Middle School Energy Skate Park Lesson

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_Period\_\_\_\_\_\_\_\_\_\_\_\_

**ENERGY SKATE PARK**

**Learning Goals**:

* Develop a model to describes how when distance changes, different amounts of potential energy are stored in a system.
* Examine how kinetic and potential energy interact with each other.
* Interpret graphical displays of data to describe the relationships of kinetic energy to the speed of an object
* Describe how energy can be transformed and apply to real world situation.
* Examine how friction affects the motion of objects

Instructions: Open up the PhET simulation “Energy Skate Park Basics.”

Either type in [http://www.colorado.edu/physics/phet/dev/html/energy-skate-park](http://www.colorado.edu/physics/phet/dev/html/energy-skate-park-basics/) or Google “PhET Energy Skate Park Basics.”

Investigate:

1. Play with the simulation and make two observations
2. Click the pie chart function. As the skater moves, at what point on the ramp does the pie chart display 100% kinetic energy?
3. At what point on the ramp does the pie chart display 100% potential energy?

**PART A-Designing a Skate Park**

1. Click on the “**Playground**” tab. Explore the simulation by clicking and dragging the tracks in order to make different loops and hills.
2. List what variables you are able to change in the simulation:

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1. Create a track with at least on hill and one loop. Draw your design in the space below. DO NOT start your skater on your track until you draw it!
2. Place your skater at the top of the track. Did your skater complete the track? Explain what happened in the space below:

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**PART B-Potential Energy and Kinetic Energy**

1. Click on the **“Intro”** tab. Explore the simulation. List the variables that you can change in the space below:

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1. Using the simulation, describe or draw how you can change the amounts of potential energy in the table below. (make sure that you have either the pie chart or bar graph checked):

|  |  |
| --- | --- |
| **Most Potential Energy** |  |
| **Least Potential Energy** |  |

1. Using the simulation, describe or draw how you can change the amount of kinetic energy in the table below:

|  |  |
| --- | --- |
| **Most Kinetic Energy** |  |
| **Least Kinetic Energy** |  |

1. In the table below, describe what happens to the potential and kinetic energy of the skater when he is on different parts of the track (make sure that you have either the pie chart or bar graph checked):

|  |  |  |
| --- | --- | --- |
| **Position of Skater** | **Amount of Potential Energy** | **Amount of Kinetic Energy** |
| High on the track | IncreasesDecreases | IncreasesDecreases |
| In the middle of the track | IncreasesDecreases | IncreasesDecreases |
| At the bottom of the track | IncreasesDecreases | IncreasesDecreases |

1. What patterns do you see in the data to give evidence for a relationship between potential and kinetic energy?

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1. What claim can you make about the relationship between the relationship between kinetic energy and potential energy?

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**SPEED, POTENTIAL ENERGY, KINETIC ENERGY**

1. On the diagram, label where you think the speed of the skater will be the greatest.
2. In the table below, describe what happens to the speed of the skater when he is on different parts of the track (make sure that you have speed checked):

|  |  |  |  |
| --- | --- | --- | --- |
| **Position of Skater** | **Amount of Potential Energy** | **Amount of Kinetic Energy** | **Speed of Skater** |
| High on the track | IncreasesDecreases | IncreasesDecreases |  |
| In the middle of the track | IncreasesDecreases | IncreasesDecreases |  |
| At the bottom of the track | IncreasesDecreases | IncreasesDecreases |  |

1. What patterns do you see in the data to give evidence for a relationship between the relationship between potential energy, kinetic energy, and speed?

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1. What claim can you make about the relationship between the relationship between potential energy, kinetic energy, and speed?

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**TOTAL ENERGY**

11. Support or refute the following with evidence from the simulation: **Energy cannot be created nor destroyed.**

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**PART C-Friction**

1. Click on the **“Friction”** tab. Explore the simulation. List the variables that you can change in the space below:

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1. In the table below, describe the motion of the skater when you change the amount of friction (make sure that you have either the pie chart or bar graph checked):

|  |  |  |
| --- | --- | --- |
| **Action** | **Motion of Skater** | **Observations** |
| Lots of friction | IncreasesDecreases |  |
| No friction | IncreasesDecreases |  |

1. What patterns do you see in the data to give evidence for a relationship between friction and the motion of the skater?

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1. Make a claim about how friction affects the motion of the skater in the space below:

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**PART D-Designing a Skate Park**

* Click on the “**Playground**” tab. If the skater was not able to complete the track, revise your design. Make sure to include one hill and one loop. Draw your revised design in the space below:
* On your design above, label the points on the track where the potential energy of the skater is the greatest (PE).
* Label the points on the track where the kinetic energy of the skater is the greatest (KE).
* Label the points on the track where potential and kinetic energy are equal (PE=KE).
* Label the points on the track where speed is the greatest (S).
* In the space below, explain how potential energy, kinetic energy, and friction affected your track design:

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**Summary, Reflection:**

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| --- | --- |
| 3 | Scientific concepts covered in the simulation: |
| 2 | Examples of how each was used in the simulation: |
| 1 | Questions I still have, interesting things I learned: |