

YEAR AT A GLANCE
Student Learning Outcomes by Marking Period
2016-2017

FIRST TERM		
Overarching/general themes: Speed, friction, and the radius of a curve; Newton's laws of motion and the concepts of force, inertia (mass), friction, center of mass, work, and energy.		
Dates	Textual References Active Physics, 3 rd Edition	To Demonstrate Proficiency by the End of the Quarter Students Will:
Marking Period Starts: September 8, 2015 1 st Predictive Assessment: TBD Suggested Completion Date: Oct. 23, 2015 for Chapter 1 Dec. 4, 2015 for Chapter 2	Chapter 1: Driving the Roads Sec 1: Reaction Time Sec 2: Measurement, Accuracy, and Precision Sec 3: Average Speed Sec 4: Graphing Motion Sec 5: Negative Acceleration Sec 6: Using Models Sec 7: Centripetal Force	<ul style="list-style-type: none"> • Determine student reaction time to learn how reaction time is critical to avoiding accidents while driving. • Calculate stride for a given distance, share data, and compare measurements to understand the significance of uncertainties in measurements and distinguish between accurate and precise measurements (1.1, 1.2, 1.3). • Use graphs of motion to measure velocity and use equations to calculate average speed and velocity to acknowledge the difference between average speed and instantaneous speed (1.2, 1.3). • Investigate the relationship between speed and distance needed to stop a car and graph changes in velocity with respect to time to determine acceleration (noting positive and negative acceleration) (1.2, 1.3, 1.4). • Investigate the relationship between speed and stopping distance and create graphs showing changes in velocity with respect to time including negative acceleration as well (speed and braking distance) (1.2, 1.3, 1.4). • Use a spreadsheet model to explore how reaction time, speed, and stopping distance affect actions at a yellow light. (stopping beyond the STOP ZONE at an intersection) (1.2, 1.3, 1.4). • Determine the force needed to change direction of a moving object (slowing down around a curve) (1.8).
Mini-Challenge: Ch. 1 after Sec. 4 Ch 2: after Sec. 5 Chapter Challenge Ch. 1 after Sec. 7 First Marking Period Ends: November 6, 2015	Chapter 2: Physics in Action Sec 1: Newton's First Law Sec 2: Constant Speed & Acceleration Sec 3: Newton's Second Law Sec 4: Projectile Motion Sec 5: The Range of Projectiles Sec 6: Newton's Third Law	<ul style="list-style-type: none"> • Investigate Galileo's law of inertia and Newton's 1st law of motion, and relate how these relate to sports in determining the actions of a ball on both sloped and horizontal tracks (1.4). • Explain positive/negative acceleration and average speed using data from creating/analyzing ticker tape segments (1.2). • Determine the forces on an object and identify them as balanced or unbalanced to describe the concepts of weight and inertia, and apply Newton's 2nd law of motion (1.4). • Determine that a projectile's vertical motion is independent of its horizontal velocity and provide an explanation (1.4). • Analyze motion of actual projectiles to construct models of trajectories launched at various angles (1.4). • Create physical models and drawing of free-body diagrams to explore Newton's 3rd law of motion and explain concept of center of mass (1.5).

