1.The Fermi-Dirac distribution function deals with

(a) Band theory of solids
(b) Probability of occupancy of electron levels
(c) Classification of solids
(d) None

Answer:
Option **(b)**

2.

Fermi energy is the maximum energy possessed by an electron in a conductor at

(a) 0 K

(b) 273 K

(c) 0°C

(d) 273°C

Answer:
Option **(a)**

3. In metals at absolute temperature, all the energy levels lying above Fermi level are

(a) Filled
(b) Partially filled
(c) Vacant
(d) none

Answer:
Option **(c)**

4. The probability of occupancy of Fermi level at any temperature other than 0 K is

(a) Zero
(b) one
(c) ∞

(d) 0.5

Answer:
Option **(d)**

5. Semiconductors have

(a) Zero coefficient of resistivity
(b) Negative coefficient of resistivity
(c) Positive coefficient of resistivity
(d) Infinite coefficient of resistivity

Answer:
Option **(b)**

6.Which of the following statement is true?

(a) The forbidden gap in metal is greater than the forbidden gap in a semiconductor
(b) Metals and semiconductors have the same forbidden gap
(c) The forbidden gap in a semiconductor is greater than the forbidden gap in metal and less than the for
(d) None

Answer:
Option **(c)**

7.At absolute zero temperature, an intrinsic semiconductor behaves as a

(a) Conductor
(b) n-type semiconductor
(c) p-type semiconductor
(d) insulator

Answer:
Option **(d)**

8. The distinction between conductors, insulators, and semiconductors is largely concerned with

(a) their ability to conduct current
(b) the type of crystal lattice
(c) binding energy of their electrons
(d) relative widths of their energy gaps

Answer:
Option **(d)**

9. In an intrinsic semiconductor at 0 K, the energy level that lies in the middle of the forbidden band is

(a) donor level
(b) acceptor level
(c) fermi level
(d) none

Answer:
Option **(c)**

10. A light emitting diode is _____
a) Heavily doped
b) Lightly doped
c) Intrinsic semiconductor
d) Zener diode

Answer: a

11. What should be the biasing of the LED?
a) Forward bias
b) Reverse bias
c) Forward bias than Reverse bias
d) No biasing required

Answer: a

12. Drude-Lorentz theory is

(a) Classical free electron theory
(b) Quantum free electron theory
(c) Band theory
(d) none

Answer:
Option **(a)**

13. Classical free electron theory of metals assumes

(a) Free electron gas
(b) Thermal motion of free electrons
(c) Drift motion of free electrons
(d) All

Answer:
Option **(d)**

14. Which process of the Electron-hole pair is responsible for emitting of light?
a) Generation
b) Movement
c) Recombination
d) Diffusion

Answer: c

15. Quantum free electron theory was developed by

(a) Drude
(b) Lorentz
(c) Somerfield
(d) None

Answer:
Option **(c)**

16. antum free electron theory assumes electrons are charged particles and obey.....principle.

(a) Pauli Exclusion
(b) Hund's
(c) aufbau
(d) None

Answer:
Option **(a)**

17. The cause for electrical resistance of a metal is

(a) impurities and crystal defects
(b) thermal vibration
(c) non - periodicity of lattice potentials
(d) all of above

Answer:
Option **(d)**

18. Quantum free electron theory of metals successfully explains

(a) electrical conductivity
(b) specific heat and thermionic emission

(c) paramagnetism

(d) all

Answer:

Option **(d)**

19. Quantum free electron theory of metals fails to explain

(a) the difference between conductors, semiconductors, and insulators

(b) positive Hall coefficient of metals

(c) lower conductivities of divalent metals than monovalent metals

(d) all

Answer:

Option **(d)**

20. Kroning - Penney model is

(a) approximate model

(b) real model

(c) both a and b

(d) none

Answer:

Option **(a)**

.21.The valence electrons of metallic atoms are.....in the spaces between the atoms.

(a) freely move

(b) difficult to move

(c) will not move

(d) none

22. Which process of the Electron-hole pair is responsible for emitting of light?

a) Generation

b) Movement

c) Recombination

d) Diffusion

Answer: c

23. The applied electrical field on a metal.....the velocity of electrons present near the Fermi leve

(a) decreases
(b) enhances
(c) both a and b
(d) none

Answer:
Option **(b)**

24.Fermi energy level
(a) is the top most filled energy level at 0K temperature
(b) is the top most filled energy level at 00C temperature
(c) separates valance band and conduction band
(d) none of the above

Ans: a and c

25. Which of the following is true regarding the position of Fermi level?
(a) lies exactly in the middle between the bottom of the conduction band and top of the valance band in an intrinsic semiconductor
(b) nearer to the conduction band in N-type semiconductor
(c) nearer to the valance band in P-type semiconductor
(d) all the above.

Ans: d

26. Fermi-Dirac statistics explains
(a) how electrons are distributed among different energy levels
(b) the probability of an energy level to be occupied by electrons
(c) the probability of an energy level to be occupied by quantum mechanical particles
(d) how quantum mechanical particles are distributed in different energy level.

Ans: All are correct

27.Fermi-Dirac (FD) statistics governs
(a) fermions
(b) free electrons
(c) gas molecules

(d) All the above

Ans: a and b

28. In free electron gas theory, electrons
(a) can move anywhere inside the metal.
(b) are considered as a gas.
(c) pairs with holes and become neutral.
(d) All the above.

