

Lake Mills School District

Year at a Glance Scope and Sequence for Science

“By the end of 12th grade, *all* students have some appreciation of the beauty and wonder of science; possess sufficient knowledge of science and engineering to engage in public discussions on related issues; are careful consumers of scientific and technological information related to their everyday lives; are able to continue to learn about science outside school; and have the skills to enter careers of their choice, including (but not limited to) careers in science, engineering, and technology.”

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Biology	Global Science	Chemistry	Adv Chem	Physics	Anatomy	Biotechnology & Forensics Science	AP Biology

Kindergarten

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Pushes and Pulls (Physical Science)	How can we create a pinball machine for our class?	<p>Pinball machines allow people to control the direction and strength of forces on a ball.</p> <p>Students take on the role of pinball machine engineers as they investigate the effects of forces on the motion of an object. They conduct tests in their own prototypes (models) of a pinball machine and use what they learn to contribute to the design of a class pinball machine. Over the course of the unit, students construct a foundational understanding of why things move in different ways.</p>	Kindergarten Standards

<p>Animal and Plant Defenses (Life Science)</p>	<p>How can a sea turtle survive in the ocean after an aquarium releases it?</p>	<p>Anchor phenomenon: Spruce the Sea Turtle lives in an aquarium and will soon be released back into the ocean, where she will survive despite ocean predators. Students play the role of marine scientists. In their role, students apply their understanding of plant and animal defense structures to explain to aquarium visitors how a sea turtle and her offspring can defend themselves from ocean predators when they are released into the wild.</p>	
<p>School Garden and Flower Beds</p>	<p>How can we prevent weeds from growing in our school flower beds?</p>	<p>Students take on the role of landscapers and explore if landscaping fabric and specific kinds of mulches are more impactful in preventing weed growth.</p>	
<p>Field Trips</p>		<p>Farm Madison Children's Museum Milwaukee Zoo</p>	

First Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
<p>Needs of Plants and Animals</p> <p>School Garden</p> <p>(Life Science)</p>	<p>How can the kids in Lake Mills attract monarch caterpillars to their neighborhood?</p>	<p>When vegetables were planted in the Lake Mills school garden, the monarch caterpillars disappeared.</p> <p>Students take on the role of scientists in order to figure out why there have been no monarch caterpillars in the school garden since vegetables were planted. They investigate how plants and animals get what they need to live and grow, and make a new plan for the school garden that provides for the needs of the monarch caterpillars in addition to producing vegetables for humans.</p> <p>Students will grow seedlings, plant seeds directly into the soil, and plant the seedlings in the garden.</p>	<p>First Grade Standards</p>
<p>Spinning Earth</p> <p>(Earth Science)</p>	<p>Why doesn't the sky always look the same?</p>	<p>The sky looks different to Sai and his grandma when they talk on the phone.</p> <p>As sky scientists, students explain why a boy living in a place near them sees different things in the sky than his grandma when he talks to her on the phone. Students record, organize, and analyze observations of the sun and other sky objects as they look for patterns and make sense of the cycle of daytime and nighttime.</p>	
<p>Field Trips</p>		<p>Community Walking Field Trip</p> <p>Aldo Leopold</p>	

Second Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Plant and Animal Relationships (Life Science)	What is happening to the chalta trees in the Bengal Tiger Reserve?	<p>No new chalta trees are growing in the fictional Bengal Tiger Reserve in India.</p> <p>In their role as plant scientists, students work to figure out why there are no new chalta trees growing in the Bengal Tiger Reserve, which is part of a broadleaf forest. Students investigate what the chalta tree needs to survive, then collect and analyze qualitative and quantitative data to solve the mystery.</p>	Second Grade Standards
Changing Landforms (Earth Science)	Why is the edge of the ocean cliff closer to the flagpole than it used to be?	<p>The cliff that Oceanside Recreation Center is situated on appears to be receding over time.</p> <p>The director of the Oceanside Recreation Center gets a scare when a nearby cliff collapses overnight. Research reveals that the distance between the Recreation Center's flagpole and the edge of the cliff have changed over time. Students play the role of geologists and work to figure out why the cliff has changed over time. Based on what they learn about erosion, they advise on whether it is safe to keep the center open even though the cliff is changing.</p>	
School Garden	How does erosion impact plant growth?	Students will take on the role of gardener and research erosion, water collection, and gather the fall harvest to reap the rewards of their first grade planting.	

