Test Review Questions Motion 3

Questions

Q1

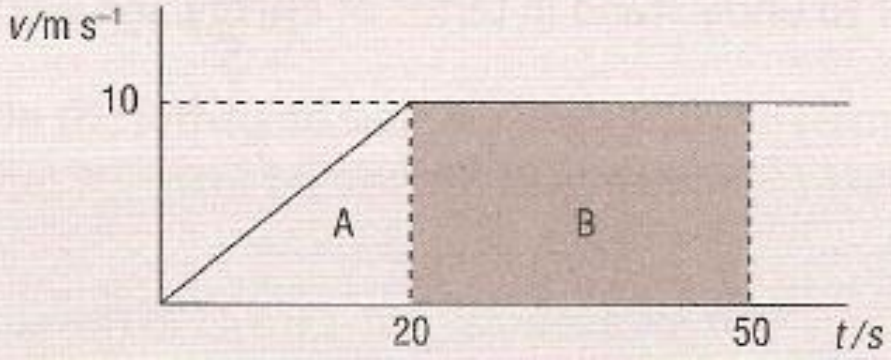
A car travels at 25 m s^{-1} for 5 minutes due north along a straight road. What is its displacement after this time?

Q2

A car accelerates from 10 m s^{-1} to 18 m s^{-1} in 4 s. What is its acceleration?

Q3

Find the displacement after 50 s of the object whose velocity–time graph is shown in the diagram.

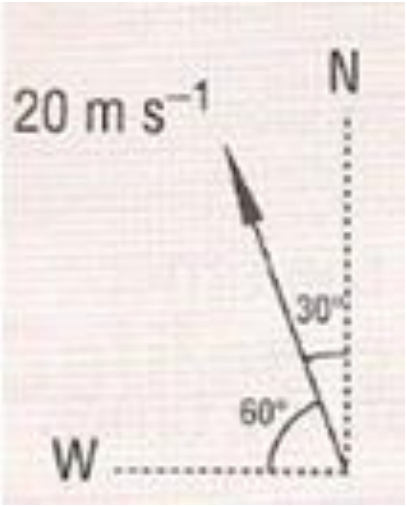


Q4

A car travelling at 20 m s^{-1} accelerates at 2 m s^{-2} for 5 s. How far will it travel in this time?

Q5

A car is travelling at 20 m s^{-1} at 30° W of N (see diagram). Calculate the components of its velocity due N and due W.



Q6

A ball is projected horizontally with an initial velocity of 2.0 m s^{-1}. It reaches the ground, a distance of 5.0 m below. Calculate the time taken and the horizontal distance it travels.

Q7

A car of mass 1000 kg is acted on by two forces: a forward force of 500 N provided by its engine, and a retarding (backward) force of 200 N caused by air resistance. What is its acceleration?

Q8

A parachutist of mass 80 kg is falling through air. The force of air resistance on her is 1200 N. Calculate her acceleration.

Q9

A car is travelling at a steady speed of 20 m s^{-1}. The driver sees an obstruction on the road ahead, and applies the brakes after a thinking time of 0.7 s. The car slows down with an acceleration of –4.0 m s^{-2}. Calculate the stopping distance.

Q10

A car of mass 800 kg is moving at 15 m s^{-1}. What is its KE?

Q11

A stone falls from a height of 5 m.

How fast is it moving when it reaches the ground?

Q12

A motorist travelling at the legal speed limit of 28 m s^{-1} (60 mph) takes his foot off the accelerator as he passes a sign showing that the speed limit is reduced to 14 m s^{-1} (30 mph). The car decelerates at 2.0 m s^{-2}.

(a) For what time interval is the motorist exceeding the speed limit?

(b) How far does the car travel in that time?

Q13

A fountain is designed so that the water leaves the nozzle and rises vertically to a height of 3.5 m.

(a) Calculate the speed of the water as it leaves the nozzle.

(b) For how long is each drop of water in the air?

Take the value of free-fall acceleration, g to be 10 $m\,s^{-2}$.

Q14

An aircraft has a total mass, including fuel and passengers, of 70 000 kg. Its take-off speed is 60 m s^{-1} and it needs to reach that speed before the end of the runway, which is 1500 m long.

(a) Calculate the minimum acceleration of the aircraft.

(b) Calculate the average force needed to achieve this acceleration.

(c) Explain how the resultant force on the aircraft is likely to change during take-off.

Q15

A crane lifts a 3 tonne (3000 kg) load through a vertical height of 18 m in 24 s. Calculate:

(a) the work done on the load

(b) the gain in gravitational potential energy of the load

(c) the power output of the crane

(d) the power input to the crane if the efficiency is 0.45.