



GRADE 10

EASTERN CAPE DEPARTMENT OF EDUCATION

AMATHOLE WEST DISTRICT

WORKSHEET

EXPERIMENT 2

Term 3: 2025

1 Topic
Uniform Accelerated Motion

2 Aim (1)

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3 List the Apparatus (1)

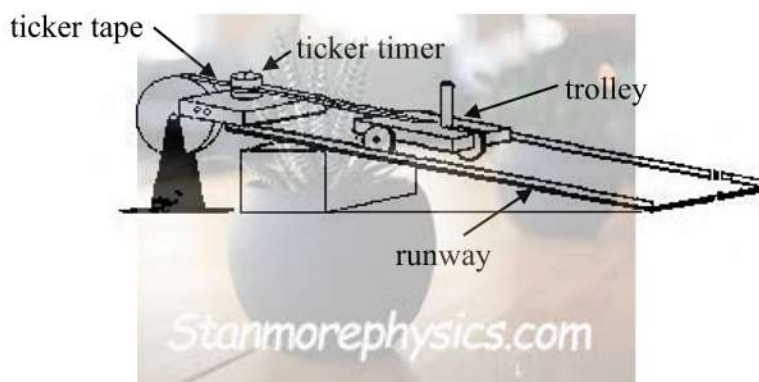
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4 Precautions, procedure / method and conducting the experiment.

To investigate the motion of a trolley travelling at uniform acceleration, a runway is set up as shown in the sketch below. The slope of the runway is adjusted before readings are taken.

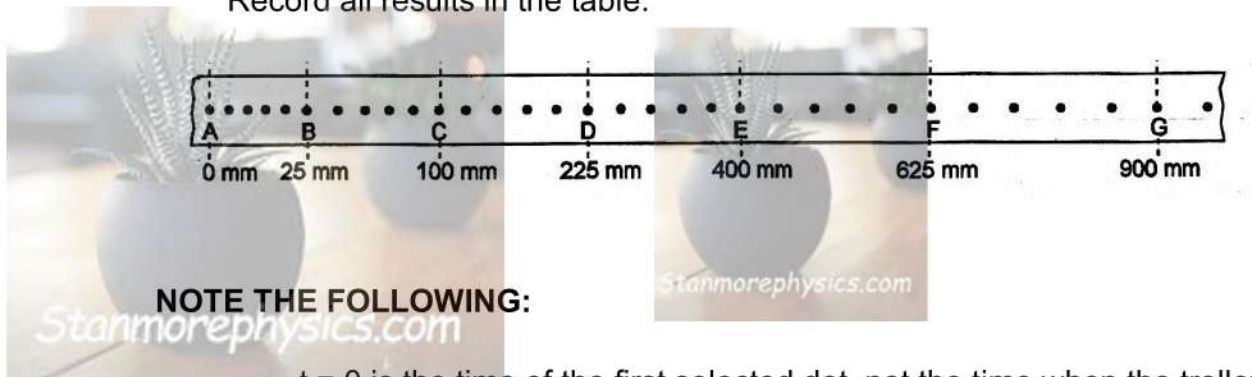
4.1 Give a reason why the slope of the runway has to be adjusted (1)

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1. Attach a long strip of paper tape to the trolley and pass the tape through the ticker timer.
2. Connect the ticker timer to the power source.
3. Raise the one end of the runway sufficiently so that the trolley moves down the runway at increasing speed.
4. Cut off the beginning and end portions of the tape where the dots cannot be clearly distinguished.
5. Mark the tape in lengths of 5 dots ($5 \times 0,02 = 0,10$ s if the frequency of the timer is 50 Hz) each. Measure the total displacement from the first chosen dot for successive time intervals, (displacement = the total length of tape for 30 dots). For each 5 space interval, calculate the *average velocity* during that interval by dividing the length of the interval (5 spaces), in meters, by 0,10 s (the time for 5 spaces).

Record all results in the table.



NOTE THE FOLLOWING:

- $t = 0$ is the time of the first selected dot, not the time when the trolley started to move.
- $x = 0$ is the position of the dot where $t = 0$, not the starting position.
- Δx is the increase in displacement during each 0,10 s period.
- v is the average velocity during each 0,10 s period. This is also the instantaneous velocity at the middle of that time interval (t_{middle}).
The v values are the instantaneous velocity values at times (t_{middle}) 0,05s; 0,15s; 0,25s etc.
- Δv is the increase in v from one-time interval to the next.
- Last column shows the change in velocity per second (obtained by dividing each Δv value by Δt). This is acceleration.

