| Unit #: Name   | Time span (days) | Priority Standards Addressed  |
|--|------------------|---|
| 1: Introduction  | 5                | CC.3.5.9-10.A, CC.3.5.9-10.C,   |
| 2: Scientific Method   | 20               | CC.3.5.9-10.A, CC.3.5.9-10.C, CC.3.5.9-10.G,                              |
| 3: Scientific Theories   | 20               | CC.3.5.9-10.A, CC.3.5.9-10.G, CC.3.5.9-10.H, 3.1.10.A9                    |
| Common Assessment #1 and differentiated study                  | 3                |   |
| 4: Scientific Measurement                                      | 20               | CC.3.5.9-10.C, CC.3.5.9-10.G,   |
| 5: Scientific Analysis   | 20               | CC.3.5.9-10.G, CC.3.5.9-10.H,   |
| Common Assessment #2 and differentiated study                  | 3                |   |
| 6: Atomic Structure  | 15               | CC.3.5.9-10.G, 3.2.10.A1, 3.2.10.A3,                                      |
| 7: Chemical Bonding  | 15               | CC.3.5.9-10.C, CC.3.5.9-10.G, 3.2.10.A1                                   |
| 8. Chemical Reactions  | 20               | CC.3.5.9-10.C, 3.2.10.A1, 3.2.10.A3, 3.2.10.A4,                           |
| Common Assessment #3 and differentiated study                  | 3                |   |
| 9. Force and Motion  | 10               | CC.3.5.9-10.C, CC.3.5.9-10.G, 3.2.10.B1,                                  |
| 10. Heat   | 10               | CC.3.5.9-10.C, CC.3.5.9-10.G, 3.2.10.A3, 3.2.10.B3,                       |
| 11. Waves  | 10               | CC.3.5.9-10.C, CC.3.5.9-10.G, 3.2.10.B5                                   |
| Common Assessment #4 and differentiated study                  | 3                |   |
| 12. Independent Investigations                                 | 3                | CC.3.5.9-10.C, CC.3.5.9-10.H,   |
| Keystone Biology Remediation (TBD based on Exam Proficiency)   |                  | 3.1.10.A1, 3.1.10.A7, 3.1.10.A9, 3.1.10.B3, 3.1.10.C1, 4.1.10.A, 4.1.10.E |
|  |                  |   |
| Total days of instruction, assessment and differentiated study | 180              | TAGS  |

| Common Core State<br>Standard   | PA Core Standard  |  |
|---|---|--|
| CCSS.ELA-LITERACY.RST.9-<br>10.1  |   | rific textual evidence to support analysis of science and ng to the precise details of explanations or   |
|   | Taught i  | n Unit(s)  |
| All units   |   |  |
| Explanation/Example of Sta  | ndard   |  |
| meaning from a scientific text  | and apply it to authentic   | rms that have a precise meaning; in order to make questions or problems, learners must approach their the text several times in search of specific details that  |
| Common Misconceptions   |   |  |
| A misconception that many st<br>are generally dense, and full o<br>sources, students can deciphe  | f esoteric vocabulary ter   | ce texts are impossible to comprehend; in truth, they ms, but with the use of context clues and supplemental offerings.  |
| Big Idea(   | <b>s)</b>   | Essential Question(s)  |
| Scientific writing relies upon which have precise meanings; this text, the reader must be we systematically and with a special  | in order to process<br>villing to approach it   | <ul> <li>How does one sort through the content in a<br/>science text in order to identify and apply key<br/>details?</li> </ul>  |
|   | Assess  | ments  |
| See unit map for specific un  | it common assessmen   | ts   |
| <ul> <li>Concept         <ul> <li>(what students need</li> </ul> </li> <li>Scientific texts use vocabulate meanings that are not easily common words</li> <li>Vocabulary terms can often context clues</li> <li>In order to convey the mean concepts, precise vocabulary</li> </ul> | ed to know)  ary terms with specific y replaced with  be deciphered via  ning of scientific | <ul> <li>Skills         <ul> <li>(what students must be able to do)</li> </ul> </li> <li>Identify a purpose for reading, and choose well-suited reading strategies</li> <li>Use context clues to decipher the meaning of scientific vocabulary</li> <li>Demonstrate an understanding of science concepts by identifying key information and relating it to questions and problems</li> </ul> |

