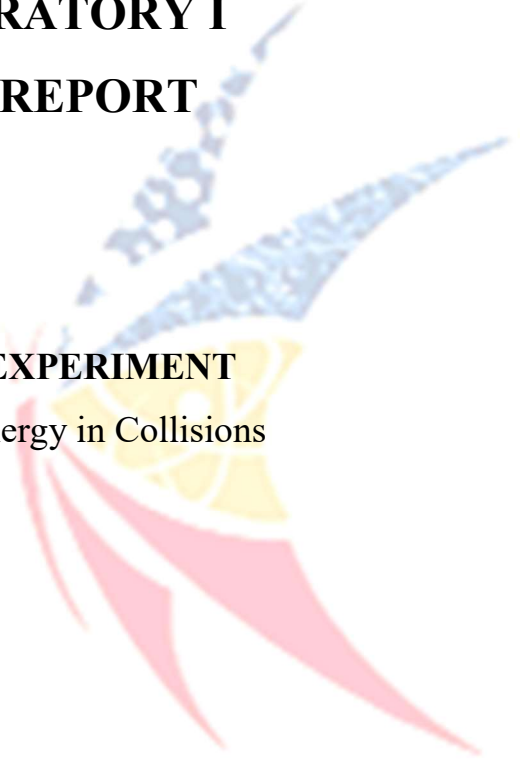


T.C.
GEBZE TECHNICAL UNIVERSITY
PHYSICS DEPARTMENT

PHYSICS LABORATORY I
EXPERIMENT REPORT

THE NAME OF THE EXPERIMENT
Momentum and Kinetic Energy in Collisions

GEBZE
TEKNİK ÜNİVERSİTESİ



PREPARED BY

NAME AND SURNAME :
STUDENT NUMBER :
DEPARTMENT :
GROUP NO :
TEACHING ASSISTANT :
DATE OF THE EXPERIMENT : / /

DATE : / /

Equipment


- Air track with standard accessories
- Air blower
- Two SpeedGates incl. connection cable
- Digital scale
- Two apparatus (cork , needle)
- Various small weights

Experimental Procedure:



Figure 1 : *The experimental set-up Momentum and Kinetic Energy in Collisions*

Elastic collision :

1. On a SpeedGate screen, the upper line is switched using the single dash button **I**, and the lower line is changed using the double dash button **II**. To reset the values on the screen, the **X** button is pressed.
2. Configure SpeedGate-A and SpeedGate-B with "Speed" on the upper line using the single dash button **I**, and "Previous Value" on the lower line using the double dash button **II**.
3. Place SpeedGate-A near one end of the rail, and SpeedGate-B near the other end of the rail.
4. Attach the side apparatus to the front of the one at the end of the glider. 



5. Attach the side apparatus to the middle glider.
6. Add the weights shown in the table to the m_1 and m_2 gliders, write the total weights added to the Table 1.
7. Activate by pressing the red button on the back of the air blower to create a frictionless environment.
8. Gently push the gliders with your fingertip so that it hits the other glider.
9. Write the masses in columns labeled as m_1 and m_2 , and write the velocities before and after the collision in columns labeled as v_1 , v_2 , v'_1 , and v'_2 . Here, v_1 and v_2 represent the velocities before the collision, while v'_1 and v'_2 represent the velocities after the collision.

The weights of the gliders is **200 g**.

Table 1 : *Masses and velocities before and after the elastic collision.*

	m_1 (.....)	m_2 (.....)	v_1 (.....)	v_2 (.....)	v'_1 (.....)	v'_2 (.....)
1						
2		+2				
3	+5					
4		+7				

Calculate momenta $p_{\text{tot. before}}$ and $p_{\text{tot. after}}$ and energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ for each measurement. Find the percentage of energy loss. Calculate the energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ of Exp-1 and Exp-2 using equations (4) and (5), respectively. Write down the intermediate steps.

Exp-1

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Exp-2

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Calculate momenta $p_{\text{tot. before}}$ and $p_{\text{tot. after}}$ and energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ for each measurement. Find the percentage of energy loss. Calculate the energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ of Exp-1 and Exp-2 using equations (8) and (9), respectively. Write down the intermediate steps.

Exp-3

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Exp-4

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Inelastic Collision:

- Remove the apparatus in the front of the end part of the gliders and attach the apparatus in the figure below. Since the cork in the apparatus covers a needle, carefully remove the cork attached to the



apparatus. remove it.

- By removing the apparatus in the middle, attach the apparatus pictured below.



- Start the air blower to create a frictionless environment.
- Accelerate the sled at the end with your hand so that it collides with the other sled.
- Write the masses in columns labeled as m_1 , m_2 and $m_1 + m_2$, and write the velocities before and after the collision in columns labeled as v_1 and v_2 and v'_{system} . Here, v_1 and v_2 represent the velocities before the collision, while v'_{system} represent the velocity after the collision. The weights of the gliders is 200 g.

Table 2 : *Masses and velocities before and after the inelastic collision.*

	m_1 (.....)	m_2 (.....)	$m_1 + m_2$ (.....)	v_1 (.....)	v_2 (.....)	v'_{system} (.....)
1				0		
2		+2		0		
3		+5		0		
4		+7		0		

Calculate momenta $p_{\text{tot. before}}$ and $p_{\text{tot. after}}$ and energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ for each measurement. Find the percentage of energy loss. Calculate the energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ of Exp-1 and Exp-2 using equations (10) and (11), respectively. Write down the intermediate steps.

Exp-1

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Exp-2

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Calculate momenta $p_{\text{tot. before}}$ and $p_{\text{tot. after}}$ and energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ for each measurement. Find the percentage of energy loss. Calculate the energies $E_{\text{tot. before}}$ and $E_{\text{tot. after}}$ of Exp-1 and Exp-2 using equations (12) and (13), respectively. Write down the intermediate steps.

Exp-3

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Exp-4

$$p_{\text{tot. before}} =$$

$$p_{\text{tot. after}} =$$

$$E_{\text{tot. before}} =$$

$$E_{\text{tot. after}} =$$

$$\% \text{ Energy Loss} = \frac{|E_{\text{tot. before}} - E_{\text{tot. after}}|}{E_{\text{tot. before}}} 100 =$$

Conclusion, Comment and Discussion:

(**Tips:** Give detail explanation about what you've learned in the experiment and also explain the possible errors and their reasons.)

-Give detail explanation about what you've learned in the experiment

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-Explain the possible errors and their reasons in the experiment

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Questions

Q1) What kinetic energy and potential energy and write two examples for each?

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Q2) Write two examples of each of elastic and inelastic collision.

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