Chapter 17 XtraWrk – Current and Resistance

Conceptual questions

CQ1. We know an electric field must be present for a current to flow through a conductor. But we also said earlier in our electrostatics unit that the electric field must be zero inside a conductor. How can you resolve this seeming contradiction?

CQ3. Charge meanders very slowly through a conductor in terms of its absolute velocity. However, it doesn't take very long for a lightbulb to light up when we flip the switch – indeed, it comes on immediately. Why?

CQ4. Compare current flow to traffic on a freeway. What is the traffic analogue for charge, Q? What is the traffic analogue for current, I?

CQ10. Modern light switches often have dimmers, which adjust the brightness of the lights by a knob or sliding bar. What is being changed in the circuit when the knob or bar is adjusted?

Problems

17.1) A current of 80.0 mA passes through a wire. How many electrons pass by a point in the circuit in 10 minutes?

17.10) A 120 voltage source produces a 13.5 amp current in a circuit. How much resistance must be in the circuit?

17.33) 120 volts is required to run a 1 kW waffle iron. What is the iron's resistance and what current will flow through the device when running?

17.38) When running at 120 V, a black and white TV requires 90 watts of power to run.
        a.) How much energy does the TV use in an hour?
        b.) At 120 V, a color TV draws 2.50 A. How long will it take for this TV to use the
            amount of energy calculated in *Part a*?