Curriculum Map: Science 8 - Physical Science

Course: PHYSICAL SCIENCE
Grade(s): 8

Course Description: This course focuses on the topics of chemistry and physics. Its overall objective is to prepare the middle school students for high school chemistry and physics. This course provides essential background information that will benefit the students at the high school level. The four main units taught in this course are properties of matter, chemistry, forces and motion, and environmental problems and solutions. The course introduces the students to such topics in chemistry as states of matter, atoms, chemical bonding, how to write chemical equations, and acids and bases. The course also introduces students to aspects of physics such as motion and forces, gas laws and behaviors, and dynamics of fluids such as buoyancy and hydraulics. Several instructional strategies will be utilized in the course including various formative assessments, small group instruction, lab activities, project based learning, and technology integration. After completing the course, students should be well prepared for further scientific investigations at the high school level.

Course Textbooks, Workbooks, Materials Citations: Textbook - Holt, Rhinehart, Winston: Holt Science and Technology - Physical Science copyright 2005.

Science Matters Inquiry Kit - Properties of Matter (STC)

Science Matters Inquiry Kit - Forces and Motion (FOSS)

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Unit: Unit 1: Properties of Matter

Unit/Module Description: The Properties of Matter unit focuses on the physical and chemical properties that characterize matter. Students examine several characteristic properties and investigate how these properties relate to pure substances and mixtures. Lessons on the scientific method, the metric system, energy, and heat will also be conducted in this unit. Students engage in a series of inquiries carefully designed to develop their understanding of these scientific topics.

Unit/Module Big Ideas: The scientific method is the basis for all scientific investigations and is the approach utilized to answer questions about the natural world.

The metric system is used for scientific measurements.

Matter has observable physical properties and the potential to mix and form new materials.

Energy is neither created nor destroyed. Energy can be transformed from one form to another, but transformation between forms often results in the loss of useable energy through the production of heat.

Unit/Module Essential Questions: How is energy transferred between objects and converted into different forms?

How do scientists identify and sort materials?

What are the differences between pure substances and mixtures?

How do energy transformations explain that energy is neither created nor destroyed?

Unit/Module Key Terminology & Definitions:

Science - the knowledge obtained by observing natural events and conditions in order to discover facts and formulate laws or principles that can be verified or tested

Physical science - the scientific study of nonliving matter

Scientific methods - a series of steps followed to solve problems

Observation - the process of obtaining information by using the senses

Hypothesis - an explanation that is based on prior scientific research or observations and can be tested

Data - any pieces of information acquired through observation or experimentation

Model - a pattern, plan, representation, or description designed to show the structure or workings of an object, system, or concept

Theory - an explanation that ties together many hypotheses and observations

Law - a summary of many experimental results and observations; a law tells how things work

Density - the ratio of the mass of a substance to the volume of a substance

Temperature - a measure of how hot (or cold) something is; specifically, a measure of the average kinetic energy of the particles in an object.

Matter - anything that has mass and takes up space

Meniscus - the curve at the liquid's surface by which one measures the volume of the liquid

Mass - a measure of the amount of matter in an object

Weight - a measure of the gravitational force exerted on an object; its value can change with the location of the object in the universe

Inertia - the tendency of an object to resist being moved or; if the object is moving; to resist a change in speed or direction until an outside force acts on the object

Physical property - a characteristic of a substance that does not involve a chemical change, such as density, color, or hardness

Density - the ratio of the mass of a substance to the volume of the substance

Physical change - a change of matter from one form to another without a change in chemical properties

Chemical property - a property of matter that describes a substance's ability to participate in chemical reactions

Chemical change - a change that occurs when one or more substances change into entirely new substances with different properties

Volume - a measure of the size of an object or region in three-dimensional space

States of matter - the physical forms of matter, which include solid, liquid, and gas

Solid - the state of matter in which the volume and shape of a substance are fixed

Liquid - the state of matter that has a definite volume but not a definite shape

Surface tension - the force that acts on the surface of a liquid and that tends to minimize the area of the surface

Viscosity - the resistance of a gas or liquid to flow

Gas - a form of matter that does not have a definite volume or shape

Pressure - the amount of force exerted per unit area of a surface

Boyle's law - the law that states that the volume of a gas is inversely proportional to the pressure of a gas when temperature is constant

Charles' law - the law that states that the volume of a gas is directly proportional to the temperature of a gas when pressure is constant

Change of state - the change of a substance from one physical state to another

Melting - the change of state in which a solid becomes a liquid by adding energy

Evaporation - the change of a substance from a liquid to a gas

Boiling - the conversion of a liquid to a vapor when the vapor pressure of the liquid equals the atmospheric pressure

Condensation - the change of state from a gas to a liquid

Sublimation - the process in which a solid changes directly into a gas

Element - a substance that cannot be separated or broken down into simpler substances by chemical means

Pure substance - a sample of matter, either a single element or a single compound, that has definite chemical and physical properties

Metal - an element that is shiny and that conducts heat and electricity well

Nonmetal - an element that conducts heat and electricity poorly

Metalloid - an element that has properties of both metals and nonmetals

Compound - a substance made up of atoms of two or more different elements joined by chemical bonds

Mixture - a combination of two or more substances that are not chemically combined

Solution - a homogenous mixture of two or more substances uniformly dispersed throughout a single phase

Solute - in a solution, the substance that dissolves in the solvent

Solvent - in a solution, the substance in which the solute dissolves

Concentration - the amount of a particular substance in a given quantity of a mixture, solution, or ore

Solubility - the ability of one substance to dissolve in another at a given temperature and pressure

Suspension - a mixture in which particles of a material are more or less evenly dispersed throughout a liquid or gas

Colloid - a mixture consisting of tiny particles that are intermediate in size between those in solutions and those in suspensions and that are suspended in a liquid, solid, or gas

Energy - the capacity to do work

Kinetic energy - the energy of an object that is due to the object's motion

Potential energy - the energy that an object has because of the position, shape, or condition, of the object

Mechanical energy - the amount of work an object can do because of the object's kinetic and potential energies.

Energy conversion - a change from one form of energy to another

Friction - a force that opposes motion between two surfaces that are in contact

Law of conservation of energy - the law that states that energy cannot be created or destroyed but can be changed from one form to another

Nonrenewable resource - a resource that forms at a rate that is much slower that the rate at which it is consumed

Fossil fuel - a nonrenewable energy resource formed from the remains of organisms that lived long ago

Renewable resource - a natural resource that can be replaced at the same rate at which the resource is consumed

Thermal expansion - an increase in the size of a substance in response to an increase in the temperature of substance

Absolute zero - the temperature at which molecular energy is at a minimum

Heat - the energy transferred between objects that are at different temperatures

Thermal energy - the kinetic energy of a substance's atoms

Thermal conduction - the transfer of energy as heat through a material

Thermal conductor - a material through which energy can be transferred as heat

Thermal insulator - a material that reduces or prevents the transfer of heat

Convection - the transfer of thermal energy by the circulation or movement of a liquid or gas

Radiation - the transfer of energy as electromagnetic waves

Unit/Module Student Learning Outcomes:

Concepts gained by the student:
Some physical properties that characterize matter include: density, melting point, boiling point, volume, and conductivity.
All matter can be classified as either a pure substance or a mixture.
Solutions, suspensions, and colloids are three types of mixtures which contain two or more pure substances that can be separated by physical means.
Factors that can affect the rate of a chemical change include temperature, concentration, nature of the reactant, and catalyst.
Changes in temperature are accompanied by changes in kinetic energy which can result in changes in the states of matter.
Changes in matter can be chemical, physical, or nuclear.
Matter exists naturally in 3 states on earth: solid, liquid, and gas.
Energy can be transferred thermally, mechanically, electrically or chemically in a system.
Energy is conserved (Law of conservation of energy).
Energy can take many different forms including mechanical, thermal, chemical, and electromagnetic.
Energy can be transferred thermally, mechanically, electrically or chemically in a system.
Heat energy is transferred between objects or regions by the process of convection, conduction, or radiation.

Competencies gained by the student:
Explain the importance of the International System of Units.
Identify the appropriate units to use for particular measurements.
Identify safety symbols.Explain that science involves asking questions.
Describe the relationship of matter and energy to physical science.
Describe the two branches of physical science.
Identify three areas of science that use physical science.
Explain what scientific methods are.
Explain how scientific methods are used to answer questions.
Describe how a hypothesis is formed and tested.
Identify methods that are used to analyze data.
Explain how a conclusion can support or disprove a hypothesis.
List methods of communicating data.
Identify tools used to collect and analyze data.
Describe the two properties of all matter.
Identify the units used to measure volume and mass.
Compare mass and weight.
Explain the relationship between mass and weight.
Identify six examples of physical properties of matter.
Describe how density is used to identify substances.
List six examples of physical changes.
Explain what happens to matter during a physical change.

