Unit 3 - Week 2 : Basic physics of semiconductors

Assignment 2

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-12, 23:59 IST.

1) Which of the following indicates monthly clearness index, where *1 point*

H_d: Monthly average of the daily diffused radiation on a horizontal surface (kJ/ m² –day)
H_g: Monthly average of the daily global radiation on a horizontal surface at a location (kJ/m² -day)
H_o: Monthly average of extraterrestrial radiation which would fall on a horizontal surface at a location (kJ/m² -day)

- H_d / H_d
- H_o / H_o
- H_g / H_o
- H_d / H_g

No, the answer is incorrect.
Score: 0
Accepted Answers:
H_g / H_o

2) Forbidden energy gap of semiconductor material measured on E-k diagram is the energy difference between: *1 point*

- Global minimum of conduction band and global maximum of valence band.
- Maximum of conduction band and minimum of valence band.
- Minimum of conduction band and maximum of valence band for given '*k*'.
- Maximum of conduction band and minimum of valence band for given '*E*'.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Global minimum of conduction band and global maximum of valence band.

3) Density of states, D(E), is defined as number of energy states per unit energy per unit volume in an interval dE. Which of the following relations correctly expresses D(E) in 3-D: *1 point*

- $D(E) \alpha E^2$
- $D(E) \alpha E^{0.5}$
- $D(E) \alpha E^{-2}$
- $D(E) \alpha E^{-0.5}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$D(E) \alpha E^{0.5}$

4) The intrinsic carrier density in a semiconductor is 10^{10} cm^{-3}. It is doped with 10^{17} donor atoms per cm^3 out of which only 10% are ionized. What will be the hole concentration in such semiconductor? *1 point*

- 10^3 cm^{-3}
- 10^4 cm^{-3}
- 10^{10} cm^{-3}
- 10^{17} cm^{-3}

No, the answer is incorrect.
Score: 0
Accepted Answers:
10^4 cm^{-3}

5) Monthly average of daily extraterrestrial radiation falling on a horizontal surface is 35206 kJ/m²-day and the ratio of monthly average of sunshine hours per day to monthly average maximum possible sunshine hours is 0.49. Empirical constants a and b is equal to 0.33 and 0.46 respectively. Calculate the monthly average daily global radiation in kJ/m²-day. *1 point*

- 17438
- 19553
- 21887
- 22595

No, the answer is incorrect.
Score: 0
Accepted Answers:
19553

6) Carrier mobility of a semiconductor decreases, with increase in *1 point*

- Temperature.
- Impurities.
- Resistivity.
- Lattice Vibrations.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Temperature.
Impurities.
Lattice Vibrations.

7) Which of the following intrinsic semiconductors have highest carrier concentration, at 350K? *1 point*

- Si
- Ge
- GaAs
- SiC

No, the answer is incorrect.
Score: 0
Accepted Answers:
Ge

8) Choose the correct statement(s) for the case of direct and indirect semiconductors, where k is a wave vector. *1 point*

- Direct bandgap semiconductor have same k-space corresponding to conduction band maxima and valence band minima.
- Direct bandgap semiconductors have high optical absorption than indirect bandgap semiconductor.
- Indirect bandgap semiconductor have different k-space corresponding to conduction band minima and valence band maxima.
- Silicon is a direct bandgap semiconductor.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Direct bandgap semiconductors have high optical absorption than indirect bandgap semiconductor.
Indirect bandgap semiconductor have different k-space corresponding to conduction band minima and valence band maxima.

9) In an extrinsic semiconductor, increase in donor concentration leads to: *1 point*

- Shift in fermi energy level towards valence band edge
- Shift in fermi energy level towards conduction band edge
- Degeneracy in semiconductor when (E_C - E_F) is less than 3kT
- Degeneracy in semiconductor when (E_F - E_V) is less than 3kT

No, the answer is incorrect.
Score: 0
Accepted Answers:
Shift in fermi energy level towards conduction band edge
Degeneracy in semiconductor when (E_C - E_F) is less than 3kT

10) Which among the following relations is correct for charge neutrality of uniformly doped semiconductor, assuming total ionization of dopant sites? *1 point*

- $n - p + N_A - N_D = 0$
- $n - p + N_D - N_A = 0$
- $p - n + N_D - N_A = 0$
- $p - n + N_A - N_D = 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$p - n + N_D - N_A = 0$

11) In an intrinsic semiconductor the effective density of states in conduction band and valence band are 2.8*10^{19} cm^{-3} and 1.04*10^{19} cm^{-3} respectively at 300K, then the intrinsic fermi energy lies *1 point*

- at midgap
- 12.81 meV below midgap
- 12.81 meV above midgap
- 25.87 meV above midgap

No, the answer is incorrect.
Score: 0
Accepted Answers:
12.81 meV below midgap

12) What is the probability of finding filled-state above fermi energy level in a semiconductor at zero kelvin? *1 point*

- 0
- 1
- 1/2
- 3/4

No, the answer is incorrect.
Score: 0
Accepted Answers:
0

13) In a doped semiconductor the acceptor concentration is 10^{14} cm^{-3} at room temperature and intrinsic carrier concentration is 10^{10} cm^{-3}. What is the electron concentration in cm^{-3}? *1 point*

- 10^4
- 10^6
- 10^{10}
- 10^{14}

No, the answer is incorrect.
Score: 0
Accepted Answers:
10^6

14) For a n-type semiconductor, the probability of electrons occupying states at an energy 2kT above conduction band edge is e^{-11}, then the value of E_C - E_F is equal to *1 point*

- 7kT
- 9kT
- 11kT
- 13kT

No, the answer is incorrect.
Score: 0
Accepted Answers:
9kT

15) In case of doped semiconductor, In which temperature region(s) would semiconductor lie when carriers concentration dominates over the number of dopant sites due to band to band excitation of carriers. *1 point*

- Freeze out region
- Extrinsic temperature region
- Intrinsic temperature region
- Extrinsic and intrinsic temperature regions

No, the answer is incorrect.
Score: 0
Accepted Answers:
Intrinsic temperature region