Physics
Overview
2026 – 2027

This document is designed to 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.

- Grading Period 1
- Grading Period 2
- Grading Period 3
- Grading Period 4

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

PHY.1A ask questions and define problems based on observations or information from text, phenomena, models, or investigations.
PHY.1B use scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems.
PHY.1C use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency approved safety standards.
PHY.1D use appropriate tools such as balances, ballistic carts or equivalent, batteries, computers, constant velocity cars, convex lenses, copper wire, discharge tubes with power supply (H, He, Ne, Ar), data acquisition probes and software, dynamics and force demonstration equipment, electrostatic generators, electrostatic kits, friction blocks, graph paper, graphing technology, hand-held visual spectroscopes, inclined planes, iron filings, lab masses, laser pointers, magnets, magnetic compasses, metric rulers, motion detectors, multimeters (current, voltage, resistance), optics bench, optics kit, photogates, plane mirrors, prisms, protractors, pulleys, resistors, rope or string, scientific calculators, stopwatches, springs, spring scales, switches, tuning forks, wave generators, or other equipment and materials that will produce the same results.
PHY.1E collect quantitative data using the International System of Units (SI) and qualitative data as evidence.
PHY.1F organize quantitative and qualitative data using bar charts, line graphs, scatter plots, data tables, labeled diagrams, and conceptual mathematical relationships.
PHY.1G develop and use models to represent phenomena, systems, processes, or solutions to engineering problems.
PHY.1H distinguish among scientific hypotheses, theories, and laws.
PHY.2A identify advantages and limitations of models such as their size, scale, properties, and materials.
PHY.2B analyze data by identifying significant statistical features, patterns, sources of error, and limitations.
PHY.2C use mathematical calculations to assess quantitative relationships in data.
PHY.2D evaluate experimental and engineering designs.

PHY.3A develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories.
PHY.3B communicate explanations and solutions individually and collaboratively in a variety of settings and formats.
PHY.3C engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.
PHY.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.
PHY.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.
PHY.4C research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers.

Recurring Themes and Concepts (RTCs):
Patterns
Systems and System Models
Cause and Effect
Scale, Proportion, and Quantity
Energy and Matter
Structure and Function
Stability and Change

Grading Period 1

Unit 1: Motion

Estimated Date Range: August 11 – September 16 (26 total school days)
Instructional Re-engagement Days in Unit: 24 days

Assessments

State/National Assessment	District Assessment(s)	District Formative Assessment Window
N/A	**NWEA MAP Growth Science:** Grade 6, 7, and 8 – September 16 & 17	Unit 1, Concept 2 September 2 – September 10 (1 day)

Unit Overview:
In this unit, students will explore motion through graphs, generated by hand and using technology, and mathematical equations. Students should interpret and explain distance/time, velocity/time, and acceleration/time graphs and be able to apply kinematic equations to support their understanding. Next students will learn about projectile motion and uniform circular motion citing real-world examples and supporting their ideas with appropriate mathematical operations. Students leave this unit with a strong understanding of how to interpret motion when presented either as a graph, chart, scenario, or mathematical representation**.**

At home connections:
Concept 1: Safety
Physics Safety at Home: Identify household situations involving electricity, moving objects, heat, or tools, and discuss the precautions that help prevent injuries.

Concept 2: Analyzing Motion
Motion Around You: Observe a person, vehicle, or object in motion and describe its distance, displacement, speed, velocity, and acceleration from a chosen frame of reference.
Graphing Motion: Track the position of a moving object at equal time intervals and sketch a simple position-versus-time graph that represents its motion.

Concept 3: Projectile Motion
Projectile Path: Observe a safely tossed ball and describe how its horizontal and vertical motion combine to create a curved path.
Compare Launches: Watch two objects launched horizontally at different speeds and predict how the launch speed affects the horizontal distance traveled before landing.

Concepts within Unit #1 Link to HS Science TEKS	**Success Criteria for this concept** *Students will…*
Concept #1: Safety (ongoing; embedded throughout the course) Phy.1C	• identify and follow safe practices when working with materials and equipment during science investigations.

