

Course Title: Honors Biology
Board Approval Date: October 20, 2014
Credit / Hours: 1 credit

Course Description:

Honors Biology focuses on mastery of the PA Academic Standards for Science and Technology, Environment and Ecology, and the Keystone Assessment Anchors. As students progress through the course they will participate in a systematic study of the nature of science/biology, chemistry, biochemistry, cells, molecular genetics, genetics, evolution, and ecology.

Biology is the branch of science that studies the living world. Since there are around 1.9 million classified species on the planet, the course will look at the things that are common to all organisms. Wherever possible, activities and lab exercises are used to show biological concepts that apply to our living world. Also, the course will bring in relevance, by using examples from our own human biology and our local area.

Learning Activities / Modes of Assessment:

Large group instruction	Tests and Quizzes
Laboratory experiments	Projects with Rubrics
Small group work	Lab Reports / Write-ups
Reading assignments	Writing Assignments
CDT Testing	

Instructional Resources:

Biology (Pearson, 2002) by Ken Miller & Joseph Levine
Online access to *Biology* by Ken Miller & Joseph Levine
Laptops
Logger Pro software
Excel, *Powerpoint*, *Word*
Google Docs
Discovery Education video services
Central Columbia School District Educational Video Library
Various instructional videos and educational websites
iPads and Resource Apps
Biology iBooks

Course Pacing Guide

Course: **Honors Biology**

Course Unit (Topic)	Length of Instruction (Days/Periods)
1. Science of Biology	12 days
2. Chemistry	16 days
3. Bio-Chemistry	16 days
4. Cells	40 days
5. Molecular Genetics	16 days
6. Genetics	16 days
7. Evolution	22 days
8. Ecology	<u>22 days</u>
DAYS TOTAL	160 Days

Topic: 01-Science of Biology

Days: 12

Subject(s): Science

Grade(s): 9th

Know:

Understand:

Do:

3.2.10.A – Essential

Apply knowledge and understanding about the nature of scientific and technological knowledge.

- Compare and contrast scientific theories and beliefs.
- Know that science uses both direct and indirect observation means to study the world and the universe.
- Integrate new information into existing theories and explain implied results.

3.7.10.A – Important

Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.

- Select and safely apply appropriate tools, materials and processes necessary to solve complex problems.
- Apply advanced tool and equipment manipulation techniques to solve problems.

SI.11-12.1 – Important

Examine the status of existing theories.

Science involves the use of technology and the scientific method to help solve problems.

3.3.10.A – Essential

Explain the structural and functional similarities and differences found among living things.

- Identify and characterize major life forms according to their placement in existing classification groups.
- Explain the relationship between structure and function at the molecular and cellular levels.
- Describe organizing schemes of classification keys.
- Identify and characterize major life forms by kingdom, phyla, class and order.

3.1.10.D – Compact

Apply scale as a way of relating concepts and ideas to one another by some measure.

- Apply dimensional analysis and scale as a ratio.
- Convert one scale to another.

3.2.10.A – Essential

Apply knowledge and understanding about the nature of scientific and technological knowledge.

- Compare and contrast scientific theories and beliefs.
- Know that science uses both direct and indirect observation means to study the world and the universe.
- Integrate new information into existing theories and explain implied results.

3.2.10.B – Essential

Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Describe materials using precise quantitative and qualitative skills based on observations.
- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.
- Use process skills to make inferences and predictions using collected information and to communicate, using space / time relationships, defining operationally.

Topic: 01-Science of Biology

Days: 12

Subject(s): Science

Grade(s): 9th

Know:

Understand:

Do:

BIO.B.3.3.1 – Important

Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.

The basis for all scientific problem solving including the main tenets of biology that we will study for the remainder of the year.

Vocabulary:

Science, Biology, Hypothesis, Theory, Law, System, Controlled

experiment, Independent variable, Dependent variable, Metric system, Dimensional analysis, Conversion of Units, Qualitative data, Quantitative data, Observation

Tools of Biology:

Compound Light Microscope, Electron Microscopes(SEM & TEM), Stereomicroscope, Centrifuge, Sensors

Characteristics of all Life:

CellsDNAHomeostasisReproduceGrowthEnergyEvolveResponse to EnvironmentMetabolism

3.2.10.C – Essential

Apply the elements of scientific inquiry to solve problems.

- Generate questions about objects, organisms and/or events that can be answered through scientific investigations.
- Evaluate the appropriateness of questions.
- Design an investigation with adequate control and limited variables to investigate a question.
- Conduct a multiple step experiment.
- Organize experimental information using a variety of analytic methods.
- Judge the significance of experimental information in answering the question.
- Suggest additional steps that might be done experimentally.

3.2.10.D – Compact

Identify and apply the technological design process to solve problems.

- Examine the problem, rank all necessary information and all questions that must be answered.
- Propose and analyze a solution.
- Implement the solution.
- Evaluate the solution, test, redesign and improve as necessary.
- Communicate the process and evaluate and present the impacts of the solution.

3.7.10.A – Important

Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.

- Select and safely apply appropriate tools, materials and processes necessary to solve complex problems.
- Apply advanced tool and equipment manipulation techniques to solve problems.

