SEMICONDUTOR PHYSICS

Multiple Choice Questions (MCQs)

1. In an intrinsic semiconductor, the Fermi level
    a. Lies at the center of forbidden energy gap.
    b. Is near the conduction band.
    c. Is near the valence band.
    d. May be anywhere in the forbidden energy gap.

2. The ratio of impurity atoms to intrinsic semiconductor atoms in an extrinsic semiconductor is about.

    a. 1:10 b. $1:10^3$ c. $1:10^5$ d. $1:10^8$

3. In a P type material the Fermi level is 0.3 eV above the valence band. The concentration of accepter atoms is increased. The new position of Fermi level is likely to be
    a. 0.5 eV above the valence band.
    b. 0.2 eV above the valence band.
    c. Below the valence band.
    d. None of the above

4. Most commonly used semiconductor material is
    a. Silicon
    b. Germanium
    c. Mixture of silicon and germanium
    d. None of the above.

5. At room temperature a semiconductor material is
    a. Perfect insulator
    b. Conductor
    c. Slightly conducting
    d. Any one of the above.

6. For silicon, the energy gap at 300 K is
   a. 1.1 W b. 1.1 J sc. 1.1 eV d. None of these

7. The forbidden gap for germanium is,
   a. 0.12 eV b. 0.72 eV c. 7.2 eV d. None of these

8. The process of adding impurities to a pure semiconductor is called
   a. Mixing b. Doping c. Diffusing d. None of the above

9. The pentavalent impurities like **antimony, arsenic, bismuth and phosphorus,** added to intrinsic semiconductors are called
   a. Acceptor or P-type impurities
   b. Donor or P-type impurities
   c. Acceptor or N-type impurities
   d. Donor or N-type impurities

10. Impurities like **boron, aluminum, gallium or indium** are added to intrinsic semiconductor to form
   a. N-type doped semiconductor
   b. P-type doped semiconductor
   c. A junction diode
   d. All of these

11. In a N-type semiconductor, the position of Fermi-level
   a. Is lower than the center of energy gap
   b. Is at the center of energy gap
   c. Is higher than the center of energy gap
   d. Can be any where

12. The mobility of electrons in a material is expressed in unit of:
   a. V/s b. m^2/V-s
   c. m^2/s d. J/K

13. In a metal
    a. The electrical conduction is by electrons and holes
    b. The conductivity decreases with the rise in temperature
    c. The conduction band is empty
    d. None of the above

14. The energy gap in a semiconductor
    a. Increases with temperature
    b. Does not change with temperature
    c. Decreases with temperature
    d. Is zero

15. Two initially identical samples A and B of pure germanium are doped with donors to concentrations of $1x10^{20}$ and $3x10^{20}$respectively. If the hole concentration in A is $9x10^{12}$, then the hole concentration in B at the same temperature will be
    a. $3x10^{12}$ m^{-3} b. $7x10^{12}$ m^{-3}
    c. $11x10^{12}$ m^{-3} d. $27x10^{12}$ m^{-3}

Answers with explanation

1. (a); for N type semiconductor it is below the conduction band and for P type it is above the valence band.
2. (d);
3. (b); it will move to be nearer the valence band.
4. (a); due to availability in abundance and less dependence on temperature.
5. (c); at 0K a semiconductor is perfect insulator. At room temperature it is slightly conducting.

6.	(c)	7.	(b)	8.	(b)	9.	(d)
10.	(b)	11.	(c)	12.	(b)	13.	(b)
14.	(c)	15.	(a)				