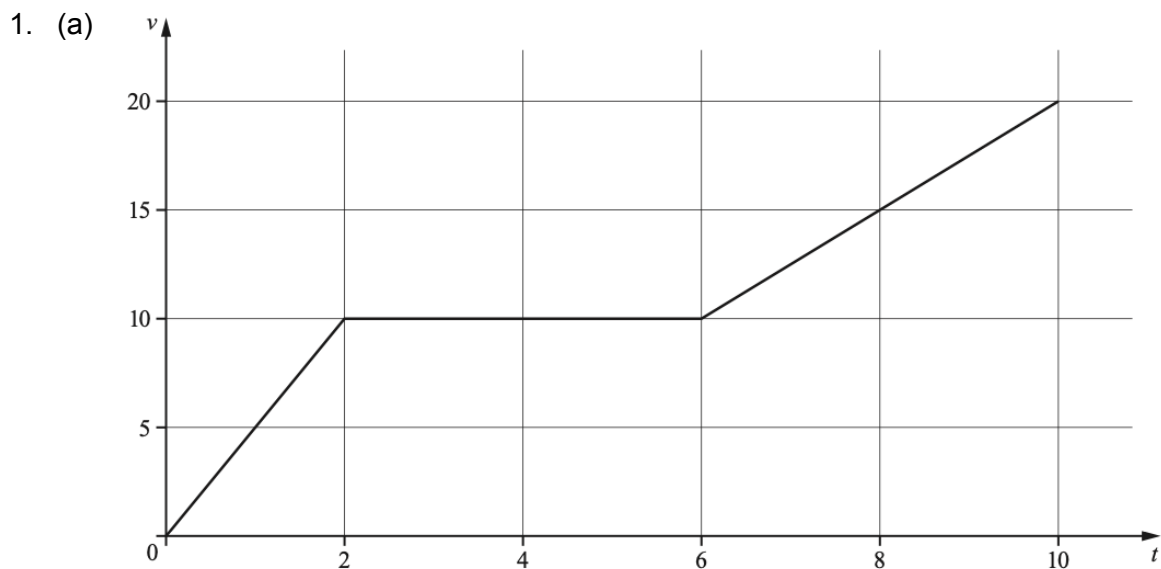


Chapter 16 Kinematics

0606/12/F/M/19



The diagram shows the velocity-time graph of a particle P moving in a straight line with velocity $v \text{ ms}^{-1}$ at time t seconds after leaving a fixed point.

- I. Write down the value of the acceleration of P when $t = 5$.

[1]

- II. Find the distance travelled by the particle P between $t = 0$ and $t = 10$.

[2]

(b) A particle Q moves such that its velocity, $v \text{ ms}^{-1}$, t seconds after leaving a fixed point, is given by $v = 3 \sin 2t - 1$.

I. Find the speed of Q when $t = \frac{7\pi}{12}$.

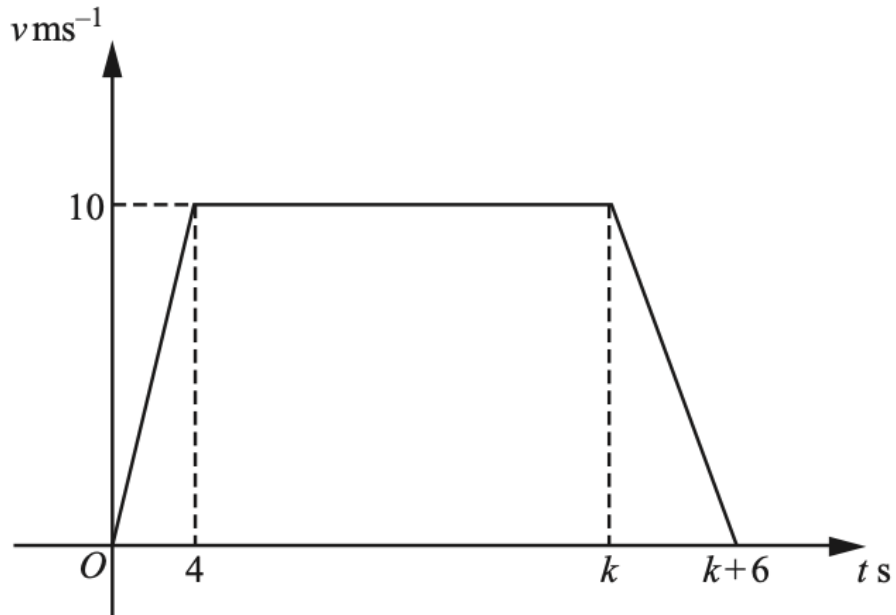
[2]

II. Find the least value of t for which the acceleration of Q is zero.

[3]

0606/21/M/J/19

2.



