Integrated Physics and Chemistry (IPC)
Overview
2024 – 2025

This document is designed provide parents/guardians/community an overview of the curriculum taught in the FBISD classroom. This document supports families in understanding the learning goals for the course, and how students will demonstrate what they know and are able to do. The overview offers suggestions or possibilities to reinforce learning at home.

Included at the end of this document, you will find:

- A glossary of curriculum components
- The content area instructional model
- Parent resources for this content area

To advance to a particular grading period, click on a link below.

The process standards describe ways in which students are expected to engage in the content. The Scientific and Engineering Practices (SEPs) describe practices that students need to do in the classroom in order to learn the content. The Recurring Themes and Concepts (RTCs) describe how students need to think about the content in order to learn it.

Scientific and Engineering Practices

IPC.1A ask questions and define problems based on observations or information from text, phenomena, models, or investigations.
IPC.1B apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems.
IPC.1C use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency approved safety standards.
IPC.1D use appropriate tools such as data-collecting probes, software applications, the internet, standard laboratory glassware, metric rulers, meter sticks, spring scales, multimeters, Gauss meters, wires, batteries, light bulbs, switches, magnets, electronic balances, mass sets, Celsius thermometers, hot plates, an adequate supply of consumable chemicals, lab notebooks or journals, timing devices, models, and diagrams.
IPC.1E collect quantitative data using the International System of Units (SI) and qualitative data as evidence.
IPC.1F organize quantitative and qualitative data using labeled drawings and diagrams, graphic organizers, charts, tables, and graphs.
IPC.1G develop and use models to represent phenomena, systems, processes, or solutions to engineering problems.
IPC.1H distinguish among scientific hypotheses, theories, and laws.
IPC.2A identify advantages and limitations of models such as their size, scale, properties, and materials.
IPC.2B analyze data by identifying significant statistical features, patterns, sources of error, and limitations.
IPC.2C use mathematical calculations to assess quantitative relationships in data.
IPC.2D evaluate experimental and engineering designs.

IPC.3A develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories.
IPC.3B communicate explanations and solutions individually and collaboratively in a variety of settings and formats.
IPC.3C engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.
IPC.4A analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student.
IPC.4B relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content.

Recurring Themes and Concepts

Unit 1	Energy and Matter, Scale, Proportion, and Quantity
Unit 2	Cause and Effect, Energy and Matter, Patterns
Unit 3	Cause and Effect, Energy and Matter, Patterns, Structure and Function
Unit 4	Cause and Effect, Stability and Change
Unit 5	Cause and Effect, Stability and Change
Unit 6	Cause and Effect, Energy and Matter, Systems and System Models
Unit 7	Cause and Effect, Matter and Energy, Patterns, Scale, Proportion, and Quantity, Stability and Change, Systems
Unit 8	Energy and Matter, Stability and Change
Unit 9	Cause and Effect, Patterns

Grading Period 1

Unit 1:

Estimated Date Range: August 8 – October 1
Estimated Time Frame: 39 days

Unit Overview:
In this unit, IPC students explore key concepts in chemistry and how they relate to everyday life. They will start by learning how to balance chemical equations, which shows that atoms and mass are conserved during a reaction. Next, students will see how the physical and chemical properties of substances, like those used in sunscreen or cookware, determine their everyday uses. Students will also build models of atomic structures to understand how an element's atomic makeup influences its bonding, reactivity, and placement on the Periodic Table. By recognizing patterns within the Periodic Table, we can predict how different elements will behave and react.
Students will learn how electrons can move between energy levels, releasing light (photons) at specific frequencies depending on the energy change. This ties into the concept of atomic energy levels and emission spectra, providing evidence for the wave-particle duality of electrons. Throughout this unit, we'll use simple models and relatable examples to make these abstract concepts more understandable and relevant to daily life.

At home connections:

- Use common household ingredients like baking soda and vinegar to perform a simple chemical reaction and then write the balanced chemical equation for it. Observe how the amounts of each substance change, demonstrating the conservation of mass.
- Examine the labels on sunscreen and cookware at home to identify the substances used and research their chemical properties. Discuss how these properties make them suitable for their specific uses, like blocking UV rays or conducting heat.

- Create a model of an atom using items like beads or candies to represent protons, neutrons, and electrons. Relate this model to the element's position on the Periodic Table and discuss its bonding and reactivity.
- Look up different elements on the Periodic Table and compare their properties, like melting points or reactivity. Predict how these elements might react with each other based on their positions in the table.
- Use a simple LED light or a prism to observe how light can be emitted at different colors, representing different energy transitions. Discuss how this relates to electrons moving between energy levels in atoms.
- Research online videos or simulations that show emission spectra for different elements and observe the unique patterns of light they emit. Explain how these spectra provide evidence for the wave-particle duality of electrons.