Describe two examples of chemical properties.
Explain what happens during a chemical change.
Distinguish between physical and chemical changes.
Describe the properties shared by particles of all matter.
Describe three states of matter.
Explain the differences between the states of matter.
Describe how energy is involved its changes of state.
Describe what happens during melting and freezing.
Compare evaporation and condensation.
Explain what happens during sublimation.
Identify the two changes that can happen when a substance loses or gains energy.
Describe three factors that affect how gases behave.
Predict how a change in pressure or temperature will affect the volume of a gas.
Describe pure substances.
Describe the characteristics of elements, and give examples.
Explain how elements can be identified.
Classify elements according to their properties.
Explain how elements make up compounds.
Describe the properties of compounds.
Explain how a compound can be broken down into its elements.
Give examples of common compounds.
Describe three properties of mixtures.
Describe four methods of separating the parts of a mixture.
Analyze a solution in terms of its solute and solvent.
Explain how concentration affects a solution.
Describe the particles in a suspension.
Explain how a colloid differs from a solution and a suspension.
Explain the relationship between energy and work.
Compare kinetic and potential energy.
Describe the different forms of energy.
Describe an energy conversion.
Give examples of energy conversions for the different forms of energy.
Explain how energy conversions make energy useful.
Explain the role of machines in energy conversions.
Explain how energy is conserved within a closed system.
Explain the law of conservation of energy.
Give examples of how thermal energy is always a result of energy conversion.
Explain why perpetual motion is impossible.
Name several energy resources.
Explain how the sun is the source of most energy on Earth.
Evaluate the advantages and disadvantages of using various energy resources.
Describe how temperature relates to kinetic energy.
Compare temperature on different temperature scales.
Give examples of thermal expansion.
Define "heat" as thermal energy transferred between objects at different temperatures.
Compare conduction, convection, and radiation.

Unit/Module Student Performance Tasks:

1. Thumbwrestling Tournament Activity (Scientific Method lab)

2. Volume lab activity - 4 stations with 2 irregular objects and the rest cubes; calculate volume

3. Density lab - students find density for 8 different objects using triple beam balance, grad. cylinder, ruler, etc.

4. Surface tension lab activity - students determine drops of water on penny; investigate unique properties of liquids

5. Solubility of sugar cube lab

6. Chromatography lab

7. Making butter - students make a common colloid and explain its properties

8. Pendulum lab - determine PE and KE of a swinging pendulum and calculate rates

9. Hot vs. cold water lab - students determine amount of energy transfer in simple calorimeter

Unit/Module Materials:

Properties of Matter Science kit - STC from Science Matters
Classroom science materials

Unit/Module Assignments: Project - Renewable and Nonrenewable Resources Paper Slide Videos

STANDARDS

STATE: Pennsylvania State Anchors (2007)

S8.A.1.1.1 (Advanced)	Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/ information may change existing theories and practice.
S8.A.1.1.2 (Advanced)	Explain how certain questions can be answered through scientific inquiry and/or technological design.
S8.A.1.1.3 (Advanced)	Use evidence, such as observations or experimental results, to support inferences about a relationship.
S8.A.1.1.4 (Advanced)	Develop descriptions, explanations, predictions, and models using evidence.
S8.A.2.1.1 (Advanced)	Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.
S8.A.2.2.1 (Advanced)	Describe the appropriate use of instruments and scales to accurately measure time, mass, distance, volume, or temperature safely under a variety of conditions.
S8.A.2.2.2 (Advanced)	Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.
S8.C.1.1 (Advanced)	Explain concepts about the structure and properties (physical and chemical) of matter.
S8.C.1.1.1 (Advanced)	Explain the differences among elements, compounds, and mixtures.
S8.C.1.1.2 (Advanced)	Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).
S8.C.2.1 (Advanced)	Describe energy sources, transfer of energy, or conversion of energy.
S8.C.2.1.1 (Advanced)	Distinguish among forms of energy (e.g., electrical, mechanical, chemical, heat, light, sound, nuclear) and sources of energy (i.e., renewable and nonrenewable energy)
S8.C.2.1.2 (Advanced)	Explain how heat is transferred from one place to another through convection, conduction, or radiation.
S8.C.2.1.3 (Advanced)	Describe how one form of energy (e.g., electrical, mechanical, chemical, heat, light, sound, nuclear) can be converted into a different form of energy.
S8.C.2.2.1 (Advanced)	Describe the sun as a major source of energy that impacts on the environment.
S8.C.2.2.2 (Advanced)	Compare the time spans of renew-ability for fossil fuels and alternative fuels.
S8.C.3.1.2 (Advanced)	Distinguish between kinetic and potential energy.

Lesson Topic: The World of Physical Science

Core Lesson/Topic Description:	This lesson provides students with information on the steps of the scientific method and answers the question "What is physical science?" This lesson provides students with the key points of the metric system and compares different units of measurement. The prefixes and metric conversions will be introduced and practiced.
Core Lesson/Topic Big Ideas:	The scientific method is the basis for all scientific investigations and is the approach utilized to answer questions about the natural world. The metric system is used for scientific measurements.
Core Lesson/Topic Essential Questions:	How is physical science different from science? How is the metric system used in science? How does the scientific method work?
Core Lesson/Topic	Science - the knowledge obtained by observing natural events and conditions in order to discover facts and formulate laws or principles that can be verified or tested

Key Terminology & Definitions:	Physical science - the scientific study of nonliving matter Scientific methods - a series of steps followed to solve problems Observation - the process of obtaining information by using the senses Hypothesis - an explanation that is based on prior scientific research or observations and can be tested Data - any pieces of information acquired through observation or experimentation Model - a pattern, plan, representation, or description designed to show the structure or workings of an object, system, or concept Theory - an explanation that ties together many hypotheses and observations Law - a summary of many experimental results and observations; a law tells how things work
Core Lesson/Topic Student Learning Outcomes:	Concepts gained by the student: Some physical properties that characterize matter include: density, melting point, boiling point, volume, and conductivity. Competencies gained by the student: Explain the importance of the International System of Units. Identify the appropriate units to use for particular measurements. Identify safety symbols.Explain that science involves asking questions. Describe the relationship of matter and energy to physical science. Describe the two branches of physical science. Identify three areas of science that use physical science. Explain what scientific methods are. Explain how scientific methods are used to answer questions. Describe how a hypothesis is formed and tested. Identify methods that are used to analyze data. Explain how a conclusion can support or disprove a hypothesis. List methods of communicating data. Identify tools used to collect and analyze data.

Differentiated Instruction:	Content variation	Independent study	Pairs	Small group
Accommodations:	Assignment Variations Time Adjustment Extension	More Less Support Varied Outcomes	Strategy Variation	Technology
Enrichment/Extensions:	Increased Breadth of Study	Project Based Learning		
Summative Evaluations:	Chapter Test	Lab Completion	Unit Test	
Formative Assessments:	Anticipation Guide Exit Tickets Quiz	1 Sentence Summary Observation	Analogy Prompt Oral Questioning	Concept Mapping Quick Write
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors Presenting knowledge through nonlinguistic representations Cues, questions, and advanced organizers	Summarizing and note-taking Organizing students into cooperative learning groups Specific types of knowledge	Reinforcing effort, giving praise and providing recognition Setting objectives and providing feedback	Homework and practice Generating and testing hypotheses

Lesson Topic: Properties of Matter - Physical and Chemical

Core Lesson/Topic Description:	In this lesson students will learn what matter is and how it can be described. They will also learn that different types of matter have unique physical and chemical properties. The physical and chemical changes that matter can undergo are also discussed. It introduces students to the physical properties of matter. It also explains how density is used to identify different substances. The unit includes an explanation of what happens to matter during physical changes. Students will learn about the chemical properties of matter and how chemical properties differ from physical properties. They will also learn that when chemical changes occur to matter, new

substances are formed.

Core Lesson/Topic Big Ideas:

Matter has observable physical properties and the potential to mix and form new materials.

Core Lesson/Topic Essential Questions:

How do scientists identify and sort materials?

Core Lesson/Topic Key Terminology & Definitions:

Physical property - a characteristic of a substance that does not involve a chemical change, such as density, color, or hardness

Density - the ratio of the mass of a substance to the volume of the substance

Physical change - a change of matter from one form to another without a change in chemical properties

Chemical property - a property of matter that describes a substance's ability to participate in chemical reactions

Chemical change - a change that occurs when one or more substances change into entirely new substances with different properties

Volume - a measure of the size of an object or region in three-dimensional space

Core Lesson/Topic Student Learning Outcomes:

Concepts gained by the student:
Some physical properties that characterize matter include: density, melting point, boiling point, volume, and conductivity.
All matter can be classified as either a pure substance or a mixture.
Solutions, suspensions, and colloids are three types of mixtures which contain two or more pure substances that can be separated by physical means.
Changes in matter can be chemical, physical, or nuclear.
Matter exists naturally in 3 states on earth: solid, liquid, and gas.

