Centerville Senior High School
Curriculum Mapping
Physics I
Mr. Damon Anderson

Physics I Overview

The Indiana Academic Standards specify the core, fundamental skills students should learn, master, and apply at grade level beginning in kindergarten and continuing through grade twelve. These academic standards serve as the basis to our curriculum in Centerville-Abington Community Schools but do not serve as curriculum alone. The Indiana Academic Standards are supported through grade-level, content-specific curriculum maps and resources. These curriculum maps and resources are aligned to the Indiana Academic Standards and provide the tools which are necessary to meet the needs of all learners. As a result, the Centerville-Abington Community Schools' curriculum maps are examined regularly and undergo periodic revisions.

Physics I aids students in synthesizing the fundamental concepts and principles concerning matter and energy through the laboratory study of mechanics, energy, wave properties, and electromagnetic radiation.

Textbook: McGraw Hill. (2017). *Physics Principles & Problems.*

Unit 1 Theme	**Duration of Unit**	**Essential Question(s)**
Mechanics	12 weeks	Can you use displacement and velocity to describe an object's motion?
End of Unit 1 Authentic Learning Task The students will perform a lab on Back and Forth Motion. The students will quantitatively analyze the motion of objects that move back and forth. They will analyze and interpret back and forth motion in kinematic graphs. They will use kinematic graphs to catalog objects that exhibit similar motion. **Academic Standards:** HS.PS.2.1, HS.PS.2.2, HS.PS.2.3		

Pacing: Unit 1, 12 weeks
Indiana Academic Standards HS.PS.2.1, HS.PS.2.2, HS.PS.2.3, HS.PS.2.4, HS.PS.2.6

Academic Vocabulary

Chapter 2: motion diagram, particle model, coordinate system, origin, position, distance, magnitude, vector, scalar, time interval, displacement, resultant, position-time graph, instantaneous position, average velocity, average speed, instantaneous velocity
Chapter 3: acceleration, velocity-time graph, average acceleration, instantaneous acceleration, free fall, free-fall acceleration
Chapter 4: force, system, free-body diagram, net force, Newton's second law, Newton's first law, inertia, equilibrium, weight, gravitational field, apparent weight, weightlessness, drag force, terminal velocity, interaction pair, Newton's third law, tension, normal force
Chapter 5: components, vector resolution, kinetic friction, static friction, coefficient of kinetic friction, coefficient of static friction, equilibrant
Chapter 9: impulse, momentum, impulse-momentum theorem, angular momentum, angular impulse-angular momentum theorem, closed system, isolated system, law of conservation of momentum, law of conservation of angular momentum

Key Concepts/Learning Targets

Chapter 2

- I can develop a graphical representation that describes the relationship between the clock reading and position of an object moving at a uniform rate.
- I can use a graphical representation to qualitatively describe the motion of an object.
- I can use a graphical representation to quantitatively describe the motion of an object.
- I can develop a mathematical representation that describes the relationship between the clock reading and position of an object moving at a uniform rate.
- I can use a mathematical representation to quantitatively describe the motion of an object.
- I can develop a pictorial representation that describes the relationship between the clock reading and position of an object moving at a uniform rate.
- I can use a pictorial representation to qualitatively describe the motion of an object
- I can describe the slope of the graphical representation of position vs. clock reading (time) in terms of the velocity of the object.
- I can recognize that the magnitude of the slope representing a negative velocity can be greater than the magnitude of the slope representing a positive velocity.
- I can rank the velocities of objects in a system based on the slope of a position vs. clock reading (time) graphical representation.
- I can recognize that velocity is a vector quantity.
- I can recognize that speed is a scalar quantity.
- I can recognize that displacement is a vector quantity.
- I can recognize that distance is a scalar quantity.
- I can calculate the distance traveled by an object moving at a constant rate during a given time interval.
- I can calculate the displacement traveled by an object moving at a constant rate during a given time interval.

- I can calculate the speed traveled by an object moving at a constant rate during a given time interval.
- I can calculate the velocity traveled by an object moving at a constant rate during a given time interval.
- I can calculate the average speed traveled by an object moving at a constant rate during a given time interval.
- I can calculate the average velocity traveled by an object moving at a constant rate during a given time interval.

