

## 2018-2019 Term 2

### PHYS1001 Essential Physics

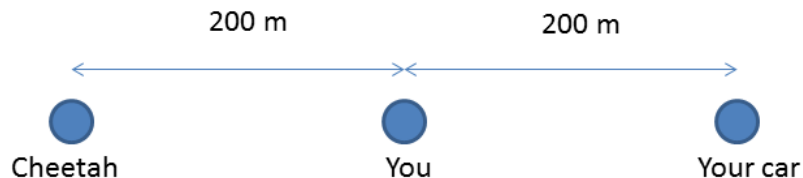
#### Assignment 1

Due date: 29<sup>th</sup> Jan, 2019 by 6:00 pm

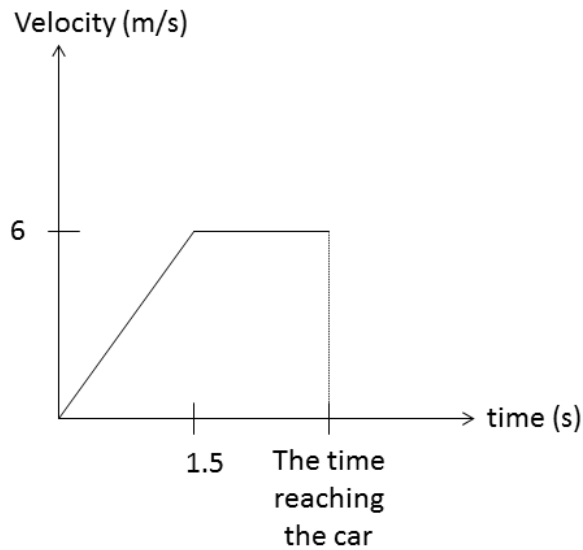
(Please leave your homework in the box with the label “PHYS 1001” outside room 213 in Science Centre North Block)

Use  $g = 9.8 \text{ m/s}^2$  in your calculation.

1. A car initially moves with a velocity of 70 km/h. When the car brake is applied, the car decelerates at  $4 \text{ m/s}^2$ . Calculate the distance travelled by the car before it stops.
2. An object undergoes a uniform acceleration motion for 2s. The displacement of the object is 10m. The acceleration of the object is  $1 \text{ ms}^{-2}$ . What is the initial speed of the object?
3. A ball with mass 1 kg starts from rest and falls under the influence of gravity. Ignore the effect of air resistance in this question.
  - (a) Draw three graphs, one for the acceleration, one for the velocity and one for the displacement of the ball as a function of time from  $t=0$  to  $t=5\text{s}$ . Please take downward as negative.
  - (b) How would you modify the above graphs if the ball has a mass 2 kg instead of 1 kg?
4. A ball is thrown vertical upwards with a certain initial velocity. When the ball is at a height 0.4 m above the starting point, the velocity is 3 m/s. Calculate the velocity of the ball when it is at a location 0.4 m below the starting point.
5.
  - (a) A cheetah is the fastest running land animal with a speed of 109.4 km/h. How far does a cheetah reach in 10s?
  - (b) Suppose your car is 400 m away from a cheetah and you are standing at the mid-point between your car and the cheetah. You know that the cheetah has seen you and you start running towards the car.

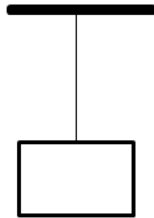


- (I) Your velocity-time graph is shown below. Calculate the acceleration in the first 1.5 s. (10%)



- (II) How long does it take you to reach the car? (10%)
- (III) Assume the cheetah runs at a constant velocity of 109.4 km/h. How long does the cheetah take to reach the car? Can you escape the tragic fate of being eaten by the cheetah? (10%)

6. A block of mass 10 kg is attached to a string as shown below: The block remains at rest



- (a) Draw a force diagram for the block.
- (b) Determine the magnitude of all forces in the force diagram in (a).
- (c) Now the string is cut, again draw a force diagram for the block. What happens to the block?