T.C.

GEBZE TECHNICAL UNIVERSITY

PHYSICS DEPARTMENT

PHYSICS LABORATORY I

EXPERIMENT REPORT

THE NAME OF THE EXPERIMENT

Motion with Constant Acceleration in Inclined Plane

PREPARED BY

NAME AND SURNAME :

STUDENT NUMBER :

DEPARTMENT :

GROUP NO :

TEACHING ASSISTANT :

DATE OF THE EXPERIMENT : ….. / ….. / …….

DATE : ….. / ….. / …….

Signature:

Equipment

- Air track with standard accessories
- Air blower
- Two SpeedGates incl. connection cable
- Wooden ramps for heigh

Figure 1 : *Motion with Constant Acceleration in Inclined Plane*

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Experimental Procedure:

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 with "Previous Value" on the lower line using the double dash button **II** and SpeedGate-B with " Interval Before " on the lower line using the double dash button **II.**
3. L is the length of the airway (inclined plane, L = m) and H is the height of the airway.
4. x is the distance between SpeedGate-A and SpeedGate-B that the glider covers, which is the distance it travels on the inclined plane.
5. Using small square boards, change the height H of one side of the airway as in Table 1.
6. According to different x values in Table 1, change the distance between SpeedGate-A and SpeedGate-B by changing only the position of SpeedGate-A.
7. Change the height H of one side of the airway using small square boards.
8. Then calculate the average of 5 time measurements for each value of x, write under column t_{avg} in Table 1.

Table 1 : *Measured positions-intervals times*

H = 0.9 m							
x (m)	**t_1 (s)**	**t_2 (s)**	**t_3 (s)**	**t_5 (s)**	**t_4 (s)**	**t_{avg} (s)**	**t^2_{avg} (s^2)**
0.8							
0.6							
0.4							
0.2							

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Plot the position x and time t data from Table 1 on the graph using points. Then draw a curve passing through these points as good as you can by your crude eye estimation.

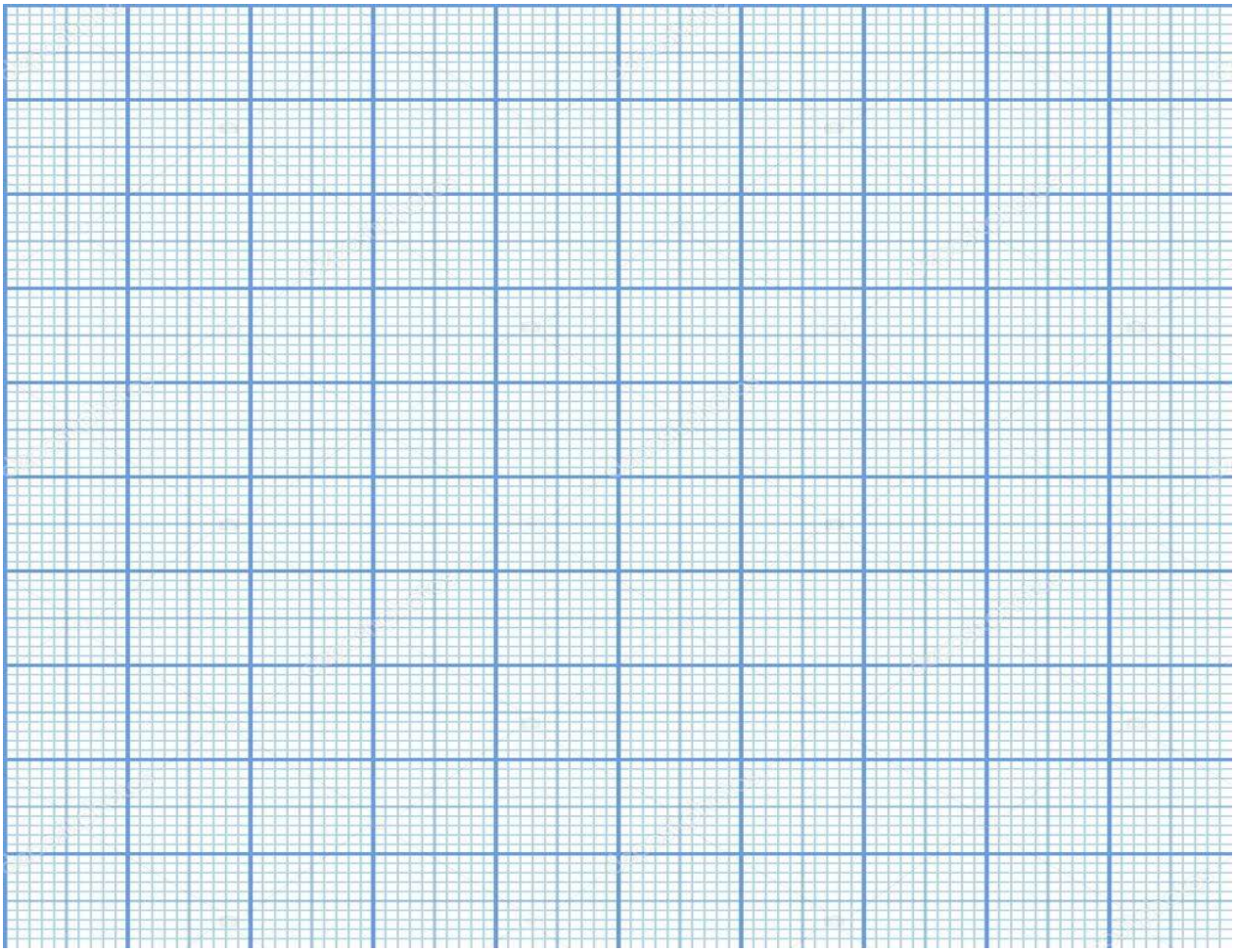

Figure 1: *The position x - time t graph*

1) Regarding the theoretical background in Eq.(6), what type of a curve is expected to pass through the points?

