Stockton Unified School District

EDISON HIGH SCHOOL

Home of the Vikings

SUSD

GRADE:	10-12	SUBJECT:	Physics and Honors Physics	SEMESTER:	1	TEAM MEMBERS:	Jessica Clark

Standard Description	Example Rigor	Prerequisite Skills	Assessment	When Taught?	Extension Standards

Essential Outcome 1:Analytical Techniques and One-Dimensional Motion

How can one explain and predict interactions between objects and within systems of objects?

What is the essential standard to be learned? Describe in student-friendly vocabulary.	What does proficient student work look like? Provide an example and/or description.	What prior knowledge, skills, and/or vocabulary is/are needed for a student to master this standard?	What assessment(s) will be used to measure student mastery?	When will this standard be taught?	What will we do when students have learned the essential standard(s)?
Essential Standard 1.1: The student will demonstrate the ability to carry out effective scientific investigations, analyze data, communicate results, and apply results to explain phenomena occurring outside the laboratory. NGSS Science and Engineering Practices (SEP): 1-8	**Students can** **a**. modify or affirm preexisting scientific conceptions through experimentation and using other evidence. **b**. use laboratory equipment properly. **c**. identify the independent and dependent variables in any experiment. **d**. graph data properly using axes labeled with appropriate quantities, appropriate units on axes, axes labeled with appropriate intervals, and an appropriate title. **e**. identify trends and sources of error using class data.	**Common Content Key Terms or Vocabulary for each standard:** • Variable: Independent & Dependent • Hypothesis • Data • Observation **Academic Vocabulary** • Describe • Compare • Contrast • Differentiate • Explain • Apply **Focused note taking Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies**	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 1**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis

	f. analyze data determining the value, units, and physical significance of the slope of the graph, and writing the equation derived from the analysis. **Honors/Extension student can also:** **g**. analyze data by *re-expressing data to determine the correct proportional relationship among variables*, determining the value, units, and physical significance of the slope of the graph, and writing the equation derived from the analysis. **h**. predict and explain everyday phenomena using equations and graphs derived from data	**Metric Measurement** using a meter sticks and rulers **Conduct /Complete:** Simple measurement Data Collection Data Analysis including finding averages Identify sources of error Graph data using various forms of graphs			

Essential Standard 1.2: The student will demonstrate the ability to apply appropriate mathematical processes to solving problems.	**Students can** a. **Apply** math skills, including unit conversions, manipulating and solving algebraic equations, scientific notation, and proportional relationships. b. Use calculators to **perform** calculations for tables and graphs. c. **Solve** problems methodically by making a diagram of the problem, identifying known and unknown quantities, identifying appropriate equations, and judging the reasonableness of an answer.	**Common Content Key Terms or Vocabulary for each standard:** ● Scientific Notation ● Significant Digits ● Direct/Inverse ● Unit ● Dimensional Analysis **Academic Vocabulary** ● Describe ● Solve ● Analyze ● Differentiate ● Explain ● Apply **Focused note taking Paragraph Summaries** ● CER Organizer ● CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	**Informal & Formal Assessments** ● Interactive Notebooks ● CER(Claim, Evidence, Reasoning)/Summary Paragraphs ● Differentiated Critical Reading ● Inquiry Labs ● Lab Reports ● Formative Assessments ● Summative Assessments	**Semester 1**	**Extension Activities / HONOR'S** ● Projects that are standard specific ● Enrichment activities ● Additional Critical Reading / literature readings related to the standard ● Virtual Labs ● Models ● **POGIL:** ***Process-oriented guided-inquiry learning*** ● **CER:** Claim Evidence & Reasoning Data Analysis

Essential Standard 1.3: The student will demonstrate the ability to define, describe, calculate, and differentiate among position, displacement, speed, velocity, and acceleration. Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS2: Motion and Stability: Forces and Interactions PS2.A—Forces and Motion	**Students can** **a**. Define position as a signed number relative to an origin. **b.** Define and calculate displacement (Δx) as the change in position of an object. **c**. Identify the frame of reference used in any problem. **d**. Define and calculate speed as the distance traveled divided by the elapsed time. **e**. Define and calculate velocity as the change in position divided by the elapsed time. **f**. Identify cases where average speed does not equal average velocity. **g**. Describe a situation when the velocity is negative. **h**. Define and calculate acceleration as the change in velocity divided by the elapsed time. **i.** Describe how the physics definition of acceleration differs from the everyday definition of acceleration. **j.** Interpret position versus time and velocity versus time graphs for motion at constant velocity and for motion at constant acceleration. **k.** Solve *basic* motion problems using the	**Common Content Key Terms or Vocabulary for each standard:** • Position' • Displacement • Speed • Velocity • Acceleration • Position –time graphs, • Velocity-time graphs • Equations of Motion **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 1**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis

