

## PHY 221 LAB 05-3: Energy Principle for a Multi-particle System

The purpose of this experiment is to measure the change in the gravitational potential energy of a system and the change in kinetic energy of the system and verify that energy is conserved for the system.

### Experiment

1. Set up an inclined track at a fairly shallow angle.
2. Place the motion detector at the top of the track and place a bumper at the bottom of the track.
3. Select a point on the track and hold the cart at this point on the track.
4. Use a meterstick to measure the height  $y_i$  of the cart at this point on the track.
5. While holding the cart at this point, use Logger Pro and the motion detector to measure the distance of the of the cart from the detector.
6. Select a second point on the track and hold the cart at this point on the track.
7. Measure the height of the cart  $y_f$  at this point.
8. Use the motion detector to measure the distance of the cart from the detector at this point.
9. Hold the cart at the initial point. Click  to begin collecting data and release the cart from rest.
10. Use the graph to determine the instantaneous speed of the cart at the second point,  $v_f$ .
11. Repeat the experiment five times and calculate the average of the measured final speed of the cart at this point.

12. Calculate the change in gravitational potential energy of the cart.

13. Calculate the change in the kinetic energy of the cart. (You'll need its mass!)

14. Is energy conserved? Calculate the % difference.

15. Now, increase the angle of the ramp to make a noticeable increase in the final speed of the cart.

16. Select the SAME two heights that you chose before and repeat the experiment.

17. How does the final speed in this case compare to what you found before?