

**Enduring Understanding # 1: Scientific inquiry affords all learners opportunities to make observations, pose questions, develop hypotheses, design and conduct investigations, and analyze data to draw conclusions.**

**Biology 1-2 Benchmarks**

| <b>Students will understand</b>   | <b>Essential Questions</b>   | <b>Students will know the/that</b>   | <b>Students will be able to</b>   | <b>Notes</b>  |
|---|--|--|---|---|
| 1.1 Inquiry is an attitude, a learner centered environment, and a cycle that involves solving problems and critical thinking. | <ul style="list-style-type: none"> <li>-What is a scientific question?</li> <li>-What is a testable hypothesis?</li> <li>-How do I know if my experimental procedure aligns with my hypothesis?</li> <li>-How do I minimize my error in collecting data?</li> <li>-Why is it important to replicate scientific experiments?</li> <li>-What is learning through inquiry?</li> </ul> | <ul style="list-style-type: none"> <li>-The steps to understand scientific inquiry include: observing, using numbers, plotting graphs, measuring, inferring, prediction, formulating models, interpreting data, hypothesizing, and experimenting.</li> <li>-Developing a scientific theory often means repeating or modifying the experiment.</li> </ul> | <ul style="list-style-type: none"> <li>-Pose questions objectively based on observations.</li> <li>-Develop hypotheses..</li> <li>-Write clear, step-by-step instructions for conducting an investigation.</li> <li>-Demonstrate appropriate practices in research such as repeating the experiment.</li> <li>-Gather and analyze necessary and sufficient data.</li> <li>-Use data to draw logical conclusions</li> <li>-Use logical argumentation to defend research results.</li> <li>-Participate in group discussions/activities on scientific topics.</li> <li>-Use logical problem solving and critical thinking skills in scientific investigations.</li> </ul> | <ul style="list-style-type: none"> <li>-Inquiry is a process that progresses from teacher-directed to learner self-directed.</li> <li>-Inquiry teamed with other practices leads to successful understanding of science.</li> <li>-Students will design and conduct an inquiry based investigation:               <ul style="list-style-type: none"> <li>• Learner poses questions.</li> <li>• Learner determines what constitutes evidence and collects it.</li> <li>• Learner formulates explanation after summarizing evidence.</li> <li>• Learner independently examines other resources and forms the links to explanations.</li> <li>• Learner forms reasonable and logical arguments to communicate explanations.</li> </ul> </li> </ul> |

**Enduring Understanding # 2: Exploring systems, order, and organizations in our natural and designed world are integral to understanding the scientific disciplines and their interdependence.**

**Biology 1-2 Benchmarks**

| <b>Students will understand:</b>   | <b>Essential Questions</b>  | <b>Students will know the/that</b>   | <b>Students will be able to</b>  | <b>Notes</b> |
|--|---|--|--|--------------|
| 2.1 The structures and functions of various cells are foundational to the understanding of | <ul style="list-style-type: none"> <li>- What are the differences between prokaryotic and eukaryotic cells?</li> <li>-What are the</li> </ul> | <ul style="list-style-type: none"> <li>- Similarities and differences between prokaryotic and eukaryotic cells.</li> <li>- Similarities and</li> </ul> | <ul style="list-style-type: none"> <li>-Culture prokaryotes in order to investigate differences between prokaryotic and eukaryotic cells.</li> </ul> |              |

