SCI 215SC - Conservation of Energy

Energy Skate Park Simulation

Purpose: In this lab, you will analyze energy transfer between gravitational potential energy, kinetic energy, and energy lost due to collisions or friction (thermal energy) as a skate boarder rides along a track.

Instructions: Go to http://phet.colorado.edu/en/simulation/energy-skate-park-basics and click the “Run Now” button. The simulation will open in a moment.

Take some time to play with the simulation. Turn on the Bar Graph, Grid, and Speed options on the right side of the screen. Become familiar with the Reset buttons on the right and how to change the speed of the simulation with the buttons on the bottom.

Part I: Introduction
Turn on the Bar Graph, Grid, and Speed options. Set the skater 2 meters above the ground on the ramp and release him. The skater should move back and forth along the track. If this does not happen, try again.

1. What type of energy does the skater have at the 2 meter mark?
2. How high does the skater get on the other end of the ramp?
3. Explain, in terms of the conservation of energy, why the skater will never go higher than your answer to question 2 at this point.

Click the ‘Reset All’ button.

4. If you were to place the skater at the 5 meter mark, how high will the skater go on the other side of the track? Try it to confirm your prediction.
5. How does the skater’s kinetic energy change as he moves down the ramp?

Adapted from Paul Broberg, retrieved from phet.colorado.edu
6. How does the skater’s kinetic energy change as he moves up the ramp?

7. How does the skater’s potential energy change as he moves down the ramp?

8. How does the skater’s potential energy change as he moves up the ramp?

9. How does the skater’s total energy change as he moves down the ramp?

10. How does the skater’s total energy change as he moves up the ramp?

11. Describe the skater’s kinetic energy at the bottom of the ramp.

12. Describe the skater’s potential energy at the bottom of the ramp.

13. Observe the following situations. Draw the possible bar graphs for the situation shown.

Top of the ramp, stopped for just an instant.

Mid-way down the ramp, moving about mid-speed.

3/4 of the way down the ramp, moving pretty fast.

Bottom of the ramp, zooming past the middle.

14. Consider this zany track.
Part II: Analyzing the effects of friction on energy transfer
Now, click the Friction tab and choose to turn on Friction for the skater by checking the box on the right side of the screen. Also, turn on the Bar Graph, Grid, and Speed options on the right side of the screen. Release the skater from the 5 meter mark and observe what happens to the skater.

15. How high does the skater get on the other end of the track on the first pass?

16. What happened to the total energy?

17. Notice how the thermal energy graph increases with each pass the skater makes along the track. What is the relationship between the change in potential energy in one pass and the change in thermal energy of the track?

18. What would change in the simulation if you increased the amount of friction on the track?

19. Over time, the thermal energy in the track will dissipate. Where does this energy go?