

Course Title: Physical Science
Board Approval Date: 11/18/13
Credit / Hours: 1 Credit

Course Description:

This course focuses on mastery of the PA Academic Standards for Science and Technology, as well as Environmental Science and Ecology. As students' progress through this course, they will participate in the systematic study of the Physical Sciences that deal with the relationship between Matter and Energy. Physical Science serves as an introduction to many of the basic principles found in the Sciences. The scope of the course is broad, covering from the Classification of Matter and Chemical Properties, Periodic table relationships, and Nuclear Physics, up to classic Physics such as the Laws of Motion and Gravity, Work, Power, Thermodynamics, along with discovery of Magnetism, Electricity, and explanations of Sound and Light. Wherever possible, applications of basic principles are correlated to activities or events the student would encounter in everyday activities. Another focus of the course is incorporate open-ended questions so students will be successful on PA State mandated assessments. A broad objective of the course is to develop within the student an appreciation of what Science has accomplished and to stimulate the student to further study of science.

Learning Activities / Modes of Assessment:

Large group instruction	Tests and Quizzes
Laboratory experiments	Projects with Rubrics
Small group work	Lab Reports / Write-ups
Reading assignments	Writing Assignments – John Collins
	Graphic Organizers
	Model Making

Instructional Resources:

Textbook: "Exploring Physical Science" – Copyright 1999 Prentice-Hall
Simon & Schuster Education Group

Computer, Power-point presentations, Study guides, Activboard, Educational Videos, Lab-generated Activities/Worksheets, Education Video Library, Camcorder for videotaping students for video productions.

Course Pacing Guide

Course: **Physical Science**

Course Unit (Topic)	Length of Instruction (Days/Periods)
1. Introduction to Physical Science	16 days
2. Forces and Motion	36 days
3. Energy Forms and Transformations	26 days
4. Electricity, Magnetism, and Waves	29 days
5. Investigations of Matter	30 days
6. Chemical Reactions and the Periodic Table	25 days
7. Nuclear Reactions and Radiation	<u>16 days</u>
DAYS TOTAL	178 Days

Topic: 1-Introduction to Physical Science
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
<p>The Scientific method for solving problems</p> <p>The metric system and properly converting from one unit to another using lab equipment</p> <p>Vocabulary: hypothesis, controlled experiment, experimental set-up, theory, conclusion, manipulated variable, responding variable, dependent variable, independent variable, meter, liter, gram, Celsius, kilo, hecto, deka, deci, centi, milli</p>	<p>Scientists explore the physical world by using the scientific method</p>	<p>SI.8-10.2 – Essential Know that both direct and indirect observations are used by scientists to study the natural world and universe.</p> <p>SI.8-10.3 – Essential Identify questions and concepts that guide scientific investigations.</p> <p>SI.8-10.5 – Important Recognize and analyze alternative explanations and models.</p> <p>SI.8-10.6 – Essential Explain the importance of accuracy and precision in making valid measurements.</p> <p>S11.A.1.1.1 – Essential Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession).</p> <p>S11.A.1.1.2 – Essential Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws.</p> <p>S11.A.1.1.3 – Important Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).</p> <p>S11.A.1.1.5 – Essential Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p> <p>S8.A.2.1.1 – Essential Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.</p> <p>S8.A.2.1.2 – Essential Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.</p>

Topic: 1-Introduction to Physical Science
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>S8.A.2.1.3 – Essential 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.</p> <p>S8.A.2.1.4 – Essential Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.</p> <p>S8.A.2.1.5 – Essential Use evidence from investigations to clearly communicate and support conclusions.</p> <p>SI.11-12.3 – Essential Judge that conclusions are consistent and logical with experimental conditions.</p> <p>SI.11-12.4 – Essential Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.</p> <p>SI.8-10.1 -Compare and contrast scientific theories.</p> <p>SI.8-10.2 - Know that both direct and indirect observations are used by scientists to study the natural world and universe.</p> <p>SI.8-10.3 - Identify questions and concepts that guide scientific investigations.</p> <p>SI.8-10.5 - Recognize and analyze alternative explanations and models.</p> <p>SI.8-10.6 - Explain the importance of accuracy and precision in making valid measurements.</p> <p>S11.A.1.1.1 - Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession).</p>

Topic: 1-Introduction to Physical Science
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>S11.A.1.1.2 - Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws.</p> <p>S11.A.1.1.3 - Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).</p> <p>S11.A.1.1.5 - Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p> <p>S8.A.2.1.1 - Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.</p> <p>S8.A.2.1.2 - Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.</p> <p>S8.A.2.1.3 - 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.</p> <p>S8.A.2.1.4 - Interpret data/observations; develop relationships among variables based on data/ observations to design models as solutions.</p> <p>S8.A.2.1.5 - Use evidence from investigations to clearly communicate and support conclusions.</p> <p>SI.11-12.3 - Judge that conclusions are consistent and logical with experimental conditions.</p> <p>SI.11-12.4 - Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.</p> <p>S11.A.3.1.3 - Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).</p>

