Recitation Week 6

Ch.6 #69

$m = 0.120\ kg$

a) $r = 0.40 m.$
$v = 0.70\ m/s$

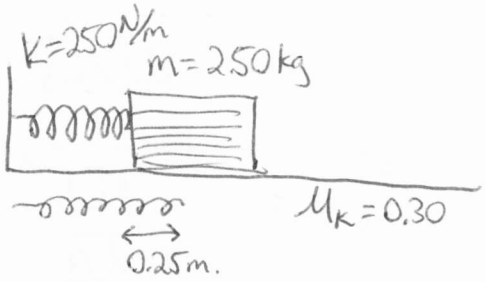
$$F_c = \frac{mv^2}{r} = \frac{(0.120)(0.70)^2}{0.40} = \boxed{0.147\ N}$$

b) $r = 0.10 m$
$v = 2.80\ m/s$

$$F_c = \frac{mv^2}{r} = \frac{(0.120)(2.80)^2}{0.10} = \boxed{9.408\ N}$$

c) $$W = \Delta K = K_f - K_o = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_o^2$$
$$= \frac{1}{2}(0.120)(2.80)^2 - \frac{1}{2}(0.120)(0.70)^2$$
$$= \boxed{0.441\ J}$$

Ch.6 #77



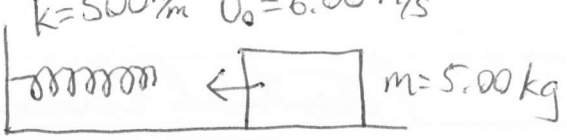
Energy in compressed spring
$$= \frac{1}{2}kx^2$$
$$= \frac{1}{2}(250)(0.25)^2$$
$$= 7.81\ J$$

$$F_f = \mu N = \mu mg = 0.30(2.50)(9.8) = 7.35\ N$$

Energy in compressed spring = Energy taken away by friction

$$7.81\ J = F_f \cdot d = 7.35 \cdot d$$
$$\boxed{d = 1.06\ m}$$

Ch.6 #81



a) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(5)(6.00)^2$
$= 90\ J$

PE of spring = $KE = \frac{1}{2}kx^2$

$\frac{1}{2}kx^2 = 90$

$\frac{1}{2}(500)x^2 = 90$

$x^2 = 0.36$

$\boxed{x = 0.6\ m}$

b) PE of spring $= \frac{1}{2}kx^2 = \frac{1}{2}(500)(0.150)^2 = 5.625\ J$

$\frac{1}{2}mv^2 = 5.625\ J$

$\frac{1}{2}(5.00)v^2 = 5.625$

$v^2 = 2.25$

$\boxed{v = 1.5\ m/s}$

Ch.6 #93

a) Volume of blood $= 7500\ L \cdot \frac{1\ m^3}{1000\ L} = 7.5\ m^3$

mass of blood $= \rho V = 1.05\times10^3\ \frac{kg}{m^3} \cdot 7.5\ m^3 = 7.875\times10^3\ kg$

$W = F \cdot d = mgd$

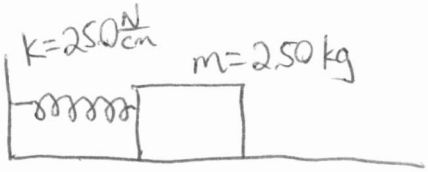
$= 7.875\times10^3\ (9.8)(1.63)$

$= \boxed{1.258\times10^5\ J}$

b) Power $= \frac{\text{Energy}}{\text{time}} = \frac{1.258\times10^5\ J}{1\ day} \cdot \frac{1\ day}{24\ hrs.} \cdot \frac{1\ hr}{60\ min} \cdot \frac{1\ min}{60\ sec.}$

$= \boxed{1.456\ W}$

Ch. 7 #23



a) PE in spring = 11.5 J

KE of mass = 11.5 J = $\frac{1}{2}mv^2$

$\frac{1}{2}(2.50)v^2 = 11.5$

$v^2 = 9.2$

$\boxed{v = 3.03 \text{ m/s}}$

b) Force from spring = $-kx$, greatest when x is biggest, this means greatest acceleration happens at maximum compression of spring.

