Name: Key

Practice - 18.1 Static Electricity and Charge: Conservation of Charge

1. There are very large numbers of charged particles in most objects. Why, then, don't most objects exhibit static electricity?

Most objects have the same number of positive and negative charges, and, hence, are charge neutral.

2. Why do most objects tend to contain nearly equal numbers of positive and negative charges?

The electric force is strong. Any imbalance of charge will create a force to attract the missing charge

3. Common static electricity involves charges ranging from nanocoulombs to microcoulombs.

   A. How many electrons are needed to form a charge of -2.00 nC?

$$-2.00\times10^{-9}\,C\left(\frac{1\ electron}{-1.60\times10^{-19}\,C}\right) = \boxed{1.25\times10^{10}\ electrons}$$

   B. How many electrons must be removed from a neutral object to leave a net charge of 0.500 μC ?

$$0.500\times10^{-6}\,C\left(\frac{1\ electron}{1.60\times10^{-19}\,C}\right) = \boxed{3.13\times10^{12}\ electrons}$$

4. If 1.80×10^{20} electrons move through a pocket calculator during a full day's operation, how many coulombs of charge moved through it?

$$1.80\times10^{20}\,e^{-}\left(\frac{1.60\times10^{-19}\,C}{1\,e^{-}}\right) = \boxed{28.8\,C}$$

5. To start a car engine, the car battery moves 3.75×10^{21} electrons through the starter motor. How many coulombs of charge were moved?

$$3.75\times10^{21}\,e^- \left(\frac{1.60\times10^{-19}\,C}{1\,e^-}\right) = \boxed{6.00\times10^{2}\,C}$$

6. A certain lightning bolt moves 40.0 C of charge. How many fundamental units of charge $|q_e|$ is this?

$$40.0\,C \left(\frac{1\,|q_e|}{1.60\times10^{-19}\,C}\right) = \boxed{2.50\times10^{20}\,|q_e|}$$