Electrical Charge Equation Notes:

- In physics, q is measured in _____
- 1C = _____ electrons
- 1 electron = _____ Coulombs
- Electric Current Equation: I = _____
- Amperes: 1A = _____
- Potential Difference Equation: V = _____
- Volts: 1V = _____
- In physics, ΔE is measured in _____
- Electrical Energy Equation: ΔE = _____

Sample Problem 2

A light bulb with a current of 0.80 A is left burning for 25 min. How much electric charge passes through the filament of the bulb?

Solution

$\Delta t = 25 \text{ min}$

$\Delta t = 1.5 \times 10^3 \text{ s}$

$I = 0.80 \text{ A}$

$Q = ?$

$$Q = I\Delta t$$
$$= (0.80 \text{ A})(1.5 \times 10^3 \text{ s})$$
$$Q = 1.2 \times 10^3 \text{ C}$$

1.2×10^3 C passes through the filament of the bulb.

Sample Problem 1

Calculate the current in an electric toaster if it takes 9.0×10^2 C of charge to toast two slices of bread in 1.5 min.

Electric Potential Difference

Sample Problem 1

A 12-V car battery supplies 1.0×10^3 C of charge to the starting motor. How much energy is used to start the car?

Electric Potential Difference

Sample Problem 2

If a current of 10.0 A takes 3.0×10^2 s to boil a kettle of water requiring 3.6×10^5 J of energy, what is the potential difference (voltage) across the kettle?

Understanding Concepts

1. What amount of energy does a kettle use to boil water if it has 810 C of charge passing through it with a potential difference of 120 V?
2. What is the potential difference across a refrigerator if 75 C of charge transfers 9.0×10^3 J of energy to the compressor motor?
3. An electric baseboard heater draws a current of 6.0 A and has a potential difference of 240 V. For how long must it remain on to use 2.2×10^5 J of electrical energy?
4. A flash of lightning transfers 2.0×10^9 J of electrical energy through a potential difference of 7.0×10^7 V between a cloud and the ground. Calculate the quantity of charge transferred in the lightning bolt.
5. Calculate the energy stored in a 9.0 V battery that can deliver a continuous current of 4.0 mA for 2.0×10^3 s.
6. If a charge of 0.30 C moves from one point to another in a conductor and, in doing so, releases 5.4 J of electrical energy, what is the potential difference between the two points?
7. Describe the significance of two points in a conductor that are at the same electric potential. How much work must be done to move a charge between the two points?