Diocese of Toledo
IN AMERICA

Science
Course Of Study

Catholic Schools Different bydesign

Adopted August 2019
(Reviewed August 2024)

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Introduction

The Science Course of Study is based on Ohio's New Learning Standards, Mathematics, which are to be implemented in 2014-2015. It contains the diocesan philosophy of education, a "Science Program Philosophy" and a listing of grade level standards for Science. These Science standards are to be infused with the Diocesan Catholic Identity standards whenever possible.

Course Of Study Revision Process

Under the direction of the superintendent, one central staff member conducted the revision process. The review began in August 2013 with nine regional meetings throughout the diocese. All elementary administrators and teachers, as well as High School Science Department Chairpersons attended these meeting. These meetings provided instruction on how to read the new standards, along with a discussion of the major instructional shifts that would be required to properly implement the standards. Participants also received training on how to "unpack" the standards into specific student learning objectives at the local level. Teachers were asked to pilot the new standards during the 2013-14 school year and provide feedback to the diocese. This feedback was used to amend the standards into this final document, which was published in June 2014.

Superintendent: Christopher Knight

Project Facilitator: Timothy Mahoney

Diocese Of Toledo Philosophy of Education

"The duty of human perfection, like the whole universe, has been renewed, recast, supernaturalized, in the Kingdom of God. It is a truly Christian duty to grow... and to make one's talents bear fruit...It is a part of the essentially Catholic vision to look upon the world as maturing--not only in each individual or in each nation, but in the whole human race."
(Teilhard de Chardin, The Divine Milieu)

The schools of the Catholic Diocese of Toledo assist parents in preparing their youngsters to assume their Christian vocation. The schools enable youngsters to perfect and grow in the knowledge, skills, values and attitudes to which they are called by Jesus Christ. This vocation begins and grows as each member hears the message of the Gospel, seeks to achieve a personal relationship with Jesus Christ and shares in a commitment of love and service of God and others in order to transform self and society.

Catholic education in the Toledo Diocesan schools is intended to make students become people of faith who can experience--inside and outside the school setting--learning and living in the light of this faith commitment. Students are instructed in human knowledge and skills in order to best relate human culture to God's plan for His evolving creation. Religious education, i.e., instruction in truths and development of values, is of primary concern. This religious education serves as the basis by which students can integrate their experiences of learning and living at each stage of their development.

This integration thrives in a thoroughly Christian atmosphere where faculties and staffs share and demonstrate in their professional and private lives this same commitment to personal perfection and growth in Jesus Christ.

Toledo Diocesan schools enable students to extend their personal faith commitment through prayer and by serving others. Together with faculty and staff, students participate in liturgical activities that foster community. Students explore ways to meet the challenges of tensions and conflicts that occur in community, especially in peacemaking and the achievement of justice. Gospel values impel students to a special concern for all who suffer any disadvantage. Students are enabled to commit themselves to the public interest by developing the skills and talents needed to contribute to the life of the nation.

This experience of integrating learning and living a commitment of faith is a reason for hope. It is the duty of the schools of the Diocese of Toledo to continually explore and rekindle hope for the future in the light of the present reality of the universe. Engaging our members—and the community-at-large--in a search for growth and perfection is our never-ending obligation. Our ultimate goal is union with Jesus Christ, "the way, the truth and the life.

Philosophy Of Science Program

As Catholic School Educators we believe that:
Science education provides, helps, and shares the understanding of God's creation through exploration and inquiry.

Earth and Space science is the understanding of the composition of the parts of the universe, their interactions and our responsibility as stewards of creation.

Life science is knowledge, understanding and exploration of all living systems, in their physical environment. It includes the creation process, respect for life, and the responsibility for human animal and plant life of our earth.

Physical science is the knowledge of the structures, the processes and the interactions that drive our natural world. It includes the stewardship of all creation.

Scientific Inquiry is the ability to ask valid questions; gather and analyze information; develop and understand a hypothesis; make projections; develop a plan of action; and evaluate a variety of conclusions. It should include the teaching that life has dignity and in the process of study there needs to be responsibility and respect.

Scientific Knowledge is the ability to understand the relationship and interaction between living and non-living systems. It is based on evidence, prediction and logic, and it is subject to modification. It includes the understanding that God is the author of all life and there will be growth and advances as new evidence is discovered.