	equations, $\Delta x = v_i t + (1/2)at^2$ and $v_f = v_i + at$. **EXAMPLE:** Students analyze and interpret [SEP-4] tables or graphs of d-t and v-t for objects subjected to a constant, net unbalanced force and compare their observations to predictions from the mathematical model (HS-PS2-1).				

Essential Outcome 2:Forces, Two-Dimensional Motion, and Gravity

How can one explain and predict interactions between objects and within systems of objects?

What is the essential standard to be learned? Describe in student-friendly vocabulary.	What does proficient student work look like? Provide an example and/or description.	What prior knowledge, skills, and/or vocabulary is/are needed for a student to master this standard?	What assessment(s) will be used to measure student mastery?	When will this standard be taught?	What will we do when students have learned the essential standard(s)?
Essential Standard 2.1: The student will demonstrate the ability to state and apply Newton's three laws of motion. **Associated Disciplinary Core**	**Students can** **a.** Explain that objects change their motion only when a net force is applied. **b.** Apply the relationship, a = F/m, to physical situations in order to explain qualitatively and	**Content Vocabulary/Concepts:** • Force • Free-body diagram • Newton's first law • Inertia • Equilibrium • Net force • Newton's second law	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs	**Semester 1**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related to the standard

Ideas (DCIs) from NGSS include: **PS2: Motion and Stability: Forces and Interactions** **PS2.A—Forces and Motion**	quantitatively how any one variable is affected by a change in another. **c**. Use a = F/m in conjunction with motion equations to solve problems involving motion in one dimension. **d**. Explain that force is not something that an object "has", but is characteristic of the action between objects. **e.** Explain that when one object applies a force to a second object, the second object simultaneously applies an equal and opposite force to the first object. **EXAMPLE:** Calculate F_{net} given m and a → calculate a where F remains constant like gravity: moving down ramp, falling	• Weight • Newton's third law • Static and kinetic friction **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	• Lab Reports • Formative Assessments • Summative Assessments **SUSD Common:** • Common District Lab Activity: F=ma (Vernier equipment)		• Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis
Essential Standard 2.2: The student will demonstrate the ability to apply vector concepts and vector	**Students can** **a.** Identify scalar and vector quantities. **b.** Perform vector addition geometrically.	**Content Vocabulary/Concepts:** • Scalar • Vector • Vector Components	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summ	**Semester 1**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical

math to appropriate physical situations encountered throughout the course.	**c**. Determine the components of a vector using a geometric method. **d.** Apply vector concepts to physical situations involving forces, projectile motion, and circular motion. **e.** Identify and sketch forces acting on an object and determine the net force on the object using geometric vector addition.	**Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	ary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments		Reading / literature readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis
Essential Standard 2.3: The student will demonstrate the ability to describe the path of a projectile using motion equations and vector components. **Associated Disciplinary Core Ideas (DCIs) from NGSS include:** **PS2: Motion and Stability: Forces and Interactions** **PS2.A—Forces and Motion**	**Students can** **a.** Identify a projectile as an object which has been launched and whose motion is affected only by gravity (ignoring air resistance). **b.** Analyze the motion of a projectile by breaking its velocity and acceleration vectors into horizontal and vertical components. **c.** Use motion equations to solve for a projectile that has been launched horizontally.	**Content Vocabulary/Concepts:** • Projectile • Trajectory • Range • Launch **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic**	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 1**	

