



Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:

Meeting the needs of all students with a proud tradition of academic excellence.

Curriculum Development Timeline

School: Ocean Township High School
Course: Principles of Chemistry and Physics
Department: Science

Board Approval	Supervisor	Notes
July 2015	Patrick Sullivan	Born Date
August 2017	Patrick Sullivan	Revisions
March 2019	Patrick Sullivan	Review

Pacing Guide

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Week	Marking Period 1	Week	Marking Period 3
1	Lab Safety & the Nature of Science	11	Motion & Forces
2	Solids, Liquids, & Gases	12	Motion & Forces
3	Solids, Liquids, & Gases	13	Motion & Forces
4	Classification of Matter & Solutions	14	Work & Energy
5	Classification of Matter & Solutions	15	Work & Energy
Week	Marking Period 2	Week	Marking Period 4
6	Properties of Atoms & the Periodic Table	16	Waves & Sound Energy
7	Properties of Atoms & the Periodic Table	17	Waves & Sound Energy
8	Chemical Bonds & Chemical Reactions	18	Electromagnetic Waves & Light
9	Chemical Bonds & Chemical Reactions	19	Electromagnetic Waves & Light
10	Acids & Bases	20	Energy Sources & the Environment

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Core Instructional & Supplemental Materials including various levels of Texts

Texts:

Glencoe Physical Science– McGraw Hill Companies, Inc. 2012

Digital Resources Across All Levels: (D=differentiated)

Edpuzzle (D)

Gizmo (D)

Streaming YouTube Videos

New York Times Articles

PhET Interactive Simulations (D)

Science News (D)

Ted Talks

Time Frame	1 Week
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Topic

Lab Safety and The Nature of Science

Essential Questions

- Apply knowledge of appropriate safety precautions
- Apply the scientific method to solve problems
- How to manipulate numbers in decimal and scientific notation
- Use the mathematical definition of density to calculate density given appropriate data.
- Convert from one size SI unit to another
- Correctly plot/graph experimental data and determine slope
- Understand the purpose of various graphs in presentation of data

Enduring Understandings

- Students should study physical sciences because it plays an integral part in all aspects of life.
- Having students learn the scientific method will help them to develop a theory using

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observations, hypotheses, and experiments.

- Students will demonstrate the basic safety rules that must be followed when working in the laboratory.
- Students will understand the necessity of standard units, and convert within the SI system.
- Students will be able to analyze and interpret various types of graphs

Alignment to Standards

- HS-PS3-1
- HS-PS3-2
- HS-PS3-3
- HS-PS3-4
- HS-ETS1-2

Learning Activities & Key Concepts and Skills

- Scientists ask questions and perform investigations to learn more about the natural world.
- Describe the activities that are part of the scientific method.
- List the basic safety rules that must be followed when working in the laboratory.
- Models help scientists visualize concepts.
- The SI system was established to provide a standard of measurement and reduce confusion.
- The size of an object will determine the unit you will use.
- Graphs are visual representation of data.
- Scientists often graph their data to detect patterns.
- Lab Safety Story – Reading to learn science.
- Scientific Method Vocabulary Scavenger Hunt Game.
- Make a Model – Design a paper airplane activity.
- Reading/History Activity – The “Hand” Measurement for Horses.
- Make your own Thermometer Activity

Assessments

Formative:

- Do Now – scientific inquiry
- Strategic questioning - lab safety scenarios
- Group discussion – Safety in the lab

Summative:

- Lab Safety Quiz
- Metric Quiz

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- The Nature of Science Test ((M/C and open ended)

Benchmark:

- Principles of Chemistry and Physics Skills Benchmark

Alternative:

- Lab Portfolio
- Lab Safety Informational Poster
- Digital Lab Safety Breakout

Career Education

- CRP-2 – Students use knowledge and skills through their lab work.
- CRP-6 - Students use creativity and innovation in designing lab safety posters to demonstrate proper conduct while in a lab setting
- CRP-12 – Students work productively in collaborative groups using culturally global competence

21st Century Skills

- 9.3.ST- SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST- ET.5 Apply the knowledge learned in STEM to solve problems.

Interdisciplinary Connections

Mathematics:

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MP.4 Model with mathematics

ELA:

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

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Technology Integration

TECH.8.1.12.C - Additional resources and extension activities are on google classroom in order to reflect their learning and expand on knowledge.

TECH.8.1.12.C - Students will use google docs to formulate and submit assignments on google classroom.

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 - Students complete a lab safety digital breakout.

