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PHYS 211X
Lab 6: Momentum, 3/7/2023, Partners: Maite Valentin-Lugo, Seth Waln

Part 1

1.

$$\vec{p} = m\vec{v} \tag{1}$$

Momentum is derived as the mass of an object times its velocity.

$$\vec{F_{net}} = \frac{d\vec{p}}{dt} \tag{2}$$

The net force of a system is the rate of change of the momentum.

$$\vec{p_i} = m_1\vec{v_{1f}} + m_2\vec{v_{2f}} \tag{3}$$

The total momentum of a system where an elastic collision occurs is the sum of the masses times their velocities, both at the beginning and at the end.

2. The small glider will move back in the direction it came and the large glider will travel with a smaller magnitude to the right than the mall glider initially had.

3. The experiment mimicked what I guessed would happen.
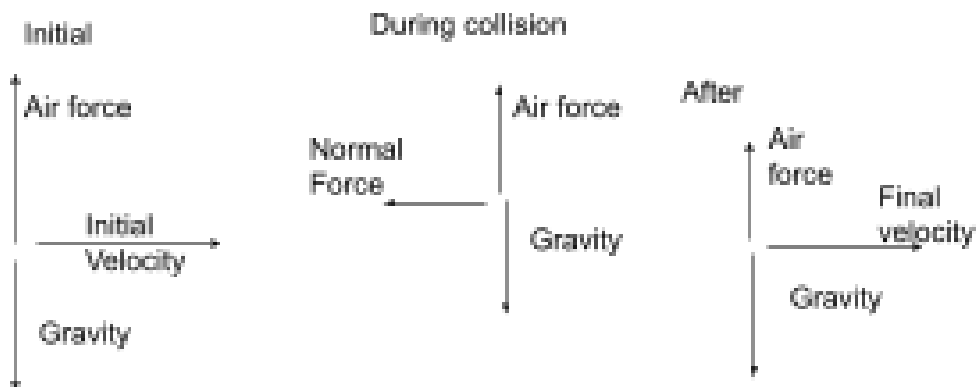
4.
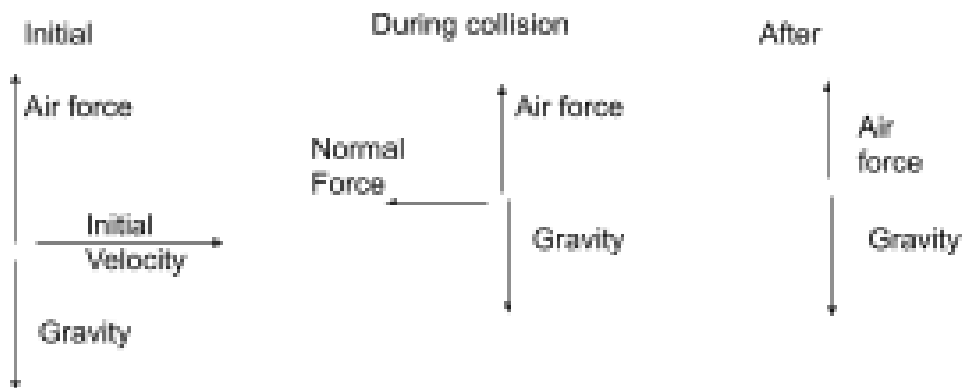
5. The larger glider had a larger velocity after the collision.

6. The smaller glider has a much larger velocity after the collision than the larger glider.

7. The gliders will stick together and travel at a reduced velocity.

8. The results were as predicted, although the nature of the tape caused some strange behavior between the carts on impact.
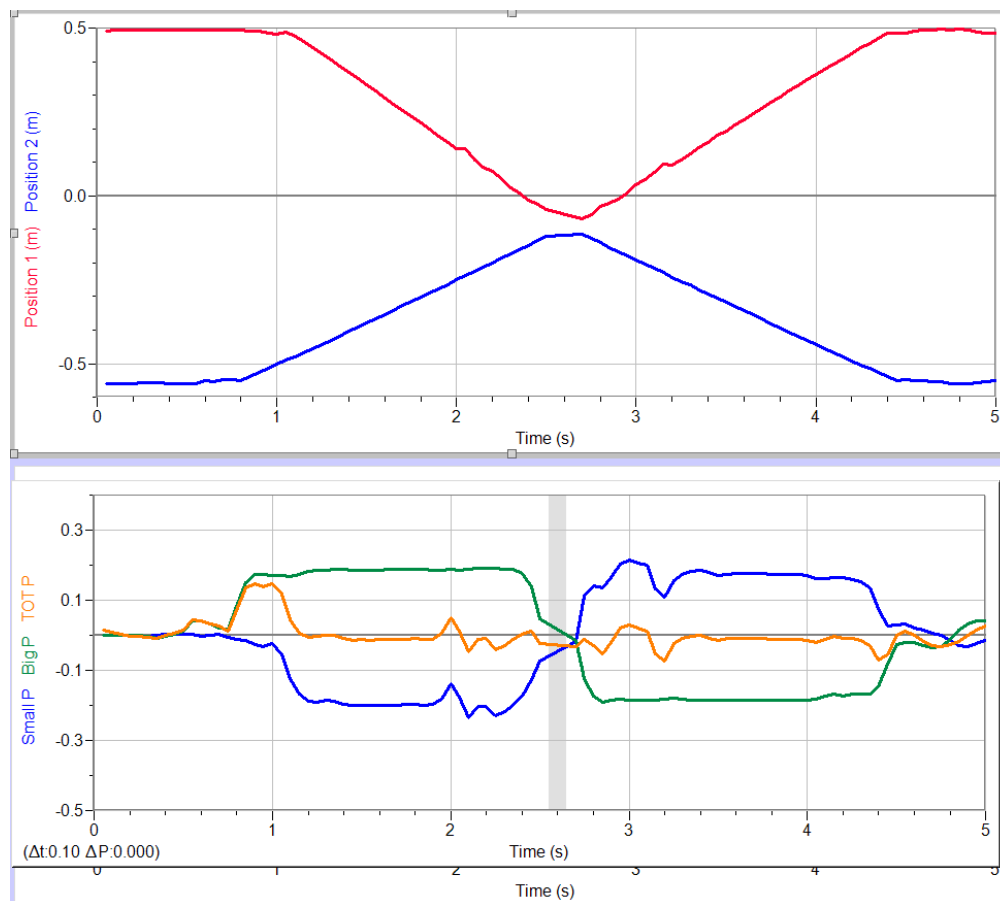
1

