



PHYSICAL SCIENCES (PHYSICS)

GRADE 12 TERM 1 FORMAL EXPERIMENT - PART 2

TIME: 1 HOUR

CONSERVATION OF LINEAR MOMENTUM

INDIVIDUAL WORK (should be done under strict supervision)

Write a scientific report which must include the following

1. **Aim** (1)
2. **Apparatus** (1)
3. **Method** (This should be a description of what you did; it should not be a copy of the method on the worksheet provided to you), (4)
4. **Observations and Recording of results** (Copy tables A and B below onto your book or sheet of paper and transfer the results you recorded when conducting the experiment).
 - 4.1. Determine the period of the ticker timer (3)
 - 4.2. Complete the attached table by analysing the tapes obtained from Part 1 of the experiment and doing the necessary calculations. (20)

Analysis and Interpretation of results and observations

5. Explain why the velocity with which the block hit the trolley cannot be used to calculate the momentum of the block before collision. (3)
6. Give a reason why the experiment must be performed more than once. (1)
7. What precautions were taken to ensure that the results are reliable? (3)
8. Discuss your finding by comparing the magnitudes of P_{before} and P_{after} . (2)

CONCLUSION.

9. Write down a conclusion for your experiment and explain how you reached to your conclusion. (4)

[42]

Before drop						After drop				
Mass (kg)		Δx (m)	Δt (s)	Velocity (m.s^{-1}) $v = \frac{\Delta x}{\Delta t}$	Momentum (kg.m.s^{-1}) $P_{\text{before}} = mv$	Δx (m)	Δt (s)	Mass of trolley + brick (kg)	Velocity (m.s^{-1}) $v = \frac{\Delta x}{\Delta t}$	Momentum(kg.m.s^{-1}) $P_{\text{after}} = mv$
m_{trolley}	m_{block}			v_{trolley}	v_{block}					



PHYSICAL SCIENCES (PHYSICS)

GRADE 12 TERM 1 FORMAL EXPERIMENT - PART 2

TIME: 1 HOUR

CONSERVATION OF LINEAR MOMENTUM



1. Aim stated correctly. ✓ (1)
2. All apparatus listed. ✓ (1)
3. All steps of the method correct and logically stated, ✓✓ correct tense used. ✓✓ (4)
- 4.1 $T = \frac{1}{f}$ ✓ = $\frac{1}{\text{correct value}}$ ✓ = correct value ✓ (3)
- 4.2 Refer to the attached table. (20)
5. The velocity with which it hit the trolley is perpendicular to the direction of motion✓, the velocity used to calculate the momentum is the velocity parallel to the direction of motion✓, which is zero✓. (3)
6. For reliable / fair results ✓ (1)
7. Compensate for friction by✓
 - Inclining the trolley track. ✓
 - Ensuring that the wheels and the track are clean and smooth. ✓ (3)
8. P_{before} (momentum before collision) is equal to the P_{after} (momentum after collision)✓✓ (2)
9. The total linear momentum of a closed / isolated system is conserved / constant. ✓✓

Explanation:

Calculations in the table indicate that the total linear momentum before collision is equal the total linear momentum after collision. ✓✓ (4)

[42]

Before drop/collision						After drop/collision					
Mass (kg)		Δx (m)	Δt (s)	Velocity ($\text{m}\cdot\text{s}^{-1}$) $v = \frac{\Delta x}{\Delta t}$	Momentum ($\text{kg}\cdot\text{m}\cdot\text{s}^{-1}$) $P_{\text{before}} = m_t v + m_b v$		Δx (m)	Δt (s)	Mass of trolley + brick (kg)	Velocity ($\text{m}\cdot\text{s}^{-1}$) $v = \frac{\Delta x}{\Delta t}$	Momentum ($\text{kg}\cdot\text{m}\cdot\text{s}^{-1}$) $P_{\text{after}} = (m_t + m_b) v$
m_{trolley}	m_{block}			v_{trolley}	v_{block}						

Marking guidelines for the table:

- Mass of trolley ✓
- Mass of block ✓
- Displacement of the trolley before the drop (Δx) ✓✓
- Time before the drop (Δt) ✓✓
- Velocity of the trolley before the drop (Δx) ✓✓
- Velocity of the block before the drop (Δx) ✓
- Total momentum before the drop ✓✓
- Mass of trolley + block ✓
- Displacement of the trolley and block after the drop (Δx) ✓✓
- Time after the drop (Δt) ✓✓
- Velocity of the trolley and block after the drop (Δx) ✓✓
- Total momentum after the drop ✓✓