Suggested problems: Chapter 26- HRW-Principles of Physics- ISV 10th Edition.

15. A heater contains a Nichrome wire (resistivity $5.00\times10^{-7}\Omega$.m) of length 5.85 m, with end-to-end potential difference of 112 V, and with a dissipation power of 4000 W. (a) What is wire's cross-sectional area? (b) If 100 V is used to obtain the same dissipation rate, what should the length be?

Answer:(a) 9.33 x 10^{-7} m^2 ; (b) 4.66 m

20. Figure 26-21 gives the electric potential V(*x*) along a copper wire carrying uniform current, from a point of higher potential V_s = 12.0 μV at *x* = 0 to a point of zero potential at x_s = 3.00 m. The wire has a radius of 2.20 mm.What is the current in the wire?

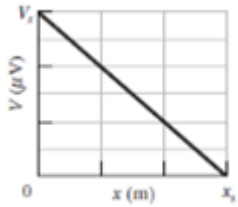

Fig. 26-21 Problem 20

Answer:3.6 mA.

26. A small but measurable current of 1.2×10^{-10} A exists in a copper wire whose diameter is 3.0 mm. The number of charge carriers per unit volume is 8.49×10^{28} m^{-3}. Assuming the current is uniform, calculate the (a) current density and (b) electron drift speed.

Answer: (a) 1.7×10^{-5} A/m^2; (b) 1.3×10^{-15} m/s.

30. A copper wire of cross-sectional area 2.40×10^{-6} m^2 and length 4.00 m has a current of 2.00 A uniformly distributed across that area. (a) What is the magnitude of the electric field along the wire? (b) How much electrical energy is transferred to thermal energy in 30 min?

Answer:(a) 1.41×10^{-2} V/m ; (b) 203 J

35. A wire initially has length L_0 and resistance 5.0 Ω . The resistance is to be increased to 45.0 Ω by stretching the wire. Assuming that the resistivity and density of the material are un affected by the stretching , find the ratio of new length to L_0.

Answer:3

42. Copper and aluminum are being considered for a high-voltage transmission line that must carry a current of 50.0 A. The resistance per unit length is to be 0.150 Ω/km.The densities of copper and aluminum are 8960 and 2600 kg/m^3, respectively. Compute (a) the magnitude J of the current density and (b) the mass per unit length λ for a copper cable and (c) J and (d) λ for an aluminum cable.

Answer:(a) 4.44×10^5 A/m^2 ; (b) 1.01 kg/m ; (c) 2.73×10^5 A/m^2 ; (d) 0.495 kg/m.

51. A common flashlight bulb is rated at 0.20 A and 3.2 V (the values of the current and voltage under operating conditions). If the resistance of the tungsten bulb filament at room temperature (20°C) is 1.1 Ω, what is the temperature of the filament when the bulb is on?

Answer:3.0 x 10^3 °C.

52. An isolated conducting sphere has a 20 cm radius. One wire carries a current of 1.000 002 0 A into it. Another wire carries acurrent of 1.000 000 0 A out of it. How long would it take for thesphere to increase in potential by 1000 V?

Answer:1.1×10^{-2}s.