

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 2 Kinematics in one dimension

### Exercise B, Question 13

#### Question:

A cyclist is travelling along a straight horizontal road. As she passes a bus stop she sees a red traffic light ahead of her. She continues to travel with a constant speed of  $3 \text{ m s}^{-1}$  for 20 seconds and then decelerates at a constant rate of  $0.2 \text{ m s}^{-2}$  until coming to rest at the traffic light.

- (a) Calculate the distance between the bus stop and the traffic light.
- (b) Calculate the time the cyclist takes to travel from the bus stop to the traffic light.
- (c) Calculate the average speed of the cyclist between the bus stop and the traffic light. [A]

#### Solution:

$$\text{1st part, } s = ut$$

$$s_1 = 3 \times 20 = 60 \text{ m}$$

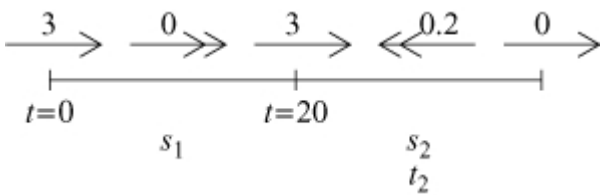
$$\text{2nd part, } v^2 = u^2 + 2as$$

$$(a) \quad 0^2 = 3^2 + 2(-0.2)(s_2)$$

$$\therefore 0.4s_2 = 3^2$$

$$s_2 = \frac{3^2}{0.4} = 22.5 \text{ m}$$

$$\therefore \text{total distance} = s_1 + s_2 = 60 + 22.5 = 82.5 \text{ metres}$$



$$(b) \text{ 2nd part, } v = u + at \quad 0 = 3 + (-0.2)t_2, \therefore 0.2t_2 = 3$$

$$\therefore t_2 = \frac{3}{0.2} = 15 \text{ seconds}$$

$$\therefore \text{total time} = 20 + 15 = 35 \text{ seconds}$$

$$(c) \quad \text{Average speed} = \frac{\text{total distance}}{\text{total time}} = \frac{82.5}{35} = 2.3571\dots$$

$$= 2.36 \text{ m s}^{-1} \text{ (3 s.f.)}$$