UNIT IVA

Q. At absolute zero, Si acts as?
A. non-metal
B. metal
C. insulator
D. none of these
Ans.C

Q. Carbon, Silicon and Germanium atoms have four valence electrons each. Their valence and conduction bands are separated by energy band gaps represented by (Eg)C, (Eg)Si and (Eg)Ge respectively. Which one of the following relationship is true in their case?
A. (Eg)C> (Eg)Si
B. (Eg)C<(Eg)Si
C. (Eg)C=(Eg)Si
D. (Eg)C<(Eg)Ge
Ans. A

Q. The forbidden energy gap in an insulator is
A. > 6 eV
B. < 6 eV
C. 1 eV
D. 4 Ev
Ans.B

Q. In an insulator, the number of electrons in the valence shell in general is
A. lessthan 4
B. more than 4
C. equal to 4
D. none of these
Ans.C

Q. Energy band gap size for semiconductors is in the range __________ eV.
A. 1-2
B. 2-3
C. 3-4
D. >4
Ans.A

Q. Energy band gap size for insulators is in the range _____ eV.
A. 1-2
B. 2-3
C. 3-4
D. 3-6
Ans.D

Q. Not an example for intrinsic semiconductor
A. Si
B. Al
C. Ge
D. Sn
Ans.B

Q. Which is the correct ordering of the band gaps within the group 14 elements?
A. Diamond>silicon<germanium
B. Diamond>silicon >germanium
C. Diamond<silicon>germanium
D. Diamond<silicon<germanium
Ans.B

Q. Energy bandformation is prominent in
A. Solids
B. Liquids
C. Gases
D. All the above
Ans.A
Q. Elements in gaseous state give rise to
A. band spectrum
B. line spectrum
C. continuous spectrum
D. all the above
Ans.B

Q. Elements in crystalline solid give rise to
A. band spectrum
B. line spectrum
C. continuous spectrum
D. all the above
Ans.A

Q. In solids there is significant interaction between _____ electrons orbit of different atoms.
A. innermost
B. outermost
C. both A and B

D. neither A nor B
Ans.B

Q. The band which contains free electrons is
A. Valence band
B. Conduction band
C. Forbidden band
D. Both valence and conduction bands
Ans.B

Q. The band which contains valence electrons is
A. Valence band
B. Conduction band
C. Forbidden band
D. Both valence and conduction bands
Ans.A

Q. __________band does not contain electrons.
A. Valence
B. Conduction
C. Forbidden
D. Both valence and conduction
Ans.C

Q. Electrons can exist in
A. Valence band
B. Conduction band
C. Forbidden band
D. Both valence and conduction band
Ans.D

Q. If N atoms are brought close together to form a solid, the s energy band can accommodate
A. Nelectrons
B. 2N electrons
C. 6N electrons
D. 8N electrons
Ans.B

Q. If N atoms are brought close together to form a solid, the p energy band can accommodate
A. N electrons
B. 2Nelectrons
C. 6N electrons
D. 8Nelectrons
Ans.C

Q. If the outermost energy band in a solid is partially filled, the solid will be
A. Insulator
B. Semiconductor
C. Good conductor
D. Any of the above
Ans.C

Q. If the outermost energy band in a solid is completely filled, the solid will be
A. Insulator
B. Semiconductor
C. Good conductor
D. Either insulator or semiconductor
Ans.D

Q. If the outermost energy band in a solid is completely filled and the energy difference with the next energy band is small, the solid will be
A. Insulator
B. Semiconductor
C. Good conductor
D. Any of the above
Ans.B

Q. If the outermost energy band in a solid is completely filled and the energy difference with the next energy band is large, the solid will be
A. Insulator
B. Semiconductor
C. Good conductor
D. Any of the above
Ans.A

Q. An energy band is
A. A set of continuous energies
B. A set of closely spaced allowed energy levels
C. A set of widely spaced allowed energy levels
D. None of the above
Ans.B

Q. The origin of energy bands in solids is
A. Atomic mass
B. Temperature

C. Closely packed periodic structure of solid
D. Atomic number of atoms in solid
Ans.C

Q. Which of the following decides electrical properties of a solid?
A. Electronic configuration
B. Interatomic distance
C. Both Electronic configuration and Interatomic distance
D. Neither Electronic configuration nor Interatomic distance
Ans.C

Q. Valence band in a metal contains ………..
A. Free electrons
B. Holes
C. Valence electrons
D. Both holes and valence electrons
Ans.A

Q. Valence band in a semiconductor contains
A. Electrons
B. Holes
C. Valence electrons
D. Both holes and valence electrons
Ans.D

Q. Conduction band in a metal contains
A. Free electrons
B. Holes
C. Valence electrons
D. Both holes and valence electrons
Ans.A

Q. Conduction band in a semiconductor contains
A. Free electrons
B. Holes
C. Valence electrons
D. Both holes and valence electrons
Ans.A