Concepts within Unit #1 Link to High School Science TEKS	**Success Criteria for this concept** *Students can…*
Concept #1: Safety IPC.1B	• identify and use the correct safety equipment, such as goggles, gloves, and lab coats, during laboratory activities. • follow safety procedures and guidelines as outlined in the Texas Education Agency approved safety standards. • demonstrate safe handling and disposal of chemicals and other materials in the lab. • recognize and respond appropriately to safety hazards in the classroom, laboratory, and field settings. • explain the importance of safety practices and how they prevent accidents and injuries.
Concept #2: Classification of Matter IPC.8B, 7C	• Create models that represent the reactants and products in a chemical reaction. • Accurately balance chemical equations by ensuring the number of atoms of each element is the same on both sides of the equation. • Explain how the balanced equation demonstrates the conservation of mass by showing that the number of atoms of each element remains constant. • Provide real-world examples of chemical reactions where mass is conserved. • Explain how physical properties of substances are related to their usage in everyday life. • Identify and describe physical properties of substances. • Give specific examples of substances used in everyday items and explain the connection between their physical properties and their uses. • Compare the physical properties of different substances used in similar applications and discuss why one might be preferred over the other.
Concept #3: Properties of Atoms and the Periodic Table IPC.7A, 7B, 7D, 7E	• create a model of an atom and explain how its structure determines its position on the Periodic Table. • describe how the atomic structure of an element affects its bonding and reactivity with other elements. • identify and explain patterns within the Periodic Table. • use the position of an element on the Periodic Table to predict its reactivity and how it might react with other elements. • describe how electrons move between energy levels and how these transitions result in the emission of light. • provide examples of how electron transitions are observed in real life, such as in neon lights or fireworks. • explain how emission spectra are produced and how they provide evidence for the wave-particle duality of electrons.

	• relate the concept of atomic energy levels and wave-particle duality to the behavior of electrons in atoms.
Concept #4: Elements and their Properties IPC. 7A, 7B, 7C	• Identify and describe physical properties of substances. • Explain how these physical properties determine the suitability of substances for specific applications. • Give examples of substances used in everyday items and explain the connection between their physical properties and their uses. • Compare the physical properties of different substances.

Unit 2: Chemical Reactions

Estimated Date Range: October 2 – October 9
Estimated Time Frame: 5 days

Unit Overview:

In this unit, we will explore the fundamental concepts of atomic structure, the forces within atoms, and how these principles relate to chemical reactions and the properties of elements. We'll begin by modeling basic atomic structures to understand how protons, neutrons, and electrons determine an element's position on the Periodic Table and its bonding and reactivity. Through recognizing patterns within the Periodic Table, we can predict the relative physical and chemical properties of elements. This foundational knowledge will help us develop models to balance chemical equations, demonstrating that atoms and mass are conserved during chemical reactions. We will also investigate how changes in properties, such as color or temperature, indicate chemical reactions, using examples like the combustion of fuels and the neutralization of acids and bases.

The unit will also cover the four fundamental forces, focusing on the strong and weak nuclear forces, and how they govern nuclear processes like fission and fusion. We'll research the applications of nuclear reactions in modern technologies, weighing their advantages and disadvantages in areas such as energy production and medical treatments. Finally, we will connect the physical and chemical properties of substances to their practical uses in everyday life, examining how these properties influence the selection of materials for products like sunscreen and cookware. Through these investigations, students will gain a comprehensive understanding of atomic theory, chemical reactions, and the practical applications of these concepts in the real world.

At home connections:

- Research videos or animations online that explain the four fundamental forces, focusing on strong and weak nuclear forces, fission, and fusion. Then, discuss with a family member how these forces play a role in phenomena like the sun's energy and nuclear power plants.
- Use everyday items like marshmallows and toothpicks to create models of simple atoms, showing the protons, neutrons, and electrons. Relate these models to their positions on the Periodic Table and discuss how this affects their chemical behavior.
- Explore an interactive Periodic Table online and select a few elements to compare their properties, such as melting points and reactivity. Predict how these elements might behave in reactions based on their positions and then look up real-world examples to confirm your predictions.
- Try a simple experiment at home, like mixing baking soda and vinegar, and write the chemical equation for the reaction. Use this example to explain how mass is conserved by showing that the number of atoms on both sides of the equation remains equal.
- Conduct a safe experiment, such as observing the rusting of a piece of iron or a nail over time and document the changes you see. Use these observations to explain how changes in properties indicate a chemical reaction, such as oxidation.
- Look at common household items like non-stick pans or gasoline and research their chemical properties. Discuss how these properties make the materials suitable for their everyday uses, like heat resistance in cookware or energy density in fuels.

Concepts within Unit #2 Link to High School Science TEKS	**Success Criteria for this concept** *Students can…*
Concept #1: Radioactivity and Nuclear Reactions IPC.5D, 8C	• describe strong and weak nuclear forces. • explain how the strong and weak nuclear forces operate within the nucleus of an atom and describe the processes of fission and fusion.

	• research and explain the uses of nuclear reactions in various technologies, such as power generation, medicine, and industry. • communicate the advantages and disadvantages of nuclear energy.

Grading Period 2

Unit 2: Chemical Reactions (continued)

Estimated Date Range: October 16 – November 12
Estimated Time Frame: 23 days

Unit Overview:

In this unit, we will explore the fundamental concepts of atomic structure, the forces within atoms, and how these principles relate to chemical reactions and the properties of elements. We'll begin by modeling basic atomic structures to understand how protons, neutrons, and electrons determine an element's position on the Periodic Table and its bonding and reactivity. Through recognizing patterns within the Periodic Table, we can predict the relative physical and chemical properties of elements. This foundational knowledge will help us develop models to balance chemical equations, demonstrating that atoms and mass are conserved during chemical reactions. We will also investigate how changes in properties, such as color or temperature, indicate chemical reactions, using examples like the combustion of fuels and the neutralization of acids and bases.

