

18PYB103J-Semiconductor Physics

Question Bank –Unit II

Multiple Choice Questions.

1. A semiconductor is formed by bonds.
 - a. **Covalent**
 - b. Electrovalent
 - c. Co-ordinate
 - d. None of the above
2. A semiconductor has temperature coefficient of resistance.
 - a. Positive
 - b. Zero
 - c. **Negative**
 - d. None of the above
3. When a pure semiconductor is heated, its resistance
 - a. Goes up
 - b. **Goes down**
 - c. Remains the same
 - d. Can't say
4. An n-type semiconductor is
 - a. Positively charged
 - b. Negatively charged
 - c. **Electrically neutral**
 - d. Infinite charge
5. A hole in a semiconductor is defined as
 - a. A free electron
 - b. **The incomplete part of an electron pair bond**
 - c. A free proton
 - d. A free neutron
6. The random motion of holes and free electrons due to thermal agitation is called
 - a. **Diffusion**
 - b. Pressure
 - c. Ionisation
 - d. None of the above
7. As the doping to a pure semiconductor increases, the bulk resistance of the semiconductor
 - a. Remains the same

- b. Increases
- c. Decreases**
- d. Infinite

8. The Fermi level in a p-semiconductor lies close to

- a. The top of the valence band**
- b. The top of the conduction band
- c. The bottom of the valence band
- d. The bottom of the conduction band.

9. Electron-hole pairs are produced by

- a. Recombination
- b. Thermal energy**
- c. Ionization
- d. Doping

10. The p-region has a greater concentration of _____ as compared to the n-region in a P-N junction.

- a. holes**
- b. electrons
- c. both holes & electrons
- d. phonons

11. A p-type semiconductor material is doped with _____ impurities whereas a n-type semiconductor material is doped with _____ impurities

- a. acceptor, donor**
- b. acceptor, acceptor
- c. donor, donor
- d. donor, acceptor

12. The n-region has a greater concentration of _____ as compared to the p-region in a P-N junction diode.

- a. holes
- b. electrons**
- c. both holes & electrons
- d. phonons

13. Which of the below mentioned statements is false regarding a p-n junction diode?

- a. Diode are uncontrolled devices
- b. Diodes are rectifying devices
- c. Diodes are unidirectional devices
- d. Diodes have three terminals**

14. In the p & n regions of the p-n junction the _____ & the _____ are the minority charge carriers respectively.

- a. holes, holes

- b. electrons, electrons
- c. holes, electrons
- d. electrons, holes**

15. Lets assume that the doping density in the p-region is 10^{-9} cm^{-3} & in the n-region is 10^{-17} cm^{-3} as such the p-n junction so formed would be termed as a

- a. p- n-
- b. p⁺ n⁻**
- c. p⁻ n⁺
- d. p⁺ n⁺

16. When a physical contact between a p-region & n-region is established which of the following is most likely to take place?

- a. Electrons from N-region diffuse to P-region**
- b. Holes from P-region diffuse to P-region
- c. Electrons from N-region diffuse to N-region
- d. Nothing will happen

17. Which of the following is true in case of an unbiased p-n junction diode?

- a. Diffusion does not take place
- b. Diffusion of electrons & holes goes on infinitely
- c. There is zero electrical potential across the junctions
- d. Charges establish an electric field across the junction**

18. Which of the following is true in case of a forward biased p-n junction diode?

- a. The positive terminal of the battery sucks electrons from the p-region**
- b. The positive terminal of the battery injects electrons into the p-region
- c. The negative terminal of the battery sucks electrons from the p-region
- d. The negative terminal of the battery sucks electrons from the N-region

19. What is the continuity equation in words?

- a. Rate of increase = (inflow – outflow) + drift – diffusion
- b. Rate of increase = (inflow – outflow) + generation - recombination**
- c. Rate of increase = (inflow - outflow)
- d. Rate of increase = (inflow + outflow)

20. The forward bias current in a typical Schottky barrier is due to what physical mechanism?

- a) Drift
- b) Diffusion
- c) Recombination
- d) Thermionic emission**

21. What is the forward bias ideality factor of a Schottky barrier diode?
- a) $n = 1$
 - b) $n = 2$
 - c) $1 < n < 2$
 - d) $n > 2$
22. The amount of radiance in planer type of LED structures is
- a) Low
 - b) High
 - c) Zero
 - d) Negligible
23. The overall power conversion efficiency of electrical lens coupled LED is 0.8% and power applied 0.0375 V. Determine optical power launched into fiber
- a) 0.03
 - b) 0.05
 - c) 0.3
 - d) 0.01
24. The InGaAsP is emitting LEDs are realized in terms of restricted
- a) Length strip geometry
 - b) Radiance
 - c) Current spreading
 - d) Coupled optical power

Short Answer Type Questions

25. Write note on intrinsic semiconductor?

26. What is meant by Fermi level in semiconductor? Where does the Fermi level lie in an intrinsic semiconductor?

27. Describe the difference between P-type and N-type semiconductor materials?

28. Explain about carrier generation and recombination?

29. Discuss about drift current.

30. Discuss about diffusion current.

31. Explain concepts of p-n junction.

32. Write note on forward and reverse bias p-n junction.

33. What happens to the bands when we make contact between metals and semiconductors?

34. What is a rectifying contact? explain with diagram.

35. Write note on photocurrent in p-n junction?

36. Explain Organic LED?

Descriptive Type Questions

37. What is intrinsic semiconductor? Explain atomic structure and energy level diagram of intrinsic semiconductor? Where does the Fermi level lie in an intrinsic semiconductor?

38. What is Extrinsic semiconductor? Explain N - type semiconductor with diagram and variation of Fermi level with temperature?

39. What is Extrinsic semiconductor? Explain P - type semiconductor with diagram and variation of Fermi level with temperature?

40. Explain principle, construction, working of LED? Mention merits, demerits, applications?

41. Explain principle, construction, working of OLED? Mention merits, demerits, applications?