| Common Core State<br>Standard   | 1 Mg : 1  | PA Core Standard   |
|---|---|--|
| CCSS.ELA-LITERACY.RST.9-  | CC.3.5.9-10.C: Follow precisely a complex multistep procedure when carrying |  |
| 10.3  | out experiments, taking measurements, or performing technical tasks,        |  |
|   | ·   | ses or exceptions defined in the text.   |
|   | Taught  | in Unit(s)   |
| All units   |   |  |
| Explanation/Example of Sta  | andard  |  |
| Scientific protocols convey in order to achieve expected out  |   | es that must be applied with precision and accuracy in   |
| Common Misconceptions   | ar January and San                      |  |
|   | lowed one step at a time  | , without looking ahead for potential issues or relevan  |
| preparations.   | •   | ,  |
| Big Idea  | (s)   | Essential Question(s)  |
| must have knowledge of the s<br>the work in order to effective<br>prepare for the use of specific<br>complex apparatuses. | ly anticipate and   | protocol?  |
|   |   |  |
|   | Asses   | sments .   |
| See unit map for specific ur  |   | The state of the s |
| Concep  | nit common assessmer<br>ts  | nts<br>Skills  |
| Concep<br>(what students ne   | nit common assessmer<br>ts<br>ed to know)                                   | Skills (what students must be able to do)  |
| Concep (what students ne Scientific protocols require   | nit common assessmer  ts  ed to know) e reactants and                       | Skills (what students must be able to do)  Plan the use of equipment and supplies in   |
| (what students ne  Scientific protocols require equipment that often must   | nit common assessmer  ts  ed to know) e reactants and t be prepared in      | Skills (what students must be able to do)  • Plan the use of equipment and supplies in advance of their intended use   |
| Concep (what students ne Scientific protocols require equipment that often must advance of their intended to              | nit common assessmer  ts ed to know) e reactants and t be prepared in use   | Skills (what students must be able to do)  Plan the use of equipment and supplies in advance of their intended use Decipher scientific units and convert them to   |
| (what students ne  Scientific protocols require equipment that often must   | ts ed to know) e reactants and t be prepared in use et timing of steps, and | Skills  (what students must be able to do)  • Plan the use of equipment and supplies in advance of their intended use  |

|  |   | •   |
|--|---|---|
| Common Core State<br>Standard  | \$ 6 P  | PA Core Standard  |
| CCSS.ELA-LITERACY.RST.9-<br>10.7   | words in a text into vis  | e quantitative or technical information expressed in<br>ual form (e.g., a table or chart) and translate<br>visually or mathematically (e.g., in an equation) into   |
|  | <del></del>   | in Unit(s)  |
| All units  |   |   |
| Explanation/Example of Sta   | ndard   |   |
| Scientific work requires the or analysis of the results in order   | rganization of both quali<br>to achieve valid and rel   | itative and quantitative data in order to facilitate the iable conclusions.   |
| <b>Common Misconceptions</b>   |   |   |
| preference. Scientific data is open to inter   |   | terchangeable, and chosen based upon the developer's ne's own point-of-view.  |
| Big Idea   | <b>[s]</b>  | Essential Question(s)   |
| The organization and present observer to make valid and re about the meaning of data set   | liable conclusions  | <ul> <li>How does a scientist record the data that is produced during a scientific investigation?</li> <li>How does a scientist match the appropriate figure to a given data set?</li> </ul>  |
|  | Asses:  | sments  |
| See unit map for specific un   | it common assessmen   | ts  |
| Concept<br>(what students ne   |   | Skills (what students must be able to do)   |
| <ul> <li>Line graphs are used to she bar graphs are used to contain and pie charts show the period of something.</li> <li>All figures and tables must captioned such that they captured further explanation; tables</li> </ul> | ow a change over time, npare several things, ercentage composition be appropriately n stand alone without | <ul> <li>Accurately record the data and observations that are produced during a scientific investigation</li> <li>Select an appropriate figure, and then present a given data set in a manner that facilitates analysis and conclusion making</li> <li>Analyze a given figure or mathematical model and make valid conclusions</li> </ul> |

while figures are captioned beneath.

