Teacher Reference

Introduction:
Collisions between objects create some interesting questions about which conservation laws apply. In this lab you will be comparing elastic and inelastic collisions and determining whether momentum and/or kinetic energy are conserved.

Experimental goals:
After completing this experiment, students will be able to describe elastic and inelastic collisions in terms of energy and momentum conservation. They will be able to name the quantities conserved in each type of collision.

Equipment (per group):
Dynamics Track       iBook Computer       Cart Launcher
Vernier LabPro Interface Dynamics Cart       End Stop
2- Motion Detectors  Collision Cart       2- 500 g Masses

Keywords:
Elastic, Inelastic, Conservation, Momentum, Energy

Notes:
Make sure that students do not set the carts on their wheels when the carts aren’t in use. The low-friction wheels will allow the carts to roll off tables easily!
Alignment and background are critical with the motion detector. If students are getting rough data try to eliminate motion in the vicinity while data is being taken and make sure that the motion sensor is aimed correctly. If you put your eye at the aim point, you should be able to see your reflection in the gold motion sensor window.

Answers:
Elastic collisions:
Both momentum and kinetic energy will decrease from before to after the collision, but the change should be small and should be in line with the energy losses seen on the single cart just before the collision. Students should see that the change is so small that momentum and kinetic energy are both conserved.

When cart 1 is more massive than cart 2 it continues in the original direction after the collision. When carts 1 and 2 have the same mass, cart 1 stops and cart 2 moves off at the original speed of cart 1.
When cart 1 is less massive than cart 2, cart 1 goes back the other direction after the collision.

Inelastic collisions:
Momentum should decrease just a small amount, but kinetic energy should drop of greatly. Students will hopefully notice the difference in the small change versus the huge decrease. They should see that kinetic energy is not conserved, but momentum is.