

Unit # - 1 - Forces and Motion

Standards Addressed	Student Learning Objectives for this Unit	Content Skills and Knowledge	Learning Activities and Instructional Strategies
<p>NSES Standards: Motion & Forces Science as Inquiry Science & Technology History & Nature of Science</p> <p>PA STEE Standards:</p> <p>3.2.7.A (sci. k) 3.2.7.B (app k) 3.4.7.C (force & motion) 3.4.7.B (e ht trn) 3.1.7.B (models) 3.7.7.B (instr)</p> <p>1.2 read crit 1.4 writing 1.8 presentation</p>	<p>Students will be able to...</p> <p>Part 1: Matter in Motion (4 weeks)</p> <ul style="list-style-type: none"> ▪ Identify the relationship between motion and a reference point. ▪ Identify the two factors that speed depends on. ▪ Determine the difference between speed and velocity ▪ Analyze the relationship of velocity to acceleration ▪ Interpret a graph showing acceleration ▪ Determine the net force on an object ▪ Compare balanced and unbalanced forces ▪ Explain why friction occurs ▪ Define gravity <p>Part 2: Forces in Motion (4 weeks)</p> <ul style="list-style-type: none"> ▪ Explain how gravity and air resistance affect the acceleration of falling objects ▪ Explain why objects in orbit appear to be weightless ▪ Describe how orbit is formed and projectile motion ▪ State and apply Newton's Laws of Motion. 	<p>Part 1:</p> <p>Knowledge Motion, speed, velocity Acceleration Force, net force, Newton Friction and Types of friction Gravity, weight, and mass Law of Universal Gravitation</p> <p>Skills Calculate average speed Analyze speed & acceleration on a graph Calculate acceleration</p> <p>Part 2:</p> <p>Knowledge Terminal velocity, free fall Projectile motion (horizontal & vertical) Inertia, Momentum</p> <p>Skills Calculate the velocity of falling objects Calculating using Newton's second law $f=ma$ Use second law equation ($f=ma$) to solve problems</p>	<p>Part 1:</p> <p>Lab or Demonstration: A Mission in Motion Detecting Acceleration</p> <p>Reading: Matter in Motion Matter in Motion Puzzlers</p> <p>Worksheet: Matter in Motion Worksheet Bug Race Friction Action Avg. Speed in Pinewood Derby</p> <p>Technology: Two Dimensional Collisions http://www.phys.virginia.edu/classes/109N/more_stuff/Applets/Collision/jarapplet.html Fundertanding Roller Coaster http://www.funderstanding.com/k12/coaster/</p> <p>Part 2:</p> <p>Lab or Demonstration: Guinea Tube Demonstration</p> <p>Reading: Forces to Reckon With Newton: Force and Motion</p> <p>Worksheet: Falling Fast</p> <p>Technology: Interactive Example http://www.mhhe.com/math/devmath/aleks/wt-ba/student/olc/graphics/author_ed/sl04sec04.htm</p>

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<p>NSES Standards: Properties & Changes of Properties in Matter</p> <p>PA STEE Standards: 3.2.7.A (sci. k) 3.2.7.B (app k) 3.4.7.C (forces motion) 3.4.7.B (e ht trn) 3.1.7.B (models) 3.7.7.B (instr)</p> <p>1.2 Read Crit 1.4 Writing 1.8 Presentation</p>	<p>Part 3: Forces in Fluid (4 weeks)</p> <ul style="list-style-type: none"> ▪ Describe how fluids exert pressure ▪ Analyze how fluid depth affects pressure ▪ State and apply Pascal’s principle ▪ Explain the relationship between fluid pressure and buoyant force ▪ Predict whether an object will float or sink in a fluid (density) ▪ Describe the relationship between pressure and fluid speed ▪ Analyze the roles of lift, thrust, and drag in flight. ▪ Give examples of Bernoulli’s principle in real-life situations. 	<p>Part 3: Knowledge Fluid, pressure, pascal, atmospheric pressure, density, Pascal’s principle</p> <p>Buoyant force Archimedes’ principle</p> <p>Bernoulli’s principle Lift, thrust, and drag</p> <p>Skills Calculate pressure Calculate density</p>	<p>Part 3: Lab or Demonstration: Fountain of Knowledge The Rise and Fall of Raisins Spinning Sprinklers</p> <p>Reading: Forces in Fluids (Puzzlers)</p> <p>Worksheet: Build a Better Submarine</p> <p>Technology: Principles of Flight http://www.hpedsb.on.ca/sg/quinte/flight/principles_of_flight.htm Wing Forces Virtual Lab http://207.10.97.102/explsci/dswmedia/wingforc.htm</p>

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Unit Modifications

- Density Diver Demonstration
- The Rise and Fall of Raisins
- Matter in Motion: Vocabulary and Notes
- Force and Motion Review Sheet

Unit Enrichments

- A Mission in Motion (binder)
- Forces to Reckon With
- Fundertanding Roller Coaster
- <http://www.funderstanding.com/k12/coaster/>
- Two Dimensional Collisions
- http://www.phys.virginia.edu/classes/109N/more_stuff/Applets/Collision/jarapplet.html
- Build a Better Submarine
- Exploring Reference Points
- Matter in Motion: Puzzlers

Suggested Assessment Techniques for Unit

Core 1: Performance Assessment: Alien ph (Chemistry)

Core 2: Performance Assessment: Trouble in Flume Country (Forces and Motion)

Core 3: Unit Assessment: Forces and Motion

Materials/Technology for Unit

- Acceleration Timers (Ken Hall)
- Remote Control Cars (student supplied, mostly)
- Guinea Tube Demonstration
- Amusement Park resources
- Using Toys to Teach Physics (Beth Price)
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