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| living systems. | <p>similarities and differences between plant and animal cells?</p> <p>-How do active transport and osmosis help a cell maintain homeostasis?</p> <p>-Are photosynthesis and cellular respiration interrelated processes?</p> <p>-What is an organelle and what do they do for the cell?</p> <p>-How does a cell get what it needs and get rid of what it doesn't need?</p> <p>-How is there sunlight in every bite?</p> <p>-What kinds of molecules characterize living things?</p> <p>-Is life possible without water?</p> | <p>differences between plant and animal cells.</p> <p>- Similarities and differences between photosynthesis and cellular respiration.</p> <p>-Role of active transport and osmosis in homeostasis.</p> <p>- Properties of water make life on earth possible.</p> <p>- Structures and functions of proteins, carbohydrates, lipids, and nucleic acids.</p> | <p>- Identify plant and animal cells.</p> <p>- Identify the reactants and products of photosynthesis and cellular respiration in a lab setting.</p> <p>- Demonstrate osmosis in living cells.</p> <p>- Identify the unique properties of water in a living system.</p> <p>- Identify the presence of proteins, carbohydrates, lipids, and nucleic acids.</p> |
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| Biology 1-2 Benchmarks    |   |   |  |       |
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| Students will understand: | Essential Questions   | Students will know the/that   | Students will be able to   | Notes |
|                           | <p>-What are the differences between mitosis and meiosis?</p> <p>-How does gene expression lead to traits?</p> <p>-What is the role of protein synthesis in the expression of genes?</p> <p>-How does the structure of DNA affect function?</p> <p>-How does sexual reproduction and mutation contribute to genetic variation?</p> <p>-Why do cells need to divide?</p> <p>-Why don't offspring look exactly like their parents?</p> <p>-How is cell division different in body cells and reproductive cells?</p> <p>-If DNA produces proteins, what do proteins produce?</p> | <p>- Similarity and difference between mitosis and meiosis.</p> <p>- Similarity and difference between dominant and recessive traits.</p> <p>- Process of DNA replication and protein synthesis.</p> <p>- Process of expression of a gene leads to a trait.</p> <p>- Genes from both parents results in new combinations of genes in offspring.</p> <p>-Impact genetic knowledge and the advances in DNA technology have on the individual and society.</p> | <p>- Use scientific methods to make predictions of genotype and phenotype inheritance. i.e.) monohybrid and dihybrid cross</p> <p>- Investigate ethical and social impacts of genetic science.</p> <p>- Analyze the implication of DNA and chromosomal changes.</p> <p>- Identify the phases of mitosis and meiosis.</p> <p>- Demonstrates knowledge of DNA replication and protein synthesis.</p> |       |

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| 2.2 Genetics provides a framework to understand the transmission of characteristics from parent to offspring and leads to variation. |   |   |  |  |
| 2.3 The interconnectedness of biotic and abiotic systems determines ecological relationships.  | <ul style="list-style-type: none"> <li>-How does energy flow through an ecosystem? i.e. trophic levels, food webs</li> <li>-How do environmental factors affect population dynamics?</li> <li>-How do humans affect the global and local environment?</li> <li>-What factors affect human population dynamics?</li> <li>-How do disturbances affect ecological communities?</li> <li>-How do ecologists study populations?</li> </ul> | <ul style="list-style-type: none"> <li>-Similarity and difference between biotic and abiotic factors.</li> <li>- The flow of energy through an ecosystem.</li> <li>- Factors that affect population dynamics.</li> <li>-Human impact on global and local environments and give examples.</li> <li>-Unique dynamics of human populations.</li> <li>- Interactions between populations in a community.</li> <li>- Different strategies for studying communities.</li> </ul> | <ul style="list-style-type: none"> <li>-Identify primary biotic and abiotic factors in an environment.</li> <li>-Trace the flow of energy through and ecosystem.</li> <li>-Model population dynamics.</li> <li>-Predict the consequences of continued human population growth.</li> <li>-Use sampling to determine characteristics of a population.</li> </ul> |  |
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## Biology 1-2 Benchmarks

| Students will understand:  | Essential Questions   | Students will know the/that  | Students will be able to   | Notes |
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| 2.4 Body systems are the result of complex structures and functions. | <ul style="list-style-type: none"> <li>-What are the main tissues, organs, and functions of body systems?</li> <li>-How do systems maintain homeostasis? i.e.) blood sugar, CO<sub>2</sub> concentration, reproduction, muscle contraction, waste products</li> <li>-How does an understanding of body systems increase one's ability to make informed decisions on health issues?</li> </ul> | <ul style="list-style-type: none"> <li>- Relationship between structures to functions in body systems.</li> <li>- Mechanisms that regulate homeostasis.</li> <li>-Current health issues and relate them to knowledge of body systems.</li> </ul> | <ul style="list-style-type: none"> <li>- Identify the organs and explain their function using a biological specimen.</li> <li>- Monitor homeostatic response in an organism. i.e.) heart rate response, temperature response, osmoregulation</li> <li>- Apply an understanding of anatomy and physiology to personal health issues i.e. diabetes, cancer, autoimmune disorders, etc</li> </ul> |       |
| 2.5 Adaptation and evolution lead to diversity in living things.     | <ul style="list-style-type: none"> <li>-How does evolution produce diversity in living things?</li> <li>-What are the driving forces of evolution?</li> <li>-How does variation impact a population?</li> <li>-How does evolutionary theory lead to understanding life on earth?</li> <li>-What forms the basis of our understanding of evolution?</li> </ul>                                 | <ul style="list-style-type: none"> <li>- Role of evolution in species diversity.</li> <li>- Mechanisms that result in biological changes over time.</li> <li>- Evidence that supports evolutionary theory.</li> </ul>                            | <ul style="list-style-type: none"> <li>- Identify evolutionary influences. i.e. mass extinctions, antibiotic resistance, pesticide resistance, bottle neck, isolation, competition</li> <li>- Compare organisms to demonstrate key concepts that support the theory of evolution.</li> </ul>   |       |

