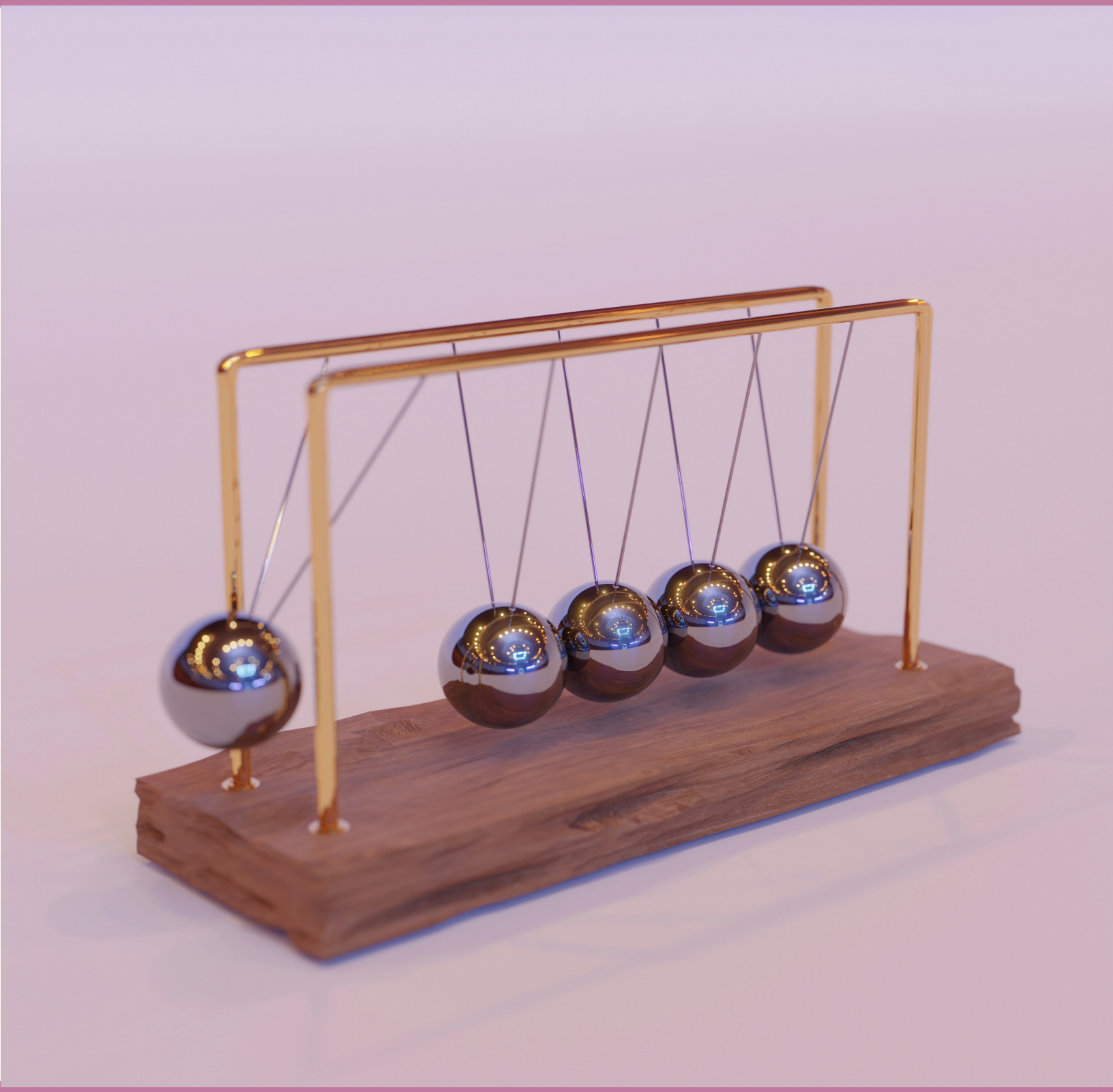
E3 Summer Training 2024

SCIENCE

Grade 8 Physical Science



A+ EDUCATION PARTNERSHIP

A Program of the A+ Education Partnership
In partnership with the Alabama State Dept. of Education

Grade 8
Physical Science

Grade 8 Physical Science is designed to help students apply physical science concepts to daily life, including electricity, thermal energy transfer, and the acceleration of objects such as a car. It also provides students with the skills and content knowledge necessary to be successful in high school chemistry, physics, and physical science courses. Physical Science requires comprehensive learning and the use of reading, writing, and mathematics skills.

