

SEMICONDUCTOR

MULTIPLE CHOICE QUESTIONS:

1. What bonds are present in a semiconductor?
a. Monovalent b. Bivalent c. Trivalent d. Covalent

Answer: (d) Covalent

2. The number of electrons in the valence shell of a semiconductor is
a. 1 b. 2 c. 3 d. 4

Answer: (d) 4

3. What happens to the forbidden energy gap of a semiconductor with the fall of temperature?
a. Decreases b. Increases
c. Unchanged d. Sometimes decreases and sometimes increases

Answer: (b) Increases

4. In a p-type semiconductor, the current conduction is due to
a. Holes b. Atoms c. Electrons d. Protons

Answer: (a) Holes

5. In a semiconductor, what is responsible for conduction?
a. Electrons only b. Holes only
c. Both electrons and holes d. Neither electrons nor holes

Answer: (c) Both electrons and holes

6. What happens to the resistance of semiconductors on heating?
a. Increases b. Decreases
c. Remains the same d. First increases later decrease

Answer: (b) decreases

7. In intrinsic semiconductors at room temperature, the number of electrons and holes are
a. Unequal b. Equal c. Infinite d. Zero

Answer: (b) Equal

8. A p-type semiconductor is
a. Positively charged b. Negatively charged
c. Uncharged d. None of the above

Answer: (c) Uncharged

9. In a n-type semiconductor, the current conduction is due to
a. Holes b. Atoms c. Electrons d. Protons

Answer: (c) electrons

10. In the fig., E_v and E_c are the valence band and conduction band corresponding to an extrinsic semiconductor. E is energy state corresponding to the impurity present in it. The impurity present in it can be

- a. arsenic b. indium c. phosphorous d. antimony

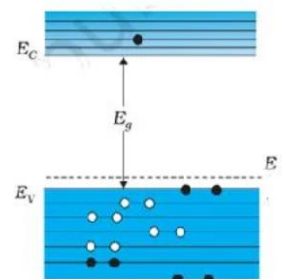
answer: b. indium

11. Resistivity of conductor are in the range
a. $10^{11} - 10^{19} \Omega m$ b. $10^{-2} - 10^{-8} \Omega m$ c. $10^{-5} - 10^6 \Omega m$ d. none

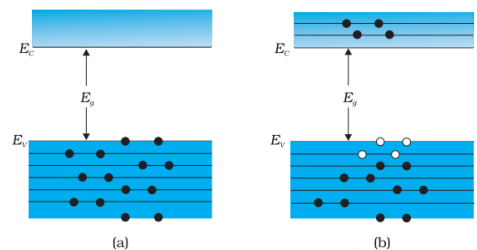
12. Resistivity of semiconductor are in range
a. $10^{11} - 10^{19} \Omega m$ b. $10^{-2} - 10^{-8} \Omega m$ c. $10^{-5} - 10^6 \Omega m$ d. none

13. Resistivity of insulator are in the range
a. $10^{-2} - 10^{-8} \Omega m$ b. $10^{11} - 10^{19} \Omega m$ c. $10^{-5} - 10^6 \Omega m$ d. none

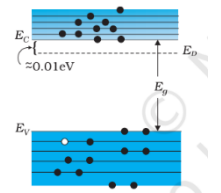
14. Elemental semiconductors is
a. **Si** b. CdS c. GaAs, d. CdSe