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SECOND TERM		Overarching/general themes: Newton's laws of motion; force; inertia (mass); friction; center of mass; work; energy; collision; momentum and conservation of momentum; power and work; displacement; pitch; electric and magnetic fields; light.
Dates	Textual References Active Physics, 3 rd Edition	To Demonstrate Proficiency by the End of the Quarter Students Will:
Marking Period Starts: November 9, 2015 Suggested Completion Date: Dec. 4, 2015 for Ch. 2 Dec. 9, 2015 for Ch. 4: Sec. 8 Jan. 22, 2016 for Ch. 5 Feb 5, 2016 For Ch. 7: Sec 6 and Doppler Effect Close Reading: <i>Ch 2: Helium, not so super after all</i> <i>Ch 5: What happens when a jet breaks the sound barrier?</i> Mini- and Chapter Challenges Ch 2 after Sec. 9 Ch 5 after Sec. 4 Ch 5 after Sec. 10 2 nd Predictive Assessment: TBD Second Marking Period Ends: January 29, 2016	Chapter 2: Physics in Action Sec 7: Frictional Forces Sec 8: PE and KE Sec 9: Conservation of Energy	<ul style="list-style-type: none"> • Measure the amount of force necessary to slide athletic shoes on various surfaces to investigate and explain how the coefficient of sliding friction affects motion (1.6). • Use a model of a pole vault to describe law of conservation of energy and define work (2.1, 2.2, 2.3). • Measure hang time and analyze vertical jumps in slow motion to calculate energy (2.1, 2.2).
	Chapter 4: Thrills and Chills Sec 8: Work and Power	<ul style="list-style-type: none"> • Define work in terms of force and displacement; calculate work done by a force acting in the direction of the displacement; and define power by pulling a dynamic cart up a fixed height by various paths (2.4).
	Chapter 5: Let Us Entertain You Sec 1: Sounds in Vibrating String Sec 2: Making Waves Sec 3: Sounds in String Revisited Sec 4: Sounds from Vibrating Air Sec 5: Shadows Sec 6: Reflected Light Sec 7: Curved Mirrors Sec 8: Refraction of Light Sec 9: Effect of Lenses on Light Sec 10: Color	<ul style="list-style-type: none"> • Vibrate strings to learn then explain how tension and string length affect the pitch of a sound. (4.1). • Make waves with coiled springs to understand that waves carry energy and learn how wavelength, frequency, and the speed of a wave are related. Write a description that explains the relationships. (4.1, 4.3). • Observe coiled springs to understand the meaning of direct and inverse relationships between different variables (4.1). • Model musical instruments to demonstrate how sound is produced by longitudinal compression waves (4.3). • Observe light and shadows then use illustrations and descriptions so explain that light travels in straight lines. • Use observations/data from studying changes in patterns of reflection to show the relationship between the angles of incidence and reflection of flat mirrors (4.4). • Use concave and convex mirrors and predict the path of a light beam reflected off a mirror to learn the difference between real and virtual images, and apply knowledge of reflection to define the focal length of a curved mirror (4.4). • Describe what happens when light goes from air to another substance, using observations of light rays sent through a block of acrylic. Measure angle of incidence and refraction and relate them to the index of refraction to understand Snell's law (4.4). • Describe the effect of mixing different colored lights and mixing paints of different colors to explore color addition.
	Chapter 7: Toys for Understanding Sec. 6: EM Spectrum	<ul style="list-style-type: none"> • Read historical experiments (electromagnetic waves, electromagnetic spectrum, and speed of light) and write a narrative that includes main points and key details that influenced scientific understanding (4.2, 6.1, 6.2). • Calculate the distance light travels to calculate distance traveled by electromagnetic waves (MA 4.1, 6.1).

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THIRD TERM	Overarching/general themes: Force; work-energy theorem; impulse; momentum and conservation of momentum; acceleration due to gravity; inertial mass and weight; projectile motion; effect of gravity on friction; electricity; circuits; batteries; Ohm's law; power; load limits; energy; fuses; switches; heat energy; specific heat; laws of thermodynamics; and electrical efficiency.	
Dates	Textual References Active Physics, 3rd Edition	To Demonstrate Proficiency by the End of the Quarter Students Will:
Marking Period Starts: February 1, 2016 Suggested Completion Date: March 11, 2016 for Ch. 3 April 8, 2016 for Ch. 9 May 24, 2016 for Ch. 6 Mini-Challenge Ch 9 after Sec. 5 Chapter Challenge Ch 3 after Sec. 7 Ch 9 after Sec. 8 (if time)	Chapter 3: Safety Sec 1: Accidents Sec 2: Newton's 1st Law of Motion Sec 3: Energy and Work Sec 5: Momentum Sec 6: Conservation of Momentum Chapter 9: Sports on the Moon Sec 1: Identifying and Classifying Sec 2: Acceleration Due to Gravity Sec 3: Mass, Weight, and Gravity Sec 5: Gravity, Work, and Energy Sec 6: Momentum and Gravity Sec 7: Friction Sec 8: Modeling Human Motion	<ul style="list-style-type: none"> • Assess, discuss, and evaluate safety features of crash safety design. • Investigate and apply Newton's laws of motion (1.2, 1.4). • Use observations of clay figures and an egg during a collision to describe and apply the relationship between force, pressure, and area (how spreading the force of an impact over a greater distance reduces the amount of damage). • Calculate results from experimental data to define momentum and elastic collision (2.2, 2.5). • Analyze collisions in one dimension using the law of conservation of momentum and data from experiments (2.5). <ul style="list-style-type: none"> • Discuss attributes of sports and how different environments on Earth and the Moon affect the outcome of such a sport. • Use measurements from slow-motion video and "double exposures" of an astronaut dropping objects on the Moon and on Earth to compare the acceleration due to gravity on Earth to that on the Moon (1.2). • Use a simulation to define inertia and weight and compare both for objects on Earth and on the Moon (1.3, 1.7). • Calculate the total change in height by recording different positions during a jump and predict the height of a jump on the Moon using the principles of conservation of energy (2.2, 2.3). • Compare bounce height of different balls on Earth to consider how a golf club or ball could be modified to limit the range of a golf ball when hit on the Moon (2.2, 2.5). • Use sliding friction of a spring scale to predict how this force will decrease on the Moon (1.6). • Compare the motion of a pendulum to the swinging motion of human legs when walking (4.1).
Third Marking Period Ends: April 15, 2016	Chapter 6: Electricity for Everyone Sec 1: Generating Electricity Sec 2: Modeling Electricity Sec 3: Series and Parallel Circuits	<ul style="list-style-type: none"> • Generate electrical energy & make circuits to identify/explain energy transformations. Describe how bulbs work (5.3). • Describe flow of electric charges in series and parallel circuits with a kinesthetic model (circuit) (5.2, 5.3). • Use a model to simulate circuits and show a comparison of series and parallel circuits (5.3).