Time Frame	Week 2
Topic	
Solids, Liquids, and Gases	
Essential Questions	
<ul style="list-style-type: none">● What is the kinetic theory of matter?● How do particles move in different states of matter?● How do particles behave at the boiling and melting points?● What is Archimedes' Principle?● What is Pascal's Principle?● What is Bernoulli's principle?● What are some applications of the above principles?● How does a gas exert pressure on its container?● How is a gas affected when pressure, temperature, or volume change?	
Enduring Understandings	
<ul style="list-style-type: none">● Students should be able to understand that changes in the arrangement and motion of particles occur as matter changes state.● Students should understand that the properties of solids, liquids, and gases are defined by the motion of their particles.● A substance's changes of state are directly related to changes in the kinetic energy of its	

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particles

- Students should be able to understand and demonstrate that fluids flow and exert forces on objects
- Through studying the properties of gases, students should understand that gases respond to changes in pressure, temperature, and volume in predictable ways

[Alignment to Standards](#)

- HS-PS3-1
- HS-PS3-2
- HS-PS3-3
- HS-PS3-4
- HS-ETS1-2

Learning Activities & Key Concepts and Skills

- The kinetic theory is an explanation of how particles that make up gases behave.
- Thermal energy is the total energy of the particles that make up a material, including kinetic and potential energy.
- Temperature is the average kinetic energy of a substance.
- If the buoyant force on an object is equal to or greater than the gravitational force on that object, the object will float. If the buoyant force on an object is equal to or less than the gravitational force on that object, the object will sink.
- Pascal's principle states that pressure applied to a fluid is transmitted throughout the fluid.
- Bernoulli's principle states that as the velocity of a fluid increases, the pressure exerted by the fluid decreases.
- The resistance to flow by a fluid is called viscosity.
- Boyle's law states that if the temperature is constant, as the volume of the gas decreases, the pressure increases.
- Charles's law states that at a constant pressure, the volume of the gas increases with increasing temperature.
- Both Boyle's and Charles's laws can be expressed as a mathematical equation.
- Altitude & cooking activity
- Cross-curricular- Amorous solids – The Art of Glass Making
- Floating and density lab
- Inquiry- Preserving a Solid State- How should you pack and transport a fragile chocolate sculpture?
- Lab- Phase Changes, a Heating and Cooling Curve
- Mini-Lab- Relate Density & Buoyancy
- Mini-Lab- Observe Pressure
- Lab- Viscosity of various Common Liquids

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- Engineering Design Process – Sink or Float Challenge
- Engineering Design Process – Ice Cube Challenge

Assessments

Formative:

- Do Now - States of Matter
- Strategic questioning - Why are some objects more buoyant than others
- Group discussion – What causes a substance to change from one state of matter to another
- Do Now - Boyle's and Charles' Law
- Heating/ cooling curve graph

Summative:

- States of Matter Quiz
- Solids, liquids, gases test ((M/C and open ended)
- States of matter lab

Benchmark:

Alternative:

- Students create questions to be used in a review game
- Lab Portfolio
- Design a boat that will hold the most pennies

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-4- Communicate clearly and effectively and with reason.

21st Century Skills

9.3.ST- ET.5 Apply the knowledge learned in STEM to solve problems.
9.3.STSM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Interdisciplinary Connections

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HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MP.4 Model with mathematics

ELA:

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Technology Integration

TECH.8.1.12.F-1 - Students complete Archimedes' Principle Gizmo

TECH.8.1.12.C - Additional resources and extension activities are on google classroom in order to reflect their learning and expand on knowledge.

TECH.8.1.12.F-1 - Students complete States of Matter Phet simulation.

Time Frame	2 Weeks
Topic	
Classification of Matter & Solutions	
Essential Questions	
<ul style="list-style-type: none">● How is matter classified?● How do elements, compounds, mixtures differ?● Why can physical methods be used to separate mixtures, but not compounds?● In what state of matter does water have a definite volume but not a definite shape?● How are suspensions, colloids, and solutions different?	

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- What is a solutes and solvent?
- How do substances dissolve in liquids?
- How do solid and gaseous solutions form?
- What factors affect the rates at which solids dissolve in liquids?
- What is solubility?
- What are saturated, unsaturated, and supersaturated solutions?
- How do solutes affect the freezing point and boiling points of solvents?
- What are the chemical and physical properties and changes of matter?
- How does the law of conservation of mass apply to chemical change?

Enduring Understandings

- Students should be able to name and describe the four states of matter.
- Students will be able to compare and contrast the difference between a pure substance and a mixture.
- Learning the difference between homogeneous and heterogeneous mixtures will allow students to describe several techniques to separate mixtures.
- Determine the difference between suspensions, colloids, and solutions.
- Students will use experimentation to determine the factors that affect solubility.
- Create and interpret a solubility curve.
- Understand how addition of a solute to a solvent will either lower or raise the freezing or boiling points.
- Through studying matter, students will be able to compare their chemical and physical properties.

[Alignment to Standards](#)

- HS-PS1-1
- HS-PS1-2
- HS-PS3-1
- HS-PS3-2
- HS-PS3-3
- HS-PS3-4
- HS-ETS1-2

Learning Activities & Key Concepts and Skills

- Classify examples of matter as pure substances or mixtures.
- Mixtures can be heterogeneous or homogeneous and can be separated by physical means.
- A solution is a homogeneous mixture.
- Solutions are composed of solutes and solvents.

