

## AP Physics 1 Scope & Sequence

| Days | Unit                                                                                                                                                                                                                                                                             | Standard(s)/Outcome(s)                                                                                                                                                                                                                                                                                                                      | Essential/Guiding Questions                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| 9    | <b>Unit 1: Kinematics</b><br><br><i>Students are introduced to the study of motion by exploring the idea of acceleration and showing how representations can be used to model and analyze scientific information.</i>                                                            | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>Force Interactions</li> <li>Change</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>Creating Representations</li> <li>Mathematical Routines</li> <li>Scientific Questioning and Argumentation</li> </ul>                                  | <p>How can the idea of frames of reference allow two people to tell the truth yet have conflicting reports?</p> <p>How can we estimate the height of a very tall building with only a small rock and a stopwatch?</p> <p>Why might it seem like you are moving backwards when a car passes you on the highway?</p> <p>Why is the general rule for stopping your car "when you double your speed, you must give yourself four times as much distance to stop"?</p> |
| 14   | <b>Unit 2: Force and Translational Dynamics</b><br><br><i>Students are introduced to the concept of force where they will analyze and come to understand a variety of physical phenomena by revisiting and building upon the models and representations presented in Unit 1.</i> | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>Systems</li> <li>Fields</li> <li>Force Interactions</li> <li>Change</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>Creating Representations</li> <li>Mathematical Routines</li> <li>Scientific Questioning and Argumentation</li> </ul> | <p>Why do we feel pulled toward Earth but not toward a pencil?</p> <p>Why is it more difficult to stop a fully loaded dump truck than a small passenger car?</p> <p>Why is it difficult to walk on ice?</p> <p>Why will a delivery truck filled with birds sitting on its floor be the same weight as a truck with</p>                                                                                                                                            |

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|    |                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                              | the same birds flying around inside?                                                                                                                                                                                                                                                                                                                                                                                               |
| 14 | <b>Unit 3: Work, Energy, and Power</b><br><br><i>Students are introduced to the idea of conservation as a foundational principle of physics, along with the concept of work as the primary agent of change for energy.</i>  | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>• Change</li> <li>• Conservation</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>• Creating Representations</li> <li>• Mathematical Routines</li> <li>• Scientific Questioning and Argumentation</li> </ul>                               | <p>How much money can you save by charging your cell phone at school instead of at home?</p> <p>If energy is conserved, why are we running out of it?</p> <p>Does pushing an object always change its energy?</p> <p>Why does it seem easier to carry a large box up a ramp rather than up a set of stairs?</p>                                                                                                                    |
| 8  | <b>Unit 4: Linear Momentum</b><br><br><i>Students are introduced to the relationships between force, time, impulse, and linear momentum via calculations, data analysis, designing experiments, and making predictions.</i> | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>• Force Interactions</li> <li>• Change</li> <li>• Conservation</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>• Creating Representations</li> <li>• Mathematical Routines</li> <li>• Scientific Questioning and Argumentation</li> </ul> | <p>How is the physics definition of momentum different from how momentum is used to describe things in everyday life?</p> <p>Can a person on an elevator that breaks loose and falls to the ground avoid harm by jumping at the last second?</p> <p>Why will a water balloon break when thrown on the pavement, but not break if caught carefully?</p> <p>Why is it important that cars are designed to include crumple zones?</p> |

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| 11 | <b>Unit 5: Torque and Rotational Dynamics</b><br><br><i>Students reinforce the Unit 2 ideas of force and linear motion by introducing them to torque and rotational motion.</i> | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>• Force Interactions</li> <li>• Change</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>• Creating Representations</li> <li>• Mathematical Routines</li> <li>• Scientific Questioning and Argumentation</li> </ul>                         | <p><b>Why does it matter where a door handle is placed?</b></p> <p><b>Why are long wrenches more effective?</b></p> <p><b>What do mobiles have in common with the Grand Canyon Skywalk?</b></p> <p><b>Why does a tightrope walker use a long pole?</b></p>                          |
| 8  | <b>Unit 6: Energy and Momentum of Rotating Systems</b><br><br><i>Students will apply their knowledge of energy and momentum to rotating systems.</i>                            | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>• Change</li> <li>• Conservation</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>• Creating Representations</li> <li>• Mathematical Routines</li> <li>• Scientific Questioning and Argumentation</li> </ul>                               | <p><b>What keeps a bicycle balanced?</b></p> <p><b>Why do planets move faster when they travel closer to the sun?</b></p> <p><b>What do satellites and projectiles have in common?</b></p> <p><b>What do ice skaters do with their arms when they want to spin faster? Why?</b></p> |
| 6  | <b>Unit 7: Oscillations</b><br><br><i>Students will apply previously encountered models and methods of analysis to simple harmonic motion.</i>                                  | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>• Force Interactions</li> <li>• Change</li> <li>• Conservation</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>• Creating Representations</li> <li>• Mathematical Routines</li> <li>• Scientific Questioning and Argumentation</li> </ul> | <p><b>How can oscillations be used to make our lives easier and more comfortable?</b></p> <p><b>How can an astronaut be “weighed” in space?</b></p> <p><b>How could you measure the length of a long string with a stopwatch?</b></p> <p><b>What do a child on a swing, a</b></p>   |

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|   |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                               | beating heart, and a metronome have in common?                                                                                                                                                                                                                                                |
| 9 | <b>Unit 8: Fluids</b><br><br><i>Students consider how the forces and conservation laws can be applied to the study of ideal fluids.</i> | <b><u>BIG IDEAS:</u></b> <ul style="list-style-type: none"> <li>• Systems</li> <li>• Force Interactions</li> <li>• Conservation</li> </ul> <b><u>SCIENCE PRACTICES:</u></b> <ul style="list-style-type: none"> <li>• Creating Representations</li> <li>• Mathematical Routines</li> <li>• Scientific Questioning and Argumentation</li> </ul> | <b>Why do some objects float while others sink?</b><br><br><b>Why is an object's ability to float an important characteristic?</b><br><br><b>What implications to our lives would there be if nothing floated?</b><br><br><b>Why don't we feel the miles of air above us pushing us down?</b> |