High School Physics

Unit Course Outline	Unit 1 Forces and Motion (14 weeks)	Unit 2 Types of Interactions (8 weeks)	Unit 3 Energy (4 weeks)	Unit 4 Electricity and Magnetism (6 weeks)	Unit 5 Waves and their Applications (4 weeks)
NGSS Disciplinary Core Ideas (DCI)	HS.PS2.A, HS.PS3.C, HS.ESS1.A, HS.ESS1.C, HS.ESS2.C	HS.PS2.B, HS.ESS1.B, HS.PS2.A, HS.PS1.A, HS.PS3.A, HS.ESS1.A, HS.ESS1.C, HS.ESS2.C, HS.ESS3.A	HS.PS3.A, HS.PS3.B, HS.PS1.A, HS.PS1.B, HS.PS2.B, HS.LS2.B, HS.ESS1.A, HS.ESS2.A, HS.ESS3.A	HS.PS2.B, HS.PS3.A, HS.PS4.B, HS.ESS1.A, HS.ESS1.B, HS.ESS1.C, HS.ESS2.A, HS.ESS2.C, HS.ESS3.A	HS.PS4.B, HS.PS1.A, HS.PS1.C, HS.PS3.A, HS.PS3.B, HS.PS3.D, HS.PS4.A, HS.LS1.C, HS.ESS1.A, HS.ESS2.A, HS.ESS2.D
Performance Expectations	HS-PS2-1, HS-PS2-2, HS-PS2-3	HS-PS2-4, HS-ESS1-4, HS-PS2-6,	HS-PS3-2, HS-PS3-1, HS-PS3-3	HS-PS3-5, HS-PS2-4, HS-PS2-5, HS-PS2-6	HS-PS4-1, HS-PS4-4, HS-PS4-3, HS-PS4-5, HS-PS4-2, HS-ESS1-2
Common Core Language Arts	RST.11-12.1, RST.11-12.7, WHST.11-12.7, WHST.11-12.9	RST.11-12.1, RST.11-12.7, WHST.11-12.2, WHST.11-12.7, WHST.11-12.8, WHST.11-12.9	RST.11-12.7, WHST.9-12.7, SL.11-12.5	RST.11-12.1, WHST.11-12.2, WHST.11- 12.7, WHST.11- 12.8, WHST.9-12.9, SL.11-12.5	RST.9-10.8, RST.11-12.1, RST.11-12.7, RST.11-12.8, WHST.9-12.2, WHST.11-12.8
Technology Standards	8.1.12.A.1, 8.1.12.B.2, 8.1.12.C.1, 8.1.12.D.1, 8.1.12.D.2 8.1.12.E.1, 8.1.12.F.1, 8.2.12B3: 8.2.12D1; 8.2.12.E.1, 8.2.12.E.2, 8.2.12.E.3	8.1.12.A.1, 8.1.12.B.2, 8.1.12.C.1, 8.1.12.D.1, 8.1.12.D.2 8.1.12.E.1, 8.1.12.F.1, 8.2.12B3: 8.2.12D1; 8.2.12.E.1, 8.2.12.E.2, 8.2.12.E.3	8.1.12.A.1, 8.1.12.B.2, 8.1.12.C.1, 8.1.12.D.1, 8.1.12.D.2 8.1.12.E.1, 8.1.12.F.1, 8.2.12B3: 8.2.12D1; 8.2.12.E.1, 8.2.12.E.2, 8.2.12.E.3	8.1.12.A.1, 8.1.12.B.2, 8.1.12.C.1, 8.1.12.D.1, 8.1.12.D.2 8.1.12.E.1, 8.1.12.F.1, 8.2.12B3: 8.2.12D1; 8.2.12.E.1, 8.2.12.E.2, 8.2.12.E.3	8.1.12.A.1, 8.1.12.B.2, 8.1.12.C.1, 8.1.12.D.1, 8.1.12.D.2 8.1.12.E.1, 8.1.12.F.1, 8.2.12B3: 8.2.12D1; 8.2.12.E.1, 8.2.12.E.2, 8.2.12.E.3
Personal Financial Literacy	9.1.12.A.3, 9.1.12.A.4, 9.1.12.B.1	9.1.12.A.3, 9.1.12.A.4, 9.1.12.B.1	9.1.12.A.3, 9.1.12.A.4, 9.1.12.B.1	9.1.12.A.3, 9.1.12.A.4, 9.1.12.B.1	9.1.12.A.3, 9.1.12.A.4, 9.1.12.B.1

Career Awareness, Exploration, and Preparation	9.2.12.C.1, 9.2.12.C.2, 9.2.12.C.3, 9.2.12.C.4, 9.2.12.C.7	9.2.12.C.1, 9.2.12.C.2, 9.2.12.C.3, 9.2.12.C.4, 9.2.12.C.7	9.2.12.C.1, 9.2.12.C.2, 9.2.12.C.3, 9.2.12.C.4, 9.2.12.C.7	9.2.12.C.1, 9.2.12.C.2, 9.2.12.C.3, 9.2.12.C.4, 9.2.12.C.7	9.2.12.C.1, 9.2.12.C.2, 9.2.12.C.3, 9.2.12.C.4, 9.2.12.C.7
Clarification Statements:	Students should be able to accurately move from one representation of motion to another. Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force. Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle. Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a	Emphasis is on both quantitative and conceptual descriptions of gravitational fields. Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons. Include the use of mathematical or computational representations that depict that the square of a revolving body's period of revolution is proportional to the cube of its distance to a gravitational center (where T is the orbital period and R is the semi-major axis of the orbit, Kepler's Third Law of Planetary Motion). Emphasis is on the contact forces that determine the functioning of the material. Examples could include why flexible but durable materials are made up of	Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations. Emphasis is on explaining the meaning of mathematical expressions used in the model.	Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other. Emphasis is on both quantitative and conceptual descriptions of electric fields. The focus is on the mechanisms that explain conductors and insulators. : Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal. Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could	Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth. Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias. Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include