This course focuses on four disciplinary core ideas from the physical sciences domain. In "Matter and Its Interactions," students study the structure and function of matter and their effects on chemical reactions. In the second core idea, "Motion and Stability: Forces and Interactions," students explore different forces and various types of interactions. They also engage in predicting and developing explanations for changes in motion. The "Energy" core idea involves the conservation of energy, energy transformations, and applications of energy to everyday life. In the final core idea, "Waves and Their Applications in Technologies for Information Transfer," students examine the relationships between wave properties, types of signals, and their interactions with different instruments.

Embedded in the content standards are the disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain, which require students to use design strategies in conjunction with knowledge and understanding of science and technology to solve practical problems. Engineering standards are denoted with a gear icon⚙. Through guided participation in the engineering design process, students design and test a device that can release or absorb thermal energy by chemical reactions and design, construct, and modify an electromagnet.

Each content standard completes the stem *"**Students will**…"*

Matter and Its Interactions		
Structure and	1. Plan and carry out investigations to support the claim that pure substances can be described and defined by their properties, including solubility, electrical conductivity, and density.	**Structure and Function**

Properties	2. Develop and manipulate models to explain changes in particle motion, temperature, and state of a pure substance when thermal energy is added to or removed from a system.	**Energy and Matter**
	3. Justify a claim, based on evidence from investigations, that pure substances differ from mixtures, including solutions.	**Structure and Function**
	4. Obtain and communicate information from the periodic table, including atomic number, number of electrons and neutrons, average atomic mass, groups, and periods, to illustrate the structure and composition of atoms of different elements. a. Analyze and interpret data to differentiate among elements based on their properties and classify the elements as metals, nonmetals, or metalloids.	**Patterns**
	5. Obtain, evaluate, and communicate information from the periodic table to make predictions about the reactivity of the main group elements. a. Use valence electron configuration to model ionic and covalent bonds.	**Structure and Function**
Chemical Reactions	6. Observe and analyze data regarding characteristic properties of substances before and after they are combined to determine whether a chemical reaction has occurred. *Examples: color change, temperature change, production of a gas, formation of a precipitate*	**Stability and Change**
	7. Analyze data from an investigation to determine whether thermal energy is released or absorbed in a chemical reaction. a. ⚙Design and test a device that can release or absorb thermal energy by chemical reactions.	**Energy and Matter**

	8. Engage in an argument from evidence to support the claim that matter is conserved in a chemical reaction. a. Use a model to verify that atoms of reactants are conserved as products in a chemical reaction. *Examples: simulations, atomic and molecular drawings, or equations to compare atoms in the reactants and products*	
Motion and Stability: Forces and Interactions		
Forces and Motion	9. Use data from an investigation to identify factors that affect acceleration. *Examples: velocity vs. time graphs, data tables, diagrams*	**Cause and Effect**
	10. Develop and use models to illustrate how individual external forces affect the motion of objects. *Examples: frictional forces, gravitational force, applied forces*	
	11. Use models to demonstrate each of Newton's laws of motion and explain the effect of net force on objects. *Examples: A model car on a table remains at rest until pushed, and a marble rolls across the floor until friction causes it to stop (first law of inertia); a bicycle rider's leg muscles apply force to the mass of the bicycle, causing the bicycle to move, and greater acceleration results when pedaling harder creates a greater net force (second law); a ball hitting the ground applies downward action force and the ground applies an upward reaction force, causing the ball to bounce (third law).* a. Use mathematical representations to explain how the sum of external forces on an object and the object's mass affect its acceleration. *Examples: data tables, graphs, diagrams*	

