

AP Physics 1

Unit of Study	Central Theme	Essential Question(s)	Resources & Activities	Standards(College Board Standards for Science)
<p style="text-align: center;">Unit 1 KINEMATICS</p> <p style="text-align: center;">3 weeks</p>	<p style="text-align: center;">Describing the motion of objects.</p> <p style="text-align: center;">Use Free-body diagrams to analyze and solve problems</p> <p style="text-align: center;">Projectile Motion</p>	<p style="text-align: center;">How can one or two dimensional motion be described?</p> <p style="text-align: center;">Why is it an advantage to use vectors over scalars?</p> <p style="text-align: center;">How is Velocity different from speed, and why is it important to understand when solving problems?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 1 Models • Chapter 2 One Dimension • Chapter 3 vectors <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p><u>Physics Sims</u></p> <p><u>Learn AP Physics</u></p> <p>https://youtu.be/LMF82fRIWWQ</p> <p>Activities</p> <ul style="list-style-type: none"> • Measure the height of the flagpole. • Distance/displacement to wawa • Speed Trap • https://youtu.be/q20-DBAmm2E (surveying) 	<p>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.</p> <p>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.</p> <p>CC.3.5.11-12.E. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</p> <p>3.A.1.1: The student is able to express the motion of an object using narrative, mathematical, and graphical representations. [SP 1.5, 2.1, 2.2]</p> <p>3.A.1.3: The student is able to analyze experimental data describing the motion of an object and is able to express the results of the analysis using narrative, mathematical.</p> <p>Big Idea 3</p> <p>3.A.1.1, 3.A.1.2, 3.A.1.3</p>

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<p>Unit 2 DYNAMICS</p> <p>2 weeks</p>	<p>Forces describe the interaction of objects.</p> <p>Interaction between systems can result in changes to the systems.</p> <p>All forces have an agent.</p>	<p>How can you use Newton's laws of motion to predict the behavior of Objects?</p> <p>How can free-body diagrams be used to analyze the physical interactions between objects?</p> <p>How does the inertial mass of an object affect how it's motion changes when interacting with other objects?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 4 • Chapter 5 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p>Physics Sims</p> <p>Learn AP Physics</p> <p>https://youtu.be/Xuj8iPVu7q0</p> <p>Activities</p> <ul style="list-style-type: none"> • Coefficient of Friction on a ramp 	<p>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically</p> <p>CC.1.3.11–12.J Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.</p> <p>3.B.2.1: The student is able to create and use free-body diagrams to analyze physical situations to solve problems with motion qualitatively and quantitatively.</p> <p>3.B.1.1: The student is able to predict the motion of an object subject to forces exerted by several objects using an application of Newton's second law in a variety of physical situations with acceleration in one dimension.</p> <p>Big Idea 1,2,3,4</p> <p>1.C.1.1, 1.C.1.3, 2.B.1.1, 3.A.2.1, 3.A.3.1, 3.A.3.2, 3.A.3.3, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.1, 3.B.1.2, 3.B.1.3, 3.B.2.1, 3.C.4.1, 3.C.4.2, 4.A.1.1, 4.A.2.1, 4.A.2.2, 4.A.2.3, 4.A.3.1, 4.A.3.2</p>

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<p style="text-align: center;">Unit 3 CIRCULAR MOTION AND GRAVITATION</p> <p style="text-align: center;">3 weeks</p>	<p>Force of gravity varies based on position and mass.</p> <p>Objects in orbit are subject to constant acceleration.</p> <p>Universal Gravitation.</p>	<p>Why do you stay in your seat when a roller coaster goes through a loop?</p> <p>Why can a person do a complete loop on a playground swing?</p> <p>Why is gravitational acceleration constant?</p> <p>Are astronauts in orbit weightless?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 6 (Lessons 1-10) <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p><u>Physics Sims</u></p> <p><u>Learn AP Physics</u></p> <p>https://youtu.be/Usg_IPT5gJQ</p> <p>Activities</p> <ul style="list-style-type: none"> • Washer spinning • Measuring gravity with a pendulum. 	<p>CC.3.5.11-12.C. 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.</p> <p>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable</p> <p>3.A.3.1: The student is able to analyze a scenario and make claims (develop arguments, justify assertions) about the forces exerted on an object by other objects for different types of forces or components of forces.</p> <p>Big Idea 1,2,3,4</p> <p>1.C.3.1, 2.B.1.1, 2.B.2.1, 2.B.2.2, 3.A.3.1, 3.A.3.3, 3.B.1.2, 3.B.1.3, 3.B.2.1, 3.C.1.1, 3.C.1.2, 3.C.2.1, 3.C.2.2, 3.G.1.1, 4.A.2.2</p>