| Common Core State<br>Standard  |  | PA Core Standard   |
|--|--|--|
| CCSS.ELA-LITERACY.RST.9-<br>10.8   |  | ne extent to which the reasoning and evidence in a tex<br>aim or a recommendation for solving a scientific or  |
| *  | <u> </u>   | n Unit(s)  |
| All units  |  | No. 100 100 100 100 100 100 100 100 100 10   |
|  | 12   | There are a second and a second a second and |
| Explanation/Example of Sta   |  |  |
| properties of the natural wor and reasonable.  | thesis, data, conclusions a<br>ld and the scientific meth  | and theories must apply their knowledge of the od in order to determine whether they are objective   |
| <b>Common Misconceptions</b>   | The representation of the state |  |
|  | naccurate, based upon lin  | nited facts, and are simply the result of speculation;   |
| because of this, theories can l  |  |  |
|  | ,  |  |
| Big Idea   | (s)  | Essential Question(s)  |
| that has occurred via the scie been validated by continued a false; consequently, they are urepresent the best possible exphenomena.   | attempts to prove them<br>unlikely to change and   | <ul><li>hypothesis?</li><li>Why is a scientific theory very unlikely to be wrong?</li></ul>  |
|  | Assess   | ments  |
| See unit map for specific ur   | nit common assessmen   | ts   |
| Concep   | ts .   | Skills   |
| (what students ne  |  | (what students must be able to do)   |
| <ul> <li>Hypothesis are based upon but are still reasonable and study</li> <li>Valid conclusions are alwaydata, and clearly cited data</li> <li>Scientific theories have be reasonable doubt, and then foundation for future scientific</li> </ul> | d worthy of further  ys based upon reliable  en proven beyond a  refore represent the  | <ul> <li>Determine whether a statement is a hypothesis, conclusion or theory</li> <li>Explain the difference between a common theory and a scientific theory</li> </ul>  |

#### CV Priority Standard/PA Academic Standard

3.2.10.A1: Predict properties of elements using trends of the periodic table. Identify properties of matter that depend on sample size. Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.

### Taught in Unit(s)

Unit 3

### **Explanation/Example of the Standard**

The periodic table is organized around predictable trends in the properties of the elements; these trends demonstrate a periodicity that is a function of the quantities of protons, neutrons and electrons which are present.

Depending on how these elements are combined (e.g. in pure elemental form, compounded with other elements), the molecules that are formed will have specific properties (e.g. density, polarity, solubility, pH). The properties of water are rather unique, and are essential to the survival of life on Earth.

| Big Idea(s)  | Essential Question(s)   |
|--|---|
| <ul> <li>The numbers of subatomic particles present in an atom determine its chemical properties.</li> <li>Atoms combine into molecules because of their properties.</li> <li>The properties of water are essential to living things.</li> </ul> | How does the composition of an atom relate to its properties, and its tendency to combine with other atoms? |

#### **Assessments**

| Concepts   | Skills  |
|--|---|
| (what students need to know)   | (what students must be able to do)  |
| <ul> <li>Atoms are arranged on the Periodic table according to their relative numbers of subatomic particles.</li> <li>Atoms combine into molecules based upon their chemical properties.</li> <li>The properties of matter (e.g. density, polarity, specific heat capacity) determine how they interact with one another and effect living things.</li> </ul> | <ul> <li>Use a periodic table to determine the number of protons neutrons and electrons in an atom.</li> <li>Describe the influence of specific chemical properties on the behavior of matter.</li> <li>Describe how the properties of water are important to living things.</li> </ul> |