Ans: a and b

29. Which of the following can be explained by using free electron theory
(a) copper
(b) Gold
(c) Silver
(d) Sodium

Ans: All are correct since all are metals which contain free electrons

30. Free electron theory gas is applicable to
(a) metals
(b) gas
(c) solids
(d) all the above.

Ans: a and c. a is a more accurate answer

31. Free electron gas theory assumes
(a) electrons are free from Coulomb force
(b) the Coulomb force of repulsion is negligible.
(c) Electrons are free to move anywhere.
(d) All the above.

Ans: b. Electrons are free to move inside the metal only
32
. For a semiconductor-based light source, it should be a
(a) direct bandgap semiconductor
(b) indirect direct bandgap semiconductor
(c) either direct bandgap or indirect bandgap

(d) the semiconductor can not be used as a light source

Ans: a

33. In an indirect bandgap semiconductor, a transition between conduction band and valance band results in
(a) heat
(b) light
(c) both
(d) none of the above.

Ans: a

34. In a direct bandgap semiconductor
(a) The two points of intersection of a vertical line with the E-K curve of both valance band and conduction band are at the same momentum.
(b) The two points of intersection of a vertical line with the E-K curve of both valance band and conduction band are having the same wave vector.
(c) The K value of the lowest point of the conduction band is equal to the K value of highest point of valance band.
(d) The transitions of electrons take place directly.

Ans: All are correct.

35. Which of the following is true?
(a) In an indirect bandgap semiconductor, emission of photons is not possible
(b) In a direct bandgap semiconductor emission of both light and heat is possible.

Ans: b. Option a is not true. The emission of photons is possible with less probability.

36. In an indirect bandgap semiconductor, emission of light does not occur because of the fact that
(a) momentum is not conserved in case of direct transition
(b) electrons are trapped in defects before making the transition.

Ans: a and b

37. Which of the following is an indirect bandgap semiconductor?
(a) silica
(b) germanium
(c) carbon
(d) all the above.

Ans: d

38. Which of the following is a radiative semiconductor
(a) Silica
(b) Gallium Arsenide
(c) Germanium
(d) None of the above

Ans: b. The radiative semiconductor is the one that emits light.

39. Diffusion current occurs due to
(a) charge density gradient
(b) electric field
(c) nonuniform distribution of electron and holes
(d) all the above

Ans: a and c..

40. The shape of E-K diagram of the conduction band and valance band is
(a) horizontal
(b) vertical
(c) parabolic
(d) none of the above.

Ans: c

41. The curvature of E-K diagram
(a) is higher in conduction band than valance band
(b) is lower in valence band than the conduction band
(c) is negative in the conduction band
(d) b and c

Ans: a and b. Curvature is negative in the valance band.

42. The symbol K in Fermi energy represents
(a) Maxwell-Boltzmann constant
(b) Boltzmann constant
(c) Wave vector
(d) None of the above.

Ans: b. K is a wave vector or propagation constant in the wave function.

43. Hertz is the unit of
(a) frequency of ultrasound
(b) frequency of AC
(c) frequency of waves
(d) all the above.

Ans: d

44. The effective mass of a charge carrier
(a) is directly proportional to the curvature of E-K curve
(b) is inversely proportional to the curvature of E-K curve
(c) is positive near the bottom of the conduction band
(d) is negative near the top of the valance band

Ans: b, c, d. The effective mass may be positive or negative according to the sign of curvature. The curvature may be positive or negative in both the conduction band and the valance band.

45. Electronic bands are formed due to
(a) split-up of energy levels
(b) to satisfy Pauli's exclusion principle
(c) The shift in energy levels
(d) All the above

Ans: a and b

46. An electronic band is
(a) Any range of energy levels
(b) Energy levels where free electrons exist
(c) A range of energy level is characterized by the existence of electrons.
(d) All the above.

Ans: c

47. The interaction of different atoms leads to the formation of
(a) electronic band
(b) electronic bond
(c) none of the above
(d) all the above

Ans: a and b

48. A forbidden band
(a) is the one where electrons are forbidden
(b) is the one where energy is forbidden
(c) is not there in between the conduction and valence band in conductors
(d) all the above.

Ans: a and c

49. Current flow is in the direction of
(a) electric field
(b) opposite to the flow of electrons
(c) flow of holes
(d) all the above.

Ans: d

50. Dopant for N-type semiconductor
(a) should be a pentavalent impurity
(b) should be a trivalent impurity
(c) either a or b
(d) depends on the number of valance electrons in the host atom

Ans: a

51. Hall voltage is developed due to the
(a) change in the magnetic field
(b) change in the electric field
(c) polarization of charges
(d) none of the above.

Ans: c

52. In the Hall effect, electrons experience
(a) electrostatic force
(b) magnetic force
(c) Lorentz force
(d) all the above

Ans: c

53. The force acting on moving electrons due to a perpendicular magnetic the field is in the direction in hall experiment
(a) parallel to the magnetic field
(b) perpendicular to the magnetic field and parallel to the direction of electrons
(c) perpendicular to the direction of electrons and parallel to the magnetic field
(d) Opposite to the magnetic field.

Ans: All are wrong. Perpendicular to both electric and magnetic field

54. **Schottky diode consists of _____semiconductor junction.**

a. PN
b. NP
c. MS
d. All are correct

Answer: c

55. To make a good ohmic contact to a semiconductor, what should be done?
a) Choose a metal with a high Schottky barrier height.
b) Use a lightly doped semiconductor.
c) Introduce defects into the semiconductor to lower its lifetime.
d) Dope the semiconductor very heavily.
e) Reduce the contact area.

Answer: d