Biology – (second semester)
High School
Standards, Supporting Skills, Assessments, and Resources

Indicator 1: Analyze the various structures and processes of the Earth system.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Comprehension)	**9-12.E.1.1. Students are able to explain how elements and compounds cycle between living and non-living systems.** • Diagram and describe the N, C, O and H_2O cycles. • Describe the importance of the N, C, O and H_2O cycles to life on this planet. Examples: water cycle including evaporation, cloud formation, condensation.	• Illustrate and describe the N, C, O and H_2O cycles. • Describe the importance of the N, C, O and H_2O cycles to life on this planet. **Examples: water cycle including evaporation, cloud formation, condensation.**		**Biology text Chapter 2 (intro)** **Biology text Chapter 3**

(Application)	**9-12.E.1.2. Students are able to describe how atmospheric chemistry may affect global climate.** **Examples**: Greenhouse Effect, ozone depletion, ocean's effects on weather	• Use information to explain ozone depletion, global warming, acid rain, and the dead zone in the Gulf of Mexico from fertilizer runoff		**Biology text Chapter 6**
(Analysis)	**9-12.E.1.3. Students are able to assess how human activity has changed the land, ocean, and atmosphere of Earth.** **Examples**: forest cover, chemical usage, farming, urban sprawl, grazing	• Explain role of human impact on ozone depletion, global warming, acid rain, the dead zone in the Gulf of Mexico from fertilizer runoff, deforestation, desertification, conservation of resources, modern farming practices including use of technology, alternative energy sources		**Biology text Chapter 6**
(Evaluation)	**9-12.S.1.2. Students are able to evaluate and describe the impact of scientific discoveries on historical events and social, economic, and ethical issues.** **Examples:**	• Decide personal views on topics discussed during class and determine subjectivity of sources presented		**Biology text Chapter 6**

	Greenhouse Effect, ozone depletion, forest depletion			

Core High School Earth/Space Science
Performance Descriptors

Advanced	**High school students performing at the advanced level:** • predict the effect of an interruption in a given cycles; • predict how human activity may change the land, ocean, and atmosphere of Earth.
Proficient	**High school students performing at the proficient level:** • explain how H_20, N, C, and O cycle between living and non-living systems; • describe how various factors may affect global climate; • explain how human activity changes the land, ocean, and atmosphere of Earth.
Basic	**High school students performing at the basic level:** • given pictorial representations of the H_20 and C cycles, explain how elements and compounds move between living and nonliving systems; • describe one factor that may affect global climate; • give an example of human activity that changes the land, ocean, or atmosphere of Earth.

Advanced High School Earth/Space Science
Standards, Supporting Skills, Assessments, and Resources

Indicator 1: Analyze the various structures and processes of the Earth system.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Application)	**9-12.E.1.1A. Students are able to explain how elements and compounds cycle between living and non-living systems.** • Diagram and describe the P, S, and Ca cycles.	• Illustrate the P cycle		**Biology text Chapter 3**

(Analysis)	**9-12.E.1.2A. Students are able to compare, quantitatively and qualitatively, methods used to determine geological time.** **Examples**: fossil record, radioactive decay, tree rings, geologic stratification, South Dakota geology • Construct a geologic time scale over the past 4.8 billion years.	• describe how fossils form • compare the methods used to determine the geologic time scale including relative dating, index fossils, radioactive C_{14} dating • analyze evidence found in fossil records to describe how populations change over time • Construct a geologic time scale over the past 4.8 billion years		**Biology text Chapter 17**

Core High School Nature of Science
Standards, Supporting Skills, Assessments, and Resources

Indicator 1: Understand the nature and origin of scientific knowledge.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessment	Resources
(Evaluation)	**9-12.N.1.1. Students are able to evaluate a scientific discovery to determine and describe how societal, cultural, and**	• Recognize scientific knowledge is not merely a set of static facts but a dynamic and affords the best current explanations		**Biology text Chapter 15, & 16** **www.pbs.org/wgbh/evolution/educators/teachstuds/svideos.html**

	personal beliefs influence scientific investigations and interpretations. **Examples**: telescope, birth control pill, penicillin, electricity Examples: spontaneous generation, relativity, geologic time	• Discuss how progress in science can be affected by social issues, like overuse of antibiotics leading to antibiotic resistant strains of tuberculosis bacteria, societal pressure leading to Darwin's reluctance to publish Theory of Evolution		
(Synthesis)	**9-12.N.1.2. Students are able to describe the role of observation and evidence in the development and modification of hypotheses, theories, and laws.** **(pseudo-science).**	• Propose scientific hypotheses • Predict outcome of experiments • Generalize from data gathered in experiments • Draw conclusions from data gathered and analyzed during experiments		**Biology text and Labs:** **Photosynthesis Lab (Chapter 8)** **Exercise Physiology Lab (Chapter 9)** **Good Buddies Activity (Chapter 3)** **How Many Bears Activity (Chapter 3)** **Lima Bean Lab (Chapter 15)** **Canary Island Lizards Lab (Chapter 16)** **Dichotomous Keying Labs (Chapter 18)**