Q. The energy gap in good conductors is
A. 0
B. ~1 eV
C. ~5 eV
D. None of the above
Ans.A

Q. The energy gap in insulators is
A. 0
B. ~ 1 eV
C. ~ 5 eV
D. None of the above
Ans.C

Q. The energy gap in semiconductors is
A. 0
B. ~ 1 eV
C. ~ 5 eV
D. None of the above
Ans.B

Q. Which of the following has maximum band gap energy?
A. Tin
B. Silicon
C. Germanium
D. Carbon in diamond form
Ans.D

Q. Which of the following has minimum band gap energy?
A. Tin
B. Silicon
C. Germanium
D. Carbon in diamond form
Ans.A

Q. Pure semiconductors are known as
A. Intrinsic
B. Doped
C. Extrinsic
D. Compound
Ans.A

Q. Impure semiconductors are known as
A. Intrinsic
B. wide band
C. Extrinsic
D. Compound
Ans.C

Q. When number of electrons in conduction band is equal to number of holes in valance band at particular temperature the semiconductor is

A. Intrinsic
B. Doped
C. Extrinsic
D. Compound
Ans. A

Q. When number of electrons in conduction band is greater than number of holes in valance band at particular temperature the semiconductor is

A. Intrinsic
B. Extrinsic p type
C. Extrinsic n type
D. Compound
Ans. C

Q. When number of electrons in conduction band is less number of holes in valance band at particular temperature the semiconductor is

A. Intrinsic
B. Extrinsic p type
C. Extrinsic n type
D. Compound
Ans. B

Q. The donor impurity level lie
A. Just above the valence band
B. Just below the conduction band
C. At the centre of forbidden band
D. Just above the conduction band
Ans.B

Q. The acceptor impurity level lie
A. Just above the valence band
B. Just below the conduction band
C. At the centre of forbidden band
D. Just above the conduction band
Ans.A

Q. There is no forbidden band in
A. Good conductor
B. Semiconductor
C. Insulators
D. Both semiconductors and insulators
Ans.A

Q. The band gap energy in Silicon is
A. 0eV
B. 0.7 eV
C. 1.1 eV
D. 5 eV
Ans.C

Q. The band gap energy in Germanium is
A. 0eV
B. 0.7 eV
C. 1.1 eV
D. 5 eV
Ans.B

Q. Which of the following is not a semiconductor?
A. Silicon
B. Germanium
C. GaAs
D. Carbon
Ans.D

Q. Valence band of a semiconductor at 0 K will be
A. Completely filled
B. Partially filled
C. Completely empty
D. Either completely filled or completely empty
Ans.A

Q. Valence band of a semiconductor at temperatures above 0 K will be
A. Completely filled
B. Partially filled
C. Completely empty
D. Either completely filled or completely empty
Ans.B

Q. Conduction band of a semiconductor at 0 K will be
A. Completely filled
B. Partially filled
C. Completely empty
D. Either completely filled or completely empty
Ans.C

Q. Conduction band of a semiconductor at temperatures above 0 K will be
A. Completely filled

B. Partially filled
C. Completely empty
D. Either completely filled or completely empty
Ans.B

Q. Which of the following, when added as an impurity, into the Silicon, produces n-type semi conductor
A. Phosphorous
B. Aluminum
C. Magnesium
D. Both 'B' and 'C'
Ans.A

Q. When arsenic is added as an impurity to Silicon, the resulting material is
A. n-type semiconductor
B. p-type semiconductor
C. n-type conductor
D. Insulator
Ans.A

Q. To obtain a p-type germanium semiconductor, it must be doped with?
A. Arsenic
B. Antimony
C. Indium
D. Phosphorus
Ans.C

Q. Which of the following when added acts as an impurity into silicon produced n-type semi-conductor?
A. P
B. Al
C. B
D. Mg
Ans.A

Q. A semiconductor is doped with donor impurity is
A. p-type
B. n-type
C. npn type
D. pnp type
Ans.B

Q. One serious drawback of semiconductors is
A. they are costly
B. they pollute the environment
C. they do not last for long time
D. they can't withstand high voltage
Ans.D

Q. In a p type semiconductor, the acceptor level is
A. Just above the conduction band of the host crystal
B. Just below the conduction band of the crystal
C. Just above the valence band of the crystal
D. Just below the valance band of the crystal
Ans.C

Q. In intrinsic semiconductors, number of free electrons is _____________number of holes.
A. Equal to
B. Greater than
C. Less than
D. Can not define
Ans.A

Q. In n-type semiconductors, number of holes is __________ number of free electrons.
A. Equal to
B. Greater than
C. Less than
D. Can not define
Ans.C

Q. In p-type semiconductors, number of holes is__________number of free electrons.
A. Equal to
B. Greater than
C. Less than
D. Twice
Ans.B

Q. n-type semiconductors is
A. pure semiconductor
B. produced when Indium is added as an impurity to Germanium

C. produced when phosphorous is added as an impurity to silicon
D. None of the above
Ans.C

Q. p-type semiconductors are
A. Negatively charged
B. Produced when Indium is added as an impurity to Germanium
C. Produced when phosphorous is added as an impurity to silicon
D. None of the above
Ans.B

Q. A long specimen of p-type semiconductor material:
A. Is positively charged
B. Is electrically neutral
C. Has an electric field directed along its length
D. None of the above
Ans.B

Q. When N-type semiconductor is heated,
A. Number of free electrons increases while that of holes decreases
B. Number of holes increases while that of electrons decreases
C. Number of electrons and holes remain same
D. Number of electron and holes increases equally
Ans.D

Q. A piece of copper and other of germanium are cooled from the room temperature to 80K, then
A. Resistance of each will increase
B. Resistance of copper will decrease
C. The resistance of copper will increase while that of germanium will decrease
D. The resistance of copper will decrease while that of germanium will increase
Ans.D

