

Momentum and Collisions Auxilliary Items

For Balloon Toss Lab

(Tape the following into your Post-Lab Question section and complete.)

Post-Lab Questions:

Assume that we were able to collect the following table of data for a balloon toss lab. The table represents numerical values for force, time, mass, velocity change, impulse, and momentum change for various catches of a balloon. Use the table to answer the following questions.

	Mass (kg)	Δ Velocity (m/s)	Δ Momentum (kg m/s)	Impulse (N s)	Force (N)	Time (s)
a.	0.50	-4.0				0.010
b.	0.50			-2.0		0.100
c.	0.10		-0.40			0.010
d.	0.20	-8.0			-80	
e.	0.50				-400	1.0
f.	0.50	-8.0				0.010

1. Use the impulse-momentum change theorem (and the definitions of impulse and momentum change) to fill in the above table.
2. The force required to stop a balloon is dependent upon the mass, velocity change, and collision time. Use the data in the table above to express your understanding of these relationships.
 - a. What effect does a ten-fold increase in time have upon the subsequent force which is required to change an object's momentum (assuming other quantities are constant)?

Identify at least one set of two rows which illustrate this cause-effect relationship.

- b. What effect does a five-fold increase in mass have upon the subsequent force which is required to change an object's momentum (assuming other quantities are constant)?

Identify at least one set of two rows which illustrate this cause-effect relationship.

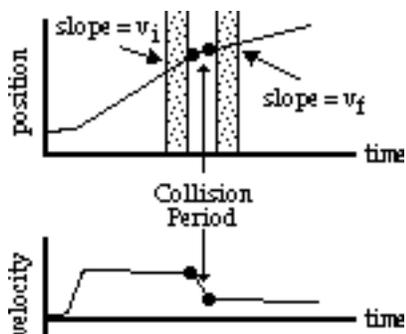
- c. What effect does a two-fold increase in velocity change have upon the subsequent force which is required to change an object's momentum (assuming other quantities are constant)?

Identify at least one set of two rows which illustrate this cause-effect relationship.

For the Inelastic Collision Analysis Lab

(Tape the following into your Data section and complete.)

Orient the carts so that their Velcro strips are facing each other. Conduct a number of inelastic collisions on the low-friction track. Vary the mass of the *carts* using bricks ($m_{\text{cart}} = 0.25 \text{ kg}$; $m_{\text{brick}} = 0.25 \text{ kg}$). Use the motion detectors and the Logger Pro software to determine speeds of the moving carts. Identify the collision location by carefully observing the two graphs. Determine the speed of the carts immediately before and immediately after each collision. One way to determine the speed values is to highlight the graph during the 0.1-0.2 second prior to the collision and then to click on the **Linear Fit** button on the Button strip at the top of the page. Take care to obtain reasonable and representative speed values. **Note:** the motion detectors cannot detect objects located within 40 cm of the detector.



Primary Data:

Trial	m ₁ (kg)	m ₂ (kg)	Before Collision		After Collision
			v ₁ (m/s)	v ₂ (m/s)	v ₁ = v ₂ (m/s)
1				0	
2				0	
3				0	
4				0	
5				0	

Secondary Data:

Trial	Before Collision			After Collision			Δ Momentum	
	p ₁ (kg•m/s)	p ₂ (kg•m/s)	p _{total} (kg•m/s)	p ₁ (kg•m/s)	p ₂ (kg•m/s)	p _{total} (kg•m/s)	Δ p ₁ (kg•m/s)	Δ p ₂ (kg•m/s)
1		0						
2		0						
3		0						
4		0						
5		0						

For AAA Lab

(Tape the following into your BBB section and complete.)