	12. Use a model to identify factors affecting the strength of noncontact forces, including magnetic, gravitational, and electrical forces, and demonstrate that fields exist even though the objects are not in contact. a. ✪Design and construct an electromagnet and modify the design to change its strength.	
Energy		
Types of Energy	13. Analyze graphical displays of data to describe the relationship of mass and velocity of an object to its kinetic energy (KE). *Examples: mass vs. KE graph, velocity vs. KE graph, data table*	**Scale, Proportion, and Quantity**
	14. Use models to construct an explanation of how a system of objects may contain varying amounts of potential energy, including gravitational, elastic, and chemical.	**Systems and System Models**
Conservation of Energy	15. Use models to construct an explanation of how energy is transformed but still conserved. *Example: kinetic energy to potential energy*	
	16. Develop and use a model to construct an explanation of how electrical energy is transferred and transformed. *Example: In a circuit, there is an energy source (battery) that has chemical potential energy. Chemical energy is transformed into electrical energy (current), transferred through the wires, and transformed again into light and heat in the light bulb. Add a resistor and analyze its effect on current.*	

Waves and Their Applications in Technologies for Information Transfer		
Wave Properties	17. Use models of mechanical and electromagnetic waves to qualitatively describe the relationships among wave properties, including amplitude, wavelength, and frequency. *Example: Use a model to show that frequency and wavelength are inversely proportional.* a. Use models to compare and contrast light and sound wave behaviors, including reflection, refraction, diffraction, and speed, as waves propagate and interact with matter.	**Scale, Proportion, and Quantity**
Information Transfer	18. Construct an argument from evidence that digital and analog signals encode and transmit information differently.	

GRADE 8 PHYSICAL SCIENCE

Course Overview

1ST 9-WEEKS

Nature of Science
Unit 1: Structure and Properties of Matter
Unit 2: Atomic Structure and the Periodic Table

2ND 9-WEEKS

Unit 3: Chemical Bonding, Reactions, and Energy
Unit 4: Mixtures and Solutions

3RD 9-WEEKS

Unit 5: Forces and Motion

4TH 9-WEEKS

Unit 6: Energy
Unit 7: Wave Properties, Electromagnetic Radiation, and Information Technology

GRADE 8 PHYSICAL SCIENCE

Course Overview

STANDARDS CROSSWALK
This table matches the 2023 standards to the current Grade 8 Physical Science curriculum.

ALCOS	1ST 9-WEEKS	2ND 9-WEEKS	3RD 9-WEEKS	4TH 9-WEEKS
1	Not fully met			
2	X			
3		X		
4	X			
5		X		
6		X		
7		X		
8		X		
9			X	
10			X	
11			11a. Not fully met	
12			X	
13				X
14				X
15				X
16	Standard not met			
17				17a. Not fully met
18				X

GRADE 8 PHYSICAL SCIENCE

Scope and Sequence 1st 9-Weeks

Nature of Science	UNIT 1: Properties of Matter	UNIT 2: Atomic Structure and the Periodic Table

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	Establish a Science Classroom	Lesson 1- Lab Safety	Lesson 2- Lab Equipment	Lesson 3- Measurement and Dimensional Analysis	Measurement and Dimensional Analysis continued
WEEK 2	Measurement and Dimensional Analysis continued	Lesson 4- Graphing	Graphing continued	Lesson 5- Scientific Investigation	Scientific Investigation continued
WEEK 3	Scientific Investigation continued	Lesson 1- Matter	Lesson 2- Pure Substance vs. Mixture Lesson 3- Properties of Matter	Properties of Matter continued	Properties of Matter continued
WEEK 4	Properties of Matter continued	Properties of Matter continued	Properties of Matter continued	Properties of Matter continued	Lesson 4- Thermal Energy/ Heat/ Temperature
WEEK 5	Lesson 5- States of Matter	States of Matter continued	Lesson 6- Change in State	Change in State continued	Change in State continued
WEEK 6	Lesson 1- Introduction	Lesson 2- Atomic Theory	Atomic Theory continued	Lesson 3- Atomic Structure	Atomic Structure continued
WEEK 7	Lesson 4- Periodic Table Organization	Periodic Table Organization continued	Lesson 5- Atoms and Isotopes	Atoms and Isotopes continued	Atoms and Isotopes continued
WEEK 8	Lesson 6- Energy Level Models	Energy Level Models continued	Energy Level Models continued	Flex day	Flex Day
WEEK 9	Open for flexibility in schedule				

GRADE 8 PHYSICAL SCIENCE

Nature of Science Overview

Nature of Science	RECOMMENDED TIME FRAME: 2 weeks

UNIT OVERVIEW

Accurately conveying the nature of science is common to most science education curricula worldwide. There is a clear message that understanding the nature of science is crucial for effective science teaching, for valuable science learning, and for responsible participation in society. The A+ College Ready curriculum clearly and strongly emphasizes the importance of the nature of science by placing it as the introductory unit to science.