Q. The intrinsic semiconductor becomes an insulator at
A. 0°C
B. 0K
C. 300K
D. 27°C
Ans.B

Q. In semiconductors at a room temperature
A. The conduction band is completely empty
B. The valence band is partially empty and the conduction band is partially filled
C. The valence band is completely filled and the conduction band is partially filled
D. The valence band is completely filled
Ans.B

UNIT IVB

Q. Choose the only false statement from the following.
A. In conductors the valence and conduction bands overlap.
B. Substances with energy gap of the order of 5 eV are insulators.
C. The resistivity of a semiconductor increases with increase in temperature.
D. The conductivity of a semiconductor increases with increase in temperature.
Ans. C

Q. What is the conductivity of semiconductor if free electron density = $5x10^{12}/cm^3$ and hole density = $8x10^{13}/cm^3$? [μ_e = 2.3 and μ_h = 0.01 in SI units]
A. 5.634
B. 1.968
C. 3.421
D. 8.964
Ans. B

Q. The difference in the variation of resistance with temperature in semiconductor arises essentially due to the difference in
A. type of bonding
B. crystal structure
C. scattering mechanism with temperature

D. number of charge carriers with temperature
Ans. D

Q. Resistance of a semiconductor
A. Increases with temperature
B. Decreases with temperature
C. Remains unaffected with temperature
D. None of these
Ans. B

Q. The temperature coefficient of the resistance of semiconductors is always
A. Positive
B. Negative
C. Zero
D. Infinite
Ans. B

Q. Electrical conductivity of insulators is of the order of
A. $10^{-10}(\Omega\text{-mm})^{-1}$
B. $10^{-10}(\Omega\text{-cm})^{-1}$
C. $10^{-10}(\Omega\text{-m})^{-1}$
D. $10^{-8}(\Omega\text{-m})^{-1}$
Ans. A

Q. Unit for electric field strength is
A. A/cm2
B. mho/meter
C. cm^2/V.s
D. V/cm
Ans. D

Q. Flow of electrons is affected by the following
A. Thermal vibrations
B. Impurity atoms
C. Crystal defects
D. all
Ans. D

Q. Mobility of holes is________mobility of electrons in intrinsic semiconductors.
A. Equal to
B. Greater than
C. Less than
D. Can not define
Ans. C

Q. The conductivity of an intrinsic semiconductor is given by (symbols have the usual meanings):
A. $\sigma_i = en_i2\ (\mu_n - \mu_p)$
B. $\sigma_i = en_i\ (\mu_n - \mu_p)$
C. $\sigma_i = en_i\ (\mu_n + \mu_p)$
D. None of the above
Ans. C

Q. In an intrinsic semiconductor, the mobility of electrons in the conduction band is:
A. Less than the mobility of holes in the valence band
B. Zero
C. Greater than the mobility of holes in the valence band
D. None of the above
Ans. C

Q. If the drift velocity of holes under a field gradient of 100 V/m is 5m/s, the mobility (in the same SI units) is
A. 0.05
B. 0.55
C. 500
D. None of the above
Ans. A
Q. The electron and hole concentrations in aintrinsic semiconductor are $n_i$and p_i respectively. When doped with a p-type material, these change to n and p, respectively. Then:
A. $n + p = n_i + p_i$
B. $n + n_i = p + p_i$
C. $np = n_ip_i$
D. None of the above
Ans. D

Q. If the temperature of an extrinsic semiconductor is increased so that the intrinsic carrier concentration is doubled, then:
A. The minority carrier density doubles
B. The majority carrier density doubles
C. Both majority and minority carrier densities double
D. None of the above
Ans. A

Q. At room temperature, the current in an intrinsic semiconductor is due to
A. Holes
B. Electrons
C. Holes and electrons
D. None of the above
Ans. C

Q. The mobility is given by (notations have their usual meaning:
A. $\mu = v_d/E$
B. $\mu = v_d/2E$
C. $\mu = v_d/E^2$
D. None of the above
Ans. A

Q. In a p-type semiconductor, the conductivity due to holes (σ_p) is equal to (e is the charge of hole, μ_p is the hole mobility, ρ_0 is the hole concentration):
A. $\rho_0.e/\mu_p$
B. $\mu_p/\rho_0.e$
C. $\rho_0.e.\mu_p$
D. None of the above
Ans. C

Q. Near room temperature, resistivity is maximum for
A. Good conductors
B. Semiconductors
C. Insulators
D. Both semiconductors and insulators
Ans. C

Q. Near room temperature, resistivity is minimum for
A. Good conductors
B. Semiconductors
C. Insulators
D. Both semiconductors and insulators
Ans. A

Q. Resistivity increases with increase in temperature for
A. Good conductors
B. Semiconductors
C. Insulators
D. Both semiconductors and insulators
Ans. A

Q. Resistivity decreases with increase in temperature for
A. Good conductors
B. Semiconductors
C. Insulators
D. Both semiconductors and insulators
Ans. D

Q. If a semiconductor is transparent to light of wavelength greater than λ, the band gap energy will be
A. $\frac{h\lambda}{c}$
B. $\frac{hc}{\lambda}$
C. $\frac{h}{\lambda}$
D. $\frac{\lambda c}{h}$
Ans. B