The unit will also cover the four fundamental forces, focusing on the strong and weak nuclear forces, and how they govern nuclear processes like fission and fusion. We'll research the applications of nuclear reactions in modern technologies, weighing their advantages and disadvantages in areas such as energy production and medical treatments. Finally, we will connect the physical and chemical properties of substances to their practical uses in everyday life, examining how these properties influence the selection of materials for products like sunscreen and cookware. Through these investigations, students will gain a comprehensive understanding of atomic theory, chemical reactions, and the practical applications of these concepts in the real world.

At home connections:

- Research videos or animations online that explain the four fundamental forces, focusing on strong and weak nuclear forces, fission, and fusion. Then, discuss with a family member how these forces play a role in phenomena like the sun's energy and nuclear power plants.
- Use everyday items like marshmallows and toothpicks to create models of simple atoms, showing the protons, neutrons, and electrons. Relate these models to their positions on the Periodic Table and discuss how this affects their chemical behavior.
- Explore an interactive Periodic Table online and select a few elements to compare their properties, such as melting points and reactivity. Predict how these elements might behave in reactions based on their positions and then look up real-world examples to confirm your predictions.
- Try a simple experiment at home, like mixing baking soda and vinegar, and write the chemical equation for the reaction. Use this example to explain how mass is conserved by showing that the number of atoms on both sides of the equation remains equal.
- Conduct a safe experiment, such as observing the rusting of a piece of iron or a nail over time and document the changes you see. Use these observations to explain how changes in properties indicate a chemical reaction, such as oxidation.
- Look at common household items like non-stick pans or gasoline and research their chemical properties. Discuss how these properties make the materials suitable for their everyday uses, like heat resistance in cookware or energy density in fuels.

Concepts within Unit #2 **Link to TEKS**	**Success Criteria for this concept** *Students can…*
Concept #1: Radioactivity and Nuclear Reactions IPC.5D, 8C	• describe strong and weak nuclear forces. • explain how the strong and weak nuclear forces operate within the nucleus of an atom and describe the processes of fission and fusion. • research and explain the uses of nuclear reactions in various technologies, such as power generation, medicine, and industry. • communicate the advantages and disadvantages of nuclear energy.
Concept #2: Chemical Bonds IPC.7A, 7B	• create models of atoms that accurately represent protons, neutrons, and electrons, and explain how these particles determine an element's identity and properties. • explain how an element's atomic structure influences its bonding and reactivity, using examples from the Periodic Table.

	• identify trends and patterns in the Periodic Table, such as groups and periods, and use these patterns to predict an element's properties. • predict an element's reactivity and physical properties based on its position in the Periodic Table and provide examples of how this information is used in real-world applications.
Concept #3: Chemical Reactions IPC.8A, 8B, 7C	• identify and describe the observable changes that indicate a chemical reaction has occurred, such as color change, gas production, and temperature change. • Design an experiments to investigate chemical reactions and explain how changes in properties confirm that a reaction has taken place. • balance chemical equations by ensuring that the number of atoms of each element is the same on both sides of the equation. • use models to explain how atoms are rearranged during a chemical reaction and how this supports the conservation of mass. • identify the physical and chemical properties of substances and explain how these properties determine their practical uses in products like sunscreen and cookware. • analyze real-world examples of how the properties of materials influence their selection and use in various industries and consumer products.

Unit 3: Chemical Relationships

Estimated Date Range: November 13 – December 9
Estimated Time Frame: 22 days

Unit Overview:

In this unit, we will delve into the fascinating world of acids and bases, focusing on their properties, reactions, and applications in everyday life. We will begin by exploring the physical and chemical properties of acids and bases and how these properties relate to their practical uses in products like cleaning agents, food preservation, and personal care items. Students will learn about the characteristics of acids and bases, such as pH levels, corrosiveness, and reactivity, and examine how these properties make them suitable for specific applications in industries and households. By understanding these connections, students will gain insights into why substances like hydrochloric acid are used in industrial cleaning or why baking soda (a base) is a common household item for neutralizing odors.

Additionally, students will plan and conduct investigations to provide evidence of how various factors affect the rate of reactions involving acids and bases. Through experiments, we will explore how particle size, stirring, temperature, and concentration influence the speed of reactions, using examples like dissolving antacid tablets or reacting vinegar with baking soda. We will also investigate how changes in properties indicate chemical reactions, focusing on reactions such as hydrochloric acid reacting with metals and neutralizing acids with bases. By observing these reactions, students will identify indicators of chemical change, such as gas production, color changes, and temperature variations, and apply this knowledge to real-world scenarios where controlling reaction rates and outcomes is crucial. This unit will provide students with a comprehensive understanding of the role of acids and bases in both natural processes and technological applications.

At home connections:

Examine common household items such as lemon juice, vinegar, and baking soda, and test their acidity or basicity using pH test strips. Discuss how these substances are used for cooking or cleaning and how their properties make them effective for these purposes.

Conduct a simple experiment by dissolving an antacid tablet in warm and cold water, observing the difference in reaction rates. Discuss how factors like temperature affect the speed at which reactions occur, relating this to practical applications such as dissolving medicine in the body.

Concepts within Unit #3 **Link to High School Science TEKS**	**Success Criteria for this concept** *Students can…*
Concept #1: Solutions IPC.7C, 7F	• identify the physical and chemical properties of common solutions. • relate the properties of solutions to their practical applications. • design an experiment to investigate how factors such as temperature, concentration, and stirring affect the rate at which a solute dissolves in a solvent. • analyze and interpret data from experiments to explain how particle size affects the rate of dissolving.
Concept #2: Acids and Bases IPC.8A, 7C	• identify and explain how the pH of substances affects their use in everyday products. • identify and explain how the pH of substances affects their use in everyday products. • conduct experiments to observe how acids react with metals, identify the signs of a chemical reaction. • explain how neutralization reactions between acids and bases occur, identify the products formed, and provide real-world examples of neutralization.