Field Trips		Rockford Children's Museum Play/Performance	
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Third Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Earth's Features (Earth Science)	What was the environment of this place like in the past?	<p>A mysterious fossil is discovered in a canyon within the fictional Desert Rocks National Park.</p> <p>Playing the role of geologists, students help the director of Desert Rocks National Park explain how and when a particular fossil formed and how it came to be in its current location. Students figure out what the environment of the park was like in the past and why it has so many visible rock layers.</p>	Third Grade Standards
Environments and Survival (Life Science)	How can learning about how grove snails survive help engineers design effective solutions to problems?	<p>Over the last 10 years, a population of grove snails has changed: The number of grove snails with yellow shells has decreased, while the number of snails with banded shells has increased.</p> <p>In their role as biomimicry engineers, students work to figure out how the traits of grove snails affect their survival in different environments, then apply what they learn to designing solutions to problems. They explore how the traits of different organisms make them more likely or less likely to survive, collecting and interpreting data to understand how organisms' traits affect their survival in different environments. Students then apply their understanding to a new challenge: Using the structural traits of giraffes as inspiration, they design effective solutions for the removal of invasive plants.</p>	

School Garden	How can LMES repurpose our lunch waste into rich compost for our school garden?	In their role as compost engineers, students will develop a plan for cafeteria composting and a process to turn food waste into compost for our school garden. Additionally students will “put the garden to bed” each fall and use the garden waste for compost.	
Field Trips	Utilizing their skills learned as geologists, students will experience hands-on activities and experiences to give additional context to their earth science study.	Cave of the Mounds	

Fourth Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Balancing Forces	What can make an object move or not move?	People in Faraday are excited to hear that a new train service will be built for their city, but concerned when they hear that it will be a floating train. Students are challenged to figure out how a floating train works in order to explain it to the citizens of Faraday. They develop models of how the train rises, floats, and then falls back to the track, and then write an explanation of how the train works.	Fourth Grade Standards
Waves, Energy, and Information (Physical Science)	How can a mother dolphin and her calf communicate underwater when they cannot see each other? How can humans use patterns to communicate?	Mother dolphins in the fictional Blue Bay National Park seem to be communicating with their calves when they are separated at a distance underwater. In their role as marine scientists, students work to figure out how mother dolphins communicate with their calves. They write a series of scientific explanations with diagrams to demonstrate their growing understanding of how sound waves travel. Then they apply what they've	

		learned about waves, energy, and patterns in communication to figure out how to create patterns that can communicate information over distances. As they solve these problems, students construct a foundational understanding of how waves transfer information from one place to another.	
School Garden	How is a greenhouse beneficial to growing plants in WI?	In their role as greenhouse managers, students will plant seeds and nurture their growth to seedlings.	

Fifth Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Investigate Matter (Physical Science)	<ul style="list-style-type: none"> -What are the properties of -matter? What happens when different materials are mixed together? -How does matter change when it interacts with other matter? -What are the differences between solids, liquids, and gasses? 	What do we need to know about matter to use it to solve problems?	Fifth Grade Standards
Matter in Ecosystems (Life Science)	<ul style="list-style-type: none"> -What do plants need to survive? -What happens when different materials are mixed together? -What is the role of decomposers in an ecosystem? 	How does matter cycle between the living and nonliving parts of an ecosystem?	
Energy in Ecosystems (Earth, Life, and Physical Science)	<ul style="list-style-type: none"> -What are Earth's major systems? -How does matter cycle in ecosystems? -How is energy transferred in ecosystems? 	How is energy from the Sun essential for life on Earth?	
Earth's Water System (Earth Science)	<ul style="list-style-type: none"> -What types of water features are on Earth's surface? -How do humans impact Earth's water? 	How can we collect water to conserve water resources?	

	-How does the hydrosphere interact with Earth's other systems?		
Earth's Other Systems (Earth Science)	-How does the geosphere interact with other systems? -How does the atmosphere interact with other systems? -How does the biosphere interact with other systems?	How do Earth's systems interact with one another?	
Earth's Patterns and Movement (Earth Science)	-What pulls objects down? -How does Earth move through space?	What patterns are caused by Earth's movement?	
Earth and Space (Earth Science)	-Where is Earth located in space? -What causes some stars to be brighter than others?	What causes different stars to appear during different seasons throughout the year?	

Sixth Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Exploring Space Sun-Earth-Moon System	-What causes the cyclic pattern of the seasons? -What causes the cyclic pattern of the lunar phases? -What causes the cyclic pattern of eclipses?	How can a model of the Sun-Earth-Moon system be used to explain cyclic patterns of the seasons, lunar phases, and eclipses of the Sun and Moon?	Sixth Grade Standards
Exploring Space Exploring the Universe	-What role does gravity play in the formation in motion of components within galaxies and our solar system? -What are the distinguishing properties of objects in our solar system ?	What is the role of play in the Milky Way galaxy and solar system, and how do objects within the solar system compare and contrast?	
Water and Climate The Water Cycle	-How does water cycle into and through the atmosphere? -How does water cycle on earth's surface?	What drives the cycling of water among the oceans, atmosphere, land, and organisms?	

