Scientist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Per: \_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Skate Park Physics Lab Answer all questions in your notebook**

**Go to phet.colorado.edu 🡪 Search: Skate Park 🡪 Click on: Energy Skate Park: Basics (html5)**

**Mechanical Energy** is the total energy an object has: the sum of kinetic energy and potential energy.

The **law of conservation of energy** states that energy cannot be *created* or *destroyed*, but can be *transferred* from one form to another. This means that if an object has a certain amount of energy, it will keep that energy unless the energy is transferred to another object.

**Directions:**

Go to the Skate Park Basics

Turn on Pie Chart and Bar Graph

1.) Explore the simulation, trying the various track designs. Observe how the skater's potential and kinetic energy change as he moves. List 2 observations that you make while exploring. *Ex: What do you have to do to get the skater to fly off? What do you have to do to get the skater stuck?*

2.) Switch to INTRO screen, with the U-shaped track. Drag the skater to the top of one side, then let them go. Observe the energy bar graph as they go back and forth. You may also explore the W-shaped track.

a.) When does the skater have the *highest* potential energy?

b.) When does the skater have the *lowest* potential energy?

c.) When does the skater have the *highest* kinetic energy?

d.) When does the skater have the *lowest* kinetic energy?

3.) While they are moving, change the mass using the slider on the right side. Observe the energy graph.

a.) If mass increases, what happens to *kinetic* energy?

b.) If mass increases, what happens to *potential* energy?

c.) If mass increases, what happens to *mechanical* (total) energy?

4.) Complete the table based on what you observed (circle one answer for each KE and PE box):

|  |  |  |
| --- | --- | --- |
| **Position (height) of skater on track**  | **Kinetic Energy**  | **Potential Energy**  |
| Top of track | high medium low  | high medium low  |
| Middle/side of track | high medium low  | high medium low  |
| Bottom/lowest point on track | high medium low  | high medium low  |

5.) Circle the correct answer:

a.) As the skater goes **up** the hill, their **kinetic** energy: *increases / decreases / stays constant*

b.) As the skater goes **up** the hill, their **potential** energy: *increases / decreases / stays constant*

c.) As the skater goes **up** the hill, their **mechanical** energy: *increases / decreases / stays constant*

d.) As the skater goes **down** the hill, their **kinetic** energy: *increases / decreases / stays constant*

e.) As the skater goes **down** the hill, their **potential** energy: *increases / decreases / stays constant*

f.) As the skater goes **down** the hill, their **mechanical** energy: *increases / decreases / stays constant*

6.) Switch to the “Friction” tab at the bottom of the page. Turn friction **on** using the button on the right side of the page. What is different about the skater's motion *with* friction, compared to *without* it? Use the words speed and energy in your explanation.

7.) Switch to the “track playground” tab at the bottom of the page. Make sure that friction is **off** on the right side of the page.

a.) Design your own track (something **unique,** not just a U or W), and draw it in your notebook:

b.) Label the points on your track where *kinetic* energy was **high** with the letters **“KH,”** *kinetic* energy was **low** with the letters **“KL”** where *potential* energy was **high** with the letters **“PH”** andwhere *potential* energy was **low** with the letters **“PL”**

c.) How could you change your track to **maximize** the kinetic energy of the skater? **Explain.**

Post-Lab Questions:

1. Find a way to increase the “total energy”. What two variables affect the total mechanical energy of an object?

2. Why does the mechanical (total) energy of the skater not change over time (unless friction is turned on)?

3. Re-read the law of conservation of energy; what do you think happens to the skater's energy when friction is involved?

4. Based on your observations of total energy at different times and positions, write an equation to show the relationship between the total energy, potential energy and kinetic energy. (hint: total energy is equal to what?)