Students have seen the topics in this unit in previous science classes. The tendency is for students to "forget" what they have learned in the past. Do not let the students slow down the pace of this unit. These topics should be addressed at the beginning of the year and then put into practice throughout the physical science course.

STANDARDS

- ✓ Analyzing & Interpreting Data
- ✓ Asking Questions
- ✓ Constructing Explanations
- ✓ Engaging in Argument from Evidence
- ✓ Mathematics & Computational Thinking
- ✓ Obtain, Evaluate, Communicate Information
- ✓ Planning & Carrying Out Investigations

RESOURCES

Learning Plans
Student Progress Monitoring Document
Student Notes and PowerPoints
Labs/Activities
Checkpoint Questions

GRADE 8 PHYSICAL SCIENCE

Unit 1 Overview

Structure and Properties of Matter	RECOMMENDED TIME FRAME: 3 weeks

UNIT OVERVIEW

Understanding the properties of matter and how to use this information to identify and describe substances and/or objects is a very important objective for students in physical science. These ideas are vital to the rest of the physical science curriculum. Properties of matter are reinforced when studying the Periodic Table of the Elements, mixtures and compounds, chemical bonds and reactions, etc.

Common Student Misconceptions:

- Big objects will always sink, and small objects will always float.
- Heavy objects will always sink, and lighter objects will always float.
- Property is something owned. Property, in this unit, is a type of characteristic used to describe matter.
- Volume is always measured the same way.
- Mass and weight are the same thing.
- An amount of liquid in a tall container has more volume when poured into a short container. When in fact it is the same amount (volume) of liquid, it just takes on a different shape.
- Density and weight are the same.

STANDARDS

8.PS.2 Plan and carry out investigations to generate evidence supporting the claim that one pure substance can be distinguished from another based on characteristic properties.

8.PS.4 Design and conduct an experiment to determine changes in particle motion, temperature and state of a pure substance when thermal energy is added to or removed from a system.

PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
✓ Planning and Carrying Out Investigations	✓ Matter and Its Interactions	✓ Patterns ✓ Systems and System Models

RESOURCES

Learning Plans
Student Progress Monitoring Document
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Labs/Activities
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GRADE 8 PHYSICAL SCIENCE

Unit 2 Overview

Atomic Structure and the Periodic Table	RECOMMENDED TIME FRAME: 2-3 weeks

UNIT OVERVIEW

The Periodic Table of Elements can be considered one of the greatest organizational accomplishments of science. With such a large scope of elements that occur in our world, finding order and patterns in the chaos helps us to realize similarities and differences that we might not have noticed prior. Relationships between elements become more evident and repeating patterns emerge as we examine the groups and periods as they are arranged. Students begin this unit by examining how atomic structure impacts the properties of specific atoms and elements. These atoms and elements can then be compared to one another using models to elucidate patterns present in the periodic table.

STANDARDS

8.PS.1 Analyze patterns within the periodic table to construct models (e.g., molecular-level models, including drawings; computer representations) that illustrate the structure, composition, and characteristics of atoms and molecules.

PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
✓ Developing and Using Models	✓ Matter and Its Interactions	✓ Patterns

RESOURCES

Learning Plans
Student Progress Monitoring Document
Student Notes and PowerPoints
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GRADE 8 PHYSICAL SCIENCE