5. Collection and Recording of Data

Complete the table below using the values from the ticker tape.

time interval	Total time for 5 space interval (t) s	Total displacement from the first dot x in (m)	Displacement during each interval Δx in (m)	Increase in Δx for each succeeding interval in (m)	Time for each interval Δt in (s)	Middle of total time interval t_{middle} in s	Average velocity $v = \frac{\Delta x}{\Delta t}$ in m.s^{-1}	Increase in velocity Δv in m.s^{-1}	Average acceleration $a = \frac{\Delta v}{\Delta t}$ in m.s^{-2}
1				--				--	--
2									
3									
4									
5									
6									

(9)

6 Data Analysis and Interpretation

6.1 Position – time graph

6.1.1 Draw a Position – time graph on the graph paper provided (4)

6.1.2 What is the shape of this graph? (1)

6.1.3 Draw a tangent to the graph at $t = 0,25 \text{ s}$ (2)

6.1.4 Calculate the gradient of the tangent. (3)

6.1.5 What quantity does the gradient of the tangent at $t = 0,25 \text{ s}$ represent? (2)

6.2 Velocity – time graph

6.2.1 Draw the velocity time graph on the graph paper provided (4)
Use the values of column 7 (Mid-value of total time interval) and column 8 (average velocity)

6.2.2 What is the shape of the graph? What can you deduce from this shape? (2)

.....
.....

6.2.3 What quantity does the gradient of the graph represent? (1)

.....

6.2.4 Use the graph to determine the acceleration of the trolley. (3)

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.....

6.2.5 How does this value compare with the calculated value for acceleration in the table? (1)

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6.2.6 Use the graph to determine the total distance travelled by the trolley in 0,5s (4)

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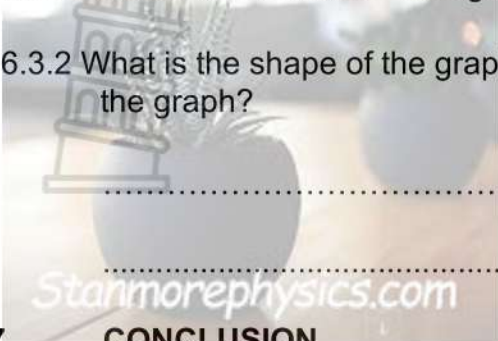
6.2.7 How does this answer compare with the value of displacement in 0,5 s as indicated in the table? (1)

.....
.....

6.3 **Acceleration - time graph**

6.3.1 Draw an acceleration - time graph for the motion of the trolley (3)

6.3.2 What is the shape of the graph? What can you deduce from the shape of the graph? (2)



7 **CONCLUSION**

7.1 What type of motion (UNIFORM MOTION or UNIFORM ACCELERATED MOTION) is represented by the graphs? (1)

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7.2 Give reasons for the answer to 7.1 based on the

7.2.1 Position time graph (2)



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7.2.2 Velocity time graph (2)

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TOTAL: 50 Marks



EASTERN CAPE DEPARTMENT OF EDUCATION

AMATHOLE WEST DISTRICT MARKING GUIDELINE

EXPERIMENT 2

Term 3: 2025

GRADE 10

1 Topic

Uniform Accelerated Motion

2 Aim

To investigate the motion of a trolley running down an inclined plane ✓ (1)

3 List the Apparatus

Ticker timer, Ticker tape, Power source, Trolley, Trolley track ✓ (1)

4 Precautions, procedure / method and conducting the experiment.

4.1 To compensate for friction ✓ (1)

5. Collection and Recording of Data

Complete the table below using the values from the ticker tape.

time inter- val	Total time for 5 space interval (t)s	Total displacement from the first dot x in (m)	Displacement during each interval Δx in (m)	Increase in Δx for each succeeding interval in(m)	Time for each interval Δt in(s)	Middle of total time interval t_{middle} in s	Average velocity $v = \frac{\Delta x}{\Delta t}$ in m.s^{-1}	Increase in velocity Δv in m.s^{-1}	Average acceleration $a = \frac{\Delta v}{\Delta t}$ in m.s^{-2}
1	0,1	0,025	0,025	--	0,1	0,05	0,25	--	--
2	0,2	0,1	0,075	0,05	0,1	0,15	0,75	0,5	5
3	0,3	0,225	0,125	0,05	0,1	0,25	1,25	0,5	5
4	0,4	0,4	0,175	0,05	0,1	0,35	1,75	0,5	5
5	0,5	0,625	0,225	0,05	0,1	0,45	2,25	0,5	5
6	0,6	0,9	0,275	0,05	0,1	0,55	2,75	0,5	5