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<p style="text-align: center;">Unit 4 WORK, ENERGY, POWER & LINEAR MOMENTUM</p> <p style="text-align: center;">2 weeks</p>	<p>Work is done to change the energy of and object</p> <p>Power describes the rate work is done.</p> <p>Law of Conservation of Energy.</p>	<p>How are humans dependent on transformations of energy?</p> <p>How can changes in momentum be used to determine the Net Forces applied to an object?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 9 • Chapter 10 • Chapter 11 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p><u>Physics Sims</u></p> <p><u>Learn AP Physics</u></p> <p><u>https://youtu.be/54VrCrWqaPU</u></p> <p>Activities</p> <ul style="list-style-type: none"> • Work and power on the steps • Coefficient of restitution using golf balls 	<p>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.</p> <p>3.E.1.1: The student is able to make predictions about the changes in kinetic energy of an object based on considerations of the direction of the net force on the object as the object moves.</p> <p>4.C.1.2: The student is able to predict changes in the total energy of a system due to changes in position and speed of objects or frictional interactions within the system.</p> <p>5.D.1.1: The student is able to make qualitative predictions about natural phenomena based on conservation of linear momentum and restoration of kinetic energy in elastic collisions.</p> <p>Big idea 3,4,5</p> <p>3.E.1.1, 3.E.1.2, 3.E.1.3, 3.E.1.4, 4.C.1.1, 4.C.1.2, 4.C.2.1, 4.C.2.2, 5.A.2.1, 5.B.1.1, 5.B.1.2, 5.B.2.1, 5.B.3.1, 5.B.3.2, 5.B.3.3, 5.B.4.1, 5.B.4.2, 5.B.5.1, 5.B.5.2, 5.B.5.3, 5.B.5.4, 5.B.5.5, 5.D.1.1, 5.D.1.2, 5.D.1.3, 5.D.1.4, 5.D.1.5, 5.D.2.1, 5.D.2.3</p>

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<p style="text-align: center;">Unit 5 MOMENTUM</p> <p style="text-align: center;">2 weeks</p>	<p>Work is done when to change the energy of a system.</p> <p>Law of conservation of momentum.</p> <p>impulses</p>	<p>If the ISS is moving at 9 times the speed of a bullet, how do the astronauts survive?</p> <p>Why do power hitters use the heaviest bat possible?</p> <p>Recreating accidents to determine fault.</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 9 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p>Physics Sims</p> <p>Learn AP Physics</p> <p>https://youtu.be/vXijNRSELTw</p> <p>Activities</p> <ul style="list-style-type: none"> • Conservation of momentum and energy. • Accident Investigation. 	<p>3.D.2.2: The student is able to predict the change in momentum of an object from the average force exerted on the object and the interval of time during which the force is exerted.</p> <p>5.D.1.2: The student is able to apply the principles of conservation of momentum and restoration of kinetic energy to reconcile a situation that appears to be isolated and elastic, but in which data indicate that linear momentum and kinetic energy are not the same after the interaction, by refining a scientific question to identify interactions that have not been considered. Students will be expected to solve qualitatively and/or quantitatively for one-dimensional situations and only qualitatively in two-dimensional situations.</p> <p>5.D.2.3: The student is able to apply the conservation of linear momentum to a closed system of objects involved in an inelastic collision to predict the change in kinetic energy.</p> <p>Big idea 3,4,5</p> <p>3.D.1.1, 3.D.2.1, 3.D.2.2, 3.D.2.3, 3.D.2.4, 4.B.1.1, 4.B.1.2, 4.B.2.1, 4.B.2.2, 5.A.2.1, 5.D.1.1, 5.D.1.2, 5.D.1.3, 5.D.1.4, 5.D.1.5, 5.D.2.1, 5.D.2.2, 5.D.2.3, 5.D.2.4, 5.D.2.5, 5.D.3.1</p>