Indicator 2: Apply the skills necessary to conduct scientific investigations.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Synthesis)	**9-12.N.2.1. Students are able to apply science process skills to design and conduct student investigations.** Examples: Computer-based data collection	• Identify the questions and concepts to guide the development of hypotheses. • Analyze primary sources of information to guide the development of the procedure. • Select and use appropriate instruments to extend observations		**Biology text and Labs:** **Photosynthesis Lab (Chapter 8)** **Exercise Physiology Lab (Chapter**

	Graphical analysis and representation Use appropriate technology to display data (i.e. spreadsheets, PowerPoint, web).	and measurements • Revise explanations and models based on evidence and logic. • Use technology and mathematic skills to enhance investigations, communicate results, and defend conclusions. Example: • computer-based data collection • graphical analysis and representation • use appropriate technology to display data - spreadsheets - PowerPoint - Web		**9)** **Good Buddies Activity (Chapter 3)** **How Many Bears Activity (Chapter 3)** **Lima Bean Lab (Chapter 15)** **Canary Island Lizards Lab (Chapter 16)** **Dichotomous Keying Labs (Chapter 18)** **Lab Simulations** **Biodetectives**

(Application)	**9-12.N.2.2. Students are able to practice safe and effective laboratory techniques.**	• Handle hazardous materials properly. • Use safety equipment correctly. • Practice emergency procedure. • Wear appropriate attire. • Practice safe behaviors**.**		**Labwork**

Core High School Nature of Science
Performance Descriptors

Advanced	**High school students performing at the advanced level:** • given a scientific discovery, evaluate how different societal, cultural, and personal beliefs influenced the investigation and its interpretation; • design and conduct an investigation using an alternative student- developed hypothesis.
Proficient	**High school students performing at the proficient level:** • given a scientific discovery narrative, determine and describe how societal, cultural, and personal

	beliefs influenced the investigation and its interpretation; • describe the role of observation and evidence in the development and modification of hypotheses, theories, and laws; then apply science process skills to design and conduct student investigations.
Basic	**High school students performing at the basic level:** • describe the role of observation in the development of hypotheses, theories, and laws and conduct student investigations; • given a scientific discovery narrative, identify the cultural and personal beliefs that influenced the investigation.

Core High School Physical Science
Standards, Supporting Skills, Assessments, and Resources

Indicator 1: Describe structures and properties of, and changes in, matter

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Comprehension)	**9-12.P.1.2. Students are able to describe ways that atoms combine.** • Name and write formulas for binary ionic and covalent compounds. Example: sodium chloride (NaCl), carbon dioxide (CO_2) • Compare the roles of electrons in covalent, ionic, and metallic bonding. • Discuss the special nature of carbon covalent bonds.	• Name and write formulas for binary ionic and covalent compounds. Example: sodium chloride (NaCl), carbon dioxide (CO_2)		**Biology Text (Chapter 8, 9, & 3)**

(Application)	**9-12.P.1.3. Students are able to predict whether reactions will speed up or slow down as conditions change.** **Examples**: temperature, concentration, surface area, and catalysts	• Use information to and experiment to discover factors that affect rate of photosynthesis		**Biology text (Chapter 8)** **Lab simulation**
(Application)	**9-12.P.1.4. Students are able to balance chemical equations by applying the Law of Conservation of Matter.** • Trace number of particles in diagrams and pictures of balanced equations. Example: Write out an equation with symbols: $Mg + 2HCL \rightarrow MgCl_2 + 2H_2$	• Trace number of particles in diagrams and pictures of balanced equations. Example: Write out an equation with symbols:		**Biology text (Chapters 8 & 9)**

