(62) \( W_{\text{grav}} = F \cdot \Delta y = mg \Delta y = (0.12 kg)(9.8 N/kg)(0.07 m) = 0.082 J \)

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

\( \Delta K = K_f - K_i = \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2 = \frac{1}{2} (0.12 kg)[(2.85 m/s)^2 - (3.80 m/s)^2] = -0.206 J \)

\( W_{\text{spring}} = \Delta K - W_{\text{grav}} = -0.206 J - 0.082 J = -0.288 J \)

(69) 

\[ K_i + U_i = K_f + U_f \]

\[ \frac{1}{2} m v_i^2 - GmM \quad \frac{1}{2} m v_f^2 - \frac{GmM}{r_f} \]

\[ v_f = \sqrt{\frac{2}{2} v_i^2 - \frac{2GM}{r_i} + \frac{2GM}{r_f}} = 42.60 \text{ m/s} \]

(70) 

\[ U_{12} = U_{13} = U_{34} = U_{14} = \frac{1}{4 \pi \epsilon_0} \frac{e^2}{d} \]

\[ U_{13} = U_{24} = \frac{1}{4 \pi \epsilon_0} \frac{e^2}{\sqrt{2d}} \]

Total \( U_i = \frac{1}{4 \pi \epsilon_0} \frac{e^2}{d} (4 + \frac{2}{\sqrt{2}}) \)

\[ K_i + U_i = K_f + U_f \quad K_i = 0 \quad U_f = 0 \]

\[ 4\left(\frac{1}{2} m v_f^2\right) = \frac{1}{4 \pi \epsilon_0} \frac{e^2}{d} (4 + \frac{2}{\sqrt{2}}) \Rightarrow \quad U_f = \frac{1}{2} \sqrt{\frac{1}{2} \frac{e^2}{2 \pi \epsilon_0 m d} (4 + \frac{2}{\sqrt{2}})} \]

(83) 

Initial energy \( = M_i c^2 + K_i \quad \text{but} \quad K_i = 0 \)

Final energy \( = M_f c^2 + K_f \)

Initial energy \( \neq \text{Final energy} \Rightarrow \quad M_i c^2 = M_f c^2 + K_f \)

\[ K_f = c^2 (M_i - M_f) = (2.998 \times 10^8 m/s)^2 \left[3.917263 \times 10^{-25} kg \right. \]

\[ - 3.850768 \times 10^{-25} kg \]

\[ - 6.440678 \times 10^{-27} kg \]

\[ = 8.379 \times 10^{-13} J \]