DPP - 03

Subject : Electronic Devices & Circuits

Chapter : Basic SC Physics

[MCQ]

1. In a pure Si, intrinsic carrier concentration is $n_i = 1.5 \times 10^{10}/cm^3$ it is desired to have hole concentration $p_0 = 1.5 \times 10^{15}/cm^3$ then required doping will be

(a) Phosphorous with concentration $N_S = 1.5 \times 10^{15}/cm^3$

(b) Boron with concentration $N_S = 1.5 \times 10^{10}/cm^3$

(c) All with concentration $N_S = 1.5 \times 10^{15}/cm^3$

(d) As with concentration $N_S = 2.25 \times 10^{15}/cm^3$

[MCQ]

2. In pure Ge, impurities are added such that hole concertation is found to be $p_0 = 1.25 \times 10^{10}/cm^3$ and electrons concentration is found to be $n_0 = 5 \times 10^{14}/cm^3$ then which of the following is true?

(a) Intrinsic carrier concentration is $n_i = 2.5 \times 10^{12}/cm^3$

(b) Intrinsic carrier concentration is $n_i = 2.5 \times 10^{13}/cm^3$ and it is n-type semiconductor.

(c) Intrinsic carrier concentration is $n_i = 1.25 \times 10^{10}/cm^3$ & is p-type semiconductor

(d) None of these

[MCQ]

3. Which of the following is true about doped semiconductors.

(a) Minority carrier concentration is directly proportional to intrinsic carrier concentration.

(b) Minority carrier concentration is inversely proportional to intrinsic carrier concentration.

(c) Minority carrier concentration is directly proportional to doping concentration.

(d) None of these.

[MCQ]

4. In a p-type semiconductor concentration of holes and electrons are $p_0 = 10^{15}/cm^3$, $n_0 = 10^{10}/cm^3$. We want to change the concentration of electrons to $10^{11}/cm^3$ then we need to add

(a) Phosphorous with concentration $N_D = 10^{11}/cm^3$

(b) Phosphorous with concentration $N_D = 9 \times 10^{14}$

(c) As with concentration $N_D = 10^{14}/cm^3$.

(d) Boron with concentration $N_D = 10^{14}/cm^3$.

[MCQ]

5. In Si, donors are added to the extent $N_D = 10^{10}/cm^3$. Intrinsic carrier concentration $n_i = 1.5 \times 10^{10}/cm^3$ then which of the following is true?

(a) It is p-type semiconductor with $p_0 = 2.25 \times 10^{10}/cm^3$

(b) It is n-type semiconductor with $n_0 = 10^{10}/cm^3$

(c) It is p-type semiconductor with $p_0 = 1.5 \times 10^{10}/cm^3$

(d) It is n-type semiconductor with $n_0 = 2.08 \times 10^{10}/cm^3$

[MCQ]

6. a pure Ge is doped with Boron in the ratio $1:10^6$ i.e. 1 atom per 10^6 atoms of Ge if density of Ge is $4 \times 10^{22}/cm^3$ and intrinsic carrier concentration is $n_i = 2 \times 10^{11}/cm^3$ then

(a) Concentration of electrons is $n_0 = 10^6/cm^3$

(b) Concentration of holes is $p_0 = 10^6/cm^3$

(c) Concentration of electrons is $n_0 = 4 \times 10^{16}/cm^3$

(d) None of these

[MCQ]

7. In pure Si is doped with donor impurities

$N_D = 10^{16}/cm^3$. At room temperature to,

$n_i = 1.5 \times 10^{10}/cm^3$. At room temperature to, concentration of electrons is n_0 & concentration of holes is ρ_0. Now temperature is increased to T_1 and at T_1, value of n_i is $3 \times 10^{10}/cm^3$. (Double of the initial value) then new concentration of electrons & holes will be

(a) $n_0 = n_0$ & $p_{0'} = 2\ p_0$
(b) $n_0 = 2n_0$ & $p_{0'} = 2\ p_0$
(c) $n_0 = n_0$ & $p_{0'} = 4\ p_0$
(d) $n_0 = 2n_0$ & $p_{0'} = 4\ p_0$

[NAT]

8. A pure Si is converted into n-type semiconductor with impurity doping concentration $N_D = 10^{15}/cm^3$. If intrinsic carrier concentration $n_i = 1.5 \times 10^{10}/cm^3$ & $\frac{\mu_n}{\mu_\rho} = 2.5$ then the ration of conductivity of doped semiconductor to conductivity of pure semiconductor is _____.

[MSQ]

9. Minority carrier concentration in a doped semiconductor will increase if

(a) Operating temperature decreases
(b) Doping concentration increases
(c) Doping concentration decreases
(d) Operating temperature increases

[MCQ]

10. In presence of electric field:

(a) Electrons and holes flow in opposite direction and contribute current in opposite direction.
(b) Electrons and holes flow in same direction and contribute current in same direction.
(c) Electrons and holes flow in opposite direction and contribute current in same direction.
(d) None of these.

Answer Key

1. **(c)**
2. **(a)**
3. **(c)**
4. **(b)**
5. **(d)**
6. **(a)**
7. **(c)**
8. **(4.76×10^4)**
9. **(c, d)**
10. **(c)**