ANSWERS

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.

$I = q/\Delta t$

$q = 9.0 \times 10^2 C$

$\Delta t = 1.5 min = 90 s$

$I = \frac{9.0 \times 10^2}{90} = 10 A$

$= 1.0 \times 10^1 A$

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?

$V = \Delta E / q$. OR $\Delta E = Vq$.

$V = 12 V$

$q = 1.0 \times 10^3$

$\Delta E = 1.0 \times 10^3 \times 12$

$\Delta E = 1.2 \times 10^4 J$

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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?

$\Delta E = V I \Delta t$ OR $V = \frac{\Delta E}{I \Delta t}$

$\Delta t = 3.0 \times 10^2$ s.

$\Delta E = 3.6 \times 10^5$ J.

$I = 10.0$ A

$V = \frac{3.6 \times 10^5}{(10.0)(3.0 \times 10^2)}$

$V = \frac{1.2 \times 10^2}{}$

$V = 1.2 \times 10^2$ V

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? 9.7×10^4 J
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? 1.2×10^2 V
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? 1.5×10^2 s
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. 2.9×10^1 C
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. 7.2×10^1 J
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? 1.8×10^1 V
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? DIFFERENCE IN V IS = 0 SO $\Delta E = 0$ (WORK = 0)