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Pendulum Wave Demonstration
#WVDEM02

Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **Contains small parts.**
- **California Proposition 65 Warning: This product can expose you to chemicals including ethyl acrylate and lead, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.P65Warnings.ca.gov.**

This product demonstrates an interesting quirk of pendulums. If arranged so that each successive pendulum in a line of pendulums has one more swing per period than the one before it, a pattern emerges while they swing. The pendulums, when released from the same height at the same time, will start their swing in unison, but then quickly fall out of sync with each other. The pendulums will cycle between being in sync, being in what looks like chaotic motion, having half swing left while the other swing right, and returning to being in sync. The period of this entire cycle of patterns for our demonstration lasts roughly 20 seconds.

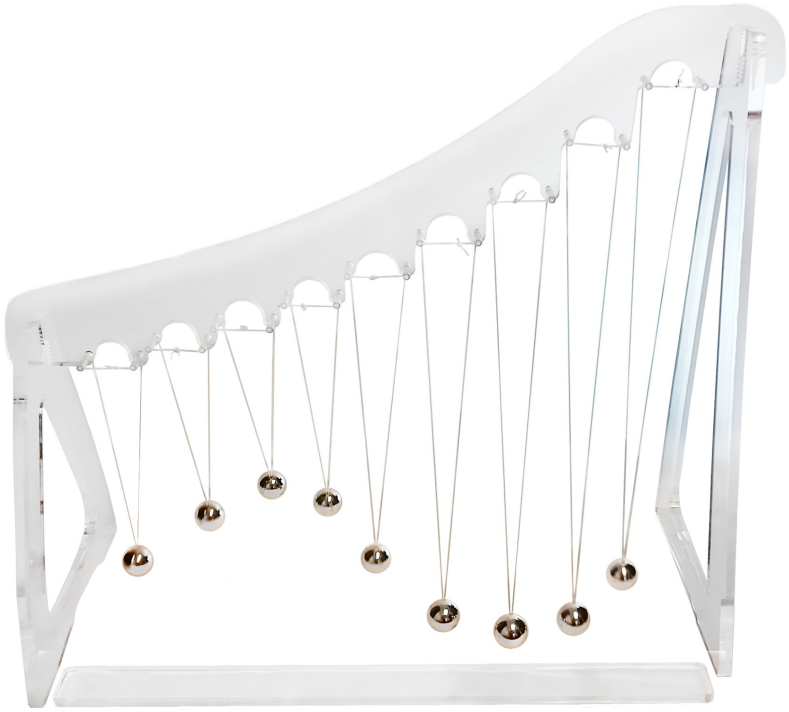
Though not technically waves, since no energy is being transmitted from pendulum to pendulum, the wave-like patterns created by this demonstration do a great job visually explaining and exploring the regularity of the oscillation of pendulums.

Introduction

A **pendulum** is any weight suspended from a pivot. When moved from its resting position at equilibrium, the force of gravity acts as a **restoring force,** causing the mass of the pendulum to oscillate back and forth around its rest position. A **period** refers to how long it takes the pendulum to complete one swing back and forth. The following formula can be used to calculate the period of a pendulum:

$$T=2\pi\sqrt{\frac{L}{g}}$$

- **T = Period (s)**
- **L = Length (m)**
- **x = Gravity (m/s^2)**



How to Use

This demonstration is very easy to set up and use. Follow the below instructions:

Assembly

1. Locate the notches on each triangular leg.
2. Gently guide the notch of the smaller triangle into the notch nearest the shortest pendulum. Do the same for the notch of the larger triangle into to the notch nearest the longest pendulum. Use the picture for guidance.

Demonstration

1. Locate the long, flat acrylic board.
2. Place the board against each pendulum so that they are at rest against it.
3. Raise the board and the pendulums higher, past the point of the pendulums' equilibrium
4. Quickly release all the pendulums at once by moving the board down and out of the way.
5. Observe the demonstration from above or through the triangle legs of the apparatus. What kind of patterns do you notice?