Q. If the band gap energy of a semiconductor is E_g,the material will be
A. transparent to wavelength greater than $\frac{hc}{E_g}$
B. opaque to wavelength greater than $\frac{hc}{E_g}$
C. transparent to wavelength less than $\frac{hc}{E_g}$
D. none of the above
Ans. A

Q. Which of the following have a positive temperature coefficient of resistance?
A. Good conductor
B. Semiconductor
C. Insulators
D. Both semiconductors and insulators
Ans. A

Q. Conduction in intrinsic semiconductors is due to
A. Only free electrons
B. Only holes
C. Both free electrons and holes

D. Positive and negative ions
Ans. C

Q. If a free electron moves towards right and combines with a hole, the hole
A. Moves towards right
B. Moves towards left
C. Remains at the same place
D. is neutralized
Ans. D

Q. If a bound electron moves towards right and combines with a hole, the hole
A. Moves towards right
B. Moves towards left
C. Remains at the same place
D. is neutralized
Ans. B

Q. In an electric field, an electron initially at rest will move
A. In the direction of electric field
B. Opposite to the direction of electric field
C. Perpendicular to the direction of electric field
D. None of the above
Ans. B

Q. In an electric field, a hole initially at rest will move
A. In the direction of electric field
B. Opposite to the direction of electric field
C. Perpendicular to the direction of electric field
D. None of the above
Ans. A

Q. Mobility of holes is _____ that of free electrons.
A. More than
B. Less than
C. Equal to
D. Can be more or less than
Ans. B

Q. The charge carriers in intrinsic semiconductors are
A. Free electrons
B. Holes
C. Both free electrons and holes
D. Neither free electrons nor holes
Ans. C

Q. The charge carriers in p - type semiconductors are
A. Free electrons
B. Holes
C. Both free electrons and holes
D. Neither free electrons nor holes
Ans. C

Q. The charge carriers in n - type semiconductors are
A. Free electrons
B. Holes
C. Both free electrons and holes
D. Neither free electrons nor holes
Ans. C

Q. The majority charge carriers in p - type semiconductors are
A. Free electrons
B. Holes
C. Both free electrons and holes
D. Neither free electrons nor holes
Ans. B

Q. The majority charge carriers in n - type semiconductors are
A. Free electrons
B. Holes
C. Both free electrons and holes
D. Neither free electrons nor holes
Ans. A

Q. The resistance of a conductor of unit length and unit cross section area is known as
A. Resistivity
B. Conductivity
C. Resistance
D. Conductance
Ans. A

Q. The reciprocal of resistivity is
A. Resistivity

B. Conductivity
C. Resistance
D. Conductance
Ans. B

Q. The reciprocal of resistance is
A. Resistivity
B. Conductivity
C. Resistance
D. Conductance
Ans. D

Q. The amount of charge flowing through unit cross section area per unit time is known as
A. Current
B. Current density
C. Conductance
D. Resistance
Ans. B

Q. The amount of charge flowing through any cross section area per unit time is known as
A. Current
B. Current density
C. Conductance
D. Resistance
Ans. A

Q. Current in a semiconductor can be due to
A. Electric field
B. Density gradient of charge carriers
C. Both electric field and density gradient of charge carriers
D. Either electric field or density gradient of charge carriers
Ans. C

Q. The unit for resistivity is
A. ohm
B. Ohm/m
C. Ohm-m
D. mho/m
Ans. C

Q. The unit for conductivity is
A. Ohm
B. Ohm/m
C. Ohm-m
D. mho/m
Ans. D

Q. Which of the following equations for mobility is correct?
A. $\mu = \frac{v_d}{E}$
B. $\mu = \frac{\sigma}{ne}$
C. $\mu = \frac{1}{ne\rho}$
D. All the above
Ans. D

Q. If I_e is the current due to electrons and I_h is the current due to holes in a semiconductor under the influence of an external electric field, the total current is
A. $I_e + I_h$
B. $I_e - I_h$
C. I_e / I_h
D. I_h / I_e
Ans. A

Q. The equation for current density 'J' is
A. n e v_d
B. n e a v_d
C. n e a
D. None of the above
Ans. A

Q. The equation for current I is
A. nev_d
B. $neav_d$
C. nea
D. None of the above
Ans. B

Q. If an electric field of 10 V/m is applied to n-type Germanium in which the mobility of free electrons is 3800 cm^2 / V.sec, the drift velocity of electrons will be
A. 38000 m/s
B. 38 m/s
C. 3.8m/s

D. 0.38m/s
Ans. C

Q. If an electric field of 10 V/m applied to p-type Germanium gives rise to a drift velocity of 1.7 m/s for the holes, the mobility of holes is
A. 1.7 cm^2 / V.sec.
B. 17 cm^2 / V.sec.
C. 170 cm^2 / V.sec.
D. 1700cm^2 / V.sec.
Ans. D

Q. A small concentration of minority carriers is injected into a homogeneous semiconductor crystal at one point. An electric field of 10 V/cm is applied across the crystal and this moves the minority carrier a distance of 1 cm in 20 µsec. The mobility (in cm^2/V.sec) is:
A. 10000
B. 5000
C. 50
D. 100
Ans. B

Q. What will the mobility of charge carriers moving with velocity 3 x 10^5 m/s when electric field of 10^3 V/m is applied to it?
A. 300m^2/V.sec
B. 3000m^2/V.sec
C. 30000m^2/V.sec
D. 300000m^2/V.sec
Ans. A