<p>Water and Climate Weather and Climate</p>	<p>How does energy transfer from the Sun to the Earth and the atmosphere? -What causes air and water to flow? -How do the interactions of air masses cause changes in weather conditions? -What factors determine different regional climates?</p>	<p>How do patterns of atmospheric and oceanic circulation impact weather and climate?</p>	
<p>Impacts on the Environment Human Impact on the Environment</p>	<p>-How can humans minimize their impact on land? -How can humans monitor and minimize their impact on water -Why must humans minimize their impact on the atmosphere? -How have human activities caused the rise in global temperatures and what is the environmental impact of global warming?</p>	<p>How do human activities impact Earth's land, water, atmosphere, and climate?</p>	
<p>Impacts on the environment Earth and Human Activity</p>	<p>-What does a growing human population affect consumption of resources? -How does resource consumption affect the environment?</p>	<p>How does human population growth and increases in per capita consumption of Natural Resources affect earth's systems?</p>	
<p>The Changing Earth Geologic Time</p>	<p>-How is the analysis of the rock and fossil records used to determine relative ages? -How do geologists correlate rock strata across regions to develop the geologic time scale and organize Earth's history?</p>	<p>How can the analysis of rock strata and fossil records be used to establish the relative ages of major events in Earth's history?</p>	
<p>The Changing Earth Dynamic Earth</p>	<p>-What evidence supports the continental drift hypothesis? -What evidence supports the theory of plate tectonics? -How does the movement of tectonic plates form mountains and volcanoes, and cause earthquakes? -What geoscience processes change Earth's surface? -How does the flow of energy and cycling of matter produce chemical and physical changes in Earth's materials?</p>	<p>How do geoscience process shape and change earth's surface over time?</p>	

The Changing Earth Distribution of Earth's Resources	-How do people use resources from Earth's land, ocean, atmosphere, and biosphere? -Why are resources distributed unevenly on Earth? -How do humans impact resource distribution and availability?	How do geoscience processes result in the uneven distribution of Earth's minerals, energy, and groundwater resources?	
The Changing Earth Natural Hazards	-Why are some areas more prone to earthquakes than others? -What geologic indicators signal the eruption of a volcano? -Why does the risk and type of severe weather vary from place to place?	How can analyzing data on natural hazards forecast future events and develop ways lessen their effects?	

Seventh Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Matter and Energy in Ecosystems	-How do plants and animals obtain and process energy? -How does energy move in an environment? -How does matter cycle through the environment?	How do matter and energy move through organisms and the environment?	Seventh Grade Standards
Dynamic Ecosystems	-How do limited resources affect populations and communities? -How do organisms interact in symbiotic and nonsymbiotic relationships? -How do natural and human disruptions to physical and biological components of ecosystems result in shifts in populations?	How are interacting populations of organisms affected by changes to ecosystems?	
Biodiversity in Ecosystems	-Why is biodiversity important? -What can be done to protect biodiversity?	Why is biodiversity important, and how can it be protected?	
Cells and Life	-What are the characteristics of living things? -What are the parts of cells and their functions, and how do the parts contribute to the function of the cell as a whole?	What are the characteristics of living things, and how do the parts of a cell work together in order to function?	

Body Systems	<ul style="list-style-type: none"> -How does the organization of cells support life functions in multicellular organisms? -How structure and support provided in multicellular organisms? -How do organisms obtain energy and remove waste? -How are materials transported in multicellular organisms? -How do multicellular organisms control life functions and process information? 	How are body systems in organisms organized, and how do they interact, in order to perform life functions?	
Reproduction of Organisms	<p>How are traits passed from one generation to the next?</p> <p>How do multicellular organisms reproduce?</p> <p>How do genetic and environmental factors affect reproduction and growth in animals?</p> <p>How do plants reproduce and grow?</p>	How do living things reproduce and which factors affect their growth?	
Natural Selection and Adaptations	<p>How do changes to genetic material alter proteins and, thereby, traits?</p> <p>How can a variation in a population result in an adaptation?</p> <p>How can humans selectively alter the traits of organisms?</p>	How do organisms adapt for survival?	
Evidence of Evolution	<p>What can fossils tell us about evolution?</p> <p>What evidence for evolution can living organisms provide?</p>	What evidence supports the theory that living things evolve over time?	

Eighth Grade

Unit Theme	Essential Questions for the Unit	Anchor Phenomenon	Standards
Energy and Motion Forces and Motion	<ul style="list-style-type: none"> -How do units and direction describe position and motion? -How does a push or pull affect motion? -How does Newton's 3rd Law relate to force pairs and collisions? -How do objects interact with non-contact forces? -What factors determine the kinetic energy of an object? -What factors determine the potential energy of an object? -How are different types of energy used? 	What determines an object's motion?	Eighth Grade Standards
Energy and Motion Mechanical Energy	<ul style="list-style-type: none"> -How do magnetic fields interact? -How do electric charges attract and repel objects? -How does a simple circuit function? 	How does mechanical energy determine the motion of an object?	
Energy and Motion Electromagnetic Forces	What is the relationship between electricity and magnetism?	How are electric and magnetic forces used to transfer energy?	
Understanding Waves Introduction to Waves	<ul style="list-style-type: none"> -How do the properties of mechanical waves correspond with the observation of waves? -How are mechanical waves reflected, absorbed, and transmitted through various materials? 	How do waves travel through matter?	
Understanding Waves Light	<ul style="list-style-type: none"> -How are light waves similar to and different from mechanical waves in how they travel and interact? -How does light reflect? -How does light refract through materials? 	Why can light be modeled as a wave?	