Scope and Sequence 2nd 9-Weeks

UNIT 3: Chemical Bonding, Reactions, and Energy	UNIT 4: Mixtures and Solutions

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	Lesson 1- Chemical Bonds and Nomenclature	Chemical Bonds and Nomenclature continued	Chemical Bonds and Nomenclature continued	Chemical Bonds and Nomenclature continued	Chemical Bonds and Nomenclature continued
WEEK 2	Lesson 2- Physical and Chemical Changes (review)	Lesson 3- Chemical Formulas and Equations	Chemical Formulas and Equations continued	Lesson 4- Conservation of Mass	Conservation of Mass continued
WEEK 3	Conservation of Mass continued	Lesson 5- Types of Reactions (if time allows)	Types of Reactions continued (if time allows)	Lesson 6- Rates of Reactions (if time allows)	Rates of Reactions continued (if time allows)
WEEK 4	Lesson 7- Energy Changes in Chemical Reactions	Energy Changes in Chemical Reactions continued	Flex day	Flex day	Flex day
WEEK 5	Lesson 1- Pure Substances vs. Mixtures	Pure Substances vs. Mixtures continued	Lesson 2- Separation Techniques	Separation Techniques continued	Lesson 3- Solutions
WEEK 6	Solutions continued	Solutions continued	Lesson 4- Acids, Bases, and pH (if time allows)	Acids, Bases, and pH continued (if time allows)	Acids, Bases, and pH continued (if time allows)
WEEK 7	Lesson 5- Natural Resources and Synthetic Materials	Natural Resources and Synthetic Materials continued	Natural Resources and Synthetic Materials continued	Flex day	Flex day
WEEK 8	Open for flexibility in schedule				
WEEK 9	Open for flexibility in schedule				

GRADE 8 PHYSICAL SCIENCE

Unit 3 Overview

Chemical Bonding, Reactions, and Energy	RECOMMENDED TIME FRAME: 4 weeks

UNIT OVERVIEW

This unit on Chemical Bonding, Reactions and Energy provides hands-on, exciting opportunities for students to explore chemical changes (reactions), how they're different from physical changes, what occurs at the atomic level, the energy involved, the different types, and how these reactions can occur at different rates. Students may have been introduced to chemical changes in Unit 1 but have yet to explore reactions in-depth in any other science course.

Chemical reactions are what drive almost every interaction in our daily lives. There are many aspects of chemical reactions to study. There are several different reaction types, the idea that mass is conserved during a chemical reaction, energy changes that take place, and various factors that affect reaction rates. Students are naturally fascinated by chemical reactions; therefore, teachers may use demos to engage students in the lessons. Though this unit is full of new information that students may view as difficult, remind students to stick with the challenge as they will build upon their skills and content knowledge in their high school biology and chemistry courses.

Provide visual and hands-on opportunities for the students to explore all topics in this unit and support their findings with the questions that correspond to each lab or activity. A powerful learning experience comes from debriefing the lab and discussing the observations that were made. Consider using PhET simulations, video clips, textual information, manipulatives, and the interactives in the student notes to accompany any direct instruction or lab experience. When students can "see" information in a variety of ways, they're better able to form connections between observations and content.

Tyler Dewitt Videos can be shown in class or assigned as homework. They contain great visuals for abstract concepts.

Valence Electrons and the Periodic Table
Ionic vs. Molecular (Covalent)
Ionic Bonding Introduction-
Ionic Bonding Part 2
Ionic Bonding Part 3
Writing Ionic Formulas: Introduction
Naming Covalent Molecular Compounds
Writing Formulas with Polyatomic Ions

Gizmos: Chemical Changes can be used throughout the unit. Certain activities are applicable to certain topics, or it can be used at the end of the unit for review.

GRADE 8 PHYSICAL SCIENCE

Unit 3 Overview

STANDARDS

8.PS.5 Observe and analyze characteristic properties of substances (e.g., odor, density, solubility, flammability, melting point, boiling point) before and after the substances combine to determine if a chemical reaction has occurred.

8.PS.6 Create a model, diagram, or digital simulation to describe conservation of mass in a chemical reaction and explain the resulting differences between the products and reactants.

8.PS.1 (supporting standard)
Analyze patterns within the periodic table to construct models (e.g., molecular- level models, including drawings; computer representations) that illustrate the structure, composition and characteristics of atoms and molecules.

