**Momentum – Inelastic Collision Lab**

**Purpose**: To determine the effect of an inelastic collision on the momentum of a system.

We will be following the procedure and using the results from <http://www.glencoe.com/sec/science/internet_lab/olc.php?olcChapter=809> for our experiment.

**Data**:

|  |  |
| --- | --- |
| **Cart Number** | **Mass of Cart (kg)** |
| Cart #1 |  |
| Cart #2 |  |
| Cart #3 |  |
| Cart #4 |  |

Note: every 3 frames = 0.1s

Collision #1 (clip 2) – Cart #1 travels and collides with Cart #2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time of approach  (s) | Distance Covered  (m) | Initial Velocity  (m/s) | Mass of approaching Cart(s)  (kg) | Initial Momentum  (kgm/s) | Time of departure  (s) | Distance Covered  (m) | Final Velocity  (m/s) | Mass of departing carts  (kg) | Final Momentum  (kgm/s) |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |

Average Initial Momentum: Average Final Momentum:

Collision #2 (clip 3) – Cart #1 and Cart #3 collides with Cart #2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time of approach  (s) | Distance Covered  (m) | Initial Velocity  (m/s) | Mass of approaching Cart(s)  (kg) | Initial Momentum  (kgm/s) | Time of departure  (s) | Distance Covered  (m) | Final Velocity  (m/s) | Mass of departing carts  (kg) | Final Momentum  (kgm/s) |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |

Average Initial Momentum: Average Final Momentum:

Collision #3 (clip 4) – Cart #1 collides with Cart #2 and Cart #3

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time of approach  (s) | Distance Covered  (m) | Initial Velocity  (m/s) | Mass of approaching Cart(s)  (kg) | Initial Momentum  (kgm/s) | Time of departure  (s) | Distance Covered  (m) | Final Velocity  (m/s) | Mass of departing carts  (kg) | Final Momentum  (kgm/s) |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |

Average Initial Momentum: Average Final Momentum:

Collision #4 (clip 5) – Cart #1 and Cart #3 collide with Cart #2 and Cart #4

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time of approach  (s) | Distance Covered  (m) | Initial Velocity  (m/s) | Mass of approaching Cart(s)  (kg) | Initial Momentum  (kgm/s) | Time of departure  (s) | Distance Covered  (m) | Final Velocity  (m/s) | Mass of departing carts  (kg) | Final Momentum  (kgm/s) |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |
| 0.1 |  |  |  |  | 0.1 |  |  |  |  |

Average Initial Momentum: Average Final Momentum:

**Analyze:**

1. What is the relationship between the calculated initial and final momentums in the systems?
2. According to the Law of Conservation of Momentum, how should the values of the initial and final momentum compare?
3. Our data points may not be the same due to the precision of the instruments, friction, or other variables. Is the initial momentum typically greater than the final momentum? Explain why or why not.
4. Calculate your percent error for each collision. (Percent error = Difference in measurements/Initial measurement × 100%)