EQUATIONS of MOTION QUESTIONS

Q1.

A car starts from rest and accelerates uniformly for 8.0 s. It reaches a final speed of 16 m s^{-1}.

    a) What is the acceleration of the car?

    b) What is the average velocity of the car?

    c) Calculate the distance travelled by the car.

Q2.

A new model BMW can start from rest and travel 400 m in 16 s.

    a) What is its average acceleration during this time?

    b) Calculate the final speed of the car.

    c) How fast is this final speed in km h^{-1}?

Q3.

A space-rocket is launched and accelerates uniformly from rest to 160 ms^{-1} in 4.5s

    a) Calculate the acceleration of the rocket.

    b) How far does the rocket travel in this time?

    c) What is the final speed of the rocket in kmh^{-1}?

Q4.

A diver plunges head first into a diving pool while travelling at 28.2ms⁻¹. Upon entering the water, the diver stops within a distance of 4.00m from the diving board. Consider the diver to be a single point located at her centre of mass and assume her acceleration through the water to be uniform.

    a) Calculate the average acceleration of the diver as she travels through the water.

    b) How long does the diver take to come to a stop?

    c) What is the speed of the diver after she has dived for 2.00m.

Q5.

A cyclist, whilst overtaking another bike, increases his speed uniformly from 4.2ms⁻¹ to 6.3ms⁻¹ over a time interval of 5.3s.

    a) Calculate the acceleration of the cyclist during this time.

    b) How far does the cyclist travel whilst overtaking?

    c) What is the average speed of the cyclist during this time?

Q6.

A car is travelling along a straight road at 75 km h⁻¹. In an attempt to avoid an accident, the motorist has to brake to a sudden stop.

    a) What is the car's initial speed in m s⁻¹?

    b) If the reaction time of the motorist is 0.25 s, what distance does the car travel while the driver is reacting to apply the brakes?

    c) Once the brakes are applied, the car has an acceleration of –6.0 m s⁻². How far does the car travel while pulling up?

    d) What total distance does the car travel from when the driver notices the danger to when the car comes to a stop?

Q7.

A billiard ball rolls from rest down a smooth ramp that is 8.0 m long. The acceleration of the ball is constant at 2.0 m s^{-2}.

  a) What is the speed of the ball when it is halfway down the ramp?

  b) What is the final speed of the ball?

  c) How long does the ball take to roll the first 4.0 m?

  d) How long does the ball take to travel the final 4.0 m?

Q8.

A cyclist is travelling at a constant speed of 12 m s^{-1} when he passes a stationary bus. The bus starts moving just as the cyclist passes, and accelerates at 1.5 m s^{-2}.

  a) When does the bus reach the same speed as the cyclist?

  b) How long does the bus take to catch the cyclist?