Competencies gained by the student:
Describe the two properties of all matter.
Identify the units used to measure volume and mass.
Compare mass and weight.
Explain the relationship between mass and weight.
Identify six examples of physical properties of matter.
Describe how density is used to identify substances.
List six examples of physical changes.
Explain what happens to matter during a physical change.
Describe two examples of chemical properties.
Explain what happens during a chemical change.
Distinguish between physical and chemical changes.
Describe the properties shared by particles of all matter.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	Assignment Variations	More Less Support	Strategy Variation	Technology
	Time Adjustment Extension	Varied Outcomes		
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion		
Formative Assessments:	Observation	Exit Tickets	Analogy Prompt	1 Sentence Summary
	Anticipation Guide	Quiz	Think Pair Share	Oral Questioning
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and	Specific types of		

advanced organizers knowledge

Lesson Topic: States of Matter

Core Lesson/Topic Description:	This lesson introduces students to three common states of matter and the characteristics of each state. Students will learn how matter changes from one state to another. In this lessson students will learn how gases behave when subjected to changes in temperature and pressure. They will also learn about two important gas laws: Charles' and Boyle's Laws.
Core Lesson/Topic Big Ideas:	Matter has observable physical properties and the potential to mix and form new materials.
Core Lesson/Topic Essential Questions:	How do scientists identify and sort materials? Why are changes in matter accompanied by changes in energy?
Core Lesson/Topic Key Terminology & Definitions:	States of matter - the physical forms of matter, which include solid, liquid, and gas Solid - the state of matter in which the volume and shape of a substance are fixed Liquid - the state of matter that has a definite volume but not a definite shape Surface tension - the force that acts on the surface of a liquid and that tends to minimize the area of the surface Viscosity - the resistance of a gas or liquid to flow Gas - a form of matter that does not have a definite volume or shape Pressure - the amount of force exerted per unit area of a surface Boyle's law - the law that states that the volume of a gas is inversely proportional to the pressure of a gas when temperature is constant Charles' law - the law that states that the volume of a gas is directly proportional to the temperature of a gas when pressure is constant Change of state - the change of a substance from one physical state to another Melting - the change of state in which a solid becomes a liquid by adding energy Evaporation - the change of a substance from a liquid to a gas Boiling - the conversion of a liquid to a vapor when the vapor pressure of the liquid equals the atmospheric pressure Condensation - the change of state from a gas to a liquid Sublimation - the process in which a solid changes directly into a gas
Core Lesson/Topic Student Learning Outcomes:	**Concepts gained by the student:** **Matter exists naturally in 3 states on earth: solid, liquid, and gas.** **Competencies gained by the student:** Describe three states of matter. Explain the differences between the states of matter. Describe how energy is involved its changes of state. Describe what happens during melting and freezing. Compare evaporation and condensation. Explain what happens during sublimation. Identify the two changes that can happen when a substance loses or gains energy. Describe three factors that affect how gases behave. Predict how a change in pressure or temperature will affect the volume of a gas.
Differentiated Instruction:	Content variation Pairs Small group Assignment Variations More Less Support Strategy Variation Technology

Accommodations:	Time Adjustment Extension			
Adaptations/Modifications:	Participation Level	Technology		
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion		
Formative Assessments:	Anticipation Guide Observation Question and Answer	1 Sentence Summary Think Pair Share	Concept Mapping Quiz	Exit Tickets Oral Questioning
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations Cues, questions, and advanced organizers	Organizing students into cooperative learning groups Specific types of knowledge	Setting objectives and providing feedback	Generating and testing hypotheses

Lesson Topic: Elements, Compounds, and Mixtures

Core Lesson/Topic Description:	This lesson will help students learn about elements, compounds, and mixtures. Students will learn the properties of each classification of matter.
Core Lesson/Topic Big Ideas:	Matter has observable physical properties and the potential to mix and form new materials.
Core Lesson/Topic Essential Questions:	What are the differences between pure substances and mixtures?
Core Lesson/Topic Key Terminology & Definitions:	Element - a substance that cannot be separated or broken down into simpler substances by chemical means Pure substance - a sample of matter, either a single element or a single compound, that has definite chemical and physical properties Metal - an element that is shiny and that conducts heat and electricity well Nonmetal - an element that conducts heat and electricity poorly Metalloid - an element that has properties of both metals and nonmetals Compound - a substance made up of atoms of two or more different elements joined by chemical bonds Mixture - a combination of two or more substances that are not chemically combined Solution - a homogenous mixture of two or more substances uniformly dispersed throughout a single phase Solute - in a solution, the substance that dissolves in the solvent Solvent - in a solution, the substance in which the solute dissolves Concentration - the amount of a particular substance in a given quantity of a mixture, solution, or ore Solubility - the ability of one substance to dissolve in another at a given temperature and pressure Suspension - a mixture in which particles of a material are more or less evenly dispersed throughout a liquid or gas Colloid - a mixture consisting of tiny particles that are intermediate in size between those in solutions and those in suspensions and that are suspended in a liquid, solid, or gas

Core Lesson/Topic Student Learning Outcomes:	**Concepts gained by the student:** **All matter can be classified as either a pure substance or a mixture.** **Solutions, suspensions, and colloids are three types of mixtures which contain two or more pure substances that can be separated by physical means.** **Competencies gained by the student:** Describe pure substances. Describe the characteristics of elements, and give examples. Explain how elements can be identified. Classify elements according to their properties. Explain how elements make up compounds. Describe the properties of compounds. Explain how a compound can be broken down into its elements. Give examples of common compounds. Describe three properties of mixtures. Describe four methods of separating the parts of a mixture. Analyze a solution in terms of its solute and solvent. Explain how concentration affects a solution. Describe the particles in a suspension. Explain how a colloid differs from a solution and a suspension.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	Assignment Variations Time Adjustment Extension	More Less Support	Strategy Variation	Technology
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study	Independent Study	
Summative Evaluations:	Chapter Test	Lab Completion		
Formative Assessments:	Observation Quiz	Exit Tickets Think Pair Share	1 Sentence Summary Question and Answer	Anticipation Guide Oral Questioning
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: Energy and Energy Resources

Core Lesson/Topic Description:	This lesson will help students recognize energy in its different forms, learn how energy is measured, and learn how energy can be converted from one form to another.
Core Lesson/Topic Big Ideas:	Energy is neither created nor destroyed. Energy can be transformed from one form to another, but transformation between forms often results in the loss of useable energy through the production of heat.
Core Lesson/Topic Essential Questions:	How do energy transformations explain that energy is neither created nor destroyed? How is energy transferred between objects and converted into different forms?
Core Lesson/Topic Key Terminology & Definitions:	Energy - the capacity to do work Kinetic energy - the energy of an object that is due to the object's motion Potential energy - the energy that an object has because of the position, shape, or condition, of the object Mechanical energy - the amount of work an object can do because of the object's kinetic and

potential energies.

Energy conversion - a change from one form of energy to another

Friction - a force that opposes motion between two surfaces that are in contact

Law of conservation of energy - the law that states that energy cannot be created or destroyed but can be changed from one form to another

Nonrenewable resource - a resource that forms at a rate that is much slower that the rate at which it is consumed

Fossil fuel - a nonrenewable energy resource formed from the remains of organisms that lived long ago

Renewable resource - a natural resource that can be replaced at the same rate at which the resource is consumed

Core Lesson/Topic Student Learning Outcomes:

Concepts gained by the student:
Energy can be transferred thermally, mechanically, electrically or chemically in a system.
Energy is conserved (Law of conservation of energy).
Energy can take many different forms including mechanical, thermal, chemical, and electromagnetic.
Energy can be transferred thermally, mechanically, electrically or chemically in a system.

Competencies gained by the student:
Explain the relationship between energy and work.
Compare kinetic and potential energy.
Describe the different forms of energy.
Describe an energy conversion.
Give examples of energy conversions for the different forms of energy.
Explain how energy conversions make energy useful.
Explain the role of machines in energy conversions.
Explain how energy is conserved within a closed system.
Explain the law of conservation of energy.
Give examples of how thermal energy is always a result of energy conversion.
Explain why perpetual motion is impossible.
Name several energy resources.
Explain how the sun is the source of most energy on Earth.

