MP/84

$-8.3 m/s$

$\vec{v}_1 = 8.3 m/s$ [down]

$\Delta t = 6.9 s$

$-9.81 m/s$

$\vec{a} = 9.81 m/s^2$ [down]

$\Delta \vec{d} = ?$

$\Delta d = v_1 \Delta t + \frac{1}{2} a (\Delta t)^2$

$\Delta d = (-8.3 m/s)(6.9 s) + \frac{1}{2}\left(-9.81 \frac{m}{s^2}\right)(6.9 s)^2$

$\Delta d = -57.27 m - 233.53 m$

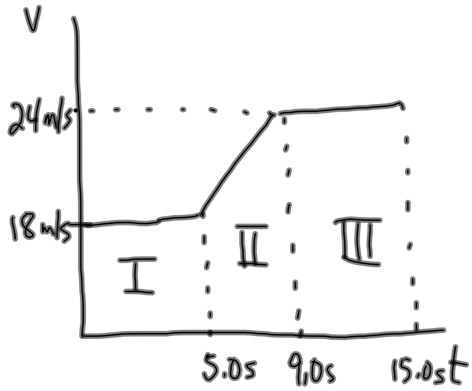
$\Delta d = -290.80 m$

$\boxed{\Delta \vec{d} \doteq 2.9 \times 10^2 m \text{ [down]}}$

Displacement

$\therefore$ The height of the cliff is $2.9 \times 10^2 m$

mp 145



Section I ⇒ constant velocity

$v = 18\,m/s$

$\Delta t = 5.0\,s$

$\Delta d = ??$

$v = \frac{\Delta d}{\Delta t}$

$\Delta d = v\Delta t$

$\Delta d = \left(18\frac{m}{s}\right)(5.0\,s)$

$\Delta d = 90\,m$

Section II - constant acceleration

$v_1 = 18\,m/s$

$v_2 = 24\,m/s$

$\Delta t = 4.0\,s$

$\Delta d = ?$

$v_{ave} = \frac{\Delta d}{\Delta t}$

$\Delta d = v_{ave}\Delta t$

$\Delta d = \left(\frac{v_1 + v_2}{2}\right)\Delta t$

$\Delta d = \left(\frac{18\,m/s + 24\,m/s}{2}\right)(4.0\,s)$

$\Delta d = (21\,m/s)(4.0\,s)$

$\Delta d = 84\,m$

Section III - constant velocity

$v = 24\,m/s$

$\Delta t = 6.0\,s$

$\Delta d = ?$

$v = \frac{\Delta d}{\Delta t}$

$\Delta d = v\Delta t$

$\Delta d = \left(24\frac{m}{s}\right)(6.0\,s)$

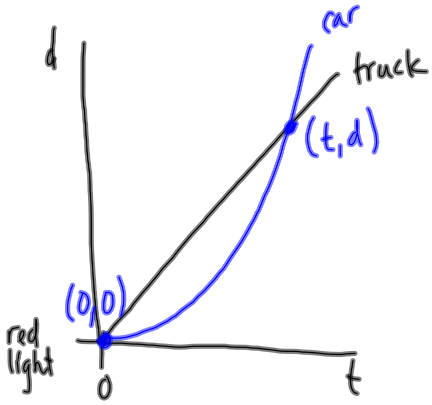
$\Delta d = 144\,m$

OVERALL

$$\begin{array}{r} 90\,m \\ 84\,m \\ +\;144\,m \\ \hline 318\,m \end{array}$$

$3.2 \times 10^2\,m$ [EAST]

MP|87



Truck - constant velocity

$v = 22\,m/s$ [N]

$\Delta d = v\Delta t$

$d - 0 = \left(22\frac{m}{s}\right)(t - 0)$

$\boxed{d = \left(22\frac{m}{s}\right)t}$ ← truck

Car - constant acceleration

$v_1 = 0$

$a = 4.8\,m/s^2$

$\Delta d = \overset{0}{\cancel{v_1\Delta t}} + \frac{1}{2}a(\Delta t)^2$

$d = \frac{1}{2}(4.8\,m/s^2)t^2$

$\boxed{d = (2.4\,m/s^2)t^2}$

Using substitution:

$22t = 2.4t^2$

$0 = 2.4t^2 - 22t$

$0 = t(2.4t - 22)$

$t = 0$ and $2.4t - 22 = 0$

$\underset{m/s^2}{2.4}t = \underset{m/s}{22}$

$\boxed{t \doteq 9.2\,s}$

Sub $t = 9.2\,s$ into $d = \left(22\frac{m}{s}\right)t$

$d = \left(22\frac{m}{s}\right)(9.2\,s)$

$\boxed{d \doteq 2.0 \times 10^2\,m}$

The car would catch the truck after 9.2s and 2.0×10^2 m [N] of the traffic light

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