**Thomas the Train collision lab**

**Purpose:** The purpose of this lab is to measure the momentum before and after to see if momentum is conserved. Another purpose is to measure gravitational potential energy to see if it is conserved throughout the collision.

**Materials:**

* Thomas the trains and track
* photogate timers
* books and rulers

**Procedure:**

1. Set up the Thomas the train track on one of the lab stations.
2. Using two physics books, set up 1-2 tracks on the books for a ramp. Be sure to tape the tracks together to minimize any bumps in the track.
3. Measure the mass of each Thomas the train. Put it in the data table.
4. You will be doing this experiment in two steps. You will be putting both photogate timers right before impact.
   1. You want the instantaneous momentum just before it hits the stationary object and the instantaneous momentum when it collides.
   2. Momentum will not be an average over time.
5. Put Thomas #2 on the bottom of the track. Make sure this Thomas is flat on the table. This will be your reference point of where to put the 2 photogate timers right before impact.
6. Put Thomas #1 at the top of the track. Without pushing it, let go of Thomas. Record the time and distance between the 2 photogate timers. Repeat 14 more times and find an average. Enter this data into the table.
7. Put Thomas #2 on the bottom again. This time move the photogate timers to the back of Thomas #2. You will be measuring the distance and time of the impact of the two Thomas trains.
8. Do step #7 15 times. Find an average.
9. Find the gravitational potential energy of Thomas #1 from the center of its mass to the table top in meters. Enter this number into the data table.
10. Calculate the amount of KE right before impact and right after impact. Find how much energy was lost to friction and collision.

**Data and Observations:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Trial | Thomas #1  mass (kg) | Thomas #1  distance (m) | Thomas #1  time initial (s) | Thomas #1  time final (s) | Thomas #1 and 2  mass (kg) | Thomas #1 and 2  distance (m) | Thomas #1 and 2  time initial (s) | Thomas # 1 and 2 time final (s) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial | Velocity Thomas #1  (m/s) | Momentum  Thomas #1 | Velocity Thomas #1 and 2 (m/s) | Momentum Thomas #1 and 2 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Gravitational  Potential energy | Kinetic energy Thomas #1 | Kinetic energy Thomas #1 and 2 | Change in energy GPE – KE1 | Change in energy KE1 – KE1,2 | Change in energy GPE – KE1,2 |

**Conclusion:**

**Errors:**