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- Stirring, surface area, and temperature change all affect the rate of dissolving.
- Solubility curves predict how much solute can dissolve at a particular temperature.
- Solute particles lower freezing points, while solute particles raise boiling points of solutions.
- Identify the states and the physical and chemical properties of matter.
- The law of conservation of mass states that matter is neither created nor destroyed in a chemical reaction
- Virtual lab – Properties of Matter
- Lab- Pure Substances vs Mixtures
- Mini- Lab – Identify Changes
- Lab- Making Ice Cream
- Reading / Writing –Ice Cream Article
- Lab- Saturated Solutions
- Making Snow Flakes
- Lab- Boiling Points of Solutions
- Mini-Lab- Observe the effects of surface area on a solute

Assessments

Formative:

- Do now - pure substance or mixture
- Identify changes mini lab
- Diagram differences between pure substances and mixtures
- Strategic questioning - how would you separate various mixtures

Summative:

- Chapter Quiz
- Boiling points of solutions lab
- Separating a mixture lab
- Chapter test - Classification of matter and solutions - multiple choice and open ended

Benchmark:

Alternative:

- Elements, compounds, mixtures children's book
- Separating mixtures google - slides

Career Education

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CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-11- Use technology to enhance productivity.

21st Century Skills

9.3.ST- SM.3 Analyze the impact that science and mathematics has on society.

Interdisciplinary Connections

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Technology Integration

TECH.8.1.12.C - Additional resources and extension activities are on google classroom in order to reflect their learning and expand on knowledge.

TECH.8.1.12.C - Students will use google docs to formulate and submit assignments on google classroom.

Time Frame

2 weeks

Topic

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Properties of Atoms and the Periodic Table

Essential Questions

- What are the names and symbols of common elements?
- What is the structure of the atom?
- Who were the early scientists that led to the current model of the atom?
- What is the electron cloud model of the atom?
- How do you determine the atomic mass and mass number of an atom?
- What are isotopes?
- How is the periodic table organized?
- What are electron dot diagrams?
- What are the trends on the periodic table?
- What are the properties of metals, nonmetals, and metalloids?
- What are the common names of the main group elements?

Enduring Understandings

- Studying the periodic table is very useful for discovering, learning, and remembering the different properties of the elements.
- The contributions of the various scientists led to the current development of the periodic table.
- Students will demonstrate the understanding of the current atomic model by studying the past history of the atom.
- Learning the major components of the atom will lead students to the understanding of atomic number, mass number, ions, and isotopes.
- Students will demonstrate of periodic trends.

[Alignment to Standards](#)

- HS-PS1-1
- HS-PS1-2
- HS-PS3-1
- HS-PS3-2
- HS-PS3-3
- HS-PS3-4

Learning Activities & Key Concepts and Skills

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- Given the name of an element, write its correct symbol; from the symbol, write the correct name.
- Use the periodic table to identify the groups and the period of an element and decide whether it is a metal, metalloid, or a nonmetal.
- Discuss contributions that scientists made to the periodic table.
- Explain why elements in a group have similar properties.
- Define the term atom.
- Discuss the contributions of various scientists that lead to the atomic structure.
- Name and describe the three subatomic particles of an atom.
- Determine the number of protons, neutrons, and electrons in an atom or ion.
- Create models of elements from the periodic table.
- Define isotopes and atomic mass.
- Elements on the periodic table are classified as metals, nonmetals, or metalloids.
- Conservation of Mass
- Foldable Activity – History of the atom
- Window pane activity
- Adopt an Element Activity
- Element Cube Activity
- Atoms- Mini-Project
- Creating Atomic Models
- History of the Atom – research Activity / Presentation
- Atom Gizmo

Assessments

Formative:

- Element symbols - Do Now
- Strategic questioning - types of elements
- Group discussion - what are the uses of different elements
- Strategic questioning - why is the periodic table set up the way that it is?
- Do Now -metal, nonmetal, or metalloid

Summative:

- Parts of an atom quiz
- Periodic table quiz
- Properties of an atom and the Periodic Table test (multiple choice/ open ended)

Benchmark:

Alternative:

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- Lab Portfolio
- Atom Gizmo
- Adopt an element project

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-4- Communicate clearly and effectively and with reason.