Topic: 1-Introduction to Physical Science
 Subject(s): Science

Days: 16
 Grade(s): 9th

Know:	Understand:	Do:
		<p>S11.A.3.1.4 - Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating systems, motor, food production) and identify the resources necessary for operation of the system.</p> <p>SI.8-10.2 - Know that both direct and indirect observations are used by scientists to study the natural world and universe.</p> <p>SI.8-10.3 - Identify questions and concepts that guide scientific investigations.</p> <p>SI.8-10.5 - Recognize and analyze alternative explanations and models.</p> <p>SI.8-10.6 - Explain the importance of accuracy and precision in making valid measurements.</p> <p>S11.A.1.1.1 - Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession).</p> <p>S11.A.1.1.2 - Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws.</p> <p>S11.A.1.1.3 - Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).</p> <p>S11.A.1.1.5 - Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p> <p>S8.A.2.1.1 - Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.</p> <p>S8.A.2.1.2 - Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.</p> <p>S8.A.2.1.3 - 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.</p> <p>S8.A.2.1.4 - Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.</p> <p>S8.A.2.1.5 - Use evidence from investigations to clearly communicate and support conclusions.</p> <p>SI.11-12.3 - Judge that conclusions are consistent and logical with experimental conditions.</p> <p>SI.11-12.4 - Interpret results of experimental</p>

Topic: 1-Introduction to Physical Science
Subject(s): Science

Days: 16
Grade(s): 9th

Know:	Understand:	Do:
		research to predict new information, propose additional investigable questions, or advance a solution.

Topic: 2-Forces and Motion
Subject(s): Science

Days: 36
Grade(s): 9th

Know:	Understand:	Do:
<p>Calculate speed, velocity, and acceleration and be able to interpret graphs.</p> <p>Forces involved in circular motion distinguishing between centripetal and centrifugal forces.</p> <p>Newton's three Laws of Motion and how it explains the experiences students have come across in everyday living.</p> <p>Newton's Universal Law of Gravitation.</p> <p>What is fluid pressure and how to calculate and forces involved in creating fluid pressure?</p> <p>Archimedes principle</p> <p>Bernoulli's principle</p> <p>Six types of Simple Machines</p> <p>Vocabulary: Speed, velocity, acceleration, centripetal motion, centrifugal motion, 1st Law, 2nd Law, 3rd Law, Law of Gravitation, fluid, pressure, Archimedes principle, capillary action, surface tension, cohesion, adhesion, Bernoulli's principle.</p>	<p>The way an object moves is related to the forces acting upon the object</p>	<p>3.2.10.B1.a – Essential FORCE & MOTION OF PARTICLES AND RIGID BODIES - Analyze the relationships among the net forces acting on a body, the mass of the body, and the resulting acceleration using Newton's Second Law of Motion.</p> <p>3.2.10.B1.c – Important FORCE & MOTION OF PARTICLES AND RIGID BODIES - Use Newton's Third Law to explain forces as interactions between bodies.</p> <p>3.2.10.B1.d – Essential FORCE & MOTION OF PARTICLES AND RIGID BODIES - Describe how interactions between objects conserve momentum.</p> <p>3.4.10.C2. – Essential ENGINEERING DESIGN - Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments.</p> <p>3.4.10.C3. – Important RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Illustrate the concept that not all problems are technological and not every problem can be solved using technology.</p> <p>S11.C.3.1.1 – Essential Explain common phenomena (e.g., motion of bowling ball, a rock in a landslide, an astronaut during a space walk, a car hitting a patch of ice on the road) using an understanding of conservation of momentum.</p> <p>S11.C.3.1.2 – Essential Design or evaluate simple technological or natural systems that incorporate the principles of force and motion (e.g., simple and compound machines).</p> <p>S11.C.3.1.3 – Essential Explain that acceleration is the rate at which the velocity of an object is changing.</p>

Topic: 2-Forces and Motion
 Subject(s): Science

Days: 36
 Grade(s): 9th

Know:	Understand:	Do:
		<div data-bbox="850 344 1455 562"> <p>3.2.12.B2.b – Essential ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Demonstrate how the law of conservation of momentum and conservation of energy provide alternate approaches to predict and describe the motion of objects.</p> </div> <div data-bbox="850 573 1455 705"> <p>S11.C.3.1.5 – Essential Calculate the mechanical advantage of moving an object using a simple machine.</p> </div> <div data-bbox="850 716 1455 848"> <p>S11.C.3.1.6 – Essential Identify elements of simple machines in compound machines.</p> </div> <div data-bbox="850 858 1455 1024"> <p>3.2.P.B1.b – Essential FORCE & MOTION OF PARTICLES AND RIGID BODIES - Use force and mass to explain translational motion or simple harmonic motion of objects.</p> </div> <p>3.2.10.B1.a - FORCE & MOTION OF PARTICLES AND RIGID BODIES - Analyze the relationships among the net forces acting on a body, the mass of the body, and the resulting acceleration using Newton's Second Law of Motion.</p> <p>3.2.10.B1.c - FORCE & MOTION OF PARTICLES AND RIGID BODIES - Use Newton's Third Law to explain forces as interactions between bodies.</p> <p>3.2.10.B1.d - FORCE & MOTION OF PARTICLES AND RIGID BODIES - Describe how interactions between objects conserve momentum.</p> <p>3.4.10.C2. - ENGINEERING DESIGN - Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments.</p> <p>3.4.10.C3. - RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Illustrate the concept that not all problems are technological and not every problem can be solved using technology.</p>

