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Educational Innovations Inc.®

Light Up Gyro Wheel

GYR-285

A retro toy... and so much more!

The Light Up Gyro Wheel is a new take on a retro "toy" that mesmerizes while it teaches! With a flick of the wrist, you can demonstrate the conversion of potential energy to kinetic energy and back again.

Plus, the colorful wheel has a hidden LED light inside. As soon as the magnetic edges of the wheel touch the metal rails, the LED lights up—a perfect demo of open and closed circuits!

Simply tip the toy upward or downward to set the magnetic wheel in motion along the metal rails. That's all it takes to get the wheel—and the questions—rolling!

How does it work?

You will marvel at how simple the Light Up Gyro Wheel is. There is a plastic wheel with built-in magnets on the ends, and a set of metal tracks upon which the wheel can travel. As the track is tilted up and down, the wheel rolls the length of the track, top and bottom, and then again on the opposite side of the wire.

In this way, the wheel always keeps in contact with the track, and can be continually propelled on its cyclical course. With proper timing, the wheel can be brought to a great speed.

Preview the Light Up Gyro Wheel in action:

Our YouTube channel includes a video explaining how the Light Up Gyro Wheel can be used to explain potential and kinetic energy:

www.youtube.com/watch?v=U-aX1S73DQw

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NGSS Correlations

Our Light Up Gyro Wheel and these lesson ideas will support your students' understanding of these Next Generation Science Standards (NGSS):

Elementary

K-PS2-1
Students can use the Rail Twirler to plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

3-PS2-2
Students can use the Rail Twirler to make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Middle School

MS-PS2-2
Students can use the Rail Twirler to plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

MS-PS2-4
Students can use the Rail Twirler in an investigation to construct and present arguments using evidence to support the claim that gravitational interactions are attractive depends on the masses of interacting objects.

DCI-MS/PS3A: Definitions of Energy.
A system of objects may also contain stored (potential) energy, depending on their relative positions.

High School

HS-PS2-1
Students can use the Rail Twirler in an investigation to apply Newton's Second Law of Motion. Students can analyze data to support the claim that Newton's Second Law of Motion describes the mathematical relationship among the net force on an object, its mass, and its acceleration.

HS-PS2-2
Students can use the Rail Twirler in an investigation and use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

Suggested Science Idea(s)

K-PS2-1 • 3-PS2-2 • MS-PS2-2 • HS-PS2-4 • DCI-MS/PS3A • HS-PS2-1 • HS-PS2-2
The Rail Twirler uses the basic laws of physics and gravity to enable hands-on opportunities. Students can use the Rail Twirler in an unlimited number of investigations. And is a great way to demonstrate the conversion of potential energy to kinetic energy and back again. The Rail Twirler has a magnetic wheel on the rail and tip the rail upward to begin the spinning action.

Demonstrating the Light Up Gyro Wheel

1. Hold the Light Up Gyro Wheel vertically with the wheel at the base. Point out to students that the wheel is at its lowest position on the rail. In this position, it has no potential energy.

2. Keeping the toy vertical, slide the wheel to the top of the rail and hold it there. Explain that by doing this small amount of "work," you have added potential energy to the wheel.

3. Ask students how high they think the wheel will return if you simply let the wheel go and allow it to "fall" without moving the rails.

4. When you release the wheel, gravity will pull it downward. As the potential energy decreases, the kinetic energy increases. On its first circuit, the wheel almost returns back to the top—but it doesn't quite make it.

5. Be sure to point out to students that, with each successive circuit around the rails, the wheel doesn't travel quite as high as the last time. Unless you add more energy to the process, eventually the wheel will stop entirely. If energy cannot be created or destroyed, then where does that energy go? *(It is transferred out to heat, sound, and friction.)*

The Law of Conservation of Energy states that energy cannot be created or destroyed, but only changed from one form into another or transferred from one object to another.