Concept #2:
Analyzing Motion
 	
Phy.5A, Phy.5B, Phy.5C
	• Draw and graph vectors using the "tail to tip" method to graphically find the vector resultant.
	• Compare and contrast distance and displacement, speed and velocity, and velocity and acceleration.
	• Generate and interpret motion graphs.
	• Using data from analyzing a distance-time graph, I will be able to create a graph that describes:
	  ○ Distance vs. Time
	  ○ Velocity vs. Time
	  ○ Acceleration vs. Time
	• Describe the acceleration of an object.
	• Calculate the acceleration (v_f-v_i/Δt) of an object.
	• Calculate instantaneous velocity using a tangent line on a position vs. time graph.
	• Use mathematical representations to analyze the acceleration of an object.
	• Identify patterns in data to explain how motion changed with velocity varies.
	• Identify the cause-and effect relationship related to constant acceleration, including acceleration due to gravity.
	• Construct an explanation about the relationship between speed, time, and acceleration.

Concept #3: Projectile Motion Phy.5D	• Differentiate between horizontal velocity and acceleration due to gravity and explain when each one would be used • Recognize and differentiate between an object's horizontal and vertical components of a projectile motion • analyze the motion of a projectile using vertical height, time in air, initial velocity and horizontal range including free falling objects. • use equations to calculate projectile motion: ○ displacement = (initial velocity) (change in time) + ½ (acceleration) (change in time)^2

Unit 2: Forces

Estimated Date Range: September 17 – October 8 (15 total school days)
Instructional Re-engagement Days in Unit: 15 days

Assessments

State/National Assessment	**District Assessment(s)**	**District Formative Assessment Window:**
N/A	**N/A**	**N/A**

Unit Overview:
In this unit, students will explore the principles of forces and motion through the lens of Newton's laws of motion and the concepts of impulse and momentum. They will start by calculating the effects of various forces on objects using free body diagrams and Newton's second law of motion. Students will then delve into the concepts of equilibrium and inertia as described by Newton's first law of motion, applying these ideas to real-world scenarios such as rockets, satellites, and automobile safety devices. By understanding these foundational principles, students will be equipped to illustrate and analyze the forces between two objects using free body diagrams and experimental designs, as per Newton's third law of motion.

Additionally, students will learn to calculate and describe the impulse and momentum of objects in various physical systems, including automobile safety features, athletics, and rockets. They will analyze the conservation of momentum qualitatively in both inelastic and elastic collisions in one dimension, using models, diagrams, and simulations to visualize these concepts. Through hands-on activities, problem-solving exercises, and real-world applications, students will develop a comprehensive understanding of how forces and motion govern the physical world around them.

At Home Connections:
Concept 1: Newton's Laws of Motion
Forces in Everyday Life: Choose an everyday situation, such as pushing a cart or riding in a vehicle, and identify examples of inertia, acceleration, and action-reaction force pairs.
Free-Body Diagram: Select a stationary or moving household object and draw a simple free-body diagram showing the forces acting on it.

Concept 2: Collisions
Momentum and Safety: Discuss how seat belts, airbags, helmets, or padded surfaces change the effect of momentum and impulse during a collision.
Collision Comparison: Observe or research an elastic and an inelastic collision and explain how momentum is conserved in each.

Concepts within Unit #2 **Link to HS Science TEKS**	**Success Criteria for this concept** *Students will…*
Concept #1: Newton's Laws of Motion Phy.5F, Phy.5E, Phy.5G	• Describe and provide examples of the law of inertia. • Calculate the forces acting on an object. • Illustrate forces using a free body diagram. • Use the definitions of mass, weight, inertia, and action/reaction to describe physical systems. • Create everyday examples of each of Newton's three laws of motion. • Use the mathematical relationship that relates force, mass, and acceleration with fluency (F=ma). • Describe Newton's laws in a physical system using real-world examples. • explain the cause/effect relationship between action/reaction pairs.

Grading Period 2

Unit 2: Forces (continued)

Estimated Date Range: October 19 – November 5 (14 total school days)
Instructional Re-engagement Days in Unit: 13 days

Assessments

State/National Assessment	District Assessment(s)	District Formative Assessment Window:
PSAT (Grade 11) – October 29	**N/A**	**N/A**

Unit Overview:

In this unit, students will explore the principles of forces and motion through the lens of Newton's laws of motion and the concepts of impulse and momentum. They will start by calculating the effects of various forces on objects using free body diagrams and Newton's second law of motion. Students will then delve into the concepts of equilibrium and inertia as described by Newton's first law of motion, applying these ideas to real-world scenarios such as rockets, satellites, and automobile safety devices. By understanding these foundational principles, students will be equipped to illustrate and analyze the forces between two objects using free body diagrams and experimental designs, as per Newton's third law of motion.

