

## 2018-2019 Term 2

### PHYS1001 Essential Physics

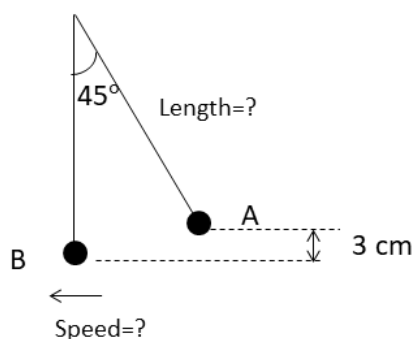
#### Assignment 3

Due date: 19<sup>th</sup> Feb, 2019 by 6:00 pm

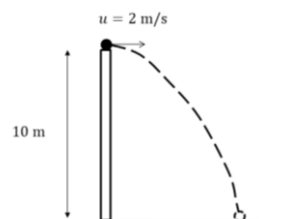
(Please leave your homework in the box with the label “PHYS 1001” outside room 213 in Science Centre North Block)

Please answer all six questions

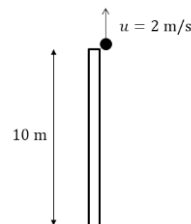
1. A pendulum is released from rest and undergoes swinging motion from A to B. The string makes an angle of  $45^\circ$  with the vertical axis initially. The change in the height of the ball is 3 cm from A to B. Ignore the effect of air resistance.



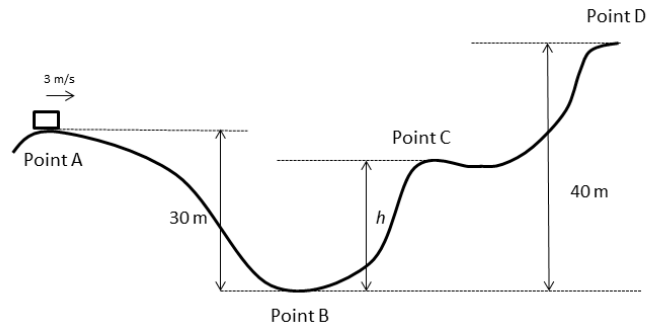
- (a) At which point does the pendulum has (i) a higher K.E. and (ii) a higher P.E.?  
(b) Calculate the speed of the pendulum at point B.  
(c) Calculate length of the string.
2. (a) A ball with mass 0.5 kg is projected horizontally at the height of 10 m with an initial speed of 2 m/s as shown in the figure on the right. Using the conservation of energy, calculate the speed of the ball when reach the ground. Ignore the effect of air resistance.



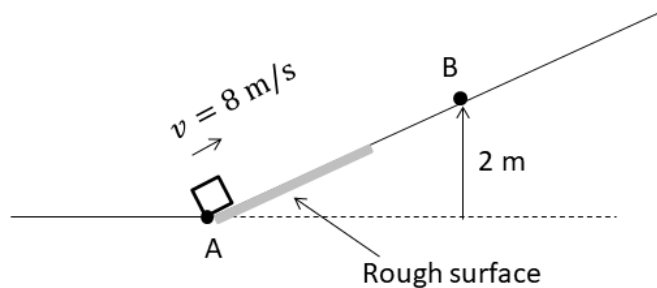
- (b) The same ball is thrown vertically upward from a height of 10 m as shown in the figure on the right. The initial speed of the ball is 2 m/s. Using the conservation of energy, calculate the speed of the ball when reach the ground. Ignore the effect of air resistance.



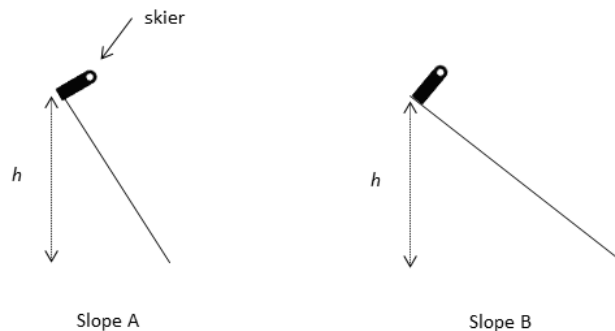
3. A roller coaster with a mass 600 kg travels on a track from point A to point C as shown below. The initial velocity of the roller coaster is 3 m/s at point A. Ignore friction and air resistance in the following question.



- Calculate the initial kinetic energy at point A.
  - Calculate the velocity of the roller coaster at B.
  - Calculate the difference in height  $h$  between point B and C if the velocity at point C is 10 m/s.
  - Will the roller coast reach point D? Explain your answer.
4. A 2 kg block which is initially at point A moves up an incline plane at 8 m/s. Point B is at a height of 2 m above the horizontal ground. It is known that the energy loss when the block moves on the rough surface is 30 J. Can the block reach B? Explain your answer.



5. Discuss which skier has a higher speed at the bottom of the slope (a) by neglecting the effect of friction (b) in the presence of friction, assuming the skier starts from rest and the frictional force is the same in both cases.



6. A block of mass 1 kg is released from rest at point A. It travels down a rough curve surface AB and a rough surface BC and finally stops at point C. The curve AB is a quarter of a circle with a radius of  $R = 0.8$  m. The length of BC is 3 m. The friction acting on the block while it moves on the horizontal track is 0.65 N. Calculate the work done by friction on the block when it moves along the track AB.

