Ch—03 Current Electricity

Daily Practice Problem 01

Q1. If 2.25 x 10^{20} electrons pass through a wire in one minute, find the magnitude of the current flowing through the wire.

Q2. A solution of sodium chloride discharges 6.1 x 10^{16} Na^+ ions and 4.6 x 10^{16} Cr^{--} ions in 2 s. Find the current passing through the solution.

Q3. In a hydrogen atom, the electron makes about 0.6 x 10^{16} revolutions per second around the nucleus. Determine the average current at any point on the orbit of the electron.

Q4. An electron moves in a circular orbit of radius 10 cm with a constant speed of 4.0 x 10^6 ms^{-1}. Determine the electric current at a point on the orbit.

Q5. The current in a wire varies with time according to the equation i = 4 + 2t, where i is in ampere and t is in second. Calculate the quantity of charge that passes through a cross section of the wire during the time t = 2 s to t = 6 s.

Q6. If 0.5 mol of electrons flows through a wire in 8 min, what are

a. The total charge that passes through the wire

b. Magnitude of current (Take N_A= 6 x 10^{23})

Q7. In a hydrogen discharge tube, the number of protons drifting across a cross section per second is 1.0 x 10^{18}, while the number of electrons drifting in the opposite direction across the same cross section is 2.7 x 10^{18} per second. Find the current flowing in the tube.

Q8. The current density across a cylindrical conductor of radius R varies in magnitude according to the equation $J = J_0\left(1 - \frac{r}{R}\right)$ where r is the distance from the central axis. Thus, the current density is a maximum J_0 at that axis (r = 0) and decreases linearly to zero at the surface (r = R). Calculate the current in terms of J_0 and the conductor's cross-sectional area A = πR^2.

ANSWERS

1. 0.6 A

2. 8.56 x 10^{-3} A

3. 0.96 mA

4. 1.02 x 10^{-12} A

5. $48\ C$

6. a. $4.8 \times 10^4 C$ **b.** 100A

7. 0.592 A

8. $\frac{J_0 A}{3}$