**Enduring Understanding # 3: Both contemporary and historical scientific understandings inform technological, ethical, cultural and life decisions.**

## Biology 1-2 Benchmarks

| Students will understand:   | Essential Questions  | Students will know the/that  | Students will be able to   | Notes |
|---|--|--|--|-------|
| 3.1 Scientific knowledge and technological advances occur in response to natural inquiry. | <ul style="list-style-type: none"> <li>-How have advances in technology lead to a greater understanding of biological systems?</li> <li>-How has natural inquiry by scientists led to advances in biological knowledge?</li> </ul> | <ul style="list-style-type: none"> <li>- How the use of new technologies has led to new discoveries and better understanding.</li> <li>- How scientists have contributed to biological understanding.</li> </ul> | <ul style="list-style-type: none"> <li>- Use modern technologies to investigate and report on a biological concept, idea, or system. i.e. microscope, electrophoresis, internet, probe.</li> <li>- Track advancements in biology to specific contributions by biologists.</li> </ul> |       |
| 3.2 Past and present biological investigations have influenced societal                   | <ul style="list-style-type: none"> <li>-How has the past and present study of biology impacted ethics in society?</li> </ul>   | <ul style="list-style-type: none"> <li>- Biological events that have influenced ethical decision making.</li> </ul>  | <ul style="list-style-type: none"> <li>- Take a position on a controversial topic in biology and support your position using</li> </ul>  |       |

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| decisions regarding ethics.  |  |   | scientific findings.<br><br>- Critically analyze a piece of scientific media using scientific knowledge. |  |
| 3.3 Cultural and societal practices have contributed to our scientific knowledge that leads to informed decisions. | -How have cultural and societal practices influenced biological understanding? | - Biological understandings that have been influenced by Native American practices. | - Investigate how Native American practices are relevant to biology.                                     |  |

**Enduring Understanding # 1: Scientific inquiry affords all learners opportunities to make observations, pose questions, develop hypotheses, design and conduct investigations, and analyze data to draw conclusions.**

**Biology 3-4 Benchmarks**

| <b>Students will understand:</b>  | <b>Essential Questions</b>  | <b>Students will know the/that</b>  | <b>Students will be able to</b>  | <b>Notes</b>  |
|---|---|---|--|---|
| 1.1 Inquiry is an attitude, a learner centered environment, and a cycle that involves solving problems and critical thinking. | <p>-What is learning through inquiry?</p> <p>-How is an inquiry lab different from science labs I usually conduct in class?</p> <p>-How do I know what kinds of data to collect?</p> <p>-Do I have a good answer if I can't justify it?</p> | <p>-Scientific inquiry may include: observing, using numbers, plotting graphs, measuring, inferring, predicting, formulating models, interpreting data, hypothesizing, and experimenting.</p> <p>-Process required to generate question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct scientific investigations, and collect and analyze data.</p> | <p>-Pose questions objectively based on observations.</p> <p>-Develop hypotheses.</p> <p>-Demonstrate appropriate practices in research.</p> <p>-Gather and analyze relevant and sufficient data.</p> <p>-Examine various resources of scientific knowledge.</p> <p>-Use data to draw logical conclusions.</p> <p>-Participate in small group discussions &amp; activities.</p> <p>-Use critical thinking to compare, contrast, and analyze the similarities and differences in organisms.</p> | <p>-Inquiry is a process that progresses from teacher-directed to learner self-directed.</p> <p>-Students should continue the process of being self directed in inquiry activities.</p> |

**Enduring Understanding # 2: Exploring systems, order, and organizations in our**

natural and designed world are integral to understanding the scientific disciplines and their interdependence.