Topic: 2-Forces and Motion
 Subject(s): Science

Days: 36
 Grade(s): 9th

Know:	Understand:	Do:
		<p>S11.C.3.1.2 - Design or evaluate simple technological or natural systems that incorporate the principles of force and motion (e.g., simple and compound machines).</p> <p>S11.C.3.1.3 - Explain that acceleration is the rate at which the velocity of an object is changing.</p> <p>3.2.10.B1.b - FORCE & MOTION OF PARTICLES AND RIGID BODIES - Apply Newton's Law of Universal Gravitation to the forces between two objects.</p> <p>3.2.10.B6. - UNIFYING THEMES - PATTERNS SCALE MODELS CONSTANCY/ CHANGE Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.</p> <p>3.23.2.10.B2.c - ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Explain the relationships between work and power.</p> <p>S11.C.3.1.2 - Design or evaluate simple technological or natural systems that incorporate the principles of force and motion (e.g., simple and compound machines).</p> <p>3.2.P.B6. - UNIFYING THEMES - PATTERNS SCALE MODELS CONSTANCY/CHANGE Use Newton's laws of motion and gravitation to describe and predict the motion of objects ranging from atoms to the galaxies.</p> <p>3.2.10.B1.a - FORCE & MOTION OF PARTICLES AND RIGID BODIES - Analyze the relationships among the net forces acting on a body, the mass of the body, and the resulting acceleration using Newton's Second Law of Motion.</p> <p>3.2.10.B1.c - FORCE & MOTION OF PARTICLES AND RIGID BODIES - Use Newton's Third Law to explain forces as interactions between bodies.</p> <p>3.2.10.B1.d - FORCE & MOTION OF PARTICLES AND RIGID BODIES - Describe how interactions between objects conserve momentum.</p> <p>3.4.10.C3. - RESEARCH & DEVELOPMENT, INVENTION & INNOVATION,</p>

Topic: 2-Forces and Motion
Subject(s): Science

Days: 36
Grade(s): 9th

Know:	Understand:	Do:
		<p>EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Illustrate the concept that not all problems are technological and not every problem can be solved using technology.</p> <p>S11.C.3.1.1 - Explain common phenomena (e.g., motion of bowling ball, a rock in a landslide, an astronaut during a space walk, a car hitting a patch of ice on the road) using an understanding of conservation of momentum.</p> <p>S11.C.3.1.2 - Design or evaluate simple technological or natural systems that incorporate the principles of force and motion (e.g., simple and compound machines).</p> <p>S11.C.3.1.3 - Explain that acceleration is the rate at which the velocity of an object is changing.</p> <p>S11.C.3.1.5 - Calculate the mechanical advantage of moving an object using a simple machine.</p> <p>S11.C.3.1.6 - Identify elements of simple machines in compound machines.</p> <p>3.2.P.B6. - UNIFYING THEMES - PATTERNS SCALE MODELS CONSTANCY/CHANGE Use Newton's laws of motion and gravitation to describe and predict the motion of objects ranging from atoms to the galaxies.</p>

Topic: 3-Energy Forms and Transformations
 Subject(s): Science

Days: 26
 Grade(s): 9th

Know:	Understand:	Do:
<p>Major Forms of Energy and relationship to the Law of the Conservation of Energy</p> <p>Difference between potential energy and kinetic energy</p> <p>Types of Energy transfer</p> <p>How to calculate heat and temperature?</p> <p>Various types of heat engines</p> <p>Vocabulary: Chemical energy, Thermal energy, mechanical energy, electromagnetic energy, nuclear energy, conduction, convection, radiation, steam engines, 4 stroke/cycle gas engine, diesel engine, hybrid engines.</p>	<p>Matter and Energy are transformed from one form into another form</p>	<div>3.2.10.B2.a – Essential ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Explain how the overall energy flowing through a system remains constant.</div> <div>3.2.10.B3.b – Important HEAT/HEAT TRANSFER - Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures.</div> <div>3.4.10.B4. – Important TECHNOLOGY AND HISTORY - Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention.</div> <div>3.4.10.E3. – Essential ENERGY AND POWER TECHNOLOGIES - Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others.</div> <div>S11.C.2.1.3 – Essential Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration system, rocket propulsion, heat pump).</div> <div>3.2.P.B3. – Essential HEAT/HEAT TRANSFER - Analyze the factors that influence convection, conduction, and radiation between objects or regions that are at different temperatures.</div> <p>3.2.10.B2.a - ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Explain how the overall energy flowing through a system remains constant.</p> <p>3.4.10.E3. - ENERGY AND POWER TECHNOLOGIES - Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others.</p>