Grading Period 3

Unit 4: Motion

Estimated Date Range: January 9 – January 30
Estimated Time Frame: 15 days

Unit Overview:
In this unit students are expected to model these concepts through various methods, including the use of tables, graphs, and mathematical relationships. This standard emphasizes the understanding of how objects move and the factors that influence their motion. By examining position, velocity, and acceleration, students will learn to describe and predict the movement of objects in different contexts, helping them to grasp the foundational principles of kinematics.

In the classroom, students might engage in activities where they collect data on moving objects, such as a rolling ball or a toy car, and then use that data to create tables and graphs that depict the object's motion over time. They will analyze these visual representations to understand the relationship between position, velocity, and acceleration, and how these quantities change as time progresses. Additionally, students will apply mathematical equations to model motion, allowing them to predict future positions or velocities based on initial conditions. Through these activities, students develop critical thinking and problem-solving skills essential for understanding more complex physical phenomena.

At home connections:
Motion Tracking with a Smartphone: Students can use their smartphones to record videos of objects in motion, such as a toy car rolling down a ramp or a ball being thrown. By playing back the video in slow motion, they can track the position of the object at different time intervals. They can then create a simple table of the object's position at various times and plot this data on a graph. This activity helps students connect real-world motion with the concepts of position, velocity, and acceleration.

Family Walk or Bike Ride Analysis: Encourage students to go on a walk or bike ride with family members and bring along a stopwatch. They can measure the time it takes to travel certain distances, then calculate the average velocity for different segments of the trip. Students can discuss how changes in speed or direction affected their overall motion and compare this data with their family members**.**

Crash Test Challenge: Ask students to design and build a simple protective device to reduce the impact on a small object (like an egg or a toy) when dropped from a height. They can use materials such as bubble wrap, foam, or cardboard to create their design. The goal is to minimize the damage to the object upon impact.

Concepts within Unit #4 Link to High School Science TEKS	**Success Criteria for this concept** *Students can…*
Concept #1: Motion IPC.5A	• accurately measure and record the position of a moving object at different times. • use math formulas to calculate how fast an object is moving and how its speed changes over time. • organize data into tables and create graphs that show the relationship between position, velocity, and time. • analyze graphs and tables to understand and explain the motion of an object, including when it is moving at a constant speed, speeding up, or slowing down.
Concept #2: Velocity and Momentum IPC.5A, 5C	• measure and record the velocity of an object at different times. • use math formulas to calculate velocity based on time and distance data. • create tables to organize my velocity and time data clearly. • create and interpret graphs that show how velocity changes over time. • explain how graphs and tables show an object's motion, including periods of constant speed or changes in speed. • explain the concepts of momentum and impulse and how they relate to collisions.

	• design a device that reduces the net force on an object during a collision, considering momentum and impulse. • evaluate the effectiveness of my device in minimizing the force during a collision by testing and analyzing the results. • refine a design based on the evaluation to improve its performance in reducing collision forces.
Concept #3: Acceleration IPC.5A	• measure and record the velocity and acceleration of an object over time. • use math formulas to calculate both velocity and acceleration from time and distance data. • organize my velocity and acceleration data into clear tables. • create and interpret graphs that show how velocity and acceleration change over time. • analyze my graphs and tables to explain the motion of an object, including changes in speed and direction. • explain how velocity, acceleration, and time are related, using evidence from my data.

Unit 5: Forces and Newton's Laws of Motion

Estimated Date Range: January 31 – February 24

Estimated Time Frame: 15 days

Unit Overview:

In this unit, students will continue learning about the four fundamental forces: gravitational force. They will describe how these forces operate and their effects on various objects, with a particular focus on gravitational force. Students will also investigate how changes in mass, charge, and distance influence the strength of gravitational interactions between objects, developing evidence-based explanations to understand these effects.

Additionally, students will analyze the relationship between mass and acceleration through the lens of net force, using force diagrams to illustrate how forces affect acceleration in one-dimensional motion. They will apply concepts of momentum and impulse to practical scenarios, such as designing and refining devices to minimize impact forces during collisions. This includes applications like vehicular safety, sports, and protecting electronic devices.

At home connections:

- Gravity in Action: Have students conduct a simple experiment using different objects of varying weights (like a ball and a piece of paper) and drop them from the same height. Discuss how gravity acts on all objects, but air resistance can affect their fall. Students can record and compare the times it takes for objects to hit the ground and discuss how gravitational force is the same for all objects, but other factors can influence their fall.
- Mass and Distance Experiments: Ask students to use household items to create a simple demonstration of gravitational attraction. For instance, they can use two objects (such as small weights or fruits) and measure how changing their distance apart affects the gravitational pull they feel (using a spring scale or similar). Students can document their findings, graph the data, and write an explanation of how changing mass and distance affects gravitational forces based on their observations.
- Home Physics Lab: Have students set up a simple experiment using a toy car, various weights, and a ramp. By adding different weights to the car and measuring its acceleration down the ramp (using a stopwatch and ruler), students can create force diagrams to illustrate how changes in mass affect acceleration. Students should analyze the data to explain the relationship between mass, net force, and acceleration, and communicate their findings through graphs and diagrams.
- Protective Design Challenge: Students can design a simple protective device to cushion a fall or impact, such as using materials like bubble wrap, foam, or cardboard to protect an egg from cracking when dropped. They should test their device by dropping it from various heights, evaluate its effectiveness in minimizing damage, and refine their design based

