

Eighth Grade

Lakewood City Schools

Course of Study

For

Science

September, 2005

EIGHTH GRADE

Scope and Sequence

Students in the eighth grade explore space and plate tectonics as they continue to draw conclusions from scientific evidence that support theories related to the change of Earth’s surface. They acquire knowledge to describe how positions and motions of objects in the universe cause predictable and cyclic events. Students explain that the universe is composed of vast amounts of matter and that it is held together by gravitational force. They explore equipment to study the universe - telescopes, probes, satellites and spacecraft. Motion of objects, effects of forces on objects, and how waves (sound, water and earthquake) transfer energy are explored. Students will be able to explain how extinction of a species occurs when the environment changes and its adaptive characteristics are insufficient to allow survival. Students design a solution to a problem or design and build a product, given certain constraints. Technological influences on the quality of life are also explored in this grade level.

Lakewood City Schools Science Standards-Based Course of Study is aligned with the Ohio Department of Education’s Academic Content Standards.

Standard 1: Earth and Space Science

Standard 2: Life Science

Standard 3: Physical Science

Standard 4: Science and Technology

Standard 5: Scientific Inquiry

Standard 6: Scientific Ways of Knowing

} (*Nature of Science*)

Academic Content Standards, Benchmarks, and Indicators are reflected at each grade level in this document.

A list of Teaching Resources is included for each Unit of Study. Lakewood eighth grade units are entitled: Nature of Science, Heredity/Evolution, Forces and Motion, Plate Tectonics, Waves, and Universe/Solar System. All eighth grade Benchmarks and Indicators are covered within these units.

Sub-objective activities are included to meet indicators for each unit for teacher planning.

MacMillan Textbook: Physical Science

Prentice Hall Textbook Modules: Heredity: The Code of Life; Sound and Light; Force and Motion; Exploring the Universe; Exploring Planet Earth

Science Standards

Standard 1: Earth and Space Sciences

Students demonstrate an understanding about how Earth systems and processes interact in the geosphere resulting in the habitability of Earth. This includes demonstrating an understanding of the composition of the universe, the solar system and Earth. In addition, it includes understanding the properties and the interconnected nature of Earth's systems, processes that shape Earth and Earth's history. Students also demonstrate an understanding of how the concepts and principles of energy, matter, motion and forces explain Earth systems, the solar system and the universe. Finally, they grasp an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with Earth and space sciences.

Standard 2: Life Sciences

Students demonstrate an understanding of how living systems function and how they interact with the physical environment. This includes an understanding of the cycling of matter and flow of energy in living systems. An understanding of the characteristics, structure and function of cells, organisms and living systems will be developed. Students will also develop a deeper understanding of the principles of heredity, biological evolution, and the diversity and interdependence of life. Students demonstrate an understanding of different historical perspectives, scientific approaches and emerging scientific issues associated with the life sciences.

Standard 3: Physical Sciences

Students demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world. This includes demonstrating an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter. In addition, it includes understanding the nature, transfer and conservation of energy; motion and the forces affecting motion; and the nature of waves and interactions of matter and energy. Students demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

Standard 4: Science and Technology

Students recognize that science and technology are interconnected and that using technology involves assessment of the benefits, risks and costs. Students should build scientific and technological knowledge, as well as the skill required to design and construct devices. In addition, they should develop the processes to solve problems and understand that problems may be solved in several ways.

Standard 5: Scientific Inquiry

Students develop scientific habits of mind as they use the processes of scientific inquiry to ask valid questions and to gather and analyze information. They understand how to develop hypotheses and make predictions. They are able to reflect on scientific practices as they develop plans of action to create and evaluate a variety of conclusions. Students are also able to demonstrate the ability to communicate their findings to others.

Standard 6: Scientific Ways of Knowing

Students realize that the current body of scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world. This includes demonstrating an understanding that scientific knowledge grows and advances as new evidence is discovered to support or modify existing theories, as well as to encourage the development of new theories. Students are able to reflect on ethical scientific practices and demonstrate an understanding of how the current body of scientific knowledge reflects the historical and cultural contributions of women and men who provide us with a more reliable and comprehensive understanding of the natural world.