Topic: 01-Science of Biology
 Subject(s): Science

Days: 12
 Grade(s): 9th

Know:	Understand:	Do:
		<div data-bbox="852 359 1455 940"> <p>3.7.10.B – Important Apply appropriate instruments and apparatus to examine a variety of objects and processes.</p> <ul style="list-style-type: none"> • Describe and use appropriate instruments to gather and analyze data. • Compare and contrast different scientific measurement systems; select the best measurement system for a specific situation. • Explain the need to estimate measurements within error of various instruments. • Apply accurate measurement knowledge to solve everyday problems. • Describe and demonstrate the operation and use of advanced instrumentation in evaluating material and chemical properties (e.g., scanning electron microscope, nuclear magnetic resonance machines). </div> <div data-bbox="852 957 1455 1551"> <p>3.1.10.A – Compact Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.</p> <ul style="list-style-type: none"> • Identify the function of subsystems within a larger system (e.g., role of thermostat in an engine, pressure switch). • Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems. • Explain the concept of system redesign and apply it to improve technological systems. • Apply the universal systems model to illustrate specific solutions and troubleshoot specific problems. • Analyze and describe the effectiveness of systems to solve specific problems. </div> <div data-bbox="852 1568 1455 1698"> <p>SI.11-12.2 – Essential Evaluate experimental information for relevance and adherence to science processes.</p> </div> <div data-bbox="852 1715 1455 1837"> <p>SI.11-12.3 – Essential Judge that conclusions are consistent and logical with experimental conditions.</p> </div>

Topic: 01-Science of Biology
 Subject(s): Science

Days: 12
 Grade(s): 9th

Know:	Understand:	Do:
		<div data-bbox="852 359 1455 501"> <p>SI.11-12.4 – Essential Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.</p> </div> <div data-bbox="852 527 1455 615"> <p>SI.11-12.5 – Essential Communicate and defend a scientific argument.</p> </div> <div data-bbox="852 640 1455 762"> <p>BIO.A.1.1.1 – Essential Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.</p> </div> <p>SI.11-12.1 - Examine the status of existing theories. SI.11-12.2 - Evaluate experimental information for relevance and adherence to science processes. SI.11-12.3 - Judge that conclusions are consistent and logical with experimental conditions. SI.11-12.4 - Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. SI.11-12.5 - Communicate and defend a scientific argument. S11.A.1.1.1 - Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession). S11.A.1.1.2 - Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws. S11.A.1.1.3 - Evaluate the appropriateness of research questions (e.g., testable vs. not-testable). S11.A.1.1.4 - Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, gas laws, processing and feedback systems). S11.A.1.1.5 - Analyze or compare the use of both</p>

Topic: 01-Science of Biology
 Subject(s): Science

Days: 12
 Grade(s): 9th

Know:	Understand:	Do:
		<p>direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p> <p>S11.A.2.2.1 - Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).</p> <p>S11.A.2.2.2 - Explain how technology is used to extend human abilities and precision (e.g., GPS, spectroscope, scanning electron microscope, pH meters, probes, interfaces, imaging technologies, telescope).</p> <p>S11.A.3.2.3 - Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).</p> <p>S11.A.1.2.1 - Apply and explain scientific concepts to societal issues using case studies (e.g., sea level change, spread of HIV, deforestation, environmental health, energy).</p> <p>S11.A.1.3.1 - Use ratio to describe change (e.g., percents, parts per million, grams per cubic centimeter).</p> <p>BIO.A.1.1.1 - Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.</p> <p>BIO.B.3.3.1 - Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.</p>

Topic: 02-Chemistry
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
<p>S11.C.1.1.1 – Important Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., proton, neutrons, electrons).</p> <p>S11.C.1.1.2 – Important Explain the relationship between the physical properties of a substance and its molecular or atomic structure.</p> <p>S11.C.1.1.3 – Important Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).</p> <p>The basis of all Chemistry which fundamentally is the basis of all life on Earth. Vocabulary: Chemistry, Atom, Molecule, Concentration, Energy Transformation, Organic Molecule, pH, Temperature, Matter, Compound, Reactant, Product, Biochemistry, Covalent, Ionic, Acid, Base, Buffer, Proton, Neutron, Electron, Nucleus, Valence Electrons, Element, Mixture, Solution, Suspension Models of the Atom Types of Bonding Use of the Periodic Table Chemical Equations</p>	<p>Atoms are the basic building blocks of all things both living and non-living.</p>	<p>3.1.10.B – Essential Describe concepts of models as a way to predict and understand science and technology.</p> <ul style="list-style-type: none"> Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA). Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability). Apply mathematical models to science and technology. <p>3.4.10.B – Compact Analyze energy sources and transfers of heat.</p> <ul style="list-style-type: none"> Determine the efficiency of chemical systems by applying mathematical formulas. Use knowledge of chemical reactions to generate an electrical current. Evaluate energy changes in chemical reactions. Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion). Explain resistance, current and electro-motive force (Ohm's Law). <p>3.2.C.A1.a – Essential PROPERTIES OF MATTER - Differentiate between physical properties and chemical properties.</p> <p>3.2.C.A1.c – Essential PROPERTIES OF MATTER - Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements.</p> <p>3.2.C.A1.d – Essential PROPERTIES OF MATTER - Use electro-negativity to explain the difference between polar and nonpolar covalent bonds.</p> <p>3.2.C.A2.a – Essential STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p>

Topic: 02-Chemistry
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>3.2.C.A2.b – Essential STRUCTURE OF MATTER - Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.</p> <p>3.2.C.A2.c – Important STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.C.A2.d – Essential STRUCTURE OF MATTER - Predict chemical formulas based on the number of valence electrons.</p> <p>3.2.C.A2.f – Essential STRUCTURE OF MATTER - Predict the chemical formulas for simple ionic and molecular compounds.</p> <p>3.2.C.A4.c – Essential REACTIONS - Balance chemical equations by applying the laws of conservation of mass.</p> <p>BIO.A.2.1.1 – Essential Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).</p> <p>3.2.C.A1.a - PROPERTIES OF MATTER - Differentiate between physical properties and chemical properties. 3.2.C.A1.c - PROPERTIES OF MATTER - Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements. 3.2.C.A1.d - PROPERTIES OF MATTER - Use electro-negativity to explain the difference between polar and nonpolar covalent bonds. 3.2.C.A2.a - STRUCTURE OF MATTER - Compare the electron configurations for the first</p>

