Q.38. (AMIE W12, 5 marks): To high purity silicon is added 10^{23} m^{-3} arsenic atoms. (i) is this material n type or p type (ii) calculate the room temperature and electrical conductivity of this material. Given the electron mobility = 0.07 m^2/Vs.

Answer: n-type because arsenic atoms are pentavalent, at 298 K, $\sigma = n_e|e|\mu_e = 10^{23} \times 1.6 \times 10^{-19} \times 0.07 = 1120\ (\Omega m)^{-1}$

Q.39. (AMIE S13, 14, 4 marks): For intrinsic gallium arsenide, the room-temperature electrical conductivity is 10^{-6} $(\Omega - m)^{-1}$; the electron and hole mobilities are respectively 0.85 m^2/Vs and 0.04 m^2/V-s. Compute the intrinsic carrier Concentra ration at room temperature.

Answer: 7.0×10^{12} m^{-3}

Hint: $n_i = \dfrac{\sigma}{|e|(\mu_e + \mu_h)}$

Q.40. (AMIE W13, 14, 5 marks): Calculate the electrical conductivity of intrinsic silicon at 150^0C, the intrinsic carrier concentration for Si at 150^0C is 4×10^{19} m^{-3} and the electron and hole mobilities are respectively 0.06 m^2/Vs and 0.022 m^2/Vs.

Answer: $0.5248(\Omega\text{-m})^{-1}$

Q.41. (AMIE S15, 5 marks): For intrinsic InSb, the room temperature electrical conductivity is 2×10^4 $(\Omega\text{-m})^{-1}$; the electron and hole mobilities are respectively 7.7 and 0.07 m^2/V-s. Compute the intrinsic carrier concentration at room temperature.

Answer: 1.608×10^{26} m^{-3}

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