LAKWOOD UNIT: Nature of Science

6 week unit – includes Science and Technology, Scientific Inquiry, and Scientific Ways of Knowing

Science and Technology Standard (ST)

Students recognize that science and technology are interconnected and that using technology involves assessment of the benefits, risks and costs. Students should build scientific and technological knowledge, as well as the skill required to design and construct devices. In addition, they should develop the processes to solve problems and understand that problems may be solved in several ways.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>A. Give examples of how technological advances, influenced by scientific knowledge, affect the quality of life. (ST-A)</p>	<p><u>Understanding Technology</u></p> <ol style="list-style-type: none"> 1. Examine how science and technology have advanced through the contributions of many different people, cultures and times in history. (ST-8-1) 2. Examine how choices regarding the use of technology are influenced by constraints caused by various unavoidable factors (e.g., geographic location, limited resources, social, political and economic considerations). (ST-8-2) 	<p>Teaching Resources: Science Action Labs Workbook (Ed Shevick) MacMillan Textbook: Physical Science</p>
<p>B. Design a solution or product taking into account needs and constraints (e.g., cost, time, trade-offs, properties of materials, safety and aesthetics). (ST-B)</p>	<p><u>Abilities To Do Technological Design</u></p> <ol style="list-style-type: none"> 3. Design and build a product or create a solution to a problem given more than two constraints (e.g., limits of cost and time for design and production, supply of materials and environmental effects). (ST-8-3) 4. Evaluate the overall effectiveness of a product design or solution. (ST-8-4) 	

LAKWOOD UNIT: Nature of Science (continued)

Continue 6 week unit – includes Science and Technology, Scientific Inquiry, and Scientific Ways of Knowing

Scientific Inquiry Standard (SI)

Students develop scientific habits of mind as they use the processes of scientific inquiry to ask valid questions and to gather and analyze information. They understand how to develop hypotheses and make predictions. They are able to reflect on scientific practices as they develop plans of action to create and evaluate a variety of conclusions. Students are also able to demonstrate the ability to communicate their findings to others.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>A. Explain that there are differing sets of procedures for guiding scientific investigations and procedures are determined by the nature of the investigation, safety considerations and appropriate tools. (SI-A)</p>	<p><u>Doing Scientific Inquiry</u></p> <p>1. Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations. (SI-8-1)</p> <p>2. Describe the concepts of sample size and control and explain how these affect scientific investigations. (SI-8-2)</p>	<p>Teaching Resources: Science Action Labs Workbook (Ed Shevick) MacMillan Textbook: Physical Science</p> <p>Sub-Objective Activities to Meet Indicators:</p> <ul style="list-style-type: none"> • Measure length, mass, temperature, density, weight, etc. in SI Units.
<p>B. Analyze and interpret data from scientific investigations using appropriate mathematical skills in order to draw valid conclusions. (SI-B)</p>	<p>3. Read, construct and interpret data in various forms produced by self and others in both written and oral form (e.g., tables, charts, maps, graphs, diagrams and symbols). (SI-8-3)</p> <p>4. Apply appropriate math skills to interpret quantitative data (e.g., mean, median and mode). (SI-8-4)</p>	

LAKWOOD UNIT: Nature of Science (continued)

Continue 6 week unit – includes Science and Technology, Scientific Inquiry, and Scientific Ways of Knowing

Scientific Ways of Knowing Standard (SK)

Students realize that the current body of scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world. This includes demonstrating an understanding that scientific knowledge grows and advances as new evidence is discovered to support or modify existing theories, as well as to encourage the development of new theories. Students are able to reflect on ethical scientific practices and demonstrate an understanding of how the current body of scientific knowledge reflects the historical and cultural contributions of women and men who provide us with a more reliable and comprehensive understanding of the natural world.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>A. Use skills of scientific inquiry processes (e.g., hypothesis, record keeping, description and explanation). (SK-A)</p>	<p><u>Nature of Science</u> 1. Identify the difference between description (e.g., observation and summary) and explanation (e.g., inference, prediction, significance and importance). (SK-8-1)</p>	<p>Teaching Resources: Teaching Science Process Skills Workbook Laboratory Skills Workbook (Mark Twain Media) Science World Magazine</p>
<p>B. Explain the importance of reproducibility and reduction of bias in scientific methods. (SK-B)</p>	<p><u>Ethical Practices</u> 2. Explain why it is important to examine data objectively and not let bias affect observations. (SK-8-2)</p>	
<p>C. Give examples of how thinking scientifically is helpful in daily life. (SK-C)</p>	<p><i>No indicators present for this benchmark (grade 7).</i></p>	