Technology is the interdisciplinary connection of our understanding of science and how we make and use tools to progress scientific knowledge. All science coursework should include technological design in a problem or project- based way of applying creativity, science engineering and mathematics to meet a human need.

Catholic Identity

These seven standards represent particular qualities wanted in our Catholic school graduates. Teachers should infuse their instruction of Mathematics with activities that promote these desired outcomes whenever possible.

1. A devout **disciple** of Christ formed in the Catholic Faith community, who possesses a solid
   grasp of Catholic Faith and Morals; who lives a devout spiritual life; who gives witness to Christ by word and deed, and who strives to build up Catholic culture whenever possible.

2. A **critical thinker** who possesses a Catholic worldview and applies this to the study of any subject; who makes responsible decisions using an informed Catholic moral conscience for the common good; and who is capable of discerning and promoting that which is good in modern media and popular culture, while creatively countering that which is not.

3. An effective **communicator** who speaks and writes with clarity and listens with compassion, responding critically in light of Gospel values.

4. A self-directed, **lifelong learner** who possesses a love of learning and desire for truth; and who develops and utilizes one's God-given potential.

5. A collaborative **contributor** who finds meaning, dignity, and vocation in work; and who respects the human rights of all as defined by God's Commandments and Church teaching, while contributing to the common good.

6. A loving **family member** who attends to family, parish, school and the wider community.

An Informed, discerning and **engaged participant** in American civic life and culture; who possesses a basic familiarity with the foundational documents of our constitutional republic; as well as understands the importance of these texts to human rights; and who gives witness to Catholic Social Teachings by promoting human dignity whenever possible, both in America and around the world.

K-8 Standards

Kindergarten

GRADE BAND THEME: OBSERVATIONS OF THE ENVIRONMENT

This theme focuses on helping students develop the skills for systematic discovery to understand the science of the physical world around them in greater depth by using scientific inquiry.

SCIENCE INQUIRY AND APPLICATION

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment;
- Plan and conduct simple investigations;
- Employ simple equipment and tools to gather data and extend the senses;
- Use appropriate mathematics with data to construct reasonable explanations;
- Communicate about observations, investigations and explanations; and
- Review and ask questions about the observations and explanations of others.

STRANDS

Strand Connections: Living and nonliving things have specific physical properties that can be used to sort and classify. The physical properties of air and water are presented as they apply to weather.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Daily and Seasonal Changes This topic focuses on observing, exploring, describing and comparing weather changes, patterns in the sky and changing seasons.	**Topic: Properties of Everyday Objects and Materials** This topic focuses on the production of sound and on observing, exploring, describing and comparing the properties of objects and materials with which the student is familiar.	**Topic: Physical and Behavioral Traits of Living Things** This topic focuses on observing, exploring, describing and comparing living things in Ohio.
CONDENSED CONTENT STATEMENTS		
K.ES.1 Weather changes are long-term and short-term. **K.ES.2** The moon, sun and stars are visible at different times of the day or night	**K.PS.1** Objects and materials can be sorted and described by their properties. **K.PS.2** Some objects and materials can be made to vibrate to produce sound.	**K.LS.1** Living things are different from nonliving things. **K.LS.2** Living things have physical traits and behaviors, which influence their survival.

Grade 1

GRADE BAND THEME: OBSERVATIONS OF THE ENVIRONMENT
This theme focuses on helping students develop the skills for systematic discovery to understand the science of the physical world around them in greater depth by using scientific inquiry.

SCIENCE INQUIRY AND APPLICATION

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:
- Observe and ask questions about the natural environment;
- Plan and conduct simple investigations;
- Employ simple equipment and tools to gather data and extend the senses;
- Use appropriate mathematics with data to construct reasonable explanations;
- Communicate about observations, investigations and explanations; and
- Review and ask questions about the observations and explanations of others.