21st Century Skills

9.3.STSM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Interdisciplinary Connections

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Technology Integration

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TECH.8.1.12.D.5 - Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 - Students complete Build an Atom Phet simulation

TECH.8.1.12.F-1 - Students complete an Isotopes Gizmo

Time Frame	2 Weeks
Topic	
Chemical Bonds and Chemical Reactions	
Essential Questions	
<ul style="list-style-type: none">● How does a compound differ from its component elements?● Why does bonding occur?● What are ionic bonds and covalent bonds?● How are ions formed in ionic bonding?● How are molecules formed in covalent bonding?● What are the reactants and products in a chemical reaction?● Why are chemical reactions important in everyday life?● How do you balance a chemical reaction?● Is energy conserved during a chemical reaction?● How can chemists affect the rates of chemical reactions?	
Enduring Understandings	
<ul style="list-style-type: none">● Using the octet rule, students will write the symbols of single ions for the representative elements.● Students will represent the correct procedure for representing ionic and covalent bonding.● Demonstrate their understanding of a correctly balanced chemical equation by balancing equations● Students will use factors such as temperature, concentration, volume, pressure, surface area, and catalysts and inhibitors to control the rates of chemical reactions.	
<u>Alignment to Standards</u>	

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- HS-PS1-2
- HS-PS1-4
- HS-PS1-5
- HS-PS1-6
- HS-PS3-1
- HS-PS3-2
- HS-PS3-3
- HS-PS3-4
- HS-ETS1-2

Learning Activities & Key Concepts and Skills

- A chemical formula describes the numbers and types of atoms in the compound.
- Most atoms need eight electrons to complete their outer energy level.
- Electron dot diagrams show electrons in the outer energy level of the atom.
- A chemical bond is a force that holds atoms together in a compound.
- Using the octet rule, write the symbols for both atoms and the single ions for the representative elements.
- Describe the characteristics of both ionic and covalent bonds.
- A chemical reaction is a process that involves one or more reactants changing into one or more products.
- A balanced chemical equation indicates the relative amounts of reactants and products.
- Breaking chemical bonds absorbs energy.
- Forming chemical bonds releases energy.
- The rates of chemical reactions can be manipulated by changing the conditions under which the reaction takes place.
- Le Chatelier's principle describes an equilibrium response to a stress in a chemical reaction
- Electronic Cereal
- A Match Made in Heaven – An Elemental Love Story (Reading / writing Activity)
- Lab- Atomic Trading Cards
- Mini-Lab – Observe Bond type
- Research Activity – Have students research the Pauling Scale
- Launch Lab – A Chemical Reaction
- Mini-Lab – Design a Team Equation
- Balancing Chemical Equations Tutorial– Chromebook Activity
- Lab- Balancing Equations
- Reading Article – Carbon Monoxide – real-life accounts
- Lab- To Glow or Not to Glow
- Lab – Reaction Rates
- Lab – Dancing Raisins

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Assessments

Formative:

- Do Now - ionic or covalent
- Ionic bonds gizmo
- Do Now - Lewis dot structures
- Strategic questioning - why do atoms bond?
- Atomic trading cards

Summative:

- Chemical Bonding Quiz
- Chapter test - chemical bonding and reactions test (multiple choice and open ended)

Benchmark:

Alternative:

- Lab Portfolio
- Balancing equations lab

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-11- Use technology to enhance productivity.

21st Century Skills

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Interdisciplinary Connections

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TECH.8.1.12.C - Students will use google docs to formulate and submit assignments on google classroom.

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.E - Organize, analyze, evaluate, and synthesize information from a variety of sources and media.

Time Frame	1 Week
Topic	
Acids and Bases	
Essential Questions	
<ul style="list-style-type: none">● What defines an acid or a base?● What is the importance of knowing the difference between acids and bases?● How are common acid and bases used in everyday life?● What are some common properties of acids and bases?● What is the pH scale?	
Enduring Understandings	

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- Students should study acids and bases because they are important substances in health, industry, and the environment.
- Students will be able to identify both acids and bases.
- Looking at a pH scale, students will be able to classify solutions as acidic, neutral, or basic.

Alignment to Standards

- HS-ETS1-2
- HS-PS1-4
- HS-PS1-2
- HS-PS1-5
- HS-PS1-6

Learning Activities & Key Concepts and Skills

- Acids are sour tasting and corrosive, and they turn blue litmus red.
- Bases are slippery, have a bitter taste, are corrosive, and turn red litmus blue.
- Describe the pH scale.
- Describe the nature of a solution based on the pH scale
- Acids and bases are classified based on pH
- Buffers are solutions that minimize the effects of the addition of an acid or base on pH.
- .Neutralization is a chemical reaction between an acid and a base
- The effects of acid rain – Reading (article and questions)
- Mini-Lab – Observe acid relief (How antacids work)
- The pH Lab
- Lab- Acid Concentrations
- Lab – Be a Soda Scientist

Assessments

Formative:

- Strategic questioning - what is the difference between an acid and a base
- Do Now - acid or base?
- Effects of acid rain article

Summative:

- Chapter quiz
- pH lab

Benchmark:

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Alternative:

- Lab Portfolio
- Acid / base slide presentations

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-4-- Communicate clearly and effectively and with reason.

21st Century Skills

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Interdisciplinary Connections

ELA:

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Technology Integration

TECH.8.1.12.C - Additional resources and extension activities are on google classroom in order to reflect their learning and expand on knowledge.

