

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

2 Kinematics in one dimension

Exercise B, Question 14

Question:

A set of traffic lights covers road repairs on a road. The traffic lights are 80 m apart. Assume that a car accelerates at 2 m s^{-2} from rest until it reaches a speed of 10 m s^{-1} and then travels at a constant speed. What is the least time taken for a car starting from rest at the first set of lights to reach the next set?

Solution:

$$\text{1st part, } v^2 = u^2 + 2as$$

$$10^2 = 0^2 + 2(2)(s_1)$$

$$100 = 4s_1$$

$$\therefore s_1 = 25 \text{ m}$$

$$\text{1st part, } v = u + at$$

$$10 = 0 + 2 \times t_1$$

$$\therefore t_1 = 5 \text{ s}$$

$$\text{2nd part } s_2 = 80 - 25 = 55 \text{ m}$$

$$\therefore s = ut \quad 55 = 10 \times t_2$$

$$\therefore t_2 = \frac{55}{10} = 5.5 \text{ s}$$

$$\therefore \text{total time} = t_1 + t_2 = 5 + 5.5 = 10.5 \text{ seconds}$$

