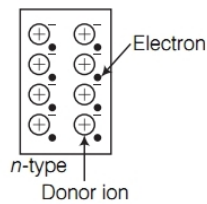


Explanations

- 1.** (c) In insulators conduction band is empty and valence band is filled with electrons.
- 2.** (c) The resistivity of semiconductors is lower than metals, this is not correct.
- 3.** (d) The band gap of 5 eV corresponds to that of an insulator.

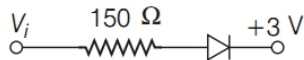
4. (d) The n -type semiconductor region has (negative) electrons as majority charge carriers and an equal number of fixed positively charged donor ions. Again, the material as a whole is neutral. That is a reason that atom is electrically neutral.



5. (c) The n -type semiconductor can be produced by doping an impurity atom of valency 5, i.e. pentavalent atoms such as phosphorus and electrons are as majority charge carrier and holes are minority charge carrier.

6. (b) When a small amount of antimony is added to germanium crystal, the crystal becomes n -type semiconductor, because antimony is a pentavalent substrate. It has excess free electrons.

7. (b) The initial current, $I_{in} = 0$

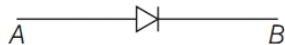


and the final current, $I_f = \frac{3}{150} = 0.02 \text{ A}$

So, change in current, ΔI

$$= I_f - I_{in} = 0.02 \text{ A} = 20 \text{ A}$$

8. (b) A diode is symbolically shown in the adjacent diagram.



The diode is said to be forward biased when, $V_A > V_B$.

The diode is said to be

reverse biased when, $V_A < V_B$

In the option (b),

$$5 \text{ V} > 0 \text{ V}$$

Hence, $V_B > V_A$

So, the diode is reverse biased.

9. (d) A p - n junction acts as a rectifier.

10. (a) In semiconductors, the energy gap between conduction band and valence band is small ($\approx 1 \text{ eV}$). Due to temperature rise, electron in the valence band gain thermal energy and may jump across the small energy gap, (to the conduction band). Thus, conductivity increases and hence resistance decreases.

11. (a) According to law of mass action, $n_i^2 = n_e n_h$. In intrinsic semiconductors $n_i = n_e = n_h$ and for p -type semiconductor n_e would be less than n_i , since n_h is necessarily more than n_i .

12. (d) Resistivity of a semiconductor decreases with the temperature. The atoms of a semiconductor vibrate with larger amplitudes at higher temperature thereby increasing its conductivity not resistivity.

13. (b) As resistance of depletion region is large, potential drop occurs mainly in depletion region. So, the applied voltage mostly drop across the depletion region and the voltage drop across the p -side and n -side of the junction is negligible.