

PQ 5d

Questions

# Q1

- Drop a coin from rest. Assume air resistance is negligible.
- A Calculate displacement after 0.500 s.
- B Calculate how long it takes to fall 1.50m.
- C Calculate its velocity after 0.500 s.
- D Calculate its speed after falling 2.00m.

## Q2

- **A bus leaves a bus stop by accelerating at  $0.8\text{ms}^{-2}$  for 5s. It then travels at a constant speed for 2 minutes before slowing down uniformly at  $4\text{ms}^{-2}$  to come to rest at the next bus stop.**
- **a) Find the constant speed in the middle part of the journey**
- **b) Find the distance travelled in the first part of the journey**
- **c) Find the total distance between the two bus stops**

## Q3

- A particle positioned at O is travelling at  $20\text{ms}^{-1}$ .
- It starts to decelerate at a constant rate of  $3\text{ms}^{-2}$  and continues to do so for 12 seconds.
- Find the time taken for the particle to come instantaneously to rest.
- Find the final velocity of the particle.
- Find the position of the particle relative to O at the end of the journey.
- Find the distance travelled in the entire 12 seconds

## Q4

- A particle is moving in a straight line from  $O$  to  $A$  with a constant acceleration of  $2\text{ms}^{-2}$ . Its velocity at  $A$  is  $30\text{ms}^{-1}$  and it takes 12 seconds to travel from  $O$  to  $A$ . Find the particle's velocity at  $O$  and the distance  $OA$ .
- $a = 2$      $v = 30$      $t = 12$  Find  $u$  and  $s$ .
- The velocity at  $O$  is  $6\text{ms}^{-1}$ .

## Q5

- **A train starts from rest at a station  $S$  and moves with constant acceleration. It passes a signal box  $B$  15 seconds later with a speed of  $81\text{kmh}^{-1}$ . Find the acceleration of the train in  $\text{ms}^{-2}$  and the distance in metres between the station and the signal box.**

## Q6

- A particle starts from rest and moves along a straight line with a constant acceleration until it reaches a velocity of  $15\text{ms}^{-1}$ . It is then brought to rest again by a constant retardation of  $3\text{ms}^{-2}$ . If the particle is then 60m from its starting point, find the time for which the particle is moving.
- Acceleration phase :  $u = 0$     $v = 15$
- Deceleration phase :  $u = 15$     $v = 0$     $a = -3$   
(negative since the particle is retarding)
- There is not enough information on the acceleration phase to proceed, so we consider the deceleration phase first.

## Q7

- **Dissatisfied with the quality of his Chinese meal, an oriental tourist drops his plate from a rooftop restaurant, 100m above the ground. How long does it take for the chop suey to hit the ground, and at what speed is it then travelling?**
- $u = 0$     $a = 9.8$     $s = 100$    Find  $t, v$ .

## Q8

- A competitor at the highland games throws a haggis vertically into the air with a velocity of  $20\text{ms}^{-1}$ , letting go at a height of 2m above the ground. Find its maximum height, the time taken to fall to the ground, and the speed on impact.
- $u = 20$      $a = -9.8$  (negative since in the opposite direction to initial velocity)     $v = 0$   
Find  $s$ .

## Q9

- A cannon fires a shell vertically upwards from ground level at  $35\text{ms}^{-1}$ . At what times is it 10m above the ground? For how long is it more than 10m high?
- $u = 35$      $a = -9.8$      $s = 10$     Find  $t$ .

# Q10

- **A juggler throws a ball up in the air with an initial speed of  $5\text{ms}^{-1}$  from a height of  $1.2\text{m}$ . Assuming that  $g$  is  $10\text{ms}^{-2}$ , find the maximum height that the ball reaches above the ground and the time it takes to reach this height.**