Topic: 02-Chemistry
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>twenty elements of the periodic table.</p> <p>3.2.C.A2.b - STRUCTURE OF MATTER - Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.</p> <p>3.2.C.A2.c - STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.C.A2.d - STRUCTURE OF MATTER - Predict chemical formulas based on the number of valence electrons.</p> <p>3.2.C.A2.f - STRUCTURE OF MATTER - Predict the chemical formulas for simple ionic and molecular compounds.</p> <p>3.2.C.A4.c - REACTIONS - Balance chemical equations by applying the laws of conservation of mass.</p> <p>S11.C.1.1.1 - Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., proton, neutrons, electrons).</p> <p>S11.C.1.1.2 - Explain the relationship between the physical properties of a substance and its molecular or atomic structure.</p> <p>S11.C.1.1.3 - Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).</p> <p>S11.C.1.1.4 - Explain how the relationships of chemical properties of elements are represented in the repeating patterns within the periodic table.</p> <p>S11.C.1.1.6 - Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature, agitation).</p> <p>S11.C.2.1.2 - Describe energy changes in chemical reactions.</p> <p>S11.C.2.1.3 - Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration system, rocket propulsion, heat pump).</p> <p>BIO.A.2.1.1 - Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).</p>

Topic: 03-Biochemistry

Subject(s): Science

Days: 16

Grade(s): 9th

Know:

3.1.B.A2.e – Important

ENERGY FLOW - Explain the importance of enzymes as catalysts in cell reactions.

3.1.B.A2.f – Important

ENERGY FLOW- Identify how factors such as pH and temperature may affect enzyme function.

BIO.A.2.2.2 – Important

Describe how biological macromolecules form from monomers.

The basis of all living things at the atomic and molecular level is primarily carbon.

Vocabulary:

Organic Chemistry, ATP, Adhesion, Bioenergetics, Macromolecules, Carbohydrates, Lipids, Proteins, Nucleic Acids, Catalyst, Cohesion, DNA, Enzyme, Freezing Point, Monomer, Polymer, Specific Heat, Adhesion, Cohesion, Surface Tension, Capillary Action, Universal Solvent, Functional Groups, Activation Energy, Lock and Key Model, Substrate, Hydrolysis Reaction, Condensation Reaction, Dehydration Synthesis Reaction

The Big Four Biomolecules:

CarbohydratesLipidsProteinsNucleic Acids

The Unique Properties of Water
 A general understanding of how organism metabolism works.

Understand:

Carbon Chemistry is the basis of the major macromolecules that compose all living things.

Do:

3.1.B.A2.d – Essential

ENERGY FLOW - Explain why many biological macromolecules such as ATP and lipids contain high energy bonds.

3.1.B.A5.b – Essential

FORM AND FUNCTIONS - Explain the role of water in cell metabolism.

3.1.B.A7.a – Essential

MOLECULAR BASIS OF LIFE - Analyze the importance of carbon to the structure of biological macromolecules.

3.1.B.A7.b – Essential

MOLECULAR BASIS OF LIFE - Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids.

3.1.B.A8.c – Essential

UNIFYING THEMES - SYSTEMS
 Describe how the unique properties of water support life.

BIO.A.2.1.1 – Essential

Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).

BIO.A.2.2.1 – Essential

Explain how carbon is uniquely suited to form biological macromolecules.

BIO.A.2.2.3 – Essential

Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.

BIO.A.2.3.1 – Important

Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.

Topic: 03-Biochemistry
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>BIO.A.2.3.2 – Important Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.</p> <p>3.1.B.A2.d - ENERGY FLOW - Explain why many biological macromolecules such as ATP and lipids contain high energy bonds.</p> <p>3.1.B.A2.e - ENERGY FLOW - Explain the importance of enzymes as catalysts in cell reactions.</p> <p>3.1.B.A2.f - ENERGY FLOW- Identify how factors such as pH and temperature may affect enzyme function.</p> <p>3.1.B.A5.b - FORM AND FUNCTIONS - Explain the role of water in cell metabolism.</p> <p>3.1.B.A7.a - MOLECULAR BASIS OF LIFE - Analyze the importance of carbon to the structure of biological macromolecules.</p> <p>3.1.B.A7.b - MOLECULAR BASIS OF LIFE - Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids.</p> <p>3.1.B.A7.c - MOLECULAR BASIS OF LIFE - Explain the consequences of extreme changes in pH and temperature on cell proteins.</p> <p>3.1.B.A8.b - UNIFYING THEMES - PATTERNS Demonstrate the repeating patterns that occur in biological polymers.</p> <p>3.1.B.A8.c - UNIFYING THEMES - SYSTEMS Describe how the unique properties of water support life.</p> <p>BIO.A.2.1.1 - Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).</p> <p>BIO.A.2.2.2 - Describe how biological macromolecules form from monomers.</p>

Topic: 03-Biochemistry
Subject(s): Science

Days: 16
Grade(s): 9th

Know:	Understand:	Do:
		<p>BIO.A.2.2.3 - Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.</p> <p>BIO.A.2.3.1 - Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.</p> <p>BIO.A.2.3.2 - Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.</p> <p>S11.B.1.1.1 - Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical, ecological).</p> <p>S11.C.1.1.6 - Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature, agitation).</p>

Topic: 04-Cells
 Subject(s): Science

Days: 40
 Grade(s): 9th

Know:

3.1.B.A2.e – Important

ENERGY FLOW - Explain the importance of enzymes as catalysts in cell reactions.

3.1.B.A2.f – Important

ENERGY FLOW- Identify how factors such as pH and temperature may affect enzyme function.

BIO.A.3.2.2 – Important

Describe the role of ATP in biochemical reactions.

BIO.A.4.1.3 – Important

Describe how membranebound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.

BIO.A.4.2.1 – Important

Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).

All the different ways that the cell helps to carry out life as we know it at this point in time.