Chapter 3

- I can develop a graphical representation that describes the relationship between the clock reading and velocity of an object moving at a uniformly changing rate.
- I can use a graphical representation to qualitatively describe the motion of an object.
- I can use a graphical representation to quantitatively describe the motion of an object.
- I can develop a mathematical representation that describes the relationship between the clock reading and velocity of an object moving at a uniformly changing rate.
- I can use a mathematical representation to quantitatively describe the motion of an object.
- I can develop a pictorial representation that describes the relationship between the clock reading and velocity of an object moving at a uniformly changing rate.
- I can use a pictorial representation to qualitatively describe the motion of an object.
- I can describe the slope of the graphical representation of velocity vs. clock reading (time) in terms of the acceleration of the object.
- I can recognize that the magnitude of the slope representing a negative acceleration can be greater than the magnitude of the slope representing a positive acceleration.
- I can rank the accelerations of objects in a system based on the slope of a velocity vs. clock reading (time) graphical representation.
- Given a graphical representation of position vs. clock reading, I can identify the corresponding velocity and acceleration vs. clock reading graphs.
- Given a graphical representation of position vs. clock reading, I can sketch the corresponding velocity and acceleration vs. clock reading graphs.
- Given a graphical representation of velocity vs. clock reading, I can identify the corresponding position and acceleration vs. clock reading graphs.
- Given a graphical representation of velocity vs. clock reading, I can sketch the corresponding position and acceleration vs. clock reading graphs.
- Given a graphical representation of acceleration vs. clock reading, I can identify the corresponding position and velocity vs. clock reading graphs.
- Given a graphical representation of acceleration vs. clock reading, I can sketch the corresponding position and velocity vs. clock reading graphs.

- I can qualitatively apply the model of constant acceleration to describe the position of an object moving in free fall near the surface of the Earth in one dimension.
- I can quantitatively apply the model of constant acceleration to determine the position of an object moving in free fall near the surface of the Earth in one dimension.
- I can qualitatively apply the models of constant velocity and constant acceleration to describe the position of an object moving in free fall near the surface of the Earth in two dimensions.
- I can quantitatively apply the models of constant velocity and constant acceleration to determine the position of an object moving in free fall near the surface of the Earth in two dimensions.
- I can qualitatively apply the model of constant acceleration to describe the velocity of an object moving in free fall near the surface of the Earth in one dimension.
- I can quantitatively apply the model of constant acceleration to determine the velocity of an object moving in free fall near the surface of the Earth in one dimension.
- I can qualitatively apply the models of constant velocity and constant acceleration to describe the velocity of an object moving in free fall near the surface of the Earth in two dimensions.
- I can quantitatively apply the models of constant velocity and constant acceleration to determine the velocity of an object moving in free fall near the surface of the Earth in two dimensions.

<u>Chapters 4 & 5</u>

- I can describe the motion of an object in the absence of a net external force.
- I can describe how Newton's first law of motion applies to the motion of an object moving at a constant rate.
- Given a data set, I can develop a graphical representation describing the relationship among the inertial mass of an object, the total force applied and the acceleration of an object moving in one dimension.
- I can use a graphical representation showing the relationship between inertial mass and acceleration to qualitatively describe the motion of an object experiencing an unbalanced force moving in one dimension.
- I can use a graphical representation showing the relationship between inertial mass and acceleration to quantitatively determine the acceleration of an object experiencing an unbalanced force moving in one dimension.
- I can develop a mathematical representation which describes the relationship among the inertial mass of an object, the total force applied and the acceleration of an object moving in one dimension.
- I can use a mathematical representation showing the relationship between inertial mass and acceleration to qualitatively describe the motion of an object experiencing an unbalanced force moving in one dimension.
- I can use a mathematical representation showing the relationship between inertial mass and acceleration to quantitatively determine the acceleration of an object experiencing an unbalanced force moving in one dimension.

