Paper Roller Coaster Lab

Activity:

The goal of your next project is to design and create a roller coaster that is made out of paper. Before we start we need to explore roller coaster design and how they work. What is centripetal force? How fast does the coaster need to go to complete a loop? What angels work best for your design? This lab will help you!

Challenge/Problem:

- To construct a track and loop and answer the following questions:
    1. What is the minimum height necessary to make it around the loop without falling out?
    2. How does the coasters angle play a roll in how well the coaster works?

Background Information

√ Create two straight track: Measure 12 inch long track, 1 inch width, walls 1 inch - Fold

√ Create Loop: Measure 18 inch long track, 1 inch width, walls 1 inch – make ½ inch marks on walls cut each one. Fold and tape

1. Prop the end of the straight track on a box
2. Hold the marble at the top of the track..measure vertical height of marble
3. Release the marble from rest
4. Listen to the marble as it travels around the loop. You will hear it make contact with the loop during its entire journey.
5. Move the marble lower; release it from rest, and listen to see if it makes contact the entire way around the loop. Repeat this process until you gone too far down the track. You will know you have gone too far when you hear the silence of the marble as it looses contact with part of the loop. Then back up until you've reached the point where the marble just barely keeps in contact with the track as it complete the loop.
6. Record this starting height on the data section of the lab.
7. Increase the angle of the straight piece of track. Do make the angle extremely steep.
8. Repeat the loop process until the marble just barely keeps in contact with the track as the marble makes it around the loop.
9. Record this starting height on the data section of the lab.
10. Answer the calculations and questions.

Name:
Section #:
Date:

Lab Questions

Use the a_c formula to calculate the centripetal acceleration of the marble as it traveled over the loop's top (m/s^2)

$$a_c = \frac{(2)(9.80)(\text{starting height on the ramp} - \text{ball's height a the loop's top})}{(\frac{1}{2})(\text{ball's height at the loop's top})}$$

Show your numbers here:

a_c= __(2)(9.80)(_____
(½)

ANSWER: _____

Calculate the g's experienced on the marble.

$$\text{g's experienced} = \frac{(2)(\text{starting height on the ramp} - \text{ball's height a the loop's top})}{\left(\frac{1}{2}\right)(\text{ball's height at the loop's top})}$$

Show your numbers here:

g's experienced = __(2)(_____
(½)

ANSWER: _____

1. What is the minimum height necessary to make it around the loop without falling out?

2. How does the coasters angle play a roll in how well the coaster works?

3. Does the height or coaster angle affect the centripetal acceleration? How?

4. Does the height or coaster angle affect the G Force? How?