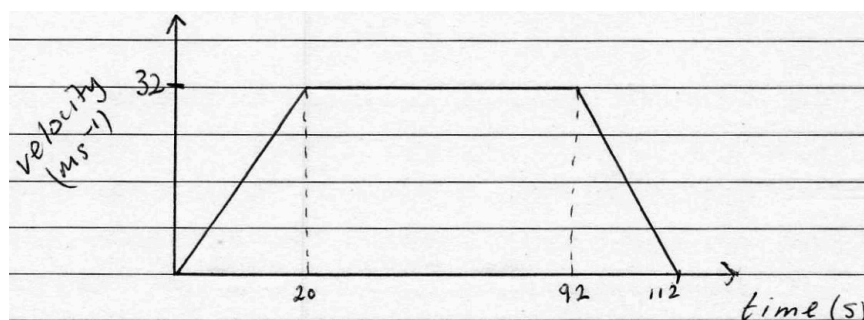


1

- (a)
- Uses the equal acceleration and deceleration magnitudes to split the remaining journey time equally: $\frac{112 - 72}{2}$. (M1)
 - Obtains 20 s. (A1)
- (b)
- Draws a trapezoidal velocity-time graph rising uniformly from (0, 0) to (20, 32), remaining horizontal until $t = 92$, and then falling uniformly to (112, 0). (B1)
 - Labels the velocity and time axes and the key values 20, 92, 112, and 32. (B1)

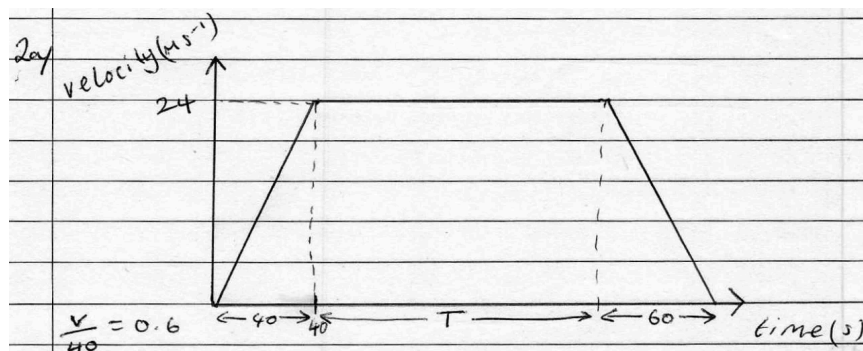


- (c)
- Uses distance as the area under the velocity-time graph. (M1)
 - Calculates the two triangular areas and the rectangular area using $\frac{1}{2}(20)(32) + 72(32) + \frac{1}{2}(20)(32)$. (M1)
 - Obtains 2944 m. (A1)

(Total for question 1 is 7 marks)

2

- (a)
- Calculates the maximum speed as $0.6 \times 40 = 24 \text{ m s}^{-1}$. (B1)
 - Calculates the deceleration time using $\frac{24}{T} = 0.4$, giving $T = 60 \text{ s}$. (B1)
 - Draws a correctly shaped and labelled trapezoidal velocity-time graph. (B1)