General Types of Cells:

Prokaryotic Eukaryotic

The Cell Theory

The Parts of a Cell:

Plasma

Membrane Cytoplasm DNA Organelles Cell Wall

Levels of Biological Organization

Homeostasis/Transport:

Passive Transport Active Transport

Photosynthesis:

Chlorophyll, Visible Light Spectrum,

Chromatography, Light Dependent

Reactions, Light Independent Reactions

Cellular Respiration:

Anaerobic Respiration, Lactic Acid

Fermentation, Alcoholic Fermentation,

Aerobic Respiration, Glycolysis, Electron

Transport Chain, ATP

Understand:

Cells are the basic units of living things. Cells have numerous parts that work together to perform all the functions that are needed for life.

Do:

3.3.10.C – Essential

Describe how genetic information is inherited and expressed.

- Compare and contrast the function of mitosis and meiosis.
- Describe mutations' effects on a trait's expression.
- Distinguish different reproductive patterns in living things (e.g., budding, spores, fission).
- Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria).
- Explain the relationship among DNA, genes and chromosomes.
- Explain different types of inheritance (e.g., multiple allele, sex-influenced traits).
- Describe the role of DNA in protein synthesis as it relates to gene expression.

3.1.10.B – Essential

Describe concepts of models as a way to predict and understand science and technology.

- Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA).
- Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability).
- Apply mathematical models to science and technology.

Topic: 04-Cells
 Subject(s): Science

Days: 40
 Grade(s): 9th

Know:	Understand:	Do:
<p>Cell Growth and Development: Cell Cycle, Mitosis, Meiosis, Chromosomes, Differentiation, Specialization, Cancer</p>		<div data-bbox="992 342 1471 884"> <p>3.3.10.A – Essential Explain the structural and functional similarities and differences found among living things.</p> <ul style="list-style-type: none"> • Identify and characterize major life forms according to their placement in existing classification groups. • Explain the relationship between structure and function at the molecular and cellular levels. • Describe organizing schemes of classification keys. • Identify and characterize major life forms by kingdom, phyla, class and order. </div> <div data-bbox="992 894 1471 1465"> <p>3.3.10.B – Essential Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. </div>

Topic: 04-Cells
 Subject(s): Science

Days: 40
 Grade(s): 9th

Know:	Understand:	Do:
		<div data-bbox="995 342 1471 972"> <p>3.4.10.B – Compact Analyze energy sources and transfers of heat.</p> <ul style="list-style-type: none"> • Determine the efficiency of chemical systems by applying mathematical formulas. • Use knowledge of chemical reactions to generate an electrical current. • Evaluate energy changes in chemical reactions. • Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion). • Explain resistance, current and electro-motive force (Ohm's Law). </div> <div data-bbox="995 982 1471 1791"> <p>3.7.10.B – Important Apply appropriate instruments and apparatus to examine a variety of objects and processes.</p> <ul style="list-style-type: none"> • Describe and use appropriate instruments to gather and analyze data. • Compare and contrast different scientific measurement systems; select the best measurement system for a specific situation. • Explain the need to estimate measurements within error of various instruments. • Apply accurate measurement knowledge to solve everyday problems. • Describe and demonstrate the operation and use of advanced instrumentation in evaluating material and chemical properties (e.g., scanning electron microscope, nuclear magnetic resonance machines). </div> <div data-bbox="995 1801 1471 1982"> <p>3.1.B.A1.b – Essential COMMON CHARACTERISTICS OF LIFE - Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms.</p> </div>

Topic: 04-Cells
 Subject(s): Science

Days: 40
 Grade(s): 9th

Know:

Understand:

Do:

3.1.B.A2.a – Essential

ENERGY FLOW - Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration.

3.1.B.A2.b – Essential

ENERGY FLOW - Explain the important role of ATP in cell metabolism.

3.1.B.A2.c – Essential

ENERGY FLOW - Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms.

3.1.B.A2.d – Essential

ENERGY FLOW - Explain why many biological macromolecules such as ATP and lipids contain high energy bonds.

3.1.B.A4.a – Essential

CELL CYCLES - Summarize the stages of the cell cycle.

3.1.B.A4.c – Essential

CELL CYCLES - Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

3.1.B.A5.a – Essential

FORM AND FUNCTIONS - Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc).

3.1.B.A5.b – Essential

FORM AND FUNCTIONS - Explain the role of water in cell metabolism.

3.1.B.A5.c – Essential

FORM AND FUNCTIONS - Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell.

Topic: 04-Cells
Subject(s): Science

Days: 40
Grade(s): 9th

Know:	Understand:	Do:
		<div>3.1.B.A5.d – Essential FORM AND FUNCTIONS - Describe transport mechanisms across the plasma membrane.</div> <div>BIO.A.1.2.1 – Essential Compare cellular structures and their functions in prokaryotic and eukaryotic cells.</div> <div>BIO.A.1.2.2 – Essential Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</div> <div>BIO.A.3.1.1 – Essential Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.</div> <div>BIO.A.3.2.1 – Essential Compare the basic transformation of energy during photosynthesis and cellular respiration.</div> <div>BIO.A.4.1.1 – Essential Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.</div> <div>BIO.A.4.1.2 – Essential Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).</div> <div>BIO.B.1.1.1 – Essential Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis.</div>

Topic: 04-Cells
 Subject(s): Science

Days: 40
 Grade(s): 9th

Know:	Understand:	Do:
		<p>BIO.B.1.1.2 – Essential Compare the processes and outcomes of mitotic and meiotic nuclear divisions.</p> <p>3.1.B.A1.b - COMMON CHARACTERISTICS OF LIFE - Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms.</p> <p>3.1.B.A2.b - ENERGY FLOW - Explain the important role of ATP in cell metabolism.</p> <p>3.1.B.A2.c - ENERGY FLOW - Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms.</p> <p>3.1.B.A2.d - ENERGY FLOW - Explain why many biological macromolecules such as ATP and lipids contain high energy bonds.</p> <p>3.1.B.A2.e - ENERGY FLOW - Explain the importance of enzymes as catalysts in cell reactions.</p> <p>3.1.B.A2.f - ENERGY FLOW- Identify how factors such as pH and temperature may affect enzyme function.</p> <p>3.1.B.A3. - LIFE CYCLES - Explain how all organisms begin their life cycles as a single cell and that in multicellular organisms, successive generations of embryonic cells form by cell division.</p> <p>3.1.B.A4.a - CELL CYCLES - Summarize the stages of the cell cycle.</p> <p>3.1.B.A4.b - CELL CYCLES - Examine how interactions among the different molecules in the cell cause the distinct stages of the cell cycle which can also be influenced by other signaling molecules.</p> <p>3.1.B.A4.c - CELL CYCLES - Explain the role of mitosis in the formation of new cells and its importance in</p>