LAKWOOD UNIT: Heredity/Evolution

5 week unit

Life Sciences Standard (LS)

Students demonstrate an understanding of how living systems function and how they interact with the physical environment. This includes an understanding of the cycling of matter and flow of energy in living systems. An understanding of the characteristics, structure and function of cells, organisms and living systems will be developed. Students will also develop a deeper understanding of the principles of heredity, biological evolution, and the diversity and interdependence of life. Students demonstrate an understanding of different historical perspectives, scientific approaches and emerging scientific issues associated with the life sciences.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>A. Explain that the basic functions of organisms are carried out in cells and groups of specialized cells form tissues and organs; the combination of these cells make up multicellular organisms that have a variety of body plans and internal structures. (LS-A)</p>	<p><i>No indicators present for this benchmark (grade 7).</i></p>	<p>Teaching Resources: <u>Prentice Hall Science Textbook:</u> <ul style="list-style-type: none"> Heredity: The Code of Life – Chapters 2-4 DNA: From Genes to Proteins <u>Your World Biotechnology & You</u> Vol. 10, Issue 1 “Genetically Modified Food Groups” Genetics Concepts Kit Video – Classification of Living Things Natural Selection Kit Discovering Genetics Best Set</p>
<p>B. Describe the characteristics of an organism in terms of a combination of inherited traits and recognize reproduction as a characteristic of living organisms essential to the continuation of the species. (LS-B)</p>	<p><u>Heredity</u> 1. Describe that asexual reproduction limits the spread of detrimental characteristics through a species and allows for genetic continuity. (LS-8-1) 2. Recognize that in sexual reproduction new combinations of traits are produced which may increase or decrease an organism's chances for survival. (LS-8-2) <u>Evolutionary Theory</u> 3. Explain how variations in structure, behavior or physiology allow some organisms to enhance their reproductive success and survival in a particular environment. (LS-8-3)</p>	

<p>C. Explain how energy entering the ecosystems as sunlight supports the life of organisms through photosynthesis and the transfer of energy through the interactions of organisms and the environment. (LS-C)</p>	<p><i>No indicators present for this benchmark (grade 7).</i></p>	
<p>D. Explain how extinction of a species occurs when the environment changes and its adaptive characteristics are insufficient to allow survival (as seen in evidence of the fossil record). (LS-D)</p>	<p><u><i>Evolutionary Theory</i></u> 4. Explain that diversity of species is developed through gradual processes over many generations (e.g., fossil record). (LS-8-4) 5. Investigate how an organism adapted to a particular environment may become extinct if the environment, as shown by the fossil record, changes. (LS-8-5)</p>	

LAKWOOD UNIT: Heredity/Evolution

5 week unit (continued)

Life Sciences Standard (LS)

Students demonstrate an understanding of how living systems function and how they interact with the physical environment. This includes an understanding of the cycling of matter and flow of energy in living systems. An understanding of the characteristics, structure and function of cells, organisms and living systems will be developed. Students will also develop a deeper understanding of the principles of heredity, biological evolution, and the diversity and interdependence of life. Students demonstrate an understanding of different historical perspectives, scientific approaches and emerging scientific issues associated with the life sciences.

**Sub-Objective Activities
to Meet Indicators**

- Describe the basic nature of DNA, chromosomes and genes.
- Recognize relationships between the work of Gregor Mendel and the laws of genetics.
- Compare and contrast dominant and recessive traits of an organism.
- Describe the Law of Segregation (meiosis).
- Compare and contrast the difference between phenotypes and genotypes.
- Investigate the Law of Independent Assortment to predict the results of genetic crosses (e.g., probability activities, Punnett squares, pedigrees).
- Describe changes in populations over time incorporating:
 - Natural variation due to meiosis and mutation
 - Natural selection (5 statements review from 7th grade)
 - Adaptations (review from 7th grade reminding students that populations adapt, individuals do not)
 - Relationship between species as percent of DNA shared
 - The fossil record as evidence of such change including relative and absolute dating and connected to plate tectonics, rock cycle, etc.
 - Extinction (review from 7th grade)
- Discuss ways in which artificial selection, genetic engineering, cloning, stem cells, etc. have contributed to medicine and agriculture.

