University of Mohammed Khaidar-Biskra

Faculty of Science and Technology
Common Core in Science and Technology
Module:PW Physics1

Level: 1st Year
First semester 2024/2025

Group :

Date :

Members of the Group:

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Practical Work Report 4: Elastic and Inelastic Collision

a. Élastic shock:

1-Fill in the table. (δt is the time it takes for the tab to pass from **δx=2.5cm**, through the optical barrier, **m_A=295g**).

m_B (gr)	195	295=m_A	395
δt_A (s)			
$\delta t'_A$ (s)			
$\delta t'_B$ (s)			
$v_A = \delta x / \delta t_A$ (m/s)			
$v'_A = \delta x / \delta t'_A$ (m/s)			
$v'_B = \delta x / \delta t'_B$ (m/s)			
$E_{cA} = m_A v_A^2/2$ (J)			
$E'_{cA} = m_A v'^2_A/2$ (J)			
$E'_{cB} = m_B v'^2_B/2$ (J)			
$P_A = m_A . v_A$			
$P'_A = m_A . v'_A$			
$P'_B = m_B . v'_B$			
$(\vec{P}_A + \vec{P}_B)/(\vec{P}'_A + \vec{P}'_B)$			
$(E_{cA} + E_{cB})/(E'_{cA} + E'_{cB})$			

2- According to the results of the table, is there conservation of momentum and kinetic energy?...
....
....

3- Describe the mouvement of the two chariots after the collision according to the values of the masses m_A and m_B?

m_A=m_B...

$m_{A<}$ m_B ....

$m_{A>}m_B$ ....

b. <u>Inelastic Shock</u> :

1-Fill in the table(v_B=0, m_A=195g

m_B (gr)			
δt_A (s)			
$\delta t'_B = \delta t'_A$ (s)			
$v_A = \delta x / \delta t_A$ (m/s)			
$v'_A = \delta x / \delta t'_B = v'_B$ **(m/s)**			
$E_{cA} = m_A v_A^2/2$ (J)			
$E'_{cA} = m_A v'^2_A/2$ (J)			
$E'_{cB} = m_B v'^2_B/2$ (J)			
$P_A = m_A.v_A$			
$P'_A = m_A.v'_A$			
$P'_B = m_B.v'_B$			
$(\vec{P}_A+\vec{P}_B)/(\vec{P'}_A+\vec{P'}_B)$			
$(E_{cA}+E_{cB})/(E'_{cA}+E'_{cB})$			

2- According to the results of the table, is there conservation of momentum and kinetic energy?...
....
....

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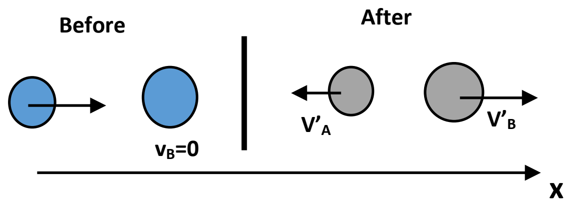
Practical Work N°4: Elastic and Inelastic Collision

1. Objective of the experiment:

The objective of this experiment is to verify that momentum is saved as well as kinetic energy by measuring the velocities of bodies in collision before and after.

2. Collisions:

fig1



In this experiment, we will verify the laws of conservation of momentum and mechanical energy. In collisions, the sum of the forces external to the study system (consisting of two chariots) is zero: $\sum \vec{F}_{ext} = \vec{0} = d\vec{p}/dt$. As a consequence, the momentum p = m v is conserved. Figure 4 shows the diagram of the experiment, where chariot A (velocities v_A) impacts chariot B initially at rest ($v_B = 0$) . Under these conditions, the law of conservation of momentum give:

$$m_A . \vec{v}_A = m_A . \vec{v}'_A + m_B . \vec{v}'_B \qquad (1)$$

Where v'_A and v'_B indicate the velocities of chariots A and B respectively after the collision.

Elastic collisions

In addition to conserving momentum, elastic shocks also conserve energy mechanics. In our case study (with $v_B = 0$):

$$m_A . v^2_A /2 = m_A . v'^2_A /2 + m_B . v'^2_B / 2 \qquad (2)$$

La solution des équations 1 et 2 donne :

$$v'_A = [(m_A - m_B)/(m_A+m_B)] . v_A \qquad (3)$$

$$v'_B = [2\, m_A/(m_A + m_B)] . v_A \qquad (4)$$

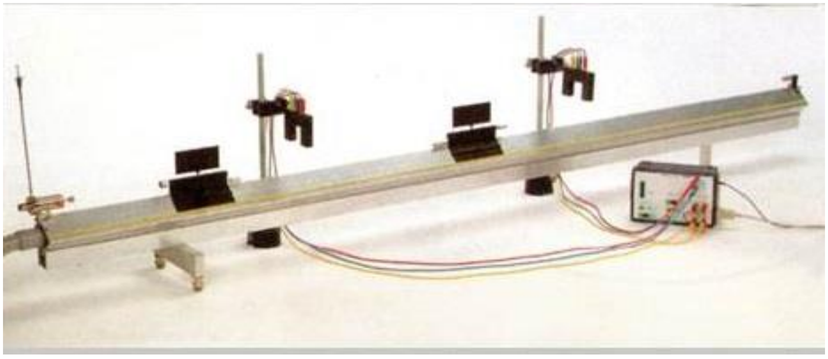
Inelastic collisions

Collisions with snagging are the extreme case among inelastic collisions. The two chariots will remain close together after the shocks ($v'_A = v'_B = v'$). With this condition, we can calculate the velocities after the collision:

$$v' = [\, m_A/(m_A + m_B)\,] . v_A \qquad (5)$$

3. Manipulation :

Elastic shock: **fig2**



- Assemble as shown in Figure.2.
- Adjust the distance between the light barriers so that the shocks occurs between them.

-Before the shocks، one of the chariots، with a fixed mass $\mathbf{m_A = 295\ g}$, is in movement, while the other chariot, with a variable mass m_B, is at rest. When passing, the chronometer records the corresponding time δt_A.

-After the shocks, the two moving chariots go in opposite directions and each passes through a L.B. The chronometer records the two times $\delta t'_A$ and $\delta t'_B$.

- Repeat the previous steps by varying the mass m_B of the chariot.

Note: δt is the time it takes for the tab to pass from δx=2cm, through the optical barrier

Inelastic shock:

After the shocks, the two moving chariots adhere and go in the same direction and pass through a L.B. The stopwatch still records the lap time.