15. which of the following is example of organic semiconductors
 a. anthracene b. CdS c. GaAs, d. CdSe
16. **STATEMENT-1:** Inside the crystal each electron has a unique position and no two electrons see exactly the same pattern of surrounding charges.
STATEMENT - 2: Each electron will have a different energy level.
 a. Both statement - 1 and statement -2 are correct and 2 is correct explanation of 1
 b. Both statement - 1 and statement -2 are correct and 2 is not correct explanation of 1
 c. Statement - 1 is wrong and statement -2 is correct and
 d. Statement - 1 is correct and statement -2 is wrong.
17. The energy band which includes the energy levels of the valence electrons is called
 a. valence band. b. conduction band c. simple band d. complex band
18. The energy band above the valence band is called the
 a. conduction band b. valence band c. simple band d. complex band
19. In metallic conductors
 a. The lowest level in the conduction band is lower than the highest level of the valence band.
 b. The lowest level in the conduction band is higher than the highest level of the valence band
 c. The lowest level in the conduction band is same level of the valence band
 d. The lowest level in the valence band is lower than the highest level of the conduction band
20. If there is some gap between the conduction band and the valence band, electrons in the valence band all remain bound and no free electrons are available in the conduction band. This makes the material
 a. Conductors b. Insulator. c. semiconductors d. super conductor
21. **STATEMENT - 1:** In semiconductors the electrons from the valence band gain external energy to cross the gap between the conduction band and the valence band. Then these electrons will move into the conduction band.
STATEMENT - 2: At the same time they will create vacant energy levels in the valence band where other valence electrons can move. Thus the process creates the possibility of conduction due to electrons in conduction band as well as due to vacancies in the valence band.
 a. Both statement - 1 and statement -2 are correct and 2 is correct explanation of 1
 b. Both statement - 1 and statement -2 are correct and 2 is not correct explanation of 1
 c. Statement - 1 is wrong and statement -2 is correct and
 d. Statement - 1 is correct and statement -2 is wrong.
22. An intrinsic semiconductor will behave like an insulator at
 a. $T = 10\text{K}$ b. $T = 0\text{K}$ c. -273K d. 100K
23. The following fig. represents the energy level diagram of semiconductor at two different temperature.. which of the following statement is correct
 a. Semiconductor in fig. (a) is at temperature $T = 0\text{K}$
 b. Semiconductor in fig. (b) is at temperature $T = 0\text{K}$
 c. Semiconductor in fig. (a) is at temperature $T = 100\text{K}$
 d. Semiconductor in fig. (a) is at temperature $T > 0\text{K}$
24. A necessary condition to attain doping process is
 a. the sizes of the dopant atom should be more than the size of semiconductor atoms



- b. **The sizes of the dopant a the semiconductor atoms should be nearly the same**
 c. The sizes of the dopant atom should be less than the size of semiconductor
 d. Doping not depend on the sizes of the dopant and the size of semiconductor
25. The following is not the example of Pentavalent material.
 a. Arsenic (As) b. Antimony (Sb) c. Phosphorous (P) **d. Carbon(C)**
26. The following is not the example of tri valent material.
a. Arsenic (As) b. Indium (In) c. Boron (B) d. Aluminium (Al)
27. The conduction (current) in extrinsic semiconductor increases
 a. On increasing temperature b. On decreasing temperature
c. On increasing doping concentration c. Depends on impurity element.
28. In n type semiconductor,
 a. **Electrons are majority charge carriers and holes are minority charge carriers.**
 b. Wholes are majority charge carriers and electrons are minority charge carriers.
 c. Both electrons and holes are majority charge.
 d. Both electrons and holes are minority charge
28. In p type semiconductor,
 a. Electrons are majority charge carriers and holes are minority charge carriers.
b. Wholes are majority charge carriers and electrons are minority charge carriers
 c. Both electrons and holes are majority charge.
 d. Both electrons and holes are minority charge
29. In the fig., E_v and E_c are the valence band and conduction band corresponding to an extrinsic semiconductor. E is energy state corresponding to the impurity present in it. The impurity present in it can be
 a. Boron (B) b. indium c. Aluminium (Al) **d. antimony**
30. In an unbiased p-n junction, holes diffuse from the p-region to n-region because
 (a) free electrons in the n-region attract them
 (b) they move across the junction by the potential difference
 (c) hole concentration in p-region is more as compared to n-region
 (d) all of these.
31. If a small amount of antimony is added to germanium crystal
 (a) its resistance is increased
 (b) it becomes a p-type semiconductor
 (c) there will be more free electrons than holes in the semiconductor
 (d) none of these.
32. Which of the following statements is correct?
 (a) Hole is an antiparticle of electron.
 (b) Hole is a vacancy created when an electron leaves a covalent bond.
 (c) Hole is the absence of free electrons.
 (d) Hole is an artificially created particle.
33. Which of the following statements is incorrect for the depletion region of a diode?
 (a) There are mobile charges exist.
 (b) Equal number of holes and electrons exist, making the region neutral.
 (c) Recombination of holes and electrons has taken place.
 (d) None of these.
34. The breakdown in a reverse biased p-n junction diode is more likely to occur due to
 (a) large velocity of the minority charge carriers if the doping concentration is small