| CV Priority Standard/  | PA Academic Standard  |  |
|--|---|--|
| 3.2.10.A3: Describe phases of matter according to the  | kinetic molecular theory.   |  |
| Taught i   | n Unit(s)   |  |
| Unit 4   |   |  |
| Explanation/Exam   | ple of the Standard   |  |
| Molecular are point masses that have no volume, but when combined with other molecules combine to form various states of matter which have volumes that are directly proportional to their temperature. While the individual particles exert no force, when their random motion causes them to collide, they exert force on each other, or the walls of a container. |   |  |
| Big Idea(s)  | Essential Question(s)   |  |
| The volume of a given quantity of matter is affected by its temperature; generally, as temperature increases, so does the volume.  | Why does an increase in temperature cause an increase in volume?    |  |
| Assess   | sments  |  |
| See unit maps for specific unit common assessments.  |   |  |
| Concepts<br>(what students need to know)   | Skills<br>(what students must be able to do)                        |  |
| <ul> <li>The molecules of matter are always in motion, and this motion is influenced by the temperature of a system.</li> <li>As the temperature of a solid increases, it will change into a liquid and then a gaseous form.</li> </ul>  | Compare the relative molecular motion of solids, liquids and gases. |  |

#### CV Priority Standard/PA Academic Standard

3.2.10.A4: Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using mole relationships. Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions.

#### Taught in Unit(s)

Unit 5

#### Explanation/Example of the Standard

Chemical reactions occur due to the rearrangement of molecules and / or the transfer of electrons. Chemical reactions are always balanced such that the number of specific atoms present in the reactants must be equal to the numbers in the products. Similarly, the quantity of energy does not change from one side of a chemical reaction to the other, but energy may be absorbed or released by molecules in what are known as endothermic or exothermic reactions.

The mole is a unit used to compare the number of elementary entities to that of 12 grams of carbon; it is often used to express the amount of reactants and products present in a chemical reaction.

| Big Idea(s)  | Essential Question(s)  |
|--|--|
| Chemical reactions must be balanced in that matter or energy is accounted for in the form of matter, and in temperature that is present in a system. | How does a chemical reaction identify the quantities of matter and energy in a system? |
| Assess   | ments  |

| Concepts   | Skills  |
|--|---|
| (what students need to know)   | (what students must be able to do)  |
| <ul> <li>Matter and energy are never created nor destroyed.</li> <li>The numbers of atoms in a molecule can be determined by evaluating the coefficients and subscripts that are present.</li> <li>A chemical reaction is balanced when the number of atoms and energy on both sides of the equation are equal.</li> </ul> | <ul> <li>Determine the number of a specified atom that is present in a chemical reaction.</li> <li>Determine whether or not a chemical reaction is balanced.</li> <li>Explain why a reaction is endothermic versus exothermic.</li> </ul> |

#### CV Priority Standard/PA Academic Standard

3.2.10.B1: Analyze the relationships among the net forces acting on a body, the mass of the body, and the resulting acceleration using Newton's Second Law of Motion. Apply Newton's Law of Universal Gravitation to the forces between two objects. Use Newton's Third Law to explain forces as interactions between bodies. Describe how interactions between objects conserve momentum.

#### Taught in Unit(s)

Unit 6

#### **Explanation/Example of the Standard**

Newton's first law states that an object at rest will remain so, while an object in motion will continue at a constant velocity unless it is affected by an additional force.

Changes in the acceleration of an object can be predicted by evaluating the net forces that are acting on it; these forces can be expressed by Newton's second law, which states that the Net Force of an object is equal to its Mass multiplied by its Acceleration (F=MA).

