

44. Let $r = 1.5 \text{ m}$, $x = 3.0 \text{ m}$, $q_1 = -9.0 \text{ nC}$, and $q_2 = -6.0 \text{ pC}$. The work done by an external agent is given by

$$\begin{aligned} W &= \Delta U = \frac{q_1 q_2}{4\pi\epsilon_0} \left(\frac{1}{r} - \frac{1}{\sqrt{r^2 + x^2}} \right) \\ &= (-9.0 \times 10^{-9} \text{ C})(-6.0 \times 10^{-12} \text{ C}) \left(8.99 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2} \right) \cdot \left[\frac{1}{1.5 \text{ m}} - \frac{1}{\sqrt{(1.5 \text{ m})^2 + (3.0 \text{ m})^2}} \right] \\ &= 1.8 \times 10^{-10} \text{ J} . \end{aligned}$$