- (b) large velocity of the minority charge carriers if the doping concentration is large
 (c) strong electric field in a depletion region if the doping concentration is small
 (d) none of these
35. Potential barrier developed in a junction diode opposes the flow of
 (a) minority carrier in both regions only (b) majority carriers only
 (c) electrons in p region (d) holes in p region
36. **STATEMENT - 1** : The conductivity of a semi-conductor increases with rise of temperature.
STATEMENT - 2 : On rising temperature covalent bonds of semiconductor breaks.
 a. Both statement – 1 and statement -2 are correct and 2 is correct explanation of 1
 b. Both statement – 1 and statement -2 are correct and 2 is not correct explanation of 1
 c. Statement – 1 is wrong and statement -2 is correct and
 d. Statement – 1 is correct and statement -2 is wrong.
37. **STATEMENT - 1** The resistance of p-n junction is low when forward biased and is high when reverse biased.
STATEMENT - 2 In reversed biased, the depletion layer is reduced.
 a. Both statement – 1 and statement -2 are correct and 2 is correct explanation of 1
 b. Both statement – 1 and statement -2 are correct and 2 is not correct explanation of 1
 c. Statement – 1 is wrong and statement -2 is correct and
 d. Statement – 1 is correct and statement -2 is wrong.
38. **STATEMENT – 1**: The direction of diffusion current in a junction diode is from n-region to p-region.
STATEMENT – 2: The majority current carriers diffuse from a region of lower concentration to a region of higher concentration.
 a. Both statement – 1 and statement -2 are correct and 2 is correct explanation of 1
 b. Both statement – 1 and statement -2 are correct and 2 is not correct explanation of 1
 c. Statement – 1 is wrong and statement -2 is correct and
 d. Statement – 1 is correct and statement -2 is wrong.
39. **STATEMENT – 1**: The half-wave rectifier work only for positive half cycle of ac.
STATEMENT – 2: In half-wave rectifier only one diode is used.
 a. Both statement – 1 and statement -2 are correct and 2 is correct explanation of 1
 b. Both statement – 1 and statement -2 are correct and 2 is not correct explanation of 1
 c. Statement – 1 is wrong and statement -2 is correct and
 d. Statement – 1 is correct and statement -2 is wrong.
40. **STATEMENT – 1**: In a semiconductor diode, the reverse biased current is due to drift of free electrons and holes.
STATEMENT – 2: The drift of electrons and holes is due to thermal excitations.
 a. Both statement – 1 and statement -2 are correct and 2 is correct explanation of 1
 b. Both statement – 1 and statement -2 are correct and 2 is not correct explanation of 1
 c. Statement – 1 is wrong and statement -2 is correct and
 d. Statement – 1 is correct and statement -2 is wrong.

FILL IN THE BLANKS

1. The pentavalent dopant is known as (donor impurity)
2. The tri valent dopant is known as (acceptor impurity)
3. During the formation of p-n junction, the motion of charge carries gives rise to..... current across the junction.(diffusion)
4. Width of depletion region of p-n junction diode will on increasing the forward bias voltage.(decrease)

5. Width of depletion region of p-n junction diode will on increasing the reverse bias voltage. (increase)
6. At the junction boundary of p-n junction diode, on each side, the minority carrier concentration significantly compared to the locations far from the junction. (Increases)
7. After the characteristic voltage, the diode current increases significantly (exponentially), even for a very small increase in the diode bias voltage. This voltage is called (threshold voltage)

2 MARKS QUESTIONS

1. Draw the graphs showing the V-I characteristics of a p-n junction diode
(a) in forward bias (b) in reverse bias.
2. Define (a) depletion region (b) diffusion current (iii) drift current in semiconductors
3. Distinguish between n-type and p-type semiconductors on the basis of energy band diagrams.
4. Distinguish between intrinsic semiconductor and extrinsic semiconductors.
5. Distinguish between conductor, semiconductor and insulator based on band theory of solids.
6. Explain how a p-n junction is formed in a semiconductor.

5 MARKS QUESTIONS

1. What is rectification? Explain the working of a full wave rectifier using diagram. Also draw input and output wave form.
2. What is rectification? Explain the working of a half wave rectifier using diagram. Also draw input and output wave form.