Topic: 3-Energy Forms and Transformations
 Subject(s): Science

Days: 26
 Grade(s): 9th

Know:	Understand:	Do:
		<p>S11.C.2.1.3 - Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration system, rocket propulsion, heat pump).</p> <p>10.B2.b - ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Describe the work-energy theorem.</p> <p>3.4.10.B4. - TECHNOLOGY AND HISTORY - Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention.</p> <p>3.4.10.E3. - ENERGY AND POWER TECHNOLOGIES - Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others.</p> <p>S11.C.2.1.3 - Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration system, rocket propulsion, heat pump).</p> <p>3.2.10.B3.a - HEAT/HEAT TRANSFER - Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached.</p> <p>3.2.10.B6. - UNIFYING THEMES - PATTERNS SCALE MODELS CONSTANCY/ CHANGE Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.</p> <p>3.4.10.B2. - TECHNOLOGY AND ENVIRONMENT - Demonstrate how humans devise technologies to reduce the negative consequences of other technologies.</p> <p>S11.A.3.1.4 - Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating systems, motor, food production) and identify the resources necessary for operation of the system.</p> <p>3.2.12.B3. - HEAT/HEAT TRANSFER - Describe the relationship between the average kinetic molecular energy, temperature, and phase changes.</p> <p>SI.11-12.1 - Examine the status of existing theories.</p>

Topic: 3-Energy Forms and Transformations
Subject(s): Science

Days: 26
Grade(s): 9th

Know:	Understand:	Do:
		<p>3.2.10.B2.a - ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Explain how the overall energy flowing through a system remains constant.</p> <p>3.2.10.B3.b - HEAT/HEAT TRANSFER - Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures.</p> <p>3.4.10.B4. - TECHNOLOGY AND HISTORY - Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention.</p> <p>3.4.10.E3. - ENERGY AND POWER TECHNOLOGIES - Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others.</p> <p>S11.C.2.1.3 - Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration system, rocket propulsion, heat pump).</p> <p>SI.11-12.1 - Examine the status of existing theories.</p>

Topic: 4-Electricity, Magnetism, and Waves

Subject(s): Science

Days: 29

Grade(s): 9th

Know:	Understand:	Do:
<p>Difference between static electricity and current electricity</p> <p>Ohm's Law</p> <p>Discovery of magnetism and materials that are magnetic</p> <p>Electromagnetism and inventions that came about from its discovery</p> <p>How sound waves travel?</p> <p>Science of musical instruments</p> <p>Electromagnetic spectrum</p> <p>Particle theory of light vs wave theory of light</p> <p>Vocabulary: static electricity, current electricity, electron, proton, neutron, voltage, current, resistance, Ohm's Law, series circuit, parallel circuit, direct current, alternating current, electric power, electric energy, lines of force, magnetic poles, induction, generator, motor, turbines, reactor, compression, rarefaction, frequency, amplitude, wavelength, Doppler effect, reflection, refraction,</p>	<p>There are various types of waves with corresponding properties</p>	<p>3.2.10.B4.a – Essential ELECTRICAL AND MAGNETIC ENERGY - Describe quantitatively the relationships between voltage, current, and resistance to electrical energy and power.</p> <p>3.2.10.B4.b – Essential ELECTRICAL AND MAGNETIC ENERGY - Describe the relationship between electricity and magnetism as two aspects of a single electromagnetic force.</p> <p>3.2.10.B5.c – Essential NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Describe the components of the electromagnetic spectrum.</p> <p>3.4.10.B4. – Important TECHNOLOGY AND HISTORY - Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention.</p> <p>S11.A.3.3.3 – Essential Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).</p> <p>S11.C.2.1.1 – Essential Compare or analyze different types of waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, x-rays, microwaves) as it relates to their properties, energy levels, and motion.</p> <p>S11.C.2.1.4 – Essential Use Ohm's Law to explain resistance, current and electro-motive forces.</p> <p>S11.C.3.1.4 – Essential Describe electricity and magnetism as two aspects of a single electromagnetic force.</p> <p>3.2.P.B4.a – Important ELECTRICAL AND MAGNETIC ENERGY - Explain how stationary and moving particles result in electricity and magnetism.</p>

Topic: 4-Electricity, Magnetism, and Waves

Days: 29

Subject(s): Science

Grade(s): 9th

Know:

solar cells, photoelectric effect, cones, rods

Understand:

Do:

3.2.P.B4.b – Essential

ELECTRICAL AND MAGNETIC ENERGY - Develop qualitative and quantitative understanding of current, voltage, resistance, and the connections among them.

3.2.10.B4.a - ELECTRICAL AND MAGNETIC ENERGY - Describe quantitatively the relationships between voltage, current, and resistance to electrical energy and power.

