(62) (a) $W_{grav} = F \cdot \Delta y = mg\Delta y = (0.12\,kg)(9.8\,N/kg)(0.07\,m) = 0.0823\,J$

(b) $W_{net} = \Delta K = W_{grav} + W_{spring}$

$\Delta K = K_f - K_i = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 = \frac{1}{2}(0.12\,kg)\left[(2.85\,\frac{m}{s})^2 - (3.40\,\frac{m}{s})^2\right] = -0.206\,J$

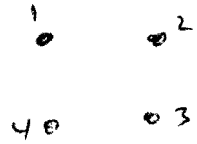
$W_{spring} = \Delta K - W_{grav} = -0.206\,J - 0.082\,J = -0.288\,J$

(69) $K_i + U_i = K_f + U_f$

$\frac{1}{2}mv_i^2 - \frac{GmM}{r_i} = \frac{1}{2}mv_f^2 - \frac{GmM}{r_f}$

$v_f = \sqrt{v_i^2 - \frac{2GM}{r_i} + \frac{2GM}{r_f}} = 4260\ m/s$

(76)



$U_{12} = U_{23} = U_{34} = U_{14} = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{d}$

$U_{13} = U_{24} = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{\sqrt{2}d}$

Total $U_i = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{d}\left(4 + \frac{2}{\sqrt{2}}\right)$

$K_i + U_i = K_f + U_f \qquad K_i = 0 \quad U_f = 0$

$4\left(\frac{1}{2}mv_f^2\right) = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{d}(4+\sqrt{2}) \Rightarrow v_f = \frac{1}{2}\sqrt{\frac{1}{2\pi\varepsilon_0}\frac{e^2}{md}(4+\sqrt{2})}$

(83) Initial energy $= M_i c^2 + K_i$ but $K_i = 0$

Final energy $= M_f c^2 + K_f$

Initial energy = Final energy $\Rightarrow M_i c^2 = M_f c^2 + K_f$

$K_f = c^2(M_i - M_f) = (2.998\times10^8\,\frac{m}{s})^2\left[3.917268\times10^{-25}\,kg - 3.850768\times10^{-25}\,kg - 6.640678\times10^{-27}\,kg\right]$

$= 8.379\times10^{-13}\,J$