Topic: 04-Cells
 Subject(s): Science

Days: 40
 Grade(s): 9th

Know:	Understand:	Do:
		<p>maintaining chromosome number during asexual reproduction.</p> <p>3.1.B.A5.a - FORM AND FUNCTIONS - Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc).</p> <p>3.1.B.A5.b - FORM AND FUNCTIONS - Explain the role of water in cell metabolism.</p> <p>3.1.B.A5.c - FORM AND FUNCTIONS - Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell.</p> <p>3.1.B.A5.d - FORM AND FUNCTIONS - Describe transport mechanisms across the plasma membrane.</p> <p>BIO.A.1.2.1 - Compare cellular structures and their functions in prokaryotic and eukaryotic cells.</p> <p>BIO.A.1.2.2 - Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p>BIO.A.3.1.1 - Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.</p> <p>BIO.A.3.2.1 - Compare the basic transformation of energy during photosynthesis and cellular respiration.</p> <p>BIO.A.3.2.2 - Describe the role of ATP in biochemical reactions.</p> <p>BIO.A.4.1.1 - Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.</p> <p>BIO.A.4.1.2 - Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport-diffusion, osmosis, facilitated diffusion; and active transport-pumps, endocytosis, exocytosis).</p> <p>BIO.A.4.1.3 - Describe how membrane</p>

Topic: 04-Cells
Subject(s): Science

Days: 40
Grade(s): 9th

Know:	Understand:	Do:
		<p>bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.</p> <p>BIO.A.4.2.1 - Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).</p> <p>BIO.B.1.1.1 - Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis.</p> <p>BIO.B.1.1.2 - Compare the processes and outcomes of mitotic and meiotic nuclear divisions.</p>

Topic: 05-Molecular Genetics

Subject(s): Science

Days: 16

Grade(s): 9th

Know:	Understand:	Do:
<p>3.1.B.B1.d – Important HEREDITY - Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation.</p> <p>3.1.B.B3.e – Important MOLECULAR BASIS OF LIFE - Cite evidence to support that the genetic code is universal.</p> <p>3.1.B.B5.c – Compact UNIFYING THEMES - CONSTANCY AND CHANGE Explain how the processes of replication, transcription, and translation are similar in all organisms.</p> <p>The overall process of how the DNA makes the RNA, and how the RNA then makes the proteins for that particular organism. The Structure and Function of DNA The History of DNA Studies The different types of RNA and the different functions that they have. The process of Protein Synthesis Vocabulary: Nucleotide, N-Base, Deoxyribose, Adenine, Thymine, Guanine, Cytosine, Replication, Helicase, DNA Polymerase, Complementary Base</p>	<p>DNA directs the production of proteins necessary for the growth and function of cells.</p>	<p>3.1.10.B – Essential Describe concepts of models as a way to predict and understand science and technology.</p> <ul style="list-style-type: none"> Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA). Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability). Apply mathematical models to science and technology. <p>3.3.10.C – Essential Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> Compare and contrast the function of mitosis and meiosis. Describe mutations' effects on a trait's expression. Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). Explain the relationship among DNA, genes and chromosomes. Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). Describe the role of DNA in protein synthesis as it relates to gene expression. <p>BIO.B.1.2.1 – Essential Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.</p> <p>BIO.B.1.2.2 – Essential Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.</p> <p>BIO.B.2.2.1 – Essential Describe how the processes of transcription and translation are similar in all organisms.</p>

Topic: 05-Molecular Genetics
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
<p>Pairing, Semi-Conservative Model, Hydrogen Bonds, DNA, RNA, Ribose, Uracil, Transcription, RNA polymerase, mRNA, tRNA, rRNA</p> <p>Translation, Codon, Anti-codon, Ribosome, Amino Acid, Peptide bond, Gene Mutation, Mutagen, Gene Expression</p> <p>Chromosome Mutations, Deletion, Inversion, Duplication, Translocation, Nondisjunction</p> <p>Gene Mutations, Frame-Shift Mutation, Point Mutations, Nonsense Mutation, Missense Mutation, Silent Mutation</p>		<p>BIO.B.2.3.1 – Essential Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frameshift).</p> <p>3.1.B.B1.a – Essential HEREDITY - Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules.</p> <p>3.1.B.B1.b – Essential HEREDITY - Explain the basic process of DNA replication.</p> <p>3.1.B.B1.c – Essential HEREDITY - Describe the basic processes of transcription and translation.</p> <p>3.1.B.B3.a – Essential MOLECULAR BASIS OF LIFE - Describe the basic structure of DNA, including the role of hydrogen bonding.</p> <p>3.1.B.B3.b – Essential MOLECULAR BASIS OF LIFE - Explain how the process of DNA replication results in the transmission and conservation of the genetic code.</p> <p>3.1.B.B3.c – Essential MOLECULAR BASIS OF LIFE - Describe how transmission and translation result in gene expression.</p> <p>3.1.B.B3.d – Essential MOLECULAR BASIS OF LIFE - Differentiate among the end products of replication, transcription, and translation.</p> <p>3.1.B.B5.d – Essential UNIFYING THEMES - Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life.</p> <p>3.1.B.B5.e – Essential UNIFYING THEMES - SCALE Demonstrate how inherited characteristics can be observed at the molecular, cellular, and organism levels.</p>