LAKWOOD UNIT: Forces and Motion

7 week unit

Physical Sciences Standard (PS)

Students demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world. This includes demonstrating an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter. In addition, it includes understanding the nature, transfer and conservation of energy; motion and the forces affecting motion; and the nature of waves and interactions of matter and energy. Students demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>A. Relate uses, properties and chemical processes to the behavior and/or arrangement of the small particles that compose matter. (PS-A)</p>	<p><i>No indicators present for this benchmark (grade 7).</i></p>	
<p>B. In simple cases, describe the motion of objects and conceptually describe the effects of forces on an object. (PS-B)</p>	<p><u><i>Forces and Motion</i></u> 1. Describe how the change in the position (motion) of an object is always judged and described in comparison to a reference point. (PS-8-1) 2. Explain that motion describes the change in the position of an object (characterized by a speed and direction) as time changes. (PS-8-2) 3. Explain that an unbalanced force acting on an object changes that object's speed and/or direction. (PS-8-3)</p>	<p>Teaching Resources: <u>Prentice Hall Science Textbook:</u> • Force and Motion MacMillan Textbook: Physical Science Bill Nye Videos Science Plus – Blue / S-Section Conceptual Physics – Resource Book (Hewitt)</p>

LAKWOOD UNIT: Forces and Motion

7 week unit (continued)

Physical Sciences Standard (PS)

Students demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world. This includes demonstrating an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter. In addition, it includes understanding the nature, transfer and conservation of energy; motion and the forces affecting motion; and the nature of waves and interactions of matter and energy. Students demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

Sub-Objective Activities to Meet Indicators
<ul style="list-style-type: none"> • Measure and calculate speed and velocity through the use of mathematical formulas. <p>Newton’s Laws of Motion:</p> <ul style="list-style-type: none"> • Compare and contrast sources of potential and kinetic energy. • Conduct an experiment to demonstrate the change of energy from potential to kinetic and vice versa. • Observe that an object at rest or in uniform motion will remain at rest or in motion until an outside force acts on the object (Newton’s First Law of Motion/Inertia). • Describe changes in the motion of an object when it experiences a force or forces (e.g., gravity, friction, air pressure, magnetism, air resistance). • Define operationally (through experimentation) that “force x mass = acceleration” (i.e., Newton’s Second Law of Motion). • Define operationally (through experimentation) that when a force acts on an object, it changes the momentum of that object, and that this change is proportional to the applied force and to the time it acts upon the object (i.e., Newton’s Second Law of Motion). • Describe examples of Newton’s Third Law of Motion that indicate every action (force) is accompanied by an equal and opposite reaction (force). • Identify action and reaction forces given examples of objects in motion. • Predict the motion of objects thrown or released by people who are in motion. • Describe how the motion of one object can affect the motion of other objects. • Describe the apparent forces or impacts people can feel as a result of a change in an object’s motion (e.g., elevator rides, boating in windy weather). • Recognize the following relationships related to motion, including: <ul style="list-style-type: none"> ◦ Things move only when something moves them. ◦ Things keep moving until something stops them. ◦ The harder something is pushed, the faster it goes. ◦ The more massive something is, the harder it is to move. • Trace the transmission, transformation, and conservation of various forms of energy in a simple mechanical system. • Distinguish between constant speed and average speed. • Distinguish between speed and velocity. • Illustrate speed and velocity through the development of a distance/time graph.

- Measure and calculate speed and velocity through the use of mathematical formulas.

Newton’s Laws of Motion:

- Compare and contrast sources of potential and kinetic energy.
- Conduct an experiment to demonstrate the change of energy from potential to kinetic and vice versa.
- Observe that an object at rest or in uniform motion will remain at rest or in motion until an outside force acts on the object (Newton’s First Law of Motion/Inertia).
- Describe changes in the motion of an object when it experiences a force or forces (e.g., gravity, friction, air pressure, magnetism, air resistance).
- Define operationally (through experimentation) that “force x mass = acceleration” (i.e., Newton’s Second Law of Motion).
- Define operationally (through experimentation) that when a force acts on an object, it changes the momentum of that object, and that this change is proportional to the applied force and to the time it acts upon the object (i.e., Newton’s Second Law of Motion).
- Describe examples of Newton’s Third Law of Motion that indicate every action (force) is accompanied by an equal and opposite reaction (force).
- Identify action and reaction forces given examples of objects in motion.
- Predict the motion of objects thrown or released by people who are in motion.
- Describe how the motion of one object can affect the motion of other objects.
- Describe the apparent forces or impacts people can feel as a result of a change in an object’s motion (e.g., elevator rides, boating in windy weather).
- Recognize the following relationships related to motion, including:
 - Things move only when something moves them.
 - Things keep moving until something stops them.
 - The harder something is pushed, the faster it goes.
 - The more massive something is, the harder it is to move.
- Trace the transmission, transformation, and conservation of various forms of energy in a simple mechanical system.
- Distinguish between constant speed and average speed.
- Distinguish between speed and velocity.
- Illustrate speed and velocity through the development of a distance/time graph.

