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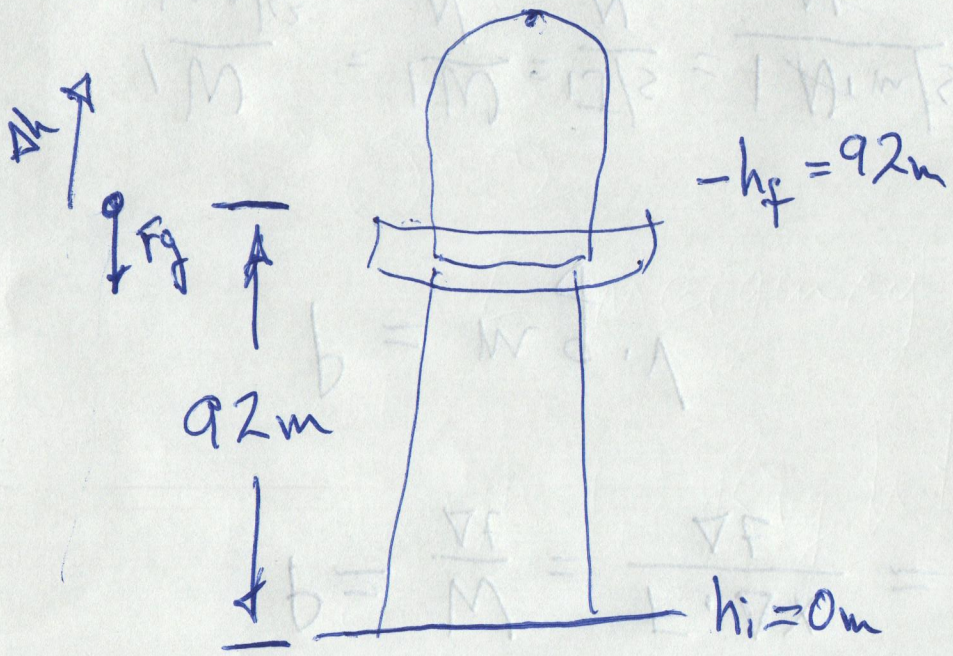
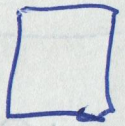
April 23 HRHS Physics

7.



$m = 1kg$



1L of water

$(1kg/L)(1000mL) = 1000g = 1kg$

$W = F \cdot \Delta X \cos\theta$

$W = mg\,\Delta h \cos\theta$

$W = (1kg)(9.8m/s^2)(92m)\cos 180°$

$W = 901.6\,J/L$

$P = \frac{W}{t} = \frac{(901.6\,J/L)(75L)}{1s} = 67{,}620\,J/s$

$1\,J/s = 1W$

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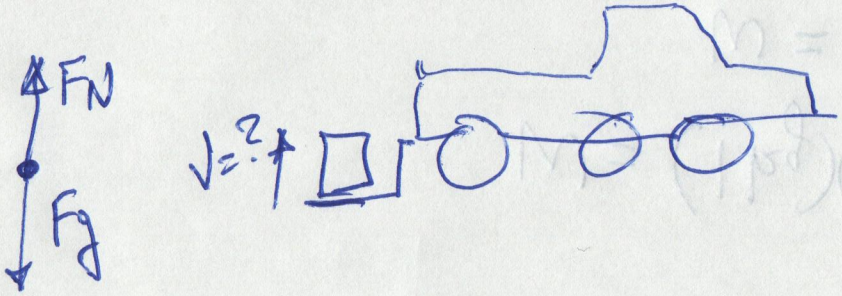
$m = 613\,kg$
$P = 950\,W$

