

Quiz #2B

Clearly indicate (with a box) your answers to the following questions. SHOW ALL WORK.

1. A driver wants to complete a trip along a straight road with an average velocity of 75 miles/hour. The driver starts by driving 77 miles/hour for 45 minutes. After a 7.0-minute break, the driver drives for another 35 minutes. How fast must he go in order to achieve the desired average velocity?

$$A: \bar{v}_A = 77 \text{ mi/hr}$$

$$t_A = 45 \text{ min} = 0.75 \text{ hr}$$

$$\Delta x_A = (77)(0.75) = 57.75 \text{ mi}$$

$$B: \bar{v}_B = 0$$

$$t_B = 7.0 \text{ min} = 0.117 \text{ hr}$$

$$\Delta x_B = 0$$

$$C: \bar{v}_C = ?$$

$$t_C = 35 \text{ min} = 0.583 \text{ hr}$$

$$\Delta x_C = ?$$

$$\bar{v} = 75 \frac{\text{mi}}{\text{hr}} = \frac{\Delta x_A + \Delta x_B + \Delta x_C}{t_A + t_B + t_C}$$

$$75 = \frac{57.75 + 0 + \Delta x_C}{0.75 + 0.117 + 0.583} = \frac{57.75 + \Delta x_C}{1.45}$$

$$\Delta x_C = 75(1.45) - 57.75 = 51$$

$$\bar{v}_C = \frac{51}{0.583} = \boxed{87 \text{ mi/hr}}$$

2. A truck on a straight road starts at rest and accelerates to a speed of 35 miles/hr over a 6.0-second time interval. Immediately upon reaching this speed, the driver spots a deer in the road and the slams on the brakes, giving the truck an acceleration of  $-4.2$  meters/sec<sup>2</sup>. What is the average velocity of the truck during the time interval between starting and stopping?

A:

$$\Delta x_A = 46.8 \text{ m}$$

$$v_0 = 0$$

$$v = 35 \text{ mi/hr} = 15.6 \text{ m/s}$$

$$a = ?$$

$$t_A = 6.0 \text{ s}$$

$$\Delta x = \frac{1}{2}(v + v_0)t = \frac{1}{2}(15.6 + 0)(6.0)$$

$$= 46.8 \text{ m}$$

B:

$$\Delta x_B = 29.0 \text{ m}$$

$$v_0 = 15.6 \text{ m/s}$$

$$v = 0$$

$$a = -4.2 \text{ m/s}^2$$

$$t_B = 3.7 \text{ s}$$

$$v = v_0 + at$$

$$0 = 15.6 - 4.2t \quad t = 3.71 \text{ s}$$

$$v^2 = v_0^2 + 2a\Delta x$$

$$0 = (15.6)^2 - 8.4\Delta x \quad \Delta x = \frac{-15.6^2}{-8.4} = 29.0$$

$$\bar{v} = \frac{\Delta x_A + \Delta x_B}{t_A + t_B} = \frac{46.8 + 29.0}{6.0 + 3.7} = 7.8 \text{ m/s}$$

$$= 17 \text{ mi/hr}$$

3. A student throws a ball straight up in the air, and the ball returns to the student's hand after 3.6 seconds.

a) To what maximum height does the ball reach above the point from which it was thrown?

b) What is the average velocity of the ball over the 3.6 second time interval?

$$\begin{aligned} \Delta x &= ? \\ a) \quad v_0 &= ? \\ v &= 0 \\ a &= -9.8 \text{ m/s}^2 \\ t &= 1.8 \text{ s} \end{aligned}$$

$$\begin{aligned} \Delta x &= vt - \frac{1}{2}at^2 \\ &= 0 + 4.9(1.8)^2 = 15.9 \end{aligned}$$

$$\boxed{\Delta x = 16 \text{ m}}$$

$$b) \quad \Delta x_{\text{tot}} = 0$$

$$\boxed{\bar{v} = 0}$$