SLAPT Lab Practica Workshop

March 1, 2008

Model Deployed / Topic: Refraction of light, total internal reflection

Problem: Calculate the depth of the top of the bulb below the water's surface.

Equipment: Bucket painted black inside or line a bucket with a black plastic bag, battery pack, bulb and socket, lycopodium powder, masses to adjust height of bulb.

Setup: Fill the bucket with water. Place the bulb in the water and connect the battery pack.

Students may only measure the diameter of the lit portion of the water's surface with a caliper and may not break the surface of the water. Students are given a second bulb so that they can adjust their depth for the distance from the filament to the top of the bulb.

Sample Calculation: $1.33 \sin \phi_w = 1 \sin 90^\circ$ $\phi = 48.8^\circ$ Tangent 48.8 = radius of lit circle / depth

Title: Uniform Acceleration

Source: Madison West High School, shared by Debbie Rice

Model Deployed: Uniformly Accelerated Motion

Problem: Place two strips of electrical tape across a Plexiglas strip so that the time from the bottom edge of the first tape to the bottom edge of the second tape as it falls through a photogate is exactly 0.1 seconds.

Equipment: Plexiglas strip, electric tape, metric ruler, scissors, photogate and computer in pulse timing, one gate, mode.





Model Deployed / Topic: Uniform Circular Motion

Problem: A toy "flys" around in a circle suspended on a string. As a class, measure the height of the toy above a reference point while moving, time 30 revolutions with a stopwatch, then hide the stopwatch and ask students to time shown on the stopwatch.

Equipment: Circular motion toy, meterstick, stopwatch, swivel at the end of a lab rod, table clamp

Sample calculations:

 $tan \phi = radius / vertical dist = Fc / Fg$

where Fc = mv2 / r; solve for v

period = $2\pi r$ / velocity



Model Deployed / Topic: Uniform Circular Motion

Problem: Find the tension in the string when the circular motion toy is going around. Students may find the mass, measure length of string, radius, period

Equipment: Apparatus shown by Gary Taylor. Vernier's WDSS sensor (or force probe) allows checking calculated tension against predictions.



Title: Electric Circuits

Model Deployed / Topic: Electric Circuit: Series and parallel circuits

Problem: Given a complex circuit physically set up, students must determine its schematic and rank the brightness of the bulbs.

Equipment: Batteries or power supply, bulbs, sockets, connecting wires.

The circuit shown is particularly good at bringing up misconceptions.

Model Deployed / Topic: Light and optics

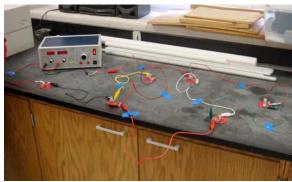
Problem: trace an equilateral glass prism on a piece of paper. Draw a line of your choosing to represent the incident ray, then predict where the ray will exit the prism. Once the prediction is made, test using a laser pointer.

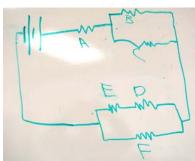
Equipment: equilateral prism, laser pointer

Model Deployed / Topic: Light and optics

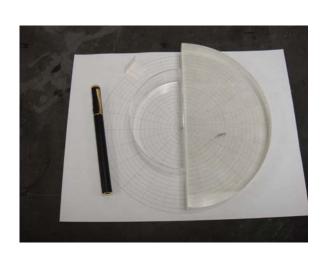
Problem: predict the path of a light ray as it passes from plexiglas to water

Equipment: Semi-circular dish, semi-circular Plexiglas refraction block, polar graph paper, laser pointer









Model Deployed / Topic: net force particle model, friction, kinematics

Problem: Predict the velocity time graph for the oatmeal container rolling up and down the towel-covered board.

Equipment: board, towel, motion detector

Process: roll the container up the towel-covered ramp toward the motion detector and allow it to roll back down the ramp.