Additionally, students will learn to calculate and describe the impulse and momentum of objects in various physical systems, including automobile safety features, athletics, and rockets. They will analyze the conservation of momentum qualitatively in both inelastic and elastic collisions in one dimension, using models, diagrams, and simulations to visualize these concepts. Through hands-on activities, problem-solving exercises, and real-world applications, students will develop a comprehensive understanding of how forces and motion govern the physical world around them.

At Home Connections:

Concept 1: Newton's Laws of Motion

Forces in Everyday Life: Choose an everyday situation, such as pushing a cart or riding in a vehicle, and identify examples of inertia, acceleration, and action-reaction force pairs.

Free-Body Diagram: Select a stationary or moving household object and draw a simple free-body diagram showing the forces acting on it.

Concept 2: Collisions

Momentum and Safety: Discuss how seat belts, airbags, helmets, or padded surfaces change the effect of momentum and impulse during a collision.

Collision Comparison: Observe or research an elastic and an inelastic collision and explain how momentum is conserved in each.

Concepts within Unit #4 Link to HS Science TEKS	Success Criteria for this concept *Students will…*
Concept #2: Collisions Phy.7D, Phy.7E	• measure the mass and velocity of a moving object before and after a collision to calculate its momentum. • Determine the impulse from the change in momentum and relate this to real-world systems like car safety features. • Set up and observe a simple collision experiment, recording the velocities of objects before and after the collision. • Analyze whether a collision is elastic or inelastic and explain how the total momentum is conserved in the system.

Unit 3: Forces That Govern Orbits and Motion

Estimated Date Range: November 6 – December 18 (25 total school days – includes 4 days semester exam review and 4 days exams)
Instructional Re-engagement Days in Unit: 17 days

Assessments

State/National Assessment	District Assessment(s)	District Formative Assessment Window:	Final Exam Review:
N/A	N/A		Dec. 7 - 11 **Final Exam Schedule**: Dec. 14 - 18

Unit Overview:

In this unit, students will explore the concepts of work, power, and energy, focusing on their calculations and real-world applications. They will begin by learning to calculate and explain work and power in one dimension, identifying situations where work is and is not being done on a system. Students will conduct experiments and solve problems to understand the conditions under which work is performed and how power quantifies the rate of doing work. They will also investigate and calculate the mechanical, kinetic, and potential energy of various systems, analyzing how these different forms of energy are quantified and interrelated.

Building on this foundation, students will apply the concept of conservation of energy using the work-energy theorem, energy diagrams, and energy transformation equations. They will explore how energy transforms between kinetic, potential, and thermal forms in different scenarios, and how these transformations illustrate the principle of energy conservation. Through hands-on activities, problem-solving exercises, and real-world examples, students will develop a comprehensive understanding of how work, energy, and power are fundamental to the functioning of physical systems.

At home connections:

Concept 1: Circular Motion

Circular Motion Around You: Identify an object moving in a circle, such as a ceiling fan blade or a vehicle turning, and describe the direction of its velocity and acceleration.

Changing the Motion: Predict how increasing speed or decreasing the radius would affect the force needed to keep an object moving in a circular path.

Concept 2: Universal Gravitation

Gravity Comparison: Compare two pairs of objects and predict which pair would have the greater gravitational force based on mass and distance.

Gravity in Space: Research a planet or moon and explain how its mass and size influence the gravitational force experienced near its surface.

Concept 3: Orbital Motion

Why Objects Orbit: Explain how forward motion and gravitational attraction work together to keep a satellite or planet in orbit.

Orbit Comparison: Compare two orbiting objects and discuss how orbital distance affects their motion.