8.PS.7 (supporting standard)
Design, construct, and test a device (e.g., glow stick, hand warmer, hot or cold pack, thermal wrap) that either releases or absorbs thermal energy by chemical reactions (e.g., dissolving ammonium chloride or calcium chloride in water) and modify the device as needed based on criteria *e.g., amount/ concentration, time, temperature).* Engineering, Technology and Applications of Science Standard

PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
✓ Analyzing and Interpreting Data ✓ Developing and Using Models ✓ Constructing Explanations and Designing Solutions	✓ Matter and Its Interactions	

RESOURCES

Learning Plans
Student Progress Monitoring Document
Student Notes and PowerPoints
Labs/Activities
Checkpoint Questions

GRADE 8 PHYSICAL SCIENCE

Unit 4 Overview

Mixtures and Solutions	RECOMMENDED TIME FRAME: 3 weeks

UNIT OVERVIEW

Compounds, mixtures, and solutions are an important part of everything we do in life. Without this ability to chemically and physically combine atoms, we would not have the diversity present in our world. It is important for students to understand how these things work together to make the world around them what it is. In this unit, students will begin by exploring elements, compounds, and mixtures. By this point, students should have a firm understanding of atoms and elements from Unit 2 as this knowledge will help them when determining the differences between compounds and mixtures.

Knowledge of compounds, mixtures, and solutions is very important in our society. From the food we eat and drink, the clothes we wear, the vehicles we drive, and the fun we have, none of it would be possible without compounds, mixtures, and solutions. This knowledge is also crucial for solving some of the worlds' problems. For example, without the quick thinking of engineers in Victoria's underground tunnel, a disaster could have occurred. Instead, the understanding of chemistry and the ability to find sugar saved the day! (For more info)

Common Misconceptions

- The idea of pure substances- Many students believe that all clear, colorless solutions are pure substance because there appears to be only one thing in the glass.
- When something dissolves it disappears.
- A compound is a type of mixture.
- Solutions can only be liquid.
- Weak acids have lower pH numbers than strong acids.
- The pH scale and it's logarithmic adjustments.

STANDARDS

8.PS.3 Construct explanations based on evidence from investigations to differentiate among compounds, mixtures and solutions.

a. Collect and analyze information to illustrate how synthetic materials (e.g. medicine, food additives, alternative fuels, plastics) are derived from natural resources and how they impact society.

PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
✓ Constructing Explanations ✓ Analyzing and Interpreting Data ✓ Obtaining, Evaluating, and Communicating Information	✓ Matter and Its Interactions	✓ Patterns

GRADE 8 PHYSICAL SCIENCE

Unit 4 Overview

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Learning Plans
Student Progress Monitoring Document
Student Notes and PowerPoints
Labs/Activities
Checkpoint Questions

GRADE 8 PHYSICAL SCIENCE

Scope and Sequence 3rd 9-Weeks

UNIT 5: Forces and Motion

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	Lesson 1- Position and Motion	Position and Motion continued	Lesson 2- Speed and Velocity	Speed and Velocity continued	Speed and Velocity continued
WEEK 2	Speed and Velocity continued	Lesson 3- Acceleration	Acceleration continued	Lesson 4- Forces	Forces continued
WEEK 3	Forces continued	Forces continued	Lesson 5- Gravity	Gravity continued	Lesson 6- Friction
WEEK 4	Friction continued	Friction continued	Friction continued	Lesson 7- Electric and Magnetic Force	Electric and Magnetic Force continued
WEEK 5	Electric and Magnetic Force continued	Electric and Magnetic Force continued	Electric and Magnetic Force continued	Electric and Magnetic Force continued	Electric and Magnetic Force continued
WEEK 6	Unit 8- Newton's Laws of Motion	Newton's Laws of Motion continued	Newton's Laws of Motion continued	Newton's Laws of Motion continued	Newton's Laws of Motion continued
WEEK 7	Newton's Laws of Motion continued	Newton's Laws of Motion continued	Newton's Laws of Motion continued	Flex day	Flex day
WEEK 8	Open for flexibility in schedule				
WEEK 9	Open for flexibility in schedule				

GRADE 8 PHYSICAL SCIENCE

Unit 5 Overview

Forces and Motion	RECOMMENDED TIME FRAME: 8 weeks

UNIT OVERVIEW

This unit is designed to help students see the relationships that exist between forces and motion. Through the development of specific ideas, such as Newton's Laws, students will better understand and be able to explain the world around them. It is important to help students make connections with what they see in their lives and the phenomena that they are studying in class. This not only furthers their understanding, but it also helps them to apply the ideas to new situations. The unit is organized so that students first learn about motion and then the forces that cause motion. This was done because students are often familiar with motion in their lives but are unfamiliar with the invisible forces that may cause it. By developing their understanding of motion, we can bridge their understanding into how forces cause motion. Finally, students will show their understanding of forces, motion, and Newton's Laws through several labs and performance assessments.