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<p>Unit 6 SIMPLE HARMONIC MOTION</p> <p>2 weeks</p>	<p>The pendulum is an example simple harmonic motion</p> <p>Restoring forces act towards equilibrium point.</p>	<p>How does NASA determine an astronaut's mass in space?</p> <p>Does the mass of an object affect the period of its motion?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 14 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p><u>Physics Sims</u></p> <p><u>Learn AP Physics</u></p> <p>https://youtu.be/tNpuTx7UQbw</p> <p>Activities</p> <ul style="list-style-type: none"> • Hooke's Law and pendulums 	<p>3.B.3.2: The student is able to design a plan and collect data in order to ascertain the characteristics of the motion of a system undergoing oscillatory motion caused by a restoring force.</p> <p>3.B.3.4: The student is able to construct a qualitative and/or a quantitative explanation of oscillatory behavior given evidence of a restoring force.</p> <p>5.B.3.3: The student is able to apply mathematical reasoning to create a description of the internal potential energy of a system from a description or diagram of the objects and interactions in that system.</p> <p>Big Idea 3,5</p> <p>3.B.3.1, 3.B.3.2, 3.B.3.3, 3.B.3.4, 5.B.2.1, 5.B.3.1, 5.B.3.2, 5.B.3.3, 5.B.4.1, 5.B.4.2</p>

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<p style="text-align: center;">Unit 7 ROTATIONAL MOTION</p> <p style="text-align: center;">2 weeks</p>	<p style="text-align: center;">Torque occurs when forces are not applied through the center of mass.</p> <p style="text-align: center;">Changes in rotation motion occur when the net torque is not zero.</p>	<p>How can 2 people with different masses balance on a see-saw?</p> <p>Why do baseball players choke up on the bat?</p> <p>What conditions are necessary for static equilibrium?</p> <p>How do the mass and shape of an object affects its rotational motion?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 7 • Chapter 8 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p><u>Physics Sims</u></p> <p><u>Learn AP Physics</u></p> <p><u>https://youtu.be/fDJJeVR0o_w</u></p> <p>Activities</p> <ul style="list-style-type: none"> • Which trees will fall first? • Baseball bat balancing. 	<p>3.F.1.2: The student is able to compare the torques on an object caused by various forces.</p> <p>3.F.1.3: The student is able to estimate the torque on an object caused by various forces in comparison to other situations.</p> <p>4.D.2.2: The student is able to plan a data collection and analysis strategy to determine the change in angular momentum of a system and relate it to interactions with other objects and systems.</p> <p>4.D.2.2: The student is able to plan a data collection and analysis strategy to determine the change in angular momentum of a system and relate it to interactions with other objects and systems.</p> <p>Big Idea 3,4,5</p> <p>3.F.1.1, 3.F.1.2, 3.F.1.3, 3.F.1.4, 3.F.1.5, 3.F.2.1, 3.F.2.2, 3.F.3.1, 3.F.3.2, 3.F.3.3, 4.A.1.1, 4.D.1.1, 4.D.1.2, 4.D.2.1, 4.D.2.2, 4.D.3.1, 4.D.3.2, 5.E.1.1, 5.E.1.2, 5.E.2.1.</p>