Q. What will the mobility of charge carriers moving with velocity 3 x 10^6 m/s when electric field of 10^3 V/m is applied to it?
A. 300m^2/V.sec
B. 3000m^2/V.sec
C. 30000m^2/V.sec
D. 300000m^2/V.sec
Ans. B

Q. If the electrical resistivity of T_i is 4.3 × 10^{-7} Ω m, what is the resistance of a 0.85 m long piece of wire of cross section 2.0 × 10^{-6} m^2?
A. 0.18 Ω
B. 5.47 Ω
C. 0.25 Ω
D. 3.95 Ω
E. A

UNIT IVC

Q. The Fermi-Dirac probability distribution function is
A. $P(E) = \frac{1}{1+e^{(E-E_f)/KT}}$
B. $P(E) = \frac{1}{1+e^{(E_F-E)/KT}}$
C. $P(E) = \frac{1}{e^{(E-E_f)/KT}}$
D. $P(E) = \frac{1}{1-e^{(E-E_f)/KT}}$
Ans. A
Q. The value of Fermi Function at 0K for $E < E_F$ is
A. 0
B. 1
C. 0.5
D. 0.75
Ans. B

Q. The value of Fermi Function at 0K for $E > E_F$ is
A. 0
B. 1
C. 0.5
D. 0.75
Ans. A

Q. The value of Fermi Function at T > 0K for $E = E_F$is ………….
A. 0
B. 1
C. 0.5
D. 0.75
Ans. C

Q. The probability that an electron in a metal occupies the Fermi-level, at any temperature (>0 K) is:
A. 0
B. 1

C. 0.5
D. None of the above
Ans. C

Q. The value of Fermi-distribution function at absolute zero (T = 0K) is 1, i.Ans. P(E) = 1, under the condition
A. $E > E_F$
B. $E < E_F$
C. $E = E_F$
D. $E >> E_F$
Ans. B

Q. Fermi energy level for intrinsic semiconductors lies
A. At middle of the band gap
B. Close to conduction band
C. Close to valence band
D. None
Ans. A

Q. Fermi energy level for p-type semiconductors lies
A. At middle of the band gap
B. Close to conduction band
C. Close to valence band
D. None
Ans. C

Q. Fermi energy level for n-type extrinsic semiconductors lies
A. At middle of the band gap
B. Close to conduction band
C. Close to valence band
D. None
Ans. B

Q. Fermi level for extrinsic semiconductor depends on
A. Donor element
B. Impurity concentration
C. Temperature
D. All
Ans. D

Q. When we increase the temperature of extrinsic semiconductor, after a certain temperature it behaves like
A. an insulator
B. an intrinsic semiconductor
C. a conductor
D. a superconductor
Ans. B

Q. In a n-type semiconductor, the Fermi level at 0K is
A. between valence band and acceptor levels
B. between acceptor levels and intrinsic Fermi level
C. between intrinsic Fermi level and donor level
D. between donor level and conduction band
Ans. D

Q. In a p-type semiconductor, the Fermi level at 0 K is
A. between valence band and acceptor levels
B. between acceptor levels and intrinsic Fermi level
C. between intrinsic Fermi level and donor level
D. between donor level and conduction band
Ans. A

Q. In a n-type semiconductor, the Fermi level at T > 0 K is
A. between valence band and acceptor levels
B. between acceptor levels and intrinsic Fermi level
C. between intrinsic Fermi level and donor level
D. between donor level and conduction band
Ans. C

Q. In a p-type semiconductor, the Fermi level at T > 0K is
A. between valence band and acceptor levels
B. between acceptor levels and intrinsic Fermi level
C. between intrinsic Fermi level and donor level

D. between donor level and conduction band
Ans. B

Q. The Fermi level shifts ______ in p-type semiconductor with increase in temperature.
A. upwards
B. downwards
C. neither upward nor downward
D. none of the above
Ans. A

Q. The Fermi level shifts ______ in n-type semiconductor with increase in temperature.
A. upwards
B. downwards
C. neither upward nor downward
D. none of the above
Ans. B

Q. The Fermi level shifts ________ in intrinsic semiconductor with increase in temperature.
A. upwards
B. downwards
C. neither upward nor downward
D. none of the above
Ans. C

Q. The Fermi level shifts ________ in n-type semiconductor with increase in impurity concentration.
A. upwards
B. downwards
C. neither upward nor downward
D. none of the above
Ans. A

Q. The Fermi level shifts _________ in p-type semiconductor with increase in impurity concentration.
A. Upwards
B. downwards
C. neither upward nor downward
D. none of the above
Ans. B

Q. When the current flows in semiconductor due to the influence of external electric field it is called as
E. diffusion current
F. drift current
G. ac current
H. dc current
Ans. B

Q. When the current flows from one place to other in semiconductor due to the concentration gradient it is called as
I. diffusion current
J. drift current
K. ac current
L. dc current
Ans. A

Q. In a semiconductor the charge carriers (electrons or holes) have a tendency to move from the region of higher concentration to the region of lower concentration of same type of charge carriers resulting a current called as
A. diffusion current
B. drift current
C. ac current
D. dc current
Ans. A