on their observations. Students can document their process, explain how their design minimizes force, and discuss the concepts of momentum and impulse in their design decisions.	
Concepts within Unit #5 **Link to High School Science TEKS**	**Success Criteria for this concept** *Students can…*
Concept #1: Forces IPC.5D, 5E	• explain what gravitational force is and how it acts on different objects. • describe how gravitational force affects the motion of objects toward the Earth. • identify examples of how gravitational force influences objects in everyday life. • explain how changing the mass of objects affects the strength of gravitational forces between them. • describe how increasing or decreasing the distance between two objects changes the gravitational force between them. • use evidence from experiments or data to support my explanations of how mass and distance affect gravitational forces. • communicate my findings clearly through written explanations, graphs, or presentations.
Concept #2: Newton's Laws of Motion IPC.5B	• use force diagrams to show the relationship between mass, net force, and acceleration. • analyze data from experiments to explain how changes in mass affect an object's acceleration. • accurately draw and label force diagrams that represent the forces acting on an object. • explain how my data and diagrams demonstrate the connection between mass, net force, and acceleration.
Concept #3: Using Newton's Laws IPC.5C	• design a device that reduces the force experienced by an object during a collision. • evaluate how well my device works by testing and observing the impact on the object. • use concepts of momentum and impulse to explain how a device minimizes the net force. • refine my design based on testing results to improve its effectiveness in reducing collision forces. • communicate how my device works and why it is effective.

Unit 6: Energy

Estimated Date Range: February 25 – March 7
Estimated Time Frame: 8 days

Unit Overview:
In this unit, students will investigate the principle of energy conservation and the transfer of thermal energy through different methods. Students will perform investigations to observe and measure how energy changes forms but remains constant in a closed system, reinforcing the concept that energy is neither created nor destroyed. They will analyze their data to demonstrate this principle and understand its application in various physical scenarios.

Additionally, students explore how thermal energy moves through solids, liquids, and gases via convection, conduction, and radiation. They will conduct experiments to observe these heat transfer processes and apply their findings to real-world examples, such as weather systems, biological processes, and mechanical operations. By examining how heat is transferred in different states and systems, students will gain a deeper understanding of thermal energy dynamics and its role in everyday phenomena.

At home connections:

- Energy Conservation in a Sealed Container: Have students place a small amount of hot water in a sealed thermos or container and measure its temperature at different time intervals. Discuss how the temperature changes over time and how the system is conserving energy. Students can record their observations and create a graph to show how the temperature stabilizes, illustrating the principle of energy conservation in a closed system.

- Heat Transfer in Everyday Objects: Ask students to conduct a simple experiment using different materials to demonstrate heat transfer. For example, they can place a metal spoon, a plastic spoon, and a wooden spoon into a hot cup of water and observe how quickly each spoon heats up. They should discuss how conduction occurs through the different materials. Another activity could involve placing ice cubes in different locations (like near a window for radiation or in a drafty area for convection) and observing how the ice melts at different rates. Students can document their findings and explain how each type of heat transfer (convection, conduction, and radiation) is occurring in their experiments.

Concepts within Unit # 6 Link to High School Science TEKS	**Success Criteria for this concept** *Students can…*
Concept #1: Conservation of Energy IPC.6C	• explain how energy is transferred within a closed system. • measure and record data on energy changes in the system, such as temperature or energy input/output. • analyze my data to show that the total energy in the closed system remains constant, even as it changes forms. • explain energy conservation. • explain evidence to demonstrate that energy is conserved.
Concept #2: Thermal Energy IPC.6D	• explain heat transfer through conduction, convection, and radiation. • describe and provide examples of how thermal energy moves through solids, liquids, and gases in my experiments. • measure and record how different materials and environments affect the rate of heat transfer. • explain the processes of convection, conduction, and radiation based on experimental observations.

Grading Period 4

Unit 7: Electricity

Estimated Date Range: Marcy 17 – March 28
Estimated Time Frame: 10 days

Unit Overview:
In this unit, students will delve into the principles of electrical circuits and forces, focusing on practical applications and fundamental concepts. Students will design and construct both series and parallel circuits to model real-world systems such as home wiring, automobile wiring, and simple electrical devices. Students will evaluate how electrical energy is transferred in these circuits, learning to troubleshoot and optimize their designs to understand the flow and use of electrical energy in various contexts.

Additionally, students will describe the effects of gravitational and electromagnetic forces on objects and interactions. They will explore how these fundamental forces operate in different scenarios, from gravitational effects on everyday objects to electromagnetic interactions in electrical and magnetic phenomena. IPC 6.B involves designing, evaluating, and refining a device that generates electrical energy through the interaction of electric charges and magnetic fields. Through hands-on projects, students will gain practical experience in energy generation and enhance their understanding of how magnetic fields and electric charges can be harnessed to produce electricity.