(Comprehension)	**9-12.P.1.5. Students are able to distinguish among chemical, physical, and nuclear changes.** • Differentiate between physical and chemical properties used to describe matter. • Identify key indicators of chemical and physical changes. • Describe the effects of changing pressure, volume, or temperature upon gases. • Identify characteristics of a solution and factors that affect the rate of solution formation. • Explain the differences among nuclear, chemical, and physical	• Describe physical changes of water associated with the water cycle		**Biology text (Chapter 3)**

	changes at the atomic level. Examples: solute, solvent, concentrated, dilute, saturated, unsaturated, supersaturated Factors affecting rate: agitation, heating, particle size, pictures of particles			

Core High School Physical Science
Performance Descriptors

Advanced	**High school students performing at the advanced level:** • predict the type of bonds formed as elements combine; • balance chemical equations involving polyatomic ions; • describe electrical effects in terms of motion and concentrations of charged particles.
Proficient	**High school students performing at the proficient level:** • use the Periodic Table to determine the properties of elements and the ways they combine; • given a variable, predict whether reactions will speed up or slow down as conditions change; • balance simple chemical equations; • describe chemical, physical, and nuclear changes at the atomic and macroscopic levels; • calculate velocity, acceleration, force, work, energy, and power given the formulas; • describe electrical effects in terms of motion and concentrations of charged particles.
Basic	**High school students performing at the basic level:** • use the Periodic Table to determine the properties of the 1st 18 elements; • provide the coefficients for an unbalanced synthesis or decomposition equation; • identify chemical and physical changes at the macroscopic level; • identify electricity as movement of charged particles.

Core High School Life Science
Standards, Supporting Skills, Assessments, and Resources

Indicator 1: Understand the fundamental structures, functions, classifications, and mechanisms found in living things.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	R
(Analysis)	**9-12.L.1.1. Students are able to relate cellular functions and processes to specialized structures within cells.** • Transport Examples: cell membrane, homeostasis • Photosynthesis and respiration Examples: ATP-ADP energy cycle Role of enzymes Mitochondria Chloroplasts • Storage and transfer of genetic information Examples: replication, transcription, and	• Explain the role of transport in photosynthesis and respiration Examples: photosynthesis and cellular respiration • Put in sequence the biochemical pathways involved in photosynthesis and respiration • Relate structure of mitochondrion to cellular respiration and structure of chloroplast to photosynthesis Examples: ATP-ADP energy cycle Role of enzymes Mitochondria Chloroplasts		**Bi (C &

	translation • Cell life cycles Examples: somatic cells (mitosis), germ cells (meiosis)			
(Application)	**9-12.L.1.2. Students are able to classify organisms using characteristics and evolutionary relationship of major taxa.** • Kingdoms Examples: animals, plants, fungi, protista, monera • Phyla Examples: invertebrates, vertebrates, divisions of plants Note: There is an ongoing scientific debate about the number of groupings and which organisms should be included in each.	• **Understand why living things are organized for study** • **Explain how bionomial nomenclature is used to name organisms (genus, species)** • **Describe Linnaeus's system of classification (Kingdom, Phylum, class, family)** • **Analyze characteristics used to classify organisms including phylogeny, derived characters, similarities in DNA and RNA, molecular clocks** • **Analyze taxonomic groupings and major characteristics of the five Kingdoms** • **Compare and contrast life functions of monerans, protests, fungi, plants, animals including humans** • **Classify organisms using characteristics and evolutionary Relationships of domains (eubacteria, archaebacteria, eukaryotes)** • **Classify organisms using a dichotomous key (PROFICIENT)**		**Bi (C 18**

(Analysis)	**9-12.L.1.3. Students are able to identify structures and function relationships within major taxa.** **Examples**: Relate how the layers in a leaf support leaf function. Interaction of agonist and antagonist muscles to support bone movement	• **Compare and contrast life functions of monerans, protests, fungi, plants, animals including humans**		**Bi** **(C** **18**

Indicator 2: Analyze various patterns and products of natural and induced biological change.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Synthesis)	**9-12.L.2.2. Students are able to describe how genetic recombination, mutations, and natural selection lead to adaptations, evolution, extinction, or the emergence of new species.** **Examples**: behavioral adaptations, environmental pressures, allele variations, bio-diversity • Use comparative anatomy to support evolutionary relationships.	• **Explain Darwin's observations of population variation** • **Predict inheritance patterns using a sing allele** • **Describe how genetic recombination, mutations, and natural selection lead to adaptations, evolution, extinction, or emergence of new species (Directional, stabilizing, disruptive selection, Genetic drift, Founder effect)** • **Use comparative anatomy to support evolutionary relationships (homologous structures, embryology)** • **Predict the impact of genetic changes in populations (mutation, natural selection, artificial selection, gene shuffling)** • **predict the results of complex inheritance patterns involving multiple alleles and genes. (SYNTHESIS)**		**Biology text (Chapter 6, 15, & 16)**