	-What are colors?		
Understanding Waves Information Technologies	-How do people communicate? -Why are digital signals more reliable than analog signals?	How does technology allow people to share information?	
Understanding Matter Classification and States of Matter	-What is temperature and how is it measured? -How does energy determine the state of matter of a substance? -In which direction does heat flow from one object to another? -What properties of materials affect the way energy is transferred? -How does the structure of a substance and the energy of its particles relate to its properties in different states of matter? -What effect does changing temperature have on substances? -What effect does changing pressure have on substances? -How do atomic structures determine the properties of a substance	What happens to matter when its energy level changes? How do atomic structure, pressure, and temperature determine the state of a substance?	
Interactions of Matter Properties and Changes	-How can you use properties to identify a substance? -How do atoms rearrange to form new substances in a chemical reaction? -Why do some reactions give off thermal energy and some absorb thermal energy?	How do properties and energy change during a chemical reaction?	
Interactions of Matter Material Science	-How does the structure and function of materials influence how synthetic materials are made? -How are the impacts on society and the environment of producing and using synthetic materials?	How are synthetic materials made and what are the effects on individuals, society, and the environment?	

Biology (9th and 10th)

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Science of Biology	To explore biology as one of the sciences.	Students will understand that the scientific method is the basis for advancement of science, and characteristics of life to show what specific traits determine an organism's status as "living". Students will also understand that measurements and graphing are essential for accurately documenting and reporting scientific data.	<ol style="list-style-type: none"> 1. How is science different from other forms of knowledge? 2. How has science changed and progressed over time?
Chemistry of Life	To understand the chemical basis for life.	Students will understand that a knowledge of atomic structure, bonding, carbon, the water molecule, and macromolecules are important for the concepts of the nature of all matter and the relationships of and between living organisms and how they maintain life.	<ol style="list-style-type: none"> 1. What about water makes it essential to life? 2. How does chemistry play a fundamental role in biology?
Cell Biology and Transport	To explore the structure and function of living organisms.	Students will understand that cell structure and organelles (plant and animal cells) are the basic unit of life. Also, cell transport, cell respiration and photosynthesis, mitosis and meiosis, and cell specialization are essential in making connections of how cells are able to maintain life processes and functions. Students will also understand that microscope techniques are important to be able to observe and comprehend the scale and functioning of cells and cell structure.	<ol style="list-style-type: none"> 1. Could mitosis be utilized in sexual reproduction? Why or why not? 2. Why is it necessary for cells to maintain a particular size?
Heredity and Genetics	To explore how genes and traits are passed from parent to offspring.	Students will understand that the structure of nucleic acids, relationships between DNA, RNA, and protein synthesis provide the blueprints of life. Additionally students will understand that the history of genetics, genetic crosses and Punnett squares, and pedigrees will provide essentials on the probabilities of genetic crosses and processes of evolution.	<ol style="list-style-type: none"> 1. Why do individuals of the same species vary in how they look, function, and behave? 2. What connections can be drawn between genetics and heredity? 3. Which adaptations are most vital for survival within a given ecosystem?

Evolution	To realize that evolution is the central organizing principle of biology.	Students will understand evolution as change through time, the principles of natural selection, and the many examples of the evidence for evolution, as the way species form and change. Students will also understand that classification and taxonomy; and how the use of dichotomous keys, allows scientists to group and organize all the species on the planet.	<ol style="list-style-type: none"> 1. How do scientists define and support evolution? 2. How do misconceptions about evolution and natural selection affect society's perception of life on earth? 3. Does life have to be carbon and water based?
Ecology and the Environment	To explore the relationships of organisms to their environments.	Students will understand that population dynamics, ecosystems, biomes, food chains/webs, succession influence and control the patterns and existence of life on earth.	<ol style="list-style-type: none"> 1. How do changes within the ecosystem affect other parts of the ecosystem? 2. How do humans impact the diversity and stability of an ecosystem?

Global Science (9th-12th Grade)

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Astronomy	Use concepts of system analysis to identify major topics in astronomy and discuss their relationship to other fields of Earth and space science.	Students will understand that patterns, cycles and movement govern the universe.	<p>What is the universe, and what is Earth's place in it?</p> <p>How can recognizing and understanding feedback and patterns help you figure out what's going on in the Earth System?</p>

<p>Earth, Sun and Moon</p>	<p>Use concepts to discover how the Earth, Sun and Moon need each other for survival.</p>	<p>Students will understand that the relationship between the Earth, Moon and Sun creates changes over time encompassing the water cycle, weather, and seasonal patterns.</p>	<p>In what ways has Earth changed throughout its history?</p> <p>What if one of these three (Sun, Earth Moon) disappeared?</p>
<p>Rocks and Minerals</p>	<p>To examine sedimentary rocks, igneous rocks and metamorphic rocks to find out what minerals are present in each rock.</p>	<p>Students will understand that all of the rocks are not the same and they develop in different ways that could affect their various qualities.</p>	<p>What are the similarities and differences between rocks and minerals?</p> <p>How are rocks used to tell our past?</p>
<p>Weather</p>	<p>To discover how climate and weather are different and how weather could change from day to day.</p>	<p>Students will understand that there is a tool to measure/calculate all aspects of weather and how to use those tools.</p>	<p>How do we know a weather forecast is accurate?</p> <p>Why is it important for a weather forecast to be accurate?</p> <p>What type of method could be developed to reduce severe weather where we live?</p>
<p>Global Warming</p>	<p>To examine greenhouse and carbon gasses, the ozone layer and how humans affect global warming (good and bad)</p>	<p>Students will understand that global warming is a threat to society and ways to reduce global warming.</p>	<p>How do human activities affect global warming?</p> <p>What efforts are underway to research and reduce climate change?</p>

