

# Physics - Unit 4 - Circular Motion

## Unit Focus

Students will explore and analyze objects that move in a circular path. This analysis is based on prior units, however, allows students to apply their reasoning and problem solving to specific real-world situations that they are very familiar with; why they feel like they are pushed to the outside of a car when they go around a curve, why they lift off their seat at the top of a roller coaster hill and why they feel heavy at the boom of the Ferris wheel. Students apply their knowledge of circular motion and forces to analyze the motion of man-made and natural (celestial) satellites. Students will study the laws of physics that govern the motion of planets, moons and the universal law of gravitation that holds the universe together.

## Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p><b>Next Generation Science</b> <i>High School Physical Sciences: 9 - 12</i></p> <ul style="list-style-type: none"> <li>Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. <i>HS-PS2-4</i></li> </ul> <p><b>Next Generation Science Standards (DCI)</b> <i>Science: 10</i></p> <ul style="list-style-type: none"> <li>Newton's second law accurately predicts changes in the motion of macroscopic objects. <i>PS2.9.A1</i></li> </ul> <p><b>Student Growth and Development 21st Century Capacities Matrix</b> <i>Critical Thinking</i></p> <ul style="list-style-type: none"> <li>Analyzing: Students will be able to examine information/data/evidence to make inferences and identify possible underlying assumptions, patterns, and relationships. <i>MM.1.2</i></li> </ul> <p><i>Collaboration/Communication</i></p> <ul style="list-style-type: none"> <li>Collective Intelligence: Students will be able to work respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. <i>MM.3.1</i></li> </ul>	<p><b>T1</b> Make observations and ask questions to define a problem based on prior knowledge and curiosity that stimulates further exploration, analysis, and discovery.</p>	
	<p style="text-align: center;"><b>Meaning</b></p>	
	<p style="text-align: center;"><b>Understanding(s)</b></p>	<p style="text-align: center;"><b>Essential Question(s)</b></p>
	<p><b>U1</b> Centripetally directed forces govern many phenomena. <b>U2</b> The acceleration of an object depends upon its mass and the net force acting on it.</p>	<p><b>Q1</b> How can you explain phenomenon that involves centripetal force? <b>Q2</b> What can cause objects to not maintain a circular path?</p>
	<p style="text-align: center;"><b>Acquisition of Knowledge and Skill</b></p>	
	<p style="text-align: center;"><b>Knowledge</b></p>	<p style="text-align: center;"><b>Skill(s)</b></p>
<p><b>K1</b> Objects moving in a circular path have a net force directed inward <b>K2</b> Friction, gravity, normal force, tension can all be "centripetally directed" forces <b>K3</b> The centripetal acceleration is dependent on the radius of the circle and the velocity of the object</p>	<p><b>S1</b> calculate the centripetal acceleration of an object <b>S2</b> find the maximum speed an object can swing in a circle without the string breaking <b>S3</b> draw free body diagrams of circularly moving objects and identify the net force directed inward</p>	