Physics Curriculum Map

Standards	**Content**	**Skills/Practices**	**Materials/ Resources**	**Assessments (All)** Daily/Weekly/ Benchmarks	**Timeline** (Months/Weeks /Days)
NYS Key Idea 3: Critical thinking skills are used in the solution of mathematical problems. M3.1 Apply algebraic and geometric concepts and skills to the solution of problems. • explain the physical relevance of properties of a graphical representation of real world data, e.g., slope, intercepts, area under the curve	**Unit 1: Mathematical Tools** 1. Perform calculations with SI units and scientific notation 2. Understand the need for accuracy and precisions when making measurements and reporting data 3. Display and evaluate data using graphs as well as linearizing data and create mathematical models 4. Dimensional analysis	1. Perform calculations with SI units and scientific notation 2. Understand the need for accuracy and precisions when making measurements and reporting data 3. Display and evaluate data using graphs as well as linearizing data and create mathematical models 4. Dimensional analysis 5. Significant figures 6. Review of algebra/trig(SOH CAH TOA)	School Issued Chromebooks Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Labs:** ● Life of Pi **Summative:** ● Test: Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Math Pre-test ● Bellringers ● Homework	First week of September

Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design. 2.2 Collect information about the behavior of a system and use modeling tools to represent the operation of the system. • use observations of the behavior of a system to develop a model 2.3 Find and use mathematical models that behave in the same manner as the	5. Significant figures 6. Review of algebra/trig(SOH CAH TOA)				

processes under investigation. • represent the behavior of real-world systems, using physical and mathematical Models Key Idea 1: Engineering design is an iterative process involving modeling and optimization (finding the best solution within given constraints) which is used to develop technological solutions to problems within given constraints. (Note: The design process could apply to activities from simple investigations to					

long-term					
NYS Key Idea 5: Energy and matter interact through forces that result in changes in motion. 5.1 Explain and predict different patterns of motion of objects (e.g., linear and uniform circular motion, velocity and acceleration, momentum and inertia). i. construct and interpret graphs of position, velocity, or acceleration versus time ii. determine and interpret slopes and areas of motion	**Unit 2:** **Kinematics: 1D Motion** **in the x direction** **1.** Represent scalar versus vector quantities 2. Describing the difference between distance and displacement 3. Study average & instantaneous velocity 4. Study average & constant acceleration 5. Describe motion with motion diagrams and incorporating coordinate systems. 6. Use graphs and equations to solve problems involving moving objects 7. Draw motion	**1.** Represent scalar versus vector quantities 2. Describing the difference between distance and displacement 3. Study average & instantaneous velocity 4. Study average & constant acceleration 5. Describe motion with motion diagrams and incorporating coordinate systems. 6. Use graphs and equations to solve problems involving moving objects 7. Draw motion graphs, and motion maps and interpret motion graphs using slope and area.	School Issued Chromebooks Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Labs:** ● Scalar v. Vector ● Roll with it ● Waterfall ● We all Fall Down **Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	Late September/Early October

graphs iii. determine the acceleration due to gravity near the surface of Earth iv. determine the resultant of two or more vectors graphically or algebraically performance indicators: 5.1a Measured quantities can be classified as either vector or scalar. 5.1b A vector may be resolved into perpendicular components.* 5.1c The resultant of two or more vectors, acting at any angle, is determined by	graphs, and motion maps and interpret motion graphs using slope and area. **-In the y direction** **1.** Calculate free fall acceleration				

vector addition. 5.1d An object in linear motion may travel with a constant velocity* or with acceleration*. (Note: Testing of acceleration will be limited to cases in which acceleration is constant. 5.1 iii. determine the acceleration due to gravity near the surface of Earth					
NYS 5.1 vii. sketch the theoretical path of a projectile Performance indicators: 5.1e An object in	**Unit 3: Projectile Motion-2D motion** 1. Describe and calculate projectile motion 2. Predict the pathway of a projectile	SWBAT: sketch the theoretical path of a projectile Use equations to analyze projectiles	School Issued Chromebook Teacher generated google slides notes Calculator	**Labs:** ● Shoot For Your Grade ● Rocket Science **Summative:** ● Test:Created using previous years	Mid to Late October

free fall accelerates due to the force of gravity.* Friction and other forces cause the actual motion of a falling object to deviate from its theoretical motion. (Note: Initial velocities of objects in free fall may be in any direction.) 5.1f The path of a projectile is the result of the simultaneous effect of the horizontal and vertical components of its motion; these components act independently. 5.1g A projectile's time of flight is dependent	3. Determine height and range of projectile 4. Observe and show how horizontal and vertical velocities are independent of each other	both launched horizontally and at an angle Explain the optimal angle to launch a projectile that will result in the greatest horizontal and vertical distances	School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	

