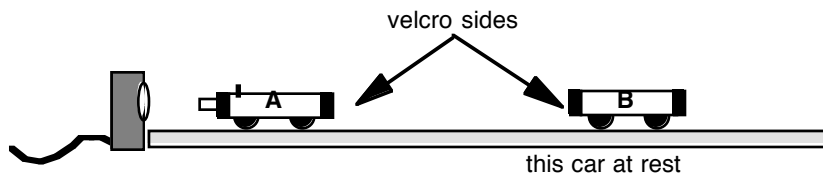


Lab 9-3: Inelastic Collisions

Purpose: To determine if momentum and kinetic energy are conserved in a collision in which two objects stick to each other after the collision.

Materials: 1 track 2 carts 1 500 gram bar

Procedure:



1. Arrange the empty carts so that the velcro ends face each other as shown in the diagram. Start the motion detector and give the cart a little push. Make sure the resulting graph shows the velocity both before and after the collision.
2. Record the velocity of cart A alone, and the velocity of the carts combined. (Probably easiest to do with the "Examine" tool and inspecting the velocity graph just before and after the collision.)
3. Place a 500 gram bar in cart B (the target cart) and repeat.
4. Place the 500 gram bar in cart A instead and repeat.
5. Calculate the momentums and kinetic energies in the rest of the table:

Data and Results:

	Mass (kg)	Initial Velocity (m/s)	Final Velocity (m/s)	Initial Momentum (kg•m/s)	Final Momentum (kg•m/s)	Initial Kinetic Energy (J)	Final Kinetic Energy (J)
Cart A	0.5						
Cart B	0.5	0					
<i>Totals</i>	---	---	---				

Cart A	0.5						
Cart B	1.0	0					
<i>Totals</i>	---	---	---				

Cart A	1.0						
Cart B	0.5	0					
<i>Totals</i>	---	---	---				

Conclusions:

1. Was momentum conserved in these collisions? Explain.

2. Was kinetic energy conserved in these collisions? Explain.

Lab 9-3: Inelastic Collisions

Follow-up Questions:

1. A 2 kg cart traveling at 4 m/s crashes and sticks to a 1 kg cart initially at rest. How fast are the two carts going when they are stuck together?
2. A 2 kg cart traveling at 2.5 m/s crashes and sticks to a 3 kg cart initially at rest. How fast are the two carts going when they are stuck together?
3. A 2 kg cart crashes and sticks to a 1 kg cart initially at rest. If they are going at 2 m/s when they are stuck together, how fast was the first cart going by itself?
4. A 2 kg cart crashes and sticks to a 3 kg cart initially at rest. If they are going at 1.75 m/s when they are stuck together, how fast was the first cart going by itself?
5. A cart traveling at 3.2 m/s collides and sticks to a 1.2 kg cart that is initially at rest. The two carts have a speed of 2.5 m/s right after the collision. What was the mass of the first cart?
6. It turns out that any time two objects collide and stick, kinetic energy is lost. Why? How can energy be conserved then?
7. Imagine a poor moth is floating in the air on the highway. A car comes along and collides with the moth, sadly resulting in the moth being smeared on the windshield of the still moving car.
 - a. Who experienced a greater change in velocity?
 - b. Who experienced a greater acceleration?
 - c. Who experienced a greater force?
 - d. Who experienced a greater impulse?
 - e. Who experienced a greater change in momentum?