



Date: 18.08.2012

Course: E2Sem1_ ECE

Time: 30 Min

Max Marks: 10

1. Which of the following is not a semiconductor?

a) silicone b) Germanium c) Gallium arsenide d) Gallium nitride e) Zinc oxide

2) A particle of rest mass m_0 has a kinetic energy k its debroglie wavelength is

a) $\lambda = hc/(k+2 m_0c^2)^{1/2}$ b) $\lambda = hc/(k(k+2 m_0c^2))^{1/2}$ c) $h/(2 m_0c^2)^{1/2}$ d) $h/k^{1/2}$ e) none of these

3. If the energy gap of a semiconductor is 1.1 e V it would be

a) Opaque to visible light
b) Transparent to the visible light
c) Transparent to the UV radiation
d) Corresponds to microwave radiation
e) None of the above

4) If a semiconductor is in thermal equilibrium, which of the following statements are true.

A) No External forces acting on semiconductor the other than temperature
B) All properties of the semiconductor will be independent of time
C) There will be net motion charge carriers

a) A & B b) B & C c) B only d) A and C e) A, B and C

5) Which of the following statements are incorrect?

Statement 1: semiconductor is invisible at $T = 300$ K with no excitation is in thermal equilibrium.

Statement 2: A LED is driven at constant current is in steady state is also in thermal equilibrium.

Statement 3: If semiconductor is in thermal equilibrium then it may or may not be in steady state.

Statement 4: If a semiconductor is in steady state then it must be under thermal equilibrium.

a) 1 and 2 b) 1 & 3 c) 2 and 3 d) 1 and 4 e) 2, 3 and 4

6) Diamond has FCC space lattice, R is the atomic radius and a is lattice constant then which of the following statements are incorrect

Statement 1: no of atoms per unit cell is 4

Statement 2: $4R = \sqrt{3}a$

Statement 3: packing fraction is 34 %

a) 1 & 2 b) 2 and 3 c) 1 and 3 d) 2 only e) 1, 2 and 3

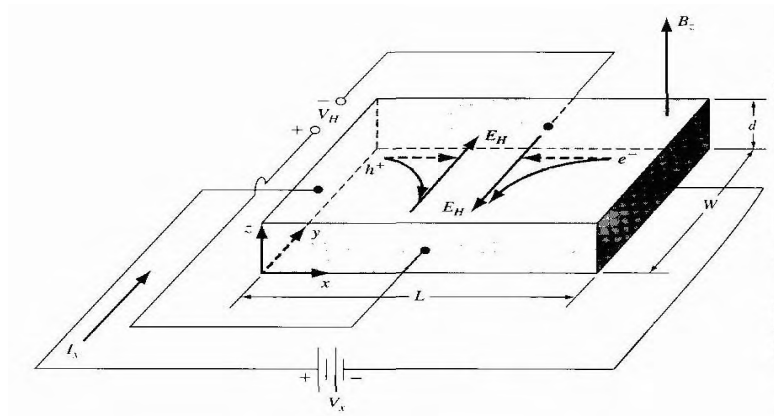
7. Flow of electrons is affected by the following

(a) Thermal vibrations (b) Impurity atoms (c) Crystal defects (d) both a & b e) a, b, and c

8. No of particles required (approximately) to create an electron-hole pair at $T=600\text{K}$ in GaAs semiconductor is

a) 43 b) 33 c) 25 d) 18 e) 27

9. Consider a gallium arsenide sample at $T = 300\text{ K}$. A Hall Effect device has been fabricated with the following geometry: $d = 0.01\text{ cm}$, $W = 0.05\text{ cm}$, and $L = 0.5\text{ cm}$ the electrical parameters are: $I = 2.5\text{ mA}$, $V = 2.2\text{ V}$, and $B = 250\text{ Gauss}$. The Hall voltage is $V_H = -4.5\text{ mV}$.



What is *the* majority carrier concentration?

a) $8.68 \times 10^{14}\text{ m}^{-3}$ b) $7.68 \times 10^{14}\text{ cm}^{-3}$ c) $9.68 \times 10^{15}\text{ m}^{-3}$ d) $8.68 \times 10^{12}\text{ m}^{-3}$ e) none of these

10. Use the data mentioned in the above question what is the resistivity of the sample

a) 0.88 ohm-cm b) 0.82 ohm-m c) 1.42 ohm-m d) 0.88 ohm e) 0.88 ohm/cm

key

1. a
2. b
3. a
4. d
5. d
6. a
7. e
8. e
9. e
10. a