3.2.10.B4.b - ELECTRICAL AND MAGNETIC ENERGY - Describe the relationship between electricity and magnetism as two aspects of a single electromagnetic force.

3.2.10.B5.c - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Describe the components of the electromagnetic spectrum.

3.4.10.B4. - TECHNOLOGY AND HISTORY - Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention.

S11.A.3.3.3 - Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).

S11.C.2.1.1 - Compare or analyze different types of waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, x-rays, microwaves) as it relates to their properties, energy levels, and motion.

S11.C.2.1.4 - Use Ohm's Law to explain resistance, current and electro-motive forces.

S11.C.3.1.4 - Describe electricity and magnetism as two aspects of a single electromagnetic force.

Topic: 4-Electricity, Magnetism, and Waves
 Subject(s): Science

Days: 29
 Grade(s): 9th

Know:	Understand:	Do:
		<p>3.2.P.B4.a - ELECTRICAL AND MAGNETIC ENERGY - Explain how stationary and moving particles result in electricity and magnetism.</p> <p>3.2.P.B4.b - ELECTRICAL AND MAGNETIC ENERGY - Develop qualitative and quantitative understanding of current, voltage, resistance, and the connections among them.</p> <p>3.2.10.B5.a - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Understand that waves transfer energy without transferring matter.</p> <p>3.2.10.B5.b - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Compare and contrast the wave nature of light and sound.</p> <p>3.2.10.B5.d - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Describe the difference between sound and light waves.</p> <p>3.2.10.B6. - UNIFYING THEMES - PATTERNS SCALE MODELS CONSTANCY/ CHANGE Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.</p> <p>S11.A.3.1.3 - Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).</p> <p>3.2.C.B4.c - ELECTRICAL AND MAGNETIC ENERGY - Explain how electrical induction is applied in technology.</p> <p>3.2.C.B5.a - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Explain how waves transfer energy without transferring matter.</p> <p>3.2.P.B5.b - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Explain how waves carry information from remote sources that can be detected and interpreted.</p> <p>3.2.10.B4.a - ELECTRICAL AND MAGNETIC ENERGY - Describe quantitatively the relationships between voltage, current, and resistance to electrical energy and power.</p> <p>3.2.10.B4.b - ELECTRICAL AND MAGNETIC</p>

Topic: 4-Electricity, Magnetism, and Waves
Subject(s): Science

Days: 29
Grade(s): 9th

Know:	Understand:	Do:
		<p>ENERGY - Describe the relationship between electricity and magnetism as two aspects of a single electromagnetic force.</p> <p>3.2.10.B5.c - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Describe the components of the electromagnetic spectrum.</p> <p>3.4.10.B4. - TECHNOLOGY AND HISTORY - Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention.</p> <p>S11.A.3.3.3 - Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).</p> <p>S11.C.2.1.1 - Compare or analyze different types of waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, x-rays, microwaves) as it relates to their properties, energy levels, and motion.</p> <p>S11.C.2.1.4 - Use Ohm's Law to explain resistance, current and electro-motive forces.</p> <p>S11.C.3.1.4 - Describe electricity and magnetism as two aspects of a single electromagnetic force.</p> <p>3.2.C.B4.c - ELECTRICAL AND MAGNETIC ENERGY - Explain how electrical induction is applied in technology.</p> <p>3.2.C.B5.a - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Explain how waves transfer energy without transferring matter.</p> <p>3.2.P.B5.b - NATURE OF WAVES (SOUND AND LIGHT ENERGY) - Explain how waves carry information from remote sources that can be detected and interpreted.</p>

Topic: 5-Investigations of Matter

Subject(s): Science

Days: 30

Grade(s): 9th

Know:	Understand:	Do:
<p>Properties of matter such as volume, density, mass, size, texture, states of matter, temperature, etc.</p> <p>The difference between a physical and chemical change.</p> <p>How to calculate density.</p> <p>Graphing a temperature change.</p> <p>The difference between a heterogeneous and homogeneous mixture.</p> <p>Parts of a solution and concentrations of solutions.</p> <p>The relationship between atoms, elements, molecules, and compounds.</p> <p>Relationship between symbols, subscripts, coefficients, and formulas.</p> <p>Balancing equations.</p> <p>Interpret solubility graphs.</p> <p>Development of Atomic theory, Greek Model, Plum Pudding Model, Rutherford Model, Bohr's Solar system model and the Wave Mechanic model.</p>	<p>How the properties of matter relate to the atomic theory and the way matter is classified</p>	<p>3.2.10.A2.b – Essential STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.</p> <p>3.2.10.A3. – Essential MATTER & ENERGY - Describe phases of matter according to the kinetic molecular theory.</p> <p>3.2.10.A2.a – Essential STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.</p> <p>3.2.CA1.a – Essential PROPERTIES OF MATTER - Differentiate between physical properties and chemical properties.</p> <p>3.2.CA1.b – Essential PROPERTIES OF MATTER - Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.</p> <p>3.2.CA2.a – Essential STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p> <p>3.2.CA2.c – Important STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.CA3.a – Essential MATTER AND ENERGY - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.</p> <p>3.2.CA4.b – Essential REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p>

