

38. (a) The initial gravitational potential energy is

$$U_i = -\frac{GM_A M_B}{r_i} = -\frac{(6.67 \times 10^{-11}) (20)(10)}{0.80} = -1.67 \times 10^{-8} \text{ J} .$$

- (b) We use conservation of energy (with $K_i = 0$):

$$\begin{aligned} U_i &= K + U \\ -1.67 \times 10^{-8} &= K - \frac{(6.67 \times 10^{-11}) (20)(10)}{0.60} \end{aligned}$$

which yields $K = 5.6 \times 10^{-9} \text{ J}$. Note that the value of r is the difference between 0.80 m and 0.20 m.