- I can use a graphical representation showing the relationship between inertial mass and acceleration to quantitatively determine the total unbalanced force acting on an accelerating object moving in one dimension.
- I can construct force diagrams using appropriately labeled vectors with magnitude, direction, and units.
- I can use force diagrams to qualitatively analyze a scenario.
- I can use force diagrams to quantitatively analyze a scenario.
- I can use force diagrams to make claims about forces exerted on an object by other objects.
- I can describe the interaction of two objects using Newton's third law.
- I can use Newton's third law to describe action-reaction pairs.
- I can construct graphical representations that describe the relationship between the gravitational mass of an object and the force due to gravity.
- I can construct mathematical representations that describe the relationship between the gravitational mass of an object and the force due to gravity.
- I can analyze the graphical representations to describe how changing the gravitational mass will affect that force due to gravity acting on the object.
- I can analyze the mathematical representations to describe how changing the gravitational mass will affect that force due to gravity acting on the object.
- I can describe the slope of the force due to gravity vs. gravitational mass graphical representation in terms of gravitational field.
- I can explain the equivalence of the inertial and gravitational masses.
- I can explain that acceleration in free fall is independent of an object's mass.

Chapter 9

- I can define linear momentum as the product of an object's mass and velocity.
- I can quantitatively determine the linear momentum of a single object moving at a constant rate.
- I can define "impulse" as the area under a force vs. change in clock reading (time) curve.
- I can use a force vs. change in clock reading (time) curve to determine the change in linear momentum of a system acted on by an external force.
- I can predict the change in linear momentum of an object given the average force exerted on the object and time interval during which the force is exerted.
- I can describe how when two objects interact through a collision or separation that both objects experience an equal amount of force in the opposite direction.
- I can describe how when two objects interact through a collision or separation that both objects experience an equal change in linear momentum in the opposite direction.

- I can describe how when two objects interact through a collision or separation that the object with a greater mass experiences a smaller change in velocity.
- I can quantitatively determine the total linear momentum of a system consisting of two objects moving in one dimension before a collision or separation occurs.
- I can quantitatively determine the total linear momentum of a system consisting of two objects moving in one dimension after a collision or separation occurs.
- I can quantitatively prove that the total initial linear momentum of a system consisting of two objects moving in one dimension is equal to the total final linear momentum of the same system when no external force is applied consistent with Newton's third law.
- I can classify an interaction between two objects as elastic or inelastic based on the change in linear kinetic energy of the system.
- I can quantitatively determine the center of mass of a system consisting of two or more masses.
- I can prove that the linear momentum of the center of mass remains unchanged during any interaction between the masses.

Question Stems

Chapter 2

- How do motion diagrams represent motion?
- How can you use a particle model to represent a moving object?
- What is a coordinate system?
- How does the chosen coordinate system affect the sign of objects' positions?
- How are time intervals measured?
- What is displacement?
- How are motion diagrams helpful in answering questions about an object's position or displacement?
- What information do position-time graphs provide?
- How can you use a position-time graph to interpret an object's position or displacement?
- What are the purposes of equivalent representations of an object's motion?
- What is velocity?
- What is the difference between speed and velocity?
- How can you determine an object's average velocity from a position-time graph?
- How can you represent motion with pictorial, physical, and mathematical models?

Chapter 3

- What is acceleration
- How is acceleration different from velocity
- What information can you learn from velocity-time graphs?
- What do a position-time graph and a velocity-time graph look like for motion with constant acceleration?
- How can you determine the displacement of a moving object from its velocity-time graph?

- What are the relationships among position, velocity, acceleration, and time?
- What is free-fall acceleration?
- How do objects in free fall move?

Chapter 4

- What is a force?
- What is the relationship between force and acceleration?
- How does motion change when the net force is zero?
- How are the weight and the mass of an object related?
- How do actual weight and apparent weight differ?
- What effect does air have on falling objects?
- What is Newton's third law?
- What is the normal force?

Chapter 5

- How are vectors added graphically?
- What are the components of a vector?
- How are vectors added algebraically?
- What is the friction force?
- How do static and kinetic friction differ?
- How can you find the force required for equilibrium?
- How do you resolve force vector components for motion along an inclined plane?