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<p>Unit 8 MECHANICAL WAVES</p> <p>2 weeks</p>	<p>Waves can transfer energy and momentum.</p> <p>Waves can interfere with each other constructively and destructively.</p>	<p>Does the mass of a pendulum affect the period of its motion?</p> <p>What is the relationship between velocity, frequency and wavelength of a wave?</p> <p>How do sounds travel around corners?</p> <p>What is a rainbow?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 15 • Chapter 16 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p>Physics Sims</p> <p>Learn AP Physics</p> <p>https://youtu.be/Tul2JfUEnpA</p> <p>Activities</p> <ul style="list-style-type: none"> • Measuring the speed of sound in air. • Diffraction of light. 	<p>6.B.4.1: The student is able to design an experiment to determine the relationship between periodic wave speed, wavelength, and frequency and relate these concepts to everyday examples.</p> <p>6.D.3.2: The student is able to predict properties of standing waves that result from the addition of incident and reflected waves that are confined to a region and have nodes and antinodes.</p> <p>6.D.4.2: The student is able to calculate wavelengths and frequencies (if given wave speed) of standing waves based on boundary conditions and length of region within which the wave is confined, and calculate numerical values of wavelengths and frequencies. Examples should include musical instruments.</p> <p>Big Idea 6</p> <p>Learning Objectives: 6.A.1.1, 6.A.1.2, 6.A.1.3, 6.A.2.1, 6.A.3.1, 6.A.4.1, 6.B.1.1, 6.B.2.1, 6.B.4.1, 6.B.5.1, 6.D.1.1, 6.D.1.2, 6.D.1.3, 6.D.2.1, 6.D.3.1, 6.D.3.2, 6.D.3.3, 6.D.3.4, 6.D.4.1, 6.D.4.2, 6.D.5.1</p>

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<p>Unit 9 ELECTROSTATICS</p> <p>3 weeks</p>	<p>Electric Charge and conservation of charge.</p> <p>Coulombs Law</p>	<p>How is gravitational force similar to electric force?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 20 • Chapter 21 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p>Physics Sims</p> <p>Learn AP Physics</p> <p>https://youtu.be/QpVxi3XrLgk</p>	<p>6.D.4.2: The student is able to calculate wavelengths and frequencies (if given wave speed) of standing waves based on boundary conditions and length of region within which the wave is confined, and calculate numerical values of wavelengths and frequencies. Examples should include musical instruments.</p> <p>3.C.2.1: The student is able to use Coulomb’s law qualitatively and quantitatively to make predictions about the interaction between two electric point charges.</p> <p>Big Idea 1,3,5</p> <p>1.B.1.1, 1.B.1.2, 1.B.2.1, 1.B.3.1, 3.C.2.1, 3.C.2.2, 5.A.2.1.</p>

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<p style="text-align: center;">UNIT 10 DC CIRCUITS</p> <p style="text-align: center;">3 weeks</p>	<p style="text-align: center;">Series and parallel circuits</p> <p style="text-align: center;">Electric forces</p>	<p>How are voltage, resistance and current related in a series circuit? In a Parallel circuit?</p> <p>Why is a 100,000 volt stun gun “safe” while 110 volt outlet dangerous?</p>	<p>College Physics</p> <ul style="list-style-type: none"> • Chapter 22 • Chapter 23 <p>Assessments</p> <ul style="list-style-type: none"> • Mid-unit quiz • Unit Test <p>Online Resources</p> <p><u>Physics Sims</u></p> <p><u>Learn AP Physics</u></p> <p>https://youtu.be/imlqEKrfs-k</p>	<p>1.B.1.2: The student is able to make predictions, using the conservation of electric charge, about the sign and relative quantity of net charge of objects or systems after various charging processes, including conservation of charge in simple circuits.</p> <p>1.B.1.2: The student is able to make predictions, using the conservation of electric charge, about the sign and relative quantity of net charge of objects or systems after various charging processes, including conservation of charge in simple circuits.</p> <p>5.C.3.3: The student is able to use a description or schematic diagram of an electrical circuit to calculate unknown values of current in various segments or branches of the circuit.</p> <p>Big idea 1,5</p> <p>1.B.1.1, 1.B.1.2, 1.E.2.1, 5.B.9.1, 5.B.9.2, 5.B.9.3, 5.C.3.1, 5.C.3.2, 5.C.3.3</p>