

**Understanding the Properties of Energy**  
Energy Skate Park

Name \_\_\_\_\_ Per \_\_\_\_\_

**Instructions (Part I):**

- ☞ Go to your instructors web page (or use the link below), and open the link: **Skate Park Energy Transfers: More Advanced:** [http://phet.colorado.edu/sims/energy-skate-park/energy-skate-park\\_en.inlp](http://phet.colorado.edu/sims/energy-skate-park/energy-skate-park_en.inlp)
- ☞ Click on the checkbox to show the **Grid** (shows distances in meters)
- ☞ Click on **Show Pie Chart and with Thermal** (shows kinetic, gravitational potential, and thermal energy)
- ☞ Click on the button **Bar graph** (shows total energy)
- ☞ Click on **Potential Energy Reference** (shows where  $PE = 0$ ). **Raise the line to the bottom of the track.**
- ☞ Click on **Track Friction** (allows you to select amount of friction...**start with NONE**)
- ☞ The program should be running. You can click on **Pause** or simply drag the skater and put him anywhere on the ramp at any time.

**Answer the following questions in COMPLETE SENTENCES in your notebook. (You can type your answers in this page in BOLD, then print it out if you wish, but you still must complete the sketches.)**

1. Start your skater at a height of 6m. What happens? How high does he go on the other side of the track? Draw the track and label where kinetic and gravitational potential energy are each the highest.
2. What do the pie charts tell you?
3. What does the bar graph show? What rules does it seem to follow?
4. What is the relationship between kinetic energy and gravitational potential energy of the skater on the track?
5. Make the right side of the track longer, and start the skater at the top of the track. What happens?
6. Now increase the friction. What determines the Thermal energy pie section? What rules does it seem to follow? Draw two pie charts to illustrate your explanation and show how the energy changes. (Hint: If you're savvy, you can pause the simulations, and use Snipping Tool to copy and paste pie charts into this document.)
7. What determines the starting Gravitational Potential section of the bar graph? (Hint: Try changing the starting points on the ramp.) Draw two bar charts to illustrate your explanation.
8. What determines the Kinetic energy pie section? (Hint: Where is the skater the fastest? What can you make him do to move faster?) Draw two bar charts to illustrate your explanation.
9. What does the size of the pie represent? How can you make the pie bigger or smaller? (Hint: Try changing the starting points on the ramp.)
10. Under Locations, choose SPACE. How does going into outer space affect the energy pie charts? Specifically, what happens to the gravitational potential energy?
11. What must be in your system in order to have Gravitational potential energy?

**Instructions (Part II):**

- ☞ Go back to Earth.
- ☞ Click on Reset in the upper right corner and Pause the Skater.
- ☞ Click on the three blue dots in the upper left hand corner that says, "Drag to add Track".
- ☞ Add some sections onto your track and arrange your track as you see fit. Make sure to add hills and valleys.
- ☞ Keep friction turned off, and leave the gravity on Earth.

**Sketch your track below:**

12. What general rule about the hills do you have to follow to get the skater to go all the way from one side of your track to the other? What can affect whether it works or not?