BIRZEIT UNIVERSITY

Faculty of Science كلية العلوم

Department of Physics دائرة الفيزياء

Phys111 Report

Experiment #2: Conservation of Linear Momentum

Name:	Bayan Saleem Alkamel	**ID #:**	1231030
Partner:		**ID #:**	
Section:	12		
Date:			

(1) Abstract:

Aim of the experiment: Prove the law of conservation of linear momentum p=mv By accounting the ratio for the linear momentum of two balls collisions in isolated system.

The main result is:

$$R = 1.04 \pm 0.04$$

(2) Data:

$m_1 = 16.5 \pm 0.1\ g$ $m_2 = 5.5 \pm 0.1 g$

	1.	2.	3.	4.	5.	6.
$x_{1b}\ (cm)$	48.2	48.5	48.1	48.8	47.1	46.4
$x_{1a}\ (cm)$	27.2	25.7	24.9	25.1	26.2	25.8
$x_{2a}\ (cm)$	74.1	72.2	71.2	73.0	73.7	73.8

(2)Calculations:

$\bar{x}_{1b} = 47.85$ cm	$\sigma_s(x_{1b}) = 0.913783344$ cm	$\Delta\bar{x}_{1b} = 0.373050488$cm≈0.4 cm
$\bar{x}_{1a} = 25.81666667$ cm	$\sigma_s(x_{1a}) = 0.828049918$ cm	$\Delta\bar{x}_{1a} = 0.338049963$cm≈0.3 cm
$\bar{x}_{2a} = 72.93333333$cm	$\sigma_s(x_{2a}) = 1.076413799$cm	$\Delta\bar{x}_{2a} = 0.439444093$cm≈0.4 cm

$A = m_1x_{1a} + m_2x_{2a}$ = (16.5*25.81666667) + (5.5*72.93333333) = 823.8083332g.cm
$\Delta A = m_1\Delta x_{1a} + \Delta m_1x_{1a} + m_2\Delta x_{2a} + \Delta m_2x_{2a}$ = (16.5*0.338049963) +(0.1*25.81666667) +(5.5*0.439444093) +(0.1*72.93333333) =17.8697669g.cm
$B = m_1x_{1b}$ = (16.5) * (47.85) = 789.525 g.cm ≈790
$\Delta B = m_1\Delta x_{1b} + \Delta m_1x_{1b}$ = (16.5*0.373050488) +(0.1*47.85) = 10.94033305 g.cm ≈11
$R = \frac{A}{B} = \frac{823.8083332}{789.525}$ = 1.043422733
$\frac{\Delta R}{R} = \frac{\Delta A}{A} + \frac{\Delta B}{B} = \frac{\Delta R}{1.043422733} = \frac{17.8697669}{823.8083332} + \frac{10.94033305}{789.525}$
ΔR = 0.037092123 ≈ 0.04

(3)Results:

$$R = 1.04 \pm 0.04$$

(4)Conclusions:

R= 1.04 ± 0.04

Discrepancy test→ | True value - Exp.value | ≤ 2ΔR
→ | 1 – 1.04 | ≤ 2×0.04 → 0.04≤0.08 → so, the result is accepted.

The result is accepted, the value I measured is very close to the true value. Its due to many possible reasons:

- **The way that the measurements was took is accurate (note that the measurements has taken from the photos).**
- **I focused on taking measurements from the drill centers perfectly.**

There are many mistakes that I could have made if I had not measured properly.

-But my results not identical this difference can be attributed to various reasons, including if the lower end of the track is not horizontal , it can impact the experiments outcome .as a result, it will cause a slight backward movement of ball number 1, leading to an increased distance between the two balls. Thereby affecting the the measured distance. other factors contributing to the deviation from the actual result include random errors in measurement readings like the possibility of the sand sandbox being slightly displaced , meaning that the distance between the top two balls and the sandbox was not precisely degrees.