TECH.8.1.12.C - Students will use google docs to formulate and submit assignments on google classroom.

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 - Students complete a Phet simulation on acids and bases

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Time Frame	3 weeks
Topic	
Motion & Forces	
Essential Questions	
<ul style="list-style-type: none">● How are distance and displacement different?● How is an object's' speed calculated?● What information does a distance-time graph provide?● What is the difference between speed and velocity?● How is the motion of two objects relative to each other described?● How can an object's' momentum be calculated?● How are acceleration, time, and velocity related?● What are three ways an object can accelerate?● How can an object's' acceleration be calculated?● What are the similarities and differences between straight line motion, circular motion, and projectile motion?● How are force and motion related?● How is net force determined?● Why is there friction between objects?● What is the difference between mass and weight?● What is inertia, and how is it related to Newton's first law?● How can you calculate acceleration using Newton's second law?● According to Newton's third law of motion, how are the forces between interacting objects related?● How does Newton's first law explain what happens in a car crash?● How does Newton's second law explain the effects of air resistance?● When is momentum conserved?	
Enduring Understandings	
<ul style="list-style-type: none">● Students will use both speed and velocity to describe an object's speed and direction of motion.● Students will demonstrate understanding of how acceleration describes how the velocity of an object is changing with time.● Students should understand that objects that interact exert forces on each other.● Students will demonstrate how unbalanced forces cause the motion of objects to change.	

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- Having students study gravity, weight and friction will help them to understand our physical world.
- Students will be able to explain Newton's three laws both qualitatively and quantitatively.
- Students will use Newton's laws can be used to explain everyday events, such as falling and collisions.

[Alignment to Standards](#)

- HS-PS2-1
- HS-PS2-2
- HS-PS2-3
- HS-PS2-4
- HS-PS2-5
- HS-ETS1-2

Learning Activities & Key Concepts and Skills

- Motion occurs when an object changes its position relative to a reference point
- Displacement is the distance and direction of a change in position from a starting point.
- Speed is the rate at which an object's position changes.
- Interpret distance-time graphs and calculate slope.
- Velocity of an object includes both speed and direction.
- The momentum of an object is the product of its mass and velocity.
- Acceleration is the rate of change of velocity.
- Calculate acceleration
- Acceleration toward the center of a curved circular path is called centripetal acceleration.
- A force is a push or pull on an object.
- Calculate net forces.
- Unbalanced forces cause the motion of an object to change.
- Friction is an opposing force between two objects in contact.
- Gravity is an attractive force between objects that have mass.
- Newton's laws of motion relate changes in an object's motion with the forces acting on it.
- Newton's laws will be used to explain real-life phenomena.
- Virtual lab – inquiry –Speed
- Mini-Lab – Measure Average Speed
- Virtual Lab-Speed Distance Graphs Gizmo
- Activity – Momentum and Sports
- Mini-Lab – Determining the Direction of Acceleration
- Lab – Motion Graphs
- The Scooter Games
- Lab – The Momentum of Colliding Objects

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- Foldable Activity – Newton’s Laws
- Reading Activity – Newton’s laws and car crashes
- Mini-Lab – Compare Friction and Gravity
- Mini-Lab – Observe Inertia
- Demo – Newton’s Third Law- Balloon Rocket
- Lab- The Effects of Air Pressure
- Lab- Motion from Different Forces
- Activity-Research the Physics of.....
- Activity-Create a car

Assessments

Formative:

Group discussion - what are some real world examples of Newton’s laws

Do Now - Speed problems

Problems - Force = mass X acceleration

Do Now - Newton’s second law problems

Observe inertia mini- lab

Summative:

- Motion Quiz
- Motion and Forces test (m/c and open ended)
- The momentum of colliding objects lab

Benchmark:

Alternative:

- Lab Portfolio
- Phet interactive simulations - Forces and Motion
- Create a car activity
- Research the physics of activity

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-11- Use technology to enhance productivity.

21st Century Skills

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9.3.ST- SM.3 Analyze the impact that science and mathematics has on society.

Interdisciplinary Connections

Mathematics:

HSA-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

MP.4 Model with mathematics. HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

HSA-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

HSA-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

HSA-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations

ELA:

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Technology Integration

TECH.8.1.12.C - Additional resources and extension activities are on google classroom in order to reflect their learning and expand on knowledge.

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 - Students complete Distance time graph Gizmo

Time Frame

2 weeks

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Topic

Work & Energy

Essential Questions

- What is work?
- How can work be calculated when force and motion are parallel to each other?
- How do machines make work easier?
- What are mechanical advantages and efficiency?
- What is the difference between kinetic energy and potential energy?
- How can you calculate kinetic energy?
- How can you calculate gravitational potential energy?
- What is the law of conservation of energy?
- What is mechanical energy?
- Why is mechanical energy not always conserved?
- How are power and energy related?

