Ch. 5

#33 (A) $KE_i + PE_i = KE_f + PE_f$ ($KE_i = 0$, $PE_i = 0$)

$$\frac{1}{2}Kx^2 = mgh$$

$$K = \frac{2mgh}{x^2} = \frac{2(.02\,kg)(9.8\,m/s^2)(20m)}{.12^2}$$

$$\boxed{K = 544\ \frac{N}{m}}$$

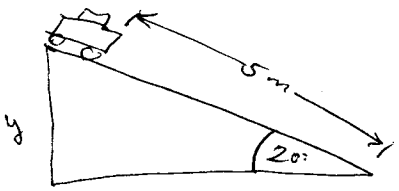
(B) $KE_i + PE_i = KE_f + PE_f$

$$\frac{1}{2}Kx^2 = \frac{1}{2}mV^2$$

$$\left(544\frac{N}{m}\right)(.12m)^2 = (.02kg)V^2$$

$$\boxed{V = 19.7\ \frac{m}{s}}$$

#41



$KE_i + PE_i = KE_f + PE_f + W_f$ ($KE_i = 0$, $PE_f = 0$)

W_f = WORK DUE TO FRICTION!

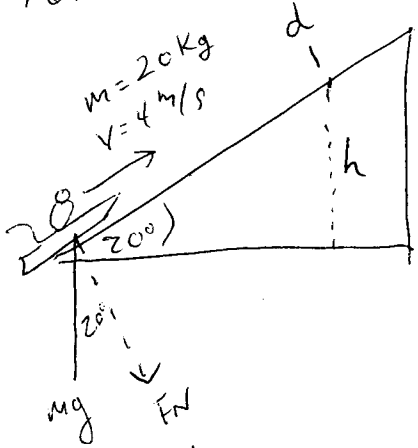
$W_f = F_K d = (4\times10^3 N)(5m) = 20\times10^3\,J$

$$mgh = \frac{1}{2}mV^2 + 20\times10^3$$

$$\frac{1}{2}(2.1\times10^3)V^2 = (2.1\times10^3)(9.8)(5\sin 20) - 20\times10^3$$

$$\boxed{V = 3.8\ m/s}$$

#46.



$\sin 20° = \frac{h}{d}$

$h = d\sin 20°$

$F_K = \mu_K F_N = (.2)(mg\cos 20°) = (.2)(20kg)(\cos 20°)(9.8)$

$F_K = 36.8N$

$KE_i + PE_i = KE_f + PE_f + W_f$ ($KE_i = 0$, $PE_f = 0$)

$$\frac{1}{2}mV^2 = mgh + F_K d$$

$$mgh = \frac{1}{2}mV^2 - F_K d$$

$$(20)(9.8)(d\sin 20°) = \frac{1}{2}(20)(4)^2 - (36.8)d$$

$$67d = 160 - 36.8d$$

$$\boxed{d = 5.29m}$$

51. $P = Fv = \frac{F \cdot \Delta y}{\Delta t} = \frac{F}{\Delta t} \cdot \Delta y = \frac{mg}{\Delta t} \Delta y = (1.2 \times 10^6 \frac{Kg}{s})(9.8 \frac{m}{s^2})(50\,m)$

$\boxed{P = 5.9 \times 10^8\, W}$

75. (A) $E_T = PE_i = \frac{1}{2} Kx^2 + mgh = \frac{1}{2}(2.5 \times 10^4 \frac{N}{m})(.1m)^2 - (25Kg)(9.8)(.1m)$

$\boxed{E_T = 100.5\,J}$

(B) $mgX_2 = E_T$

$X_2 = \frac{100.5}{(25)(9.8)} = .41\,m$

(C) $\frac{1}{2} mV^2 = E_T$

$V = \sqrt{\frac{2E}{m}} = \sqrt{\frac{2(100.5\,J)}{(25\,Kg)}} = \boxed{2.84 \frac{m}{s}}$

(D) $KE(x) = E_T - PE(x)$

$KE(x) = E_T - (mgx + \frac{1}{2} Kx^2)$

AT MAX $\frac{dK(x)}{dx} = -mg - Kx = 0$

$x = \frac{-mg}{K} = \frac{(25Kg)(9.8 \frac{m}{s^2})}{(2.5 \times 10^4)} = .0098\,m$

(E) $KE(x) = E_T - (25Kg)(9.8)(.0098) - \frac{1}{2}(2.5 \times 10^4)(.0098m)^2$

$KE(x) = 96.9\,J$

$\frac{1}{2} mV^2 = 96.9\,J$

$\boxed{V = 2.7 \frac{m}{s}}$