Concepts within Unit # 3 Link to HS Science TEKS	Success criteria for this concept *Students will…*
Concept #1: Circular Motion Phy.5D	• describe work and power. • calculate work and power using the appropriate formulas for different scenarios. • identify examples of when work is done and when it is not in a system. • explain the relationship between work, power, and energy transformations. • create models that illustrate energy flow and transformations within a system.
Concept #2: Universal Gravitation	• identify different forms of energy within a system, including potential and kinetic energy.

Phy.5H	• calculate the change in energy of a component in a system using given energy values of other components. • explain the transformation of potential energy to kinetic energy and vice versa in real-world examples. • Create and interpret energy diagrams to illustrate energy conservation within a system.
Concept #3: Orbital Motion Phy.5H	• explain how energy is a property that depends on the motion and interactions of a system's components. • identify examples of energy transfer between different systems in real-world scenarios. • model energy flow in both open and closed systems, illustrating how energy enters and exits. • recognize and describe how the total energy of a closed system remains constant, demonstrating the principle of energy conservation.

Grading Period 3

Unit 4: Energy

Estimated Date Range: January 6 – January 29 (17 total school days)
Instructional Re-engagement Days in Unit: 17 days

Assessments

State/National Assessment	District Assessment(s)	District Formative Assessment Window:
N/A	N/A	N/A

Unit Overview:

In this unit, students will explore the concepts of work, power, and energy, focusing on their calculations and real-world applications. They will begin by learning to calculate and explain work and power in one dimension, identifying situations where work is and is not being done on a system. Students will conduct experiments and solve problems to understand the conditions under which work is performed and how power quantifies the rate of doing work. They will also investigate and calculate the mechanical, kinetic, and potential energy of various systems, analyzing how these different forms of energy are quantified and interrelated.

Building on this foundation, students will apply the concept of conservation of energy using the work-energy theorem, energy diagrams, and energy transformation equations. They will explore how energy transforms between kinetic, potential, and thermal forms in different scenarios, and how these transformations illustrate the principle of energy conservation. Through hands-on activities, problem-solving exercises, and real-world examples, students will develop a comprehensive understanding of how work, energy, and power are fundamental to the functioning of physical systems.

At home connections:

Concept 1: Classifying Energy and Work

Work or No Work?: Identify everyday examples in which a force does and does not perform mechanical work, and explain the difference.

Power at Home: Compare two tasks that involve the same amount of work but take different amounts of time, and determine which requires more power.

Concept 2: Mechanical Energy

Kinetic and Potential Energy: Choose a moving or elevated object and describe how its mass, speed, or height affects its kinetic or potential energy.

Mechanical Energy in Action: Observe a swing, rolling ball, or moving bicycle and describe how kinetic and potential energy change during the motion.

Concept 3: Conservation of Energy
Energy Transformations: Trace the energy changes in an everyday system, such as a toaster, fan, flashlight, or roller coaster.
Where Did the Energy Go?: Observe a moving object that slows down and explain how some of its mechanical energy is transformed into thermal energy.

Concepts within Unit #4 **Link to HS Science TEKS**	**Success Criteria for this concept** *Students will…*
Concept #1: Classifying Energy and Work Phy.7A, Phy.7B	• describe work and power. • calculate work and power using the appropriate formulas for different scenarios. • identify examples of when work is done and when it is not in a system. • explain the relationship between work, power, and energy transformations. • create models that illustrate energy flow and transformations within a system.
Concept 2: Mechanical Energy Phy.7B	• identify different forms of energy within a system, including potential and kinetic energy. • calculate the change in energy of a component in a system using given energy values of other components. • explain the transformation of potential energy to kinetic energy and vice versa in real-world examples. • Create and interpret energy diagrams to illustrate energy conservation within a system.
Concept #3: Conservation of Energy Phy.7C	• explain how energy is a property that depends on the motion and interactions of a system's components. • identify examples of energy transfer between different systems in real-world scenarios. • model energy flow in both open and closed systems, illustrating how energy enters and exits. • recognize and describe how the total energy of a closed system remains constant, demonstrating the principle of energy conservation.