### Biology 3-4 Benchmarks

| Students will understand:   | Essential Questions  | Students will know the/that  | Students will be able to   | Notes  |
|---|--|--|--|--|
| <p><i>By investigating a wide variety of organism students will:</i></p> <p>2.1 Discover the importance of classification and the diversity of living organisms.</p> <p>2.2 Gain a better understanding of the world around them, both microscopic and macroscopic.</p> <p>2.3 Gain important information about how organisms critically impact Earth's systems.</p> <p>2.4 Understand the influence of biological evolution.</p> | <p>-How and why do we group organisms?<br/>-Why is it necessary to classify organisms?<br/>-Are all animals that look similar related?<br/>-What constitutes life?<br/>-How do bacteria live in extreme conditions?<br/>-Is a virus like a bacterium?<br/>-How does an organism get what it needs and get rid of what it doesn't need?<br/>-What are the different characteristics that place organisms in the Kingdom Protista?<br/>-Why does bread mold?<br/>-What makes an animal an animal?<br/>-How do organisms differ from each other?<br/>-Which came first, the chicken or the egg?<br/>-What makes a plant a plant?<br/>-How do we control bacteria?<br/>-Why do bacteria respond differently to antibiotics?<br/>-How is there sunlight in every bite?<br/>-What came first, plants or animals?</p> | <p>-Biologists use modern taxonomy to organize and group organisms.</p> <p>-Similarities and differences between prokaryotic and eukaryotic organisms.</p> <p>-Adaptations in body plans have contributed to the evolutionary success of organisms.</p> <p>-Adaptations in body plans change over time, leading to the formation of new traits.</p> <p>-Defining characteristics for the 6 kingdoms and 3 domains.</p> <p>-Organisms either directly or indirectly impact all other life and the physical environment.</p> | <p>-Use modern taxonomy to classify organisms.</p> <p>-Culture prokaryotes in order to investigate differences between prokaryotic and eukaryotic cells.</p> <p>-Identify plant and animal cells.</p> <p>-Use comparative anatomy and physiology to analyze body systems.</p> <p>-Use dissection to investigate characteristics of plants and animals.</p> | <p>Activities might include:<br/>Bacteria Unknown Lab, Gram Staining, Infectious diseases presentations, student designed investigation of plant physiology.</p> <p>Defining characteristics include coelom formation, body symmetry, embryological evidence, macromolecules, tissue/organ/organ system development, etc.</p> <p>Recommended animal dissections might include: Ascaris, Clam, Squid, Earthworm, Grasshopper, Crayfish, Sea stars, Lamprey, Perch, Shark, Frog, Bird, and Owl Pellet.<br/>Recommended plant dissections might include: Flowers, stems, leaves, seeds, and fruits.<br/>Various live organisms can be used to demonstrate behavior.</p> |

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### Biology 3-4 Benchmarks

| Students will understand:  | Essential Questions   | Students will know the/that  | Students will be able to  | Notes |
|--|---|--|---|-------|
| <p>3.1 Scientific knowledge and technological advances occur in response to natural inquiry.</p> | <p>-How have advances in technology lead to a greater understanding of biological systems?<br/><br/>-How has natural inquiry by scientists led to</p> | <p>- The use of new technologies has led to new discoveries and better understanding.</p> <p>-Scientists have contributed to</p> | <p>- Use modern technologies to investigate and report on a biological concept, idea, or system, e.g. microscope &amp; internet.<br/>- Track advancements</p> |       |

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|  | advances in biological knowledge?  | biological understanding   | in biology to specific contributions by biologists.  |  |
| 3.2 Past and present biological investigations have influenced societal decisions regarding ethics.                | -How has the past and present study of biology impacted ethics in society?     | - Biological events that have influenced ethical decision making.                  | - Take a position on a controversial topic in biology and support your position using scientific findings.<br><br>- Critically analyze a piece of scientific media using scientific knowledge. |  |
| 3.3 Cultural and societal practices have contributed to our scientific knowledge that leads to informed decisions. | -How have cultural and societal practices influenced biological understanding? | -Biological understandings that have been influenced by Native American practices. | - Investigate how Native American practices are relevant to biology.   |  |

**Enduring Understanding # 1: Scientific inquiry affords all learners opportunities to make observations, pose questions, develop hypotheses, design and conduct investigations, and analyze data to draw conclusions.**

