Name: _____ Section #: _____ Date: _____

Conservation of Momentum and Energy

Part 1

Collision 1

Prediction

For the first, inelastic collision of two carts with equal masses, how will the velocity of the carts after collision compare to the initial velocity of the impact cart? Why will you expect it to be this way? (Sketch a diagram of the inelastic collision. Show the directions of the initial and final velocities. Identify the masses of the carts.)

After the Experiment

Discuss whether any of your group members' predictions match the experimental results. Write the major points of your discussion below.

Collision 2

Prediction

For the second, inelastic collision of two carts with unequal masses, how will the velocity of the carts after collision compare to the initial velocity of the impact cart? Check the values of the masses first to make a more accurate prediction. Why will you expect it to be this way? (Sketch a diagram of the inelastic collision. Show the directions of the initial and final velocities. Identify the masses of the carts.)

After the Experiment

Discuss whether any of your group members' predictions match the experimental results. Write the major points of your discussion below.

Collision 3

Prediction

For the third, elastic collision of two carts with equal masses, how will the velocity of the carts after collision compare to the initial velocity of the impact cart? Why will you expect it to be this way? (Sketch a diagram of the elastic collision. Show the directions of the initial and final velocities. Identify the masses of the carts.)

After the Experiment

Discuss whether any of your group members' predictions match the experimental results. Give an example of this type of collision from your life experience. Write the major points of your discussion below.

Collision 4

Prediction

For the fourth, elastic collision of two carts with unequal masses, how will the velocity of the carts after collision compare to the initial velocity of the impact cart? What direction will the carts move after the collision? Why will you expect it to be this way? (Sketch a diagram of the elastic collision. Show the directions of the initial and final velocities. Identify the masses of the carts.)

After the Experiment

Discuss whether any of your group members' predictions match the experimental results. Write the major points of your discussion below.

Show Your Work

Part 2

Below, provide formulas and calculations of initial momentum for carts 1 and 2 ($\mathbf{p}_{1\mathrm{i}}$ and $\mathbf{p}_{2\mathrm{i}}$), final momentum for carts 1 and 2 ($\mathbf{p}_{1\mathrm{f}}$ and $\mathbf{p}_{2\mathrm{f}}$), total momentum of the system before the collision ($\mathbf{p}_{\mathrm{i}}$), total momentum of the system after the collision ($\mathbf{p}_{\mathrm{f}}$), and relative percent change in momentum ($\Delta\mathbf{p}/\mathbf{p}_{\mathrm{i}} \cdot 100\%$) for one of the collisions using the exact data entered in Table 1. Split collisions between each group member to be sure that no one does calculations for the same collision. Complete Table 2 in the Inlab using the results calculated by each group member.

Part 3

Below, provide formulas and calculations of initial kinetic energy for carts 1 and 2 (K_{1i} and K_{2i}), final kinetic energy for carts 1 and 2 (K_{1f} and K_{2f}), total kinetic energy of the system before the collision (K_i), total kinetic energy of the system after the collision (K_f), and relative change in kinetic energy ($\Delta K/K_i \cdot 100\%$) for one of the collisions using the exact data entered in Table 1. Split collisions between each group member to be sure that no one does calculations for the same collision. Complete Table 3 in the Inlab using the results calculated by each group member.

Conclusion

Provide a clear statement about whether the objective of the Conservation of Momentum and Energy lab was met. Do your experimental results confirm the validity of the Law of Conservation of Momentum? Based on your experimental data, did the Law of Conservation of Mechanical Energy hold true in all types of collisions? Support all your answers with evidence.

Have your TA sign this worksheet below and then upload it to the Inlab.

TA Signature: _____