

### PHY101 Demo Calendar

| Chapter | Topics                              | Demos  |
|---------|-------------------------------------|--|
| CH1     | Units, trigonometry, and vectors    | Pasco cart with vertical launching ball<br>Skateboard and tennis ball  |
| CH2     | Motion in one dimension             | Ramp with bowling ball, meter stick, colored masking tape, stop watch ( <a href="http://www.multistopwatch.com/">http://www.multistopwatch.com/</a> )<br>Vernier cart with motion detector<br>Feather and coin drop  |
| CH3     | Motion in two dimensions            | Monkey banana toss   |
| CH4     | Newton's laws of motion             | Vernier cart, weights and fan with motion detector<br>Vernier friction cart and weights on incline track with force sensor<br>Vernier friction cart on track with force sensor, pulley and 50 g weight at the end of track<br>School bus on incline with force sensor<br>Weights and spring scales<br>Pasco fan cart with sail<br>Newton's cradle<br>Air track<br>Wooden block with felt and slab<br>Pulley with same weight on both sides |
| CH5     | Energy                              | Vernier cart and fan with motion detector<br>Vernier cart and spring with force sensor ( $F=-kx$ )<br>Stand with 2 springs and weights, meter stick<br>Ball on V-track<br>Pendulum of death<br>Tracks that transition to horizontal with ping pong balls<br>Pasco spring loaded vertical launch with ball  |
| CH6     | Momentum, impulse, and collisions   | Bolas (center of mass)<br>Vernier carts and weights with motion sensors<br>Two ball drop with basketball and tennis ball<br>Ballistic pendulum   |
| CH7     | Rotational motion and gravitation   | Rotational inertia demo<br>Incline with different shapes<br>Vernier rotating accelerometer<br>Loop the loop track<br>Ball with string attached   |
| CH8     | Rotational equilibrium and dynamics | Lever balance demo with weights and spring scale (for torque)<br>Balancing bird, balancing pencils (center of gravity)<br>Cylinder and double cone on triangular ramp<br>Chair with dumbbells<br>Chair with bike wheel<br>Hoberman sphere<br>Gyroscope<br>Stainless steel spinning top<br>Precession of bike wheel   |
| CH9     | Fluids and solids                   | Cartesian diver<br>Magdeburg spheres with vacuum pump<br>Tubes of various shapes joined at the bottom with colored liquid<br>Balloon inside a vacuum jar<br>Water tank, boat and weights<br>Water hammer   |
| CH10    | Thermal physics                     | Metal ball and plate with hole, hole expands as plate gets heated<br>Ball and ring apparatus<br>Thermal expansion of bimetallic strip<br>Gas laws demo with temperature monitor<br>Thermal expansion of gas inside sealed metal sphere with pressure gauge<br>Ethanol vapor explosion with Tesla coil<br>Heat switch with red and blue lamps<br>Molecular motion demonstrator  |
| CH11    | Energy in thermal processes         | Rubber bands<br>Boiling water inside vacuum jar<br>Boiling water inside a metal container with rubber plug, with Bunsen burner<br>Cryophorus<br>Drinking bird<br>Conduction of heat demo with various metal rods<br>Laptop motherboard   |
| CH12    | The laws of thermodynamics          | Thermoelectric generator with fan with Vernier temperature probe<br>Hero's engine  |
| CH13    | Vibrations and waves                | Vernier mass on a spring with force sensor and motion detector<br>Vernier mass on a spring with force sensor and beaker of water<br>Simple pendulum<br>Damped simple harmonic motion demo<br>Slinky<br>Speed of wave in latex tube with electronic scale<br>Wave motion demonstrator<br>Vortex rings   |
| CH14    | Sound                               | Bell inside vacuum jar<br>Doppler effect (Buzzer on cord; buzzer has polar connection)<br>Interference from two speakers<br>Tuning forks and resonance boxes (there is a tunable pair)<br>Slinky<br>Standing wave on string<br>Standing waves in vertical glass tubes demo<br>Beats (Wavetek generator and Pasco speakers)   |