STRANDS

Strand Connections: Energy is observed through movement, heating, cooling and the needs of living organisms.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Sun, Energy and Weather This topic focuses on the sun as a source of energy and energy changes that occur to land, air and water.	**Topic: Motion and Materials** This topic focuses on the changes in properties that occur in objects and materials. Changes of position	**Topic: Basic Needs of Living Things** This topic focuses on the physical needs of living things in Ohio. Energy from the sun or food, nutrients, water, shelter and air are some of the physical needs of living things.
CONDENSED CONTENT STATEMENTS		
1.ES.1 The sun is the principal source of energy. **1.ES.2** The physical properties of water change.	**1.PS.1** Properties of objects and materials can change. **1.PS.2** Objects can be moved in a variety of ways, such as straight, zigzag, circular and back and forth.	**1.LS.1** Living things have basic needs, which are met by obtaining materials from the physical environment. **1.LS.2** Living things survive only in environments that meet their needs.

Grade 2

GRADE BAND THEME: OBSERVATIONS OF THE ENVIRONMENT
This theme focuses on helping students develop the skills for systematic discovery to understand the science of the physical world around them in greater depth by using scientific inquiry.

SCIENCE INQUIRY AND APPLICATION
During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:
• Observe and ask questions about the natural environment;
• Plan and conduct simple investigations;
• Employ simple equipment and tools to gather data and extend the senses;
• Use appropriate mathematics with data to construct reasonable explanations;
• Communicate about observations, investigations and explanations; and
• Review and ask questions about the observations and explanations of others.

STRANDS
Strand Connections: Living and nonliving things may move. A moving object has energy. Air moving is wind and wind can make a windmill turn. Changes in energy and movement can cause change to organisms and the environments in which they live.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: The Atmosphere This topic focuses on air and water as they relate to weather and weather changes that can be observed and measured.	**Topic: Changes in Motion** This topic focuses on observing the relationship between forces and motion.	**Topic: Interactions within Habitats** This topic focuses on how ecosystems work by observations of simple interactions between the biotic/living and abiotic/nonliving parts of an ecosystem. Just as living things impact the environment in which they live, the environment impacts living things.
CONDENSED CONTENT STATEMENTS		
2.ES.1 The atmosphere is made up of air. **2.ES.2** Water is present in the air **2.ES.3** Long- and short-term weather changes occur due to changes in energy.	**2.PS.1** Forces change the motion of an object.	**2.LS.1** Living things cause changes on Earth **2.LS.2** Some kinds of individuals that once lived on Earth have completely disappeared, although they were something like others that are alive today.

Grade 3

GRADE BAND THEME: INTERCONNECTIONS WITHIN SYSTEMS

This theme focuses on helping students develop the skills for systematic discovery to understand the science of the physical world around them in greater depth by using scientific inquiry.

SCIENCE INQUIRY AND APPLICATION

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment;
- Plan and conduct simple investigations;
- Employ simple equipment and tools to gather data and extend the senses;
- Use appropriate mathematics with data to construct reasonable explanations;
- Communicate about observations, investigations and explanations; and
- Review and ask questions about the observations and explanations of others.

Grade 3

STRANDS

Strand Connections: Matter is what makes up all substances on Earth. Matter has specific properties and exists in different states. Earth's resources are made of matter. Matter can be used by living things and can be used for the energy they contain. There are many different forms of energy. Each living component of an ecosystem is composed of matter and uses energy.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Earth's Resources This topic focuses on Earth's resources. While resources can be living and nonliving, within this strand, the emphasis is on Earth's nonliving resources, such as water, air, rock, soil and the energy resources they represent.	**Topic: Matter and Forms of Energy** This topic focuses on the relationship between matter and energy. Matter has specific properties and is found in all substances on Earth. Heat is a familiar form of energy that can change the states of matter.	**Topic: Behavior, Growth and Changes** This topic explores life cycles of organisms and the relationship between the natural environment and an organism's (physical and behavioral) traits, which affect its ability to survive and reproduce.

CONDENSED CONTENT STATEMENTS		
3.ES.1 Earth's nonliving resources have specific properties. **3.ES.2** Earth's resources can be used for energy. **3.ES.3** Some of Earth's resources are limited.	**3.PS.1** All objects and substances in the natural world are composed of matter. **3.PS.2** Matter exists in different states, each of which has different properties. **3.PS.3** Heat, electrical energy, light, sound and magnetic energy are forms of energy.	**3.LS.1** Offspring resemble their parents and each other. **3.LS.2** Individuals of the same kind differ in their traits and sometimes the differences give individuals an advantage in surviving and reproducing. **3.LS.3** Plants and animals have life cycles that are part of their adaptations for survival in their natural environments.

