELL REPLICATION

Missouri Grade-Level Expectations (or other standards)

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 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.E.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.
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.
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 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.

Learning Goal	Proficiency Scales
The student will be able to discuss the benefits and consequences of sexual and asexual reproduction. The student will be able to label DNA structures and explain in detail the steps of	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to evaluate evidence provided by data sets to support the

cell and DNA replication.	claim that heritable information is passed from one generation to another generation through mitosis, or meiosis followed by fertilization. ● The student is able to design a plan for collecting data to support the scientific claim that the timing and coordination of physiological events involve regulation. 2: Student demonstrates he/she is nearing proficiency by: ● The student can describe the events that occur in the cell cycle. ● The student is able to represent the connection between meiosis and increased genetic diversity necessary for evolution. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-PROTEIN SYNTHESIS

Missouri Grade-Level Expectations (or other standards)

Essential knowledge 2.B.3: Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.
Essential knowledge 2.E.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.
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 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.B.1: Interactions between molecules affect their structure and function.

Learning Goal	Proficiency Scales
The student will be able to discuss the processes and transcription and translation and their role in protein synthesis. The student will be able to understand how external and internal stimuli can cause	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to explain how the regulation of gene

protein synthesis to occur to keep normal cell function.	expression is essential for the processes and structures that support efficient cell function. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to explain the connection between the sequence and the subcomponents of a biological polymer and its properties. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-Gene Regulation

Missouri Grade-Level Expectations (or other standards)

Essential knowledge 2.B.3: Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.
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.E.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.
Essential knowledge 3.A.1: DNA, and in some cases RNA, is the primary source of heritable information.
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 4.A.3: Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues and organs.
Essential knowledge 4.B.1: Interactions between molecules affect their structure and function.

Learning Goal	Proficiency Scales
The student will be able to explain how external stimuli like temperature and nutrients can cause genes to turn on or off.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

The student will be able to analyze data and predict the physiological outcome of organism development.	3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function. ● The student is able to explain how signal pathways mediate gene expression, including how this process can affect protein production. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to describe the connection between the regulation of gene expression and observed differences between different kinds of organisms. ● The student can use representations to describe mechanisms of the regulation of gene expression. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-GENETICS

Missouri Grade-Level Expectations (or other standards)

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.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 4.A.3: Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues and organs.
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.

Learning Goal	Proficiency Scales
The student will be able to analyze	4: Student demonstrates an in-depth inference or advanced application or

advanced inheritance patterns. The student will be able to use ratios, mathematical equations, and data to calculate phenotype and genotype ratios of future generations.	innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to pose questions about ethical, social or medical issues surrounding human genetic disorders. ● The student is able to describe representations of an appropriate example of inheritance patterns that cannot be explained by Mendel's model of the inheritance of traits. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets. ● The student is able to explain deviations from Mendel's model of the inheritance of traits. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-BIOTECHNOLOGY

Missouri Grade-Level Expectations (or other standards)

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 3.A.1: DNA, and in some cases RNA, is the primary source of heritable information.
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.C.3: Viral replication results in genetic variation, and viral infection can introduce genetic variation into the hosts.
Essential knowledge 4.B.1: Interactions between molecules affect their structure and function.
Essential knowledge 4.B.2: Cooperative interactions within organisms promote efficiency in the use of energy and matter.

Learning Goal	Proficiency Scales
The student will be able to illustrate the life cycles of viruses and explain how this allows genetic transfer between cells to occur. The student will be able to describe different technologies available and match them with what real life application would use these tools.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to construct an explanation of how viruses introduce genetic variation in host organisms. ● The student can justify the claim that humans can manipulate heritable information by identifying at least two commonly used technologies. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-MICROEVOLUTION

Missouri Grade-Level Expectations (or other standards)

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.2: Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.
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.
Essential knowledge 3.C.1: Changes in genotype can result in changes in phenotype.

Essential knowledge 3.D.1: Cell communication processes share common features that reflect a shared evolutionary history.

Learning Goal	Proficiency Scales
The student will be able to use data and mathematical equations to predict population growth, evolution, and extinction/speciation of organisms. The student will be able to explain how chromosomal and base mutations can lead to advantageous phenotypes and cause speciation.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to convert a data set from a table of numbers that reflect a change in the genetic makeup of a population over time and to apply mathematical methods and conceptual understandings to investigate the cause(s) and effect(s) of this change. ● The student is able to use data from mathematical models based on the Hardy-Weinberg equilibrium to analyze genetic drift and effects of selection in the evolution of specific populations. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to evaluate evidence provided by data to qualitatively and quantitatively investigate the role of natural selection in evolution. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-MACROEVOLUTION

Missouri Grade-Level Expectations (or other standards)

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.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 become reproductively isolated from each other.
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.
Essential knowledge 2.E.3:Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.
Essential knowledge 3.D.1: Cell communication processes share common features that reflect a shared evolutionary history.

