Releasing Your Potential Pendulum Kit

PX-4400

INSTRUCTIONAL GUIDE

Contents

- 1 ea. 20 x 20 cm base
- 1 ea. Pendulum Assembly
- 2 ea. Wood Screws
- ½" Steel Ball
- ¾" Steel Ball

Recommended for activities:

- Graph Paper
- Meter Stick
- C-clamp

Assembly

Unpack the components, and remove the screws and set aside. Then, insert the pendulum assembly into the two holes in the base. Screw the two screws into the pendulum from the bottom of the base assembly to tighten them together. Check to make sure the pendulum swings freely. If you wish, use a 'C' Clamp to attach the pendulum to the edge of a tabletop.

Activity

Discussion

Drop two balls of different mass and they fall together. Tie each of them to two strings of the same length and they will swing together as pendulums. The speed of falling and of swinging does not depend on the mass, but only on how high the balls are raised at the beginning. This experiment uses a rigid pendulum raised to a certain height. At the bottom of the pendulum's swing, a cross bar stops the pendulum, but the ball leaves the holder and keeps going. How far the ball travels horizontally from the cross bar depends on how fast the ball is going and how long it remains in the air. How fast it is going is related to its **kinetic energy**, which depends on its initial **potential energy**. How long it remains in the air depends on how high it is above the table.

Procedure

Step 1: Measure Vertical Height

Devise an appropriate method for measuring the vertical height h the steel ball falls, that is, the height from which the pendulum is released.

Step 2: Launch Ball with Pendulum

Raise the pendulum to the desired vertical height, using your finger to hold the ball in place. Take your finger away in such a manner that you do not push the pendulum up or down. Both ball and pendulum swing down together, and the ball is launched upon impact with the cross bar. Practice your technique until the ball lands at a consistent distance downrange.

Step 3: Measure the Range
When your results have become consistent, release the ball three times from the same height. Use a meter stick to measure the downrange distance for each trial. Repeat the experiment for six different heights. Record results in the data table below.

DATA TABLE

HEIGHT	DISTANCE				LAUNCH SPEED
	Trial 1	Trial 2	Trial 3	Average	

Step 4: Compute Launch Speed Use the law of conservation of energy to calculate the speed of the ball just as it is released from the launcher. The velocity, ***v***, can be found by rearranging the equation:

$$m \cdot g \cdot h = {}^{1}/_{2}\, mv^2$$

In this equation, ***m*** is the mass of the projectile, ***g*** is the acceleration due to gravity, and ***h*** is the starting height of the pendulum. Record your computation of the launch speed for each height from which the pendulum was released in the last column of the data table.

Step 5: Drawing Conclusions
What do the average distance and launch speed tell you about the impact of mass on the conservation of energy?

Related Products

Converting Gravitational Potential Energy to Kinetic Energy Kit (P6-7930) This kit introduces students to the concepts of kinetic and gravitational potential energy and the conversion of one form of energy into another.

Air Puck Physics Kit (P4-2155) Our exclusive Air Puck Physics Kit includes two pucks, inelastic collision kit, and puck launcher.

Economy Air Track (P4-2710) The Economy Air Track compares favorably to 2.0m air tracks. The aluminum precision air track not only comes with an air source and accessories but also includes data-logger and photogates!