upon the vertical component of its motion.					
NYS 5.1 iv. determine the resultant of two or more vectors graphically or algebraically 5.1vi. resolve a vector into perpendicular components both graphically and algebraically viii. use vector diagrams to Analyze mechanical systems (equilibrium and nonequilibrium) Performance Indicators: 5.1a Measured quantities can be classified as either vector or scalar.	**Unit 4: DYNAMICS AND STATICS** **Vectors** 1. What is the difference between vector and scalar 2. Graphical vector representation 3. Graphical vector addition 4. Mathematical vector addition **Forces** 1. Free body diagrams: define and show forces acting on an object 2. Determine the normal force on the object 3. Recognize and calculate static and kinetic friction	HS-PS2-1. Analyze data to support the claim that Newton's Second Law of Motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration	School Issued Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Labs:** ● Atwood Lab ● Foot Friction ● Weight v. Mass **Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	November

5.1b A vector may be resolved into perpendicular components.* 5.1c The resultant of two or more vectors, acting at any angle, is determined by vector addition 5.1i According to Newton's First Law, the inertia of an object is directly proportional to its mass. An object remains at rest or moves with constant velocity, unless acted upon by an unbalanced force 5.1k According to	4. Resolve forces into x and y components with forces on an incline plane				

Newton's Second Law, an unbalanced force causes a mass to accelerate*. 5.1q According to Newton's Third Law, forces occur in action/reaction pairs. When one object exerts a force on a second, the second exerts a force on the first that is equal in magnitude and opposite in direction. 5.1 v. draw scaled force diagrams using a ruler and a protractor Performance indicators:					

5.1j When the net force on a system is zero, the system is in equilibrium. 5.1o Kinetic friction* is a force that opposes motion.					
NYS 5.1n Centripetal force* is the net force which produces centripetal acceleration.* In uniform circular motion, the centripetal force is perpendicular to the tangential velocity. 5.1t Gravitational forces are only attractive, whereas electrical and magnetic forces can be attractive or repulsive.	**Unit 5: Uniform Circular Motion & Universal Law of Gravitation** 1. Use the masses and distances between objects to calculate the gravitational force 2. Understand and calculate centripetal force of a motion in circular	HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.	School Issued Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology	**Labs:** ● The Circle of Life **Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	Late November/Early December

5.1u The inverse square law applies to electrical* and gravitational* fields produced by point sources.	motion		Castle Learning		
NYS 5.1p The impulse* imparted to an object causes a change in its momentum*. 5.1q According to Newton's Third Law, forces occur in action/reaction pairs. When one object exerts a force on a second, the second exerts a force on the first that is equal in magnitude and opposite in direction. 5.1r Momentum is conserved in a closed system.* (Note: Testing will	**Unit 6: Momentum & Impulse** 1. Students will be able to understand Momentum and Its Conservation according to Newton's 3rd law 2. Describe Momentum & impulse and apply them to the interactions of objects 3. Elastic versus inelastic collisions	HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.* HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. [	School Issued Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Labs:** ● The Explosion Lab ● Impulse Lab **Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	December

be limited to momentum in one dimension.)					
NYS Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved. 4.1 Observe and describe transmission of various forms of energy. i. describe and explain the exchange among potential energy, kinetic energy, and internal energy for simple mechanical systems, such as a pendulum, a roller coaster, a spring, a freely falling object	**Unit 7: Energy** 1. Differentiating between potential and kinetic energy 2. Deriving KE and PE formulas graphically 3. Calculating the PE and KE at various points~ Determine how energy is used to do work 4. Explain that the total amount of energy in a closed system never changes 5. Energy form changes and conservation on energy 6. Work energy theorem 7. Calculating work and power 8. Relating power	HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).	School Issued Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Labs:** ● Hooke's Law ● Pendulum ● Dropper Popper ● Who is the Most Powerful? **Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning ● Rube Goldberg Project: Students will design and build a rube goldberg machine outside of the classroom **Formative:** ● Bellringers ● Homework	January

v. observe and explain energy conversions in real -world situations vi. recognize and describe conversions among different forms of energy in real or hypothetical devices such as a motor, a generator, a photocell, a battery 4.1a All energy transfers are governed by the law of conservation of energy.* 4.1b Energy may be converted among mechanical, electromagnetic, nuclear, and thermal forms.	to energy 9. Elastic potential energy calculation	HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy			

