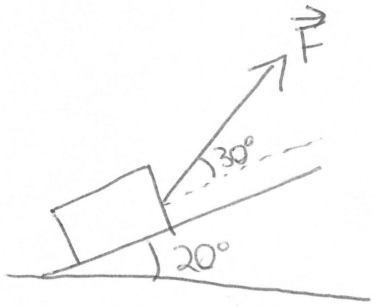
Recitation Week 3

Ch. 4 #4



a) $F_x = F\cos 30$

$60.0\,N = F\frac{\sqrt{3}}{2}$

$F = \boxed{69.3\,N}$

b) $F_y = F\sin 30$

$= 69.3\left(\frac{1}{2}\right) = \boxed{34.7\,N}$

Ch. 4 #16

a) $v_f^2 = v_o^2 + 2a(\Delta x)$

$(3.00\times10^6\,m/s)^2 = 0 + 2a(1.80\,cm)\cdot\frac{1\,m}{100\,cm}$

$2a = \frac{9.00\times10^{12}\,\frac{m^2}{s^2}}{0.018\,m}$

$a = \boxed{2.5\times10^{14}\,m/s^2}$

b) $v_f = v_o + at$

$3.00\times10^6\,m/s = 0 + 2.5\times10^{14}\,\frac{m}{s^2}(t)$

$t = \boxed{1.2\times10^{-8}\,s}$

c) $F = ma = 9.11\times10^{-31}\,kg\,(2.5\times10^{14}\,m/s^2)$

$= 2.278\times10^{-16}\,\frac{kg\cdot m}{s^2}$

$= \boxed{2.278\times10^{-16}\,N}$

Ch.4 #37

a) $F_{1y} = F_1 \sin 60 = 100 \sin 60\ N = 100\frac{\sqrt{3}}{2}\ N = 87\ N$

$F_{2y} = F_2 \sin(-30) = -140 \sin 30\ N = -140\left(\frac{1}{2}\right) N = -70\ N$

To move horizontally, $F_{Toty} = 0 = F_{1y} + F_{2y} + F_{3y}$

$87 - 70 + F_{3y} = 0$

$F_{3y} = -17\ N$ minimum force is $\boxed{17\ N}$

b) $F_{Totx} = F_{1x} + F_{2x} + F_{3x}$ ~~↗°~~

$F_{1x} = F_1 \cos 60 = 100 \cos 60\ N = 50\ N$

$F_{2x} = F_2 \cos(-30) = 140 \cos 30\ N = 140\frac{\sqrt{3}}{2}\ N = 121\ N$

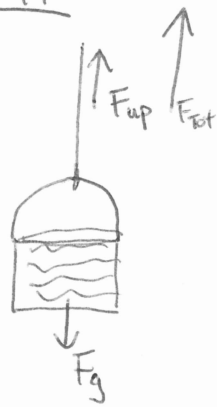
$F_{Totx} = 50 + 121\ N = 171\ N$

$F = ma$

$171\ N = m(2.0\ m/s^2) \Rightarrow m = \boxed{85.5\ kg}$

Ch.4 #41

a)



b) $F_{Tot} = 75.0\ N$

$F_{up} = F_{Tot} - F_g$

$= 75.0N - mg$

$= 75.0N - 4.80kg(9.8\ m/s^2)$

$= 75.0N - 47.04\ N$

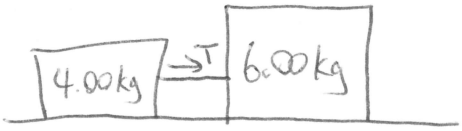
$= 27.96\ N = ma$

$a = \frac{27.96\ N}{4.8\ kg} = \boxed{5.8\ m/s^2}$

Ch.4 #43

a) Crates are connected, if a on one crate is $2.50\ m/s^2$, a on other crate is also $\boxed{2.50\ m/s^2}$

b)