Topic: 5-Investigations of Matter
 Subject(s): Science

Days: 30
 Grade(s): 9th

Know:	Understand:	Do:
<p>Subatomic particles that make-up an atom such as protons, neutrons, electrons and other quarks.</p> <p>Relationship between atomic number, atomic mass, mass number and isotopes.</p> <p>Vocabulary: density, phases, chemical change, physical change, heterogeneous mixture, homogeneous mixture, element, atom, molecule, compound, solubility, solute, solvent, colloid, solution, coefficient, subscript, symbol, formula, proton, neutron, electron, atomic number, atomic mass, mass number, isotope</p>		<p>3.2.C.A5.a – Essential UNIFYING THEMES - MODELS Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory.</p> <p>S11.A.1.1.5 – Essential Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p> <p>S11.C.1.1.1 – Essential Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., proton, neutrons, electrons).</p> <p>S11.C.1.1.5 – Essential Predict the behavior of gases through the application of laws (i.e., Boyle's law, Charles' law, or ideal gas law).</p> <p>3.2.10.A2.b - STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.</p> <p>3.2.10.A3. - MATTER & ENERGY - Describe phases of matter according to the kinetic molecular theory.</p> <p>3.2.10.A2.a - STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.</p> <p>3.2.C.A1.a - PROPERTIES OF MATTER - Differentiate between physical properties and chemical properties.</p> <p>3.2.C.A1.b - PROPERTIES OF MATTER - Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.</p>

Topic: 5-Investigations of Matter
 Subject(s): Science

Days: 30
 Grade(s): 9th

Know:	Understand:	Do:
		<p>3.2.C.A2.a - STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p> <p>3.2.C.A2.c - STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.C.A3.a - MATTER AND ENERGY - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.</p> <p>3.2.C.A4.b - REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p> <p>3.2.C.A5.a - UNIFYING THEMES - MODELS Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory.</p> <p>S11.A.1.1.5 - Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p> <p>S11.C.1.1.1 - Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., proton, neutrons, electrons).</p> <p>S11.C.1.1.5 - Predict the behavior of gases through the application of laws (i.e., Boyle's law, Charles' law, or ideal gas law).</p> <p>3.2.10.A5.a - UNIFYING THEMES - MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory.</p> <p>3.2.C.A5.b - UNIFYING THEMES - Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.</p>

Topic: 5-Investigations of Matter
 Subject(s): Science

Days: 30
 Grade(s): 9th

Know:	Understand:	Do:
		<p>S11.C.1.1.2 - Explain the relationship between the physical properties of a substance and its molecular or atomic structure.</p> <p>3.2.10.A5.a - UNIFYING THEMES - MODELS Describe the historical development of models of the atom and how they contributed to modern atomic theory.</p> <p>3.2.C.A5.b - UNIFYING THEMES - Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.</p> <p>S11.C.1.1.2 - Explain the relationship between the physical properties of a substance and its molecular or atomic structure.</p> <p>3.2.C.A4.a - REACTIONS - Predict how combinations of substances can result in physical and/or chemical changes.</p> <p>3.2.10.A2.b - STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.</p> <p>3.2.10.A3. - MATTER & ENERGY - Describe phases of matter according to the kinetic molecular theory.</p> <p>3.2.10.A2.a - STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.</p> <p>3.2.C.A1.a - PROPERTIES OF MATTER - Differentiate between physical properties and chemical properties.</p> <p>3.2.C.A1.b - PROPERTIES OF MATTER - Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.</p> <p>3.2.C.A2.a - STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p> <p>3.2.C.A2.c - STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.C.A3.a - MATTER AND ENERGY - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.</p>

Topic: 5-Investigations of Matter

Days: 30

Subject(s): Science

Grade(s): 9th

Know:	Understand:	Do:
		<p>3.2.C.A4.b - REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p> <p>3.2.C.A5.a - UNIFYING THEMES - MODELS Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory.</p> <p>S11.A.1.1.5 - Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p> <p>S11.C.1.1.1 - Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., proton, neutrons, electrons).</p> <p>S11.C.1.1.5 - Predict the behavior of gases through the application of laws (i.e., Boyle's law, Charles' law, or ideal gas law).</p>

