Problem 1.11

A rechargeable flashlight battery is capable of delivering 90 mA for about 12 h. How much charge can it release at that rate? If its terminal voltage is 1.5 V, how much energy can the battery deliver?

Solution

Multiply the current by the time to get the amount of charge delivered.

$$Q = \left(90 \text{ mA} \times \frac{1 \text{ A}}{1000 \text{ mA}}\right) \times \left(12 \text{ h} \times \frac{3600 \text{ s}}{1 \text{ h}}\right) = 3888 \text{ A} \cdot \text{s} = 3888 \text{ C}$$

Note that terminal voltage is the amount of work it takes to move a unit of positive charge from one battery terminal to the other. Multiply the calculated charge by the terminal voltage to get the amount of energy the battery can deliver.

$$W = QV = (3888 \text{ C})(1.5 \text{ V}) = 5832 \text{ J}$$