At home connections:
Home Wiring Exploration: Have students examine and sketch the wiring of a simple household device, such as a lamp or a fan. They can identify whether the device uses a series or parallel circuit and describe how electrical energy is transferred. For a hands-on project, students can create simple series and parallel circuits using a battery, light bulbs, and wires, and observe how the configuration affects the brightness of the bulbs.
Gravity and Magnets at Home: Ask students to conduct simple experiments to observe gravitational and electromagnetic forces. For example, they can drop different objects from the same height and discuss how gravity affects their fall. For electromagnetic forces, they can use a magnet to pick up various metal objects and discuss how magnetic forces interact with different materials. Students can document their observations and explain how gravitational and electromagnetic forces influence the objects.
DIY Generator Project: Have students design and build a simple generator using materials like a small motor, magnets, and copper wire. They can test how moving magnets through the coils generates electricity and refine their design to improve its efficiency. Students can also explore how different configurations and materials affect the amount of electrical energy produced. Encourage them to document their design process, evaluate its performance, and make improvements based on their findings.

Concepts within Unit # 7 Link to High School Science TEKS	**Success Criteria for this concept** *Students can…*
Concept #1: Electricity IPC.6A	• design and build series and parallel circuits using basic components like batteries, light bulbs, and wires. • explain how series and parallel circuits differ in terms of electrical energy transfer and component behavior. • model real-world circuits, such as those found in home wiring or automobile systems and evaluate how electrical energy is transferred within these systems. • communicate how a circuit design demonstrates the principles of electrical energy transfer.
Concept #2: Magnetism and Its Uses IPC.5D, 6A, 6B	• design a device that generates electrical energy using the interaction of electric charges and magnetic fields. • build and test a device to measure how effectively it generates electrical energy. • evaluate the performance of a device and identify areas for improvement. • refine a device based on testing results to enhance its efficiency and effectiveness in generating electrical energy. • explain how a device works and how it generates electrical energy.

Unit 8: Energy Sources and Environmental Impact

Estimated Date Range: April 1 – April 23
Estimated Time Frame: 15 days

Unit Overview:
In this unit, students will delve into the complexities of nuclear reactions and energy sources, exploring their technological applications, impacts, and environmental consequences. They will research and communicate the various uses, advantages, and disadvantages of nuclear reactions in modern technologies, understanding how nuclear fission and fusion contribute to energy production and other applications. Students will also describe the nature of strong and weak nuclear forces and mass-energy equivalency, gaining insights into fundamental nuclear processes and their significance in scientific and practical contexts.

Additionally, students will evaluate and critique different energy sources, including both renewable and nonrenewable types, by assessing evidence from multiple sources. They will explore how these energy sources impact society and the environment, considering factors such as sustainability and ecological footprint. Furthermore, students will construct and communicate evidence-based explanations regarding the environmental impact of chemical reaction end-products, examining how these by-products can affect water, soil, air quality, and contribute to global climate change.

At home connections:

- Nuclear Energy at Home: Encourage students to research the role of nuclear energy in their community or country. They can investigate local or national nuclear power plants, their benefits, and their challenges. Students can create a presentation or report summarizing their findings, including how nuclear fission and fusion are used in energy production and the advantages and disadvantages of nuclear technologies.
- Nuclear Forces Exploration: Have students use online resources or educational videos to learn about strong and weak nuclear forces. They can create a simple infographic or poster that illustrates these forces, how they work, and their role in nuclear reactions. Students can share their work with family members to discuss the significance of these forces in everyday technology and scientific applications.
- Energy Source Research Project: Ask students to evaluate different energy sources, such as solar, wind, coal, and natural gas, by researching their advantages and disadvantages. Students can prepare a comparison chart or a digital presentation that highlights each energy sources could impact on society and the environment. They can discuss their findings with family members and consider the energy sources used in their own home.
- Chemical Reactions and the Environment: Have students investigate household chemicals and their environmental impacts. They can look into how products like cleaning agents, fertilizers, or vehicle emissions could affect water, soil, and air quality. Students can create a short report or presentation discussing their findings and suggest ways to reduce negative environmental impacts from these products.

Concepts within Unit #8 Link to High School Science TEKS	**Success Criteria for this concept** *Students can…*
Concept #1: Nuclear Energy IPC.5D, 6G, 8C,	• describe the strong nuclear force and explain how it holds atomic nuclei together. • explain the weak nuclear force and its role in processes such as beta decay. • differentiate between nuclear fission and fusion, explaining how each process releases energy. • describe the concept of mass-energy equivalency and how it relates to energy production in nuclear reactions. • provide examples of how strong and weak nuclear forces, fission, and fusion are used in real-world applications and scientific contexts. • identify various uses of nuclear reactions in current technologies, such as energy production and medical applications. • explain the advantages of using nuclear reactions. • describe the disadvantages of nuclear reactions.

Concept #2: Renewable and Energy Sources IPC.6G	• explain different renewable energy sources, such as solar, wind, and hydro power. • analyze the advantages of each renewable energy source. • identify and explain the disadvantages of renewable energy sources. • evaluate how each energy source affects society and the environment.
Concept #3: Environmental Impact IPC.6G, 8D	• describe renewable and nonrenewable energy sources. • compare the advantages of different energy sources, including their efficiency, sustainability, and economic benefits. • identify and explain the disadvantages of various energy sources, such as environmental impact, cost, and resource depletion. • identify and describe the end-products of chemical reactions. • explain how end-products of chemical reactions could impact the environment.

Unit 9: Waves

Estimated Date Range: April 24 – May 29
Estimated Time Frame: 25 days

Unit Overview:
In this unit, students will investigate the transfer of energy and information through different materials using various types of waves, including wireless signals, ultraviolet radiation, and microwaves. They will design and conduct experiments to explore how these waves move through different media, examining their practical applications in technologies such as communication systems and microwave ovens. This hands-on approach will help students understand how energy is transferred and how different types of waves interact with materials.