Unit 5: Electricity and Magnetism

Estimated Date Range: February 1 – March 4 (22 total school days)
Instructional Re-engagement Days in Unit: 21 days

Assessments

State/National Assessment	District Assessment(s)	District Formative Assessment Window
TELPAS: February 15 – March 26 SAT (Grade 11) March 4	N/A	

Unit Overview:

In this unit, students will delve into the principles of electric forces and fields, starting with Coulomb's law to understand how the magnitude of the electric force between two objects depends on their charges and the distance between their centers. Using scientific notation, students will predict and calculate these forces, applying their knowledge to real-world scenarios (PHY.6A). They will also explore everyday examples of electric and magnetic forces and fields, such as those found in generators, motors, and transformers (PHY.6B). This will help them identify and describe the roles of electric forces and fields in various technologies and daily life applications.

Students will investigate the conservation of charge through processes such as induction, conduction, and polarization using materials like electroscopes, balloons, rods, fur, silk, and Van de Graaf generators (PHY.6C). Additionally, they will analyze, design, and construct series and parallel circuits using schematic diagrams and materials such as switches, wires, resistors, lightbulbs, batteries, voltmeters, and ammeters (PHY.6D). By applying Ohm's law, they will calculate the current, potential difference, resistance, and power in these circuits (PHY.6E). Through hands-on experiments, problem-solving activities, and theoretical analysis, students will develop a comprehensive understanding of electric forces, fields, and circuits.

At home connections:

Concept 1: Electric Force

Static Electricity: Observe a safe example of static electricity, such as a balloon attracting small paper pieces, and explain how electric charges interact.

Charge and Distance: Predict how changing the amount of charge or the distance between charged objects affects the electric force.

Concept 2: Circuits

Circuits at Home: Identify devices that operate in complete electric circuits and discuss the roles of the energy source, conducting path, and load.

Series or Parallel?: Examine household lighting or research common wiring systems and explain why homes typically use parallel circuits.

Concept 3: Magnetic Forces

Magnetic Fields: Use a household magnet safely to test several objects and identify which materials respond to magnetic forces.

Magnetism in Technology: Identify a motor, generator, speaker, or transformer used at home and explain how magnetic fields are involved in its operation.

Concepts within Unit # 5 Link to HS Science TEKS	Success Criteria for this concept *Students will…*
Concept #1: Electric Force Phy.6A, Phy.6B, Phy.6C	• Calculate and predict electric forces using Coulomb's law. • Explain how devices use electric forces to function. • Explain charge conservation in different materials and processes. • Predict charge behavior in various materials. • Describe electromagnetic induction in generators.

Concept #2: Circuits Phy.6B, Phy.6D, Phy.6E	• Differentiate between series and parallel circuits • Compare current flow and voltage distribution in each type. • Plan series and parallel circuit layouts using Ohm's law principles • Determine component placement and connections • Design and build a series and parallel circuits.
Concept #3: Magnetic Forces Phy.6B	• Differentiate between series and parallel circuits • Compare current flow and voltage distribution in each type. • Plan series and parallel circuit layouts using Ohm's law principles • Determine component placement and connections • Design and build a series and parallel circuits.

Grading Period 4

Unit 6 Waves

Estimated Date Range: March 15 – April 21 (27 total school days)
Instructional Re-engagement Days in Unit: 26 days

Assessments

State/National Assessment	District Assessment(s)	District Formative Assessment Window:
TELPAS: February 15 – March 26	N/A	**N/A**

Unit Overview:

This unit explores the properties, behaviors, and interactions of waves, including mechanical and electromagnetic waves. Students will analyze how waves transfer energy, how wave properties relate to wave speed, and how waves interact with different materials. The unit progresses from fundamental wave properties to complex wave interactions, culminating in the study of wave optics and image formation. The study of waves is divided into three key concepts:

Concept 1: Properties of Waves – Students will investigate wave types (transverse and longitudinal) and their properties, including amplitude, wavelength, frequency, and wave speed. They will analyze how waves transfer energy and explore the relationship between wave motion and simple harmonic motion.

Concept 2: Wave Behavior and Sound – Students will examine how waves interact with their environment, including reflection, refraction, diffraction, and interference. They will also explore sound waves as a type of longitudinal wave and investigate standing waves and resonance.

Concept 3: Wave Optics and Light – Students will analyze how light waves interact with matter through reflection and refraction. They will study image formation through lenses and mirrors and apply wave optics concepts to real-world applications.

