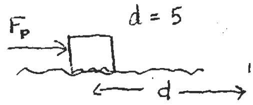
7 – 31, 40, 54, 58
8 – 2, 5, 10, 24, 30, 36

(31)



$m = 40$
$d = 5$

$F_p = 130$
$\mu_k = .30$

a) $F_p d = 130 \cdot 5 = \boxed{650\,J}$

b) $\Delta E_{system} = \Delta K + \Delta E_{int} = F_p d$

$\Delta K = -\mu mgd + F_p d$

$\Rightarrow \quad \Delta E_{int} = \mu mgd = \boxed{588\,J}$

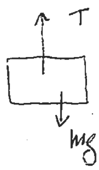
c) $W_N = 0$ because $\vec{F}_N \cdot d\vec{r} = \boxed{0}$

d) $m\vec{g} \cdot d\vec{r} = \boxed{0}$

e) $\Delta KE = F_p d - \mu mgd = d(F_p - \mu mg) = \boxed{62\,J}$

f) $= \frac{1}{2} m v^2 = \Delta KE \Rightarrow v = \left(\frac{2\Delta KE}{m}\right)^{1/2} = \boxed{1.76\ m/s}$

(40)



$m = 650$

$T - mg = ma \Rightarrow T = m(a+g)$

$a = \frac{\Delta v}{\Delta t} = \boxed{\frac{7}{12}\ m/s^2} = .58\ m/s^2$

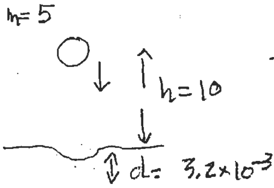
$d = \bar{v} t = \frac{7}{8} \times 3 = \boxed{\frac{21}{8}\ m}$
$= 2.63\,m$

So $T = m(9.8 + .58\bar{3})$

$\frac{Td}{t} = P = \frac{650(9.8 + .583)\,21/8}{3} =$

or $P = mg\frac{v}{2} + \frac{1}{2}\frac{mv^2}{t} = \frac{mv}{2}\left[g + \frac{v}{t}\right] = 650\,\frac{7}{8}\left(9.8 + \frac{7}{12}\right) =$
$\boxed{5.91 \times 10^3\,W}$

(54)



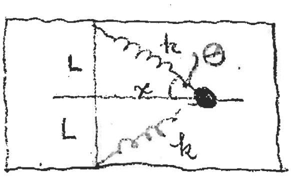
$m = 5$

$-(F_p - mg)d = \Delta KE = 0 - mgh$

$F_p - mg = \frac{mgh}{d} \Rightarrow F_p = mg\left(\frac{h}{d} - 1\right)$

$= 5(9.8)\left[\frac{10}{3.2\times10^{-3}} - 1\right] = \boxed{1.53 \times 10^5\,N}$

(58)



$k\left[(L^2+x^2)^{1/2} - L\right]$ is force from each

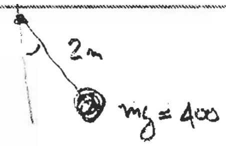
$-2k\left[(L^2+x^2)^{1/2} - L\right]\cos\theta =$

$-2k\left[(L^2+x^2)^{1/2} - L\right]\frac{x}{(L^2+x^2)^{1/2}} = \boxed{-2kx\left[1 - \frac{L}{(L^2+x^2)^{1/2}}\right]\hat{i}}$

$-\int_A^0 2kx\left[1 - \frac{L}{(L^2+x^2)^{1/2}}\right]dx = -\int_A^0 2kx\,dx + \int_A^0 \frac{2kxL}{(L^2+x^2)^{1/2}}\,dx$

$= \frac{2kx^2}{2}\Big|_0^A + 2kL(L^2+x^2)^{1/2}\Big|_A^0 = \frac{2kA^2}{2} + 2kL^2 - 2kL(L^2+A^2)^{1/2}$