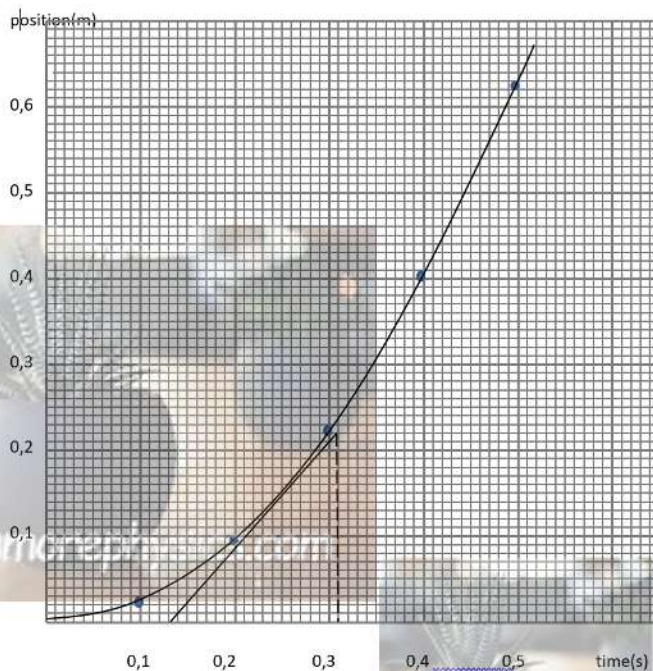
Columns 2-9 : one mark each

1x9 = (9)

6.1.1



Position- time graph



(4)

Assessment criteria for graph

- Suitable heading and labels on both axes ✓
- Correct scale on both axes ✓
- Correct plotting of points: minimum 3 ✓
- Correct shape of the graph ✓

6.1.2 What is the shape of this graph?

(1)

Parabola ✓ / curve with increasing steepness of slope

6.1.3 Draw a tangent to the graph at $t = 0,25s$

(2)

On the graph ✓✓

6.1.4 Calculate the gradient of the tangent.

(3)

$$\begin{aligned}
 \text{Gradient} &= \Delta y / \Delta x \quad \checkmark \\
 &= \frac{0,22 - 0}{0,31 - 0,13} \quad \checkmark \\
 &= 1,22 \quad \checkmark
 \end{aligned}$$

6.1.5 What quantity does the gradient of the tangent at $t = 0,25s$ represent?

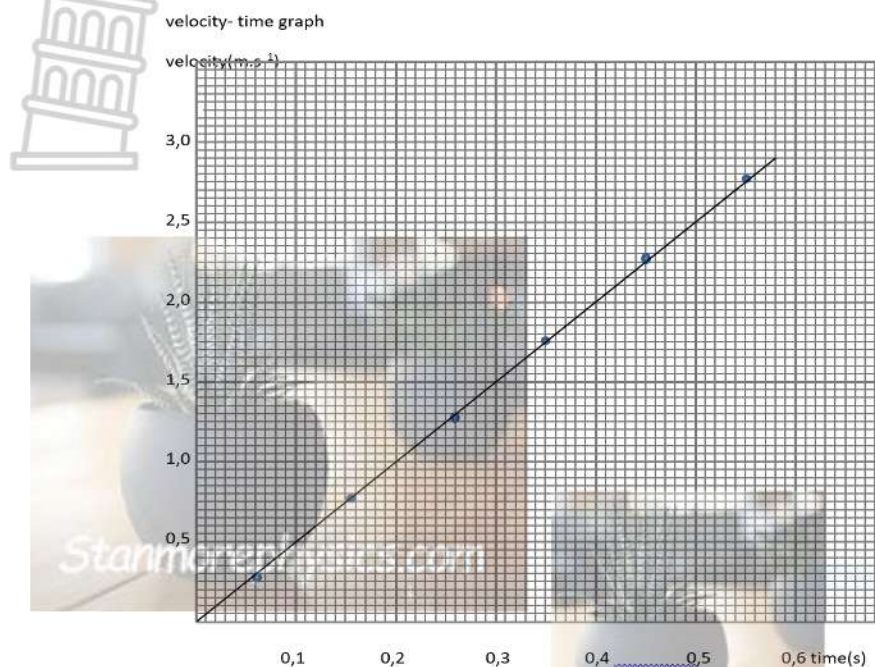
(2)