Differentiated Instruction:	Content variation	Pairs	Small group	Teams
Accommodations:	Assignment Variations Time Adjustment Extension	More Less Support	Strategy Variation	Technology
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study	Project Based Learning	
Summative Evaluations:	Chapter Test	Lab Completion	Project Completion	
Formative Assessments:	1 Sentence Summary Journal Entry Question and Answer	Anticipation Guide Think Pair Share	Exit Tickets Quiz	Observation Oral Questioning
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: Heat and Heat Technology

Core

This lesson will help students learn about the nature of heat and thermal energy. The students

Lesson/Topic Description:	will learn about the difference between heat and temperature, relationships between matter and heat, and heat technology.
Core Lesson/Topic Big Ideas:	Energy is neither created nor destroyed. Energy can be transformed from one form to another, but transformation between forms often results in the loss of useable energy through the production of heat.
Core Lesson/Topic Essential Questions:	How is energy transferred between objects and converted into different forms?
Core Lesson/Topic Key Terminology & Definitions:	Thermal expansion - an increase in the size of a substance in response to an increase in the temperature of substance Absolute zero - the temperature at which molecular energy is at a minimum Heat - the energy transferred between objects that are at different temperatures Thermal energy - the kinetic energy of a substance's atoms Thermal conduction - the transfer of energy as heat through a material Thermal conductor - a material through which energy can be transferred as heat Thermal insulator - a material that reduces or prevents the transfer of heat Convection - the transfer of thermal energy by the circulation or movement of a liquid or gas Radiation - the transfer of energy as electromagnetic waves
Core Lesson/Topic Student Learning Outcomes:	**Concepts gained by the student:** **Heat energy is transferred between objects or regions by the process of convection, conduction, or radiation.** **Competencies gained by the student:** Describe how temperature relates to kinetic energy. Compare temperature on different temperature scales. Give examples of thermal expansion. Define "heat" as thermal energy transferred between objects at different temperatures. Compare conduction, convection, and radiation.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion	Unit Test	
Formative Assessments:	Anticipation Guide	1 Sentence Summary	Journal Entry	Observation
	Exit Tickets	Quiz	Think Pair Share	Oral Questioning
	Question and Answer			
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Unit: Unit 2 - Chemistry Unit

Unit/Module Description:	The Chemistry unit will discuss the development of the atomic theory over the years, from the prescientific ideas of Democritius through Dalton, Thompson, and Rutherford to modern

"electron cloud" theory. Then, the parts of the atom, including the forces that hold an atom together, are described and discussed. Students will learn about the periodic table of elements. It describes some of the history of the development of the table and describes characteristics of each group of elements on the table. It
will help students learn about chemical bonding. The unit describes how the valence electrons of atoms are involved in forming chemical bonds and describes the three kinds of chemical bonds; ionic, covalent, and metallic.
The unit will help them learn about chemical reactions. It describes what is involved in a chemical reaction, how chemical reactions are expressed, what the different kinds of chemical reactions are, and how energy and rates are involved in chemical reactions.
The unit also describes the properties and uses of acids and bases. Students will learn the properties of acids and bases and will learn about the uses of acids and bases.

Unit/Module Big Ideas:

Atomic theory is the foundation for the study of chemistry.
Periodic trends in the properties of atoms allow for the prediction of physical and chemical properties.
Chemical bonding occurs as a result of attractive forces between particles.
Changes in matter are accompanied by changes in energy.

Unit/Module Essential Questions:

What patterns in the properties of the elements contribute to the layout of the periodic table?

What factors determine the types of chemical bonds that form between particles?

Why are changes in matter accompanied by changes in energy?

In what ways has the theory of the atom changed over time due to technological improvements?

What factors determine the types of chemical bonds that form between particles?

How does the distribution of electrons in atoms affect the formation of a compound?

Unit/Module Key Terminology & Definitions:

Atom - the smallest unit of an element that maintains the properties of that element

Electron - a subatomic particle that has a negative charge

Nucleus - in physical science, an atom's central region, which is made up of protons and neutrons

Electron cloud - a region around the nucleus of an atom where electrons are likely to be found

Proton - a subatomic particle that has a positive charge and that is found in the nucleus of an atom

Atomic mass unit - a unit of mass that describes the mass of an atom or molecule

Neutron - a subatomic particle that has no charge and that is found in the nucleus of an atom

Atomic number - the number of protons in the nucleus of an atom; the atomic number is the same for all atoms of an element

Isotope - an atom that has the same number of protons (or the same atomic number) as other atoms of the same element do but that has a different number of neutrons (and thus a different atomic mass)

Mass number - the sum of the numbers of protons and neutrons in the nucleus of an atom

Atomic mass - the mass of an atom expressed in atomic units

Periodic - describes something that occurs or repeats at regular intervals

Periodic law - the law that states that the repeating chemical and physical properties of elements change periodically with the atomic numbers of the elements

Period - in chemistry, a horizontal row of elements in the periodic table

Group - a vertical column of elements in the periodic table; elements in a group share chemical properties

Alkali metal - one of the elements in Group 1 of the periodic table (lithium, sodium, potassium, rubidium, cesium, and francium)

Alkaline-earth metal - one of the elements of Group 2 of the periodic table (beryllium, magnesium, calcium, strontium, barium, and radium)

Halogen - one of the elements of Group 17 of the periodic table (fluorine, chlorine, bromine, iodine, and astatine); halogens combine with most metals to form salts

Noble gas - one of the elements of Group 18 of the periodic table (helium, neon, argon, krypton, xenon, and radon); noble gases are unreactive

Chemical bonding - the combining of atoms to form molecules or ionic compounds

Chemical bond - an interaction that holds atoms or ions together

Valence electrons - an electron that is found in the outermost shell of an atom and that determines the atom's chemical properties

Ionic bond - a bond that forms when electrons are transferred from one atom to another, which results in a positive ion and negative ion

Ion - a charged particle that forms when an atom or group of atoms gains or loses one or more electrons

Crystal lattice - the regular pattern in which a crystal is arranged

Covalent bond - a bond formed when atoms share one or more pairs of electrons

Molecule - the smallest unit of a substance that keeps all of the physical and chemical properties of that substance

Metallic bond - a bond formed by the attraction between positively charged metal ions and the electrons around them

Chemical reaction - the process by which one or more substances change to produce one or more different substances

Precipitate - a solid that is produced as a result of a chemical reaction in solution

Chemical formula - a combination of chemical symbols and numbers to represent a substance

Chemical equation - a representation of a chemical reaction that uses symbols to show the relationship between the reactants and the products

Reactant - a substance or molecule that participates in a chemical reaction

Product - the substance that forms in a chemical reaction

Law of conservation of mass - the law that states that mass cannot be created or destroyed in ordinary chemical and physical changes

Synthesis reaction - a reaction in which two or more substances combine to form a new compound

Decomposition reaction - a reaction in which a single compound breaks down to form two or more simpler substances

Single-displacement reaction - a reaction in which one element or radical takes the place of another element or radical in a compound

Double-displacement reaction - a reaction in which a gas, a solid precipitate, or a molecular compound forms from the exchange of ions between two compounds

Exothermic reaction - a chemical reaction in which heat is released to the surroundings

Endothermic reaction - a chemical reaction that requires heat

Law of conservation of energy - the law that states that energy cannot be created or destroyed but can be changed from one form to another

Activation energy - the minimum amount of energy required to start a chemical reaction

Inhibitor - a substance that slows down or stops a chemical reaction

Catalyst - a substance that changes the rate of a chemical reaction without being used up or changed much

Acid - any compound that increases the number of hydronium ions when dissolved in water

Indicator - a compound that can reversibly change color depending on the pH of the solution or other chemical change

Base - any compound that increases the number of hydoxide ions when dissolved in water

Neutralization reaction - the reaction of an acid and a base to form a neutral solution of water and a salt

pH - a value that is used to express the acidity or basicity (alkalinity) of a system

salt - an ionic compound that forms when a metal atom replaces the hydrogen of an acid

Unit/Module Student Learning Outcomes:

Concepts gained by the student:
According to the law of conservation of mass, a chemical change can be represented by a balanced chemical equation.
Atoms gain, share, or lose electrons to form chemical bonds.
Ionic bonds result from the transfer of electrons; covalent bonds result from the sharing of electrons.
Elements within the same family on the periodic table have similar chemical properties because of similar atomic structure.
Electrons occupy various energy levels within the atom, each of which can hold a maximum number of electrons.
The octet rule guides the formation of chemical bonds because atoms gain, share, or lose electrons to achieve stability.
All matter is made of atoms, which consist of protons, neutrons, and electrons that are identifiable by location, mass, and charge.

Competencies gained by the student:
Describe some of the experiments that led to the current atomic theory.
Compare the different models of the atom.
Explain how the atomic theory has changed as scientists have discovered new information about the atom.
Describe the size of the atom.
Name the parts of the atom.
Describe the relationship between numbers of protons and neutrons and atomic number.
State how isotopes differ.
Calculate atomic masses.
Describe the forces within an atom.
Describe how Mendeleev arranged elements in the first periodic table.
Explain how elements are arranged in the modern periodic table.
Compare metals, nonmetals, and metalloids based on their properties and on their location in the periodic table.
Describe the difference between a period and a group.
Explain why elements in a group often have similar properties.
Describe the properties of the elements in the groups of the periodic table.
Describe chemical bonding.
Identify the number of valence electrons in an atom.
Predict whether an atom is likely to form bonds.
Explain how ionic bonds form.
Describe how positive ions form.
Describe how negative ions form.
Explain why ionic compounds are neutral.
Explain how covalent bonds form.
Describe molecules.
Explain how metallic bonds form.
Describe the properties of metals.
Describe how chemical reactions produce new substances that have different chemical and physical properties.
Identify four signs that indicate that a chemical reaction might be taking place.