Humans on our Earth (both beneficial and destructive)	To examine our day to day lives and how we affect our world in a positive or negative way.	Students will understand that humans, as a whole, are being destructive to Earth, but it is not too late to turn the corner and make it beneficial.	How could a force be destructive and constructive at the same time? How could something happening on the other side of the world affect me?
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Chemistry (Grade 10)

[Year at a Glance Link](#)

Unit Theme	Unit Goal	Enduring Understandings	Essential Questions
Introduction to Chemistry: Laboratory Principals	To prepare for solving chemistry problems throughout the course, students learn about the metric system, significant figures, lab safety techniques, and the scientific method as applied in chemistry research.	The metric system, significant figures, and safe laboratory procedures need to be used as parts of the scientific method.	Is the metric system superior to the English system? When and why are significant figures necessary for use in the real world?
Atomic Theory	To learn about the parts of the atom, its properties and theories of atomic structure.	Different representations of the specific atomic theories have been developed over decades through indirect observation.	Which atomic structure is best used to represent an atom? Will we ever be able to directly observe an atom?

The Electron	To understand the probable locations of all electrons within an individual atom and how energy when added to a system can relocate these electrons.	Use the periodic table to determine the number of valence electrons of an atom and potential charge of its respective ion.	<p>What principal energy level contains the valence electrons for a specific atom?</p> <p>How does the “flame test” help scientists determine which element(s) are present in an unknown sample?</p>
Periodic Trends & Bonding	To examine properties and trends that are brought out by the arrangement of the periodic table and different types of bonds.	<p>The properties of the periodic table influence where elements end up and what trends occur.</p> <p>Ionic and covalent bonds have key differences but also share many similarities.</p>	<p>How could the periodic table be reorganized into a better configuration?</p> <p>Are chemical bonds a necessary part of the world we live in?</p>
Chemical Nomenclature	To explore why and how bonds form as well as the naming and chemical groupings of the substances involved.	Bonds form molecules that belong to specific groups based on their names and properties.	<p>Why is alphabetically categorizing chemicals is not the best way to do it?</p> <p>What happens if everyone stops using the same chemical naming system?</p>
Moles & Reactions	To learn how bonds break and form in chemical reactions and balance equations to show that mass is conserved as change happens in these reactions using stoichiometry.	<p>Bonds make chemical reactions that all involve different products, reactants, and processes.</p> <p>All chemical reactions must be balanced.</p>	<p>Would it be possible to make a non-balanced reaction occur in nature?</p> <p>Why is it useful to know how much of each product you need for a reaction?</p>

Matter	To examine different types of matter and substances and explore relationship of matter and energy, including learning about classification of matter, accuracy and precision, and density.	Data can be accurate or precise, changes are physical or chemical, and density is an intensive property that can be changed.	As a scientist, is it more important to be accurate or precise? What is the best way to classify chemical substances?
Acids and Bases	To examine the properties of acids and bases, analyze different definitions of acids and bases that have been developed.	Titration can be used to observe common properties of acids and bases to determine properties of other unknown substances.	How could acid-base reactions be useful in the world around us? When is it possible for a weak base to fully neutralize strong acid?

Advanced Chemistry (Grades 11-12)

Unit Theme	Unit Goal	Enduring Understandings	Essential Questions
Molecular Geometry	To discover why different substances such as ice, liquid water, and even water vapor behaves differently.	Molecular interactions depend upon the shape and arrangement of atoms. Different types of molecular shapes can be drawn and represented in different ways.	Could the world exist without polar molecules? How could flipping one polar molecule affect the entire world?

<p>Stoichiometry and Energy</p>	<p>To determine how energy is conserved during chemical reactions and when substances change from gas to liquids to solids—and back again.</p>	<p>The finite amount of energy in the universe can be traced and calculated.</p> <p>Matter experiences chemical and physical changes.</p> <p>Stoichiometry and the law of conservation of energy will be applied when using calculations to solve problems.</p>	<p>Are humans going to run out of usable energy eventually?</p> <p>Why are some sources of energy considered more efficient than others if energy cannot be lost?</p>
<p>Solutions</p>	<p>To explore how the properties of solutions can be understood by examining the interactions between the parts of a solution.</p>	<p>The different measures of concentration and be able to convert between them.</p> <p>Solubility controls concentrations and saturation.</p> <p>Various units are used to describe the concentration of solutions and separate the component substances.</p>	<p>Is there such a thing as something that is completely soluble?</p> <p>How do you know which part of an aqueous mixture is doing the dissolving if both are soluble in water?</p>
<p>Acids and Bases</p>	<p>To compare and contrast complex properties of acids and bases and different definitions of acids and bases to be used in designing titration experiments.</p>	<p>Acids and bases are only acids and bases when there is a change in hydronium concentration and hydronium concentrations can be used to manipulate acid, bases, and buffers.</p>	<p>How can human activity affect the balance of acids and bases?</p> <p>Is it essential to have a balance of acids and bases on earth?</p>