		Organizers			
Essential Standard 2.4: The student will demonstrate the ability to analyze and explain uniform circular motion. **Associated Disciplinary Core Ideas (DCIs) from NGSS include:** **PS2: Motion and Stability: Forces and Interactions** **PS2.A—Forces and Motion**	**Students can** **a.** Identify uniform circular motion. **b**. Identify the type of force supplying the centripetal force that acts on any object in uniform circular motion. **c.** Identify a centrifugal force as a fictitious force and explain how it results from an accelerated frame of reference. **d.** Determine the directions of the velocity, acceleration, and net force vectors for an object in uniform circular motion.	**Content Vocabulary/Concepts:** ● Uniform Circular Motion ● Centripetal ● Period **Academic Vocabulary** ● Describe ● Define ● Calculate ● Analyze ● Differentiate ● Apply **Focused note taking Paragraph Summaries** ● CER Organizer ● CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	**Informal & Formal Assessments** ● Interactive Notebooks ● CER(Claim, Evidence, Reasoning)/Summary Paragraphs ● Differentiated Critical Reading ● Inquiry Labs ● Lab Reports ● Formative Assessments ● Summative Assessments	**Semester 1**	**Extension Activities / HONOR'S** ● Projects that are standard specific ● Enrichment activities ● Additional Critical Reading / literature readings related to the standard ● Virtual Labs ● Models ● **POGIL:** ***Process-oriented guided-inquiry learning*** ● **CER:** Claim Evidence & Reasoning Data Analysis
Essential Standard 2.5 The student will demonstrate the ability to describe the law of universal gravitation. **Associated Disciplinary Core Ideas (DCIs) from NGSS include:** **PS2-4: Motion and Stability: Forces and Interactions** **PS2.A—Forces and Motion**	**Student can** **a**. Apply the proportional relationship of the law of universal gravitation, $F = Gm_1m_2/d^2$. **b**. Explain why a spaceship in a stable circular orbit is in free fall and why a person in that spaceship experiences weightlessness. **c.** Use Newton's	**Content Vocabulary/Concepts:** ● Universal Gravitation ● Orbit **Academic Vocabulary** ● Describe ● Define ● Calculate ● Analyze ● Differentiate ● Apply **Focused note taking Paragraph Summaries** ● CER Organizer ● CER Summary **Differentiated Critical**	**Informal & Formal Assessments** ● Interactive Notebooks ● CER(Claim, Evidence, Reasoning)/Summary Paragraphs ● Differentiated Critical Reading ● Inquiry Labs ● Lab Reports ● Formative Assessments ● Summative Assessments	**Semester 1**	**Extension Activities / HONOR'S** ● Projects that are standard specific ● Enrichment activities ● Additional Critical Reading / literature readings related to the standard ● Virtual Labs ● Models ● **POGIL:** ***Process-oriented guided-inquiry learning*** ● **CER:** Claim

	second law and the law of universal gravitation to show why all objects near the surface of the earth fall with the same constant acceleration.	**Reading Strategies** **Problem Solving Graphic Organizers**			Evidence & Reasoning Data Analysis

Essential Outcome 3 :Energy and Momentum

How is energy transferred and conserved?

What is the essential standard to be learned? Describe in student-friendly vocabulary.	**What does proficient student work look like? Provide an example and/or description.**	**What prior knowledge, skills, and/or vocabulary is/are needed for a student to master this standard?**	**What assessment(s) will be used to measure student mastery?**	**When will this standard be taught?**	**What will we do when students have learned the essential standard(s)?**
Essential Standard 3.1 The student will demonstrate the ability to apply the concepts of momentum, impulse, conservation, and system to describe and numerically solve simple collision and explosion problems. **Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS2: Motion and Stability: Forces and Interactions**	**Students can** **a.** Calculate the momentum ($p = mv$) of an object. **b.** Define and calculate impulse ($F\Delta t$) and apply it in the relationship, $F\Delta t = m\Delta v$. **c.** Use the concept of impulse to explain and demonstrate mathematically why it is safer in a collision to take a longer time to come to a stop. **d.** Analyze a problem and choose a system to determine if the forces are internal or external to that system.	**Content Vocabulary/Concepts:** ● Momentum ● Impulse ● Impulse-momentum theorem ● Conservation of momentum ○ Closed and Isolated systems ● Law of conservation of momentum ○ Recoil ● Elastic and inelastic collision ● Impulse-momentum theorem **Academic Vocabulary** ● Describe ● Define ● Calculate ● Analyze	**Informal & Formal Assessments** ● Interactive Notebooks ● CER(Claim, Evidence, Reasoning)/Summary Paragraphs ● Differentiated Critical Reading ● Inquiry Labs ● Lab Reports ● Formative Assessments ● Summative Assessments **SUSD Curriculum Office:** ● Collision activities (using metal balls)	**Semester 2**	**Extension Activities / HONOR'S** ● Projects that are standard specific ● Enrichment activities ● Additional Critical Reading / literature readings related to the standard ● Virtual Labs ● Models ● **POGIL:** ***Process-oriented guided-inquiry learning*** ● **CER:** Claim Evidence & Reasoning Data Analysis **NGSS Capstone:** ● Collision Challenge