UNIT IVD

Q. p-n junction is said to be forward biased, when
A. The positive pole of the battery is joined to the p-semiconductor and negative pole to the n-semiconductor
B. The positive pole of the battery is joined to the n-semiconductor and negative pole of the battery is joined to the p-semiconductor
C. The positive pole of the battery is connected to n- semiconductor and p-semiconductor
D. A mechanical force is applied in the forward direction
Ans. A

Q. The depletion layer in the P-N junction region is caused by?
E. Drift of holes
F. Diffusion of charge carriers
G. Migration of impurity ions
H. Drift of electrons
Ans. B

Q. A semi-conducting device is connected in a series circuit with a battery and a resistance. A current is found to pass through the circuit. If the polarity of the battery is reversed, the current drops to almost zero. The device may be
A. A p-n junction
B. An intrinsic semi-conductor
C. A p-type semi-conductor
D. An n-type semi-conductor
Ans. A

Q. The cause of the potential barrier in a p-n diode is
A. Depletion of positive charges near the junction
B. Concentration of positive charges near the junction
C. Depletion of negative charges near the junction
D. Concentration of positive and negative charges near the junction
Ans. D

Q. In forward bias, the width of potential barrier in a p-n junction diode
A. increases
B. decreases
C. remains constant
D. first increases then decreases
Ans. B

Q. A depletion layer consists of
A. electrons
B. protons
C. mobile ions
D. immobile ions
Ans. D

Q. The part of depletion layer in the p-type contains
A. holes
B. positive ions
C. free electrons
D. negative ions
Ans. D

Q. The part of depletion layer in the n-type contains
A. holes
B. positive ions
C. free electrons
D. negative ions
Ans. B

Q. In a junction diode, the holes are due to
A. protons
B. extra electrons
C. neutrons
D. missing electrons
Ans. D

Q. In an unbiased p-n junction
A. The potential of the p and n sides becomes higher alternately
B. The p side is at higher electrical potential than the n side
C. The n side is at higher electrical potential than the p side
D. Both the p and n sides are at the same potential
Ans. B

Q. Reverse bias applied to a junction diode
A. increases the minority carrier current
B. lowers the potential barrier
C. raises the potential barrier
D. increases the majority carrier current
Ans. C

Q. Application of a forward bias to a pn junction
A. Widens the depletion zone.
B. Increases the potential difference across the depletion zone.
C. Increases the number of donors on the n side.
D. Increases the electric field in the depletion zone.
Ans. C

Q. On increasing the reverse bias to a large value in pn junction diode, the current
A. Increases slowly
B. remains fixed
C. Suddenly increases
D. decreases slowly
Ans. C

Q. The number of _________ charge carriers increases with increase in temperature in n-type semiconductor.
A. minority
B. majority
C. both minority and majority
D. neither minority nor majority
Ans. C

Q. The number of ________ charge carriers increases with increase in temperature in p-type semiconductor.
A. minority
B. majority
C. both minority and majority
D. neither minority nor majority
Ans. C

Q. The electrical resistance of depletion layer is large because
A. it has no charge carriers
B. it has large number of charge carriers
C. it contains electrons as charge carriers
D. it has holes as charge carriers
Ans. A

Q. In forward biased p-n junction the current is of the order of
A. ampere
B. milliampere
C. microampere
D. nanoampere
Ans. B

Q. When p-n junction diode is reverse biased the flow of current across the junction is mainly due to
A. diffusion of charges
B. depends on nature of material
C. drift of charges
D. both drift and diffusion of charges
Ans. C

Q. The number of ______ charge carriers increases with increase in light incident on n-type semiconductor.
A. minority
B. majority
C. both minority and majority
D. neither minority nor majority
Ans. C

Q. The number of _______ charge carriers increases with increase in light incident on p-type semiconductor.
A. minority
B. majority
C. both minority and majority
D. neither minority nor majority
Ans. C

Q. Application of forward bias to the p-n junction
A. increases the number of donors on n side
B. increases electric field in depletion region
C. increases potential difference across the depletion region
D. widens the depletion zone
Ans. B

Q. Within depletion region of the p-n junction diode
A. p side is positive and n side is negative
B. p side is negative and n side is positive
C. both sides are either positive or negative
D. both sides are neutral
Ans. B

Q. Barrier potential of p-n junction does not depend on
A. temperature
B. forward bias
C. reverse bias
D. diode design
Ans. D

Q. For the same electric field and density of doping in two identical semiconductors,

one p-type and the other n-type, the current will be
A. more in n-type
B. more in p-type
C. same in both
D. none of the above
Ans. B

Q. The potential difference across an open circuited p-n junction is known as
A. knee voltage
B. cut-in-voltage
C. barrier potential
D. none of the above
Ans. C

Q. The dominant mechanism for motion of charge carriers in forward and reverse biased silicon p-n junction are
A. drift in both forward and reverse bias
B. diffusion in both forward and reverse
C. diffusion in forward and drift in reverse
D. drift in forward and diffusion in reverse
Ans. A

Q. If V_B is the barrier potential, the energy difference between the conduction bands of n-type and p-type in open circuited (unbiased) p-n junction diode is
A. eV_B
B. $\frac{V_B}{e}$
C. $e+V_B$
D. $e-V_B$
Ans. A

Q. If V_B is the barrier potential and V is the applied voltage, the energy difference between the conduction bands of n-type and p-type in forward biased p-n junction diode is
A. eV_B
B. eV_B+eV
C. eV_B-eV
D. $V-V_B$
Ans. C

