Department: **Science**
Course Title: **Honors Physics '25 - '26**
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Unit Title *subject to variation due to textbook being updated from 2002 to 2017	**Unit Length (weeks)**	**Dates of Unit (Month - Month)**	**Essential Questions**	***Topics to be Covered*** ***Texts Used***	**Skills to be Assessed**	**Standard Alignment**	**Formative Assessments**	**Summative Assessments**
Lab Safety & Overview	1	August	How are distance and time measured?	***Textbook*** *"Zitzewitz, Physics Principles and Problems, Glencoe McGraw-Hill, 2017."* *Lab Safety Flinn Scientific* *Chapter 1: What is Physics?* *Chapter 2: A Mathematical Toolkit*	Units, Writing Scientific Notation, Significant Figures, Define Accuracy and Precision	NGSS **SEP**: Using mathematics and computational thinking. **SEP**: Analyzing and interpreting data. **CCC**: Scale, proportion, and quantity.	Section Review, Pocket Lab	Chapter Quiz
Unit 2: Mechanics (Kinematics)	3-4	September	How is motion graphed over time?	*Chapter 3: Describing Motion* *Chapter 4: Vector Addition* *Chapter 5: A Mathematical Model of Motion*	Measuring Velocity, Distance and Displacement, Vector Addition, Reading a Position-Time Graph, Velocity-Time Graph, and Acceleration-Time Graph	**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. [Clarification Statement: 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 sliding down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]	Section Review, Pocket Lab	Chapter Quiz, Unit Test, Lab
Unit 3: Forces	8-10	Sept-Feb	How does Newton's law f=ma determine motion?	*Chapter 6: Forces* *Chapter 7: Forces and Motion in Two Dimensions* *Chapter 8: Universal Gravitation* *Chapter 9: Momentum and its Conservation* *Momentum Car Crash Project: Design a car that protects the driver better (Engineering project)*	Measuring Gravity, Newton's Laws, Centripetal motion, and momentum	**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. [Clarification Statement: 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 sliding down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.] **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. [Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] [Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.] **HS-PS2-3** Apply science and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. **Engineering Project/Momentum Project Car crashes- design a car that protects the driver be**tter **HS-ETS1-1** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ETS1-2** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **HS-ETS1-3** Evaluate a solution to a complex real-world problem based on prioritized criteria and teadeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. **HS-ETS1-4** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. **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.	Section Review, Pocket Lab	Chapter Quiz, Unit Test, Lab

Unit 4: Energy	4-5	Feb-March	How are work and energy measured?	*Chapter 10: Energy, Work, and Simple Machines* *Chapter 11: Energy* *"Materials:"* *Chapter 12: Thermal Energy* *Chapter 13: States of Matter*	Measuring Work and 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. [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: 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, magnetic, or electric fields.] **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 motion of particles (objects) and energy associated with the relative positions of particles (objects). [Clarification Statement: 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.] **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.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.] **HS-PS3-4.** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.] **HS-PS2-6.** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: 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, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]	Section Review, Pocket Lab	Chapter Quiz, Unit Test, Lab
Unit 5: Waves	6	March-May	How is wave behavior measured?	*Chapter 14: Waves and Energy Transfer* *Chapter 15: Sound* *Chapter 16: Light* *Chapter 17: Reflection and Refraction* *Chapter 18: Mirrors and Lenses* *Chapter 19: Diffraction and Interference of Light*	Measuring Simple Harmonic Motion, Pendulums, Wave interactions, Properties of Waves, Sound Waves, Light Waves, Mirrors, Color, Reflection, Refraction, Diffraction and Interference	**HS-PS4-1.** Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: 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.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.] **PS2.B:** Types of Interactions-Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. **HS-PS2-4:HS-PS4-2** Evaluate questions about the advantages of using digital transmission and storage of information. **HS-PS4-5** Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	Section Review, Pocket Lab	Chapter Quiz, Unit Test, Lab
Unit 6: Electricity and Magnetism (Electromagnetism)	7	May-June	How is electromagnetism measured?	*Chapter 20: Static Electricity* *Chapter 21: Electric Fields* *Chapter 22: Current Electricity* *Chapter 23: Series and Parallel Circuits* *Chapter 24: Magnetic Fields* *Chapter 25: Electromagnetic Induction* *Chapter 26: Electromagnetism*	Measuring Electric Charge, Electric fields, Electrical Energy, Currents, and Circuits, Electric Current	**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. [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.] **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. [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]	Section Review, Pocket Lab	Chapter Quiz, Unit Test, Lab

Unit 7: Modern Physics Crashcourse *(This unit will run if there is time)*	3-5	May-June	How is nuclear physics modeled?	*Chapter 27: Quantum Theory* *Chapter 28: The Atom* *Chapter 29: Solid State Electronics* *Chapter 30: The Nucleus* *Chapter 31: Nuclear Applications*	Defining/modeling quantum theory and nuclear physics	**HS-PS2-6.** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: 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, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]	Section Review, Pocket Lab	Chapter Quiz, Unit Test, Lab