Indicator 3: Analyze how organisms are linked to one another and the environment.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Comprehension)	**9-12.L.3.1. Students are able to identify factors that can cause changes in stability of populations, communities, and ecosystems.** • Define populations, communities, ecosystems, niches and symbiotic relationships. • Predict the results of biotic and abiotic interactions. Examples: Responses to changing of the seasons Tolerances (temperature, weather, climate) Dormancy and migration	• **Define populations, communities, & ecosystems (COMPREHENSION)** • **Define niches and symbiotic Relationships (COMPREHENSION)** • **Compare and contrast the community interactions in an ecosystem (predation, competition, food chains, commensalism, parasitism, mutualism)** • **Diagram and describe the importance of the N, C, O and H_2O cycles** • **Predict the effect of an interruption in a given cycle (ADVANCED)** • **Predict the results of biotic and**		**Biology text (Chapter 3 & 4-2)**

	Fluctuation in available resources (water, food, shelter) Human activity Biogeochemical cycles Energy flow Cooperation and competition in ecosystems Response to external stimuli	**abiotic interactions (COMPREHENSION)**		

Core High School Life Science
Performance Descriptors

Advanced	**High school students performing at the advanced level:** • explain the steps of photophosphorylation and the Calvin Cycle; • analyze chemical reaction and chemical processes involved in the Calvin Cycle and Krebs Cycle; • predict the function of a given structure; • predict the outcome of changes in the cell cycle; • explain how protein production is regulated; • predict how homeostasis is maintained within living systems; • predict how traits are transmitted from parents to offspring; • construct an original dichotomous key.

Proficient	**High school students performing at the proficient level:** • describe and give examples of chemical reactions required to sustain life (hydrolysis, dehydration synthesis, photosynthesis, cellular respiration, ADP/ATP, role of enzymes); • describe the relationship between structure and function (cells, tissues, organs, organ systems, and organisms); • compare and contrast the cell cycles in somatic and germ cells; • tell how DNA determines protein formation; • explain how homeostasis is maintained within living systems; • explain how traits are transmitted from parents to offspring; • predict the impact of genetic changes in populations (mutation, natural selection and artificial selection, adaptation/extinction); • predict how life systems respond to changes in the environment; • classify organisms using a dichotomous key.
Basic	**High school students performing at the basic level:** • name chemical reactions required to sustain life (hydrolysis, dehydration synthesis, photosynthesis, cellular respiration, ADP/ATP, role of enzymes); • recognize that different structures perform different functions; • describe the life cycle of somatic cells; • identify DNA as the structure that carries the genetic code; • define homeostasis; • identify that genetic traits can be transmitted from parents to offspring; • know the purpose of a dichotomous key.

Advanced High School Life Science
Standards, Supporting Skills, and Examples

Indicator 1: Understand the fundamental structures, functions, classifications, and mechanisms found in living things.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resourc
(Synthesis)	**9-12.L.1.1A. Students are able to explain the physical and chemical processes of photosynthesis and cell respiration and their importance to plant and animal life.** **Examples**: photosystems, photophosphorylation, Calvin Cycle and Krebs Cycle	• Predict the effects of changes in photosynthesis and cellular respiration on plants and animals Examples: the effect of changes in light and temperature on a plant, the availability of glucose on the behavior of a person • What if oxygen is not available for the Krebs Cycle Examples: photosystems, photophosphorylation, Calvin Cycle and Krebs Cycle		**Biology text (Chapter 8 &**

(Analysis)	**9-12.L.1.5A. Students are able to classify organisms using characteristics and evolutionary relationships of domains.** **Examples:** eubacteria, archaebacteria, and eukaryotes	• **Classify organisms using characteristics and evolutionary relationships of domains (eubacteria, archaebacteria, eukaryotes)**		**Biology text (Chapter 18)**

Indicator 2: Analyze various patterns and products of natural and induced biological change.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resourc
(Synthesis)	**9-12.L.2.1A. Students are able to predict the results of complex inheritance patterns involving multiple alleles and genes.** **Examples**: human skin color, polygenic inheritance • Relate crossing over to genetic variation. • Evaluate changes in gene frequencies in populations to see if Hardy-Weinberg equilibrium exists or evolution has occurred.	• **Predict the results of complex inheritance patterns involving polygenic traits** Example: (Skin color) • **Evaluate changes in gene frequencies in populations to determine if Hardy-Weinberg equilibrium exists or evolution has occurred**		**Biology Text (Chapter 15)**

