**Investigation of Potential and Kinetic Energy**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Review [Potential Energy](https://www.texasgateway.org/resource/potential-and-kinetic-energy-1?binder=95096). Follow the link and click on Potential Energy in the menu bar on the left.
   1. Visit the *Gravitational Potential Energy Interactive* to explore the height the skateboarder will travel at three different starting heights. Based on what you learned, the greater the starting height of the skateboarder, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the gravitational potential energy.
   2. Visit the *Drop Interactive*. Based on what you learned, the greater the mass of an object the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the gravitational potential energy.
2. Review [Kinetic Energy](https://www.texasgateway.org/resource/potential-and-kinetic-energy-1?binder=95096). Follow the link and click on Kinetic Energy in the menu bar on the left.
   1. Visit the *Bowling Ball Interactives*. Based on what you learned, how does velocity affect kinetic energy?
3. Take a virtual ride on the [Millennium Force](https://www.cedarpoint.com/rides/Roller-Coasters/Millennium-Force) at Cedar Point! Select the *video option and press play*.
   1. Describe the forces acting on the rider during the roller coaster ride.
4. What does a roller coaster have to do with science and energy? Check out the energy in a roller coaster ride! Read the article and play the picture on this page to answer the questions below. [How Stuff Works](http://science.howstuffworks.com/roller-coaster3.htm)
5. What is potential energy?
6. At which point is potential energy the greatest?
7. What is kinetic energy?
8. At which point is kinetic energy the greatest?
9. Open the [Interactive Rollercoaster](http://www.pbslearningmedia.org/asset/mck05_int_rollercoaster/). This roller coaster is a model. In real life, not all of the potential energy of the coaster cars is converted to kinetic energy and back again; some mechanical energy is converted to thermal energy. Complete the following questions.
   1. Describe how mechanical energy gets converted to thermal energy along the track.
   2. How does this conversion affect the potential and kinetic energy during the ride?
   3. At which point or points (1-6) was there the greatest amount of potential energy?
   4. At which point or points (1-6) was there the least amount of kinetic energy?
   5. At which point or points (1-6) was there the greatest amount of kinetic energy?
   6. At which point or points (1-6) was there the least amount of potential energy?
   7. What do you notice about the relationship between potential and kinetic energy and the path of the coaster?
10. Take a second virtual ride, this time on the [Top Thrill Dragster](https://www.cedarpoint.com/rides/Roller-Coasters/Top-Thrill-Dragster). Make a sketch (below) of what the roller coaster track looks like. Label the point at which the coaster has the greatest potential energy AND the greatest kinetic energy.
11. What is the best seat on a roller coaster? Why? [Read here!](http://science.howstuffworks.com/transport/engines-equipment/question624.htm)
12. Create your own coaster! Keep in mind all that you have learned about potential and kinetic energy while building your coasters!
    1. [Coaster Creator.](http://dep.disney.go.com/sodi_app/index.html?st=2) 
       1. Draw your final successful roller coaster and label the highest potential energy AND highest kinetic energy on your diagram.
    2. [Build A Super Coaster!](http://content3.jason.org/resource_content/content/digitallab/4859/misc_content/public/coaster.html) Read the directions, “Learn How to Build a Super Coaster” and complete the questions below as you read through the directions.
       1. How are tsunamis and roller coasters similar?
       2. How is mass related to potential energy?
       3. Why is it important to consider mass when building your coaster?
       4. Explain why the height of the first hill is important to the energy of the roller coaster.
       5. Explain how gravity and height affect potential energy.
       6. In turn, explain how gravity and height eventually affect kinetic energy.
       7. Can kinetic energy be converted back into potential energy during the ride?
       8. Explain how you know that kinetic energy is being converted back to potential energy.
       9. What does *DE* stand for and what does it represent?
       10. Build your coaster and test it. Rebuild as necessary! Draw your final successful roller coaster and label the highest potential energy AND highest kinetic energy on your diagram. (Use your results page and the time bar to find the actual number for the highest potential energy and highest kinetic energy.) Record the numbers on your diagram (🡹PE = \_\_\_\_\_, 🡹KE= \_\_\_\_\_).
       11. How did you do? Complete the score box below for your best coaster.

|  |  |  |
| --- | --- | --- |
| Hills |  |  |
| Loops |  |  |
| Difficulty |  |  |
|  | TOTAL |  |
| Screams |  |  |
| Top Speed |  |  |
| Stop Accuracy |  |  |
|  | TOTAL |  |
| TOTAL SCORE | |  |