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FOURTH TERM		
Overarching/general themes: Electricity; circuits; batteries; Ohm's law; load limits; energy; fuses; switches; heat energy; specific heat; laws of thermodynamics; electrical efficiency; energy and power calculations; acceleration; vectors; kinematics; gravitational force; Newton's laws; kinetic and potential energy; gravitational potential energy; conservation of energy; circular motion; work and power; magnetism; electromagnetism; motors; generators; and electromagnetic waves.		
Dates	Textual References Active Physics, 3rd Edition	To Demonstrate Proficiency by the End of the Quarter Students Will:
Marking Period Starts: April 25, 2016 Suggested Completion Date: May 24, 2016 for Ch. 6 May 31, 2016 for MCAS Review June 11, 2016 for Ch. 4 June 22, 2016 for Ch. 7 Close Reading: Chapter 6 - <i>Thermal equilibrium</i> - <i>Hot technology: heat producing electricity</i>	Chapter 6: cont'd Sec 4: Ohm's Law Sec 5: Electric Power Sec 6: Current, Voltage, and Resistance in Parallel and Series Circuits Sec 7: Laws of Thermodynamics Sec 9: Energy Consumption	<ul style="list-style-type: none"> • Explore resistors in a circuit to graph and describe the relationship between voltage and current, and calculate the resistance of an unknown resistor using Ohm's Law (5.2). • Calculate power and distinguish between energy and power usage in an electric circuit. Build a fuse and explain its purpose and how it works and distinguish between a fuse and a circuit breaker, as well as conductors and insulators (5.3, 5.5). • Use switches in parallel circuits to describe how currents, voltages and power are distributed in such and determine current for its elements and the whole circuit. Apply this knowledge to series circuits (5.2, 5.3). • Experiment with circuits to describe how energy is transferred, the role of the battery, and resistance (5.2, 5.3). • Calculate the relationship between electric energy and heat and the heat lost and gained by two objects placed in thermal contact (3.2, 3.3). • Describe and apply the laws of thermodynamics, and explain the concept of entropy (3.2). • Describe and distinguish among conduction, convection, and radiation (3.1, 3.3, 3.4). • Investigate static electricity and Coulomb's law to understand the forces holding the atom together (5.1, 5.4). Note: Chapter 8: Sec. 1 may be embedded here between Chapter 6 Challenge Intro and Chapter 6: Sec. 1.
<i>Select areas of interest or importance from the remaining sections of chapters 4 and 7 to use after MCAS and before it as well, if you have time!</i>		
Mini-Challenge Ch 6 after Sec. 6 Chapter Challenge Ch. 6 after Sec. 9 MCAS: June 1 & 2, 2016 End of Course Assessment: June 1-20, 2016	Chapter 4: Thrills and Chills Sections 1-7 and 9-10	<ul style="list-style-type: none"> • Investigate the speed of a ball on an incline and compare it to the velocity of a pendulum to describe vectors and scalars, calculate kinetic and gravitational potential energy, and apply the conservation of energy to solve problems. (2.2). • Use a spring "pop" toy to apply KE, GPE, & conservation of energy to a coaster and calculate spring PE (2.1, 2.2). • Calculate spring constants using springs; and describe Hooke's law and apply it to solve problems (1.1). • Describe the difference between rest weight and apparent weight using Newton's laws and to analyze forces on a mass at rest and under acceleration. • Explain how centripetal acceleration depends on the radius of the curve and the velocity of the roller coaster, and relate this to the safety limits of acceleration for a rollercoaster. • Calculate centripetal force, apparent weight, normal force and the net force acting on coasters to apply concepts of centripetal force and energy to determine forces acting on riders, and to know how to add thrills into a coaster's design.
Fourth Marking Period Ends: June 22, 2016	Chapter 7: Toys for Understanding Sections 1 - 5	<ul style="list-style-type: none"> • Work with bar magnets and compasses to investigate the magnetic interaction and map a magnetic field. • Observe how a current-carrying wire affects a magnetic compass to investigate and explain the interaction between an electric current and a magnetic field. • Build and use a motor, explain how it works and identify ways to improve its performance. • Investigate and explain the interaction between a moving magnet and a coil of wire. • Read about a galvanometer and measure current using it to explain how a galvanometer works.