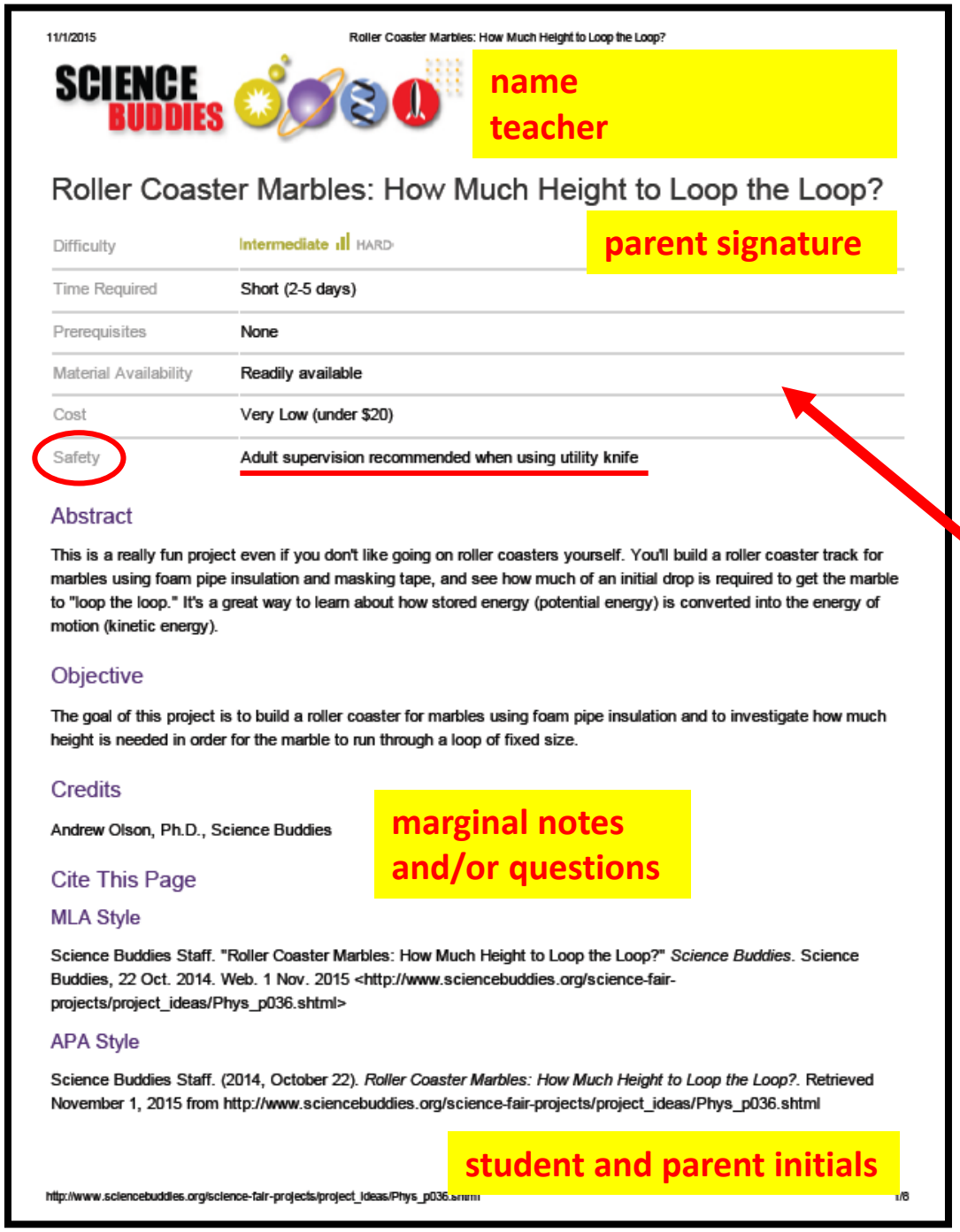


11/1/2015 Roller Coaster Marbles: How Much Height to Loop the Loop?

SCIENCE BUDDIES

name
teacher

Roller Coaster Marbles: How Much Height to Loop the Loop?

parent signature

Difficulty	Intermediate HARD
Time Required	Short (2-5 days)
Prerequisites	None
Material Availability	Readily available
Cost	Very Low (under $20)
Safety	Adult supervision recommended when using utility knife

Abstract

This is a really fun project even if you don't like going on roller coasters yourself. You'll build a roller coaster track for marbles using foam pipe insulation and masking tape, and see how much of an initial drop is required to get the marble to "loop the loop." It's a great way to learn about how stored energy (potential energy) is converted into the energy of motion (kinetic energy).

Objective

The goal of this project is to build a roller coaster for marbles using foam pipe insulation and to investigate how much height is needed in order for the marble to run through a loop of fixed size.

Credits

Andrew Olson, Ph.D., Science Buddies

marginal notes
and/or questions

Cite This Page

MLA Style

Science Buddies Staff. "Roller Coaster Marbles: How Much Height to Loop the Loop?" *Science Buddies*. Science Buddies, 22 Oct. 2014. Web. 1 Nov. 2015 <http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p036.shtml>

APA Style

Science Buddies Staff. (2014, October 22). *Roller Coaster Marbles: How Much Height to Loop the Loop?*. Retrieved November 1, 2015 from http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p036.shtml

student and parent initials

http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p036.shtml 1/8

Background Research

- Do your background research so that you are knowledgeable about the terms, concepts, and questions pertaining to your project.
- The sticker below allows students to **view-at-a-glance** all the components for their research required by their project.
- These components are located right after the project's ***Introduction***.