Enduring Understandings

- Students will be able to explain scenarios in which work is done, identify the forces, displacement, and energy transfer.
- Quantitatively calculate work.
- Determine the component simple machines present in complex machines.
- Categorize a wedge and screw as variations of inclined planes, a pulley and wheel and axle as variations of a lever.
- Define the term ideal and actual mechanical advantage.
- Calculate the mechanical advantage and efficiency of machines.
- Exemplify the relationship between kinetic energy, potential energy, and heat to illustrate the total energy is conserved in mechanical systems such as a pendulum and roller coaster.

[Alignment to Standards](#)

- HS-PS3-2
- HS-PS3-1
- HS-PS3-3
- HS-ETS1-2

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Learning Activities & Key Concepts and Skills

- Energy can be transferred and transformed from one form into another.
- Energy has many forms and can be transferred through work.
- Work requires both motion and forces.
- Many modern technologies, such as automobile engines and power plants, transform one form of energy into another.
- Machines make doing work easier or faster by changing the force needed to do the work.
- Energy is the ability to cause change.
- Energy cannot be created or destroyed.
- Power is the rate that work is done.
- Lab – Mechanical Advantage & Efficiency
- Mini-Lab – Interpret Data from a Slingshot
- Virtual Lab – Energy Conservation
- Reading / History – Newton’s Apple Article & questions
- Mini-Lab – Calculate Your Power
- Lab – Swinging Energy

Assessments

Formative:

- Group discussion - how is energy transformed
- Do now - Types of Energy
- Mechanical advantage practice problems
- Calculate your power mini-lab

Summative:

- Quiz - Machines
- Quiz - Types of energy
- Test - work and energy (multiple choice and open ended)

Benchmark:

Alternative:

- Lab Portfolio
- Roller coaster physics gizmo

Career Education

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CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-11- Use technology to enhance productivity.

21st Century Skills

9.3.STSM.4 Apply critical thinking skills to review information, explain statistical analysis, and To translate, interpret and summarize research and statistical data.

Interdisciplinary Connections

ELA:

WHST.9-12.2 -Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- **WHST.11-12.8 -Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.**

Mathematics:

- HSA.CED.A.4- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations
- MP.4 - Model with mathematics

Technology Integration

TECH.8.1.12.C - Additional resources and extension activities are on google classroom in order to reflect their learning and expand on knowledge.

TECH.8.1.12.A-1 - Students will use google slides to synthesize and present information on machines

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 - Students complete a roller coaster physics gizmo

Time Frame

2 weeks

Topic

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Waves & Sound Energy

Essential Questions

- How do waves transfer energy?
- What are mechanical waves?
- How do transverse waves differ from mechanical waves?
- How are wavelength and period related?
- What is the relationship between frequency and wavelength?
- How do you calculate the speed of a wave?
- What is the law of reflection?
- Why do waves change direction when they travel from one material to another?
- How are refraction and diffraction similar? How are they different?
- What happens when waves interfere with each other?
- How does sound travel through different mediums?
- What affects the speed of sound?
- How does your ear enable you to hear?
- How are amplitude, intensity, and loudness related?
- How is sound intensity measured?
- What is the relationship between frequency and pitch?
- What is the Doppler Effect?
- What are some of the factors that affect the design of concert halls and movie theaters?
- How do some animals use sound to hunt and navigate?
- How does sonar work?
- How is ultrasound used in medicine?

Enduring Understandings

- Students will be able to explain and understand that waves transfer energy from place to place without transferring matter.
- Students will understand that wave properties depend on the vibrations of the wave source and the material in which the wave travels.
- Students will understand how waves interact with matter and with each other.
- Students will understand that sound waves are longitudinal waves produced by vibrations.
- The loudness of a sound depends on its intensity, and the pitch of a sound depends on its frequency.
- Sound waves are used to locate objects, to form images, and to treat medical problems.

[Alignment to Standards](#)

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HS-PS4-1
HS-ETS1-2

Learning Activities & Key Concepts and Skills

- A wave is a repeating disturbance that transfers energy through matter and space.
- Waves carry energy without transporting matter.
- In a transverse wave, matter in the medium moves at right angles to the direction that the wave travels.
- In a longitudinal wave, matter in the medium moves back and forth along the direction that the wave travels.
- Wavelength is the distance between a point on a wave and the nearest point just like it.
- Wave frequency is the number of wavelengths passing a fixed point each second.
- Wave period is the amount of time it takes one wavelength to pass a fixed point.
- The speed of a wave is the product of its frequency and its wavelength.
- As the amplitude of a wave increases, the disturbance from the wave increases.
- When reflection of a wave occurs, the angle of incidence equals the angle of reflection.
- Refraction occurs when a wave changes direction as it moves from one medium to another.
- Diffraction occurs when a wave changes direction by bending around an obstacle.
- Interference occurs when two or more waves overlap and form a new wave.
- Sound waves are longitudinal waves produced by vibrating objects.
- The compressions and rarefactions of sound waves transfer energy.
- Sound cannot travel through a vacuum.
- The ear detects sound waves and converts them to electrical impulses.
- Sound intensity is measured in decibels.
- Pitch is related to frequency.
- The Doppler Effect is the change in wave frequency due to a wave source moving toward an observer.
- Acoustics is the study of sound.
- Sound waves are used by animals and the medical field.
- Foldable Activity – Venn diagram – Transverse vs. Longitudinal waves
- Mini-Lab – Wave Type – Slinky activity
- Virtual Lab – Waves
- Mini-Lab – Observe wavelength
- Lab – Wave Speed and Tension
- Lab – Wavelength, Frequency, and Wave Speed
- Virtual Lab – Animal hearing
- Mini-Lab-Compare Sounds
- Mini-Lab-Measure Sound intensities
- Reading / Poster Activity (life science integration) – Choose an animal, and research its