Instantaneous velocity ✓ at $t = 0,25 s$. ✓

6.2 Velocity – time graph

6.2.1 Draw the velocity time graph on the graph paper provided

(4)



Assessment criteria: same as in the position time graph

6.2.2 What is the shape of the graph? What can you deduce from this shape? (2)

Straight line with increasing speed(speeding up) ✓ and gradient is constant ✓

6.2.3 What quantity does the gradient of the graph represent? (1)

acceleration ✓

6.2.4 Use the graph to determine the acceleration of the trolley. (3)

$$\begin{aligned} \text{Gradient} &= \Delta y / \Delta x \checkmark \\ &= \frac{2.75 - 0}{0.55 - 0} \checkmark \quad (\text{or any correct values from the graph}) \\ &= 5 \checkmark \end{aligned}$$

6.2.5 How does this value compare with the calculated value for acceleration in the table? (1)

same ✓

6.2.6 Use the graph to determine the total distance travelled by the trolley in 0.5s (4)

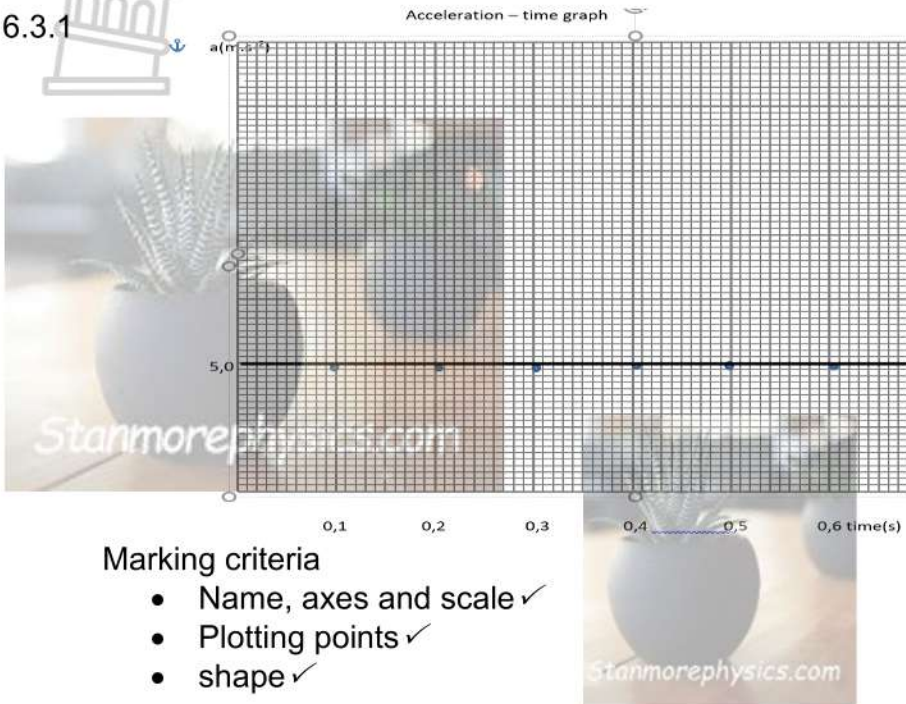
$$\begin{aligned} \text{Distance} &= \text{area under the graph} \checkmark \\ &= \frac{1}{2}bh(\text{triangle}) \checkmark \\ &= \frac{1}{2} \times 0.5 \times 2.5 \checkmark \\ &= 0.625\text{m} \checkmark \end{aligned}$$

6.2.7 How does this answer compare with the value of displacement after 0,5 s, (1)
as indicated in the table?

same ✓

6.3 Acceleration - time graph

6.3.1 (3)



Marking criteria

- Name, axes and scale ✓
- Plotting points ✓
- shape ✓

6.3.2 What shape is the graph and what can you deduce from the shape of the graph? (2)

Horizontal line: acceleration is constant ✓

7 CONCLUSION

7.1 What type of motion (UNIFORM MOTION or UNIFORM ACCELERATED MOTION) is represented by the graphs? (1)

Uniform accelerated motion ✓

Give reasons for the answer to 7.1 based on position- time graph and velocity time graph

7.2.1 *The gradient of the graph increases constantly. ✓* (2)
The velocity increases constantly. ✓

7.2.2 *Gradient of the graph is constant. ✓* (2)
Acceleration is constant. ✓

TOTAL: 50 Marks