2.

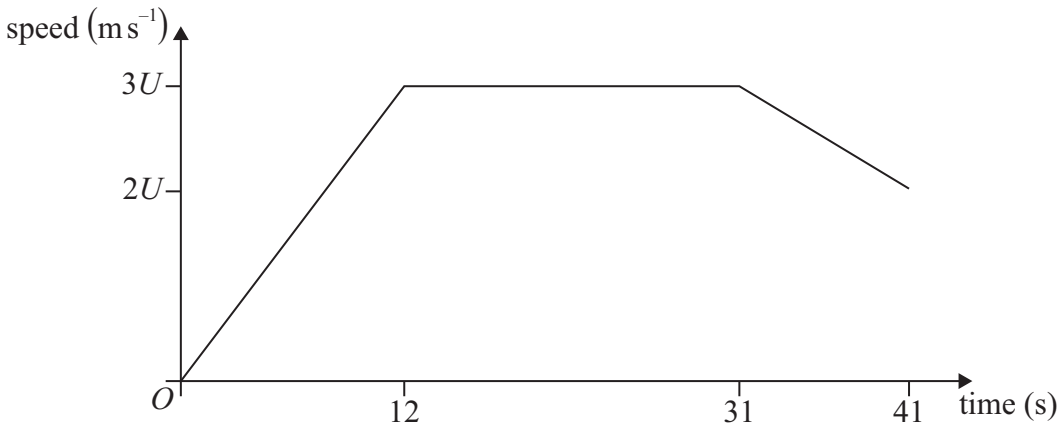


Figure 1

A particle P starts from rest at time $t = 0$ and moves in a straight line

- from $t = 0$ to $t = 12\,\text{s}$, P accelerates uniformly until it reaches a speed of $3U\,\text{m s}^{-1}$
- from $t = 12\,\text{s}$ to $t = 31\,\text{s}$, P moves with constant speed $3U\,\text{m s}^{-1}$
- from $t = 31\,\text{s}$ to $t = 41\,\text{s}$, P decelerates uniformly until it has speed $2U\,\text{m s}^{-1}$

as shown on the speed-time graph in Figure 1.

The distance travelled by P between $t = 0$ and $t = 41\,\text{s}$ is 600 m.

(a) Show that $U = 6$

(3)

(b) Find the distance travelled by P whilst moving from rest to a speed of $6\,\text{m s}^{-1}$

(2)

(c) Find the acceleration of P between $t = 0$ and $t = 12\,\text{s}$.

(1)

(d) Find the deceleration of P between $t = 31\,\text{s}$ and $t = 41\,\text{s}$.

(2)

(e) Sketch an acceleration-time graph to represent the motion of P from $t = 0$ to $t = 41\,\text{s}$.

(2)

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Question 2 continued

(Total for Question 2 is 10 marks)