At home connections:
Concept 1: Properties of Waves
Wave Properties: Observe waves in water, a rope, or a spring and describe their amplitude, wavelength, frequency, and speed.
Transverse or Longitudinal?: Identify examples of transverse and longitudinal waves and explain how the particles of the medium move in each.

Concept 2: Wave Behavior and Sound
Sound Around You: Compare sounds with different pitches and loudness levels and relate the differences to frequency and amplitude.
Wave Behaviors: Find or research an everyday example of reflection, refraction, diffraction, interference, or the Doppler effect and explain what happens.

Concept 3: Wave Optics and Light
Reflection and Images: Observe an image in a plane mirror and describe how the image's orientation, size, and apparent location compare with the object.

Refraction Through Lenses: Use a safe household lens, such as a magnifying glass, to observe how the appearance of an object changes when the distance changes.

Concepts within Unit #6 Link to HS Science TEKS	**Success Criteria for this concept** *Students will…*
Concept #1: Properties of Waves Phy.8A, Phy.8B, Phy.8C	• describe how mechanical waves transfer energy through a medium without moving the medium itself. • explain how wave properties (frequency, wavelength, amplitude) determine the amount of energy carried by a wave. • analyze the relationship between wave motion and energy transfer in transverse and longitudinal waves. • describe how simple harmonic motion relates to oscillatory motion, such as masses on springs and pendulums. • explain how the restoring force affects oscillatory motion and the period of a pendulum. • analyze the cause-and-effect relationship between mass, restoring force, and oscillation frequency in a wave system. • explain how wave speed is determined by the stiffness and density of a medium. • compare how waves travel through different media, including water, ropes, and air. • analyze how wave speed changes at an interface, such as when moving from deep to shallow water. • use mathematical equations (**v = fλ**) to calculate wave speed, frequency, or wavelength when given two variables. • explain how changes in frequency or wavelength affect wave speed in different media. • identify patterns in wave properties and explain how frequency and wavelength are related when wave speed remains constant. • analyze how waves are used in real-world applications, such as communication, medical imaging, and navigation.
Concept #2: Wave Behavior and Sound Phy.8A, Phy.8B, Phy.8C, Phy.8D	• describe how waves change direction when they reflect, bend when they refract, and spread when they diffract. • identify patterns in how waves interact through interference and superposition. • analyze how standing waves form and explain the relationship between nodes, antinodes, and wave frequency. • describe how transverse and longitudinal waves move and transfer energy. • identify patterns in how sound waves (longitudinal) and electromagnetic waves (transverse) travel through different media. • analyze why sound requires a medium but electromagnetic waves can travel through space. • describe how wave speed, frequency, and wavelength are related in different media. • apply the wave equation (v = fλ) to calculate wave speed, frequency, or wavelength when given two values. • analyze the cause-and-effect relationship between wave behavior and medium density. • describe simple harmonic motion in springs, pendulums, and surface waves.

	• identify patterns in oscillatory motion and explain how energy moves through a medium in waves. • analyze the cause-and-effect relationship between restoring force, mass, and period in oscillating systems. • describe how the frequency of a wave changes when the source moves toward or away from an observer. • identify patterns in how the Doppler effect affects sound waves and light waves (redshift and blueshift).
Concept #3: Wave Optics and Light Phy.8D, Phy.8G	• explain how diffraction, reflection, and refraction affect the direction of light waves using diagrams and written descriptions. • develop and use models to represent patterns in wave behaviors and communicate explanations about how different conditions affect wave interactions. • analyze data to describe how wave speed changes when light travels through different media and explain why these changes occur. • describe the cause-and-effect relationship between wave behavior and the type of material a wave travels through. • communicate explanations about how converging and diverging lenses form images and identify patterns in how image size and location change based on object placement.

Unit 7: Electromagnetic Radiation

Estimated Date Range: April 22 – May 27 (25 total school days – includes 2 days semester exam review and 4 days exams)
Instructional Re-engagement Days in Unit: 19 days

Assessments

State/National Assessment	District Assessment(s)	District Formative Assessment Window:	Final Exam Review:
N/A	N/A	**N/A**	May 17 – 21 **Final Exam Schedule**: May 24 - 27

Unit Overview:
In this unit, students will explore the concepts of work, power, and energy, focusing on their calculations and real-world applications. They will begin by learning to calculate and explain work and power in one dimension, identifying situations where work is and is not being done on a system. Students will conduct experiments and solve problems to understand the conditions under which work is performed and how power quantifies the rate of doing work. They will also investigate and calculate the mechanical, kinetic, and potential energy of various systems, analyzing how these different forms of energy are quantified and interrelated.