<p>Electrochemistry</p>	<p>To experiment with the basics of the conversion of electrical energy to chemical energy and vice versa. Students examine voltaic cells, batteries and electrolytic cells.</p>	<p>Energy depends upon the movement of subatomic particles and that chemical reactions can be used to produce and predict energy flow.</p>	<p>How is it possible to make a battery that constantly produces power without having to charge?</p> <p>Why will every battery eventually die?</p>
<p>Entropy and Gibbs Free Energy</p>	<p>To examine the role of energy in two important chemical phenomena: reaction rates and system equilibria. Students develop an understanding of why chemical reactions do and do not occur.</p>	<p>Enthalpy and entropy determine whether or not a reaction will occur and what effects they will have on free energy and rates of reaction.</p>	<p>Can an unfavorable chemical reaction be forced to happen?</p> <p>Why does the world still have order even though the universe favors disorder?</p>

Physics (11th and 12th Grade)

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
Introduction to Physics	Explore physics and its place among science	Students will understand that everything that they accomplish is related to physics, because motion, sound, waves, etc. are all based on physics.	<ol style="list-style-type: none">1. How do the principles of physics affect your daily life?2. How has something in nature become more compelling because of an understanding of physics principles.
Physical Units and Measurement	To prepare for solving problems using the correct data and method.	Students will understand that the SI units and significant figures are important in finding out the final answer because it increases the certainty of your final answer.	<ol style="list-style-type: none">1. Can you ever be sure about your precision and accuracy?2. Is the degree of precision relevant to our lives?
Kinematics	Explore direct study of physics using kinematics motion.	Students will understand that velocity (initial and final), acceleration, displacement (initial and final) and time, are directly related in a given formula.	<ol style="list-style-type: none">1. Why is it important for understanding various physical properties about motion to be useful in understanding everyday occurrences?2. How can kinematics be applied to real-world motion problems?

Forces	Explore how forces affect the motion of a body.	Students will understand that all forces are acting upon a body and could draw them out in a free body diagram.	<ol style="list-style-type: none"> 1. How can an athlete in a given sport improve their performance using one of Newton's three laws of motion? 2. Is it important to understand that variables can be manipulated to affect the movement of objects?
Motion in Two Dimensions	Explore the kinematics and forces in two directions of motion on a physical body.	Students will understand that projectile motion and circular motion are in two dimensions and could calculate it out by going in the horizontal and vertical direction.	<ol style="list-style-type: none"> 1. Where do you observe that vertical and horizontal motions of a projectile are related? 2. What are the relationships between a projectile's height, time in the air, initial velocity, and horizontal distance traveled?
Momentum, Work and Energy	Explore the quality of motion and forms of energy	Students will understand that conservation of momentum and conservation of energy are important in everyday life because we need energy and movement to survive.	<ol style="list-style-type: none"> 1. How do you know something has energy? In what ways do we witness the effects of something having energy? 2. What limits the efficiency of a car engine?
Waves and Light	Explore how energy moves from one place to another through waves.	Students will understand that the characteristics of waves are important to hear and see because that brings our senses into a physics topic.	<ol style="list-style-type: none"> 1. How do you know that waves carry energy? 2. How does the knowledge of waves help us understand our world better and improve the quality of our lives?

Anatomy and Physiology (11-12)

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
<p>Introduction to Anatomy & Physiology, and Homeostasis</p>	<p>To explore anatomical terms, and homeostatic mechanisms.</p>	<p>Students will understand that anatomical terms and directions as the basis of scientific language, and that homeostasis utilizes both negative and positive feedback mechanisms to regulate body functions.</p>	<ol style="list-style-type: none"> 1. Do the various homeostatic mechanisms always provide balance in the body? 2. What ways and why does the body cause potential harm in order to maintain homeostasis?
<p>Histology</p>	<p>To discover the functions and connections of the tissue types.</p>	<p>Students will understand that the functions and connections of the 4 primary tissue types: epithelial, connective, muscle, and nervous, are essential in the composition of organs and the functioning of the body.</p>	<ol style="list-style-type: none"> 1. How does tissue type correlate to the function of the organs in which they are found? 2. What does the composition of a primary tissue type have to do with its main function?
<p>Integumentary System</p>	<p>To examine the functions and the structure of the skin and associated appendages</p>	<p>Students will understand that the functions and the structure of the skin and associated appendages are essential in protecting our internal structures and to maintain homeostasis.</p>	<ol style="list-style-type: none"> 1. What is the purpose of the integumentary system? 2. What are various diseases associated with the integumentary system? 3. How does the skin help regulate the body?