PS2-2, PS2-3 PS2.A—Forces and Motion	**e.** Explain that a conserved quantity is a quantity that remains numerically constant. **f.** Define and identify situations involving elastic and inelastic collisions and explosions. **g.** State the law of conservation of momentum and use it to solve one - dimensional explosion and collision problems using the equation, m1v1+m2v2 = m1v1′+m2v2′. **EXAMPLE:** Research, drawing info from different sources → Essay on the science behind: Helmets, seatbelts, airbags	• Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	• Explosion (dynamic carts) (Vernier equipment) • Eggdrop – parachute, cushioning		
Essential Standard 3.2 The student will demonstrate the ability to explain the relationships between work and energy.	**Student can** **a.** Define energy in terms of work. **b**. Calculate work (W = Fd) and illustrate that simple machines do not decrease work, rather, they decrease application force by increasing	**Content Vocabulary/Concepts:** • Work • Kinetic energy • Potential energy • Conservation of Energy **Academic Vocabulary** • Describe • Define	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading	**Semester 2**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related

Associated Disciplinary Core Ideas (DCIs) from NGSS include: **PS3: Energy** **PS3.A—Definitions of Energy** **PS3.B—Conservation of Energy and Energy Transfer** **PS3.C—Relationship Between Energy and Forces** **PS3.D—Energy in Chemical Processes**	the distance that the force is applied. **c.** Define and calculate kinetic energy (KE = $(1/2)mv^2$), and gravitational potential energy (GPE = mgh). **d.** State and apply the relationship that work done with no opposing force equals the change in kinetic energy. **e.** State and apply the relationship that work done against gravity equals the change in gravitational potential energy	• Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	• Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments		to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis
Essential Standard 3.3 The student will demonstrate the ability to discuss how energy in a system is transferred from one form to another or from one object to another, and use the conservation of energy to solve simple problems. **Associated Disciplinary Core Ideas (DCIs) from NGSS include:** **PS3: Energy**	**Student can** a. **Define** and **calculate** mechanical energy as the sum of the kinetic and potential energy. **b. Identify** the different forms of energy in simple systems such as a swinging pendulum or a car on a frictionless roller coaster. **c**. Describe the law of conservation of energy for a system and apply it to	**Content Vocabulary/Concepts:** • Work • Kinetic energy • Potential energy • Conservation of Energy **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical**	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 2**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis

PS3.A—Definitions of Energy **PS3.B—Conservation of Energy and Energy Transfer** **PS3.C—Relationship Between Energy and Forces** **PS3.D—Energy in Chemical Processes**	problems where friction and air resistance are ignored.	**Reading Strategies** **Problem Solving Graphic Organizers**			

Essential Outcome 4: Electricity and Magnetism

How are waves used to transfer energy and to send and store information?

What is the essential standard to be learned? Describe in student-friendly vocabulary.	What does proficient student work look like? Provide an example and/or description.	What prior knowledge, skills, and/or vocabulary is/are needed for a student to master this standard?	What assessment(s) will be used to measure student mastery?	When will this standard be taught?	What will we do when students have learned the essential standard(s)?
Essential Standard 4.1 The student will demonstrate the ability to identify kinds of electric charges, analyze interactions between two charged objects, and describe electric fields. Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS2: Forces and Interactions PS2.B: Types of Interactions	**Student can** **a.** Identify two kinds of electric charges and describe the interaction of like and unlike charges. **b.** Describe the acquisition of net charge in terms of the gain or loss of electrons by friction, conduction, and induction, and explain that connecting objects to the ground discharges them. **c**. Explain why an electrically charged object can attract an electrically neutral object.	**Content Vocabulary/Concepts:** • charge • conduction • induction • Electrostatics • Electric field • Coulomb's Law **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 2**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis

