

37. We choose the zero of electric potential to be at infinity. The initial electric potential energy U_i of the system before the particles are brought together is therefore zero. After the system is set up the final potential energy is

$$\begin{aligned} U_f &= \frac{q^2}{4\pi\epsilon_0} \left(-\frac{1}{a} - \frac{1}{a} + \frac{1}{\sqrt{2}a} - \frac{1}{a} - \frac{1}{a} + \frac{1}{\sqrt{2}a} \right) \\ &= \frac{2q^2}{4\pi\epsilon_0 a} \left(\frac{1}{\sqrt{2}} - 2 \right) = -\frac{0.21q^2}{\epsilon_0 a} . \end{aligned}$$

Thus the amount of work required to set up the system is given by $W = \Delta U = U_f - U_i = -0.21q^2/(\epsilon_0 a)$.