Chapter 9

- What is impulse?
- What is momentum?
- What is angular momentum?
- How does Newton's third law relate to conservation of momentum?
- Under which conditions is momentum conserved?
- How can the law of conservation of momentum and the law of conservation of angular momentum help explain the motion of objects?

Resources/Activities	**Assessment(s)**
• Physics textbook (McGrawHill) Principles and Problems • McGrawHill Principles and Problems lab book • Physics with Computers Vernier lab book • Vernier Logger Pro lab program	• Daily homework (from textbook) • Tests, • Labs

Unit 2 Theme	**Duration of Unit**	**Essential Question(s)**
Energy	6 weeks	Does doing work on a system change the system's energy?

End of Unit 2 Authentic Learning Task

The students will perform a lab on Work and Energy. The students will use a Motion Detector and a force sensor to measure the position and force on a hanging mass, a spring, and a dynamics cart. They will then determine the work done on an object using a force vs distance graph. They will use a Motion Detector to measure velocity and calculate kinetic energy. Then they will compare the work done on a cart to its change of mechanical energy.

Academic Standards: HS.PS.3.1, HS.PS.3.2, HS.PS.3.3

Pacing: Unit 2, 6 Weeks

Indiana Academic Standards

HS.PS.3.1, HS.PS.3.2, HS.PS.3.3, HS.PS.3.5, HS.PS.3.6

Academic Vocabulary

Chapter 10: work, joule, energy, work-energy theorem, kinetic energy, power, watt
Chapter 11: rotational kinetic energy, potential energy, gravitational potential energy, elastic potential energy, thermal energy

Key Concepts/Learning Targets

Chapter 10

- I can use the mathematical definition of translational kinetic energy to determine its value for an object in motion.
- I can use the mathematical definition of gravitational energy to determine its value for an object in a gravitational field.
- I can use the mathematical definition of elastic potential energy to determine its value for an object attached to a spring.
- I can mathematically relate the initial and final values of the translational kinetic, gravitational potential, and elastic potential energies in the absence of a net external force.
- I can identify the forms of energy present stored in a system for an object at any position in a scenario.
- I can recognize that the potential energy associated with a system of objects is not stored in the object itself.
- I can define "work" as the process of transferring of energy into or out of a system when an object is moved under the application of an

external force.

- I can define “work” as the area under a force vs. change in position curve.
- I can quantitatively determine the amount of work done on a system by an unbalanced force exerted in one dimension as an object moves in the same dimension
- I can quantitatively determine the amount of work done on a system by an unbalanced force exerted in two dimensions as an object moves in only one dimension.

Chapter 11

- I can describe the principle of conservation of energy.
- I can quantitatively determine the total initial mechanical energy stored in a closed system.
- I can quantitatively determine the total final mechanical energy stored in a closed system.
- I can apply the principle of conservation of energy to show that the total mechanical energy of the system remains constant as long as no dissipative (i.e. non-conservative) forces are present.
- I can use a pictorial representation to qualitatively describe the distribution of energy stored in a system at two different positions in the absence of non-conservative forces.
- I can use a pictorial representation to quantitatively describe the distribution of energy stored in a system at two different positions in the absence of non-conservative forces.
- I can use a mathematical representation to quantitatively describe the distribution of energy stored in a system at two different positions in the absence of non-conservative forces.
- I can use a graphical representation to quantitatively describe the distribution of energy stored in a system at two different positions in the absence of non-conservative forces.
- I can use a pictorial representation to qualitatively describe the distribution of energy stored in a system at two different positions with non-conservative forces.
- I can use a pictorial representation to quantitatively describe the distribution of energy stored in a system at two different positions with non-conservative forces.
- I can use a mathematical representation to quantitatively describe the distribution of energy stored in a system at two different positions with non-conservative forces.
- I can use a graphical representation to quantitatively describe the distribution of energy stored in a system at two different positions with non-conservative forces.

Question Stems

Chapter 10

- What is work?

- What is energy?
- What is power, and how is it related to work and energy?
- What is a machine, and how does it make tasks easier?
- How are mechanical advantage, the effort force, and the resistance force related?
- What is a machine's ideal mechanical advantage?
- What does the term efficiency mean?