**Biology Honors 5-6 Benchmarks**

| <b>Students will understand:</b>  | <b>Essential Questions</b>   | <b>Students will know the/that</b>   | <b>Students will be able to</b>   | <b>Notes</b>                                     |
|---|--|--|---|--|
| 1.1 Inquiry is an attitude, a learner centered environment, and a cycle that involves solving problems and critical thinking. | -What is learning through inquiry?<br><br>-How are controlled scientific experiments designed?<br><br>-What does the credibility of science depend upon? | -Scientific inquiry may include: observing, using numbers, plotting graphs, measuring, inferring, predicting, formulating models, interpreting data, hypothesizing, and experimenting.<br><br>-Process required to generate question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct scientific investigations, and collect and analyze data. | -Pose questions objectively based on observations.<br><br>-Develop hypotheses<br>-Write clear, step-by-step instructions for conducting an investigation.<br><br>-Demonstrate appropriate practices in research such as repeating the experiment.<br><br>-Gather and analyze necessary and sufficient data.<br><br>-Use data to draw logical conclusions.<br><br>-Use logical argumentation to defend research results. | <b>Themes</b><br>1. Science is a way of knowing. |

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|  |  |  | <ul style="list-style-type: none"> <li>-Participate in group discussions/activities on scientific topics.</li> <li>-Use logical problem solving and critical thinking skills in scientific investigations.</li> <li><b>-Design their own lab in the AP Lab: Behavior</b></li> </ul> |  |
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Enduring Understanding # 2: Exploring systems, order, and organizations in our natural and designed world are integral to understanding the scientific disciplines and their interdependence.

### Biology Honors 5-6 Benchmarks

| Students will understand:   | Essential Questions  | Students will know the/that  | Students will be able to  | Notes   |
|---|--|--|---|---|
| 2.1 Biology is a scientific process that observes patterns in nature and predicts outcomes based on the laws of nature. | <ul style="list-style-type: none"> <li>-Is a candle alive? Why?</li> <li>-Why are there uncertainties in science?</li> <li>-What is strong inference?</li> <li>-What is the difference between law, theory, and hypothesis?</li> </ul> | <ul style="list-style-type: none"> <li>- Emergent properties arise in biological systems.</li> <li>- Hierarchy of biological systems.</li> <li>-Science is a process that seeks closer and closer approximations to truth</li> <li>-Laws are observable facts</li> <li>-Hypotheses are testable explanations.</li> <li>-Theories are based on laws of physics and chemistry and explain a large variety of phenomena and have never been disproven. They are VERY powerful explanations in science.</li> </ul> | <ul style="list-style-type: none"> <li>-Distinguish features of science from non science; public facts from private facts</li> <li>-Describe how science can study the relationship between “nature and nurture” in understanding organism’s response to their environment.</li> <li>-Identify the scientific principles underlying the hypotheses tested in labs.</li> <li>-Draw on the past experience in chemistry and physics to understand biological systems.</li> <li>- Recognize structures and functions that distinguish life from non-life.</li> </ul> | <ul style="list-style-type: none"> <li>-Energy transfers make life possible in biological systems.</li> <li>-Structure and function are emergent properties of all levels of hierarchy in biological systems.</li> <li>-Regulation is an important function for biologic systems to maintain homeostasis.</li> <li>-Interdependence in nature is a common feature in nature.</li> </ul> |

### Biology Honors 5-6 Benchmarks

| Students will understand:  | Essential Questions  | Students will know the/that  | Students will be able to   | Notes |
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| 2.2 There is an intimate relationship between molecules and cells. | <ul style="list-style-type: none"> <li>-What is the basic unit of structure and function in biological systems?</li> <li>-Why is understanding chemical reactions important to understanding biological systems?</li> <li>-How do both laws of thermodynamics constrain metabolic pathways?</li> </ul> | <ul style="list-style-type: none"> <li>-Characteristics of water that make it essential to life.</li> <li>-Basics of organic chemistry (composition, structure &amp; function) lead to understanding biological system.</li> <li>-Importance of free energy to understanding biological systems.</li> <li>-Three metabolic stages of cellular respiration.</li> <li>-Steps of chemiosmosis.</li> </ul> | <ul style="list-style-type: none"> <li>-Describe the composition, (monomer, polymer) and structural detail of both and biological function of macromolecules:</li> <li>-Explain the role of ATP in cells.</li> <li>-Observe the effects of light and denaturation in the <b>AP Lab: Plant Pigments &amp; Photosynthesis.</b></li> <li>-Compare and contrast the energy pathways of autotrophs and heterotrophs.</li> </ul> |       |