Learning Goal	Proficiency Scales
The student will be able to use data and evidence to support the claim that speciation and evolution has occurred. The student will be able to categorize organisms based on similar structures, functions, and abilities and use this categorization to sort unknown organisms.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to evaluate data-based evidence that describes evolutionary changes in the genetic makeup of a population over time. ● The student is able to design a plan for collecting data to investigate the scientific claim that speciation and extinction have occurred throughout the Earth's history. ● The student is able to describe a model that represents evolution within a population. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to connect evolutionary changes in a population over time to a change in the environment. ● The student is able to analyze data related to questions of speciation and extinction throughout the Earth's history. ● The student is able to justify the selection of data that address questions related to reproductive isolation and speciation. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-NERVOUS SYSTEM

Missouri Grade-Level Expectations (or other standards)

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 direct contact with other cells or from a distance via chemical signaling.
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.

Learning Goal	Proficiency Scales
The student will be able to illustrate the complex process of receiving stimuli and eliciting a response via nerve impulses and chemicals. The student will be able to explain the difference between cell to cell communication and communication between organisms.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to construct explanations of cell communication through cell-to-cell direct contact or through chemical signaling. ● The student is able to construct an explanation, based on scientific theories and models, about how nervous systems detect external and internal signals, transmit and integrate information, and produce responses. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to create representation(s) that depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling. ● The student is able to describe how nervous systems transmit information. ● The student is able to describe how nervous systems detect external and internal signals. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-ENDOCRINE SYSTEM

Missouri Grade-Level Expectations (or other standards)

Essential knowledge 2.B.1: Cell membranes are selectively permeable due to their structure.
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 direct contact with other cells or from a distance via chemical signaling.
Essential knowledge 4.A.4: Organisms exhibit complex properties due to interactions between their constituent parts.
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.

Learning Goal	Proficiency Scales
The student will be able to explain the role the endocrine system has in cell communication.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● The student is able to construct explanations of cell communication through cell-to-cell direct contact or through chemical signaling. ● The student is able to use representation(s) and appropriate models to describe features of a cell signaling pathway. 2: Student demonstrates he/she is nearing proficiency by: ● The student is able to create representation(s) that depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling. 1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-IMMUNE SYSTEM

Missouri Grade-Level Expectations (or other standards)

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 3.D.2: Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.
Essential knowledge 4.B.1: Interactions between molecules affect their structure and function.

Learning Goal

The student will be able to identify and describe key leukocytes and their role in fighting pathogens.

The student will be able to explain the chemical communication done between the immune system cells and other system cells.

Proficiency Scales

4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- The student can create representations and models to describe immune responses.
- The student can connect concepts in and across domains to show that timing and coordination of specific events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms.

2: Student demonstrates he/she is nearing proficiency by:

- The student can create representations or models to describe nonspecific immune defenses in plants and animals.
- The student is able to connect concepts that describe mechanisms that regulate the timing and coordination of physiological events.

1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-BOTANY

Missouri Grade-Level Expectations (or other standards)

Essential knowledge 2.E.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.
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.
Essential knowledge 3.C.2: Biological systems have multiple processes that increase genetic variation.
Essential knowledge 3.D.1: Cell communication processes share common features that reflect a shared evolutionary history.
Essential knowledge 4.A.4: Organisms exhibit complex properties due to interactions between their constituent parts.
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.

Learning Goal

The student will be able to identify plant anatomy that illustrates differentiation and organ system functions.

The student will be able to explain reproductive organ parts and the variety of reproductive life cycles.

Proficiency Scales

4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- The student is able to analyze data to identify how molecular interactions affect structure and function.
- The student is able to evaluate scientific questions concerning organisms that exhibit complex properties due to the interaction of their constituent parts.
- The student is able to construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions.

2: Student demonstrates he/she is nearing proficiency by:

- The student is able to refine representations and models to illustrate biocomplexity due to interactions of the constituent parts.

1: Student demonstrates a limited understanding or skill with the learning goal.

AP BIOLOGY-ECOLOGY

Missouri Grade-Level Expectations (or other standards)

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 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.C.2: Organisms respond to changes in their external environments.
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 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.
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.2: Cooperative interactions within organisms promote efficiency in the use of energy and matter.
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.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.

Learning Goal

The student will be able to draw abiotic cycles of materials and explain their role in an ecosystem.

The student will be able to use behavior and lifestyle to identify what type of role an organism plays in an ecosystem.

The student will be able to analyze data to

Proficiency Scales

4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- The student is able to apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways.
- The student is able to use visual representations to analyze situations or solve problems qualitatively to illustrate how interactions among living systems and with their environment result in the movement of matter and energy.

conclude what interactions and relationships organisms have with each other.	2: Student demonstrates he/she is nearing proficiency by: ● The student is able to predict the effects of a change in the community's populations on the community. ● The student is able to predict the effects of a change of matter or energy availability on communities. 1: Student demonstrates a limited understanding or skill with the learning goal.