Explain what happens to chemical bonds during a chemical reaction.
Interpret and write simple chemical formulas.
Write and balance simple chemical equations.
Explain how a balanced equation show the law of conservation of mass.
Describe four types of chemical reactions.
Classify a chemical reaction as one of the four types of chemical reactions.
Compare exothermic and endothermic reactions.
Explain activation energy.
Interpret an energy diagram.
Describe the five factors that affect the rate of a reaction.
Describe four properties of acids.
Identify four uses of acids.
Describe four properties of bases.
Identify four uses of bases.
Explain the difference between strong acids and bases and weak acids and bases.
Identify acids and bases by using the pH scale.
Describe the formation and uses of salts.

Unit/Module Student Performance Tasks:

1. Periodic table project - students create a document highlighting the groups of the periodic table, facts, and color coding for each group.

2. Slime lab - students investigate a simple chemical reaction and identify products and reactants.

3. Acids and bases lab

4. pH lab - identify the basic procedures for testing a solution using pH equipment.

Unit/Module Materials:

Properties of Matter Science Matters Kit
Classroom science materials

Unit/Module Assignments:

Periodic Table Project

STANDARDS

STATE: Pennsylvania State Anchors (2007)

S8.A.1.1.2 (Advanced)	Explain how certain questions can be answered through scientific inquiry and/or technological design.
S8.A.1.1.3 (Advanced)	Use evidence, such as observations or experimental results, to support inferences about a relationship.
S8.A.2.1.1 (Advanced)	Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.
S8.A.2.1.3 (Advanced)	Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.
S8.A.2.1.4 (Advanced)	Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.
S8.C.1.1 (Advanced)	Explain concepts about the structure and properties (physical and chemical) of matter.
S8.C.1.1.3 (Advanced)	Identify and describe reactants and products of simple chemical reactions.

Lesson Topic: Introduction to the Atom

Core Lesson/Topic Description:

This lesson will discuss the development of the atomic theory over the years, from the prescientific ideas of Democritius through Dalton, Thompson, and Rutherford to modern "electron cloud" theory. Then, the parts of the atom, including the forces that hold an atom together, are described and discussed.

Core Lesson/Topic Big Ideas:

Atomic theory is the foundation for the study of chemistry.

Core Lesson/Topic Essential

In what ways has the theory of the atom changed over time due to technological improvements?

Questions:

Core Lesson/Topic Key Terminology & Definitions:

Atom - the smallest unit of an element that maintains the properties of that element

Electron - a subatomic particle that has a negative charge

Nucleus - in physical science, an atom's central region, which is made up of protons and neutrons

Electron cloud - a region around the nucleus of an atom where electrons are likely to be found

Proton - a subatomic particle that has a positive charge and that is found in the nucleus of an atom

Atomic mass unit - a unit of mass that describes the mass of an atom or molecule

Neutron - a subatomic particle that has no charge and that is found in the nucleus of an atom

Atomic number - the number of protons in the nucleus of an atom; the atomic number is the same for all atoms of an element

Isotope - an atom that has the same number of protons (or the same atomic number) as other atoms of the same element do but that has a different number of neutrons (and thus a different atomic mass)

Mass number - the sum of the numbers of protons and neutrons in the nucleus of an atom

Atomic mass - the mass of an atom expressed in atomic units

Core Lesson/Topic Student Learning Outcomes:

Concepts gained by the student:
All matter is made of atoms, which consist of protons, neutrons, and electrons that are identifiable by location, mass, and charge.

Competencies gained by the student:
Describe some of the experiments that led to the current atomic theory.
Compare the different models of the atom.
Explain how the atomic theory has changed as scientists have discovered new information about the atom.
Describe the size of the atom.
Name the parts of the atom.
Describe the relationship between numbers of protons and neutrons and atomic number.
State how isotopes differ.
Calculate atomic masses.
Describe the forces within an atom.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Summative Evaluations:	Chapter Test	Lab Completion		
Formative Assessments:	1 Sentence Summary	Anticipation Guide	Journal Entry	Quiz
	Think Pair Share	Exit Tickets	Observation	Oral Questioning
	Question and Answer			
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: The Periodic Table

Core Lesson/Topic Description:	In this lesson students will learn about the periodic table of elements. It describes some of the history of the development of the table and describes characteristics of each group of elements on the table.
Core Lesson/Topic Big Ideas:	Periodic trends in the properties of atoms allow for the prediction of physical and chemical properties.
Core Lesson/Topic Essential Questions:	What patterns in the properties of the elements contribute to the layout of the periodic table?
Core Lesson/Topic Key Terminology & Definitions:	Periodic - describes something that occurs or repeats at regular intervals Periodic law - the law that states that the repeating chemical and physical properties of elements change periodically with the atomic numbers of the elements Period - in chemistry, a horizontal row of elements in the periodic table Group - a vertical column of elements in the periodic table; elements in a group share chemical properties Alkali metal - one of the elements in Group 1 of the periodic table (lithium, sodium, potassium, rubidium, cesium, and francium) Alkaline-earth metal - one of the elements of Group 2 of the periodic table (beryllium, magnesium, calcium, strontium, barium, and radium) Halogen - one of the elements of Group 17 of the periodic table (fluorine, chlorine, bromine, iodine, and astatine); halogens combine with most metals to form salts Noble gas - one of the elements of Group 18 of the periodic table (helium, neon, argon, krypton, xenon, and radon); noble gases are unreactive
Core Lesson/Topic Student Learning Outcomes:	Concepts gained by the student: **Elements within the same family on the periodic table have similar chemical properties because of similar atomic structure.** Competencies gained by the student: Describe how Mendeleev arranged elements in the first periodic table. Explain how elements are arranged in the modern periodic table. Compare metals, nonmetals, and metalloids based on their properties and on their location in the periodic table. Describe the difference between a period and a group. Explain why elements in a group often have similar properties. Describe the properties of the elements in the groups of the periodic table.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion	Project Completion	
Formative Assessments:	1 Sentence Summary	Anticipation Guide	Oral Questioning	Question and Answer
	Observation	Exit Tickets	Quiz	Think Pair Share
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and	Specific types of		

advanced organizers knowledge

Lesson Topic: Chemical Bonding

Core Lesson/Topic Description:	This lesson will help students learn about chemical bonding. The unit describes how the valence electrons of atoms are involved in forming chemical bonds and describes the three kinds of chemical bonds; ionic, covalent, and metallic.
Core Lesson/Topic Big Ideas:	Chemical bonding occurs as a result of attractive forces between particles.
Core Lesson/Topic Essential Questions:	What factors determine the types of chemical bonds that form between particles?
Core Lesson/Topic Key Terminology & Definitions:	Chemical bonding - the combining of atoms to form molecules or ionic compounds Chemical bond - an interaction that holds atoms or ions together Valence electrons - an electron that is found in the outermost shell of an atom and that determines the atom's chemical properties Ionic bond - a bond that forms when electrons are transferred from one atom to another, which results in a positive ion and negative ion Ion - a charged particle that forms when an atom or group of atoms gains or loses one or more electrons Crystal lattice - the regular pattern in which a crystal is arranged Covalent bond - a bond formed when atoms share one or more pairs of electrons Molecule - the smallest unit of a substance that keeps all of the physical and chemical properties of that substance Metallic bond - a bond formed by the attraction between positively charged metal ions and the electrons around them
Core Lesson/Topic Student Learning Outcomes:	Concepts gained by the student: **The octet rule guides the formation of chemical bonds because atoms gain, share, or lose electrons to achieve stability.** **Atoms gain, share, or lose electrons to form chemical bonds.** **Ionic bonds result from the transfer of electrons; covalent bonds result from the sharing of electrons.** Competencies gained by the student: Describe chemical bonding. Identify the number of valence electrons in an atom. Predict whether an atom is likely to form bonds. Explain how ionic bonds form. Describe how positive ions form. Describe how negative ions form. Explain why ionic compounds are neutral. Explain how covalent bonds form. Describe molecules. Explain how metallic bonds form. Describe the properties of metals.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion		
Formative Assessments:	1 Sentence Summary Quiz Oral Questioning	Anticipation Guide Exit Tickets	Journal Entry Observation	Think Pair Share Question and Answer
	Identifying Similarities and Differences,	Summarizing and note-taking	Reinforcing effort, giving praise and providing	Homework and practice

Data-Based Instructional Practices:	Comparing, Contrasting, Classifying, Analogies, Metaphors		recognition	
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: Chemical Reactions

