Name: ______________________________ BU ID: _______________ Lab Section: ______
Partner's name: ______________________ BU ID: ______________ Date: _____________
TF's signature: _______________________

PY105 Momentum, Energy, and Collisions (MBL) Report Sheet

Fill in all the blanks and answer all the questions. Check with your TF to make sure that you have done everything before you leave.

Part I. -- Measurements

Mass of plunger cart: ______ Mass of collision cart: _____ Extra mass: ______

Perform at least 10 trials including the 9 trials described in the manual.

Table 1. Fill the empty boxes in the table. Remember that velocity is a vector. Give your measurement by taking right to be positive. (**1.78 points maximum**: 0.04 point × 43 + 0.01 point × 12 for the last two lines. This includes 0.06 bonus points)

Trial	Mass of cart 1 (kg)	Mass of cart 2 (kg)	Velocity of cart 1 before collision (m/s)	Velocity of cart 2 before collision (m/s)	Velocity of cart 1 after collision (m/s)	Velocity of cart 2 after collision (m/s)
1			0			
2			0			
3			0			
4			0			
5			0			
6			0	0		
7			0	0		
8			0			
9			0			
10						
11**(See Q4 below)**						

Part II Data Analysis

Fill the tables below by using momentum = mv and kinetic energy, KE = $mv^2/2$. Note that momentum is a vector. Give your measurement by taking right to be positive.

Table 2. (**1.98 points maximum:** 0.04 point × 48 + 0.01 point × 12 for the last two lines where data in the last column is not counted. This includes 0.06 bonus point.)

Trial	Momentum of cart 1 before collision (kg·m/s)	Momentum of cart 2 before collision (kg·m/s)	Momentum of cart 1 after collision (kg·m/s)	Momentum of cart 2 after collision (kg·m/s)	Total momentum before collision (kg·m/s)	Total momentum after collision (kg·m/s)	Ratio of total momentum after/before
1	0						
2	0						
3	0						
4	0						
5	0						
6	0	0			0		undefined
7	0	0			0		undefined
8	0						
9	0						
10							
11**(See Q4 below)**							undefined

Table 3. (**1.98 points maximum:** 0.04 point × 48 + 0.01 point × 12 for the last two lines where data in the last column is not counted. This includes 0.06 bonus point.)

Trial	KE of cart 1 before collision (J)	KE of cart 2 before collision (J)	KE of cart 1 after collision (J)	KE of cart 2 after collision (J)	Total KE before collision (J)	Total KE after collision (J)	Ratio of total KE after/before
1	0						
2	0						
3	0						
4	0						
5	0						
6	0	0			0		undefined
7	0	0			0		undefined
8	0						
9	0						
10							
11**(See Q4 below)**							undefined

(0.4 point) Q1. (a) When you rolled one cart along the track and measured the cart's velocity at several consecutive times, what did you observe? (0.1 point) (b) Was momentum conserved? (0.1 point) (b) Explain if you think that the Law of Conservation of Momentum applies here.(0.2 point)

(0.84 point) Q2. (a) Did you observe the momentum to be very close (within about 15%) to being conserved in the trails where the carts do not stick together after the collision? (0.1 point) (b) Do we expect momentum to be conserved in such situations if friction and air resistance can be ignored? (0.2 point) (c) State how Newton's second law is related to the law of conservation of momentum. (0.34 point) (d) Does it make a difference if the carts stick to each other or bounce from each other? (0.2 point)

(0.52 point) Q3. (a) You observe the kinetic energy to be better conserved in collisions where …

(0.13 point) [ ] the carts bounce off from each other after the collision. [ ] the carts stick to each other after the collision.

Elastic collisions are the ones in which KE(final/initial) = 1. But in practice, there are losses. Let's allow for 15% losses, and count those collisions where 100% ≥ KE(final/initial) ≥ 85% to be elastic. Then,

(b) the collision you found for trial 1 is …

(0.13 point) [ ] super-elastic [ ] elastic [ ] inelastic [ ] completely inelastic

(c) the collisions you found for trials 4 and 5 are …

(0.13 point) [ ] super-elastic [ ] elastic [ ] inelastic [ ] completely inelastic

(d) From your result, the collisions you found for trials 6 and 7 are …

(0.13 point) [ ] super-elastic [ ] elastic [ ] inelastic [ ] completely inelastic

(0.5 point) Q4. Is it possible to set up a collision in which two moving carts both stop after the collision even if there is no friction? If your answer is yes, state a condition for the collision. (0.2 point) Would momentum (0.15 point) and kinetic energy (0.15 point) be conserved in this collision? **Show you data in Tables 1 to 3 for Trial 11**.

Pre-lab: ____________________________ (10 × 20% = 2 points)

Lab: ______________________________________ (10 × 80% = 8 points)

- Punctuality (1 ponint) + performance (1point): ________________ (2 points)
- Report sheet ______________________________ (8 points)

Total: _________________________________

TF: ___________________________________ Grader: ________________________________