	football helmet or a parachute.	long chained molecules, and pharmaceuticals are designed to interact with specific receptors.		include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.	resonance, interference, diffraction, and photoelectric effect. Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology. Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.
Assessment Boundary:	Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds. Assessment is limited to systems of two macroscopic bodies moving in one dimension.	Assessment is limited to systems with two objects. Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.	Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational fields.	Assessment is limited to systems containing two objects. Assessment is limited to systems with two objects. Assessment is limited to designing and conducting investigations with	Assessment is limited to algebraic relationships and describing those relationships qualitatively. Assessment is limited to qualitative descriptions. Assessment does not include using quantum theory calculations.

	Assessment is limited to qualitative evaluations and/or algebraic manipulations.	Assessment is limited to provided molecular structures of specific designed materials.		provided materials and tools. Assessment is limited to provided molecular structures of specific designed materials. Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.	Assessments are limited to qualitative information. Assessments do not include band theory.
Teacher Notes:		Students connect this concept to Kepler's third law by replacing the mass of the earth with the mass of the sun and let R represent the radius of orbit of the planet being studied.		The emphasis in this unit is on the electrical properties of materials.	
Activities	Activity: Marshmallow Challenge Mousetrap Car Project Virtual lab on describing motion. Lab on vectors and vector addition Class activity on drawing vectors. Lab on balanced and unbalanced forces Class activity on inertia Parachute lab	Collision lab Linear particle accelerator demo (transfer of momentum) Newton's Cradle inquiry lab Egg Drop Challenge Project Labs Research working of Van De Graff generator- Example of Interdisciplinary with ELA Build a Van De Graff generator	Practice problems on PE and KE Demonstration on centripetal force. Lab activities to demonstrate PE and KE (Pendulum) Energy Webquest Project to build a Roller Coaster	Practice problems on Ohm's law- Build series and parallel circuits Lab: Calculate I, V and R for series and parallel circuits Demonstrate electromagnetism (Oersted Experiment) Lab activity: Build an electric motor and an electric generator	Lab activity: Wave motion using slinky and long spring. Practice problems on wave equation Lab to observe wave phenomena: reflection, refraction and interference Wave Town activity (Label and color)

	Class activity on drawing free body diagram Lab to demonstrate static and sliding friction Project to build and demonstrate the motion of hovercraft Practice problems to calculate net force and acceleration using FBD- Example of Interdisciplinary with Math Freefall Lab	Labs to demonstrate gravity and static electricity Lab Apparent weightlessness Activities to locate center of gravity Lab to demonstrate inverse square law Practice problems on Gravitational law and Coulomb's Law Practice drawing electric field lines (Coulomb's law) Activity/Lab:Kepler's Law		(Compare the working and transfer of energy) Practice problems on Transformers	
Interdisciplinary Examples (common core language)		Egg Drop Lab: writing and research of analysis for their methods of return to Earth used by NASA. Labs Research working of Van De Graff generator- Example of Interdisciplinary with ELA Build a Van De Graff generator			Designing/ Engineering Disaster; investigate how engineers design buildings to withstand earthquakes

Mathematics Standards Examples	Mouse Trap Cars: Calculating average velocity of cars using Newton's Laws] Using conservation of momentum formulas to find final momentum after a collision; elastic inelastic		Researching Potential energy/ Kinetic Energy formulas; reviewing rollercoaster formulas (such as G forces & velosit) from various amusement parks The effect of the length on a period of a pendulum; relate to modern machinery	Calculating total resistance of series and parallel circuits Voltage drop of alternating current circuits	Calculating Energy using the speed of light; E = MC2
Evaluation/ Formative Assessments	-Lab reports -Projects and web quests -Quizzes/tests -Do Nows -Class Discussions -Class Assignments - Constructed Response --Benchmark Assessment: Egg Drop Challenge -Exit Tickets -Homework	-Lab reports -Projects and web quests -Quizzes/tests -Do Nows -Class Discussions -Class Assignments -Constructed Response --Wonder of Science CER 1 Wonder of Science CER 2 -Exit Tickets -Homework	-Lab reports -Projects and web quests -Quizzes/tests -Do Nows -Class Discussions -Class Assignments - Constructed Response --Roller Coaster Equation/Problems Test -Exit Tickets -Homework	-Lab reports -Projects and web quests -Quizzes/tests -Do Nows -Class Discussions -Class Assignments - Constructed Response --Benchmark Assessment: Power Grid project -Exit Tickets -Homework	-Lab reports -Projects and web quests -Quizzes/tests -Do Nows -Class Discussions -Class Assignments - Constructed Response --Model electric and magnetic field lines Wonder of Science Assessment -Exit Tickets -Homework
Resources	http://physicsquest.homestead.com/ http://www.bozemanscience.com/physics/ http://www.gpb.org/chemistry-physics/students/physics	http://physicsquest.homestead.com/ http://www.bozemanscience.com/physics/ http://www.gpb.org/chemistry-physics/students/physics	http://physicsquest.homestead.com/ http://www.bozemanscience.com/physics/ http://www.gpb.org/chemistry-physics/students/physics	http://physicsquest.homestead.com/ http://www.bozemanscience.com/physics/ http://www.gpb.org/chemistry-physics/students/physics	http://physicsquest.homestead.com/ http://www.bozemanscience.com/physics/ http://www.gpb.org/chemistry-physics/students/physics

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Common Accommodations	Extra time, chunking, modeling, frequent breaks, assigned seats, guided notes, use of models				

BOLD The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.