611-1890 (40-207) Maxwell's Wheel

Description: Use our Maxwell's Wheel Demonstration to demonstrate conservation of mechanical energy. After carefully winding up the wheel, release it. The wheel will slowly roll down the string and climb almost to its original height. This illustrates the conversion of gravitational potential energy to rotational and translational kinetic energy.

How to Teach with Maxwell's Wheel:
Concepts Taught: Gravitational Potential Energy, Kinetic energy
Curriculum Fit: Grades 9 and up.

Additional Materials Needed but not included:

C-Clamp
Electronic Balance

Demonstration of Conservation of Energy:

1. Place your Maxwell's Wheel on a solid, level surface.
2. Clamp down Maxwell's Wheel with a C-Clamp (This will limit vibration and allow your demonstration to last longer).
3. With two hands, carefully wind up your wheel until it reaches the top.
4. Make sure to check the axle at this time to be sure it is parallel to the upper support beam. If not, unwind and roll up again.
5. Release both hands at the same time.
6. Make observations on what you see happening.

Question:

Why does the wheel go to a lower height after each return?

Answer: Some of the energy is lost to air friction, string friction, and stretching of the string.

Demonstration of Forces:

1. Place the entire assembly, unwound and at rest on an electronic balance.
2. Record the weight reading. Note that the balance reading equals the sum of the stand mass and "force" exerted by the pair of strings on the wheel and axle.
3. Next, wind up the wheel as before and set the system into its motion.
4. Record the new reading. Note the new reading is the same both for upward and downward motion. The reason for this is that the linear and angular accelerations are constant in both directions of motion (velocity).

Question 1:

Why is the new reading slightly less than the original reading?

Answer 1: This difference is due to the decrease in upward "force" exerted by the string on the axle during the acceleration of the wheel and axle.

Question 2: Why is the difference in balance readings so small?

Answer 2: The difference in readings is small because the accelerations are low. In other words, the wheel has a large inertia (I) and the torque on the axle is small.

Warranty and Parts:
We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Designed for ages 13 and up. Item is not a toy. It may contain small objects that can be choking hazards.

May we suggest:

611-1028 Atwood's Machine: Teach acceleration and forces with this tried and tested teaching device. Hang two different masses and teach how to combine forces and determine acceleration. 1 lb (0.5kg).