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| **Names** | **ID** | **Group** | **Case** |
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**SYNTHESIS – VARIABLE FRICTION (PART I)**

**When you finish this synthesis, format this document, supressing or adding spaces, lines and page breaks.**

**Remember to delete all the instructions in blue!**

**Initial Expectations**

Give a brief description of the coin trajectory in the case assigned to you and write a few paragraphs about your initial expectations and predictions, retrieving the answers to questions on item B1.

**Obtained Data**

Copy the graphs of item B4 in the spaces below. Make here comments to interpret each plot: describe its shape; tell if one quantity varies (or not) with the other, and if this variation is uniform along time; gives the maximum and/or minimum value, if it exists. Your text must have a call to each graph in the document. In the legends, add any other information that you think relevant and is not already given in the plot.

Insert here the graph $x\left(t\right)$

**Figure 1.** Position *x* of the coin in function of the time for case nn.

Insert here the graph $y\left(t\right)$

**Figure 2.** Position *y* of the coin in function of the time for case nn.

Insert here the graph $y×x$.

*Remember that the trajectory graph must be isometric, this is, the scales in x and y must be equal.*

**Figure 3.** Coin trajectory for case nn.

**Data Analysis**

Insert here the table built from items B3 – B14. Give the inclination angle of the plane with the horizontal and insert a call for the table. If your table has a format different of the suggested one, explain what you did.

**Table 1.** Measured time and position of the coin motion, along with the calculated values of the

components and magnitudes of the velocity, acceleration, resultant force and friction force.

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|  | *t*(s) | *x*(cm) | *y*(cm) | *vx*(cm/s) | *vy*(cm/s) | *v*(cm/s) | *ax*(cm/s²) | *ay*(cm/s²) | *Fx*(g.cm/s²) | *Fy*(g.cm/s²) | *FR*(g.cm/s²) | *fkx*(g.cm/s²) | *fky*(g.cm/s²) | *fk*(g.cm/s²) |
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| Uncertainties | 0 | 0,04 | 0,04 |  |  |  |  |  |  |  |  |  |  |  |

Insert below the graphs requested in item B8 and make some comments to interpret the plots (tell about shape, variation, extremes, etc). Your text must have a call to each graph in the document. In the legends, add any other information that you think relevant and is not already given in the plot.

Insert here the graph $v\_{x}\left(t\right)$

**Figure 4.** Component *x* of the coin velocity in function of the time.

Insert here the graph $v\_{y}\left(t\right)$

**Figure 5.** Component *y* of the coin velocity in function of the time.

Insert here the graph $v\left(t\right)$

**Figure 6.** Magnitude of the coin velocity in function of the time.

Insert below the graphs requested in item B11 and make some comments to interpret the plots; remember to call each graph in the document.

Insert here the graph $F\_{x}\left(t\right)$

**Figure 7.** Component *y* of the resultant force in function of the time.

Insert here the graph $F\_{y}\left(t\right)$

**Figure 7.** Component *y* of the resultant force in function of the time.

Insert here the graph $F\_{R}\left(t\right)$

**Figure 8.** Magnitude of the resultant force in function of the time.

Insert below the graphs requested in item B15, make some comments to interpret the plots and call them properly.

Insert here the graph $f\left(t\right)$

**Figure 9.** Magnitude of the friction force in function of the time.

**Discussion**

 Answer the following questions with your own words.

1. Describe the path of the coin on the inclined plane. Comment if your guesses for the questions on item **B1** were correct; this comment will not be graded, but this was the motivating question, and we hope it engaged you.

Write your answer here – the agreement of your prediction with your observation **is not** the basis for grading this answer. We just need to know what were your expectation.

1. List the quantities that influence the trajectory of the coin.

Write your answer here.

1. List the quantities that, if modified, change the shape of the trajectory. What would be the change in each case?

Write your answer here.

1. List the forces acting on the coin as it moves. Sketch the free-body diagram and explain, in your own words, what the friction force vector along the path would look like.

Write your answer here.

1. Looking at the forces you cited in the item iv above, which one(s) remains constant? Which one(s) varies? Remember that force is a vector.

Write your answer here.

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