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Draw the x-t^2 graph using the positions x and square the time average t^2_{avg} values above.

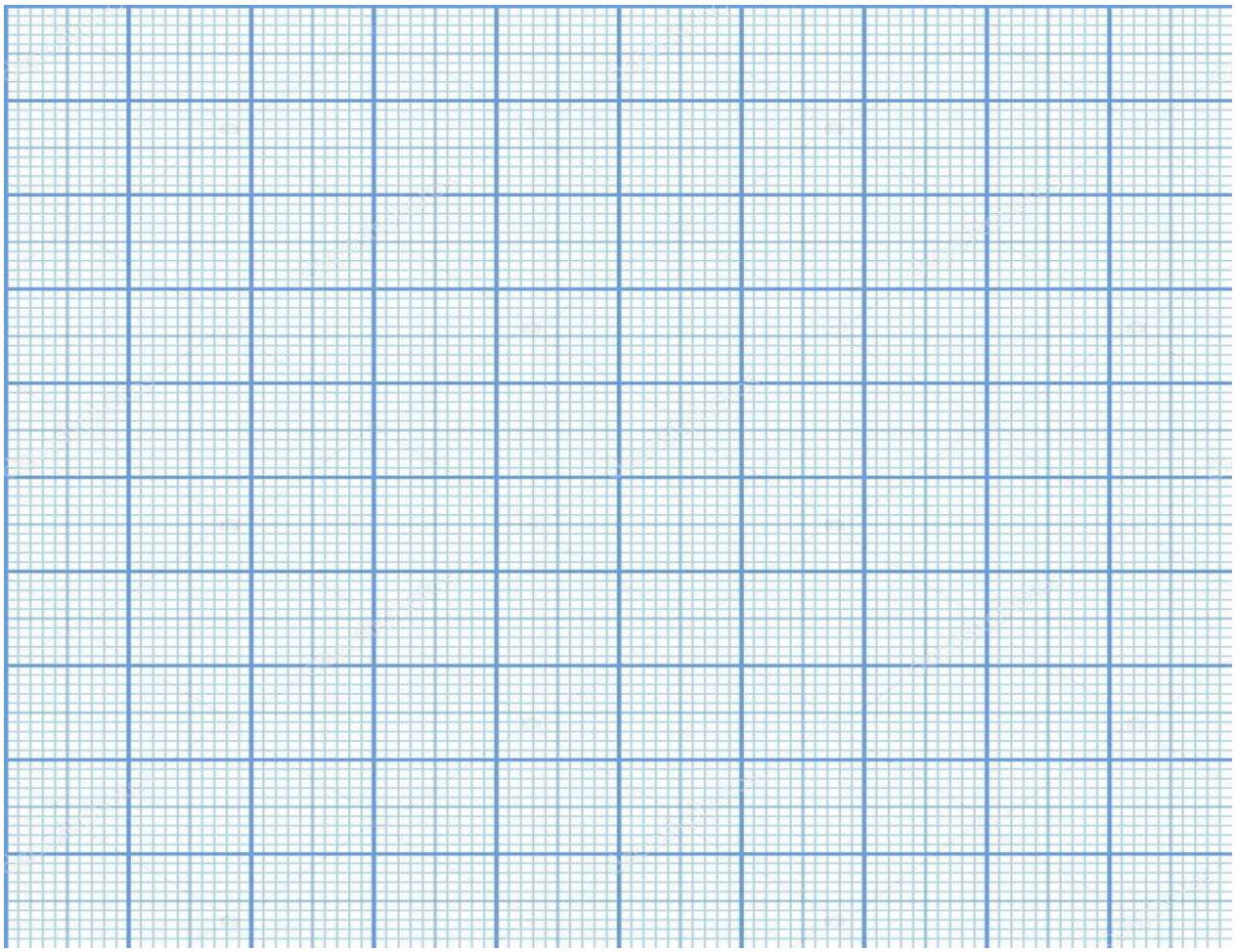

Figure 2: *The position x - square the time average t^2_{avg} graph*

2) Comment on the velocity of the object from this graph? Explain the reason.

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Calculate the slopes of the lines that fit the data points on your x vs. t^2 graphs, which are plotted in the previous step. In the following formulae, the x_i 's represent square the time average t^2_{avg}, while the y_i's represent the positions x. n is the number of data used in calculations. Write down the intermediate steps.

$$\sum_{i=1}^{n} x_i y_i =$$

$$m = \frac{\sum_{i=1}^{n} x_i y_i}{\sum_{i=1}^{n} x_i^2} =$$

$$\sum_{i=1}^{n} x_i^2 =$$

3) How is the acceleration of an object calculated with the help of the x-t^2 graph given in Figure 2 ? Explain.

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Write down the experimental acceleration a_{Exp} calculated from the graph and the theoretical acceleration a_{Theo} from Eq. (4) and calculate percent error acceleration $\%a_{\text{error}}$.

Write down the intermediate steps.

$a_{Exp} =$ ……

$sin(\theta) = \frac{H}{L} =$ = ……

$a_{Theo} =$ ……

$$\%a_{\text{error}} = \left|\frac{a_{Theo} - a_{Exp}}{a_{Theo}}\right| 100 =$$

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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

1. Derive Eq.4 and Eq. 5 from Eq. 6 in the theoretical experiment guide.

2. In the system we have adjusted according to the 30°, 45°, 75° angles of the inclined plane, list the glider speeds released at the same height from the largest to the smallest.($a_{30°}$, $a_{45°}$, $a_{75°}$)

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