Core Lesson/Topic Description:	The unit will help students learn about chemical reactions. It describes what is involved in a chemical reaction, how chemical reactions are expressed, what the different kinds of chemical reactions are, and how energy and rates are involved in chemical reactions.
Core Lesson/Topic Big Ideas:	Changes in matter are accompanied by changes in energy.
Core Lesson/Topic Essential Questions:	How does the distribution of electrons in atoms affect the formation of a compound? Why are changes in matter accompanied by changes in energy?
Core Lesson/Topic Key Terminology & Definitions:	Chemical reaction - the process by which one or more substances change to produce one or more different substances Precipitate - a solid that is produced as a result of a chemical reaction in solution Chemical formula - a combination of chemical symbols and numbers to represent a substance Chemical equation - a representation of a chemical reaction that uses symbols to show the relationship between the reactants and the products Reactant - a substance or molecule that participates in a chemical reaction Product - the substance that forms in a chemical reaction Law of conservation of mass - the law that states that mass cannot be created or destroyed in ordinary chemical and physical changes Synthesis reaction - a reaction in which two or more substances combine to form a new compound Decomposition reaction - a reaction in which a single compound breaks down to form two or more simpler substances Single-displacement reaction - a reaction in which one element or radical takes the place of another element or radical in a compound Double-displacement reaction - a reaction in which a gas, a solid precipitate, or a molecular compound forms from the exchange of ions between two compounds Exothermic reaction - a chemical reaction in which heat is released to the surroundings Endothermic reaction - a chemical reaction that requires heat Law of conservation of energy - the law that states that energy cannot be created or destroyed but can be changed from one form to another Activation energy - the minimum amount of energy required to start a chemical reaction Inhibitor - a substance that slows down or stops a chemical reaction Catalyst - a substance that changes the rate of a chemical reaction without being used up or changed much
Core Lesson/Topic Student Learning Outcomes:	**Concepts gained by the student:** According to the law of conservation of mass, a chemical change can be represented by a balanced chemical equation. **Competencies gained by the student:** Describe how chemical reactions produce new substances that have different chemical and

	physical properties. Identify four signs that indicate that a chemical reaction might be taking place. Explain what happens to chemical bonds during a chemical reaction. Interpret and write simple chemical formulas. Write and balance simple chemical equations. Explain how a balanced equation show the law of conservation of mass. Describe four types of chemical reactions. Classify a chemical reaction as one of the four types of chemical reactions. Compare exothermic and endothermic reactions. Explain activation energy. Interpret an energy diagram. Describe the five factors that affect the rate of a reaction.			
Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion		
Formative Assessments:	1 Sentence Summary	Journal Entry	Anticipation Guide	Oral Questioning
	Problem Solving Observation	Question and Answer	Observation	Exit Tickets
	Quiz	Think Pair Share		
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: Acids and Bases

Core Lesson/Topic Description:	The unit describes the properties and uses of acids and bases. Students will learn the properties of acids and bases and will learn about the uses of acids and bases.
Core Lesson/Topic Big Ideas:	Changes in matter are accompanied by changes in energy.
Core Lesson/Topic Essential Questions:	Why are changes in matter accompanied by changes in energy? How does the distribution of electrons in atoms affect the formation of a compound?
Core Lesson/Topic Key Terminology & Definitions:	Acid - any compound that increases the number of hydronium ions when dissolved in water Indicator - a compound that can reversibly change color depending on the pH of the solution or other chemical change Base - any compound that increases the number of hydoxide ions when dissolved in water Neutralization reaction - the reaction of an acid and a base to form a neutral solution of water and a salt pH - a value that is used to express the acidity or basicity (alkalinity) of a system salt - an ionic compound that forms when a metal atom replaces the hydrogen of an acid
Core Lesson/Topic Student Learning	**Competencies gained by the student:** Describe four properties of acids. Identify four uses of acids. Describe four properties of bases.

Outcomes:	Identify four uses of bases. Explain the difference between strong acids and bases and weak acids and bases. Identify acids and bases by using the pH scale. Describe the formation and uses of salts.			
Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion	Unit Test	
Formative Assessments:	1 Sentence Summary	Anticipation Guide	Think Pair Share	Exit Tickets
	Observation	Question and Answer	Oral Questioning	
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Unit: Unit 3 - Force and Motion

Unit/Module Description: Students will learn how to calculate momentum and will study the law of conservation of momentum.This unit will help students learn about fluids and the forces caused by fluids, including lift, buoyant force, and drag. Students also learn about pressure and the factors that affect flight. The unit also investigates linear motion, including position and several aspects of change of position—distance, displacement, speed, velocity, and acceleration. They investigate fundamental forces (gravity and electromagnetism) in familiar environments, such as pushes, pulls, impacts, and falls. Interaction and outcomes are represented graphically to help students think mathematically about their observations. Investigations of opposing forces and additive forces help students develop the idea that a net force on an object produces motion. Students acquire the most fundamental and important understanding about the interplay between force and motion.

Unit/Module Big Ideas: Forces can act upon an object to change the position, direction, and/or speed of its motion.
An object's motion is the result of all forces acting on it.

Unit/Module Essential Questions: What causes objects to move?

How are the forces acting on an object related to its motion?

Unit/Module Key Terminology & Definitions: Motion - an object's change in position relative to a reference point

Speed - the distance traveled divided by the time interval during which the motion occurred

Velocity - the speed of an object in a particular direction

Acceleration - the rate at which velocity changes over time; an object accelerates if its speed, direction, or both change

Force - a push or pull exerted on an object to change the motion of the object; force has size and direction

Newton - the SI unit for force (symbol, N)

Net force - the combination of all of the forces acting on an object

Friction - a force that opposes motion between two surfaces that are in contact

Gravity - a force of attraction between objects that is due to their masses

Weight - a measure of the gravitational force exerted on an object; its value can change with the location of the object in the universe

Mass - a measure of the amount of matter in an object

Terminal velocity - the constant velocity of a falling object when the force of air resistance is equal in magnitude and opposite in direction to the force of gravity

Free fall - the motion of a body when only the force of gravity is acting on the body

Projectile motion - the curved path that an object follows when thrown, launched, or otherwise projected near the surface of the earth

Inertia - the tendency of an object to resist being moved or, if the object is moving, to resist a change in speed or direction until an outside force acts on the object

Momentum - a quantity defined as the product of the mass and velocity of an object

Fluid - a nonsolid state of matter in which the atoms or molecules are free to move past each other, as in a gas or liquid

Pressure - the amount of force exerted per unit area of a surface

Pascal - the SI unit of pressure (symbol, Pa)

Atmospheric pressure - the pressure caused by the weight of the atmosphere

Buoyant force - the upward force that keeps an object immersed in or floating on a liquid

Archimedes' Principle - the principle that states that the buoyant force on an object in a fluid is an upward force equal to the weight of the volume of fluid that the object displaces

Bernoulli's principle - the principle that states that the pressure in a fluid decreases as the fluid's velocity increases

Lift - an upward force on an object that moves in a fluid

Thrust - the pushing or pulling force exerted by the engine of an aircraft or rocket

Drag - a force parallel to the velocity of the flow; it opposes the direction of an aircraft and, in combination with thrust, determines the speed of the aircraft

Pascal's principle - the principle that states that a fluid in equilibrium contained in a vessel exerts a pressure of equal intensity in all directions

Unit/Module Student Learning Outcomes:

Concepts gained by the student:
Models and graphs can be used to determine the presence or absence of unbalanced forces.
Weight is the result of the earth's gravitational force acting upon an object's mass.
The motion of an object can be described by its position, direction and speed.
The property inertia is an object's resistance to a change in its motion.
Pushes, pulls, friction, and gravity are forces that can act upon an object to change its position, direction, and/or speed.
Newton's three laws of motion can be used to explain and measure the motion of objects.

Competencies gained by the student:
Describe how fluids exert pressure.
Analyze how atmospheric pressure varies with depth.
Explain how depth and density affect water pressure.
Give examples of fluids flowing from higher to lower pressure.
Explain the relationship between fluid pressure and buoyant force.
Predict whether an object will float or sink in a fluid.
Analyze the role of density in an object's ability to float.
Explain how the overall density of an object can be changed.
Describe the relationship between pressure and fluid speed.

Analyze the roles of lift, thrust, and wing size in flight.
Explain Pascal's principle.
Describe drag and explain how it affects lift.
Describe the motion of an object by the position of the object in relation to a reference point.
Identify the two factors that determine speed.
Explain the difference between speed and velocity.
Analyze the relationship between velocity and acceleration.
Demonstrate that changes in motion can be measured and represented on a graph.
Describe forces, and explain how forces act on objects.
Determine the net force when more than one force is acting on an object.
Compare balanced and unbalanced forces.
Describe ways that unbalanced forces cause changes in motion.
Explain why friction occurs.
List the two types of friction and give examples of each type.
Explain how friction can be both harmful and helpful.
Describe gravity and its effect on matter.
Explain the law of universal gravitation
Describe the difference between mass and weight.
Explain the effects of gravity and air resistance on falling objects.
Explain why objects in orbit are in free fall and appear to be weightless.
Describe how projectile motion is affected by gravity.
Describe Newton's first law of motion, and explain how it relates to objects at rest and objects in motion.
State Newton's second law of motion, and explain the relationship between force, mass, and acceleration.
State Newton's third law of motion, and give examples of force pairs.
Calculate the momentum of moving objects.
Explain the law of conservation of momentum.