Q. If V_B is the barrier potential and V is the applied voltage, the energy difference between the conduction bands of n-type and p-type in reverse biased p-n junction diode is
A. eV_B
B. eV_B+eV
C. eV_B-eV
D. $V-V_B$
Ans. B

Q. Under equilibrium conditions in a p-n junction, the Fermi level in n-type is at ______ level than/as that in p-type.
A. higher
B. lower
C. same
Ans. none of the above
D. C

Q. When forward bias is applied to a p-n junction diode, the Fermi level in n-type ______ with respect to the Fermi level in p-type.
A. rises
B. falls
C. remains at the same level
D. initially rises and then falls
Ans. A

Q. When reverse bias is applied to a p-n junction diode, the Fermi level in n-type _______ with respect to the Fermi level in p-type.
A. rises
B. falls
C. remains at the same level
D. initially rises and then falls
Ans. B

Q. When forward bias voltage is applied to a p-n junction diode, the width of the depletion layer
A. increases
B. decreases
C. remains constant
D. initially increases and then decreases
Ans. B

Q. When reverse bias voltage is applied to a p-n junction diode, the width of the depletion layer
A. increases
B. decreases
C. remains constant
D. initially increases and then decreases
Ans. A

Q. In a forward biased diode, the conduction is mainly due to
A. electrons
B. holes
C. electrons in p-type and holes in n-type
D. holes in p-type and electrons in n-type
Ans. D

Q. In a reverse biased diode, the conduction is mainly due to
A. electrons
B. holes
C. electrons in p-type and holes in n-type
D. holes in p-type and electrons in n-type
Ans. C

Q. The recombination of electron hole pairs in a forward biased GaAs diode gives rise to _______ radiation.
A. visible
B. infra red
C. ultra violet
D. microwave
Ans. A

Q. The depletion layer opposes the flow of
A. majority charge carriers
B. minority charge carriers
C. both minority and majority charge carriers
D. neither minority nor majority charge carriers
Ans. A

Q. The part of a transistor, which is heavily doped to produce large number of majority carriers, is
A. emitter
B. base
C. collector
D. any of the above depending upon the nature of transistor
Ans. A

Q. When a n-p-n transistor is used as an amplifier then
A. the electrons flow from emitter to collector
B. the holes flow from emitter to collector
C. the electrons flow from collector to emitter
D. the electrons flow from battery to emitter
Ans. A

Q. If a transistor is to work as an amplifier, the emitter-base junction must be
A. forward biased
B. reversed biased
C. not be biased
D. any of the above
Ans. A
Q. If a transistor is to work as an amplifier, the collector-base junction must be
A. forward biased
B. reversed biased
C. not be biased
D. any of the above
Ans. B

Q. In an n-p-n transistor, _____ electrons from emitter get neutralized in base.
A. a large number of
B. very few
C. all
D. none of the
Ans. B

Q. The concentration of impurities in a transistor are
A. equal for emitter, base and collector
B. least for emitter region
C. largest for emitter region
D. largest for collector region
Ans. C

Q. In an n-p-n transistor, _____ electrons from emitter cross over to collector.
A. a large number of
B. very few

C. all
D. none of the
Ans. A

Q. In a biased n-p-n transistor, the Fermi level of emitter ________ with respect to that in base.
A. remains at the same level
B. shifts upwards
C. shifts downwards
D. first shifts up and then down
Ans. B

Q. In a biased n-p-n transistor, the Fermi level of collector ______ with respect to that in base.
A. remains at the same level
B. shifts upwards
C. shifts downwards
D. first shifts up and then down
Ans. C

Q. The base of transistor is made thin and lightly doped because
A. about 95% of the charge carriers may cross
B. about 100% of the charge carriers may cross
C. the transistors can be saved from large currents
D. none of these
Ans. A

Q. The Hall voltage in intrinsic silicon is
A. Positive
B. Zero
C. None of the above
D. Negative
Ans. B

Q. In Hall-effect, the magnetic field is applied
A. in the direction of current
B. opposite to direction of current
C. either in or opposite to direction of current
D. perpendicular to direction of current
Ans. D

Q. In Hall effect voltage is developed
A. in the direction of current
B. opposite to direction of current
C. either in or opposite to direction of current
D. perpendicular to direction of current
Ans. D

Q. If an electron moves along positive X axis and a magnetic field is applied in positive Y direction, the electron will experience a force along
A. positive Z
B. negative Z
C. positive X
D. negative X
Ans. B

Q. If a hole moves along positive X axis and a magnetic field is applied in positive Y direction, the hole will experience a force along
A. positive Z
B. negative Z
C. positive X
D. negative X
Ans. A

Q. The Hall voltage is given by V_H =
A. $\frac{IBd}{nqa}$
B. $\frac{Bd}{Inqa}$
C. $\frac{IqBd}{na}$
D. $\frac{IBad}{nq}$
Ans. A

Q. The Hall coefficient is given by R_H =
A. nq
B. $\frac{1}{nq}$
C. $\frac{n}{q}$

D. $\frac{q}{n}$
Ans. B

Q. The Hall-Effect is used to determine
A. polarity of majority charge carriers
B. density of charge carriers
C. mobility of charge carriers
D. all the above
Ans. D

Q. The Hall coefficient of an intrinsic semiconductor is
A. Positive under all conditions
B. Negative under all conditions
C. Zero under all conditions
D. None of the above
Ans. C