Topic: 6-Chemical Reactions and the Periodic Table
 Subject(s): Science

Days: 25
 Grade(s): 9th

Know:	Understand:	Do:
<p>Why the Periodic Table is shaped the way it is and what are the similarities among elements on the Periodic table?</p> <p>What the Group number and Period number determine?</p> <p>The difference is between metals, nonmetals, and metalloids?</p> <p>Characteristics of the elements in the different Groups.</p> <p>Know how to draw electron-shell diagrams for the elements.</p> <p>Know elements uses in industry.</p> <p>Difference between ionic and covalent bonding.</p> <p>The four types of chemical reactions: Synthesis, decomposition, single replacement, and double replacement reactions</p> <p>Exothermic vs endothermic reactions.</p> <p>What effects the rates of chemical reactions?</p>	<p>Periodicity of elements and how the elements combine in forming molecules and compounds</p>	<p>3.2.10.A1.a – Important PROPERTIES OF MATTER - Predict properties of elements using trends of the periodic table.</p> <p>3.2.10.A2.a – Essential STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.</p> <p>3.2.10.A2.b – Essential STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.</p> <p>3.2.10.A4.a – Essential REACTIONS - Describe chemical reactions in terms of atomic rearrangement and/or electron transfer.</p> <p>3.2.C.A1.c – Essential PROPERTIES OF MATTER - Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements.</p> <p>3.2.C.A1.d – Essential PROPERTIES OF MATTER - Use electro-negativity to explain the difference between polar and nonpolar covalent bonds.</p> <p>3.2.C.A2.a – Essential STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p> <p>3.2.C.A2.b – Essential STRUCTURE OF MATTER - Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.</p> <p>3.2.C.A2.c – Important STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p>

Topic: 6-Chemical Reactions and the Periodic Table
 Subject(s): Science

Days: 25
 Grade(s): 9th

Know:	Understand:	Do:
<p>Properties of acids, bases, and neutral solutions.</p> <p>Know how to name hydrocarbons from methane to octane along with structural formulas</p> <p>Know the four major organic molecules and general structures and functions.</p> <p>Vocabulary: Alchemists, valence electrons, atomic number, atomic mass, mass number, Group, Period, malleable, ductile, halogens, noble gases, transition metals, nonmetals, metalloids, rare-Earth elements, ionic bond, covalent bond, synthesis rx, decomposition rx, single replacement rx, double replacement rx, exothermic rx, endothermic rx, kinetics, catalyst, organic molecules, alkanes, alkenes, alkynes, alcohols, carbohydrates, proteins, lipids, nucleic acids.</p>		<p>3.2.C.A2.d – Essential STRUCTURE OF MATTER - Predict chemical formulas based on the number of valence electrons.</p> <p>3.2.C.A2.f – Essential STRUCTURE OF MATTER - Predict the chemical formulas for simple ionic and molecular compounds.</p> <p>3.2.C.A4.b – Essential REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p> <p>3.2.C.A4.c – Essential REACTIONS - Balance chemical equations by applying the laws of conservation of mass.</p> <p>3.2.C.A4.d – Essential REACTIONS - Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> <p>S11.C.1.1.3 – Essential Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).</p> <p>S11.C.1.1.6 – Essential Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature, agitation).</p> <p>3.2.10.A1.a - PROPERTIES OF MATTER - Predict properties of elements using trends of the periodic table.</p> <p>3.2.10.A2.a - STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.</p> <p>3.2.10.A2.b - STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.</p> <p>3.2.10.A4.a - REACTIONS - Describe chemical reactions in terms of atomic rearrangement and/or</p>

Topic: 6-Chemical Reactions and the Periodic Table
 Subject(s): Science

Days: 25
 Grade(s): 9th

Know:	Understand:	Do:
		<p>electron transfer.</p> <p>3.2.C.A1.c - PROPERTIES OF MATTER - Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements.</p> <p>3.2.C.A1.d - PROPERTIES OF MATTER - Use electro-negativity to explain the difference between polar and nonpolar covalent bonds.</p> <p>3.2.C.A2.a - STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p> <p>3.2.C.A2.b - STRUCTURE OF MATTER - Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.</p> <p>3.2.C.A2.c - STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.C.A2.d - STRUCTURE OF MATTER - Predict chemical formulas based on the number of valence electrons.</p> <p>3.2.C.A2.f - STRUCTURE OF MATTER - Predict the chemical formulas for simple ionic and molecular compounds.</p> <p>3.2.C.A4.b - REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p> <p>3.2.C.A4.c - REACTIONS - Balance chemical equations by applying the laws of conservation of mass.</p> <p>3.2.C.A4.d - REACTIONS - Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> <p>S11.C.1.1.3 - Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).</p> <p>S11.C.1.1.6 - Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature, agitation).</p> <p>3.2.10.A1.a - PROPERTIES OF MATTER - Predict properties of elements using trends of the periodic table.</p>

Topic: 6-Chemical Reactions and the Periodic Table
 Subject(s): Science

Days: 25
 Grade(s): 9th

Know:	Understand:	Do:
		<p>3.2.10.A2.a - STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.</p> <p>3.2.10.A2.b - STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.</p> <p>3.2.10.A4.a - REACTIONS - Describe chemical reactions in terms of atomic rearrangement and/or electron transfer.</p> <p>3.2.C.A1.c - PROPERTIES OF MATTER - Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements.</p> <p>3.2.C.A1.d - PROPERTIES OF MATTER - Use electro-negativity to explain the difference between polar and nonpolar covalent bonds.</p> <p>3.2.C.A2.a - STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p> <p>3.2.C.A2.b - STRUCTURE OF MATTER - Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.</p> <p>3.2.C.A2.c - STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.C.A2.d - STRUCTURE OF MATTER - Predict chemical formulas based on the number of valence electrons.</p> <p>3.2.C.A2.f - STRUCTURE OF MATTER - Predict the chemical formulas for simple ionic and molecular compounds.</p> <p>3.2.C.A4.b - REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p> <p>3.2.C.A4.c - REACTIONS - Balance chemical equations by applying the laws of conservation of mass.</p> <p>3.2.C.A4.d - REACTIONS - Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> <p>S11.C.1.1.3 - Explain the formation of compounds and their resulting properties using bonding theories</p>