Grade 4

GRADE BAND THEME: INTERCONNECTIONS WITHIN SYSTEMS

This theme focuses on helping students develop the skills for systematic discovery to understand the science of the physical world around them in greater depth by using scientific inquiry.

SCIENCE INQUIRY AND APPLICATION

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment;
- Plan and conduct simple investigations;
- Employ simple equipment and tools to gather data and extend the senses;
- Use appropriate mathematics with data to construct reasonable explanations;
- Communicate about observations, investigations and explanations; and
- Review and ask questions about the observations and explanations of others.

Grade 4

STRANDS

Strand Connections: Heat and electrical energy are forms of energy that can be transferred from one location to another. Matter has properties that allow the transfer of heat and electrical energy. Heating and cooling affect the weathering of Earth's surface and Earth's past environments. The processes that shape Earth's surface and the fossil evidence found can help decode Earth's history.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Earth's Surface This topic focuses on the variety of processes that shape and reshape Earth's surface.	**Topic: Electricity, Heat and Matter** This topic focuses on the conservation of matter and the processes of energy transfer and transformation, especially as they relate to heat and electrical energy.	**Topic: Earth's Living History** This topic focuses on using fossil evidence and living organisms to observe that suitable habitats depend upon a combination of biotic and abiotic factors.

CONDENSED CONTENT STATEMENTS		
4.ES.1 Earth's surface has specific characteristics and land forms that can be identified. **4.ES.2** The surface of Earth changes due to weathering. **4.ES.3** The surface of Earth changes due to erosion and deposition.	**4.PS.1** The total amount of matter is conserved when it undergoes a change. **4.PS.2** Energy can be transformed from one form to another or can be transferred from one location to another.	**4.LS.1** Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful. **4.LS.2** Fossils can be compared to one another and to present day organisms according to their similarities and differences.

Grade 5

GRADE BAND THEME: INTERCONNECTIONS WITHIN SYSTEMS

This theme focuses on helping students develop the skills for systematic discovery to understand the science of the physical world around them in greater depth by using scientific inquiry.

SCIENCE INQUIRY AND APPLICATION

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations;
- Design and conduct a scientific investigation;
- Use appropriate mathematics, tools and techniques to gather data and information;
- Analyze and interpret data;
- Develop descriptions, models, explanations and predictions;
- Think critically and logically to connect evidence and explanations;
- Recognize and analyze alternative explanations and predictions; and
- Communicate scientific procedures and explanations.

Grade 5

STRANDS

Strand Connections: Matter is what makes up all substances on Earth. Matter has specific properties and exists in different states. Earth's resources are made of matter. Matter can be used by living things and can be used for the energy they contain. There are many different forms of energy. Each living component of an ecosystem is composed of matter and uses energy.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Cycles and Patterns in the Solar System This topic focuses on the characteristics, cycles and patterns in the solar system and within the universe.	**Topic: Light, Sound and Motion** This topic focuses on the forces that affect motion. This includes the relationship between the change in speed of an object, the amount of force applied and the mass* of the object. Light and sound are explored as forms of energy that move in predictable ways, depending on the matter through which they move.	**Topic: Interactions within Ecosystems** This topic focuses on foundational knowledge of the structures and functions of ecosystems.

CONDENSED CONTENT STATEMENTS		
5.ES.1 The solar system includes the sun and all celestial bodies that orbit the sun. Each planet in the solar system has unique characteristics. **5.ES.2** The sun is one of many stars that exist in the universe. **5.ES.3** Most of the cycles and patterns of motion between the Earth and sun are predictable.	**5.PS.1** The amount of change in movement of an object is based on the mass* of the object and the amount of force exerted. **5.PS.2** Light and sound are forms of energy that behave in predicable ways.	**5.LS.1** Organisms perform a variety of roles in an ecosystem. **5.LS.2** All of the processes that take place within organisms require energy.