Additionally, students will delve into the nature of electromagnetic forces, studying how these forces influence the behavior of charged particles and waves. They will also explore atomic energy levels and emission spectra to understand the wave-particle duality of light. By examining how atomic transitions produce emission spectra, students will gain insights into how light exhibits both wave-like and particle-like properties. This unit integrates theoretical concepts with practical investigations, offering a comprehensive understanding of wave behavior, electromagnetic forces, and the fundamental nature of light.

At home connections:

- Wireless Signal Exploration: Have students explore the wireless signals in their home by using different devices, such as smartphones, tablets, and laptops, to test signal strength in various rooms. They can use apps or tools to measure Wi-Fi signal strength and discuss how obstacles like walls affect signal transmission. Students can create a map of their home showing signal strength and analyze the data to understand how energy is transferred through different materials.
- UV and Microwave Awareness: Encourage students to observe and document everyday uses of ultraviolet (UV) radiation and microwaves. For example, they can explore how UV light affects materials by checking the effectiveness of UV-blocking window films or using UV beads that change color in sunlight. For microwaves, students can compare the cooking times of different foods and discuss how microwaves transfer energy to heat food. They can report their findings and reflect on the practical applications of these types of waves.
- Magnet and Static Electricity Activities: Have students conduct simple experiments with magnets and static electricity at home. They can use magnets to explore how they attract or repel different materials, such as metal objects or other magnets. For static electricity, students can rub a balloon on their hair and observe how it attracts small paper pieces. Students can document their observations and explain how electromagnetic forces are involved in these interactions.
- Spectroscopy at Home: Students can use a simple prism or a diffraction grating to observe the visible spectrum of light from different sources, such as LED bulbs or sunlight. They can compare the spectra produced by different light sources and discuss how these observations relate to atomic energy levels and emission spectra. Students can also research how scientists use spectroscopy to study the properties of light and materials and share their findings with family members.

Concepts within Unit # 9 Link to High School Science TEKS	**Success Criteria for this concept** *Students can…*

Concept #1: Introduction to Waves IPC.6E	• explain how different types of waves, such as wireless signals, ultraviolet radiation, and microwaves, transfer energy or information through various materials. • determine how these waves behave when passing through different materials, such as walls, glass, or water. • analyze the data to determine patterns or trends in how the waves interact with different materials.
Concept #2: Electromagnetic Waves IPC.5D, 6E, 6F, 7E	• identify examples of how wave interference is applied in technology, such as in medical imaging (e.g., ultrasound), communication systems (e.g., radio waves), and scientific research (e.g., interference patterns in experiments). • explain how wave interference works, including the concepts of constructive and destructive interference. • describe what electromagnetic forces are and how they interact with charged particles. • explain how electromagnetic forces affect the behavior of objects, such as how magnets attract or repel each other and how electric charges interact. • provide examples of electromagnetic forces in everyday life, such as in electronic devices or magnetic materials. • use diagrams or models to illustrate how electromagnetic forces operate and affect different materials. • explain the role of electromagnetic forces in various scientific and technological contexts. • describe how atomic energy levels are determined and how they relate to the emission of light. • explain how emission spectra are produced and how they provide evidence for the wave-particle duality of light. • use examples of emission spectra from different elements to show how light exhibits both wave-like and particle-like properties. • explain how observations of atomic energy levels and emission spectra support the concept of wave-particle duality. • use diagrams or data to illustrate how atomic spectra and energy levels demonstrate the dual nature of light.
Concept #3: Light IPC.6E, 6F	• describe how light waves, such as visible light and ultraviolet light, transfer energy or information through various materials like glass, plastic, and water. • identify the effects of different materials on the transfer of light energy. • explain how the properties of materials influence the behavior of light, such as changes in intensity or clarity of transmitted light. • compare how different materials impact the transfer of light energy. • explain of how various materials affect light transfer. • identify examples of how light wave interference is used in technology. • explain how light wave interference impacts the performance of various technologies. • describe how light reflection is utilized in technologies like mirrors, telescopes, and cameras, and explain its importance for image quality and functionality. • explain how light refraction is used in technologies and describe how it affects the behavior of light in these devices. • create examples and diagrams, of how interference, reflection, and refraction of light are applied in technology and scientific research.

Glossary of Curriculum Components

Overview– The content in this document provides an overview of the pacing and concepts covered in a subject for the year.

TEKS – Texas Essential Knowledge and Skills (TEKS) are the state standards for what students should know and be able to do.

Unit Overview – The unit overview provides a brief description of the concepts covered in each unit.

Concept – A subtopic of the main topic of the unit.

Success Criteria—a description of what it looks like to be successful in this concept.

Parent Resources

The following resources provide parents with ideas to support students' understanding. For sites that are password protected, your child will receive login information through their campus.

Resource	How it supports parent and students
Texas Integrated Physics and Chemistry	This is the state adopted textbook for Integrated Physics and Chemistry (IPC). Students sign in through their school account in Clever.
Khan Academy	This resource contains practice exercises, instructional videos, and a personalized learning dashboard where students can learn and study at their own pace.
NSTA – Science Resources for Parents	This online resource has science activities for middle school students and their families to help support learning at home.