Discussing the Light Up Gyro Wheel

With the Light Up Gyro Wheel, you can start discussions on a wide range of science topics, such as:

- ✓ **Potential and Kinetic Energy:** At what points along the rail does the wheel have the greatest amount of potential energy? Kinetic energy?

- ✓ **Motion:** After the wheel is set in motion, what can you do to alter its speed? Challenge students to see who can get the wheel spinning the fastest… or for the longest time without stopping. How do their variations relate to Newton's First Law ("Every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force")?

- ✓ **Conversion of Energy:** **The Law of Conservation of Energy** states that energy cannot be created or destroyed, but only changed from one form into another or transferred from one object to another. Unless you continue to add energy to the circuit, the wheel will eventually slow down and come to a stop. Ask students to trace the energy—where has it gone? What is the original energy converted into? *(Answer: heat, vibration and sound energy.)*

- ✓ **Magnetism:** What role do the magnets play in the wheel's function? How much of the wheel's motion can be attributed to the magnets? Do the magnets affect the wheel's speed? Would the toy work equally well if it were able to travel along the rails without magnets?

- ✓ **Gravity:** What role does gravity play in the wheel's motion? What happens when you tilt the toy so that the wheel is not relying on gravity to move? How do you think this toy would work in outer space (in a zero gravity environment)?

- ✓ **Optical Illusions:** Instruct students to create cardboard cut-out discs that can be decorated with simple black-and-white designs and attached to the wheel. What happens when the wheel spins? Do certain designs work better than others to create optical illusions? How does the human eye (and brain) make sense of optical illusions? What does "persistence of vision" mean, and how does it relate to the Light Up Gyro Wheel?

Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons. For us, *"Teachers Serving Teachers"* isn't just a slogan—it's our promise to you!

Please visit our website for more lesson ideas:

www.TeacherSource.com

Check our blog for classroom-tested teaching plans on dozens of topics:

http://blog.TeacherSource.com

To extend your lesson, consider these Educational Innovations products:

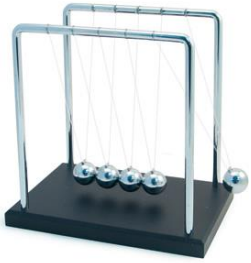
The PhiTOP (TOP-410)

This beautifully crafted top does for angular momentum what Newton's Cradle does for linear momentum. When spun, it starts out horizontal and then, surprisingly, stands upright. Wow! In the process, it illustrates the difference between equilibrium and stability. The rise of the "center of mass" is a fascinating physics problem. It will spin for minutes on end, producing a marvelous optical illusion as it slows down.

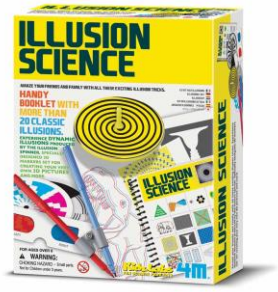
Flow Ring (PHY-265)

Constructed from a single strand of thin, flexible metal, the Flow Ring is both a kinetic sculpture and a mesmerizing flow toy. With one look, you'll see why it has been called a "4th dimensional Slinky". Folds flat and pops open into a beautiful 3D geometrical shape. Slip it on your arm or a rope and watch its translational energy change to rotational energy! Centripetal (seeking the center) forces hold the bands in their curved shape as they spin along your arm, instead of "flying off on a tangent."

Newton's Cradle (NEW-100)



Find hours of entertainment in this chic, easy to assemble Newton's Cradle! Perfect for teaching your students about Newton's laws of motion, Newton's Cradle makes a great addition to any classroom.



Illusion Science (GRN-430)

Everyone loves optical illusions. This kit gives students a chance to perform over 20 optical illusion experiments—including the classic morph illusion and Benham disk—and learn about the science behind them. A specially designed 3D marker set is provided for creating 3D pictures, as well as 3D glasses, a carrying pouch, and more.