Unit/Module Student Performance Tasks:

1. Fluids, Forces, and Floating lab - determine bouyant force needed to suspend a vessel.

2. Domino Lab - calculate motion and speed of falling dominos

3. House of Cards Lab Activity - forces in building a house of cards with mimimum materials.

4. Acceleration Lab - calculate walking vs. running to demonstrate acceleration; calculating head starts needed in a run/walk race.

5. Dot car Lab - calculating acceleration of car moving down ramps with different elevations.

Unit/Module Materials:

Forces and Motion Science Matters Kit
Classroom science materials

Unit/Module Assignments:

Project - Egg Drop Final Lab Experiment: students work cooperatively to construct a vehicle to support an egg and sustain a freefall to Earth from a predetermined elevation.

STANDARDS

STATE: Pennsylvania State Anchors (2007)

S8.A.1.1 (Advanced)	Explain, interpret and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).
S8.A.1.1.1 (Advanced)	Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/ information may change existing theories and practice.
S8.A.1.1.2 (Advanced)	Explain how certain questions can be answered through scientific inquiry and/or technological design.
S8.A.1.2.1 (Advanced)	Describe the positive and negative, intended and unintended, effects of specific scientific results or technological developments (e.g., air/space travel, genetic engineering, nuclear fission/fusion, artificial intelligence, lasers, organ transplants)
S8.A.1.2.3 (Advanced)	Describe fundamental scientific or technological concepts that could solve practical problems (e.g., Newton’s Laws of motion, Mendelian genetics, mechanical advantage)
S8.A.2.1 (Advanced)	Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.

S8.A.2.1.3 (Advanced)	Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.
S8.A.2.1.5 (Advanced)	Use evidence from investigations to clearly communicate and support conclusions.
S8.A.2.1.6 (Advanced)	Identify a design flaw in a simple technological system and devise possible working solutions.
S8.A.3.1.3 (Advanced)	Distinguish between system inputs, system processes, system outputs, and feedback (e.g., physical, ecological, biological, informational).
S8.A.3.2.2 (Advanced)	Describe how engineers use models to develop new and improved technologies to solve problems.
S8.C.3.1 (Advanced)	Describe the effect of multiple forces on the movement, speed, or direction of an object.
S8.C.3.1.1 (Advanced)	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced, inertia, momentum).
S8.C.3.1.3 (Advanced)	Explain that the mechanical advantages produced by simple machines helps to do work (physics) by either overcoming a force or changing the direction of the applied force.

Lesson Topic: Forces and Fluids

Core Lesson/Topic Description:	Students will learn how to calculate momentum and will study the law of conservation of momentum.This unit lesson help students learn about fluids and the forces caused by fluids, including lift, buoyant force, and drag. Students also learn about pressure and the factors that affect flight.
Core Lesson/Topic Big Ideas:	Forces can act upon an object to change the position, direction, and/or speed of its motion. An object's motion is the result of all forces acting on it.
Core Lesson/Topic Essential Questions:	What causes objects to move? How are the forces acting on an object related to its motion?
Core Lesson/Topic Key Terminology & Definitions:	Fluid - a nonsolid state of matter in which the atoms or molecules are free to move past each other, as in a gas or liquid Pressure - the amount of force exerted per unit area of a surface Pascal - the SI unit of pressure (symbol, Pa) Atmospheric pressure - the pressure caused by the weight of the atmosphere Buoyant force - the upward force that keeps an object immersed in or floating on a liquid Archimedes' Principle - the principle that states that the buoyant force on an object in a fluid is an upward force equal to the weight of the volume of fluid that the object displaces Bernoulli's principle - the principle that states that the pressure in a fluid decreases as the fluid's velocity increases Lift - an upward force on an object that moves in a fluid Thrust - the pushing or pulling force exerted by the engine of an aircraft or rocket Drag - a force parallel to the velocity of the flow; it opposes the direction of an aircraft and, in combination with thrust, determines the speed of the aircraft Pascal's principle - the principle that states that a fluid in equilibrium contained in a vessel exerts a pressure of equal intensity in all directions
Core Lesson/Topic Student Learning Outcomes:	**Competencies gained by the student:** Describe how fluids exert pressure. Analyze how atmospheric pressure varies with depth. Explain how depth and density affect water pressure. Give examples of fluids flowing from higher to lower pressure. Explain the relationship between fluid pressure and buoyant force. Predict whether an object will float or sink in a fluid.

Analyze the role of density in an object's ability to float.
Explain how the overall density of an object can be changed.
Describe the relationship between pressure and fluid speed.
Analyze the roles of lift, thrust, and wing size in flight.
Explain Pascal's principle.
Describe drag and explain how it affects lift.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Chapter Test	Lab Completion		
Formative Assessments:	1 Sentence Summary	Anticipation Guide	Oral Questioning	Question and Answer
	Observation	Exit Tickets	Think Pair Share	
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: Motion and Forces

Core Lesson/Topic Description:

This lesson investigates linear motion, including position and several aspects of change of position—distance, displacement, speed, velocity, and acceleration. Students investigate fundamental forces (gravity and electromagnetism) in familiar environments, such as pushes, pulls, impacts, and falls. Interaction and outcomes are represented graphically to help students think mathematically about their observations. Investigations of opposing forces and additive forces help students develop the idea that a net force on an object produces motion. An object in motion has momentum, which is conserved. Students acquire the most fundamental and important understanding about the interplay between force and motion.

Core Lesson/Topic Big Ideas:

Forces can act upon an object to change the position, direction, and/or speed of its motion.
An object's motion is the result of all forces acting on it.

Core Lesson/Topic Essential Questions:

What causes objects to move?

How are the forces acting on an object related to its motion?

Core Lesson/Topic Key Terminology & Definitions:

Motion - an object's change in position relative to a reference point

Speed - the distance traveled divided by the time interval during which the motion occurred

Velocity - the speed of an object in a particular direction

Acceleration - the rate at which velocity changes over time; an object accelerates if its speed, direction, or both change

Force - a push or pull exerted on an object to change the motion of the object; force has size and direction

Newton - the SI unit for force (symbol, N)

Net force - the combination of all of the forces acting on an object

Friction - a force that opposes motion between two surfaces that are in contact

Gravity - a force of attraction between objects that is due to their masses

Weight - a measure of the gravitational force exerted on an object; its value can change with the location of the object in the universe

Mass - a measure of the amount of matter in an object

Core Lesson/Topic Student Learning Outcomes:

Concepts gained by the student:
Models and graphs can be used to determine the presence or absence of unbalanced forces.
Weight is the result of the earth's gravitational force acting upon an object's mass.
The motion of an object can be described by its position, direction and speed.
The property inertia is an object's resistance to a change in its motion.

Competencies gained by the student:
Describe the motion of an object by the position of the object in relation to a reference point.
Identify the two factors that determine speed.
Explain the difference between speed and velocity.
Analyze the relationship between velocity and acceleration.
Demonstrate that changes in motion can be measured and represented on a graph.
Describe forces, and explain how forces act on objects.
Determine the net force when more than one force is acting on an object.
Compare balanced and unbalanced forces.
Describe ways that unbalanced forces cause changes in motion.
Explain why friction occurs.
List the two types of friction and give examples of each type.
Explain how friction can be both harmful and helpful.

Differentiated Instruction:	Content variation	Pairs	Small group	
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study		
Summative Evaluations:	Lab Completion			
Formative Assessments:	Exit Tickets	Journal Entry	Observation	Anticipation Guide
	1 Sentence Summary	Think Pair Share	Quiz	Oral Questioning
	Problem Solving Observation			
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: Newton's Laws of Motion and Momentum

Core Lesson/Topic Description:

This lesson investigates linear motion, including position and several aspects of change of position—distance, displacement, speed, velocity, and acceleration. Students investigate fundamental forces (gravity and electromagnetism) in familiar environments, such as pushes, pulls, impacts, and falls. Interaction and outcomes are represented graphically to help students think mathematically about their observations. Investigations of opposing forces and additive forces help students develop the idea that a net force on an object produces motion. An object in motion has momentum, which is conserved. Students acquire the most fundamental and important understanding about the interplay between force and motion.

Core Lesson/Topic Big Ideas:

Forces can act upon an object to change the position, direction, and/or speed of its motion.
An object's motion is the result of all forces acting on it.

Core Lesson/Topic Essential Questions:	What causes objects to move? How are the forces acting on an object related to its motion?
Core Lesson/Topic Key Terminology & Definitions:	Terminal velocity - the constant velocity of a falling object when the force of air resistance is equal in magnitude and opposite in direction to the force of gravity Free fall - the motion of a body when only the force of gravity is acting on the body Projectile motion - the curved path that an object follows when thrown, launched, or otherwise projected near the surface of the earth Inertia - the tendency of an object to resist being moved or, if the object is moving, to resist a change in speed or direction until an outside force acts on the object Momentum - a quantity defined as the product of the mass and velocity of an object
Core Lesson/Topic Student Learning Outcomes:	**Concepts gained by the student:** **Pushes, pulls, friction, and gravity are forces that can act upon an object to change its position, direction, and/or speed.** **Newton's three laws of motion can be used to explain and measure the motion of objects.** **Competencies gained by the student:** Describe gravity and its effect on matter. Explain the law of universal gravitation Describe the difference between mass and weight. Explain the effects of gravity and air resistance on falling objects. Explain why objects in orbit are in free fall and appear to be weightless. Describe how projectile motion is affected by gravity. Describe Newton's first law of motion, and explain how it relates to objects at rest and objects in motion. State Newton's second law of motion, and explain the relationship between force, mass, and acceleration. State Newton's third law of motion, and give examples of force pairs. Calculate the momentum of moving objects. Explain the law of conservation of momentum.