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|  |  | <ul style="list-style-type: none"> <li>-Role enzymes play in metabolic pathways.</li> <li>-Structure of the cell membrane and how it influences its function.</li> <li>-Two reactions of psn that cooperate together to convert light energy to chemical energy.</li> <li>- An organism transforms energy from a chemical system to a biological system</li> </ul> | <ul style="list-style-type: none"> <li>-Compare and contrast photosynthesis with respiration.</li> <li>-Observe the effects of temperature on pea germination in the <b>AP Lab: Cell Respiration.</b></li> <li>-Compare and contrast the fundamental differences between prokaryotic cells and eukaryotic cells.</li> <li>-Compare fermentation to cellular respiration.</li> <li>-Explain why, "No process is more important than photosynthesis to the welfare of life on Earth."</li> <li>-Explain the cell cycle and how it is regulated.</li> </ul> |  |
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| Biology Honors 5-6 Benchmarks  |  |  |  |       |
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| Students will understand that  | Essential Questions  | Students will know the/that  | Students will be able to   | Notes |
| 2.3 The continuity of life is based on heritable information in the form of DNA. | <ul style="list-style-type: none"> <li>-What is it about life that allows it to evolve, yet preserve its structure and function?</li> <li>-How can you make an <i>E.coli</i> green?</li> <li>-Got Milk?</li> </ul> | <ul style="list-style-type: none"> <li>-The stages of mitosis.</li> <li>-The composition and structure of DNA.</li> <li>-The molecular basis of inheritance.</li> <li>-Mechanisms that transfer genetic information to expressed phenotype.</li> <li>-Regulation of gene expression (lac and trp operon).</li> </ul> | <ul style="list-style-type: none"> <li>-Explain how meiotic division allows for genetic variation.</li> <li>-Compare and contrast protein synthesis in prokaryotic cells to eukaryotic cells.</li> <li>-Describe the ways by which gene expression is controlled.</li> <li>-Describe the use of bacteria and viruses in genetic engineering.</li> <li>-Describe the methods by which mutations will alter genetic expression.</li> <li>-Apply recombinant DNA technology to engineering biological systems.</li> <li>-Analyze the stages of mitosis in the <b>AP Lab: Mitosis.</b></li> <li>-Perform a transformation of bacteria in the <b>AP Lab: Molecular Biolog.</b></li> <li>-Use a chi square statistical analysis to test hypotheses of modes of inheritance in the <b>AP Lab: Drosophila Genetics.</b></li> </ul> |       |

## Biology Honors 5-6 Benchmarks

| Students will understand: | Essential Questions  | Students will know the/that   | Students will be able to  | Notes  |
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|                           | <ul style="list-style-type: none"> <li>-How does the theory of evolution explain both the diversity and the continuity of life?</li> <li>-How can we model evolutionary changes in populations?</li> <li>-How does variation arise in an individual and get passed on to the gene pool?</li> <li>-What is micro evolution?</li> <li>-What is macro evolution?</li> </ul> | <ul style="list-style-type: none"> <li>-Nothing in biology makes sense except in the light of evolution.</li> <li>-Stages of meiosis.</li> <li>-Population is the unit of evolution; not the individual.</li> <li>-Hardy-Weinberg model and how it can be used to explain the mechanisms by which populations evolve.</li> <li>-Speciation definition and what the different mechanisms for speciation are.</li> <li>- Effect of mutations on the genetics of populations.</li> </ul> | <ul style="list-style-type: none"> <li>-Analyze SSrRNA sequence data to evaluate the phylogeny of different kinds of bears.</li> <li>-Analyze the cladograms.</li> <li>-Observe phenotype data to measure recombination frequency in the <b>AP Lab:Meiosis.</b></li> <li>-Simulate population changes by testing different HW conditions in the <b>AP Lab: Hardy-Weinber.</b></li> <li>-Predict causes of population change.</li> </ul> | <ul style="list-style-type: none"> <li>-Evolution explains the diversity of life on Earth.</li> <li>-Continuity and change are necessary features of all species due to mechanisms of genetics and evolution.</li> </ul> |

