**Conservation of Energy at the Skate Park Name:\_\_\_\_\_\_\_\_\_\_\_**

**Learning Objective:**

*To investigate the conservation of mechanical energy in a system.*

***Open the Colorado Phet “Skate Park Physics”.***

***1. Place the skater at the top of the half-pipe and press the > button to allow him to move.***

***Make sure he starts from rest!***

1. Describe what happens to the skater:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. ***Turn on the Bar graph and Speed indicator and complete the energy chart below by pausing the motion at the different points indicated:***

|  |  |  |
| --- | --- | --- |
| Top Right of Ramp | Bottom of Ramp | Top Left of Ramp |
|  |  |  |
|  |  |  |

*2. Discuss the energy changes that you see in the bar charts. The bar chart shows the following energies:*

**Energy of motion (Kinetic energy),**

**Energy due to the skater’s height above ground (Gravitational potential energy)**

**Total mechanical energy (Kinetic energy + Gravitational Potential Energy)**

**Thermal Energy (Heat energy generated by friction)**

1. Which energy bar stayed constant ALL THE TIME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Which energy was at a maximum when the skater has a the top of the pipe:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Which energy was at a maximum when the skater was at the bottom of the pipe:\_\_\_\_\_\_\_\_\_\_\_
4. Which energy always stayed at zero? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (This makes sense because there Is no friction here!

*c. Turn on the speed dial. Discuss the skater’s speed at the top and bottom of the pipe***.**

Speed at top of pipe:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Speed at bottom of pipe:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*d. Explain how the speed is connected to the energy values in part c.*

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***3. Click on the Friction Icon at the Bottom of the screen.***

***Run the simulation again with friction in the MIDDLE of the setting range:***

a) Complete the chart.

|  |  |  |
| --- | --- | --- |
| Top Right of Ramp | Bottom of Ramp | Top Left of Ramp |
|  |  |  |
|  |  |  |

*b. Discuss what happens to the skater over time in this case.*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

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*C. Why does the skater eventually stop?*

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***Consolidation Questions:***

1. *Discuss what happens to the form of energy as the skater rolls down the hill. (Hint: discuss the conversion of energy).*

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1. *If there is no friction in the system, what can we conclude about the total mechanical energy?*

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1. *What kind of energy is generated when friction is present?*

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1. *How does friction affect the mechanical energy in the system?*

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