$11.5 \text{ J} = \frac{1}{2}kx^2$

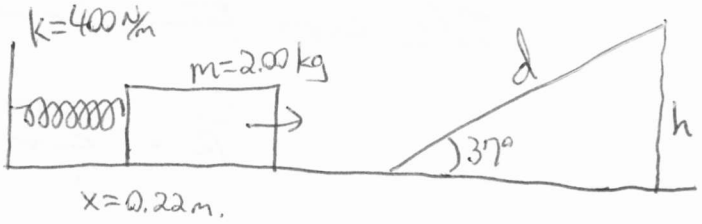
$\frac{1}{2}(2500)x^2 = 11.5$

$x^2 = 9.2 \times 10^{-3}$

$\boxed{x = 0.096 \text{ m}}$

$k = 25 \frac{\text{N}}{\text{cm}} \cdot \frac{100 \text{ cm}}{\text{m}} = 2500 \text{ N/m}$

Ch. 7 #42



a) PE in spring = $\frac{1}{2}kx^2$

$= \frac{1}{2}(400)(0.22)^2$

$= 9.68 \text{ J}$

KE of block = $\frac{1}{2}mv^2 = 9.68$

$\frac{1}{2}(2.00)v^2 = 9.68$

$\boxed{v = 3.11 \text{ m/s}}$

b) PE of block at top = $mgh = 9.68 \text{ J}$

$2.00(9.8)h = 9.68$

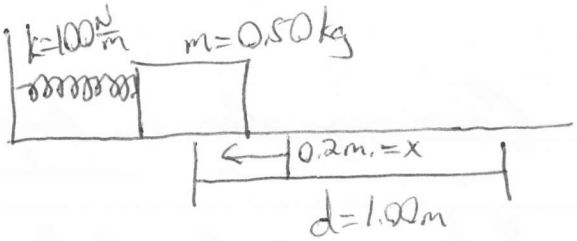
$h = 0.49 \text{ m}$

$\sin 37° = \frac{h}{d}$

$d = \frac{h}{\sin 37} = \frac{0.49}{\sin 37}$

$\boxed{d = 0.81 \text{ m}}$

Ch.7 #43



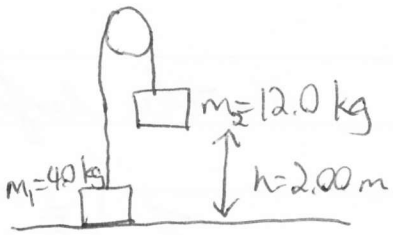
PE in spring dissolved by work done by friction, KE of block before release and after coming to a stop = 0.

$\frac{1}{2}kx^2 = F_f \cdot d = \mu_k mgd$

$\frac{1}{2}(100)(0.2)^2 = \mu_k(0.50)(9.8)(1.00)$

$\boxed{\mu_k = 0.41}$

Ch.7 #55



Initial KE = 0

Initial PE = $m_1gh_1^{\,0} + m_2gh_2$

$= m_2gh_2$

$= 12.0(4.8)(2.00)$

$= 235.2\,J$

Total Initial Energy = 235.2 J = Total Final Energy

$KE_0 + PE_0 = 235.2\,J = KE_f + PE_f$

$KE_f = \frac{1}{2}m_1v^2 + \frac{1}{2}m_2v^2 = \frac{1}{2}(m_1+m_2)v^2 = \frac{1}{2}(4+12)v^2 = 8v^2$

$PE_f = m_1gh + m_2gh^0 = 4(9.8)(2.00) = 78.4$

$235.2\,J = 8v^2 + 78.4$

$8v^2 = 156.8$

$v^2 = 19.6$

$\boxed{v = 4.43\ m/s}$