Chapter 11

- How is a system's motion related to its kinetic energy?
- What is gravitational potential energy?
- What is elastic potential energy?
- How are mass and energy related?
- Under what conditions is energy conserved?
- What is mechanical energy, and when is it conserved?
- How are momentum and kinetic energy conserved or changed in a collision?

Resources/Activities	**Assessments**
• Physics textbook (McGrawHill) Principles and Problems • McGrawHill Principles and Problems lab book • Physics with Computers Vernier lab book • Vernier Logger Pro lab program	• Daily homework (from textbook) • Tests • Labs

Unit 3 Theme	**Duration of Unit**	**Essential Question(s)**
Wave Properties	6 weeks	Are waves and simple harmonic motion examples of periodic motion?

End of Unit 3 Authentic Learning Task

The students will perform a lab on the Mathematics of Music. The students will determine the frequencies of notes of a musical scale. They will then examine the differences and ratios between these notes. Lastly they will determine the mathematical patterns used in musical scales.

Academic Standards: HS.PS.4.1

Pacing: Unit 3, 6 Weeks

Indiana Academic Standards

HS.PS.4.1

Academic Vocabulary

Chapter 14: periodic motion, period, amplitude, simple harmonic motion, Hooke's Law, simple pendulum, resonance, wave, wave pulse, transverse wave, periodic wave, longitudinal wave, trough, crest, wavelength, frequency, incident wave, reflected wave, superposition, interference, node, antinode, standing wave, law of reflection, refraction

Key Concepts/Learning Targets

Chapter 14

- I can identify the difference between transverse and longitudinal modes of oscillation for a mechanical wave traveling in one dimension.
- I can explain that a mechanical wave requires a medium to transfer energy.
- I can explain the differences between a mechanical wave and an electromagnetic wave.
- I can explain that only the energy is transferred by a mechanical wave along the medium, not the mass of the medium.
- I can use a graph to describe the relationship between frequency of a mechanical wave and the wavelength of the wave.
- I can use a mathematical representation to describe the relationship between frequency of a mechanical wave and the wavelength of the wave.
- I can qualitatively describe how changing the frequency of a mechanical wave affects the wavelength and vice versa.
- I can quantitatively determine how changing the frequency of a mechanical wave affects the wavelength and vice versa.
- I can describe the slope of the graphical representation of wavelength vs. the inverse of the frequency in terms of the speed of the mechanical wave.
- I can apply the principle of superposition to qualitatively describe the result of an interaction of two mechanical waves or pulses.
- I can apply the principle of superposition to quantitatively determine the amplitude as a result of the interaction of two mechanical waves or pulses.
- I can qualitatively describe the phenomena of resonance frequencies that arise from the interference of sound waves of slightly different frequencies.
- I can qualitatively describe the phenomena of beat frequencies that arise from the interference of sound waves of slightly different frequencies.
- I can quantitatively determine the beat frequency.
- I can describe the beat frequency as the difference between the frequencies of two individual sound wave sources.

Question Stems
Chapter 14 ● What is simple harmonic motion? ● How much energy is stored in a spring? ● What affects a pendulum's period? ● What are waves? ● How do transverse and longitudinal waves compare? ● What is the relationship between wave speed, wavelength, and frequency? ● How are waves reflected and refracted at boundaries between mediums? ● How does the principle of superposition apply to the phenomenon of interference?

Resources/Activities	**Assessments**
● Physics textbook (McGrawHill) Principles and Problems ● McGrawHill Principles and Problems lab book ● Physics with Computers Vernier lab book ● Vernier Logger Pro lab program	● Daily homework (from textbook) ● Tests ● Labs

Unit 4 Theme	**Duration of Unit**	**Essential Question(s)**
Electromagnetic Radiation	12 weeks	Do separated positive and negative charges exert forces on one another?
End of Unit 4 Authentic Learning Task The students will perform a lab focusing on Ohm's Law. The students will then determine the mathematical relationship between current, potential difference, and resistance in a simple circuit. They will then compare the potential difference vs current behavior of a resistor to that of a light bulb. **Academic Standards:** HS.PS.4.3, HS.PS.4.4		