Topic: 05-Molecular Genetics
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>BIO.B.1.2.1 - Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.</p> <p>BIO.B.1.2.2 - Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.</p> <p>BIO.B.2.2.1 - Describe how the processes of transcription and translation are similar in all organisms.</p> <p>BIO.B.2.3.1 - Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frameshift).</p> <p>S11.B.2.2.1 - Describe how genetic information is expressed (i.e., DNA, genes, chromosomes, transcription, translation, and replication).</p> <p>3.1.B.B1.a - HEREDITY - Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules.</p> <p>3.1.B.B1.b - HEREDITY - Explain the basic process of DNA replication.</p> <p>3.1.B.B1.c - HEREDITY - Describe the basic processes of transcription and translation.</p> <p>3.1.B.B1.d - HEREDITY - Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation.</p> <p>3.1.B.B1.e - HEREDITY - Explain how mutations can alter genetic information and the possible consequences on resultant cells.</p> <p>3.1.B.B3.a - MOLECULAR BASIS OF LIFE - Describe the basic structure of DNA, including the role of hydrogen bonding.</p> <p>3.1.B.B3.b - MOLECULAR BASIS OF LIFE - Explain how the process of DNA replication results in the transmission and conservation of the genetic code.</p> <p>3.1.B.B3.c - MOLECULAR BASIS OF LIFE - Describe how transmission and translation result in gene expression.</p> <p>3.1.B.B3.d - MOLECULAR BASIS OF LIFE - Differentiate among the end products of replication,</p>

Topic: 05-Molecular Genetics
Subject(s): Science

Days: 16
Grade(s): 9th

Know:	Understand:	Do:
		<p>transcription, and translation.</p> <p>3.1.B.B3.e - MOLECULAR BASIS OF LIFE - Cite evidence to support that the genetic code is universal.</p> <p>3.1.B.B5.c - UNIFYING THEMES - CONSTANCY AND CHANGE Explain how the processes of replication, transcription, and translation are similar in all organisms.</p> <p>3.1.B.B5.d - UNIFYING THEMES - Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life.</p> <p>3.1.B.B5.e - UNIFYING THEMES - SCALE Demonstrate how inherited characteristics can be observed at the molecular, cellular, and organism levels.</p>

Topic: 06-Genetics
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
<p>BIO.B.2.4.1 – Important Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).</p> <p>3.1.B.B4. – Important BIOTECHNOLOGY - Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture</p> <p>The process of how gametes with different genetic information combine to give sexually reproducing organisms new traits. The different types of genetic traits that we have discovered. How human genetics works in comparison to other organisms. The ways that biotechnology are being used today to help solve some of our problems relating to agriculture and medicine. Vocabulary: Mendelian Genetics: Dominance, Recessive, Genotype, Phenotype, Hybrid, Pure, Inheritance, Homozygous, Heterozygous, Allele,</p>	<p>Hereditary information is inherited and expressed; the gene is the functional unit of heredity.</p>	<p>3.3.10.C – Essential Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. <p>3.1.10.B – Essential Describe concepts of models as a way to predict and understand science and technology.</p> <ul style="list-style-type: none"> • Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA). • Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability). • Apply mathematical models to science and technology. <p>BIO.B.1.2.2 – Essential Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.</p> <p>BIO.B.2.1.1 – Essential Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, codominance, incomplete dominance, sexlinked, polygenic, and multiple alleles).</p>

Topic: 06-Genetics

Days: 16

Subject(s): Science

Grade(s): 9th

Know:	Understand:	Do:
<p>Trait, Gene, Independent Assortment, Segregation, Homologous Chromosome, Punnett Square, Probability, Monohybrid, Dihybrids Non-Mendelian Genetics:</p> <p>Co-dominance, Incomplete Dominance, Multiple Allele Traits, Sex-Linked Traits, Polygenic Traits</p> <p>Human Genetics: Human Genetic Diseases, Downs Syndrome, Sickle Cell Anemia, Color Blindness, Tay-Sachs, Muscular Dystrophy, ABO Blood Typing, Genetic Screening, Genetic Counseling, Ultrasound, Amniocentesis, Pedigree Studies</p> <p>Biotechnology:</p> <p>Cloning, Polymerase Chain Reaction, DNA Fingerprinting, Transgenic Organisms, Stem Cell Research, Forensics, Gene Splicing, Gene Therapy, Genetic Engineering, GMOs, Selective Breeding</p>		<p>BIO.B.2.1.2 – Essential Describe processes that can alter composition or number of chromosomes (i.e., crossingover, nondisjunction, duplication, translocation, deletion, insertion, and inversion).</p> <p>3.1.B.B1.a – Essential HEREDITY - Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules.</p> <p>3.1.B.B2.a – Essential REPRODUCTION - Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance of meiosis in sexual reproduction.</p> <p>3.1.B.B2.b – Essential REPRODUCTION - Compare and contrast the function of mitosis and meiosis.</p> <p>3.1.B.B2.c – Essential REPRODUCTION - Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.</p> <p>3.1.B.B5.a – Essential UNIFYING THEMES - PATTERNS Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance.</p> <p>3.1.B.B5.b – Essential UNIFYING THEMES - Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles)</p> <p>3.1.B.B5.d – Essential UNIFYING THEMES - Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life.</p>

Topic: 06-Genetics
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>BIO.B.1.2.2 - Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.</p> <p>BIO.B.2.1.1 - Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co dominance, incomplete dominance, sexlinked, polygenic, and multiple alleles).</p> <p>BIO.B.2.1.2 - Describe processes that can alter composition or number of chromosomes (i.e., crossingover, nondisjunction, duplication, translocation, deletion, insertion, and inversion).</p> <p>BIO.B.2.4.1 - Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).</p> <p>3.1.B.B1.a - HEREDITY - Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules.</p> <p>3.1.B.B1.e - HEREDITY - Explain how mutations can alter genetic information and the possible consequences on resultant cells.</p> <p>3.1.B.B2.a - REPRODUCTION - Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance of meiosis in sexual reproduction.</p> <p>3.1.B.B2.b - REPRODUCTION - Compare and contrast the function of mitosis and meiosis.</p> <p>3.1.B.B2.c - REPRODUCTION - Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.</p> <p>3.1.B.B4. - BIOTECHNOLOGY - Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture</p> <p>3.1.B.B5.a - UNIFYING THEMES - PATTERNS Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance.</p> <p>3.1.B.B5.b - UNIFYING THEMES - Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete</p>

Topic: 06-Genetics
Subject(s): Science

Days: 16
Grade(s): 9th

Know:	Understand:	Do:
		dominance, multiple alleles) 3.1.B.B5.d - UNIFYING THEMES - Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life.