PS4: Waves and Their Applications in Technologies for Information Transfer PS4.B—Electromagnetic Radiation	**d**.Differentiate between conducting and insulating materials in terms of the ease that electrons flow in them. **e.** Identify and apply the proportional relationships involved in Coulomb's law of electric force. ($F = kq\ q\ /d^2$) **f.** Explain that the space around a charge is altered by the presence of the charge, producing an electric field in that space. **g**. Explain that the direction of an electric field at any point is the direction of the net force on a test charge at that point. **h**. Identify characteristic field line patterns for simple charge configurations, and use the field lines to determine the relative strength and direction of the electric field	**Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**			
Essential Standard 4.2: The student will demonstrate the ability to describe an analogy between water flowing through pipes and charge flowing through circuits.	**Student can** **a.** Describe the concepts in an electrical circuit including electric potential energy, electric potential, voltage, current, and resistance. **b**. Use each concept	**Content Vocabulary/Concepts:** ● Electric potential energy ● Electric potential ● voltage ● current ● resistance ● circuit	**Informal & Formal Assessments** ● Interactive Notebooks ● CER(Claim, Evidence, Reasoning)/Summary Paragraphs ● Differentiated Critical Reading ● Inquiry Labs	**Semester 2**	**Extension Activities / HONOR'S** ● Projects that are standard specific ● Enrichment activities ● Additional Critical Reading / literature readings related to the standard

Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS4: Waves and Their Applications in Technologies for Information Transfer PS4.B—Electromagnetic Radiation	to explain the flow of charge through a simple circuit and to illustrate the electric circuit/water analogy.	**Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	• Lab Reports • Formative Assessments • Summative Assessments		• Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis
Essential Standard 4.3: The student will demonstrate the ability to describe the characteristics of simple series and parallel circuits in terms of voltage, current, and resistance. Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS4: Waves and Their Applications in Technologies for Information Transfer PS4.B—Electromagnetic Radiation	**Student can** **a.** Use Ohm's law (V = IR) to calculate circuit variables. **b.** Explain that current is not "used up" in an electric circuit, rather, the electric potential energy of a charge is converted to heat energy as the charge flows through a resistor. **c.** Identify the characteristics of simple series circuits including that the total resistance is equal to the sum of the resistances of the resistors ($R_T = R_1 + R_2 + ...$), the current is constant throughout the circuit, and the	**Content Vocabulary/Concepts:** • Ohm's Law • Series circuit • Parallel circuit **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 2**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis

	sum of the voltages across the resistors equals the voltage across the voltage source. **d.** Identify the characteristics of simple parallel circuits including the inverse of the total resistance is equal to the sum of the inverses of the resistors ($1/R_T = 1/R_1 + 1/R_2$...), the voltage across each resistor is the same as the voltage source, and the sum of the currents in the branches equals the current output by the voltage source. **e.** Explain why houses are wired in parallel and describe short circuits and the function of circuit breakers.				
Essential Standard 4.4 The student will demonstrate the ability to apply the concepts of power and energy in analyzing electrical circuits.	**Student can** **a.** Define power as the amount of energy transferred (work) divided by the elapsed time (P = W/t). **b.** Define electrical	**Content Vocabulary/Concepts:** ● Power **Academic Vocabulary** ● Describe ● Define ● Calculate ● Analyze	**Informal & Formal Assessments** ● Interactive Notebooks ● CER(Claim, Evidence, Reasoning)/Summary Paragraphs ● Differentiated	**Semester 2**	**Extension Activities / HONOR'S** ● Projects that are standard specific ● Enrichment activities ● Additional Critical Reading / literature

Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS4: Waves and Their Applications in Technologies for Information Transfer PS4.B—Electromagnetic Radiation	power as the product of voltage and current (P = VI) and apply this to simple circuits.	• Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments		readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis
Essential Standard 4.5: The student will demonstrate the ability to describe the causes of magnetism, the interaction of magnets, and electromagnetic effects. Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS2.B: Types of Interactions PS4: Waves and Their Applications in Technologies for Information Transfer PS4.B—Electromagnetic Radiation	**Student can** **a.** Identify the fundamental cause of magnetism as the movement of charged particles with reference to electron spin, magnetic domains, and electric currents. **b.** Explain that the space around a magnet is altered by the presence of the magnet producing a magnetic field. **c.** Identify the characteristic field lines for simple magnetic configurations and for a current-carrying wire, using the field lines to determine the relative strength and the direction of the magnetic field.	**Content Vocabulary/Concepts:** • Magnetism • Electron spin • Domains • Magnetic field • electromagnetism **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 2**	

	d. Describe how a motor works by using a simplified diagram of a motor and describing that a magnetic field exerts a force on a current-carrying wire. **e.** Describe how a generator works by using a simplified diagram and describing that a changing magnetic field inside a coil of wire induces an electric current in the coil of wire.				