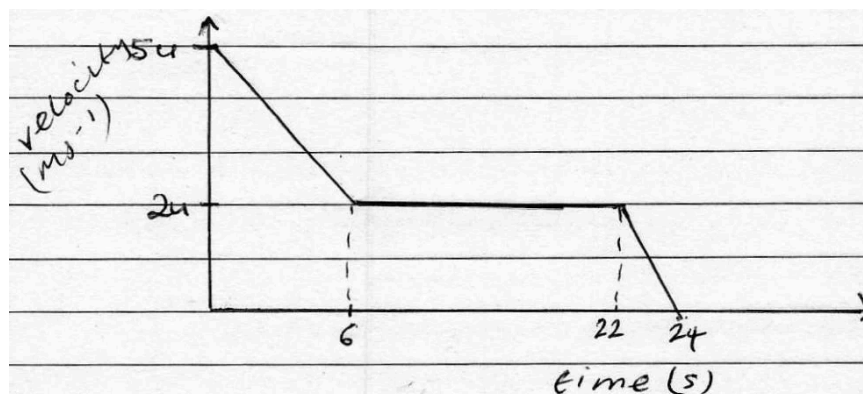


- (b)
- Uses the area under the graph and forms $\frac{1}{2}(40)(24) + 24T + \frac{1}{2}(60)(24) = 4000$, where T is the time at constant speed. (M1)
 - Solves $480 + 24T + 720 = 4000$ to obtain $T = \frac{350}{3} \text{ s}$. (A1)
 - Adds all three time intervals: $40 + \frac{350}{3} + 60 = \frac{650}{3} \text{ s} \approx 216.7 \text{ s}$. (A1)

(Total for question 2 is 6 marks)

3

- (a)
- Draws a piecewise-linear graph decreasing from $(0, 5U)$ to $(6, 2U)$, remaining horizontal to $(22, 2U)$, and then decreasing to $(24, 0)$. (B1)
 - Labels the axes and the key time and velocity values. (B1)



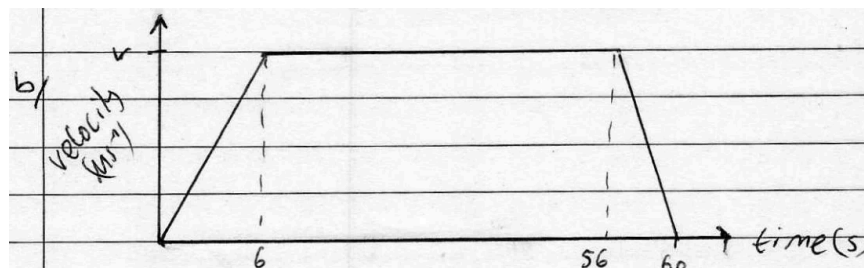
- (b)
- Uses change in speed divided by time for the first deceleration: $\frac{5U - 2U}{6}$. (M1)
 - Obtains the first deceleration as $\frac{1}{2}U \text{ m s}^{-2}$. (A1)
 - Uses change in speed divided by time for the second deceleration: $\frac{2U}{2}$. (M1)
 - Obtains the second deceleration as $U \text{ m s}^{-2}$. (A1)
- (c)
- Uses distance as the area under the velocity-time graph. (M1)
 - Calculates the area above $2U$ during the first 6 seconds as $\frac{1}{2}(6)(3U) = 9U$. (M1)
 - Calculates the rectangular area over the first 22 seconds as $22(2U) = 44U$. (M1)
 - Calculates the final triangular area as $\frac{1}{2}(2)(2U) = 2U$. (M1)
 - Forms and simplifies $220 = 9U + 44U + 2U = 55U$. (M1)
 - Obtains $U = 4$. (A1)

(Total for question 3 is 12 marks)

4

- (a)
- Writes the acceleration as $a = \frac{V}{6}$ and the deceleration as $1.5a = \frac{V}{t}$. (M1)
 - Equates $V = 6a$ and $V = 1.5at$ to obtain $t = 4$ s. (A1)
 - Calculates the total time as $6 + 50 + 4 = 60$ s. (A1)

- (b)
- Draws a graph increasing uniformly from $(0, 0)$ to $(6, V)$. (B1)
 - Shows constant velocity V from $t = 6$ to $t = 56$, followed by uniform deceleration to $(60, 0)$. (B1)
 - Labels the axes and the key time and velocity values. (B1)



- (c)
- Uses distance as the area under the velocity-time graph. (M1)
 - Forms $\frac{60 + 50}{2}V = 1320$, equivalently $55V = 1320$. (M1)
 - Obtains $V = 24 \text{ m s}^{-1}$. (A1)

(Total for question 4 is 9 marks)