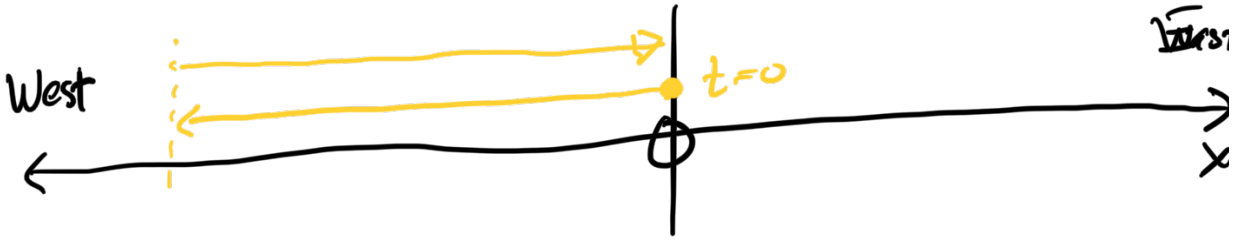
Test 1 Solutions

1.



Going Out: $v = 7.81$ m/s

$t = 0.98$ hr $= 3528$ s

$d = vt = (7.81 \text{ m/s})(3528 \text{ s})$

$= 27554$ m

$\therefore \quad \vec{x}(0) = \hat{0}$

$\vec{x}(t = 0.98 \text{ hrs}) = -27554\,\hat{i}$

a)

b) $\Delta\vec{x} = \vec{x}_f - \vec{x}_i$

$= -27554\,\hat{i} - 0\,\hat{i}$

$= -27554\ i$

c) $\Delta \vec{x} = \vec{x}_f - \vec{x}_i$

$= \hat{0} - \hat{0} = \hat{0}$

d) $\vec{v}_{avg} = \frac{\Delta \vec{x}}{\Delta t} = \frac{\hat{0}}{\Delta t} = 0$

e) Coming back : $d = 27554\ m$

$v = 5.85\ m/s$

$t = \frac{d}{v} = \frac{27554\ m}{5.85\ m/s} = 4710$

$\therefore\ t_{total} = t_{out} + t_{back}$

$= 3528\ s + 4710\ s$

$= 8238\ s$

f) $S_{avg} = \frac{\text{Total Distance}}{\text{Total Time}}$

$\supset \left(27554\ m \right)$

$= \frac{\quad}{8238\ s}$

$= 6.69\ m/s$

2.

Acc. phase | Dec. Phase.

$a = 0.07\ m/s^2$

$t = 8\ min = 480\ s$

$v_f = v_i + at$

$= 5.00 + (0.07)(480)$

$= 38.6\ m/s$

(a)

$v_i = 38.6\ m/s$

$v_f = 0$

$a = -0.650\ m/$

$t = ?$

$v_f = v_i + at$

$t = \frac{v_f - v_i}{a}$

$= \frac{0 - 38.6}{-0.650}$

$= 59.4\ s$ (b)

c) $\Delta x_{acc} = v_i t + \frac{1}{2} a t^2$

$= (5.00)(480) + \frac{1}{2}(0.07)(480$

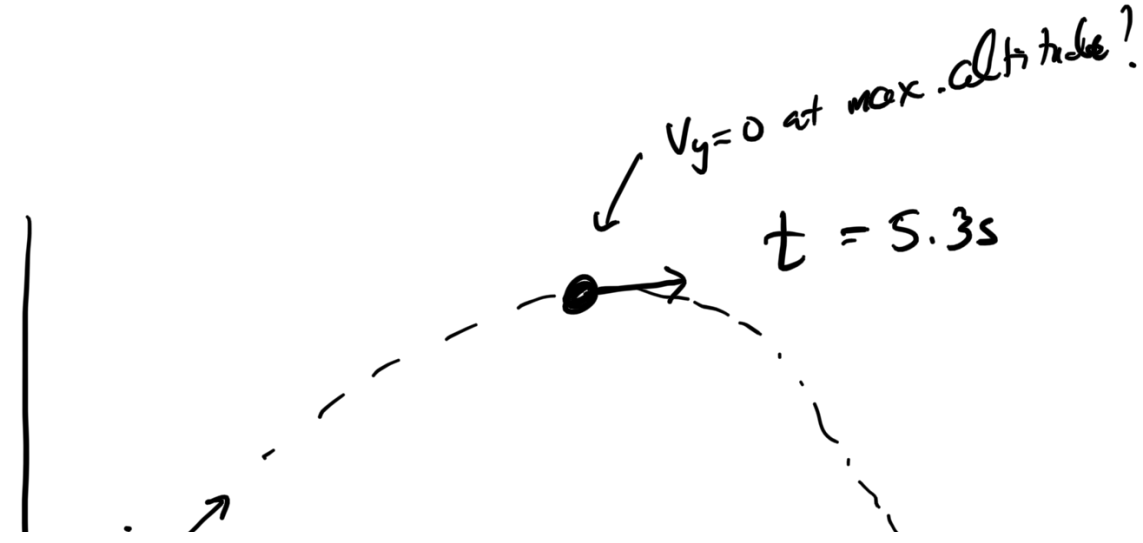
$= 10,464 \text{ m}$

$\Delta x_{dec} = v_i t + \frac{1}{2} a t^2$

$= (38.6)(59.4) + \frac{1}{2}(-0.650)($
$59.4)$

$= 1146 \text{ m}$

3.



X	Y
$a_x = 0$	$a_y = -g$
$v_{ix} = v_i \cos 60°$	$v_{iy} = v_i \sin 60°$
$t = 5.3s$	$\Delta y = 2.3$
	$t = 5.3s$

$v_{ix} = (30.49)(\cos 60°)$

$= 15.24 \text{ m/s}$

$\Delta x = v_{ix} t + \frac{1}{2} a_x t^2$

$= (15.24)(5.3)$

$= \boxed{80.8 \text{ m}}$

(c)

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

$2.3 = (v_i \sin 60°)(5.3) + \frac{1}{2}(-9.8)(5.3)^2$

$2.3 = 4.5899 v_i - 137.6$

$4.5899 v_i = 139.94$

$\boxed{v_i = 30.49 \text{ m/s}}$ a)

$\therefore \Delta \vec{r} = \Delta x \hat{i} + \Delta y \hat{j}$

$$= \boxed{80.8\,\hat{i} + 2.3\,\hat{j}}$$ d)

b) max. altitude.

$$v_{iy} = v_i \sin 60^\circ = (30.49)(\sin 60^\circ)$$
$$= 26.4 \text{ m/s}$$

$$v_{fy} = 0$$

$$a = -9.8 \text{ m/s}^2$$

$$\Delta y = ?$$

$$v_{fy}^2 = v_{iy}^2 + 2 a_y \Delta y$$

$$0 = (26.4)^2 - 2(9.8)(\Delta y)$$

$$\Delta y = \frac{(26.4)^2}{2(9.8)} = \boxed{35.6 \text{ m}}$$ (b)