

Quiz

1. What is Ohm's Law?
2. What is resistivity?
3. Briefly explain the band theory of electrical conduction.
4. What is Fermi energy?
5. Why are metals highly conductive?
6. Briefly explain the conduction mechanism in metals?
7. What is the difference between band structure of Cu and Mg?
8. How is the conductivity of metals affected by impurity level?
9. What is the role of dislocations on conductivity of metals?
10. Why does the metallic conductivity decrease with increasing temperature?
11. What is the typical band gap in semiconductors?
12. What is intrinsic semi conductivity?
13. Show that the conductivity in intrinsic semi conductors, $\sigma = n_i |e| (\mu_e + \mu_h)$
14. What is extrinsic semi conductivity? Which factors control the conductivity in these semi conductors?
15. What are acceptor and donor levels?
16. Explain the atomic and band theory models of extrinsic semi conductivity.
17. What is the effect of temperature on extrinsic semi conductivity?
18. How does the carrier concentration in intrinsic semi conductors depend on temperature?
19. Name some compound semi conductors.
20. Calculate the electrical conductivity of intrinsic Si at 150 °C.

The carries concentration in Si at 150 °C is $4 \times 10^{19} \text{ m}^{-3}$ and $\mu_e = 0.06 \text{ m}^2/\text{V-s}$ and $\mu_h = 0.022 \text{ m}^2/\text{V-s}$.

21. If the electrical conductivity $\sigma = \sigma_0 e^{-E_g/2kT}$ then calculate the conductivity of GaAs at Room temp (27 °C) and 70 °C.

$n_i = 1.4 \times 10^{12} \text{ m}^{-3}$, $\mu_e = 0.72 \text{ m}^2/\text{V}\cdot\text{s}$ and $\mu_h = 0.02 \text{ m}^2/\text{V}\cdot\text{s}$ for GaAs at RT. E_g of GaAs is 1.47 eV. $k = 8.62 \times 10^{-5} \text{ eV/K}$

22. Find the electrical conductivity of pure Si at 200 °C. Electrical resistivity of Si at RT is $2.3 \times 10^3 \text{ } \Omega\cdot\text{m}$ and $E_g = 1.1 \text{ eV}$.

23. Find the electrical conductivity of pure Ge ($E_g = 0.67 \text{ eV}$) at 250 °C. Electrical resistivity of Ge at RT is $45 \times 10^{-2} \text{ } \Omega\cdot\text{m}$

24. What is dielectric constant?

25. What is polarization? How many types are there?

26. What is ferro-electricity? Give some examples of ferro-electric materials.

27. What is piezoelectricity?