

Laboratory #4

Momentum

Demolition Derby

Concepts

Momentum; Impulse; Conservation of Momentum; Collisions

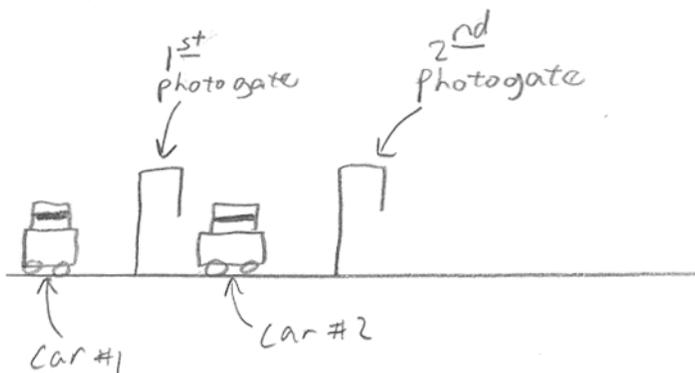
Introduction

Suppose you were standing at the bottom of a long hill and two objects were hurling down the hill toward you. One object is a kid on a skateboard and the other object is a Mack truck. Which one would you rather hit you? The answer is obvious. The reason is because the kid on the skate board has much less momentum, which means that the kid will exert less of an impulse on you when you collide, which means less force, which means less pain, and we all want less pain!

In this Lab you will learn all about collisions and how momentum and impulse play a part. The best way to do this is to actually make things collide, so that is what we will do, make car crashes!

Procedure

- Put a piece of masking tape on each of the following: all 3 carts, each fence(2), each black rectangle mass(3).
- Find the mass of item that has masking tape (be as precise as the scale – to the tenth of a gram!)
- Ensure that the track is level
- Set up the cars as shown in the picture.



- Notice the conditions for the collisions on the Chart below.

Condition	Masses	Type of Collision
A	Car1 = Car 2	Inelastic
B	Car1 > Car 2	Inelastic
C	Car1 < Car 2	Inelastic
D	Car1 = Car 2	Elastic
E	Car1 > Car 2	Elastic
F	Car1 < Car 2	Elastic

- Put the appropriate masses on the cars so that they match the conditions for the first collision (ensure that the cars are within 1 gram of each other).
- Push car #1 toward car #2, stop pushing before the first photo-gate.
- NOTE: the velocity of car 1 should always be between 65 cm/s and 75 cm/s!
- Record the velocities and masses of both cars before and after the collision.
- Repeat for all the collision conditions (if one car is supposed to be more massive than the other car, make it much more massive by putting both black masses on the heavier car).
- Answer the questions.
- Clean up (be sure the masking tape is removed!)

Lab Reporting Sheet Laboratory #4

Name: _____

Date: _____

Demolition Derby

Before the Collision				After the Collision		
Collision	Mass of Car 1	Mass of Car 2	Velocity of Car 1	Velocity of Car 2	Velocity of Car 1	Velocity of Car 2
A						
B						
C						
D						
E						
F						

Before the Collision		After the Collision			
Collision	Momentum	Momentum of Car 1	Momentum of Car 2	Total Mass	Final Momentum
A					
B					
C					
D					
E					
F					

- In Collision A, which car would you rather be in?
- In Collision B, which car would you rather be in?
- In Collision C, which car would you rather be in?
- In Collision D, which car would you rather be in?
- In Collision E, which car would you rather be in?

- **In Collision F, which car would you rather be in?**

- **If you had to choose a car and a collision, which one would you choose? Why?**

- **This experiment shows 2 things you should look for in a “crash safe” car. What are they?**
 - 1.

 - 2.

Explain to your instructor how your data shows that the experi