Pacing: Unit 4, 12 Weeks
Indiana Academic Standards HS.PS.4.3, HS.PS.4.4

Academic Vocabulary

Chapter 20: electrostatics, neutral, insulator, conductor, electroscope, charging by conduction, charging by induction, grounding, Coulomb's Law, elementary charge

Chapter 22: electric current, battery, electric circuit, ampere, resistor, parallel connection, series connection, superconductor, kilowatt-hour

Chapter 23: series circuit, equivalent resistance, voltage divider, parallel circuit, short circuit, fuse, combination series-parallel circuit

Key Concepts/Learning Targets

Chapter 20, 22, 23

- I can develop a graph which describes the relationship between the length of an ohmic device and the resistance of the device.
- I can develop a graph which describes the relationship between the cross-sectional area of an ohmic device and the resistance of the device.
- I can develop a graph which describes the relationship between the resistivity of an ohmic device and the resistance of the device.
- I can quantitatively determine how changing the length of an ohmic device affects the resistance of the device.
- I can quantitatively determine how changing the cross-sectional area of an ohmic device affects the resistance of the device.
- I can quantitatively determine how changing the resistivity of an ohmic device affects the resistance of the device.
- I can develop a graph which describes the relationship between the amount of current passing through an ohmic device and the amount of voltage (i.e. EMF) applied across the device.
- I can develop a mathematical representation which describes the relationship between the amount of current passing through an ohmic device and the amount of voltage (i.e. EMF) applied across the device.
- I can qualitatively describe how changing the voltage applied to an ohmic device affects the current passing through the device according to Ohm's Law.
- I can quantitatively determine how changing the voltage applied to an ohmic device affects the current passing through the device according to Ohm's Law.
- I can qualitatively describe how changing the voltage or resistance of a simple series (i.e. loop) circuit affects the voltage measurements of individual resistive devices and for the entire circuit.
- I can qualitatively describe how changing the voltage or resistance of a simple series (i.e. loop) circuit affects the current measurements of individual resistive devices and for the entire circuit.
- I can qualitatively describe how changing the voltage or resistance of a simple series (i.e. loop) circuit affects the power measurements of individual resistive devices and for the entire circuit.
- I can quantitatively describe how changing the voltage or resistance of a simple series (i.e. loop) circuit affects the voltage measurements of individual resistive devices and for the entire circuit.
- I can quantitatively describe how changing the voltage or resistance of a simple series (i.e. loop) circuit affects the current measurements of

individual resistive devices and for the entire circuit.

- I can quantitatively describe how changing the voltage or resistance of a simple series (i.e. loop) circuit affects the power measurements of individual resistive devices and for the entire circuit.
- I can qualitatively describe how changing the voltage or resistance of a simple parallel (i.e. ladder) circuit affects the voltage measurements of individual resistive devices and for the entire circuit.
- I can qualitatively describe how changing the voltage or resistance of a simple parallel (i.e. ladder) circuit affects the current measurements of individual resistive devices and for the entire circuit.
- I can qualitatively describe how changing the voltage or resistance of a simple parallel (i.e. ladder) circuit affects the power measurements of individual resistive devices and for the entire circuit.
- I can quantitatively describe how changing the voltage or resistance of a simple parallel (i.e. ladder) circuit affects the voltage measurements of individual resistive devices and for the entire circuit.
- I can quantitatively describe how changing the voltage or resistance of a simple parallel (i.e. ladder) circuit affects the current measurements of individual resistive devices and for the entire circuit.
- I can quantitatively describe how changing the voltage or resistance of a simple parallel (i.e. ladder) circuit affects the power measurements of individual resistive devices and for the entire circuit.
- I can use conservation of energy concepts to validate Kirchhoff's loop rule in a circuit with only a battery and resistors in series.
- I can apply conservation of electric charge (i.e. Kirchhoff's junction rule) quantitatively compare electric current in various segments of an electrical circuit with a single battery and resistors in series.
- I can apply conservation of electric charge (i.e. Kirchhoff's junction rule) to quantitatively compare electric current in various segments of an electrical circuit with a single battery and resistors in parallel.
- I can predict how the values current or voltage for individual devices would quantitatively change if the configuration of the circuit is changed by adding or removing a device.

