Raw Data Sheet

Student Name: _____

Team members:
1.- _____ 2.- _____

3.- _____ 4.- _____

Instructor: _____

One Dimensional Collisions

Length of the sail: _____ (cm)

Table 1.- Columns left to right indicate collision type, car's mass and the time required to travel the length of the sail. The subindices 1 and 2 indicate car number, while i and f refer to the initial and final states. X stands for "not required".

Collision Type	m_1 (g)	m_2 (g)	t_{1i} (s)	t_{1f} (s)	t_{2f} (s)	$t_{2f} + t_{1f}$ (s)
Perfectly Elastic				X		X
Partially Elastic						
Totally Inelastic					X	X

Two Dimensional Elastic Collisions

Frequency of the sparks : _____ (Hz)
Puck's mass : _____ (g)

Table 2.- Raw data: Δl_1 and Δl_2 are the distances between selected points along each track; θ_1 and θ_2 are the angles between the coordinate axes and the velocity vectors. **Note: time is the elapsed time between the selected points.**

State	$\lvert\vec{\Delta}l_1\rvert$ (cm)	θ_1 (degrees)	$\lvert\vec{\Delta}l_2\rvert$ (cm)	θ_2 (degrees)
Initial		zero		
Final				

Introduction[1]

Analysis

One-Dimensional, Perfectly Elastic Collision:

1. Calculate the velocities of Car 1, v_1, and Car 2, v_2. Do this by dividing the length of the sail by the respective times.

2. Calculate the percent error as stated in the analysis section of the lab manual.

One-Dimensional, Partially Elastic Collision:

1. Calculate the initial velocity, v_{1i}, of Car 1 by dividing the length of the sail by the initial time of Car 1. Then determine the initial momentum, p_i, of the system. Note that Car 2 is initially at rest.

[1]This is an adaption from S. Sugaya's original version

2. Calculate the final velocity, v_{1f}, of Car 1 as well as the final velocity, v_{2f}, of Car 2 using the corresponding final times. Determine the momentum separately for each car, and then add them to get the final momentum, p_f, of the system.

3. Calculate the percent error. Use p_i as the theoretical value, and p_f as the experimental value.

4. Calculate the energy loss, Q. Use Equation 7.4 from the lab manual. Make sure to label each kinetic energy accordingly and show your work, as usual!

5. Calculate the fraction of loss to the initial kinetic energy: $\frac{Q}{K_i}$

One-Dimensional Totally Inelastic Collision:

1. Calculate the initial velocity, v_i, and the final velocity, v_f, of the system.

2. Calculate the percent error, where v_i is the theoretical value. Is your percent error close to 50%? Why or why not?

3. Calculate initial, p_i, and final, p_f, momenta of the system as done previously.

4. Calculate the percent error where p_i is the theoretical value and p_f the experimental value.

5. Calculate the fraction of kinetic energy lost, i.e. $\frac{Q}{K_i}$. Use Equation 7.4 from the lab manual.

6. **Show in general** that the theoretical value of $\frac{Q}{K_i}$ is equal to $\frac{1}{2}$. Compare this theoretical value to your experimental value by percent error and explain your result.

Two-Dimensional Elastic Collision:

1. Calculate the initial and final momenta in each x, y direction using Equations 7.10 from the lab manual. Label them accordingly!

2. Calculate the percent error for each component. Note that you should get two percentages.

Conclusion