Topic: 07-Evolution

Subject(s): Science

Days: 22

Grade(s): 9th

Know:	Understand:	Do:
<p>3.1.B.C1.a – Important NATURAL SELECTION - Describe species as reproductively distinct groups of organisms.</p> <p>3.1.B.C1.b – Important NATURAL SELECTION - Analyze the role that geographic isolation can play in speciation.</p> <p>3.1.B.C2.a – Important ADAPTATION - Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of singlecelled organisms evolved.</p> <p>3.1.B.C2.b – Compact ADAPTATION - Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed.</p> <p>3.1.B.C2.d – Important ADAPTATION - Describe the relationship between environmental changes and changes in the gene pool of a population.</p> <p>BIO.B.3.1.2 – Important Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration).</p>	<p>How an organism's genetic make-up and the environmental conditions allow evolution by natural selection to take place both now, in the past, and in the future.</p>	<p>3.1.B.C1.c – Essential NATURAL SELECTION - Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population.</p> <p>3.1.B.C2.c – Essential ADAPTATION - Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment.</p> <p>3.1.B.C3.a – Important UNIFYING THEMES - CONSTANCY AND CHANGE Compare and contrast various theories of evolution.</p> <p>3.1.B.C3.b – Essential UNIFYING THEMES - Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution.</p> <p>3.1.B.C3.c – Essential UNIFYING THEMES - PATTERNS Discuss the implications of a universal genetic code for evolution.</p> <p>BIO.B.3.1.1 – Essential Explain how natural selection can impact allele frequencies of a population.</p> <p>BIO.B.3.1.3 – Essential Explain how genetic mutations may result in genotypic and phenotypic variations within a population.</p> <p>BIO.B.3.2.1 – Important Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).</p> <p>3.1.B.C1.a - NATURAL SELECTION - Describe species as reproductively distinct groups of</p>

Topic: 07-Evolution

Days: 22

Subject(s): Science

Grade(s): 9th

Know:	Understand:	Do:
<p>Theories of Evolution: Charles Darwin, Lamarck, Alfred Wallace, Natural Selection, Inheritance of Acquired Characteristics, Artificial Selection</p> <p>Evidences of Evolution: Homologous structures, Fossils, Vestigial Organs, Comparative Embryology, Comparative Biochemistry, Endosymbiosis</p> <p>Patterns of Evolution: Gene Pool, Genetic Variation, Population, Allele Frequency, Types of Selection, Genetic Equilibrium, Speciation, Adaptive Radiation, Convergent Evolution, Divergent Evolution, Punctuated Equilibrium, Isolating Mechanisms, Founder Effect, Genetic Drift, Gradualism, Migration,</p> <p>Classification of Organisms: Binomial Nomenclature, Taxons, Linnaeus, Cladogram, Phylogenetic Tree, Domain, Kingdom, Species, Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia</p>		<p>organisms.</p> <p>3.1.B.C1.b - NATURAL SELECTION - Analyze the role that geographic isolation can play in speciation.</p> <p>3.1.B.C1.c - NATURAL SELECTION - Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population.</p> <p>3.1.B.C2.a - ADAPTATION - Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of singlecelled organisms evolved.</p> <p>3.1.B.C2.b - ADAPTATION - Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed.</p> <p>3.1.B.C2.c - ADAPTATION - Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment.</p> <p>3.1.B.C2.d - ADAPTATION - Describe the relationship between environmental changes and changes in the gene pool of a population.</p> <p>3.1.B.C3.a - UNIFYING THEMES - CONSTANCY AND CHANGE Compare and contrast various theories of evolution.</p> <p>3.1.B.C3.b - UNIFYING THEMES - Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution.</p> <p>3.1.B.C3.c - UNIFYING THEMES - PATTERNS Discuss the implications of a universal genetic code for evolution.</p> <p>BIO.B.3.1.1 - Explain how natural selection can impact allele frequencies of a population.</p> <p>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).</p> <p>BIO.B.3.1.3 - Explain how genetic mutations may result in genotypic and phenotypic variations within a population.</p> <p>BIO.B.3.2.1 - Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical,</p>

Topic: 07-Evolution
Subject(s): Science

Days: 22
Grade(s): 9th

Know:	Understand:	Do:
		physiological, embryological, biochemical, and universal genetic code).

Topic: 08-Ecology
 Subject(s): Science

Days: 22
 Grade(s): 9th

Know:	Understand:	Do:
<p>BIO.B.4.1.1 – Important Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).</p> <p>BIO.B.4.2.4 – Important Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).</p> <p>BIO.B.4.2.5 – Important Describe the effects of limiting factors on population dynamics and potential species extinction.</p> <p>S11.B.3.1.1 – Essential Explain the significance of diversity in ecosystems.</p> <p>S11.B.3.1.2 – Essential Explain the biotic (i.e., plant, animal, and microbial communities) and abiotic (i.e., soil, air, temperature, and water) components of an ecosystem and their interaction.</p> <p>S11.B.3.1.3 – Essential Describe how living organisms affect the survival of one another.</p>	<p>Living and nonliving things interact with one another in the biosphere, and humans play a large role in hopefully sustaining the biosphere.</p>	<p>BIO.B.4.1.2 – Essential Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.</p> <p>BIO.B.4.2.1 – Essential Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).</p> <p>BIO.B.4.2.2 – Essential Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).</p> <p>BIO.B.4.2.3 – Essential Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).</p> <p>4.1.10.A.a – Essential Examine the effects of limiting factors on population dynamics.</p> <p>4.1.10.A.c – Important Explain the concept of carrying capacity in an ecosystem.</p> <p>4.1.10.B. – Essential Explain the consequences of interrupting natural cycles.</p> <p>4.1.10.C. – Essential Evaluate the efficiency of energy flow within a food web. Describe how energy is converted from one form to another as it moves through a food web (photosynthetic, geothermal).</p> <p>BIO.B.4.1.1 - Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere). BIO.B.4.1.2 - Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems. BIO.B.4.2.1 - Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy</p>