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sound, and how it uses it.

Assessments

Formative:

- Transverse vs. Longitudinal waves Venn diagram
- Measure sound intensities mini- lab
- Group discussion - Doppler Effect
- Do now - Parts of wave
- Slinky wave - type activity
- Group discussion - how are sound waves used in medicine?

Summative:

- Chapter Quiz - Sound waves
- Sound Energy Chapter test (multiple choice and short answers)
- Wave speed and tension lab

Benchmark:

Alternative:

- Lab Portfolio
- Choose an animal, and research its sound, and how it uses it.

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP4-- Communicate clearly and effectively and with reason.

21st Century Skills

9.3.ST- ET.5 Apply the knowledge learned in STEM to solve problems.

Interdisciplinary Connections

ELA:

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- **WHST.9-12.2 -Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
- **WHST.11-12.8 -Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.**

Mathematics:

- HSA.CED.A.4- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations
- MP.4 - Model with mathematics

Technology Integration

TECH.8.1.12.C - Students will use google docs to formulate and submit assignments on google classroom.

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 - Students complete wave on a string Phet simulation

Time Frame	2 weeks
Topic	
Electromagnetic Waves & Light	
Essential Questions	
<ul style="list-style-type: none">● How does a vibrating electric charge produce an electromagnetic wave?● What properties describe electromagnetic waves?● How do electromagnetic waves transfer energy?● What are the main divisions of the electromagnetic spectrum?● What are the properties of each type of electromagnetic wave?● What are some common uses of each type of electromagnetic wave?● How are carrier waves modulated to transmit information?● What is the difference between amplitude modulation and frequency modulation?	

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- What technologies use radio waves and microwaves for communication?
- How are transparent, translucent, and opaque materials different?
- What is the index of refraction of a material?
- Why does a prism separate white light into different colors?
- How do you see color?
- What is the difference between light color and pigment color?
- What happens when different colors are mixed?

Enduring Understandings

- Students will be able to explain and understand that electromagnetic waves transfer energy through matter and through space.
- The electromagnetic spectrum is divided into several sections, each with a certain range of frequencies and specific properties
- Radio waves and microwaves can be used to transmit signals and information.
- Students will understand that visible light waves are electromagnetic waves that enable us to see.
- Students will demonstrate that materials can absorb, transmit, or reflect light waves.
- Light waves of different wavelengths or combinations of wavelengths cause the human eye to detect different colors.

[Alignment to Standards](#)

- HS-PS2-1
- HS-PS2-2
- HS-PS2-3
- HS-PS2-4
- HS-PS2-5

Learning Activities & Key Concepts and Skills

- An electromagnetic wave consists of a vibrating electric field and a vibrating magnetic field.
- Electromagnetic waves carry radiant energy.
- In empty space, electromagnetic waves travel at 300,000 km/s, the speed of light.
- Electromagnetic waves travel more slowly in matter, with a speed that depends on the material.
- Electromagnetic waves can behave as particles called photons.
- The entire range of frequencies of electromagnetic waves is called the electromagnetic spectrum.
- Radio waves and microwaves have the longest wavelengths.

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- All objects emit infrared waves.
- The human eye can detect visible light.
- Ultraviolet waves, X-rays, and gamma rays are both helpful and harmful to humans.
- Radio waves and microwaves can be used to transmit signals and information.
- Objects can absorb, reflect, transmit, or reflect light waves.
- Light waves always follow the law of reflection.
- Refraction occurs when light changes speed in moving from one material to another at an angle to the normal.
- Different wavelengths of light are refracted by different amounts.
- The color of an object depends on the wavelength of light it reflects.
- Rod and cone cells are light-sensitive cells found in the human eye.
- The color of a filter is the color of the light that the filter transmits.
- All light colors can be created by mixing the primary light colors-red, green, and blue.
- Mini-Lab – Investigate Electromagnetic Waves
- Virtual Lab – Wavelength
- Mini-Lab – Investigate the Effects of Microwaves
- Lab – The Speed of Light
- Lab – Radio Broadcasts – internet research
- Mini-Lab- Observe Refraction in Water
- Light Activities – Explore & Explain
- Activity – Fun with Filters
- Inquiry Lab – Combining Colors
- Virtual Lab – How are Colors Created?
- Lab – The Color Lab

Assessments

Formative:

- Strategic questioning - parts of a wave
- Group Discussion- How can you make different colors
- Do Now - light problems
- Do Now - Colors
- Electromagnetic puzzle
- Electromagnetic WebQuest

Summative:

- Quiz - electromagnetic radiation

Benchmark:

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Alternative:

- Lab Portfolio
- Book of Electromagnetic radiation

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-11- Use technology to enhance productivity.

