MCQ Solution
ch.2

Question 1 : (C)

a) $V_{ix} = 8\ m/s$, $\Delta x = 640m$, $\Delta t = 40\ s$

$V_{ave,x} = ?$ $\quad V_{ave,x} = \frac{\Delta x}{\Delta t} = \frac{640}{40} = \boxed{16\ m/s}$

b) Use the definition of $V_{ave,x}$ for constant acceleration:

$$V_{ave,x} = \frac{V_{i,x} + V_{f,x}}{2}$$

$$\downarrow$$

$$16 = \frac{8 + V_{f,x}}{2} \Rightarrow \boxed{V_{f,x} = 24\ m/s}$$

c) $$a = \frac{\Delta V}{\Delta t} = \frac{V_{f,x} - V_{i,x}}{\Delta t} = \frac{24-8}{40} = \boxed{0.4\ m/s^2}$$

Question 2 $V_{ix} = 0$, $V_{f,x} = 2.7\ m/s$, $\Delta t = 3\ s$ (D)

a) $$a_x = \frac{\Delta V}{\Delta t} = \frac{2.7-0}{3} = \boxed{0.9\ m/s^2}$$

b) $$\Delta x = V_{ix}\Delta t + \frac{1}{2} a_x \Delta t^2$$
$$= 0 + \frac{1}{2}(0.9)(6)^2 = \boxed{16.2\ m}$$

Question 3: $v_{i,x} = 6\ m/s$ $v_{f,x} = 20\ m/s$ $\Delta t = ?$

(D) $\Delta x = 70\ m$

a) $a_x = ?$ $\quad v_{f,x}^2 - v_{i,x}^2 = 2 a_x \Delta x$

$$a_x = \frac{20^2 - 6^2}{2(70)} = 2.6\ m/s^2$$

b) $v_{f,x} = v_{i,x} + a_x \Delta t \rightarrow \cdots$ $\boxed{\Delta t = 5.4\ s}$

Question 4: $v_{i,x} = 30\ m/s$ $\quad v_{f,x} = 0$ $\quad \Delta t = 44\ s$

(C) a) $a_x = ?$ $\quad a_x = \frac{\Delta v}{\Delta t} = \frac{0 - 30}{44} = \boxed{-0.68\ m/s^2}$

b) $\Delta x = v_{i,x} \Delta t + \frac{1}{2} a_x \Delta t^2 = \cdots = \boxed{0.66\ km}$

Question 5: $\Delta t = 5\ s$ $\quad a_y = 9.8\ m/s^2$ $\quad v_{i,y} = 0$

a) $v_{f,y} = v_{i,y} + a_y \Delta t = 0 + (9.8)(5) = \boxed{49\ m/s}$

(B) b) Take downward to be positive

$$\Delta y = \cancel{v_{i,y} \Delta t}^{\,0} + \frac{1}{2} a_y \Delta t^2 = \frac{1}{2}(9.8)(5)^2 = \boxed{120\ m}$$

Question 6: $v_{i,y} = 8\ m/s$ $\quad \Delta y = 25\ m$ $\quad a_y = 9.8\ m/s^2$

a) $\Delta y = v_{i,y} \Delta t + \frac{1}{2} a_y \Delta t^2 = (8)\Delta t + \frac{1}{2}(9.8)(\Delta t^2)$

(A) $\downarrow$ $25 = 8\Delta t + 4.9 \Delta t^2 \rightarrow$ Solve $\boxed{\Delta t = 1.6\ s}$

b) $v_{f,y} = v_{i,y} + a_y \Delta t = \cdots = \boxed{24\ m/s}$

Question 7:

$\Delta t = 20\ s$, $a_y = 9.8\ m/s^2$, $\Delta y = ?$

a) $v_{iy} = 0 \rightarrow \Delta y = v_{iy}\Delta t + \frac{1}{2} a_y \Delta t^2$

$\Delta y = 0 + \frac{1}{2}(9.8)(20)^2 = 1960\ m \simeq \boxed{2\ km}$

(D)

b) $v_{iy} = -50\ m/s$ (downward is positive)

$\Delta y = (-50)(20) + \frac{1}{2}(9.8)(20)^2 = 960\ m = \boxed{0.96\ km}$

Question 8:

a) $\Delta x = \Delta x_1 + \Delta x_2 + \Delta x_3$

$= (25\ km/h)(\frac{4}{60}) + (30\ km/h)(\frac{8}{60}) + (20\ km/h)(\frac{2}{60})$

$\boxed{\Delta x = 9\ km}$

(D)

b) $v_{ave,x} = \frac{\Delta x}{\Delta t} = \frac{9\ km}{\frac{(4+8+2)}{60}} = \frac{9\ km}{\frac{14}{60}\ hr}$

$v_{ave,x} = 39\ km/h = \frac{39000\ m}{3600\ s}$

$= \boxed{10.8\ m/s}$