

46. Eq. 25-43 gives the electrostatic potential energy between two uniformly charged spherical charges (in this case $q_1 = 2e$ and $q_2 = 90e$) with r being the distance between their centers. Assuming the “uniformly charged spheres” condition is met in this instance, we write the equation in such a way that we can make use of $k = 1/4\pi\epsilon_0$ and the electronvolt unit:

$$U = k \frac{(2e)(90e)}{r} = \left(8.99 \times 10^9 \frac{\text{V} \cdot \text{m}}{\text{C}} \right) \frac{(3.2 \times 10^{-19} \text{ C})(90e)}{r} = \frac{2.59 \times 10^{-7}}{r} \text{ eV}$$

with r understood to be in meters. It is convenient to write this for r in femtometers, in which case $U = 259/r$ MeV. This is shown plotted below.