Differentiated Instruction:	Content variation	Pairs	Small group	Teams
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study	Project Based Learning	
Summative Evaluations:	Chapter Test	Lab Completion	Project Completion	Unit Test
Formative Assessments:	Anticipation Guide	Observation	Journal Entry	Exit Tickets
	Quiz	Think Pair Share	Problem Solving Observation	Question and Answer
	Oral Questioning			
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Unit: Unit 4 - Environmental Problems and Solutions

Unit/Module Description:	In this unit students will investigate various environmental problems (i.e. pollution) and solutions (i.e. recycling) and how they affect the Earth and the well being of life on it. The unit also provides information on the impacts humans have on the environment and what is being done to conserve natural resources.

Unit/Module Big Ideas:

Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.
The health of all living things is directly related to the quality of the environment.
People acting individually and/or as groups influence the environment.

Unit/Module Essential Questions:

How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

How does the quality of the environment affect the health of all living things within it?

How do humans influence the environment?

Unit/Module Key Terminology & Definitions:

Pollution - an unwanted change in the enevironment caused by substances or forms of energy

Renewable Resource - a natural resource that can be replaced at the same rate at which the resource is consumed

Nonrenewable Resource - a resource that forms at a rate that is much slower than the rate at which it is consumed

Overpopulation - the presence of too many individuals in an area for the available resources

Biodiversity - the number and variety of organisms in a given area during a specific period of time

Conservation - the preservation and wise use of natural resources

Recycling - the process of recovering valuable or useful materials from waste or scrap

Unit/Module Student Learning Outcomes:

Concepts gained by the student:
Sustainable use of natural resources is essential for the survival of humans and other organisms.
Recycling and waste management have an effect on the available resources.
Resources are either renewable or nonrenewable.
Technological advancements impact our use of resources.

Competencies gained by the student:
List five kinds of pollutants.
Distinguish between renewable and nonrenewable resources.
Describe the impact of exotic species.
Explain why human population growth has increased.
Describe how habitat destruction affects biodiversity.
Give two examples of how pollution affects humans.
Explain the importance of conservation.
Describe the three R's.
Explain how biodiversity can be maintained.
List five environmental strategies.

Unit/Module Student Performance Tasks:

Paper Slide Video - Identify one environmental problem and solution and make a presentation using slides.

Unit/Module Materials:

Flip video cameras
Classroom science materials
Short course environmental textbook; Chapter 4
Laptop cart with printer and internet access

Unit/Module Assignments:

Paper Slide Video - Identify one environmental problem and solution and make a presentation using slides.

STANDARDS

STATE: Pennsylvania State Anchors (2007)

S8.A.1.2 (Advanced)	Identify and explain the impacts of applying scientific, environmental, or technological knowledge to address solution to practical problems.

S8.A.1.2.1 (Advanced)	Describe the positive and negative, intended and unintended, effects of specific scientific results or technological developments (e.g., air/space travel, genetic engineering, nuclear fission/fusion, artificial intelligence, lasers, organ transplants)
S8.A.1.2.2 (Advanced)	Identify environmental issues and explain their potential long-term health effects (e.g., pollution, pest controls, vaccinations).
S8.A.1.3 (Advanced)	Identify evidence that certain variables may have caused measurable changes in natural or human-made systems.
S8.A.1.3.4 (Advanced)	Given a scenario, explain how a dynamically changing environment provides for the sustainability of living systems.
S8.B.3.2.3 (Advanced)	Describe the response of organisms to environmental changes (e.g., changes in climate, hibernation, migration, coloration) and how those changes affect survival.
S8.B.3.3 (Advanced)	Explain how renewable and nonrenewable resources provide for human needs or how these needs impact the environment.
S8.B.3.3.1 (Advanced)	Explain how human activities may affect local, regional, and global environments.
S8.B.3.3.3 (Advanced)	Describe how waste management affects the environment (e.g., recycling, composting, landfills, incineration, sewage treatment).
S8.C.2.2 (Advanced)	Compare the environmental impact of different energy sources chosen to support human endeavors.
S8.C.2.2.3 (Advanced)	Describe the waste (i.e., quantity, kind, and potential to cause environmental impacts) derived from the use of renewable and nonrenewable energy sources and their potential impact on the environment.

Lesson Topic: Environmental Problems

Core Lesson/Topic Description:	In this lesson students will investigate various environmental problems (i.e. pollution) and solutions (i.e. recycling) and how they affect the Earth and the well being of life on it. The lesson also provides information on the impacts humans have on the environment and what is being done to conserve natural resources.
Core Lesson/Topic Big Ideas:	Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future. The health of all living things is directly related to the quality of the environment. People acting individually and/or as groups influence the environment.
Core Lesson/Topic Essential Questions:	How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources? How does the quality of the environment affect the health of all living things within it? How do humans influence the environment?
Core Lesson/Topic Key Terminology & Definitions:	Pollution - an unwanted change in the enevironment caused by substances or forms of energy Renewable Resource - a natural resource that can be replaced at the same rate at which the resource is consumed Nonrenewable Resource - a resource that forms at a rate that is much slower than the rate at which it is consumed Overpopulation - the presence of too many individuals in an area for the available resources
Core Lesson/Topic Student Learning Outcomes:	**Concepts gained by the student:** **Sustainable use of natural resources is essential for the survival of humans and other organisms.** **Recycling and waste management have an effect on the available resources.** **Resources are either renewable or nonrenewable.** **Technological advancements impact our use of resources.** **Competencies gained by the student:**

List five kinds of pollutants.
Distinguish between renewable and nonrenewable resources.
Describe the impact of exotic species.
Explain why human population growth has increased.
Describe how habitat destruction affects biodiversity.
Give two examples of how pollution affects humans.

Differentiated Instruction:	Content variation	Pairs	Small group	Teams
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study	Project Based Learning	
Summative Evaluations:	Final Exam	Lab Completion	Project Completion	Unit Test
Formative Assessments:	Anticipation Guide	Exit Tickets	Journal Entry	Observation
	Think Pair Share	Oral Questioning	Question and Answer	Problem Solving Observation
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		

Lesson Topic: Environmental Solutions

Core Lesson/Topic Description:
In this lesson students will investigate various environmental problems (i.e. pollution) and solutions (i.e. recycling) and how they affect the Earth and the well being of life on it. The lesson also provides information on the impacts humans have on the environment and what is being done to conserve natural resources.

Core Lesson/Topic Big Ideas:
Sustainable use of natural resources is essential to provide for the needs and wants of all living things now and in the future.
The health of all living things is directly related to the quality of the environment.
People acting individually and/or as groups influence the environment.

Core Lesson/Topic Essential Questions:
How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?

How does the quality of the environment affect the health of all living things within it?

How do humans influence the environment?

Core Lesson/Topic Key Terminology & Definitions:
Biodiversity - the number and variety of organisms in a given area during a specific period of time

Conservation - the preservation and wise use of natural resources

Recycling - the process of recovering valuable or useful materials from waste or scrap

Core Lesson/Topic Student Learning Outcomes:
Concepts gained by the student:
Sustainable use of natural resources is essential for the survival of humans and other organisms.
Recycling and waste management have an effect on the available resources.
Resources are either renewable or nonrenewable.
Technological advancements impact our use of resources.

Competencies gained by the student:
Explain the importance of conservation.

	Describe the three R's. Explain how biodiversity can be maintained. List five environmental strategies.			
Differentiated Instruction:	Content variation	Pairs	Small group	Teams
Accommodations:	More Less Support	Strategy Variation	Technology	Time Adjustment Extension
Adaptations/Modifications:	Increase Assignments	Participation Level	Technology	
Enrichment/Extensions:	Increased Breadth of Study	Increased Depth of Study	Project Based Learning	
Summative Evaluations:	Final Exam	Project Completion	Unit Test	
Formative Assessments:	Anticipation Guide	1 Sentence Summary	Observation	Journal Entry
	Exit Tickets	Think Pair Share	Quiz	Problem Solving Observation
	Question and Answer	Oral Questioning		
Data-Based Instructional Practices:	Identifying Similarities and Differences, Comparing, Contrasting, Classifying, Analogies, Metaphors	Summarizing and note-taking	Reinforcing effort, giving praise and providing recognition	Homework and practice
	Presenting knowledge through nonlinguistic representations	Organizing students into cooperative learning groups	Setting objectives and providing feedback	Generating and testing hypotheses
	Cues, questions, and advanced organizers	Specific types of knowledge		