Const. Velocity

$F_y: F_N - F_g = ma_y = 0$

$F_N = F_g = mg$



$$P = \frac{W}{\Delta t} = \frac{F \cdot \Delta x}{\Delta t} = F \cdot \frac{\Delta x}{\Delta t} = F \cdot v$$

$$P = mg \cdot v \qquad v = \frac{P}{mg} = \frac{950\,W}{(613\,kg)(9.8\,m/s^2)}$$

$$1\,\frac{W}{kg\,m/s^2} = 1\,\frac{W}{N} = 1\,\frac{J/s}{N} = 1\,\frac{\cancel{N}\,m/s}{\cancel{N}}$$

$$\frac{1\,W}{1\,N} = 1\,m/s$$

$$\boxed{v = 0.158\,m/s}$$

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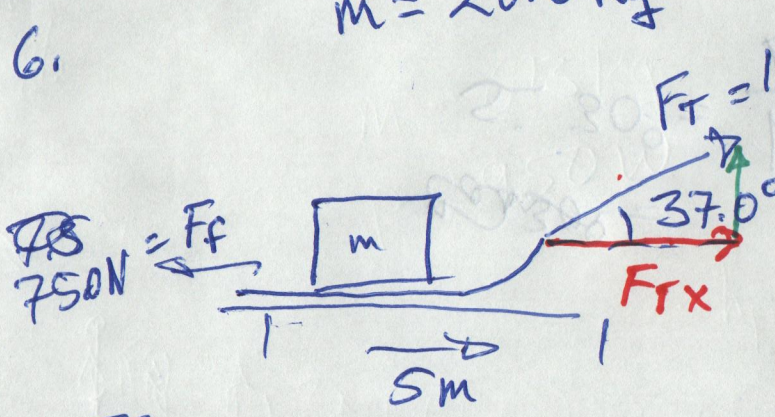
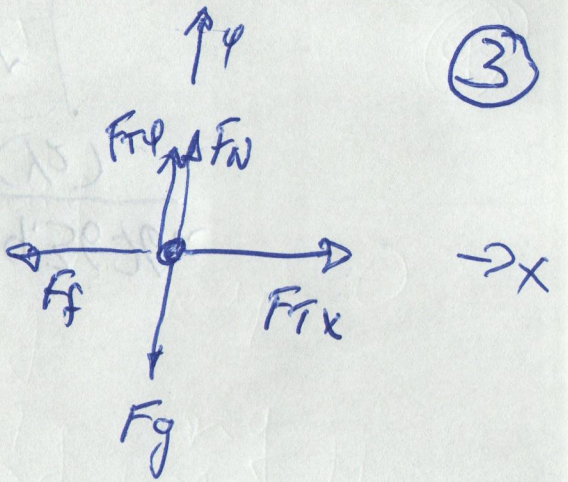
6.

$m = 20.0\,kg$



CAH

$F_{TX} = F_T \cos 37.0°$



(3)

F_x : $F_{Rx} = F_{Tx} - F_f = m a_x$

$$a_x = \frac{F_{Tx} - F_f}{m} = \frac{F_T \cos 37° - F_f}{m} = \frac{(100N)\cos 37.0° - 75N}{20.0kg}$$

$$a_x = 0.2432\,m/s^2$$

$t_i = 0\,s$ $\quad t_f = ?$

$x_i = 0m$ $\quad x_f = 5m$

$v_i = 0m/s$ $\quad v_f = ?$

$a = 0.2432\,m/s^2$

$$v_f^2 = v_i^2 + 2a\Delta x \qquad (v_i \to 0)$$

$$v_f = \pm[2a\Delta x]^{1/2} = [2(0.2432\,m/s^2)(5m)]^{1/2}$$

$$\boxed{v_f = 1.56\,m/s}$$

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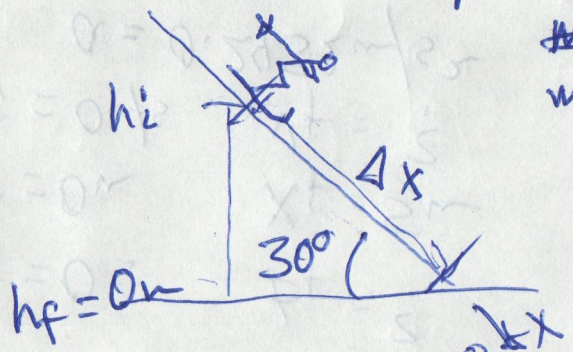


