



SEMICONDUCTORS

NEET-UG - Physics

Time Allowed: 1 hour

Maximum Marks: 200

1. The wavelength and intensity of light emitted by a LED depend upon [4]
 - a) forward bias only
 - b) energy gap of the semiconductor and reverse bias
 - c) energy gap only
 - d) forward bias and energy gap of the semiconductor
2. Basically, a photodiode is: [4]
 - a) a forward biased p-n junction diode
 - b) a reverse biased p-n junction diode
 - c) an oscillator
 - d) a rectifier
3. Diamond is very hard because [4]
 - a) high melting point
 - b) it has large cohesive energy
 - c) it is covalent solid
 - d) insoluble in all solvents
4. The most common semiconducting material used to prepare a solar cell is: [4]
 - a) Silicon
 - b) Indium arsenide
 - c) Cadmium arsenide
 - d) Gallium arsenide
5. In germanium crystal, the forbidden energy gap in joule is [4]
 - a) 1.6×10^{-19}
 - b) 1.76×10^{-19}
 - c) zero
 - d) 1.12×10^{-19}
6. To provide the abundance of holes, the impurity added should be [4]
 - a) tetravalent
 - b) pentavalent
 - c) trivalent
 - d) monovalent
7. An n-type semiconducting Si is obtained by doping intrinsic Si with: [4]
 - a) Al
 - b) B
 - c) P
 - d) In
8. A semiconductor is damaged by a strong current, because of [4]
 - a) excess of electrons
 - b) lack of free electrons
 - c) Increase of free electrons
 - d) decrease in electrons
9. For the forward biasing of a p-n junction diode, which of the following statements is **not** correct? [4]

- a) Forward current is due to the diffusion of both holes and electrons. b) Minority carrier injection occurs.
- c) The potential barrier decreases. d) Width of depletion layer increases.
10. Zener diode is fabricated by [4]
- a) heavily doping the p side and lightly doping the n side b) heavily doping p and n sides of the junction
- c) heavily doping the n side and lightly doping the p side d) lightly doping p and n sides of the junction
11. In forward bias, the width of a potential barrier in a p-n junction diode [4]
- a) remains constant b) increases
- c) decreases d) first remains constant then decreases
12. For a common emitter configuration, if α and β have their usual meanings, the incorrect relationship between α and β is: [4]
- a) $\frac{\alpha}{\beta} = \frac{1}{\beta} + 1$ b) $\alpha = \frac{\beta}{1-\beta}$
- c) $\beta = \frac{\alpha}{1-\alpha}$ d) $\alpha = \frac{\beta}{1+\beta}$
13. Knee voltage in Ge diode is of the order of: [4]
- a) 0.3 V b) 5 V
- c) 100 V d) 0.7 V
14. The reverse voltage ratio of a common emitter transistor circuit is represented as: [4]
- a) $\left(\frac{\Delta V_{ce}}{\Delta I_b}\right)_{V_{cc}}$ b) $\left(\frac{\Delta V_{be}}{\Delta I_b}\right)_{V_{cc}}$
- c) $\left(\frac{\Delta V_{be}}{\Delta V_{cc}}\right)_{I_b}$ d) $\left(\frac{\Delta I_e}{\Delta I_b}\right)_{V_{cc}}$
15. Crystalline solids are [4]
- a) anisotropic b) nebulous
- c) isotropic d) amorphous
16. An n-p-n transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800 Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192 Ω , the voltage gain and the power gain of the amplifier will respectively be [4]
- a) 3.69, 3.84 b) 4, 4
- c) 4, 3.84 d) 4, 3.69
17. Which one of the following elements will require the highest energy to take out an electron from them? [4]
Pb, Ge, C and Si
- a) C b) Ge
- c) Pb d) Si
18. The relation between the forward current I_f and saturation current I_s for p-n junction diode is: [4]

a) $I_f I_s = 1$

b) $I_f = I_s$

c) $I_f = I_s \left[\frac{qV}{KT} - 1 \right]$

d) $I_f = I_s e^{(qV/KT)-1}$

19. The correct relationship between the two current gains α and β in a transistor is: [4]

a) $\alpha = \frac{\beta}{1+\beta}$

b) $\alpha = \frac{\beta}{1-\beta}$

c) $\alpha = \frac{1+\beta}{\beta}$

d) $\beta = \frac{\alpha}{1+\alpha}$

20. The current gain for a transistor working as the common-base amplifier is 0.96. If the emitter current is 7.2 mA, then the base current is [4]

a) 0.39 mA

b) 0.43 mA

c) 0.29 mA

d) 0.35 mA

21. For detecting intensity of light we use [4]

a) the photodiode in forward bias

b) LED in forward bias

c) the photodiode in reverse bias

d) LED in reverse bias

22. A Ge specimen is doped with Al. The concentration of acceptor atoms is $\approx 10^{21}$ atoms m^{-3} . Given that the intrinsic concentration of electron-hole pair is $\approx 10^{19}$ m^{-3} , the concentration of electrons in the specimen is [4]

a) 10^{17} m^{-3}

b) 10^2 m^{-3}

c) 10^{15} m^{-3}

d) 10^4 m^{-3}

23. When a p-n diode is reverse biased, then [4]

a) the height of the potential barrier is reduced

b) the depletion region is increased

c) no current flows

d) the depletion region is reduced

24. The dominant mechanisms, due to the concentration gradient, for motion of charge carriers in silicon p-n junction are: [4]

a) Diffusion of holes from p to n and electrons from n to p

b) Diffusion of electrons only from n to p

c) Diffusion of holes only from p to n

d) Diffusion of holes from n to p and electrons from p to n

25. The number of valence electrons in a good conductor is generally [4]

a) three or less than three

b) four

c) six or more than six

d) five

26. The usual semiconductors are: [4]

a) glass and carbon

b) germanium and copper

c) germanium and silicon

d) silicon and glass

27. A semiconductor has electron and hole mobilities μ_e and μ_h respectively. If its intrinsic carrier density is n_i , then what will be the value of hole concentration n_h for which the conductivity will be minimum at a given temperature? [4]

a)

b)

- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.
45. **Assertion (A):** The number of electrons in a p-type silicon semiconductor is less than the number of electrons in a pure silicon semiconductor at room temperature. [4]
Reason (R): It is due to law of mass action.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.
46. **Assertion (A):** The conductivity of a semiconductor increases with rise of temperature. [4]
Reason (R): On rising temperature covalent bonds of semiconductor breaks.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.
47. **Assertion (A):** The resistivity of a semiconductor decreases with temperature. [4]
Reason (R): As temperature increases, the electrons gain sufficient energy and jump from valence band to conduction band.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.
48. **Assertion (A):** The drift current in a p-n junction is from the n-side to the p-side. [4]
Reason (R): It is due to free electrons only.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.
49. **Assertion (A):** The electrical conductivity of a semiconductor increases on doping. [4]
Reason (R): Doping always increases the number of electrons in the semiconductor.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.
50. **Assertion (A):** Diode lasers are used as optical sources in optical communication. [4]
Reason (R): Diode lasers consume less energy.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.



Key