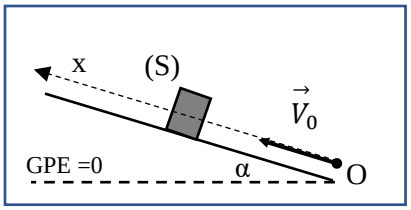
Al-Mahdi Schools	In his Name **Physics Quiz 1**	SY: 2020/2021 Duration 1 Session Grade /10
Ch. 1 : Energy	**Grade 12 LS**	**Date: 22 /9 /2022**

Exercise 1: Non conservation of mechanical energy

A solid (S) of mass m = 300 g, is launched with a speed $\overrightarrow{V_0}$ along an inclined plane making an angle α with respect to the horizontal as shown in figure of Document-1. The mechanical energy ME and the kinetic potential energy KE of the system [(S) ; Earth] are represented as a function of the position x in Document-2. The zero level of the gravitational potential energy is the horizontal plane passing through O. Given g = 10 m/s^2.



Document - 1

1) The graph shows that the mechanical energy of the system is not conserved. Justify.

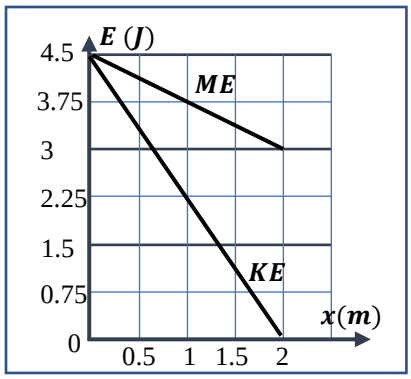
2) What is, graphically the values of the kinetic energy of the system for $x = 2\ m$ and at $t = 0$?

3) Calculate the gravitational potential energy for $x = 2\ m$ and at $t = 0$.

4) Deduce the value of the angle α.

5) Represent the graph of the function of GPE as x on the QUESTION sheet.

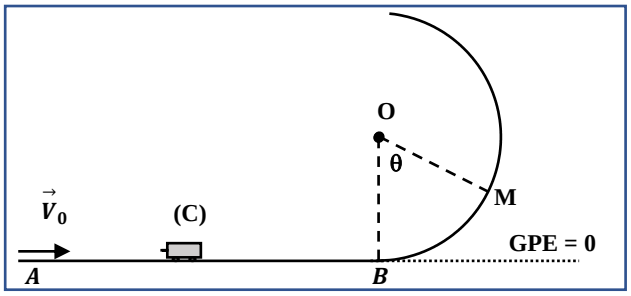
6) The non-conservation of the mechanical energy is due to a force of friction between (S) and the support. Calculate the value of this force supposed constant.



Document - 2

Exercise 2: Launching a cart on a rail

A cart (C) of mass m = 100 g is launched from position A with a speed $\overrightarrow{V_0}$ ($V_0 = 5\ m/s$) on a rail situated in a vertical plane as shown in the figure of Document-3. The cart passes through B then continues along a circular path of radius $R = 2\ m$. (C) reaches M with a speed V_M. M is at height h_M from the horizontal plane passing through B and A which is taken as the zero level of the gravitational potential energy.
Take g = 10 m/s^2.



Document-3

I- <u>Frictional forces are neglected along the track ABM</u>

1) Calculate the mechanical energy of the system [Earth; (C)] at the instant of launching the cart.

2) The speed at B is $V_B = V_A = 5\ m/s$. Justify.

3) Show that the expression of the gravitational potential energy of the cart. at any point on the circular path is: $GPE = R(1 - cos\theta)$.

4) Deduce the speed of the cart at the point M, knowing that $\widehat{BOM} = \theta = 20°$.

5) Calculate the maximum value θ_m corresponding to the maximum position reached by the cart on the circular part.

II-<u>Frictional forces are NOT neglected along the track AB</u>

In reality, friction along the track AB ($AB = 4m$) exists and the cart reaches B with speed $V_B = \sqrt{20}\ m/s$. Calculate, using the kinetic energy theory, the magnitude of the friction force considered constant.