Newton's third law explains that when one body exerts a force on a second body, an equal force is returned in the opposite direction on the first body. These three laws in addition to Newton's law of universal gravitation explain the planetary motion of a solar system.

| TT  |                                      |
|---|--------------------------------------|
| <ul> <li>The motion of objects can be explained in terms of velocity, acceleration and momentum.</li> <li>Newton's laws explain the relationship between the forces acting on an object and its acceleration.</li> <li>Changes in velocity can be predicted by evaluating the forces acting on an object</li> </ul> | ny does an object's velocity change? |

#### **Assessments**

| Concepts   | Skills   |
|--|--|
| (what students need to know)   | (what students must be able to do)   |
| <ul> <li>Velocity</li> <li>Acceleration</li> <li>Momentum</li> <li>Force</li> <li>Inertia</li> </ul> | <ul> <li>Predict changes in an objects velocity by evaluating changes in net force.</li> <li>Explain Newton's laws by using an example.</li> </ul> |

#### CV Priority Standard/PA Academic Standard

3.2.10.B3: Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached. Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures.

#### Taught in Unit(s)

Unit 9

#### Explanation/Example of the Standard

Temperature of matter and its volume are directly proportional in that increases in the temperature of an object will cause state changes from a solid, to a liquid, to a gas; given that the mass of an object remains constant, changes in temperature will affect the density of an object, which influences its interaction with other objects.

In a system, matter with a higher density will tend to move towards the bottom, while matter with a lower density will be forced to the top in a process called convection.

The kinetic motion of molecules in one object will spread heat energy by conduction until equilibrium is reached; this thermal motion produces electromagnetic radiation that will also spread across a system in the form of wave radiation.

| Big Idea(s)   | Essential Question(s)                       |  |  |  |
|---|---|--|--|--|
| Heat energy will spread across a system until equilibrium is reached. | Why does a system move towards equilibrium? |  |  |  |
| Assess  | sments                                      |  |  |  |

| Concepts   | Skills  |
|--|---|
| (what students need to know)   | (what students must be able to do)  |
| <ul> <li>Heat</li> <li>Temperature</li> <li>Convection</li> <li>Conduction</li> <li>Radiation</li> </ul> | <ul> <li>Explain the process of convection using an example.</li> <li>Explain changes in the distribution of heat energy within a given system that are cause by convection, conduction and radiation.</li> </ul> |

#### CV Priority Standard/PA Academic Standard

3.2.10.B5: Understand that waves transfer energy without transferring matter. Compare and contrast the wave nature of light and sound. Describe the components of the electromagnetic spectrum. Describe the difference between sound and light waves.

### Taught in Unit(s)

Unit 10

#### **Explanation/Example of the Standard**

A mechanical wave such as sound, is an oscillation that transfers energy through a physical medium such that little or no mass transport occurs; instead, waves consist of oscillations or vibrations around fixed locations that transfer their energy from one physical quantity to another.

Electromagnetic waves such as visible light, do not require a physical medium, but rather consist of oscillations in the electrical or magnetic field originally generated by charged particles; consequently, these waves may travel through a vacuum without the need for a physical medium. These waves vary in wavelength and include radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, X-rays and gamma rays which are all components of the electromagnetic spectrum.

| <u>\$</u> . | Big Idea(s)   | Essential Question(s)                |
|-------------|---|--------------------------------------|
| •           | Waves are defined as oscillations that transfer energy through space of mass. Sound waves require a medium to travel through, while light can move through the vacuum of space. | How does a sound travel to your ear? |
| Pij-        | Assess  | sments                               |

| Concepts  | Skills   |
|---|--|
| (what students need to know)  | (what students must be able to do)   |
| <ul> <li>Mechanical wave</li> <li>Electromagnetic wave</li> <li>Wave characteristics (e.g. wavelength. amplitude, frequency)</li> </ul> | <ul> <li>Use the appropriate vocabulary to compare the properties of two waves.</li> <li>Compare the wave characteristics of two components of the electromagnetic spectrum and their interaction with living things.</li> <li>Compare and contrast mechanical and electromagnetic waves.</li> </ul> |

#### CV Priority Standard/PA Academic Standard

3.1.10.A7: Describe the relationship between the structure of organic molecules and the function they serve in living organisms. Explain how cells store and use information to guide their functions.

