Chapter 26
Current and Resistance

Electric Current

Q1. The sum of the currents entering a junction equals the sum of the currents leaving that junction is a consequence of:Ans:conservation of charge
Q2. If 4.7×10^{16} electrons pass a particular point in a wire every minute, what is the current in the wire?Ans:1.3×10^{-4} A.
Q3. A portion of a circuit is shown in figure (6), with the values of the currents given for some branches. What is the direction and value of the current I? Ans:Down, 6 A.

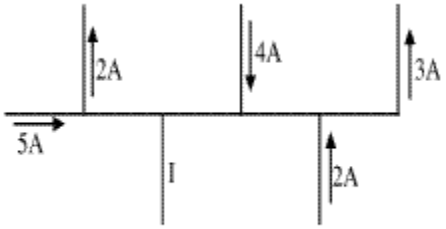

Figure 6

Current Density

Q4. A cylindrical wire of radius R = 2.0 mm has a uniform current density J = 2.0×10^{5} A/m^2. What is the current through the portion of the wire between radial distances R/3 and R/2? (see figure 1) Ans:0.35 A.

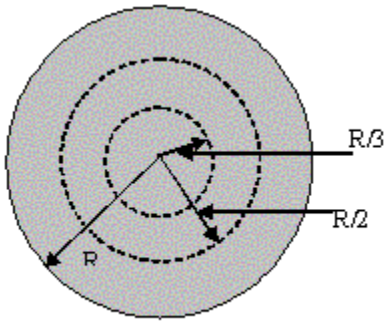

Figure 1

Q5. A conducting wire has a length of 10 m and is made of a material with a resistivity of 1.0×10^{-8} ohm-m. What is the current density in the wire if the potential difference between its ends is 0.50 V? Ans:5.0×10^{6} A/m^2

Resistance and Resistivity

Q6. A 10-m long wire has a cross section area of 0.5 mm^2. The material of the wire has a resistivity of 5.0×10^{-8} ohm-m at 20 degree-C. A potential difference of 1.0 V is maintained across the ends of the wire. If the resistance changes by 0.3 ohms for a temperature change of 60 C-degree, what is the temperature coefficient of resistivity of this material?Ans:5.0×10^{-3} /C-degree
Q7. At 40 degrees-C the resistance of a gold wire is 80 Ohms. What is the resistance of the same wire at 60 degrees-C? (Alpha(gold) = 3.4×10^{-3} /C-degrees).Ans:85 Ohms
Q8. A wire having a resistance of 3 Ohms is stretched so that its length is tripled while its volume remains unchanged. The resistance of the stretched wire is:Ans:27 Ohms

Ohm's Law

Q9. A hair dryer of resistance 80 ohms is plugged into a 120-V line. The charge passing through it in one hour is:Ans:5400 coulombs.
Q10. A potential difference of 9.0 V is applied across the length of a cylindrical conductor with radius 2.0 mm. Calculate the current density if the conductor has a resistance of 90 ohms.Ans:8.0×10^{3} A/m^{2}.
Q11. A current of 5.0 A exists in a 10 ohms resistor for 5.0 min. How many electrons pass through any cross section of the resistor in this time?Ans:9.4×10^{21}

Power in Electric Circuits

Q12. The filaments of two tungsten bulbs A and B are made with wires of the same length. At 110 Volts, the power dissipated from A and B are 400 W and 100 W, respectively. Ignore the variation of resistance with respect to temperature. The ratio of the diameter of filament A to the diameter of filament B is Ans:2:1.
Q13. How many electrons pass, in 10 minutes, through a light bulb rated at 30 W when it is operated at 120 V?Ans:9.4×10^{20} electrons
Q14. In one hour, how many electrons pass between the terminals of a 12-V car battery when a 96 watts headlight is used?Ans:1.8×10^{23} electrons