<p>Skeletal System</p>	<p>To explore the functions and the structure of bones, cartilage, and bone and bone marking identification.</p>	<p>Students will understand that the functions and the structure of bones and cartilage, are needed for support and metabolism and essential to the maintenance of homeostasis. Students will also understand bone and bone marking identification in order to make connections to support and movement of the skeleton.</p>	<ol style="list-style-type: none"> 1. What motions are possible at each type of joint? 2. How is the skeleton involved in support and movement of the body?
<p>Muscular System</p>	<p>To examine the functions and the structure of muscles, mechanisms of the muscle contraction, and muscle identification.</p>	<p>Students will understand that functions and the structure of muscles, and the mechanism of the muscle contraction are directly related to movement of and within the body, and maintenance of homeostasis. Students will also understand that muscle identification is important in making connections to skeletal and muscular interactions in regard to movement.</p>	<ol style="list-style-type: none"> 1. How are muscles responsible for motion? 2. What are the distinguishing functional characteristics of muscles and how does the muscle permit movement?

<p>Nervous System</p>	<p>To discover the functions and the structure of the nervous system including the neurons, glial cells, nervous pathways, the reflex arc, impulse transmission, and the synapse.</p>	<p>Students will understand that functions and the structure of the nervous system (including the neurons, and glial cells) allow for the control and communication in the body as well as nervous pathways, the reflex arc, impulse transmission, and the synapse to provide a means for the maintenance of homeostatic mechanisms in the body.</p>	<ol style="list-style-type: none"> 1. How does the body receive information from the environment? 2. How is sensory information sent and received within the body?
<p>Special Senses</p>	<p>To explore the functions and structure of the special senses.</p>	<p>Students will understand that functions and structure of our sense of vision, hearing, taste, and smell are essential to being able to respond to various stimuli in our environment, and to understand the homeostatic connection of the senses.</p>	<ol style="list-style-type: none"> 1. How is sensory information collected and used by the body? 2. What is the most important human special sense and why?

<p>Blood, Immunity, and Cardiovascular System</p>	<p>To explore the functions and components of blood, blood types, and the immune response, as well as to the structure and functions of the heart, vessels, and circulatory pathways.</p>	<p>Students will understand that the functions and components of blood are important in transportation throughout the body, and to understand that the different blood types, and antigen/antibody complexes are essential to the immune response. Students will also understand that the structure and functions of the heart, associated vessels, and major circulatory pathways are important in transport of blood and the maintenance of homeostasis.</p>	<ol style="list-style-type: none"> 1. Why is blood essential for the maintenance of the body? 2. How do nonspecific and specific body defenses keep the human body healthy? 3. How does the cardiovascular system maintain health?
<p>Digestive, and Urinary System</p>	<p>To discover the structure and functions of the digestive and urinary systems.</p>	<p>Students will understand that the structure and functions of the digestive system, nutrition, enzymes, and the structure and functions of filtration and urine formation are essential in delivering needed nutrients and excreting wastes as well as the maintenance of homeostasis.</p>	<ol style="list-style-type: none"> 1. What is the role of the urinary system in maintaining the body's chemical balance? 2. What happens to the foods once they enter the blood?

Biotechnology and Forensic Science (11-12)

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
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<p>Introduction/history of biotechnology</p>	<p>To explore the history and importance of biotechnology's impact.</p>	<p>Students will understand the technological advances seen in the field of biotechnology has had a tremendous impact and influence on scientific knowledge and progress.</p>	<ol style="list-style-type: none"> 1. How has biotechnology impacted human society today? 2. Does biotechnology interfere with the natural progression of evolution?
<p>DNA/Genetics</p>	<p>To discover the structure of DNA and how it is involved in life functions and heredity.</p>	<p>Students will understand an in depth knowledge of the structure and nature of DNA is essential to understanding how genetic information is stored and inherited from one generation to the next.</p>	<ol style="list-style-type: none"> 1. Why do we care about the structure of DNA? 2. Is one's persona a product of genetics alone?
<p>Restriction enzymes and electro-phoresis</p>	<p>To examine and utilize specific tools that scientists use to manipulate and use DNA in scientific discovery.</p>	<p>Students will understand specific techniques and tools have been discovered and developed to manipulate and alter DNA in species.</p>	<ol style="list-style-type: none"> 1. How can restriction enzymes be used to develop new techniques to manipulate DNA? 2. Is electrophoresis data completely discriminatory?
<p>Genetic Modification and Recombinant DNA Technology</p>	<p>To explore genetic modification and genetic engineering through DNA manipulation.</p>	<p>Students will understand that genetic modification and engineering allow for scientists to alter genomes of species to produce commercial products and improve quality of life.</p>	<ol style="list-style-type: none"> 1. How does recombinant DNA technology aid/harm human society? 2. Is it morally acceptable to insert foreign DNA into different species?

Bioethics	To evaluate ethical questions surrounding various aspects of biotechnology.	Students will understand that ethical dilemmas inherent in biotechnology must be considered and analyzed to make education decisions about the direction and ethical use of the technology.	<ol style="list-style-type: none"> 1. Should we consider pursuing the development of “designer” human babies? 2. Are GMOs good or bad for human society?
Forensic Science	To integrate biotechnology concepts and techniques in the field of forensic science.	Students will understand that biotechnology techniques and tools are utilized by forensic scientists to provide evidence to help convict/exonerate suspects and help to solve crimes.	<ol style="list-style-type: none"> 1. Does DNA evidence alone prove guilt or innocence? 2. What impact does biotechnology have on forensic science?