#### Taught in Unit(s)

Independent Study of Biology

#### **Explanation/Example of Standard**

The form of biologically important macromolecules is directly related to their functions in living things; for instance, the sequence of nitrogen bases in DNA molecules corresponds to the sequence of amino acids required to make a specific protein. If mutations alter the form of a DNA molecule, then the form and consequentially the function of the related protein(s) will follow.

### **Common Misconceptions**

- DNA's information is written as a set of instructions, as in a recipe with a series of steps
- Mutations in DNA molecules are always a bad thing for an organism

| Big Idea(s)  | Essential Question(s)                             |
|--|---|
| DNA molecules are coded messages that inform a       | How do mutations affect the behavior of proteins? |
| cell on the order to string amino acids molecules    |   |
| during protein synthesis; changes in DNA sequences,  |   |
| alter the amino acid sequences which results in      |   |
| changes in the form, and subsequent functionality of |   |
| a protein.   |   |

#### Assessments

|           | Assessment Anchor   |                   | Eligible Content   |
|-----------|---|-------------------|--|
| BIO.A.1.2 | Describe relationships between structure and function at biological levels of organization.   | BIO.A.1.2.2       | <ul> <li>Describe and interpret<br/>relationships between<br/>structure and function at<br/>various levels of biological<br/>organization (i.e.,<br/>organelles, cells, tissues,<br/>organs, organ systems,<br/>and multicellular<br/>organisms).</li> </ul>                     |
| BIO.A.2.2 | Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules). | BIO.A.2.2.1-<br>3 | <ul> <li>Explain how carbon is uniquely suited to form biological macromolecules.</li> <li>Describe how biological macromolecules form from monomers.</li> <li>Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.</li> </ul> |
| BIO.A.2.3 | Explain how enzymes regulate biochemical reactions within a cell.   | BIO.A.2.3.1-<br>2 | <ul> <li>Describe the role of an<br/>enzyme as a catalyst in<br/>regulating a specific<br/>biochemical reaction.</li> </ul>  |

|  |   |  | <ul> <li>Explain how factors such<br/>as pH, temperature, and<br/>concentration levels can<br/>affect enzyme function.</li> </ul>  |
|--|---|--|--|
| BIO.B.1.2  | Explain how genetic information is inherited. | BIO.B.1.2.1  | Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.  |
| BIO.B.2.3  | Explain how genetic information is expressed. | BIO.B.2.3.1  | <ul> <li>Describe how genetic<br/>mutations alter the DNA<br/>sequence and may or may<br/>not affect phenotype (e.g.,<br/>silent, nonsense,<br/>frame-shift).</li> </ul> |
|  | Concepts<br>what students need to know)       | (what  | Skills<br>students must be able to do)   |
| <ul> <li>The way that information is coded in a DNA molecule</li> <li>The way information stored in DNA is used to produce specific protein molecules (Central Dogma of Molecular Biology)</li> <li>The form of an enzyme allows it to interact with a substrate(s) during chemical reactions</li> </ul> |   | <ul> <li>Abstract the way in which a DNA molecule works, and apply it to an analogous situation such as written language</li> <li>Transcribe DNA into RNA code, and then translate it into a sequence of amino acids</li> <li>Explain why a DNA mutation is not always detrimental to an organism</li> </ul> |  |

| CV Priority Standard/PA Academic Standard   |  |                           |  |
|---|--|---------------------------|--|
| 3.1.10.A9: Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. |  |                           |  |
|   |  | n Unit(s)                 |  |
| Independent   | Study of Biology                       |                           |  |
| Explanation/Example of Standard   |  |                           |  |
| Click here to   | enter text.                            |                           |  |
| Common Mis  | Pile des                               |                           | 14 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - |
| Click here to   | enter text.                            |                           |  |
| <u> </u>  | Big Idea(s)                            | K.,                       | Essential Question(s)                    |
| Click here to enter text.  Click here to enter text.  |  |                           |  |
|   |  | sments                    |  |
| See unit map  | for specific unit common assessments   |                           |  |
|   | Assessment Anchor                      |                           | Eligible Content                         |
| Click here<br>to enter<br>text.   | Click here to enter text.              | Click here to enter text. | Click here to enter text.                |
| Click here<br>to enter<br>text.   | Click here to enter text.              | Click here to enter text. | Click here to enter text.                |
| Click here<br>to enter<br>text.   | Click here to enter text.              | Click here to enter text. | Click here to enter text.                |
| Click here<br>to enter<br>text.   | Click here to enter text.              | Click here to enter text. | Click here to enter text.                |
| Click here<br>to enter<br>text.   | Click here to enter text.              | Click here to enter text. | Click here to enter text.                |
|   | Concepts<br>hat students need to know) | (what                     | Skills<br>students must be able to do)   |
| Click here to   | enter text.                            | Click here to e           | enter text.                              |