4.1c Potential energy is the energy an object possesses by virtue of its position or condition. Types of potential energy include gravitational* and elastic*. 4.1d Kinetic energy* is the energy an object possesses by virtue of its motion. 4.1e In an ideal mechanical system, the sum of the macroscopic kinetic and potential energies (mechanical energy) is constant.* 4.1f In a nonideal mechanical system, as mechanical energy					

decreases there is a corresponding increase in other energies such as internal energy.* 4.1g When work* is done on or by a system, there is a change in the total energy* of the system. 4.1h Work done against friction results in an increase in the internal energy of the system. 4.1i Power* is the time-rate at which work is done or energy is expended.					
NYS 4.1j Energy may	**Unit 8: Electrostatics**	HS-PS2-4. Use mathematical	School Issued Chromebook	**Labs:** ● Static Electricity	Early February

be stored in electric* or magnetic fields. This energy may be transferred through conductors or space and may be converted to other forms of energy. 4.1k Moving electric charges produce magnetic fields. The relative motion between a conductor and a magnetic field may produce a potential difference in the conductor.	1. The difference between static and standard electricity 2. Measuring static electricity 3. Coulomb's Law 4. Conservation on charge 5. Drawing electrical fields through graphical and mathematical representation 6. Drawing magnetic field lines 7. Electric Potential energy	representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects	Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	● Shocking Pie Pan **Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	
NYS 4.1 viii. measure current and voltage in a circuit ix. use	**Unit 9: Electric Circuits** 1.Drawing and understand the difference between	HS-PS3-6.Analyze data to support the claim that Ohm's Law describes the mathematical relationship among	School Issued Chromebook Teacher generated google slides notes	**Labs:** ● Building Series Circuits ● Building Parallel Circuits	Mid to Late February

measurements to determine the resistance of a circuit element 4.1 x. interpret graphs of voltage versus current 4.1 xi. measure and compare the resistance of conductors of various lengths and cross-sectional areas 4.1 xii. construct simple series and parallel circuits 4.1 xiii. draw and interpret circuit diagrams which include voltmeters and ammeters 4.1 xiv. predict the behavior	parallel and series circuits 2. Understanding and calculating voltage, current and resistance of both parallel and series circuits 3. Ohm's Law 4. Understanding complex circuits 5. Role of capacitors within a circuit 6. Understanding measurement devices ● Ammeter ● Voltmeter ● Ohmmeter ● Multimeter	the potential difference, current, and resistance of an electric circuit.	Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	

of lightbulbs in series and parallel circuits Performance indicators 4.1l All materials display a range of conductivity. At constant temperature, common metallic conductors obey Ohm's Law*. 4.1m The factors affecting resistance in a conductor are length, cross-sectional area, temperature, and resistivity.* 4.1n A circuit is a closed path in which a current* can exist. (Note: Use conventional					

current.) 4.1o Circuit components may be connected in series* or in parallel*. Schematic diagrams are used to represent circuits and circuit elements. 4.1p Electrical power* and energy* can be determined for electric circuits.					
NYS 4.1 xv. map the magnetic field of a permanent magnet, indicating the direction of the field between the N (north-	**Unit 10: Magnetism** 1. Relating magnetism and electricity 2. Permanent vs. temporary 3. Drawing magnetic fields for bar	HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.	School Issued Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment	**Labs:** ● Mapping Magnetic Fields ● Building an Electromagnet **Summative:** ● Test:Created using previous years regents questions taken from problem	Early March

seeking) and S (south-seeking) poles Performance indicators 4.1j Energy may be stored in electric* or magnetic fields. This energy may be transferred through conductors or space and may be converted to other forms of energy. 4.1k Moving electric charges produce magnetic fields. The relative motion between a conductor and a magnetic field may produce a potential difference in the conductor.	magnets along with graphical representation 4. Electromagnetism: moving charges create magnetic fields and produce current	HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.	Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	
NYS	**Unit 11: Waves**	HS-PS4-1. Use	School Issued	**Labs:**	Mid March to

4.3 Students can explain variations in wavelength and frequency in terms of the source of the vibrations that produce them, e.g., molecules, electrons, and nuclear particles 4.3a An oscillating system produces waves. The nature of the system determines the type of wave produced. 4.3b Waves carry energy and information without transferring mass. This energy may be carried by pulses or periodic waves. 4.3c The model of	**Simple motion** 1. Identify the conditions of simple harmonic motion 2. Explain how force, velocity and acceleration change as an object vibrates 3. Identify Amplitude 4. Recognize the relationship between period and frequency 5. Calculate the period and frequency of an object in SHM 6. Calculate wave speed, frequency, and wavelength 7. Identify nodes and anodes of standing and longitudinal waves • **Wave Interactions** 1. Apply the	mathematical representations to support a claim regarding relationships among the period, frequency, wavelength, and speed of waves traveling and transferring energy (amplitude, frequency) in various media. HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	• Wave Characteristic Slinky Lab • Snell's Law Lab • Speed of Sound Lab • Standing Waves **Summative:** • Test:Created using previous years regents questions taken from problem attic/castle learning • Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** • Bellringers • Homework	Mid April

