PhET Simulator:
Energy Skate Park!

Name: _____

Date: _____ Period: _____

1) Click on the first image titled "**Intro**"

2) Check the boxes next to "**Bar Graph, Grid** and **Speed**". Place the skater anywhere above **4 meter**s Watch as the skater moves across the track and how it changes the levels of Potential and Kinetic Energy. (You can slow or pause the skater down at the bottom of the simulator window to help you observe).
   a) When is the **gravitational potential energy** the highest? _____ The lowest? _____
   b) When is the **kinetic energy** the highest? _____ The lowest? _____
   c) When are the kinetic and gravitational potential energy levels the ***same***? _____
   d) Can you think of a scenario when the kinetic and gravitational potential energy could both be ***zero***? **Describe** or **draw** how this could be possible below:

3) Change the skater's mass using the slide on the right side. what happens when
   a. the mass is as low as it can go?
   b. as high as it can go?

4) Click on "**Friction**" at the bottom center of the screen and place the skater somewhere on the left side. Let the skater go back and forth until he comes to a stop What did you notice about
   a. Kinetic Energy
   b. Gravitational Potential Energy
   c. Total Energy
   d. Thermal Energy (where does this come from?)

5) At what point did the thermal energy increase most rapidly? Which variable do you think affects thermal energy the most?

6) Click on "**Playground"** at the bottom of the screen. Click and rag the three red dots at the bottom right to the middle of the screen. Click on one circle and hold down. Move the circle to change the track's shape to however you'd like and observe how the track responds. When you feel comfortable manipulating the track, click "**Erase**" (bottom left).
7) Move the circles to make the **right** side of the track **LONGER** than the **left** side of the track. Click on "**bar graph, grid** and **speed**". Move the slider labeled "**friction**" all the way to the left for now
   a) Bring the skater up to various heights on the **left** side of the track (at the top, half way up, etc.) and then observe what happens when you let them go. Do this until you can predict to what height the skater will reach on the right side of the track. Release the skater from a height of 4 meters on the **left** side. How high will he go on the right side?

b) Use the **Law of Conservation of Energy** to explain how you can predict the height that the skater will reach on the ***right*** side depending on where you release them on the ***left*** side:

_____

_____

_____.

8) Now make the **right** side of the track **SHORTER** than the **left** side of the track. What do you think will happen if you release the skater from the top of the left side of the track? Use the relationship between gravitational potential energy and kinetic energy to explain your thinking and then test to see if your prediction was correct:

_____

_____

_____.

9) Now you are going to create your own skatepark! Your mission is to create a track complete with hills, drops and loops that your skater can complete from start to finish without getting stuck! Carefully consider the ***relationship between potential and kinetic energy*** and then sketch your plan below!

10) Once your sketch is complete, test to see if your skater is able to successfully complete the track from start to finish!

a) Was your skater successful on your first attempt? _____

b) If no, indicate on your sketch where your skater became stuck. Then, edit your plan and try again! Indicate any updates you make using a **different color** or **dotted line**- create a key so we can clearly see any changes you've made!

11) On your sketch above, clearly label the points of **greatest PE and KE** and **least PE and KE**.

Bonus: If you have time, click on the button directly beneath the right side of the friction slider. This enables the skater to disconnect from the ramp. See if you design still works with this change. What did you have to change to accommodate this new variable? Sketch your new design below.