Building on this foundation, students will apply the concept of conservation of energy using the work-energy theorem, energy diagrams, and energy transformation equations. They will explore how energy transforms between kinetic, potential, and thermal forms in different scenarios, and how these transformations illustrate the principle of energy conservation. Through hands-on activities, problem-solving exercises, and real-world examples, students will develop a comprehensive understanding of how work, energy, and power are fundamental to the functioning of physical systems.

At home connections:
Concept 1: EM Wave Properties and Applications
Electromagnetic Waves at Home: Identify technologies that use radio waves, microwaves, infrared, visible light, ultraviolet, or X-rays and explain one use of each.
Polarization in Daily Life: Investigate or research how polarized sunglasses, 3-D movie glasses, or LCD screens use polarization.

Concept 2: Quantum Phenomena

Quantum Technology: Research one application of quantum phenomena, such as quantum computing or cybersecurity, and summarize how it may be useful.
Wave-Particle Duality: Explain, in your own words, how light can show both wave-like and particle-like behavior.

Concept 3: Radiation and Matter
Emission Spectra: Research the emission spectrum of one element and explain why its pattern of colored lines is unique.
Radiation Applications: Compare two applications of electromagnetic radiation, such as X-rays, microwaves, or radio telescopes, and explain how each interacts with matter.

Concepts within Unit #7 Link to HS Science TEKS	**Success Criteria for this concept** *Students will…*
Concept #1: EM Wave Properties and Applications Phy.9B	• describe the characteristics of waves. • compare transverse and longitudinal waves and describe patterns in how they move energy through different materials. • analyze examples of wave behavior and describe cause-and-effect relationships involved. • describe patterns found in wave data or diagrams. • analyze data from a wave experiment to describe how the wave is behaving. • describe wave behavior shown in a model, such as interference or standing waves and explain the cause-and-effect relationships demonstrated. • Analyze data about wave motion and describe how the wave is behaving and what caused the observed effects. • describe how light intensity changes after passing through polarizing filters, using data or models. • identify real-world examples of waves and polarization in technology and describe simple cause-and-effect relationships in how these technologies work.
Concept #2: Quantum Phenomena Phy.9A, Phy.9C, Phy.9D	• describe photoelectric effect and its cause-and-effect relationship. • describe how emission spectra provide evidence for the photon model of light and explain the cause-and-effect process. • develop an explanation of how the photoelectric effect and emission spectra provide evidence for the photon model of light, identifying patterns and cause-and-effect relationships. • explain patterns that show light behaves as both a wave and a particle. • explain what quantum superposition means and describe patterns it creates in experiments. • describe how the Heisenberg uncertainty principle affects what we know about particles. • explain how quantum computing uses quantum phenomena to store and process information. • identify technologies that use quantum principles to improve cybersecurity. • describe patterns that show how quantum principles are used in real-world technologies.
Concept #3: Radiation and Matter Phy.9A, Phy.8E, Phy.8F	• Describe the characteristics of the electromagnetic spectrum, including visible and invisible light. • Identify examples of technologies that use different parts of the electromagnetic spectrum. • Describe what emission spectra are and how they are produced by atoms. • Explain how emission spectra relate to specific wavelengths of light. • Describe how the photon model explains the emission of light from atoms.

	• Analyze data showing emission spectra to identify patterns of light emitted by different elements. • Describe the cause-and-effect relationship between electron transitions and the color of light observed in emission spectra. • Interpret diagrams or data to explain how the electromagnetic spectrum is used in technologies such as X-rays or radio telescopes.

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 Experience Science Physics	This is the state adopted textbook for Physics. Students sign in through their school account in Clever.
EduSmart	This resource provides hand-on and vocabulary activities that are great to review the concepts learned in the classroom. 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.

Supplemental Resource and Tool designation

TI-Nspire Calculator	This calculator is a standardized technology integration tool used for Science and Mathematics in FBISD.

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.