- Compare and contrast acceleration and deceleration.
- Calculate acceleration and deceleration using mathematical formulas.
- Interpret a distance/time graph for acceleration.
- Investigate velocity and mass to calculate momentum.
- Recognize the relationship between velocity and mass to calculate momentum.
- Demonstrate Newton's Laws of Motion:
 - 1st Law – A body at rest will remain at rest unless an unbalanced force acts on it. A body in motion will remain in motion and in a straight line at a steady speed unless an unbalanced force acts on it.
 - 2nd Law – When an unbalanced force acts on a mass, it produces an acceleration in the direction of the force that is directly proportional to the force and inversely proportional to the mass ($F = ma$).
 - 3rd Law – If one object applies a force to another, the second object applies an equal and opposite force to the first object. For every action there is an equal and opposite reaction.
- Determine the forces acting upon an object under a given circumstance (e.g., magnetism, friction, gravity, surface tension).
- Explain the historical development of the Universal Gravitational Law: Objects will fall at 9.8 meters/second squared.
- Investigate terminal velocity as it pertains to free-falling objects.
- Investigate the effects of air resistance on falling objects (e.g., terminal velocity).
- Recognize relationships among the change in motion of an object, the force applied to the object, and the mass of an object.
- Explore the concepts of pressure and depth
- Demonstrate the Archimedes Principle as it relates to buoyancy.
- Investigate Bernoulli's Principle as it applies to flight.
- Apply the Laws of Conservation of Matter and Energy to everyday situations.

LAKWOOD UNIT: Plate Tectonics

5 week unit

Earth and Space Sciences Standard (ES)

Students demonstrate an understanding about how Earth systems and processes interact in the geosphere resulting in the habitability of Earth. This includes demonstrating an understanding of the composition of the universe, the solar system and Earth. In addition, it includes understanding the properties and the interconnected nature of Earth’s systems, processes that shape Earth and Earth’s history. Students also demonstrate an understanding of how the concepts and principles of energy, matter, motion and forces explain Earth systems, the solar system and the universe. Finally, they grasp an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with Earth and space sciences.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>E. Describe the processes that contribute to the continuous changing of Earth's surface (e.g., earthquakes, volcanic eruptions, erosion, mountain building and lithospheric plate movements). (ES-E)</p>	<p><u>Earth Systems</u></p> <p>9. Describe the interior structure of Earth and Earth's crust as divided into tectonic plates riding on top of the slow moving currents of magma in the mantle. (ES-8-9)</p> <p>10. Explain that most major geological events (e.g., earthquakes, volcanic eruptions, hot spots and mountain building) result from plate motion. (ES-8-10)</p> <p>11. Use models to analyze the size and shape of Earth, its surface and its interior (e.g., globes, topographic maps, satellite images). (ES-8-11)</p> <p>12. Explain that some processes involved in the rock cycle are directly related to thermal energy and forces in the mantle that drive plate motions. (ES-8-12)</p> <p>13. Describe how landforms are created through a combination of destructive (e.g., weathering and erosion) and constructive processes (e.g., crustal deformation, volcanic eruptions and deposition of sediment). (ES-8-13)</p> <p>14. Explain that folding, faulting and uplifting can rearrange the rock layers so the youngest is not always found on top. (ES-8-14)</p>	<p>Teaching Resources:</p> <p><u>Prentice Hall Science Textbook:</u></p> <ul style="list-style-type: none"> Exploring Planet Earth <p>Earth & Astronomical Activities Guide</p> <p>Earthquakes Resource Guide</p> <p>Volcanoes Activity Kit</p> <p>Bill Nye Videos</p> <p>Science World Magazine</p> <p>GeoBlox Kit</p> <p>Volcanoes Resource Guide</p> <p>GEMS: Convection [ES-8-9]</p> <p>GEMS: Dynamic Earth [ES-8-10] [ES-8-15]</p> <p>Web site: Class Zone</p> <p>United States Geological maps</p>
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	15. Illustrate how the three primary types of plate boundaries (transform, divergent and convergent) cause different landforms (e.g., mountains, volcanoes and ocean trenches). (ES-8-15)	
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Sub-Objective Activities to Meet Indicators		
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| <ul style="list-style-type: none">• Describe in comparative terms (e.g., oldest, youngest) the age of disturbed or undisturbed rock layers.• Explain how fossils provide important evidence of how life and environmental conditions have changed.• Compare and contrast convection currents in magma, air and water.• Analyze the theory of plate tectonics through investigation of the break-up of Pangaea.• Describe the stages of the break-up of Pangaea.• Investigate relationships between volcanoes and earthquakes to land formation and land deformation.• Compare and contrast various landforms (e.g., mountains, rivers, valleys, plateaus).• Describe the various layers of the earth.• Compare and contrast the destructive earth processes (e.g., weathering, erosion).• Compare and contrast constructive earth processes (e.g., volcanism, earthquakes, rifting, mountain building, glaciation).• Describe the effects of natural changes (e.g., earthquakes, volcanic eruptions, erosion) on human activities. | | |
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LAKWOOD UNIT: Waves

