

## Exercise 1.D

①

$$\textcircled{2} \quad v = 60 \text{ km h}^{-1} = 16,666 \text{ m s}^{-1}$$

Acceleration:  $v = u + at$

$$16,666 = 0 + a(3 \times 60)$$

$$\therefore a_1 = 0,0926 \text{ m s}^{-2}$$

Deceleration:  $v = u + at$

$$0 = 16,666 + a(60)$$

$$\therefore a_3 = -0,2778 \text{ m s}^{-2}$$

$v(\text{m s}^{-1})$

$$(a) \quad S_{\text{Tot}} = 16000 \text{ m}$$

$$S_1 = \frac{1}{2} a t^2$$

$$S_1 = \frac{1}{2} (0,0926) (3 \times 60)^2 = 1500 \text{ m}$$

$$S_3 = \frac{1}{2} a_3 t^2 = \frac{1}{2} 0,2778 (60)^2 = 500 \text{ m}$$

$$\therefore S_2 = 16000 - (1500 + 500) = 14000 \text{ m}$$

$$\therefore t_2 = \frac{14000}{16,666} = 840 \text{ s} = 14 \text{ min}$$

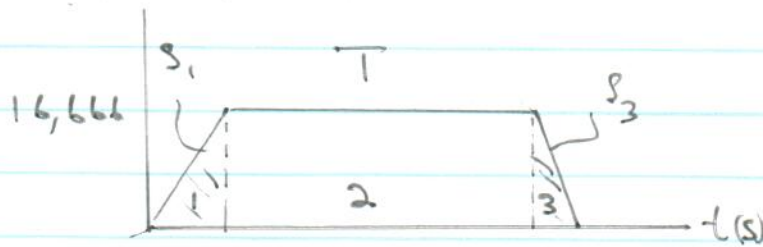
$$\therefore t_{\text{tot}} = 3 + 14 + 1 = 18 \text{ min}$$

OR (Area of trapezium)

$$S = 16000 = \frac{1}{2} [T + (T + (180 + 60))] \cdot 16,66$$

$$\therefore T = 840 \text{ s} = 14 \text{ min}$$

$$\therefore t_{\text{tot}} = t_1 + T + t_2 = 18 \text{ min}$$

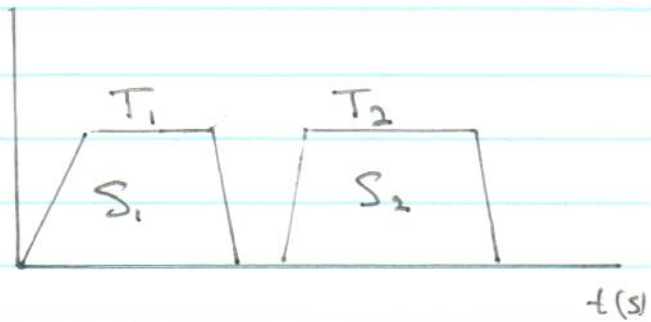


$v(\text{ms}^{-1})$ 

(b)

$$t_1 = 3 \text{ min} = 180 \text{ s} \quad 16,666$$

$$t_2 = 1 \text{ min} = 60 \text{ s}$$



$$S_1 = \frac{1}{2} (T_1 + (T_1 + t_1 + t_2)) 16,666$$

$$\therefore 9000 = \frac{1}{2} (T_1 + (T_1 + 180 + 60)) 16,666$$

$$\therefore T_1 = 420 \text{ s} = 7 \text{ min}$$

$$S_2 = \frac{1}{2} (T_2 + (T_2 + (t_1 + t_2))) 16,666$$

$$\therefore 7000 = \frac{1}{2} (T_2 + (T_2 + (180 + 60))) 16,666$$

$$\therefore T_2 = 300 \text{ s} = 5 \text{ min}$$

$$\therefore t_{\text{tot}} = 2t_1 + 2t_2 + T_1 + T_2 + 1$$

$$= 21 \text{ min}$$

1.D (3)

$$u = 15 \text{ m s}^{-1}$$
$$a = 0,5 \text{ m s}^{-2}$$
$$t = 30 \text{ s}$$

(a)  $v = u + at = 15 + 0,5(30) = 30 \text{ m s}^{-1}$

$$s = \frac{1}{2}(u+v)t = \frac{1}{2}(15+30)30 = 675 \text{ m}$$

(b)  $s' = 900 - s = 225 \text{ m}$

$$u = 30 \text{ m s}^{-1}$$
$$v = 15 \text{ m s}^{-1}$$

$$v^2 = u^2 + 2as$$

$$15^2 = 30^2 + 2(a)225$$

$$\therefore a = -1,5 \text{ m s}^{-2}$$

$$v = u + at \Rightarrow 15 = 30 - 1,5t_2 \Rightarrow t_2 = 10 \text{ s}$$

If  $v = 15 \text{ m s}^{-1}$  for whole journey  
then

$$t = \frac{s}{v} = \frac{900}{15} = 60 \text{ s}$$

$$\therefore \text{Time saved: } 60 - (30 + 10) = 20 \text{ s}$$