AP Biology (11-12)

Unit Theme	Unit Goal	Enduring Understandings for the Unit	Essential Questions for the Unit
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<p>Chemistry of Life</p>	<p>To explore the chemical basis of life, and the elements and molecules necessary for carbon-based systems to function.</p>	<p>Students will understand that living systems exist in a highly complex organization that requires input of energy and the exchange of macromolecules. and are organized in a hierarchy of structural levels that interact with each other.</p>	<ol style="list-style-type: none"> 1. What is the role of energy in the making and breaking of polymers? 2. How do living systems transmit information in order to ensure their survival? 3. How would living systems function without the polarity of the water molecule?
<p>Cell Structure and Function</p>	<p>To discover that the cell is the basic unit of life. Cells contribute to the organization of life and provide the environment in which organelles function.</p>	<p>Students will understand that cells have membranes that allow them to establish and maintain internal environments that are different from their external environments. Living systems are organized in a hierarchy of structural levels that interact.</p>	<ol style="list-style-type: none"> 1. How do the mechanisms for transport across membranes support energy conservation? 2. What are the advantages and disadvantages of cellular compartmentalization? 3. How are living systems affected by the presence or absence of subc

<p>Cellular Energetics</p>	<p>To explore enzyme structure and function, learning the ways in which the environment plays a role in how enzymes perform their function(s). To understanding the processes of photosynthesis and cellular respiration, while studying how cells use energy to fuel life processes</p>	<p>Students will understand that the highly complex organization of living systems requires constant input of energy and the exchange of macromolecules. Naturally occurring diversity among and between components within biological systems affects interactions with the environment.</p>	<ol style="list-style-type: none"> 1. How is energy captured and then used by a living system? 2. How do organisms use energy or conserve energy to respond to environmental stimuli?
<p>Cell Communication and Cell Cycle</p>	<p>To determine how cells use energy and information transmission to communicate and replicate.</p>	<p>Students will understand that cells communicate by generating, transmitting, receiving, and responding to chemical signals. Timing and coordination of biological mechanisms involved in growth, reproduction, and homeostasis depend on organisms responding to environmental cues. Heritable information provides for continuity of life.</p>	<ol style="list-style-type: none"> 1. In what ways do cells use energy to communicate with one another? 2. How does the cell cycle aid in the conservation of genetic information? 3. Why and in what ways do cells communicate with one another?

<p>Heredity</p>	<p>To find that the storage and transmission of genetic information via chromosomes from one generation to the next occurs through meiosis. To understand how genetics describes patterns of inheritance.</p>	<p>Students will understand that organisms are linked by lines of descent from common ancestry. Heritable information provides for continuity of life. Naturally occurring diversity among and between components within biological systems affects interactions with the environment.</p>	<ol style="list-style-type: none"> 1. How is our understanding of evolution influenced by our knowledge of genetics? 2. Why is it important that not all inherited characteristics get expressed in the next generation? 3. How does the diversity of a species affect inheritance?
<p>Gene Expression and Regulation</p>	<p>To learn that nucleic acids and their role in gene expression, comparison between the structures of DNA and RNA.</p>	<p>Students will understand that heritable information provides for continuity of life. Differences in the expression of genes account for some of the phenotypic differences between organisms, and an understanding how protein synthesis is vital to answering essential questions about gene expression and regulation.</p>	<ol style="list-style-type: none"> 1. How does gene regulation relate to the continuity of life? 2. How is a species' genetic information diversified from generation to generation?

<p>Natural Selection</p>	<p>To explain how natural selection allows populations that are better adapted to their environment will survive and reproduce. That evolution of a species involves a change in its genetic makeup over time, and study the evidence for and mechanisms of evolutionary change.</p>	<p>Students will understand that evolution is characterized by a change in the genetic makeup of a population over time and is supported by multiple lines of evidence.</p> <p>Organisms are linked by lines of descent from common ancestry, and life continues to evolve within a changing environment.</p> <p>Naturally occurring diversity among and between components within biological systems affects interactions with the environment.</p>	<ol style="list-style-type: none"> 1. What conditions in a population make it more or less likely to evolve? 2. How does species interaction encourage or slow changes in species?
<p>Ecology</p>	<p>To discover how a system's interactions are directly related to the system's available energy and its ability to evolve and respond to changes in its environment. High biodiversity allows a system to maintain its health and success in the face of disruption.</p>	<p>Students will understand that the timing and coordination of biological mechanisms involved in growth, reproduction, and homeostasis depend on organisms responding to environmental cues.</p> <p>Communities and ecosystems change on the basis of interactions among populations and disruptions to the environment.</p>	<ol style="list-style-type: none"> 1. How do communities and ecosystems change, for better or worse, due to biological disruption? 2. How does a disruption of a biological system affect genetic information storage and transmission? 3. How do species interactions affect the survival of an ecosystem?