6 week unit

Physical Sciences Standard (PS)

Students demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world. This includes demonstrating an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter. In addition, it includes understanding the nature, transfer and conservation of energy; motion and the forces affecting motion; and the nature of waves and interactions of matter and energy. Students demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>C. Describe renewable and nonrenewable sources of energy (e.g., solar, wind, fossil fuels, biomass, hydroelectricity, geothermal and nuclear energy) and the management of these sources. (PS-C)</p>	<p><i>No indicators present for this benchmark (grade 6).</i></p>	
<p>D. Describe that energy takes many forms, some forms represent kinetic energy and some forms represent potential energy; and during energy transformations the total amount of energy remains constant. (PS-D)</p>	<p><u>Nature of Energy</u> 4. Demonstrate that waves transfer energy. (PS-8-4) 5. Demonstrate that vibrations in materials may produce waves that spread away from the source in all directions (e.g., earthquake waves and sound waves). (PS-8-5)</p>	<p>Teaching Resources: <u>Prentice Hall Science Textbook:</u> • Sound and Light MacMillan Worksheets: Light and Sound MacMillan Textbook: Physical Science Science Plus Text – Blue / S-Sections Bill Nye Videos Science Action Labs Workbook (Ed Schevick)</p>

LAKWOOD UNIT: Waves

6 week unit (continued)

Physical Sciences Standard (PS)

Students demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world. This includes demonstrating an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter. In addition, it includes understanding the nature, transfer and conservation of energy; motion and the forces affecting motion; and the nature of waves and interactions of matter and energy. Students demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

**Sub-Objective Activities
to Meet Indicators**

- Compare and contrast the behavior and properties of electromagnetic (light) and mechanical (sound) waves.
- Compare and contrast how different forms of wave energy are produced, transferred, and detected (i.e., the nature of wave motion).
- Define operationally, through experimentation:

Frequency	Speed
Pitch	Energy
Wavelength	Refraction
Amplitude (loudness)	Reflection
- Design experiments to demonstrate the interaction of waves with various phases of matter (i.e., solids, liquids, gases, and plasma).
- Predict the path of reflected or refracted waves.
- Demonstrate the relationship between frequency and pitch to the Doppler Effect.
- Compare and contrast the risks and benefits of the use of electromagnetic (e.g., x-rays, microwaves) or sound waves in everyday settings.
- Recognize relationships between light and sound and why we are able to see and hear
- Explore light and sound in everyday, relevant situations (e.g., simple optical devices, acoustical systems, waves in/on water, music, noise).
- Apply the Laws of Conservation of Matter and Energy to everyday situations.

LAKWOOD UNIT: Universe/Solar System

6 week unit

Earth and Space Sciences Standard (ES)

Students demonstrate an understanding about how Earth systems and processes interact in the geosphere resulting in the habitability of Earth. This includes demonstrating an understanding of the composition of the universe, the solar system and Earth. In addition, it includes understanding the properties and the interconnected nature of Earth’s systems, processes that shape Earth and Earth’s history. Students also demonstrate an understanding of how the concepts and principles of energy, matter, motion and forces explain Earth systems, the solar system and the universe. Finally, they grasp an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with Earth and space sciences.

