

Name: _____

Date: _____

Period: _____

Online Simulation Lab → ROLLER COASTER PHYSICS

Purpose: *The purpose of this simulation lab is to strengthen your understanding of energy conservation in real-world applications. You will use a skateboarder and his park to represent the roller coaster and its track. You will observe many other physics concepts at work as well.*

Internet Lab Activity

Open up the University of Colorado, PhET Energy Skate Park simulation:

1. Go to <http://phet.colorado.edu/>
2. Click "Play with Sims...>"
3. Click the "Energy Skate Park" icon
4. Click "Run Now!"
5. Spend ONE MINUTE to explore the simulation and familiarize yourself with the controls.
6. Click the "Reset" button in the top-right corner. Begin the exploration below.

Exploration Questions

Use the simulation to answer the questions below.

1. Does the skater hit the same height on the opposite sides of the track? (Checkmark the "Show Grid" button to help you determine this!)
 - a. What must be true about the system for this to be possible?
 - b. Click the "Friction" TAB and click FRICTION ON found on the right side. What do you observe about the skater as you adjust the friction slider setting towards "LOTS"?
2. Now, turn on the Bar Graph, Pie Chart, Grid, and Speed. (You may need to move things around a little to see everything.) Also, turn your Friction OFF.
 - a. On the visual aids, what color represents potential energy and which is kinetic energy?
 - b. When does the skater have the highest amount of kinetic energy?
 - c. When does the skater have the highest amount of potential energy?

Build Your Roller Coaster

Use the simulation to build and test your roller coaster design from the Pre-Lab Inquiry.

1. Click "Reset ALL" located bottom right.
2. Click the TAB "Track Playground" Located at the top left
3. Drag in new pieces of track and manipulate the curves until you closely match your roller coaster design.
4. Drag and drop the rider to the location of the beginning and observe. DO NOT MAKE CHANGES YET.
 - a. The ride probably was not successful on the first attempt. If not, what physics concept(s) was/were violated?

- b. Identify several adjustments you need to make.

5. After making the initial adjustments, try the ride again. Continue making adjustments until the ride becomes successful (rider makes it from one end to the other completely - does not have to make it back through).

6. Click the "Track Friction >>" button and adjust the setting.
7. Run the rider through your track again and observe the changes.
 - a. Did the rider make it to the end?

 - b. What do you notice differently about the pie chart and/or bar graph?

8. Describe the changes you need to make to your design, as a result of the presence of friction.

9. Make the necessary adjustments until you achieve a successful long ride with friction and loops.

10. Raise your hand and show the teacher your friction-savvy coaster. Sketch your final design.