

Roller Coaster

Objective

The goal of this project is to build a roller coaster for marbles using foam pipe insulation and to investigate how much of the gravitational potential energy of a marble at the starting point is converted to the kinetic energy of the marble at various points along the track.

Questions

- 1. What is the equation for calculating an object's gravitational potential energy?
- 2. What is the equation for calculating an object's kinetic energy?

Hypothesis.

- 3. The marble has its maximum gravitational potential energy when it is at the starting point: the highest point on the roller coaster. How much of this potential energy is converted to the marble's kinetic energy?

Materials and Equipment

- - At least two 6 foot (183 cm) sections of 1-1/2 in (about 4 cm) diameter foam pipe insulation (No more than 4)
- - Marbles - Masking tape - Stopwatch - Balance

Experimental Procedure

1. To make a roller coaster track, tape two (or more) lengths of the foam U-channel together, end-to-end. The joint between the two pieces should be as smooth as possible.
2. You can make the track as simple or as complex as you'd like. You can add curves, loops, and additional uphill and downhill sections.
3. In order to measure the velocity of the marble, you'll need a way to measure how much distance the marble travels during a measured time interval.

4. Use the stopwatch to measure the time it takes for the marble to travel a certain length along the track.
5. Measure the height of the starting point for the track.
6. Measure the mass of the marble.
7. Calculate the gravitational potential energy of the marble at the starting point.
8. Run a single marble down the track 10 separate times.
9. For each run, use your measuring stick and stopwatch to **measure the velocity** of the marble as it completes the track.
10. **Calculate the average** of your 10 measurements.
11. Pick a different spot along the track to record the velocity at this point in the track. Record the distance and time for 10 trials .
12. Calculate the velocity at this point. Then calculate the average velocity.
13. Calculate the **kinetic energy** of the marble at 2 points along your track.
14. Does the marble's kinetic energy ever equal or exceed its initial gravitational potential energy?
15. Draw a diagram of you track labels the greatest potential energy and 2 greatest kinetic energy locations
16. **CREATE A DATA TABLE BEFORE DOING TRIAL RUNS.**

Bonus Competitions (4 pieces max) – Must be run successfully 2 out 3 trials

1. Most Creative Track
2. Most Loops
3. Highest 2nd Hill
4. Longest successful jump across lengths of track