Grade 6

GRADE BAND THEME: ORDER AND ORGANIZATION

This theme focuses on helping students use scientific inquiry to discover patterns, trends, structures and relationships that may be described by simple principles. These principles are related to the properties or interactions within and between systems.

SCIENCE INQUIRY AND APPLICATION

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations;
- Design and conduct a scientific investigation;
- Use appropriate mathematics, tools and techniques to gather data and information;
- Analyze and interpret data;
- Develop descriptions, models, explanations and predictions;
- Think critically and logically to connect evidence and explanations;
- Recognize and analyze alternative explanations and predictions; and
- Communicate scientific procedures and explanations.

Grade 6

STRANDS

Strand Connections: Matter is what makes up all substances on Earth. Matter has specific properties and exists in different states. Earth's resources are made of matter. Matter can be used by living things and can be used for the energy they contain. There are many different forms of energy. Each living component of an ecosystem is composed of matter and uses energy.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Rocks, Minerals and Soil This topic focuses on the study of rocks, minerals and soil, which make up the lithosphere. Classifying and identifying different types of rocks, minerals and soil can decode the past environment in which they formed.	**Topic: Matter and Motion** This topic focuses on the study of foundational concepts of the particulate nature of matter, linear motion, and kinetic and potential energy.	**Topic: Cellular to Multicellular** This topic focuses on the study of the basics of Modern Cell Theory. All organisms are composed of cells, which are the fundamental unit of life. Cells carry on the many processes that sustain life. All cells come fro pre-existing cells.

CONDENSED CONTENT STATEMENTS		
6.ES.1 Minerals have specific, quantifiable properties. **6.ES.2** Igneous, metamorphic and sedimentary rocks have unique characteristics that can be used for identification and/or classification. **6.ES.3** Igneous, metamorphic and sedimentary rocks form in different ways. **6.ES.4** Soil is unconsolidated material that contains nutrient matter and weathered rock. **6.ES.5** Rocks, minerals and soils have common and practical uses.	**6.PS.1** All matter is made up of small particles called atoms. **6.PS.2** Changes of state are explained by a model of matter composed of atoms and/or molecules that are in motion. **6.PS.3** There are two categories of energy: kinetic and potential. **6.PS.4** An object's motion can be described by its speed and the direction in which it is moving.	**6.LS.1** Cells are the fundamental unit of life. **6.LS.2** All cells come from pre-existing cells. **6.LS.3** Cells carry on specific functions that sustain life. **6.LS.4** Living systems at all levels of organization demonstrate the complementary nature of structure and function.

Grade 7

GRADE BAND THEME: ORDER AND ORGANIZATION
This theme focuses on helping students use scientific inquiry to discover patterns, trends, structures and relationships that may be described by simple principles. These principles are related to the properties or interactions within and between systems.

SCIENCE INQUIRY AND APPLICATION
During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:
• Identify questions that can be answered through scientific investigations;
• Design and conduct a scientific investigation;
• Use appropriate mathematics, tools and techniques to gather data and information;
• Analyze and interpret data;
• Develop descriptions, models, explanations and predictions;
• Think critically and logically to connect evidence and explanations;
• Recognize and analyze alternative explanations and predictions; and
• Communicate scientific procedures and explanations.

Grade 7

STRANDS

Strand Connections: Systems can exchange energy and/or matter when interactions occur within systems and between systems. Systems cycle matter and energy in observable and predictable patterns.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Cycles and Patterns of Earth and the Moon This topic focuses on Earth's hydrologic cycle, patterns that exist in atmospheric and oceanic currents, the relationship between thermal energy and the currents, and the relative position and movement of the Earth, sun and moon.	**Topic: Conservation of Mass and Energy** This topic focuses on the empirical evidence for the arrangements of atoms on the Periodic Table of Elements, conservation of mass and energy, transformation and transfer of energy.	**Topic: Cycles of Matter and Flow of Energy** This topic focuses on the impact of matter and energy transfer within the biotic component of ecosystems.
CONDENSED CONTENT STATEMENTS		
7.ES.1 The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere and atmosphere. **7.ES.2** Thermal-energy transfers in the ocean and the atmosphere contribute to the formation of currents, which influence global climate patterns. **7.ES.3** The atmosphere has different properties at different elevations and contains a mixture of gases that cycle through the lithosphere, biosphere, hydrosphere and atmosphere. **7.ES.4** The relative patterns of motion and positions of the Earth, moon and sun cause solar and lunar eclipses, tides and phases of the moon.	**7.PS.1** The properties of matter are determined by the arrangement of atoms. **7.PS.2** Energy can be transformed or transferred but is never lost. **7.PS.3** Energy can be transferred through a variety of ways.	**7.LS.1** Matter is transferred continuously between one organism to another and between organisms and their physical environments. **7.LS.2** In any particular biome, the number, growth and survival of organisms and populations depend on biotic and abiotic factors.