Research

__7__ Total – Terms and Concepts

__1__ Total – Questions (Q&A)

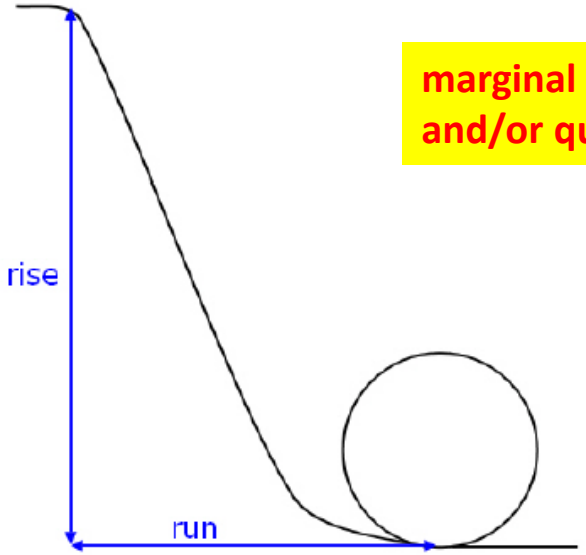
__3__ Total – Bibliography sources

How To …

- Use the teacher provided worksheets or MS Word templates, available via email.

SaRivera@PinesCharter.net

11/1/2015 Roller Coaster Marbles: How Much Height to Loop the Loop?



marginal notes and/or questions

The illustration above shows how to measure "rise" and "run" in order to calculate the average slope of the track leading in to the loop.

How much height (rise) will be required to successfully navigate a given loop size? A foam roller coaster for marbles is easy to build, so try it for yourself and find out!

7 Terms and Concepts

To do this project, you should do research that enables you to understand the following terms and concepts:

- Potential energy (stored energy)
- Kinetic energy (energy of motion)
- Conservation of energy (basic law of physics)
- Gravity
- Velocity
- Friction
- Slope (rise/run)

1 Questions

- How high do you have to make the starting point of your roller coaster in order for the marble to "loop-the-loop"?

3 Bibliography

- Here's a good webpage on kinetic and potential energy applied to roller coasters:
  Houghton Mifflin Company. (n.d.). *Energy and Motion*. Education Place. Retrieved August 29, 2014, from http://www.eduplace.com/kids/hmsc/activities

student and parent initials

http://www.sciencebuddies.org/science-fair-projects/project_Ideas/Phys_p036.sh

Background Research

- Each project has different requirements for students to gain the background knowledge they need to succeed at completing the project.
- Count the number of "bullets" for each component.

1. **Terms and Concepts** – find the definitions of these vocabulary words
2. **Questions** – answer these questions in complete sentences
3. **Bibliography** – read 2 or more sources from the bibliography list to help you with your research and find the definition to terms or answers to questions. If these sources are insufficient then search for other sources in the library or the internet.

(http://www.eduplace.com/kids/hmsc/activities/simulations/gr4/unitf.html).

- This short animation explains kinetic energy and potential energy:
  Brain POP. (n.d.). *Kinetic Energy*. Brain POP Animated Educational Site for Kids. Retrieved August 23, 2007, from http://www.brainpop.com/science/energy/kineticenergy/ (http://www.brainpop.com/science/energy/kineticenergy/).
- Here is a good reference for more advanced students:
  Henderson, T. (2004). *Work, Energy, and Power*. The Physics Classroom and Mathsoft Engineering & Education, Inc. Retrieved August 23, 2007, from http://www.physicsclassroom.com/Class/energy/u5l1c.html (http://www.physicsclassroom.com/Class/energy/u5l1c.html).

Materials and Equipment

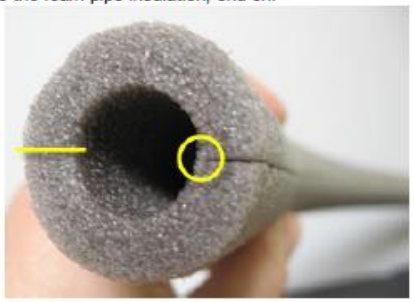
To do this experiment you will need the following materials and equipment:

- At least two 6 foot (183 cm) sections of 1-1/2 in (about 4 cm) diameter foam pipe insulation
- Glass marbles
- Utility knife
- Masking tape
- Tape measure
- Bookshelf, table, or other support for roller coaster starting point

Experimental Procedure

Note: use the utility knife with care. A fresh, sharp blade will make cutting the insulation easier.

1. Do your background research so that you are knowledgeable about the terms, concepts, and questions, above.
2. Cut the foam pipe insulation in half (the long way) to make two U-shaped channels.
   a. The illustration below shows the foam pipe insulation, end-on.



The illustration above shows the cross-section at one end of the foam pipe insulation.

   b. The insulation comes with one partial cut along the entire length. Complete this cut with the utility knife (yellow circle in the illustration above).
   c. Make a second cut on the other side of the tube (yellow line in the illustration above), along the entire length of the tube.
   d. You'll end up with two separate U-channel foam pieces. You can use masking tape to attach pieces end-to-end to make the roller coaster track as lon

marginal notes and/or questions

student and parent initials

Background Research

- The sticker below, placed near the project's ***Experimental Procedure***, is used as a reminder that the first step for all projects is the same; do your background research.

1. **Do your background research** so that you are knowledgeable about the terms, concepts, and questions, above.