Ohio Benchmarks 6-8

Grade Level Indicators

Teaching Resources

<p>A. Describe how the positions and motions of the objects in the universe cause predictable and cyclic events. (ES-A)</p>	<p><u>The Universe</u></p> <ol style="list-style-type: none"> 1. Describe how objects in the solar system are in regular and predictable motions that explain such phenomena as days, years, seasons, eclipses, tides and moon cycles. (ES-8-1) 2. Explain that gravitational force is the dominant force determining motions in the solar system and in particular keeps the planets in orbit around the sun. (ES-8-2) 3. Compare the orbits and composition of comets and asteroids with that of Earth. (ES-8-3) 4. Describe the effect that asteroids or meteoroids have when moving through space and sometimes entering planetary atmospheres (e.g., meteor-"shooting star" and meteorite). (ES-8-4) 	<p>Teaching Resources: <u>Prentice Hall Science Textbook:</u></p> <ul style="list-style-type: none"> • Exploring the Universe <p>Bill Nye Videos</p> <p>Astronomical Activity Workbook (Walker)</p> <p>Astronomy Guide (Moche)</p> <p>Conceptual Physics (Hewitt)</p> <p>NASA Glenn Engineer comes with microgravity demonstration [ES-8-2]</p> <p>NASA lithographs – Hubble Space Telescope [ES-8-5]</p>
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<p>B. Explain that the universe is composed of vast amounts of matter, most of which is at incomprehensible distances and held together by gravitational force. Describe how the universe is studied by the use of equipment such as telescopes, probes, satellites and spacecraft. (ES-B)</p>	<p><u>The Universe</u></p> <p>5. Explain that the universe consists of billions of galaxies that are classified by shape. (ES-8-5)</p> <p>6. Explain interstellar distances are measured in light years (e.g., the nearest star beyond the sun is 4.3 light years away). (ES-8-6)</p> <p>7. Examine the life cycle of a star and predict the next likely stage of a star. (ES-8-7)</p> <p>8. Name and describe tools used to study the universe (e.g., telescopes, probes, satellites and spacecraft). (ES-8-8)</p>	
<p>C. Describe interactions of matter and energy throughout the lithosphere, hydrosphere and atmosphere (e.g., water cycle, weather and pollution). (ES-C)</p>	<p><i>No indicators present for this benchmark (grade 7).</i></p>	
<p>D. Identify that the lithosphere contains rocks and minerals and that minerals make up rocks. Describe how rocks and minerals are formed and/or classified. (ES-D)</p>	<p><i>No indicators present for this benchmark (grade 6).</i></p>	

LAKWOOD UNIT: Universe/Solar System

6 week unit (continued)

Earth and Space Sciences Standard (ES)

Students demonstrate an understanding about how Earth systems and processes interact in the geosphere resulting in the habitability of Earth. This includes demonstrating an understanding of the composition of the universe, the solar system and Earth. In addition, it includes understanding the properties and the interconnected nature of Earth’s systems, processes that shape Earth and Earth’s history. Students also demonstrate an understanding of how the concepts and principles of energy, matter, motion and forces explain Earth systems, the solar system and the universe. Finally, they grasp an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with Earth and space sciences.

**Sub-Objective Activities
to Meet Indicators**

- Create models of planets and their satellites.
- Describe the motion of planets within our solar system.
- Demonstrate, through the use of models, distances between the planets (meter stick model).
- Compare and contrast meteors, comets, and asteroids.
- Simulate sun, earth and moon phenomena and arrangements through models.
- Recognize relationships among seasonal change, time, and the tilt of the earth’s axis, time of rotation and revolution, and orbital shape.
- Monitor sunrise and sunset to determine the amount of daylight over a period of time.
- Describe the effects of the tilt of the earth’s axis on seasons, climate, solstices, and equinoxes.
- Observe and record the phases of the moon over time (keep a month long calendar drawing shape of moon each night).
- Explain the effect of the phases of the moon on tidal patterns (e.g., neap tides, spring tides).
- Illustrate and explain lunar and solar eclipses.
- Research human efforts to explore the solar system, including significant aspects of space travel.