

# COL Worksheet

revised 21 February 2008

Your Name: \_\_\_\_\_ Signature: \_\_\_\_\_

Lab partner(s): \_\_\_\_\_

Course & Section: \_\_\_\_\_ Station # \_\_\_\_\_ Date: \_\_\_\_\_

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## Section D. Procedure

1. What are the masses of your two carts, gratings, and mass bars?

$m_{\text{cart1}} = \text{_____} \pm \text{_____}$  (units)

$m_{\text{cart2}} = \text{_____} \pm \text{_____}$  (units)

$m_{\text{grating1}} = \text{_____} \pm \text{_____}$  (units)

$m_{\text{grating2}} = \text{_____} \pm \text{_____}$  (units)

$m_{\text{bar1}} = \text{_____} \pm \text{_____}$  (units)

$m_{\text{bar2}} = \text{_____} \pm \text{_____}$  (units)

2. What is the average velocity for each photogate? Remember that if the two don't agree, you will have to find their ratios and adjust the velocities of all subsequent velocity measurements.

$v_{\text{photogate1}} = \text{_____} \pm \text{_____}$  (units)

$v_{\text{photogate2}} = \text{_____} \pm \text{_____}$  (units)

## Section E Analysis

3. Record your data in the tables below. Do not forget to include the directions for the vector quantities.

### Collision 1

	Cart 1 before collision	Cart 1 after collision	Cart 2 before collision	Cart 2 after collision
Mass (kg)	$\text{_____} \pm \text{_____}$	$\text{_____} \pm \text{_____}$	$\text{_____} \pm \text{_____}$	$\text{_____} \pm \text{_____}$
Velocity (m/s)	$\text{_____} \pm \text{_____}$	$\text{_____} \pm \text{_____}$	$\text{_____} \pm \text{_____}$	$\text{_____} \pm \text{_____}$
Momentum (kg m/s)				
Kinetic energy (J)				

$\epsilon_p = \text{_____}$

$\epsilon_k = \text{_____}$

### Collision 2

	Cart 1 before collision	Cart 1 after collision	Cart 2 before collision	Cart 2 after collision
Mass (kg)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Velocity (m/s)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Momentum (kg m/s)				
Kinetic energy (J)				

$$\epsilon_p = \underline{\hspace{2cm}}$$

$$\epsilon_k = \underline{\hspace{2cm}}$$

### Collision 3\*

	Cart 1 before collision	Cart 1 after collision	Cart 2 before collision	Cart 2 after collision
Mass (kg)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Velocity (m/s)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Momentum (kg m/s)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Kinetic energy (J)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____

$$\epsilon_p = \underline{\hspace{2cm}}$$

$$\epsilon_k = \underline{\hspace{2cm}}$$

### Collision 4

	Cart 1 before collision	Cart 1 after collision	Cart 2 before collision	Cart 2 after collision
Mass (kg)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Velocity (m/s)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Momentum (kg m/s)				
Kinetic energy (J)				

$$\epsilon_p = \underline{\hspace{2cm}}$$

$$\epsilon_k = \underline{\hspace{2cm}}$$

### Collision 5

	Cart 1 before collision	Cart 1 after collision	Cart 2 before collision	Cart 2 after collision
Mass (kg)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Velocity (m/s)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Momentum (kg m/s)				
Kinetic energy (J)				

$$\Delta p = \underline{\hspace{2cm}} \text{ Kg.m/s}$$

$$\Delta K = \underline{\hspace{2cm}} \text{ J}$$

**Collision 6**

	Cart 1 before collision	Cart 1 after collision	Cart 2 before collision	Cart 2 after collision
Mass (kg)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Velocity (m/s)	_____ ± _____	_____ ± _____	_____ ± _____	_____ ± _____
Momentum (kg m/s)				
Kinetic energy (J)				

$$\Delta p = \text{_____ Kg.m/s.}$$

$$\Delta K = \text{_____ J.}$$

4\*. Write out the error analysis for collision 3 to find the uncertainties in momentum and kinetic energy.

5. For the elastic collisions, did your data fit the conservation of energy and momentum model? Explain.

6. For the inelastic collisions, did your data fit the conservation of momentum model? Explain. What was the relative energy loss? Where did the energy go?

7. For the “explosion,” did your data fit the conservation of momentum model? Explain. What was the energy gained?

**GRADE:** \_\_\_\_\_  
(out of 30 points)

**GRADED BY** \_\_\_\_\_  
(TA's initials)