Indicator 3: Analyze how organisms are linked to one another and the environment.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Synthesis)	**9-12.L.3.1A. Students are able to relate genetic, instinct, and behavior patterns to biodiversity and survival of species.** • Compare and contrast learned behavior vs instinct. Example: nature vs nurture • Relate the introduction of non-native species to the disruption of an ecosystem. Examples: Asian lady beetle, Asian carp, zebra mussels, Eurasian watermilfoil, salt cedar	• **relate genetic, instinct, and behavior patterns to biodiversity and survival of species. (SYNTHESIS)** • **Relate the introduction of non-native species to the disruption of an ecosystem (Asian lady beetle, Asian carp, zebra mussels, Eurasian watermilfoil, salt cedar)**		**Biology text (Chapter 6)**

Core High School Science, Technology, Environment, and Society
Standards, Supporting Skills, Assessments, and Resources

Indicator 1: Analyze various implications/effects of scientific advancement within the environment and society.

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Evaluation)	**9-12.S.1.2. Students are able to evaluate and describe the impact of scientific discoveries on historical events and social, economic, and ethical issues.** **Examples**: cloning, stem cells, gene splicing, nuclear power, patenting new life forms, emerging diseases, AIDS, resistant forms of bacteria, biological and chemical weapons, global warming, and alternative fuels	• **Compare and contrast the use of alternative fuels on the environment compared to conventional fuels** • **Make a decision regarding the use of antibiotics and their contribution to the emergence of resistant strains.**		**Biology text (Chapter 15)** **Ethics Unit** **A Inconvenient Truth** **Too Hot Not To Handle**

(Evaluation)	**9-12.NC.1.1. Compare and contrast how societal changes mirror innovations and emerging technologies.** **Example:** Effect of emerging technology on future legal issues.	• **Evaluate effectiveness of current laws in issues relating to emerging technologies (stem cell research, alternative energies, antibiotic resistance)**		**Biology text Chapter 15** **Ethics Unit** **A Inconvenient Truth** **Too Hot Not To Handle**
(Evaluation)	**9-12.NC.1.2. Predict how the evolution of technology will influence the design and development of future technology.**	• **Assess the impact of a developing technology on future technology (development of antibiotics influences development of future antibiotics, nuclear power development causes development of waste technology)**		**Biology text Chapter 16** **Ethics Unit** **A Inconvenient Truth** **Too Hot Not To Handle**
(Analysis)	**9-12.NC.2.1. Analyze technology systems to make informed choices.**	• **Analyze cloning and stem cell procedures to make informed personal choices**		**Ethics Unit**

(Analysis)	**9-12.NC.3.1. Analyze intended and unintended impacts of a system.**	• **Connect intended use of embryos in in vitro fertilization with the unintended use in stem cell research** • **Connect the development of antibiotics with the unintended consequence of the development of antibiotic resistant strains**		**Ethics Unit**

Core High School Science Technology, Environment, and Society
Performance Descriptors

Advanced	**High school students performing at the advanced level:** • modify a technology taking into consideration limiting factors of design; • given a narrative of a scientific discovery, defend a position on the impact of the ethical issues.
Proficient	**High school students performing at the proficient level:** • given a narrative of a scientific discovery, identify and evaluate the immediate and long-term consequences of scientific issues; • identify and explain ethical roles and responsibilities of scientists conducting a given research project.; • evaluate factors that could limit technological design; • given a narrative description of a resource, analyze and describe the benefits, limitations, cost, and • consequences involved in its use, conservation, or recycling.

Basic	**High school students performing at the basic level:** • given a narrative of a scientific discovery, identify the immediate consequences of scientific issues; • identify ethical roles and responsibilities concerning a given research project; • identify factors that could limit technological design; • given a narrative description of a resource, describe a benefit and limitation involved in its use, conservation, or recycling.

Core High School Nature, Concepts and Systems Performance Descriptors

Advanced	**High school students performing at the advanced level:** • predict how the evolution of technology will influence the development of future technology • evaluate an example of an intended and unintended impact in a change system
Proficient	**High school students performing at the proficient level:** • compare and contrast how an emerging technology changes society • analyze an example of an intended and unintended impact in a system
Basic	**High school students performing at the basic level:** • identify an example of an intended and unintended impact in a system