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| 2.4 Evolution is the unifying theme in biology.                                     |   |   |  |  |
| 2.5 Structure and function are correlated at all levels of biological organization. | -In the context of a biological system, what does it mean to say that form fits function? | <ul style="list-style-type: none"> <li>-Essential structures of plants functions of those structures.</li> <li>-Essential structures of animals.</li> <li>-Functions of those structures.</li> <li>-Essential structures of a cell.</li> <li>-Functions of those structures.</li> </ul> | <ul style="list-style-type: none"> <li>-Observe and measure the effect of concentration on the movement of water on an artificial system and in a plant system in the lab <b>AP Lab: Osmosis.</b></li> <li>-Describe the fluid mosaic model of the cell.</li> <li>-Explain how its mosaic structure confers function.</li> <li>-Compare and contrast active and passive transport.</li> <li>-Measure the fitness level of an individual in the lab <b>AP Lab: Circulatory System.</b></li> <li>-Measure the effects of variables on plant transpiration in the lab <b>AP Lab: Transpiration.</b></li> <li>-Explain how the structure of an organelle fits its function.</li> <li>-Detail the structure and function of plant organ and tissue systems.</li> <li>-Detail the structure and function of animal organ and tissue systems.</li> <li>-Analyze the evolution of plant and animal organ systems from simpler beginnings.</li> </ul> |  |
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## Biology Honors 5-6 Benchmarks

| Students will understand:  | Essential Questions  | Students will know the/that   | Students will be able to   | Notes |
|--|--|---|--|-------|
| 2.6 Regulatory mechanisms ensure a dynamic balance in living systems.              | <p>-How are biological processes self-regulated?</p> <p>-What happens when regulatory balances are disrupted?</p>  | <p>-Enzymes regulate chemical systems within biological systems.</p> <p>-Feedback systems maintain a stable internal environment.</p>   | <p>-Measure the effect of time on the rate of catalysis in the <b>AP Lab: Enzyme Catalysis.</b></p> <p>-Explain how ATP uses feedback inhibition to regulate its catabolism.</p> <p>-Explain how the immune system protects the body from present and future invaders.</p> <p>-Explain the changes in the human immune system as a result of disease or infection. (HIV, cancer, vaccination, parasites, antibiotics).</p>   |       |
| 2.7 Organisms are open systems that interact continuously with their environments. | <p>-How do the interactions between organisms and their environments determine the distribution and abundance of organisms?</p> <p>-How do organisms live and adapt to their environment (biotic and abiotic)?</p> | <p>-Interactions between organisms and their environments determine the distribution and abundance of organisms.</p> <p>-Evolutionary cause of behavior.</p> <p>-Characteristics of population.</p> <p>-Different examples of symbiotic relationships.</p> <p>-Trophic relationships that determine the routes of energy flow and chemical cycling in an ecosystem.</p> | <p>-Compare and contrast the rivet and the redundancy models of community.</p> <p>-Predict how the structure of a community will evolve after a disturbance or a creation of a new environment.</p> <p>-Discuss the examples of conservation practices that can protect species diversity and avert catastrophic extinctions caused by humans.</p> <p>-Measure the overall quality of the Missouri River at the CMR study site in the lab: River Study Project.</p> <p>-Measure the effects of light on primary productivity in the lab <b>AP Lab: Dissolved Oxygen.</b></p> |       |

**Enduring Understanding # 3: Both contemporary and historical scientific understandings inform technological, ethical, cultural and life decisions.**

### Biology Honors 5-6 Benchmarks

| Students will understand:  | Essential Questions   | Students will know the/that   | Students will be able to   | Notes   |
|--|---|---|--|---|
| 3.1 Scientists have a responsibility to help educate all of society about the potential benefits and hazards of specific technologies. | <p>-How have our observational skills in biology been impacted by technology?</p> <p>-How can a scientifically literate society</p> | <p>-Science and technology are functions of a society.</p> <p>- Historical examples of breakthroughs in biology that led to better understanding.</p> | <p>-Identify and evaluate way in which technology has introduced some new problems in our society.</p> | 2. Science, technology and society interact in significant ways to impact |

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|  | differentiate between “what we would like to understand” from “what we would like to build?” | - Ways in which technology has improved our standard of living.                     |  | scientific understanding and scientific literacy. |
| 3.2 Cultural and societal practices have contributed to our scientific knowledge that leads to informed decisions. | -How have cultural and societal practices influenced biological understanding?               | - Biological understandings that have been influenced by Native American practices. | - Investigate how Native American practices are relevant to biology. |   |