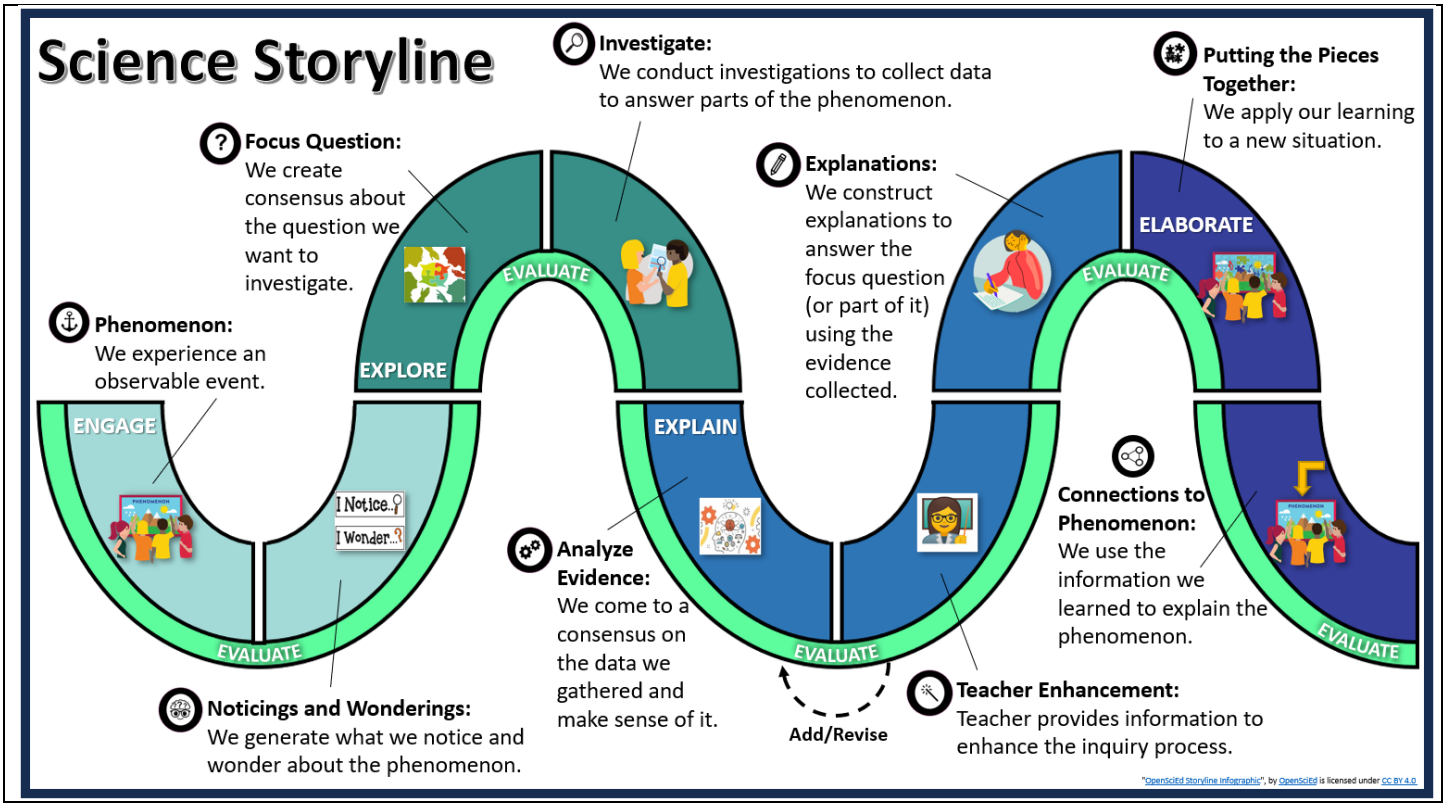
Instructional Model

An instructional model is the structure in which students engage in a particular content that ensures understanding of that content. In science, the instructional model is the 5E Instructional Model.

The 5E Model is an inquiry-based approach to teaching and learning science concepts over time. It is research-based and emphasizes that children build conceptual understanding and make meaning through experiences. Each "E" represents a stage in a learning cycle.

- Engage: Students interact with a phenomenon that sparks curiosity and assesses prerequisite knowledge or misconceptions.
- Explore: Students begin to interact with the content through hands-on investigations.
- Explain: Students connect the hands-on experience to the instruction of the concept using grade level appropriate academic vocabulary.
- Elaborate: Students apply the concept learned to a new context through problem solving or an additional hands-on experience.
- Evaluate: Evaluation of student understanding and progress occurs throughout the learning cycle.

As students learn each concept in the curriculum, they will have the opportunity to develop conceptual understanding as the teacher navigate the content as telling a story. The graphic below summarizes each component that occurs within each of the 5E stages.


Science Storyline
Investigate:
We conduct investigations to collect data to answer parts of the phenomenon.
Putting the Pieces Together:
We apply our learning to a new situation.
Focus Question:
We create consensus about the question we want to investigate.
Explanations:
We construct explanations to answer the focus question (or part of it) using the evidence collected.
Phenomenon:
We experience an observable event.
ENGAGE
EXPLORE
EXPLAIN
ELABORATE
EVALUATE
I Notice...
I Wonder...
Analyze Evidence:
We come to a consensus on the data we gathered and make sense of it.
Connections to Phenomenon:
We use the information we learned to explain the phenomenon.
Noticings and Wonderings:
We generate what we notice and wonder about the phenomenon.
Add/Revise
Teacher Enhancement:
Teacher provides information to enhance the inquiry process.
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