STANDARDS

8.PS.8 Use Newton's first law to demonstrate and explain that an object is either at rest or moves at a constant velocity unless acted upon by an external force (e.g., model car on a table remaining at rest until pushed).

8.PS.9 Use Newton's second law to demonstrate and explain how changes in an object's motion depend on the sum of the external forces on the object and the mass of the object (e.g., billiard balls moving when hit with a cue stick).

8.PS.10 Use Newton's third law to design a model to demonstrate and explain the resulting motion of two colliding objects (e.g., two cars bumping into each other, a hammer hitting a nail).*

8.PS.11 Plan and carry out investigations to evaluate how various factors (e.g., electric force produced between two charged objects at various positions; magnetic force produced by an electromagnet with varying number of wire turns, varying number or size of dry cells, and varying size of iron core) affect the strength of electric and magnetic forces.

8.PS.12 Construct an argument from evidence explaining that fields exist between objects exerting forces on each other (e.g., interactions of magnets, electrically charged strips of tape, electrically charged pith balls, gravitational pull of the moon creating tides) even when the objects are not in contact.

PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
✓ Constructing Explanations ✓ Developing and Using Models ✓ Planning and Carrying Out Investigations ✓ Engaging in Argument from Evidence	✓ Motion and Stability: Forces and Interactions	✓ Cause and Effect ✓ Stability and Change ✓ Systems and System Models

GRADE 8 PHYSICAL SCIENCE

Unit 5 Overview

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GRADE 8 PHYSICAL SCIENCE

Scope and Sequence 4th 9-Weeks

UNIT 6: Energy	UNIT 7: Waves, Electromagnetic Radiation, and Information Technology

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	Lesson 1- Introduction	Lesson 2- Types of Energy	Types of Energy continued	Types of Energy continued	Types of Energy continued
WEEK 2	Types of Energy continued	Types of Energy continued	Types of Energy continued	Types of Energy continued	Lesson 3- Forms of Energy
WEEK 3	Forms of Energy continued	Forms of Energy continued	Lesson 4- Conservation/ Energy Transformations	Conservation/ Energy Transformations continued	Lesson 5- Energy, Work, and Power (if time allows)
WEEK 4	Energy, Work, and Power (if time allows) continued	Energy, Work, and Power (if time allows) continued	Lesson 6- Temperature and Energy Transfer	Temperature and Energy Transfer continued	Temperature and Energy Transfer continued
WEEK 5	Temperature and Energy Transfer continued	Lesson 1- Wave Properties	Wave Properties continued	Wave Properties continued	Lesson 2- Sound Waves
WEEK 6	Sound Waves continued	Sound Waves continued	Sound Waves continued	Lesson 3- Light	Light continued
WEEK 7	Lesson 4- Electromagnetic Spectrum	Electromagnetic Spectrum continued	Electromagnetic Spectrum continued	Electromagnetic Spectrum continued	Electromagnetic Spectrum continued
WEEK 8	Lesson 5- Digital vs. Analog Signals	Digital vs. Analog Signals continued	Digital vs. Analog Signals continued	Digital vs. Analog Signals continued	Digital vs. Analog Signals continued
WEEK 9	Lesson 6- Information Technology	Information Technology continued	Information Technology continued	Information Technology continued	Information Technology continued

GRADE 8 PHYSICAL SCIENCE

Unit 6 Overview

Energy	RECOMMENDED TIME FRAME: 4 weeks

UNIT OVERVIEW

Understanding conservation of energy and how to use this information to identify and describe types of energy and energy transformations is a very important objective for students in physical science. These ideas are vital to the rest of the physical science curriculum. Energy is a cross-cutting concept, is involved in all of life's processes and is studied in every branch of science.