Topic: 6-Chemical Reactions and the Periodic Table
 Subject(s): Science

Days: 25
 Grade(s): 9th

Know:	Understand:	Do:
		<p>(ionic and covalent).</p> <p>S11.C.1.1.6 - Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature, agitation).</p> <p>3.2.10.A1.a - PROPERTIES OF MATTER - Predict properties of elements using trends of the periodic table.</p> <p>3.2.10.A2.a - STRUCTURE OF MATTER - Compare and contrast different bond types that result in the formation of molecules and compounds.</p> <p>3.2.10.A2.b - STRUCTURE OF MATTER - Explain why compounds are composed of integer ratios of elements.</p> <p>3.2.10.A4.a - REACTIONS - Describe chemical reactions in terms of atomic rearrangement and/or electron transfer.</p> <p>3.2.C.A1.c - PROPERTIES OF MATTER - Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements.</p> <p>3.2.C.A1.d - PROPERTIES OF MATTER - Use electro-negativity to explain the difference between polar and nonpolar covalent bonds.</p> <p>3.2.C.A2.a - STRUCTURE OF MATTER - Compare the electron configurations for the first twenty elements of the periodic table.</p> <p>3.2.C.A2.b - STRUCTURE OF MATTER - Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.</p> <p>3.2.C.A2.c - STRUCTURE OF MATTER - Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>3.2.C.A2.d - STRUCTURE OF MATTER - Predict chemical formulas based on the number of valence electrons.</p> <p>3.2.C.A2.f - STRUCTURE OF MATTER - Predict the chemical formulas for simple ionic and molecular compounds.</p> <p>3.2.C.A4.b - REACTIONS - Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p> <p>3.2.C.A4.c - REACTIONS - Balance chemical</p>

Topic: 6-Chemical Reactions and the Periodic Table
Subject(s): Science

Days: 25
Grade(s): 9th

Know:	Understand:	Do:
		<p>equations by applying the laws of conservation of mass.</p> <p>3.2.C.A4.d - REACTIONS - Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.</p> <p>S11.C.1.1.3 - Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).</p> <p>S11.C.1.1.6 - Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature, agitation).</p>

Topic: 7-Nuclear Reactions and Radiation
Subject(s):

Days: 12
Grade(s): 9th

Know:	Understand:	Do:
<p>The scientists involved in the discovery of radiation.</p> <p>The three main types of radiation and radioactive decay and predict the products they will decay into.</p> <p>Students will be able to calculate half-life problems.</p> <p>How to explain the process of fission and fusion which results in energy and the new products formed.</p> <p>The uses of radiation in industry and medicine.</p> <p>Vocabulary: Particle accelerator, transmutation, alpha decay, beta decay, gamma radiation, fission, fusion, transmutation, radioactive isotope, tracer.</p>	<p>How changes in the nucleus occur and the practical applications of nuclear energy</p>	<div>3.2.C.A3.b – Important MATTER AND ENERGY - Identify the three main types of radioactive decay and compare their properties.</div> <div>3.2.C.A3.c – Important MATTER AND ENERGY - Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope.</div> <div>3.4.10.E3. – Essential ENERGY AND POWER TECHNOLOGIES - Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others.</div> <div>S11.C.2.1.1 – Unranked Compare or analyze different types of waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, x-rays, microwaves) as it relates to their properties, energy levels, and motion.</div> <p>3.2.C.A3.b - MATTER AND ENERGY - Identify the three main types of radioactive decay and compare their properties. 3.2.C.A3.c - MATTER AND ENERGY - Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope. 3.4.10.E3. - ENERGY AND POWER TECHNOLOGIES - Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others. S11.C.2.1.1 - Compare or analyze different types of waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, x-rays, microwaves) as it relates to their properties, energy levels, and motion. 3.2.C.A3.b - MATTER AND ENERGY - Identify the three main types of radioactive decay and compare their properties. 3.2.C.A3.c - MATTER AND ENERGY - Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope.</p>

Topic: 7-Nuclear Reactions and Radiation
Subject(s):

Days: 12
Grade(s): 9th

Know:

Understand:

Do:

3.4.10.E3. - ENERGY AND POWER
TECHNOLOGIES - Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others.
S11.C.2.1.1 - Compare or analyze different types of waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, x-rays, microwaves) as it relates to their properties, energy levels, and motion.