~~$m = 6.0\,kg$~~
$m = 60.0\,kg$

$v_f = 100\,km/h$
$v_f = 27.77\,m/s$

$$\cancel{\tfrac{1}{2}mv_i^2}^{0} + mgh_i = \tfrac{1}{2}mv_f^2 + \cancel{mgh_f}^{0}$$

$$gh_i = \tfrac{1}{2}v_f^2$$

$$h_i = \frac{v_f^2}{2g} = \frac{(27.7\,m/s)^2}{2(9.8\,m/s^2)}$$

$$h_i = 39.3676\,m$$

$\cos 30° =$

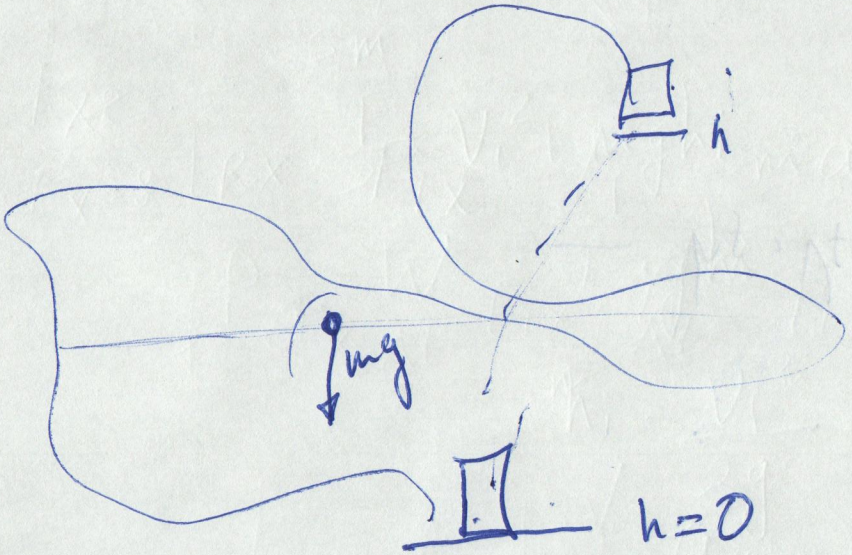
$$\sin 30° = \frac{h_i}{\Delta x}$$

$$\Delta x = \frac{h_i}{\sin 30°} = \frac{39.3676\,m}{(1/2)}$$

$$\boxed{\Delta x = 78.7\,m}$$

Gravitational Potential Energy

$$E_{pg} = mgh$$



Beginning End

$$\frac{1}{2} m V_i^2 + mgh_i = \frac{1}{2} m V_f^2 + mgh_f$$

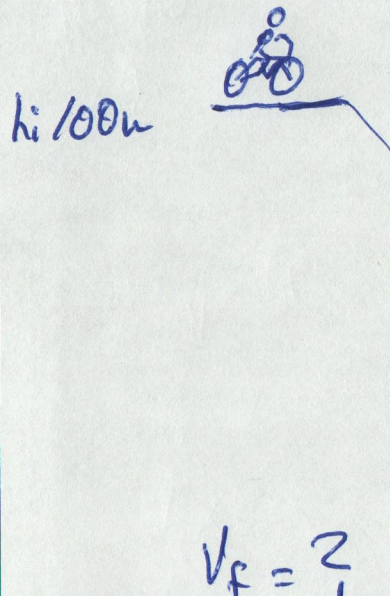
$$\frac{1}{2} V_i + gh_i = \frac{1}{2} V_f^2 + h_f$$

— h_i V_i

— h_f, V_f; $h = 0$

(7)

$m = 90\,kg$



$$\frac{1}{2}mv_i^2 + mgh_i = \frac{1}{2}mv_f^2 + mgh_f \quad (h_f \to 0)$$

$$\frac{1}{2}v_i^2 + gh_i = \frac{1}{2}v_f^2$$

$$v_f^2 = v_i^2 + 2gh_i$$

$$v_f = \pm\left[v_i^2 + 2gh_i\right]^{1/2}$$

$$v_f = \left[(5\,m/s)^2 + 2(9.8\,m/s^2)(100\,m)\right]^{1/2}$$

$$v_f = 44.5\,m/s \quad (160\,km/h)$$