

Conservation of Momentum Lab Report

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Introduction

We perform an experiment to verify that the net momentum of a system is conserved under collision.

$$\sum_i p_i = \text{const}$$

In this experiment we have two balls collide under various scenarios and then compare the initial and final momentum of the system.

Methods

Materials:

1. Balls of various masses.
2. A frictionless table.

Setup:

1. Setup the balls on table.
2. Impart some velocity on each of the balls and calculate their momentum.
3. After the balls collide measure their final velocity and momentum.
4. Repeat the experiment with different set of masses and velocities.

Data Analysis

Trial 1	Mass (kg)	Velocity Before (m/s)	Velocity After (m/s)	Momentum Before (kg m/s)	Momentum After (kg m/s)
Ball 1	10	10	-10	100	-100
Ball 2	10	-10	10	-100	100
Total Momentum				0	0

Figure 1: Two moving balls

Trial 2	Mass (kg)	Velocity Before (m/s)	Velocity After (m/s)	Momentum Before (kg m/s)	Momentum After (kg m/s)
Ball 1	15	10	5	150	75
Ball 2	5	0	15	0	75
Total Momentum				150	150

Figure 2: One initially moving ball

Trial 3	Mass (kg)	Velocity Before (m/s)	Velocity After (m/s)	Momentum Before (kg m/s)	Momentum After (kg m/s)
Ball 1	10	10	5	100	50
Ball 2	10	0	5	0	50
Total Momentum				100	100

Figure 3: Two connected balls

Trial 4	Mass (kg)	Velocity Before (m/s)	Velocity After (m/s)	Momentum Before (kg m/s)	Momentum After (kg m/s)
Ball 1	5	20	2.727	100	13.636
Ball 2	50	1	2.727	50	136.364
Total Momentum				150	150

Figure 4: Balls moving in same direction

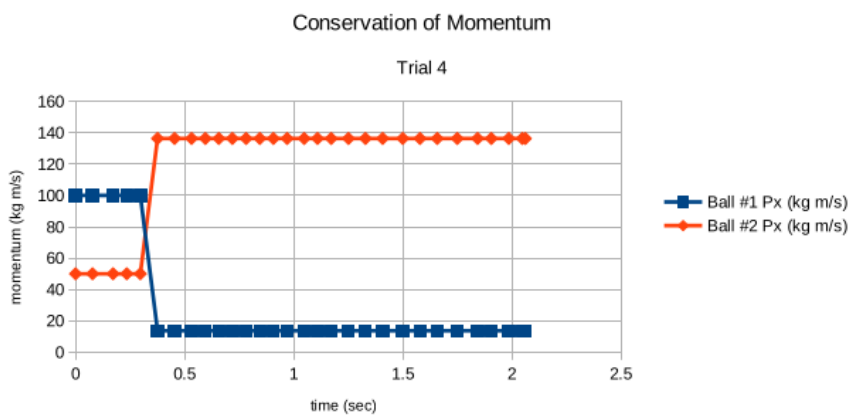


Figure 5: Trial 4 - Momentum Graph

Discussion of results

Each trial in the experiment strongly suggests that the momentum of a system of bodies is conserved when no external forces act on it. We see that as the momentum of one ball decreases, the momentum of the other ball increases by the same amount, conserving the total momentum of the system.

Conclusion

The experiment has successfully demonstrated that under various conditions the total momentum of a system is conserved.