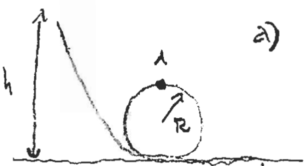
$\boxed{= kA^2 + 2kL^2 - 2kL(L^2+A^2)^{1/2}}$

2) 

a) $mg\ell = \boxed{800\,J}$

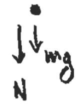
b) $(L - L\cos 30)mg = 800(1 - \sqrt{3}/2) = 800(1 - .866) = \boxed{107\,J}$

c) $= \boxed{0}$

5) 

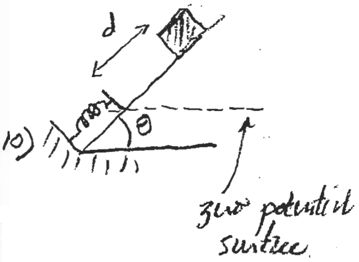
a) $mgh = mg2R + \frac{1}{2}mv^2 = v = \left(2g(h-2R)\right)^{1/2}$

$\left[2g(3.50R - 2R)\right]^{1/2} = \boxed{(3gR)^{1/2}}$

b) 

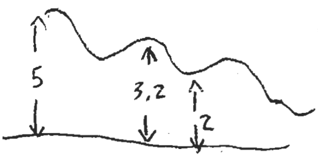
$N + mg = \frac{mv^2}{R} \Rightarrow N = \frac{mv^2}{R} - mg = \frac{m3g\cancel{R}}{\cancel{R}} - mg$

$= \boxed{2mg} \Rightarrow \boxed{.098\,N}$

10) 

$mgd\sin\theta = \frac{1}{2}kx^2 - mgx\sin\theta$

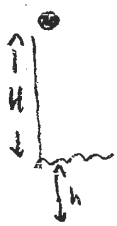
$$\boxed{d = \frac{kx^2}{2mg\sin\theta} - x}$$

24) 

(B) $mg5 = mg(3.2) + \frac{1}{2}mv^2 \Rightarrow v = [2g(1.8)]^{1/2} = \boxed{5.94\,m/s}$

(C) $mg5 = mg(2.0) + \frac{1}{2}mv^2 \Rightarrow v = (2g(3))^{1/2} = \boxed{7.67\,m/s}$

$mg\Delta h = 5(9.8)\,3 = \boxed{147\,J}$

30) 

$\rightarrow v^2 = v_0^2 + 2gH \Rightarrow v^2 = 2gH$

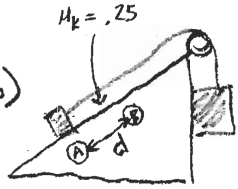
$0 = 2gH + 2h\left(\frac{mg - f_{H_2O}}{m}\right)$

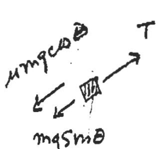
$2hg + 2gH = 2h\frac{f}{m}$

$f = \frac{m}{\cancel{2h}}(\cancel{2}hg + 2Hg) = mg + m\frac{H}{h}g =$

$mg\left(1 + \frac{H}{h}\right) = (70)(9.8)\left(1 + \frac{10}{5}\right)$

$\boxed{2.06 \times 10^3\,N}$

36) 



$$\left.\begin{array}{l} T - \mu mg\cos\theta - mg\sin\theta = ma \\ Mg - T = Ma \end{array}\right\} \quad -\mu mg\cos\theta - mg\sin\theta + Mg = a(M+m)$$

$$\boxed{a = \frac{-\mu mg\cos\theta - mg\sin\theta + Mg}{M+m}}$$

So $T = Mg - M\left(\frac{Mg - \mu mg\cos\theta - mg\sin\theta}{M+m}\right)$

So $F_N \cdot d = \Delta KE = \left[Mg - \frac{M(Mg - \mu mg\cos\theta - mg\sin\theta)}{M+m} - \mu mg\cos\theta - mg\sin\theta\right]d$

$= (980 - 391.5 - 97.8 - 294.9)\,20$

$= \boxed{3.92 \times 10^3\,J}$