**Physics 207**

**11/14/2016**

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**Title:** Lab 5- Linear Momentum

**Introduction**

The purpose of this lab is to clearly show how linear Momentum works, and also how to calculate the distance, velocities and heights. Also we had to find if linear momentum is conserved before and after collision. In order to investigate this we will utilize a steel ball a ramp and a wooden block. The ball will be used to collide with the block that will be at the end of the ramp. By allowing the ball roll down the ramp we will try to ascertain the momentum before and after collision and compare the results. We expect that following this comparison, it will be shown that momentum conserved

**Data and Calculations:** Experiment

**Experiment 1:**

Pi=mbVb (momentum) Vb=(r/t) (velocity),

t=sqrt(2b/g) (time) mb= 0.668 kg (mass),

b= 0.145 m (ball drop distance)

**Chart Value For (r)**

|  |  |
| --- | --- |
| Trial  1  2  3  4  5  6  7  8  9  10 | r (m)  0.245  0.245  0.248  0.245  0.245  0.245  0.246  0.242  0.244  0.245 |

r(avg)= 0.245 m (From the Chart Value For (r)

t=sqrt(2(0.145)/9.8))

= 0.172 s (time)

Vb=(0.245/0.172)

= 1.425 m/s

Momentum 1= (0.668 kg)(1.425 m/s)

= 0.9519

**Experiment 2:**

y= 0.4 – sqrt( 0.42 – 0.192)

= 0.048 m

Vb+m= sqrt(2gy)

= 0.97 m/s

Momentum 2 = (m+M)( Vb+m)

= 0.7307

Distance h: 0.4 m

x= 0.19 m

y= h – sqrt(h2-x2)

**Report Questions:**

1. How do multiple measurements of r change the uncertainty?

* Multiple measurements of r change the uncertainty because of the experiment of the measurement is decrease of the level and the value of experiment that is lower uncertainty.

1. Within the limits of your experimental accuracy, is momentum conserved during the collision?

* According to the limits, momentum is conserved. Many factors such as measurement accuracy, may have caused the 23% difference between momentum before and momentum after collision.

1. Derive equation (1), starting from general physics principles.

* Vf2 = Vi2 -2gy

Vf **=** velocity after collision= 0 m/s

0 = Vi2 – 2gy

Vi2=2gy

Vi= sqrt(2gy)= equation 1

1. From your results, compute the fractional loss of kinetic energy of translation during impact. Disregard rotational energy of the sphere.

* (KEi -KEf)/KEi **=** (1-(m/(m+M))KEi)/ KEi

= M/(m+M)

= 0.11 (kinetic energy lost)

1. Derive an expression for the fractional loss of kinetic energy of translation in terms only of m and M, and compare with the value calculated in the preceding question. Consider the collision as a totally inelastic one.

* Answer same as (Number 4): 0.11 (kinetic energy lost)

**Conclusion**

All results, by this experiment were an investigation into momentum. Specifically it was done to determine if linear momentum is conserved after Collision. Based on our experiment and results, it seems we have achieved this goal, despite there being a 23% difference between the momentum before and after collision. This difference can be attributed to errors in recording measurements or faults in equipment used. Another cause of difference could be the friction between surfaces.