PROBLEM SET 1 ENERGY.

① $\Delta PE = mg\Delta h = (5.00)(9.8)(150-0) = \boxed{73.5\,J}$

② $PE = mgh = (200)(9.8)(10) = \boxed{1.96 \times 10^4\,J}$

③ (A) $PE = mgh = (60)(9.8)(400) = \boxed{2.35 \times 10^5\,J}$

(B) $\Delta PE = mg\Delta h = (60)(9.8)(200-400) = \boxed{1.18 \times 5\,J}$

④ (A) $W = F \cdot d = (630N)(5m) = \boxed{3150J}$

(B) $\Delta PE = W = \boxed{3150J}$

(C) STORED ENERGY IN LEG MUSCLES

⑤ (A) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(45)(10)^2 = \boxed{2250J}$

(B) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(45)(5)^2 = \boxed{560J}$

OR CHANGES BY A FACTOR of 4 $2250J \div 4 = 560J$

(C) $\boxed{4:1 \text{ ratio}}$ $KE \propto v^2$

⑥ $KE = \frac{1}{2}mv^2 = \frac{1}{2}m\left(\frac{d}{t}\right)^2 = \frac{1}{2}(45)\left(\frac{1800m}{600s}\right)^2 = \boxed{202\,J}$

⑦ $W = \Delta KE \quad F \cdot d = \frac{1}{2}m\Delta v^2 \quad d = \frac{\frac{1}{2}(15)(3.2^2 - 7.5^2)}{-10N} = \boxed{34.5m}$

⑧ A $KE = \frac{1}{2}mv^2 = \frac{1}{2}\left(\frac{1.60N}{9.8m/s^2}\right)40^2 = \boxed{131J}$

B $W = \Delta KE = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 \quad \frac{1}{2}m(v_2^2 - v_1^2) \quad \frac{1}{2}\left(\frac{1.60N}{9.8m/s^2}\right)\left(40^2 - (-30)^2\right)$

$\boxed{v = 57.1\,m/s}$

⑨ (A) $PE_1 = KE_2 \quad KE_2 = mgh = (8)(9.8)(12) = \boxed{941\,J}$

(B) $KE_1 + PE_1 = KE_2 + PE_2$

$0 + mgh = \frac{1}{2}mv^2 + 0 \quad v = \sqrt{2gh} = \sqrt{2(9.8)(12)} = \boxed{15.3\,m/s}$

⑩ (A) $KE = \frac{1}{2}mv^2 = \frac{1}{2}(15)(12.5)^2 = \boxed{1.17 \times 10^3\,J}$

(B) $\Delta PE = mg\Delta h = (15)(9.8)(20.4) = \boxed{3000\,J}$

(C) $PE \rightarrow KE \quad \boxed{3000\,J}$

(D) $KE = KE_1 + KE_2 \quad 1.17 \times 10^3 + 3.0 \times 10^3 = \boxed{4.17 \times 10^3\,J}$

(E) $KE = \frac{1}{2}mv^2 \quad v = \sqrt{\frac{2KE}{m}} = \sqrt{\frac{2(4.17 \times 10^3)}{15}} = \boxed{23.6\,m/s}$

⑪ $KE_1 = PE_2 \quad KE_1 = mgh_2$

$h = \frac{KE}{mg} = \frac{1960J}{(10)(9.8)} = \boxed{20m}$