Problem 25.45

How many electrons must be removed from an uncharged spherical conductor of radius .3 meters if the resultant charge is to be 7500 volts?

$$V = k\frac{Q}{R}$$

$$\Rightarrow \quad (7500 \text{ V}) = (9\text{x}10^9 \text{ N} \bullet \text{m}^2/\text{C}^2)\frac{Q}{(.3 \text{ m})}$$

$$\Rightarrow \quad Q = 2.5\text{x}10^{-7} \text{ C}$$

The charge on an electron is $1.6\text{x}10^{-19}$ C/e⁻, which means the number of electrons per coulomb is:

$$\frac{1}{1.6\text{x}10^{-19} \text{ C/e}^-} = 6.25\text{x}10^{18} \text{ e}^- / \text{C}$$

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$$\# \text{electrons} = (6.25\text{x}10^{18} \text{ e}^- / \text{C})(2.5\text{x}10^{-7} \text{ C})$$

$$= 1.56\text{x}10^{12} \text{ electrons}$$