a wave incorporates the characteristics of amplitude, wavelength,* frequency*, period*, wave speed*, and phase. 4.3d Mechanical waves require a material medium through which to travel. 4.3e Waves are categorized by the direction in which particles in a medium vibrate about an equilibrium position relative to the direction of propagation of the wave, such as transverse and longitudinal waves.	superposition principle. 2. Differentiate between constructive and destructive interference 3. Predict when a reflected wave will be inverted 4. Predict whether specific traveling waves will produce a standing wave 5. Identify nodes and antinodes of standing waves 6. How mediums effect wave patterns 7. Waves at boundaries: reflection, refraction and absorption **Sound Waves** **1.** Explain how sound waves are produces 2. Relate frequency to pitch	HS-PS4-6. Use mathematical models to determine relationships among the size and location of images, size and location of objects, and focal lengths of lenses and mirrors			

4.3f Resonance occurs when energy is transferred to a system at its natural frequency. 4.3g Electromagnetic radiation exhibits wave characteristics. Electromagnetic waves can propagate through a vacuum 4.3 Explain variations in wavelength and frequency in terms of the source of the vibrations	3. Compare the speed of sound in various media 4. Explain the Doppler effect and shift 5. Explain resonance 6. Explain sonic booms 7. Harmonics • **Electromagnetic Waves** **8.** Differentiate between electromagnetic waves o Radio, microwaves, infrared, visible, UV, x-rays, gamma and cosmetic waves **Light and Reflection** 1. Characteristics of Light o Identify the components of the electromagnetic spectrum				

that produce them, e.g., molecules, electrons, and nuclear particles 4.3i When a wave moves from one medium into another, the wave may refract due to a change in speed. The angle of refraction (measured with respect to the normal) depends on the angle of incidence and the properties of the media (indices of refraction).* 4.3j The absolute index of refraction is inversely proportional to the speed of a wave.*	o Calculate the frequency or wavelength of electromagnetic radiation 2. Color and Polarization 3. Refraction o Critical angle o Solve problem's using Snell's Law 4. Reflection of light o Law of reflection 5. Total Internal Reflection 6. Dispersion 7. Diffraction o Huygen's principle o Double Slit Diffraction 8. Electromagnetic spectrum				

4.3k All frequencies of electromagnetic radiation travel at the same speed in a vacuum.*					
5.3 Compare energy relationships within an atom's nucleus to those outside the nucleus. i. interpret energy-level diagrams ii. correlate spectral lines with an energy-level diagram can compare energy relationships within an atom's nucleus to those outside the	**Unit 12: Modern & Nuclear** **1.** Quantization of Energy 2. Models of the Atom 3. Quantum Mechanics 4. The Nucleus 5. Nuclear Decay and half life o Half life calculations 6. Nuclear Reactions 7. Particle Physics 8. Photo electric effect 9. Energy of a photon 10. Energy levels o Mathematical representations	HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model (quantum theory), and that for some situations one model is more useful than the other. HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave	School Issued Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Labs:** ● Spectrometer Lab ● Quark Lab **Summative:** ● Test:Created using previous years regents questions taken from problem attic/castle learning ● Quizzes:Created using previous years regents questions taken from problem attic/castle learning **Formative:** ● Bellringers ● Homework	Mid April to Mid May

nucleus. Major Understandings: 5.3a States of matter and energy are restricted to discrete values (quantized). 5.3b Charge is quantized on two levels. On the atomic level, charge is restricted to multiples of the elementary charge (charge on the electron or proton). On the subnuclear level, charge appears as fractional values of the elementary charge (quarks). 5.3c On the atomic level,	and graphical representations 11. Quarks o Determining what subatomic particles are made up of	behavior and wave interactions with matter to transmit and capture information and energy.*			

energy is emitted or absorbed in discrete packets called photons.* 5.3d The energy of a photon is proportional to its frequency.* 5.3e On the atomic level, energy and matter exhibit the characteristics of both waves and particles. 5.3f Among other things, mass-energy and charge are conserved at all levels (from subnuclear to cosmic). 5.3g The Standard Model of					

Particle Physics has evolved from previous attempts to explain the nature of the atom and states that:					
	Regents Review		School Issued Chromebook Teacher generated google slides notes Calculator School Provided Lab equipment Lab Manual Created by Teacher Physics Reference Table Textbook: Physics Principles & Problems Schoology Castle Learning	**Labs:** ● None **Formative:** ● Practice regents exams ● Practice problems and activities from review book	Mid May/June

			Regents Review Packet provided by teacher		