<u>Question Stems</u>

<u>Chapter 20</u>

- How can you demonstrate that charged objects exert forces, both attractive and repulsive?
- How do we know that charging is the separation, not creation, of electric charge?
- What are the differences between conductors and insulators?
- How does the electrostatic force depend on the distance between charges?
- How can you charge objects by conduction and by induction?
- What is Coulomb's Law, and how is it used?

<u>Chapter 22</u>

- What is electric current?

- How does energy change in electric circuits?
- What is Ohm's Law?
- How are power, current, potential difference, and resistance mathematically related?
- How is electrical energy transformed into thermal energy?
- How are electrical energy and power related?
- How is electrical energy transmitted with as little thermal energy transformation as possible?

Chapter 23

- What are the characteristics of series and parallel circuits?
- How are currents, potential differences, and equivalent resistances in series circuits related?
- How are currents, potential differences, and equivalent resistances in parallel circuits related?
- How can you find currents and potential differences in combined series-parallel circuits?

Resources/Activities	**Assessments**
• Physics textbook (McGrawHill) Principles and Problems • McGrawHill Principles and Problems lab book • Physics with Computers Vernier lab book • Vernier Logger Pro lab program	• Daily homework (from textbook) • Tests • Labs

Indiana Academic Standards Addressed and Assessed Each Term
Physics I
(A=assessed; I=introduced; P=practiced; R=reviewed)
(Green=high priority; Yellow=moderate priority; Blue=low priority)

Standard	Standard Statement	Term 1	Term 2	Term 3	Term 4
	Forces and Interactions				
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.	I,P,R,A			
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.	I,P	R,A		

HS-PS2-3	Apply scientific and engineering ideas to design, evaluate, and refine a device for example, one that minimizes the force on a macroscopic object during a collision.		I,P,R,A		
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.				I,P,R,A
HS-PS2-6	Use mathematical representations to represent simple harmonic motion and pendulums.			I,P,R,A	
Energy					
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. [		I,P,R,A		
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 positions of particles (objects).		I,P,R,A		
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.		I,P,R,A		
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.				I,P,R,A
HS-PS3-6	Design, develop and analyze simple circuits and circuit elements.			I,P	R,A
Wave Properties					
HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.			I,P,R,A	
Electromagnetic Radiation					

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, and that for some situations one model is more useful than the other.				I,P,R,A
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.				I,P,R,A
Literacy in Science & Technical Subjects					
11-12.LST.2.1	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.	I	P,A	P,A	R
11-12.LST.2.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	I,P	P,A	P	P
11-12.LST.2.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	I,P	P,A	P,A	P,A,R
11-12.LST.3.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.	I	P,A	P	P
11-12.LST.3.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.	I,P	P,A	R	R
11-12.LST.3.3	Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.	I	P,R	R,A	R
11-12.LST.4.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	I,P,R,A	R,A	R	R

11-12.LST.4.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	I	P,R	A	
11-12.LST.4.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.	I,P	P,R,A		
11-12.LST.5.1	Write arguments focused on discipline-specific content.	I,P,R	R,A		
11-12.LST.5.2	Write informative texts, including scientific procedures/experiments or technical processes that include precise descriptions and conclusions drawn from data and research.	I,P,R,A	P,R,A	P,R,A	P,R,A
11-12.LST.6.1	Plan and develop; draft; revise using appropriate reference materials; rewrite; try a new approach, focusing on addressing what is most significant for a specific purpose and audience; and edit to produce and strengthen writing that is clear and coherent.	I,P	P,R,A	R,A	R,A
11-12.LST.6.2	Use technology to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	I	P	P	P
11-12.LST.7.1	Conduct short as well as more sustained research assignments and tasks to answer a question (including a self-generated question), test a hypothesis, or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	I	P	P	P
11-12.LST.7.2	Gather relevant information from multiple types of authoritative sources, using advanced searches effectively; annotate sources; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; synthesize and integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and over reliance on any one source and following a standard format for	I,P	P	P	P

	citation (e.g., APA or CSE).				
11-12.LST.7.3	Draw evidence from informational texts to support analysis, reflection, and research.	I,P	P	P	P