9.

10.   Larger cart: 0.7321 kg

Smaller cart: 0.5223 kg

11.

Momentum was conserved as the total P was not noticeably reduced after the collision.

	mass	Momentum before collision	Momentum after collision			Total momentum of system (small glider + large glider)
Small glider	522.3g	-0.197	0.1738		Before collision	-0.008722
Large glider	732.1g	0.1873	-0.1849		After collision	-0.009416

12., 13., 14.

The total P after the collision was the negative of the total initial momentum, with a relatively small margin of error.
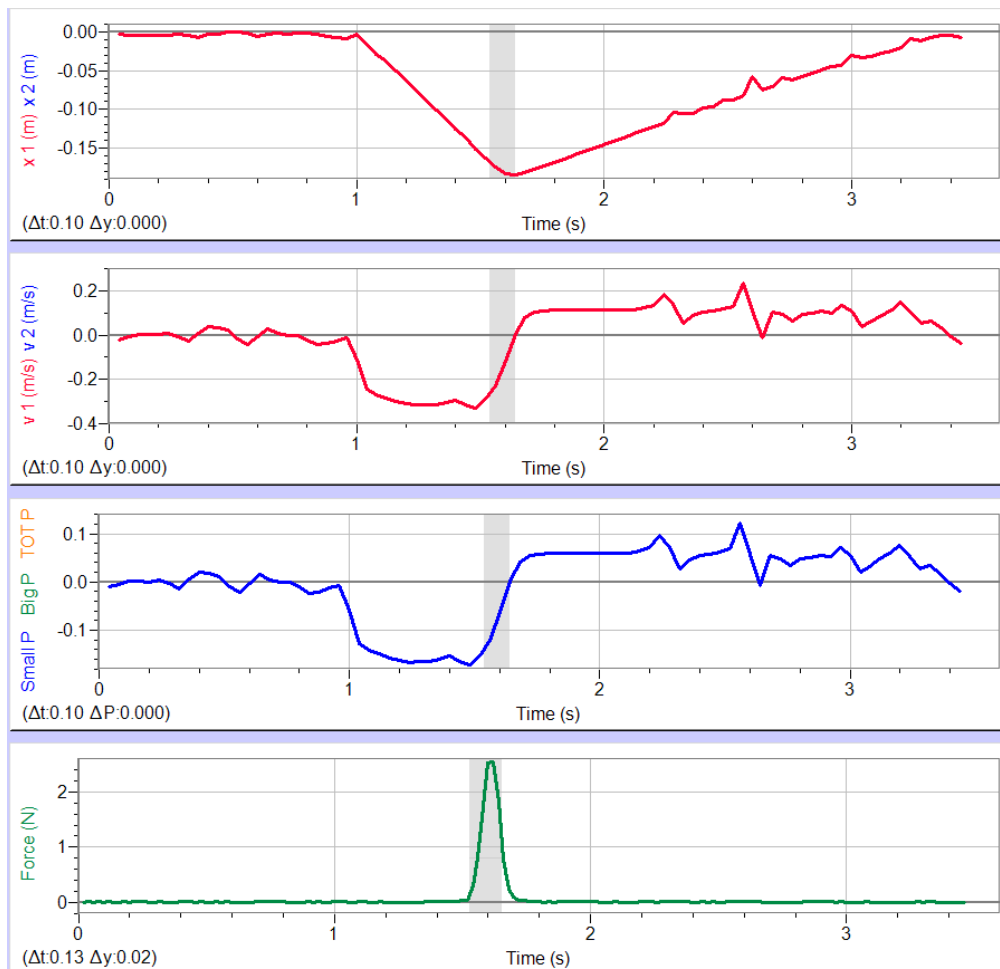
15.

16.

Initial: -0.3058m/s * 0.5223kg = -0.1597 (kg*m)/s

Final: 0.113m/s*0.5223kg = 0.0590 (kg*m)/s

0.0590 - -0.1597 = 0.2187 N*s

17. Integral for: Latest | Force

Integral: 0.2213 N*s

22d
2q
ld

qd
qw

18. In order for momentum to be conserved, there must be no way the system can leak energy out of itself, such as through air resistance or friction.

19. The force itself on the carts was the same, although because of the difference in mass, both carts were left with a final velocity that was different in magnitude from each other.

20. No, momentum was not conserved as the magnitude of both momentums after the collision were both lower than the momentum before the collision, thus a leak of energy occurred and the system did not conserve its momentum.

21. The mass of the carts, the inaccuracy of the sensor, and the several external forces such as air resistance all act as sources of uncertainty.

22. The force between the cart and the force probe was the same.

23. The Δp was 0.3%. Because of the stability of the data measurements and sheer volume of data it's working on, the one derived from force.