$T = ma = 4.00\ kg\ (2.50\ m/s^2) = \boxed{10.00\ N}$

c)

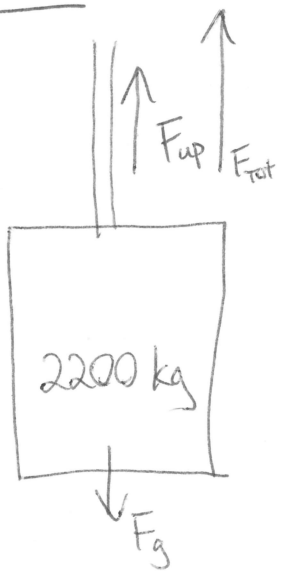
to the right, $\vec{F}$ is larger

d) $\vec{T} + \vec{F} = m\vec{a}$

$-10 + \vec{F} = 6.00\ kg (2.50\ m/s^2)$

$\vec{F} = \boxed{25.00\ N}$

Ch.4 #50



$F_{tot} = F_{up} + F_g$

$28{,}000\ N = ma_{up} + mg$

$\frac{28{,}000\ N}{2200\ kg} = a_{up} + 9.8\ m/s^2$

$a_{up} = 12.7 - 9.8\ m/s^2$

$= \boxed{2.9\ m/s^2}$

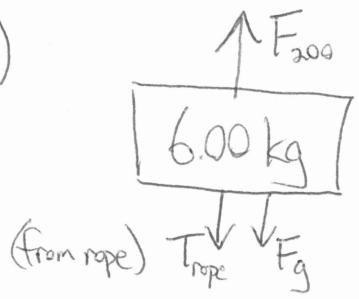
on moon replace g with $1.62\ m/s^2$

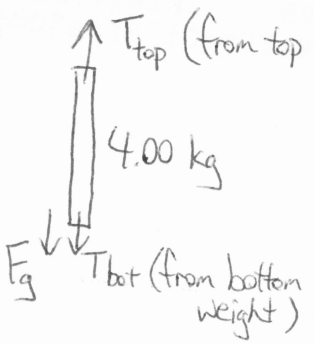
$12.7\ m/s^2 = a_{up} + 1.62\ m/s^2$

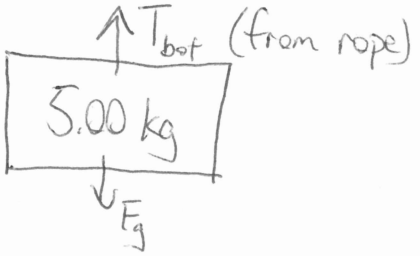
$\boxed{a_{up} = 11.08\ m/s^2}$

Ch.4 #54

a)







b) Total ~~mass~~ $= 6.00 + 4.00 + 5.00\ kg = 15.00\ kg = m_{tot}$

$F_{gtot} = m_{tot} g = 15.00(-9.8) = -147\ N$

$F_{tot} = F_{200} + F_{gtot} = 200 - 147 = 53\ N$

$53\ N = m_{tot} a = 15.00(a)$

$\boxed{a = 3.53\ m/s^2}$

c) $T_{top} = ?$ Look at free body diagram of 6.00 kg weight.

$F_{200} + T_{top} + F_g = ma$

$200 + T_{top} + 6.00(-9.8) = 6.00(3.53)$

$T_{top} + 141.2 = 21.18$

$T_{top} = -120\ N$

$\boxed{|T_{top}| = 120\ N}$

d) $T_{mid} = ? = \frac{T_{top} + T_{bot}}{2}$ Look at free body diagram of 5.00 kg weight

$T_{bot} + F_g = ma$

$T_{bot} + 5.00(-9.8) = 5.00(3.53)$

$T_{bot} = 66.65\ N$

$|T_{bot}| = 66.65\ N$

$T_{mid} = \frac{120 + 67}{2} = \boxed{93.5\ N}$