Name: _____   Date: _____

Factors that Affect Momentum Transfer

Objective: To look at momentum transfer in an elastic collision.

Equipment:
Balls of varying mass and composition   Masking tape
Meter sticks   Balance

Procedure:
Part A:
1. Set up a two meter path that is protected on both sides with a small wall. A ramp should be in front of the path.
2. Mass a ball with a large mass and record in the table below.
3. Place the at the one meter mark of the path. Again, make sure, the path (2 meters total length) should be somewhat protected with a small wall – meter sticks and books can be used to accomplish this.
4. Mass a ball that will roll down the path. It should be of lesser mass than the ball that will be struck.
5. One person will time how long it takes the first ball to roll from the beginning of the path to the point where it strikes the second ball. A second person will time how long it takes the second ball to roll the remaining one meter.
6. Begin rolling balls of different masses down the path while timing the travel of the two balls. Remember the mass of the second ball is constant!

Part B:
1. Repeat procedure A but make the following changes only:
2. The two balls that are used will be the same for each trial. The rolled ball should still be less massive than the struck ball.
3. For each trial, change the angle of the ramp so as to allow it to strike the second ball with different speeds.
4. Do not use the ramp to start the ball. Manually strike it with varying force to allow the first ball to have varying velocities.

Data:

Part A: Changing Mass

Distance of ramp: _____ cm = _____ m

Mass of 2nd ball (ball that is struck) = _____ g = _____ kg

Mass of 1st ball (kg)	Time ball rolls down ramp (s)	Time 2nd ball rolls one meter (s)

Part B: Changing Velocity

Distance of ramp: _____ cm = _____ m

Mass of 1st ball (ball that is rolled) = _____ g = _____ kg

Mass of 2nd ball (ball that is struck) = _____ g = _____ kg

Time ball rolls down ramp (s)	Time 2nd ball rolls one meter (s)

Analysis:
Part A:

1. Use $v = \dfrac{d}{t}$ to determine the velocities of the first and second ball for each trial.
2. Calculate the momentum of each ball for each trial using the mass and velocity that was just calculated.
3. Show your results in a table show below:

Mass Ball 1 (kg)	Velocity Ball 1 (m/s)	Momentum Ball 1 (kg m /s)	Mass Ball 2 (kg)	Velocity Ball 2 (m/s)	Momentum Ball 2 (kg m /s)

Part B:
Perform the same calculations as done in part A, but show them in a separate table.

Conclusion:
Was momentum conserved in this experiment? That is, was momentum fully transferred from one ball to the next? If not, give several reasons why this may not have happened.