Essential Outcome 5: Waves

How are waves used to transfer energy and to send and store information?

What is the essential standard to be learned? Describe in student-friendly vocabulary.	What does proficient student work look like? Provide an example and/or description.	What prior knowledge, skills, and/or vocabulary is/are needed for a student to master this standard?	What assessment(s) will be used to measure student mastery?	When will this standard be taught?	What will we do when students have learned the essential standard(s)?
Essential Standard 5.1 The student will demonstrate the ability to describe common forms of waves in terms of basic wave characteristics and discuss the transportation and	**Student can** **a.** Describe the motion of the wave and of the wave medium for transverse and longitudinal waves. **b.** Define wave characteristics including amplitude, wavelength (λ), and	**Content Vocabulary/Concepts:** ● Medium ● Transverse ● Longitudinal ● Amplitude ● Frequency ● wavelength **Academic Vocabulary** ● Describe ● Define	**Informal & Formal Assessments** ● Interactive Notebooks ● CER(Claim, Evidence, Reasoning)/Summary Paragraphs ● Differentiated Critical Reading ● Inquiry Labs ● Lab Reports ● Formative	**Semester 2**	**Extension Activities / HONOR'S** ● Projects that are standard specific ● Enrichment activities ● Additional Critical Reading / literature readings related to the standard ● Virtual Labs ● Models

transformation of wave energy. Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS4: Waves and Their Applications in Technologies for Information Transfer PS4.A—Wave Properties	frequency (f). **c.** Solve problems using the wave equation ($v = f\lambda$). **d.** Cite examples of the transportation of energy in waveform and describe that wave energy can be converted to other forms of energy.	• Calculate • Analyze • Differentiate • Apply • Cite **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	Assessments • Summative Assessments		• **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis
Essential Standard 5.2 The student will demonstrate the ability to explain wave behavior including reflection, refraction, diffraction, interference, and the Doppler Effect. Associated Disciplinary Core Ideas (DCIs) from NGSS include: PS4: Waves and Their Applications in Technologies for Information Transfer PS4.A—Wave Properties	**Student can** **a.** Sketch and describe how wave fronts reflect off of plane and concave barriers. **b.** Sketch and describe how wave fronts refract when crossing a boundary, how the change in wave speed at the boundary produces refraction, and how refraction is affected by the wavelength of the wave. **c.** Sketch and describe how the crests and troughs of two transverse waves can interfere (add or subtract) while passing through one another, and produce a pattern by two in-	**Content Vocabulary/Concepts:** • Wave front • reflect/reflection • refract/refraction • Interference • Aperture • Doppler Effect **Academic Vocabulary** • Describe • Define • Calculate • Analyze • Differentiate • Apply • Cite **Focused note taking** **Paragraph Summaries** • CER Organizer • CER Summary **Differentiated Critical Reading Strategies** **Problem Solving Graphic Organizers**	**Informal & Formal Assessments** • Interactive Notebooks • CER(Claim, Evidence, Reasoning)/Summary Paragraphs • Differentiated Critical Reading • Inquiry Labs • Lab Reports • Formative Assessments • Summative Assessments	**Semester 2**	**Extension Activities / HONOR'S** • Projects that are standard specific • Enrichment activities • Additional Critical Reading / literature readings related to the standard • Virtual Labs • Models • **POGIL:** ***Process-oriented guided-inquiry learning*** • **CER:** Claim Evidence & Reasoning Data Analysis

	phase point sources. **d.** Sketch and describe how wave fronts are diffracted when traveling through small apertures, and explain how diffraction varies with wavelength. **e.** Illustrate that the wavelength of an approaching or receding wave source is different from the wavelength of a stationary wave source (i.e., explain the Doppler Effect).				
LITERACY					
RST .11-12.1 **Cite specific textual evidence** to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS -PS1-1) WHST .9-12.2 **Write informative/explanatory texts**, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-1)		**Academic Language** ● Describe ● Explain ● Differentiate ● Compare/Contrast ● Marking text ● Charting text ● Interacting with text ● Annotating text	**Informal & Formal Assessments** ● Student Portfolios & or Interactive Notebooks ● Summary Paragraphs, ● Inquiry Labs ● Lab Reports ● Common Formative Assessments ● Common Summative Assessments	[Continual Practice: **Quarters 1-4]**	**Extension Activities** ● Projects that are standard specific ● Enrichment activities ● Additional literature readings related to the standard ● Virtual Labs