Grade 8

GRADE BAND THEME: ORDER AND ORGANIZATION

This theme focuses on helping students use scientific inquiry to discover patterns, trends, structures and relationships that may be described by simple principles. These principles are related to the properties or interactions within and between systems.

SCIENCE INQUIRY AND APPLICATION

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations;
- Design and conduct a scientific investigation;
- Use appropriate mathematics, tools and techniques to gather data and information;
- Analyze and interpret data;
- Develop descriptions, models, explanations and predictions;
- Think critically and logically to connect evidence and explanations;
- Recognize and analyze alternative explanations and predictions; and
- Communicate scientific procedures and explanations.

Grade 8

STRANDS

Strand Connections: Matter is what makes up all substances on Earth. Matter has specific properties and exists in different states. Earth's resources are made of matter. Matter can be used by living things and can be used for the energy they contain. There are many different forms of energy. Each living component of an ecosystem is composed of matter and uses energy.

EARTH AND SPACE SCIENCE (ESS)	PHYSICAL SCIENCE (PS)	LIFE SCIENCE (LS)
Topic: Physical Earth This topic focuses on the physical features of Earth and how they formed. This includes the interior of Earth, the rock record, plate tectonics and landforms.	**Topic: Forces and Motion** This topic focuses on forces and motion within, on and around the Earth and within the universe.	**Topic: Species and Reproduction** This topic focuses on continuation of the species.
CONDENSED CONTENT STATEMENTS		
8.ES.1 The composition and properties of Earth's interior are identified by the behavior of seismic waves. **8.ES.2** Earth's crust consists of major and minor tectonic plates that move relative to each other. **8.ES.3** A combination of constructive and destructive geologic processes formed Earth's surface. **8.ES.4** Evidence of the dynamic changes of Earth's surface through time is found in the geologic record.	**8.PS.1** Forces between objects act when the objects are in direct contact or when they are not touching. **8.PS.2** Forces have magnitude and direction. **8.PS.2** There are different types of potential energy.	**8.LS.1** Diversity of species occurs through gradual processes over many generations. Fossil records provide evidence that changes have occurred in number and types of species. **8.LS.2** Reproduction is necessary for the continuation of every species. **8.LS.3** The characteristics of an organism are a result of inherited traits received from parent(s).

High School Science Standards

Physical Science

SYLLABUS /COURSE DESCRIPTION

Physical science is a high school level course, which satisfies the Ohio Core science graduation requirements. This section of Ohio law requires a three-unit course with inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information. Physical science introduces students to key concepts and theories that provide a foundation for further study in other sciences and advanced science disciplines. Physical science comprises the systematic study of the physical world as it relates to fundamental concepts about matter, energy and motion. A unified understanding of phenomena in physical, living, Earth and space systems is the culmination of all previously learned concepts related to chemistry, physics, and Earth and space science, along with historical perspective and mathematical reasoning.

SCIENCE INQUIRY AND APPLICATION

During the years of grades 9 through 12, all students must use the following scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

- Identify questions and concepts that guide scientific investigations;
- Design and conduct scientific investigations;
- Use technology and mathematics to improve investigations and communications;
- Formulate and revise explanations and models using logic and evidence (critical thinking);
- Recognize and analyze explanations and models; and
- Communicate and support a scientific argument.

COURSE CONTENT
The following information may be taught in any order; there is no recommended sequence.