The velocity-time graph represents the motion of a particle travelling in a straight line.

- a. Find the acceleration during the last 6 seconds of the motion.

[1]

- b. The particle travels with constant velocity for 23 seconds. Find the value of k .

[1]

- c. Using your answer to **part (ii)**, find the total distance travelled by the particle.

[3]

0606/22/M/J/19

3. The velocity, $v \text{ ms}^{-1}$, of a particle travelling in a straight line, t seconds after passing through a fixed point O, is given by $v = \frac{4}{(t+1)^3}$.

a. Explain why the direction of motion of the particle never changes.

[1]

b. Showing all your working, find the acceleration of the particle when $t = 5$.

[3]

c. Find an expression for the displacement of the particle from O after t seconds.

[3]

d. Find the distance travelled by the particle in the fourth second.

[2]

0606/23/M/J/19

4. A particle travelling in a straight line passes through a fixed point O . The displacement, x metres, of the particle, t seconds after it passes through O , is given by $x = 5t + \sin t$.

a. Show that the particle is never at rest.

[2]

b. Find the distance travelled by the particle between $t = \frac{\pi}{3}$ and $t = \frac{\pi}{2}$.

[2]

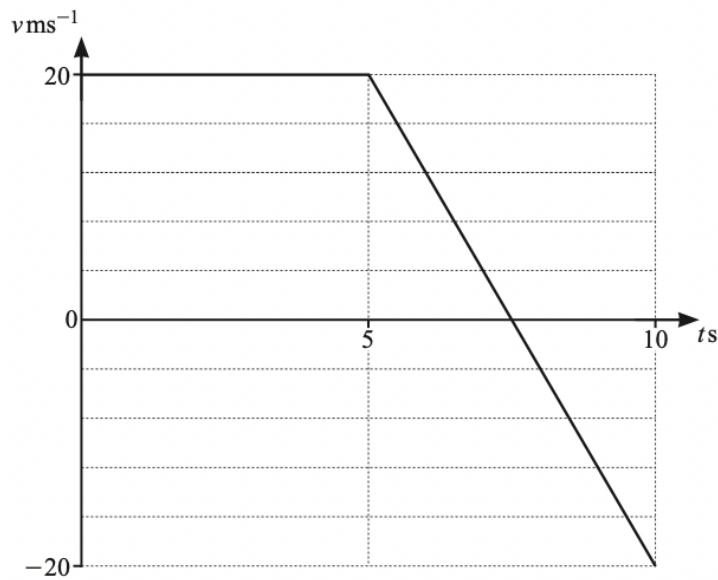
c. Find the acceleration of the particle when $t = 4$.

[2]

d. Find the value of t when the velocity of the particle is first at its minimum.

[2]

5. (a)



The velocity-time graph for a particle P is shown by the two straight lines in the diagram.

(i) Find the deceleration of P for $5 \leq t \leq 10$.

[2]

(ii) Write down the value of t when the speed of P is zero.

[1]

(iii) Find the distance P has travelled for $0 \leq t \leq 10$.

[2]

(b) A particle Q has a displacement of x m from a fixed point O, t s after leaving O. The velocity, $v \text{ ms}^{-1}$, of Q at time t s is given by $v = 6e^{2t} + 1$.

(i) Find an expression for x in terms of t .

[3]

(ii) Find the value of t when the acceleration of Q is 24 ms^{-2} .

[3]

0606/21/O/N/19

6. A particle is moving in a straight line such that t seconds after passing a fixed point O its displacement, s m, is given by $s = 3\sin 2t + 4\cos 2t - 4$.

(i) Find expressions for the velocity and acceleration of the particle at time t .

[3]

(ii) Find the first time when the particle is instantaneously at rest.

[3]

(iii) Find the acceleration of the particle at the time found in **part (ii)**.

[2]