Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Creativity in Physics PHYS13796GD – Simulation #2: Collisions**

1. What are Newton’s three laws of motion?
2. Newton’s Cradle
   1. Describe what you observe with each of the following seven collision tests:

|  |  |  |
| --- | --- | --- |
|  | Action: | Description of Results: |
| 1 | One ball is lifted and dropped at one end: |  |
| 2 | Two balls are lifted and dropped at one end: |  |
| 3 | Three balls are lifted and dropped at one end: |  |
| 4 | Four balls are lifted and dropped at one end: |  |
| 5 | One ball each lifted and dropped simultaneously at both ends: |  |
| 6 | Two balls each lifted and dropped simultaneously at both ends: |  |
| 7 | One ball at one end and two balls at the other end lifted and dropped simultaneously: |  |

* 1. Are the collisions you are observing elastic or inelastic collisions? Explain your answer.

1. Collisions: balls of different masses

Open the ‘Collision Lab’ simulation provided on SLATE and select ‘Explore 1D’.

* On the menu on the right-hand side, turn off ‘Reflecting border’ and turn on ‘Velocity’ and turn on ‘Values’.
* Set Masses at bottom of screen as: ball 1 (blue) = 3.00 kg and ball 2 (pink) = 0.10 kg.
* Click and drag each of the balls so that ball 1 is at position 0.5 m from the left, and ball 2 is at position 0.5 from the right.
* Click and drag the green velocity vector for each of the balls so that ball 1 has a velocity of 1.00 m/s to the right, and ball 2 has a velocity of 1.00 m/s to the left.
  1. Record the momentum (p) for each of the balls before collision and calculate the total momentum of the system. Remember that ball 2 will be moving in the opposite direction as ball 1, so its momentum is negative.

Ball 1 = \_\_\_\_\_\_\_\_\_\_\_ kg m/s Ball 2 = \_\_\_\_\_\_\_\_\_\_\_\_\_ kg m/s

Total p before collision = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kg m/s

* 1. Click the ‘slow’ button and then click the ‘play’ button to start the collision. After the balls have collided, click the ‘pause’ button to stop the animation.
  2. How have the velocities changed for the two balls after collision?

Ball 1 = \_\_\_\_\_\_\_\_\_\_\_\_\_m/s Ball 2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m/s

* 1. Record the momentum (p) for each of the balls after collision and calculate the total momentum of the system.

Ball 1 = \_\_\_\_\_\_\_\_\_\_\_\_\_ kg m/s Ball 2 = \_\_\_\_\_\_\_\_\_\_\_\_\_ kg m/s

Total p after collision = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kg m/s

* 1. In what direction are the two balls travelling after collision?
  2. How does this simulation prove the Law of Conservation of Momentum?

1. Which of Newton’s Laws of Motion describes Conservation of Momentum and Energy?
2. What would be a real-world application or scenario in which the concept of Conservation of Momentum and Energy and its formulas would be used?