



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>Next Generation Science <i>High School Physical Sciences: 9 - 12</i></p> <ul style="list-style-type: none"> 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> <p>Next Generation Science Standards (DCI) <i>Science: 10</i></p> <ul style="list-style-type: none"> Newton's second law accurately predicts changes in the motion of macroscopic objects. <i>PS2.9.A1</i> <p>Madison Public Schools Profile of a Graduate <i>Critical Thinking</i></p> <ul style="list-style-type: none"> Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) <p><i>Collaboration/Communication</i></p> <ul style="list-style-type: none"> Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1) 	<p>T1 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;">Meaning</p>	
	<p style="text-align: center;">Understanding(s)</p>	<p style="text-align: center;">Essential Question(s)</p>
	<p>U1 Centripetally directed forces govern many phenomena. U2 The acceleration of an object depends upon its mass and the net force acting on it.</p>	<p>Q1 How can you explain phenomenon that involves centripetal force? Q2 What can cause objects to not maintain a circular path?</p>
	<p style="text-align: center;">Acquisition of Knowledge and Skill</p>	
	<p style="text-align: center;">Knowledge</p>	<p style="text-align: center;">Skill(s)</p>
	<p>K1 Objects moving in a circular path have a net force directed inward K2 Friction, gravity, normal force, tension can all be "centripetally directed" forces K3 The centripetal acceleration is dependent on the radius of the circle and the velocity of the object</p>	<p>S1 calculate the centripetal acceleration of an object S2 find the maximum speed an object can swing in a circle without the string breaking S3 draw free body diagrams of circularly moving objects and identify the net force directed inward</p>