Topic: 08-Ecology

Days: 22

Subject(s): Science

Grade(s): 9th

Know:	Understand:	Do:
<p>S11.B.3.1.4 – Compact Explain the similarities and differences in the major biomes (e.g., desert, tropical rain forest, temperate forest, coniferous forest, tundra) and the communities that inhabit them.</p>		<p>pyramids). BIO.B.4.2.2 - Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis). BIO.B.4.2.3 - Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle). BIO.B.4.2.4 - Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires). BIO.B.4.2.5 - Describe the effects of limiting factors on population dynamics and potential species extinction.</p>
<p>S11.B.3.1.5 – Important Predict how limiting factors (e.g., physical, biological, chemical factors) can affect organisms.</p>		<p>S11.B.3.1.1 - Explain the significance of diversity in ecosystems. S11.B.3.1.2 - Explain the biotic (i.e., plant, animal, and microbial communities) and abiotic (i.e., soil, air, temperature, and water) components of an ecosystem and their interaction.</p>
<p>S11.B.3.2.1 – Compact Use evidence to explain how cyclical patterns in population dynamics affect natural systems.</p>		<p>S11.B.3.1.3 - Describe how living organisms affect the survival of one another. S11.B.3.1.4 - Explain the similarities and differences in the major biomes (e.g., desert, tropical rain forest, temperate forest, coniferous forest, tundra) and the communities that inhabit them.</p>
<p>S11.B.3.2.2 – Important Explain biological diversity as an indicator of a healthy environment.</p>		<p>S11.B.3.1.5 - Predict how limiting factors (e.g., physical, biological, chemical factors) can affect organisms. S11.B.3.2.1 - Use evidence to explain how cyclical patterns in population dynamics affect natural systems.</p>
<p>S11.B.3.2.3 – Compact Explain how natural processes (e.g., seasonal change, catastrophic events, habitat alterations) impact the environment over time.</p>		<p>S11.B.3.2.2 - Explain biological diversity as an indicator of a healthy environment. S11.B.3.2.3 - Explain how natural processes (e.g., seasonal change, catastrophic events, habitat alterations) impact the environment over time.</p>
<p>4.1.10.A.b – Important Analyze possible causes of population fluctuations.</p>		<p>4.1.10.A.a - Examine the effects of limiting factors on population dynamics. 4.1.10.A.b - Analyze possible causes of population fluctuations.</p>
<p>4.1.10.A.d – Important Describe how organisms become classified as threatened or endangered.</p>		<p>4.1.10.A.c - Explain the concept of carrying capacity in an ecosystem. 4.1.10.A.d - Describe how organisms become classified as threatened or endangered. 4.1.10.A.e - Describe how limiting factors cause</p>

Topic: 08-Ecology

Subject(s): Science

Days: 22

Grade(s): 9th

Know:	Understand:	Do:
<p>4.1.10.A.e – Important Describe how limiting factors cause organisms to become extinct.</p> <p>4.1.10.E. – Important Analyze how humans influence the pattern of natural changes (e.g. primary / secondary succession and desertification) in ecosystems over time.</p> <p>4.5.10.A.a – Compact Explain how public policy encourages or discourages the sustainable use of natural resources.</p> <p>4.5.10.D.a – Compact Research practices that impact biodiversity in specific ecosystems.</p> <p>4.5.10.D.b – Compact Analyze the relationship between habitat changes to plant and animal population fluctuations.</p> <p>Levels of Study in the Field of Ecology: Biosphere, Biome, Ecosystem, Community, Population, Species</p> <p>Energy Transfer in Ecosystems: Food Web, Food Chain, Energy Pyramids, Biomass, Autotroph, Heterotroph, Decomposer, Trophic Level</p> <p>Ecosystems of the World: Biotic, Abiotic, Terrestrial and Aquatic Ecosystems, Succession</p> <p>Organism Interactions: Symbiotic Interactions, Mutualism, Commensalism, Parasitism, Predator/Prey, Competition</p> <p>Population Dynamics: Limiting Factors, Population Density,</p>		<p>organisms to become extinct.</p> <p>4.1.10.B. - Explain the consequences of interrupting natural cycles.</p> <p>4.1.10.C. - Evaluate the efficiency of energy flow within a food web. Describe how energy is converted from one form to another as it moves through a food web (photosynthetic, geothermal).</p> <p>4.1.10.E. - Analyze how humans influence the pattern of natural changes (e.g. primary / secondary succession and desertification) in ecosystems over time.</p> <p>4.5.10.A.a - Explain how public policy encourages or discourages the sustainable use of natural resources.</p> <p>4.5.10.D.a - Research practices that impact biodiversity in specific ecosystems.</p> <p>4.5.10.D.b - Analyze the relationship between habitat changes to plant and animal population fluctuations.</p>

Topic: 08-Ecology
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Know:	Understand:	Do:
Growth Curves, Carrying Capacity, Endangered Species, Threatened Species, Extinction Environmental Issues:Acid Rain,Global Warming, Ozone Depletion, Habitat Fragmentation, Resource Conservation, Nonnative Species, Agriculture, Sustainable Use		