Q. If the Hall coefficient of a material is 1.25×10^{-11} m^3/C and charge of an electron is 1.6×10^{-19} C, the density of electron is __________ per m^3.
A. 2×1029
B. 4×1029
C. 5×1029
D. 2×1024
Ans. C

Q. Hall-Effect is observed in a specimen when it (metal or a semiconductor) is carrying current and is placed in a transverse magnetic field. The resultant electric field inside the specimen will be in
A. direction normal to both current and magnetic field
B. direction of current
C. direction anti parallel to magnetic field
D. None of the above
Ans. A

Q. When n_e and n_h are electron and hole densities, and μ_e and μ_h are the carrier mobility, the Hall coefficient is positive when
A. $n_h \mu_h > n_e\mu_e$
B. $n_h \mu_h^2 > n_e\mu_e^2$
C. $n_h\mu_h < n_e\mu_h$
D. None of the above
Ans. A

Q. Measurement of Hall coefficient in a semiconductor provides information on the
A. Sign and mass of charge carriers
B. Mass and concentration of charge carriers
C. Sign of charge carriers alone
D. Sign and concentration of charge carriers
Ans. D

Q. Hall coefficient is given by the relation
A. $R_H = -neJ$
B. $R_H = \frac{1}{ne}$
C. $R_H = -\frac{1}{Jne}$
D. $R_H = \frac{-1}{ne}$
Ans. D

Q. The Hall coefficient of sample A at room temperature is 4×10^{-4} m^3 $coulomb^{-1}$. The carrier concentration in sample A at room temperature is
A. ~ 1021 m^{-3}
B. ~ 1020 m^{-3}
C. ~ 1022 m^{-3}
D. None of the above
Ans. C

Q. The generation of an e.m.f. across an open circuited p-n junction when light is made incident on it is known as ______ effect.
A. photo emissive
B. photoconductive
C. photovoltaic
D. none of the above
Ans. C

Q. The output from a solar cell is
A. a.c.
B. d.c.
C. can be either a.c. or d.c.
D. none of the above
Ans. B

Q. A solar cell consists of

A. alkali metal
B. pure semiconductor
C. intrinsic semiconductor
D. p-n junction
Ans. D

Q. When the load resistance connected across the solar cell is infinite, we get
A. open circuit current
B. open circuit voltage
C. short circuit current
D. short circuit voltage
Ans. B

Q. When the load resistance connected across the solar cell is zero, we get
A. open circuit current
B. open circuit voltage
C. short circuit current
D. short circuit voltage
Ans. C

Q. The Hall coefficient of a n type semiconductor sample is 2.083×10^{-4} m^3/C, then number of electrons in it are
A. 2×10^{22} m^{-3}
B. 3×10^{22} m^{-3}
C. 4×10^{22} m^{-3}
D. 2×10^{21} m^{-3}
Ans. B

Q. The Hall coefficient of a p type semiconductor sample is 3.125×10^{-5} m^3/C, then number of electrons in it are
A. 2×10^{22} m^{-3}
B. 3×10^{23} m^{-3}
C. 4×10^{23} m^{-3}
D. 2×10^{23} m^{-3}
Ans. D

Q. The number of electrons of in n type semiconductor sample is 3×10^{22} m^{-3}, then Hall coefficient is
A. 2.083×10^{-4} m^3/C
B. 2.083×10^{-3} m^3/C
C. 3.083×10^{-4} m^3/C
D. 4.083×10^{-4} m^3/C
Ans. A

Q. The electric field applied across the semiconductor of length 2 cm is 200 V/m. The voltage applied across it is
A. 5 Volt
B. 3 Volt
C. 4 Volt
D. 2 Volt
Ans. C

Q. The voltage applied across the semiconductor of length 2 cm is 5 V. Then the electric field developed across it is
A. 520 Volt/m
B. 350 Volt/m
C. 400 Volt/m
D. 250 Volt/m
Ans. D

Q. The semiconductor is transparent to the radiation of wavelength 11000 A.U. The energy gap of that semiconductor is
A. 1.310 eV
B. 1.013 eV
C. 1.130 eV
D. 1.113 eV
Ans. C

Q. The energy gap of a semiconductor is 0.7 eV. Then it will absorb the light of wavelength
A. 17750 A.U.
B. 17870 A.U.
C. 17780 A.U.
D. 17760 A.U.
Ans. D

Q. The highest possible level at absolute zero temperature is called as
A. fermo level
B. fermi level
C. Dirac level
D. imaginary level
Ans. B

Q. The fermi level in semiconductor
A. is energy level of electron
B. need not be the energy level of electron
C. can be energy level of electron
D. is always energy level of electron
Ans. B

Q. The ratio of actual output power to ideal power of solar cell is called as
A. solar cell factor
B. fill factor
C. field factor
D. feel factor
Ans. B

Q. In the solar cell the light energy incident on the solar cell must be ________ than the energy gap of a semiconductor.
A. smaller
B. equal
C. greater
D. None of above
Ans. C

Q. We do not get the ideal power ($I_{sc}V_{oc}$) from the solar cell because
A. I_{sc} and V_{oc} are not measurable.
B. I_{sc} and V_{oc} cannot be measured simultaneously.
C. I_{sc} can be measured but not V_{oc}.
D. V_{oc} can be measured but not I_{sc}.
Ans. B