

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

2 Kinematics in one dimension

Exercise B, Question 5

Question:

A car accelerates uniformly from a speed of 50 km h^{-1} to a speed of 80 km h^{-1} in 20 seconds as it travels along a straight road.

- (a) Calculate the acceleration of the car in m s^{-2} .
- (b) Calculate the distance travelled during the 20 seconds, giving your answer to the nearest metre.

Solution:

$$50 \text{ km h}^{-1} = \frac{50 \times 1000}{3600} \text{ m s}^{-1} = 13 \frac{8}{9} \text{ m s}^{-1}$$

$$80 \text{ km h}^{-1} = \frac{80 \times 1000}{3600} \text{ m s}^{-1} = 22 \frac{2}{9} \text{ m s}^{-1}$$

$$v = u + at$$

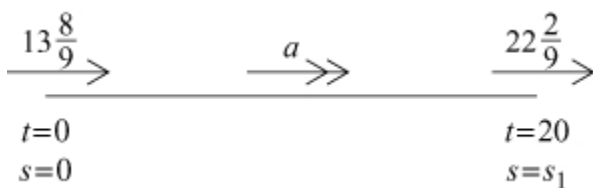
$$22 \frac{2}{9} = 13 \frac{8}{9} + a \times 20$$

$$\therefore 22 \frac{2}{9} - 13 \frac{8}{9} = 20a$$

(a)

$$\therefore \frac{8 \frac{1}{3}}{20} = a$$

$$\therefore a = \frac{5}{12} \text{ m s}^{-2} = 0.416 \text{ m s}^{-2} \text{ or } 0.417 \text{ m s}^{-2} \text{ (3 s.f.)}$$



$$(b) s = \frac{(u+v)}{2} \times t$$

$$s_1 = \frac{(13 \frac{8}{9} + 22 \frac{2}{9})}{2} \times 20$$

$$s_1 = 361 \frac{1}{9} \text{ m} = 361 \text{ metres (nearest metre)}$$