STUDY OF MATTER
- Classification of matter
  - Heterogeneous vs. homogeneous
  - Properties of matter
  - States of matter and its changes
- Atoms
  - Models of the atom (components)
  - Ions (cations and anions)
  - Isotopes
- Periodic trends of the elements
  - Periodic law
  - Representative groups
- Bonding and compounds
  - Bonding (ionic and covalent)
  - Nomenclature
- Reactions of matter
  - Chemical reactions
  - Nuclear reactions

ENERGY AND WAVES
- Conservation of energy
  - Quantifying kinetic energy
  - Quantifying gravitational potential energy
  - Energy is relative Transfer and transformation of energy (including work)
- Waves
  - Refraction, reflection, diffraction, absorption, superposition
  - Radiant energy and the electromagnetic spectrum
  - Doppler shift
- Thermal energy
- Electricity
  - Movement of electrons
  - Current
  - Electric potential (voltage)
  - Resistors and transfer of energy

FORCES AND MOTION
- Motion
  - Introduction to one-dimensional vectors
  - Displacement, velocity (constant, average and instantaneous) and acceleration
  - Interpreting position vs. time and velocity vs. time graphs
- Forces
  - Force diagrams
  - Types of forces (gravity, friction, normal, tension)
  - Field model for forces at a distance
- Dynamics (how forces affect motion)
  - Objects at rest
  - Objects moving with constant velocity
  - Accelerating objects

THE UNIVERSE
- History of the universe
- Galaxy formation
- Stars
  - Formation; stages of evolution
  - Fusion in star

Biology

SYLLABUS/COURSE DESCRIPTION

Biology is a high school level course, which satisfies the Ohio Core science graduation requirements. This section of Ohio law requires a three-unit course with inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information. This course investigates the composition, diversity, complexity and interconnectedness of life on Earth. Fundamental concepts of heredity and evolution provide a framework through inquiry-based instruction to explore the living world, the physical environment and the interactions within and between them. Students engage in investigations to understand and explain the behavior of living things in a variety of scenarios that incorporate scientific reasoning, analysis, communication skills and real-world applications.

SCIENCE INQUIRY AND APPLICATION

During the years of grades 9 through 12, all students must use the following scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

- Identify questions and concepts that guide scientific investigations;
- Design and conduct scientific investigations;
- Use technology and mathematics to improve investigations and communications;
- Formulate and revise explanations and models using logic and evidence (critical thinking);
- Recognize and analyze explanations and models; and
- Communicate and support a scientific argument.

COURSE CONTENT

The following information may be taught in any order; there is no recommended sequence.

HEREDITY

- Cellular genetics
- Structure and function of DNA in cells
- Genetic mechanisms and inheritance
- Mutations
- Modern genetics

EVOLUTION

- Mechanisms
  - Natural selection
  - Mutation
  - Genetic drift
  - Gene flow (immigration, emigration)
  - Sexual selection
  - History of life on Earth
- Diversity of Life
  - Speciation and biological classification based on molecular evidence
  - Variation of organisms within a species due to population genetics and gene frequency

DIVERSITY AND INTERDEPENDENCE OF LIFE

- Classification systems are frameworks created by scientists for describing the vast diversity of organisms indicating the degree of relatedness between organisms.
- Ecosystems
  - Homeostasis
    - Carrying capacity
    - Equilibrium and disequilibrium

CELLS

- Cell structure and function
  - Structure, function and interrelatedness of cell organelles
  - Eukaryotic cells and prokaryotic cells
- Cellular processes
  - Characteristics of life regulated by cellular processes
    - o Photosynthesis, chemosynthesis, cellular respiration
    - o Cell division and differentiation

Chemistry

SYLLABUS/COURSE DESCRIPTION

Chemistry is a high school level course, which satisfies the Ohio Core science graduation requirements. This section of Ohio law requires a three-unit course with inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information.

This course introduces students to key concepts and theories that provide a foundation for further study in other sciences as well as advanced science disciplines. Chemistry comprises a systematic study of the predictive physical interactions of matter and subsequent events that occur in the natural world. The study of matter through the exploration of classification, its structure and its interactions is how this course is organized.

Investigations are used to understand and explain the behavior of matter in a variety of inquiry and design scenarios that incorporate scientific reasoning, analysis,
communication skills and real-world applications. An understanding of leading theories and how they have informed current knowledge prepares students with higher order cognitive capabilities of evaluation, prediction and application.