Common Misconceptions:

- Energy is truly lost in many energy transformations.
- There is no relationship between matter and energy.
- Energy can be changed completely from one form to another (no energy losses).
- Things “use up” energy.
- Energy is confined to some particular origin, such as what we get from food or what the electric company sells.
- An object at rest has no energy.
- The only type of potential energy is gravitational.
- Gravitational potential energy depends only on the height of an object.
- Doubling the speed of a moving object doubles the kinetic energy.
- Energy is a “thing” or matter. This is a fuzzy notion, probably because of the way we talk about newton-meters or joules. It is difficult to imagine an “amount” of an abstraction.
- The terms “energy” and “force” are interchangeable.

GRADE 8 PHYSICAL SCIENCE

Unit 6 Overview

STANDARDS

8.PS.13 Create and analyze graphical displays of data to illustrate the relationships of kinetic energy to the mass and speed of an object (e.g., riding a bicycle at different speeds, hitting a table tennis ball versus a golf ball, rolling similar toy cars with different masses down an incline).

8.PS.14 Use models to construct an explanation of how a system of objects may contain varying types and amount of potential energy (e.g., observing the movement of a roller coaster cart at various inclines, changing the tension in a rubber band, varying the number of batteries connected in a series, observing a balloon with static electrical charge being brought closer to a classmate's hair).

8.PS.15 Analyze and interpret data from experiments to determine how various factors affect energy transfer as measured by temperature (e.g., comparing final water temperatures after different masses of ice melt in the same volume of water with the same initial temperature, observing the temperature change of samples of different materials with the same mass and the same material with different masses when adding a specific amount of energy).

8.PS.16 Apply the law of conservation of energy to develop arguments supporting the claim that when the kinetic energy of an object changes, energy is transferred to or from the object (e.g., bowling ball hitting pins, brakes being applied to a car).

PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
✓ Analyzing and Interpreting Data ✓ Developing and Using Models ✓ Engaging in Argument from Evidence	✓ Energy	✓ Scale, Proportion, and Quantity ✓ Systems and System Models ✓ Energy and Matter

RESOURCES

Learning Plans
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GRADE 8 PHYSICAL SCIENCE

Unit 7 Overview

Wave Properties, Electromagnetic Radiation, and Information Technology	RECOMMENDED TIME FRAME: 5 weeks

UNIT OVERVIEW

Waves can be a challenging topic for a middle school student. With waves being "invisible", it can be difficult for a student to relate to and explain. As a result, they have many misconceptions about wave behavior. In order to allow students to make connections, the unit begins with a lesson that helps make wave properties visible. The Next Generation Science Standards have identified an essential question that can drive student learning in "*What are the characteristic properties of waves and how can they be used?*" The end goal of this unit is for students to explain (draw, simulate, etc) using evidence for how communication devices use digitized signals/ EM waves to encode and transmit data.

This unit will go into details of the relationships between wave properties and how they are represented by the formula Speed (velocity)= wavelength x frequency. The lesson on electromagnetic radiation will be related to the electromagnetic spectrum and will allow students to research and explain the different types of waves on the electromagnetic spectrum and how they are arranged by energy, wavelength, and frequency. Students will also learn how light and sound waves differ in their interactions with various types of media and how they will react when they are transmitted. Lastly, the students will learn how common communication devices use electromagnetic waves to encode and transmit information.

STANDARDS

8.PS.17 Create and manipulate a model of a simple wave to predict and describe the relationships between wave properties (e.g., frequency, amplitude, wavelength) and energy.
a. Analyze and interpret data to illustrate an electromagnetic spectrum.

8.PS.18 Use models to demonstrate how light and sound waves differ in how they are absorbed, reflected, and transmitted through different types of media.

8.PS.19 Integrate qualitative information to explain that common communication devices (e.g., cellular telephones, radios, remote controls, Wi-Fi components, global positioning systems [GPS], wireless technology components) use electromagnetic waves to encode and transmit information.

PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
✓ Developing and Using Models ✓ Analyzing and Interpreting Data ✓ Obtaining, Evaluating and Communicating Information	✓ Waves and Their Applications in Technologies for Information Transfer	✓ Patterns ✓ Systems and System Models ✓ Structure and Function

GRADE 8 PHYSICAL SCIENCE

Unit 7 Overview

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