LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

CAPRICORN NORTH DISTRICT

FORMAL EXPERIMENT TERM 1

PHYSICAL SCIENCES

GRADE 12

YEAR: 2026

LEARNER `S FULL NAMES :………………………………………..

NAME OF THE SCHOOL :…………………………………………

NAME OF THE CIRCUIT: ……………………………………….

Learner's Mark: $\dfrac{\quad}{25}$

INTRODUCTION

Momentum refers to the motion of an object. The amount of momentum an object has depends on two factors: its mass and its velocity. Linear momentum is the momentum of an object moving in a straight line and is calculated by multiplying its mass by its velocity.

PART: A

The conservation of momentum can be experimentally verified by observing what happens during collisions and explosions.

AIM:
To verify the conservation of linear momentum during an explosion.

APPARATUS:
Trolley track/smooth surface.
Two Trolleys.
Meter ruler/ long ruler.
Wooden plank or brick
Scale

METHOD:
1. Determine the mass of the trolleys.
2. Place two trolleys, one of which contains a compressed spring, against each other on a smooth, horizontal floor.
3. Place another trolley on top of one of the other trolleys in Step 1. These two trolleys now represent a mass of 2m, while the single trolley represents a mass of m.
4. Place two sturdy wooden planks on both sides of the set-up (not further than 1–1,5 m from the set-up) as indicated in the diagram below.
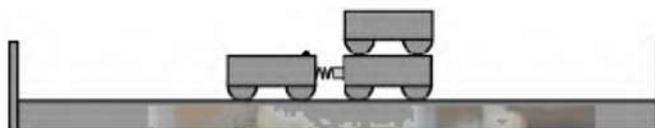
5. Release the spring of the one trolley so that the two trolley systems move apart. Listen to the collisions against the wooden planks. The trolley systems hit the wooden planks at different times, because the one trolley system moves more slowly than the other one because of different velocities.
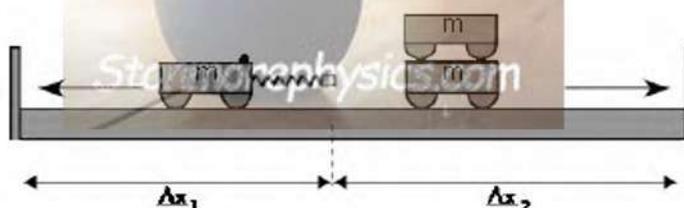
6. By means of trial and error, find a position from which the trolley systems move so that both trolleys will hit the wooden planks on both sides at the same time. Only a single collision should be heard.

7. Measure the distances $\Delta x1$ and $\Delta x2$ that each trolley moved from the starting point to the wooden plank. These distances represent the velocities of the two trolley systems respectively.

8. Repeat the above-mentioned procedure to obtain two more sets of values.

9. Repeat the above procedure for different numbers of trolleys.

10. Record the information in a table and hand it in with the rubric.

PART: A (MARKS ARE RECORDED ON RUBRIC FOR EXPT 1-PART A)

EXPERIMENT REPORT:

Write a scientific report which must include the following:

1. Aim of the experiment   (1)

………………………………………………………………………………………………
…………………………………………………………………………………………………

2. **Variables:**
   2.1. Independent variable :………………………………………………………   (1)
   2.2. Dependent Variable :……………………………………………….   (1)
   2.3. Controlled Variable :……………………………………………….   (1)

3. Method   (2)

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Results
Complete the table below using the reading obtained from the experiment   (4)

Trolley 1			Trolley 2			
Mass (trolley unit)	[Velocity V₁] Distance Δx (m)	Momentum ("unit")	Mass (trolley unit)	[Velocity V₁] Distance Δx (m)	Momentum ("unit")	Total momentum after explosion ("unit")

4. Give a reason why this experiment must be performed more than once.   (1)

………

5. From the results above a draw a conclusion   (2)

………
………
………………………………………………………………………………………………

PART: B (7 MARKS)

(This section must be written under test conditions)

1.1. What is meant by an isolated system in physics?   (2)

………
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1.2. During an experiment, a rocket of unknown mass is mounted on a toy cart of mass 20 kg. The cart-rocket combination moves at a constant speed of 2,5 m·s⁻¹ along a horizontal floor. At a certain instant, the rocket is fired horizontally in the direction of motion at a speed of 30 m·s⁻¹. As a result, the cart slows down to a speed of 0,6 m·s⁻¹, as shown in the diagram below. Ignore frictional effects

1.2.1. Calculate the mass of the rocket at the instant the rocket was fired from the toy cart (5)

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Criteria	0	1	Learner`s marks
1.Conducting the practical experiment	Relied heavily on teacher assistance to finish the practical task.	Demonstrated full independence in completing the practical activity.	
2. Correctly set up and used the equipment.	Set up of apparatus is not correct.	Set up correct and the two trolleys collided against barriers at the same time.	
3. Measuring of distances	Measurements are incomplete and inaccurate.	All measurements are correct and complete	
4. Recording of data	No value correct.	Measurements were taken correctly. Momentum before and after collision calculated correctly.	
5. Safety and precautions	Do not adhere to safety precautions	Adhered to the safety precautions fully	

PART- C (SET-UP RUBRIC) (5 MARKS)

……………………………………….. **TOTAL = 25 MARKS** ……………………………………………

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MARKING GUIDELINES

PART A (MARKS FOR PART A SHOULD BE RECORDED ON THE PROVIDED RUBRIC FOR EXPERIMENT PART A)

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1. Aim of the experiment:

   To verify the conservation of linear momentum during an explosion √
2. **Variables:**

   2.1. Independent variable: Mass of the objects √

   2.2. Dependent variable: velocity of the objects after explosion √

   2.3. Controlled variable: type of a surface √

3. Method

The method must write in past tense to allow another person to re-do the experiment

Words such as "I or we or they or shall "are not acceptable √√

Results

Trolley 1			Trolley 2			
Mass (trolley unit)	[Velocity V_1] Distance Δx (m)	Momentum ("unit")	Mass (trolley unit)	[Velocity V_1] Distance Δx (m)	Momentum ("unit")	Total momentum after explosion ("unit")
2	0.8	1.6	2	0.8	1.6 √	3.2
3	1.0	3	2	1.5	3 √	6.0 √
4	1.2	4.8	2	2.4	4.8 √	9.6

4. For reliability or accuracy √
5. conclusion

   The total linear momentum in an isolated system is conserved √√

   Or

   The momentum before collision is equal to the momentum after collision √√

TOTAL FOR PART A (13)-MARKED AND RECORDED IN THE RUBRIC PROVIDED

PART: B (7 MARKS)

1.1. A system on which the resultant/net external force is zero √√ (2)

1.2.1.

$$\sum p_i = \sum p_f \ \checkmark$$

$$(m_1 + m_2)(v_i) = m_1 v_{1f} + m_2 v_{2f}$$

$$(20 + m_2)(2,5) \ \checkmark = 20(0,6) \ \checkmark + m_2(30) \ \checkmark$$

$$m_2 = 1,38 \ kg \ \checkmark \qquad (5)$$

PART: C (SET-UP RUBRIC CARRY 5 MARKS)

.... TOTAL = 25 MARKS ....