#### CV Priority Standard/PA Academic Standard

3.1.10.C1: Explain the mechanisms of biological evolution.

### Taught in Unit(s)

Independent Study of Biology

#### **Explanation/Example of Standard**

All life on Earth has descended from a common ancestor that lived at least 3.5 billion years ago; new species have diverged regularly because of the mutation of the genetic code that holds the instructions for life and the action of evolutionary forces acting upon them. An evolutionary force called Natural Selection acts as surviving organisms reproduce and pass their traits onto the subsequent generations; these offspring share the characteristics of their parents, which were most likely an advantage over the characteristics of those not lucky enough to survive.

This repeating process of variation caused by mutation, selection and reproduction has caused the tree of life to blossom with new species competing to fill the ever expanding ecological niches.

#### **Common Misconceptions**

- Evidence is not a fact, and therefore unlikely to be an accurate explanation for the diversity of life on Earth.
- There is no evidence for evolution.
- The absence of "missing links" makes it impossible to trace the evolution of animals like humans from earlier forms of life.

| Big Idea(s)  | Essential Question(s)   |
|--|---|
| <ul> <li>Evolution is a pattern we see in living things; natural selection is one of several processes that have caused it to occur.</li> <li>Although Natural Selection is often referred to as "survival of the fittest," fitness is really a measure of reproductive success, rather than brute force or size.</li> </ul> | How did evolutionary forces lead to the patter we call evolution? |

#### **Assessments**

| Assessment Anchor               |                                      | Eligible Content |  |
|---------------------------------|--------------------------------------|------------------|--|
| BIO.B.3.1                       | Explain the mechanisms of evolution. | BIO.B.3.1.1      | Explain how natural selection can impact allele frequencies of a population.   |
| Click here<br>to enter<br>text. | Click here to enter text.            | BIO.B.3.1.2      | Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration). |

|   |   | Explain how genetic mutations may   |
|---|---|---|
| Click here to enter text.   | BIO.B.3.1.3   | result in genotypic and phenotypic variations within a population.  |
| Analyze the sources of evidence for biological evolution.   | BIO.B.3.2.1   | Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).  |
| Click here to enter text.   | Click here to enter text.   | Click here to enter text.   |
| Concepts what students need to know) pool al Selection cionary Forces (e.g. gene flow, genetic non-random mating) ation nce for evolution (i.e. vestigial traits, ural and biochemical homologies, fossil ) | <ul> <li>Explain an exan</li> <li>Explain the theo</li> <li>Make a pool tha</li> </ul>  | Skills students must be able to do) the process of natural selection using aple. how a given piece of evidence supports ary of evolution. prediction about changes in the gene t may occur given the presence of an anary force.  |
|   | Analyze the sources of evidence for biological evolution.  Click here to enter text.  Concepts  That students need to know)  pool al Selection ionary Forces (e.g. gene flow, genetic non-random mating) ation ace for evolution (i.e. vestigial traits, trail and biochemical homologies, fossil | Analyze the sources of evidence for biological evolution.  Click here to enter text.  Concepts  That students need to know)  pool al Selection ionary Forces (e.g. gene flow, genetic ion-random mating) ition ace for evolution (i.e. vestigial traits, ral and biochemical homologies, fossil  BIO.B.3.2.1  Click here to enter text.  (what  extended to know)  • Explain an exam • Explain the theo • Make a pool tha evolution |