21st Century Skills

9.3.ST- SM.3 Analyze the impact that science and mathematics has on society.

Interdisciplinary Connections

ELA:

- **WHST.9-12.2 -Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
- **WHST.11-12.8 -Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.**

Mathematics:

- HSA.CED.A.4- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations
- MP.4 - Model with mathematics

Technology Integration

TECH.8.1.12.C - Additional resources and extension activities are on google classroom in order to reflect their learning and expand on knowledge.

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 - Students complete microwaves Phet simulation

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Time Frame	1 week
Topic	
Energy Sources & the Environment	
Essential Questions	
<ul style="list-style-type: none">● Which energy resources do you use daily?● What is the law of conservation of energy?● How do fossil fuels form?● How is chemical potential energy stored in fossil fuels converted into electrical energy?● What are fusion and fission?● How do nuclear reactors convert nuclear energy into thermal energy?● What are the advantages and disadvantages of using nuclear energy to generate electricity?● What are renewable energy sources?● What are some methods for converting different types of renewable resources into electrical energy?● How does human population affect Earth's carrying capacity?● What are the causes and effects of pollution on land, water, and air?● What are some methods used to control the types and sources of pollution?● How can you help protect and preserve Earth's natural resources?	
Enduring Understandings	
<ul style="list-style-type: none">● Students will be able to explain and understand that the burning of fossil fuels converts chemical potential energy to thermal energy, which is then converted into other useful forms.● Having students understand how a nuclear power plant operates and transforms nuclear energy into electrical energy will help them not to fear this controversial energy source.● Students will understand that renewable energy resources lessen human dependence on fossil fuels.● Human impact on land, water, and air affects the natural resources available for use.	
<u>Alignment to Standards</u>	

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- HS-PS2-1
- HS-PS2-2
- HS-PS2-3
- HS-PS2-4
- HS-PS2-5

Learning Activities & Key Concepts and Skills

- Energy is conserved when it changes from one form to another.
- Petroleum, natural gas, and coal are fossil fuels.
- Power plants burn fossil fuels to extract chemical potential energy that spins turbines and power electric generators.
- Fossil fuels are nonrenewable resources.
- Nuclear power plants produce about 8 percent of the energy used each year in the United States.
- Nuclear reactors use the energy released in the fission of U-235 to produce electricity.
- Solar cells convert radiant energy into electrical energy.
- Hydroelectric power plants convert gravitational potential energy into electrical energy.
- Wind energy is converted into electrical energy using a propeller attached to an electrical generator.
- Alternative energy sources can help replace human dependence on fossil fuels.
- Human impact on Earth affects the natural resources available for use to thrive.
- Foldable Activity – Energy Sources
- Mini-Lab – Design an Efficient Water Heater
- Virtual Lab – Energy Output
- Mini-Lab – Use Solar Power at Home
- Lab – Solar Heating
- Lab – Energy-Efficient Building
- Reading / Design Activity – Read about Earth Day & design an Earth day Logo

Assessments

Formative:

- Strategic questioning - how is energy transformed to other types of energy
- Do Now - Types of Energy Sources

Summative:

- Chapter Quiz
- Alternative Energy Google slide presentation

Benchmark:

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- Multiple choice end of course benchmark
- Principles of Chemistry and Physics Skills Benchmark

Alternative:

- Design Earth Day Logo
- Lab Portfolio
- Energy - Efficient Building Lab

Career Education

CRP-12 – Students work productively in collaborative groups using culturally global competence
CRP-4- Communicate clearly and effectively and with reason.

21st Century Skills

9.3.STSM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Interdisciplinary Connections

ELA:

- **WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.**
- WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Technology Integration

TECH.8.1.12.C - Students will use google docs to formulate and submit assignments on google classroom.

TECH.8.1.12.D.5 - Demonstrate personal responsibility for lifelong learning by researching the internet to apply skills to new content.

TECH.8.1.12.E - Organize, analyze, evaluate, and synthesize information from a variety of

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sources and media.

TECH.8.1.12.A-1 - Students will use google slides to synthesize and present information on alternative energy

Modifications (ELL, Special Education, At-Risk Students, Gifted & Talented, & 504 Plans)

ELL:

- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

Gifted and Talented:

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum

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- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

Supports for Students With 504 Plans:

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns

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