SCIENCE INQUIRY AND APPLICATION

During the years of grades 9 through 12, all students must use the following scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

- Identify questions and concepts that guide scientific investigations;
- Design and conduct scientific investigations;
- Use technology and mathematics to improve investigations and communications;
- Formulate and revise explanations and models using logic and evidence (critical thinking);
- Recognize and analyze explanations and models; and
- Communicate and support a scientific argument.

COURSE CONTENT
The following topics may be taught in any order. There is no recommended sequence.

STRUCTURE AND PROPERTIES OF MATTER

- Atomic structure
  - Evolution of atomic models/theory
  - Electrons
  - Electron configurations
- Periodic table
  - Properties
  - Trends
- Intramolecular chemical bonding
  - Ionic
  - Polar/covalent
- Representing compounds
  - Formula writing
  - Nomenclature
  - Models and shapes (Lewis structures, ball and stick, molecular geometries)
- Quantifying matter
- Phases of matter
- Intermolecular chemical bonding
  - Types and strengths
  - Implications for properties of substances
    - Melting and boiling point
    - Solubility
    - Vapor pressure

INTERACTIONS OF MATTER

- Chemical reactions
  - Types of reactions
  - Kinetics
  - Energy
  - Equilibrium
  - Acids/bases
- Gas laws
  - Pressure, volume and temperature
  - Ideal gas law
- Stoichiometry
  - Molar calculations
  - Solutions
  - Limiting reagents
- Nuclear Reactions
  - Radioisotopes
  - Nuclear energy

Physics

SYLLABUS/COURSE DESCRIPTION

Physics is a high school level course, which satisfies the Ohio Core science graduation requirements. This section of Ohio law requires a three-unit course with inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information.

Physics elaborates on the study of the key concepts of motion, forces and energy as they relate to increasingly complex systems and applications that will provide a foundation for further study in science and scientific literacy.

Students engage in investigations to understand and explain motion, forces and energy in a variety of inquiry and design scenarios that incorporate scientific reasoning, analysis, communication skills and real-world applications.

SCIENCE INQUIRY AND APPLICATION

During the years of grades 9 through 12, all students must use the following scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

- Identify questions and concepts that guide scientific investigations;
- Design and conduct scientific investigations;
- Use technology and mathematics to improve investigations and communications;
- Formulate and revise explanations and models using logic and evidence (critical thinking);
- Recognize and analyze explanations and models; and
- Communicate and support a scientific argument.

COURSE CONTENT
The following information may be taught in any order; there is no recommended sequence.

MOTION

- Graph interpretations
  - Position vs. time
  - Velocity vs. time
  - Acceleration vs. time
- Problem solving
  - Using graphs (average velocity, instantaneous velocity, acceleration, displacement, change in velocity)
  - Uniform acceleration including free fall (initial velocity, final velocity, time, displacement, acceleration, average velocity)
- Projectiles
  - Independence of horizontal and vertical motion
  - Problem-solving involving horizontally launched projectiles

FORCES, MOMENTUM AND MOTION

- Newton's laws applied to complex problems
- Gravitational force and fields
- Elastic forces
- Friction force (static and kinetic)
- Air resistance and drag
- Forces in two dimensions
  - Adding vector forces
  - Motion down inclines
  - Centripetal forces and circular motion
- Momentum, impulse and conservation of momentum

ENERGY

- Gravitational potential energy
- Energy in springs
- Nuclear energy
- Work and power
- Conservation of energy

WAVES

- Wave properties
  - Conservation of energy
  - Reflection
  - Refraction
  - Interference
  - Diffraction
- Light phenomena
  - Ray diagrams (propagation of light)
  - Law of reflection (equal angles)
  - Snell's law
  - Diffraction patterns
  - Wave – particle duality of light
  - Visible spectrum and color

ELECTRICITY AND MAGNETISM

- Charging objects (friction, contact and induction)
- Coulomb's law
- Electric fields and electric potential energy
- DC circuits
  - Ohm's law
  - Series circuits
  - Parallel circuits
  - Mixed circuits
  - Applying conservation of charge and energy (junction and loop rules)
- Magnetic fields and energy
- Electromagnetic interaction