

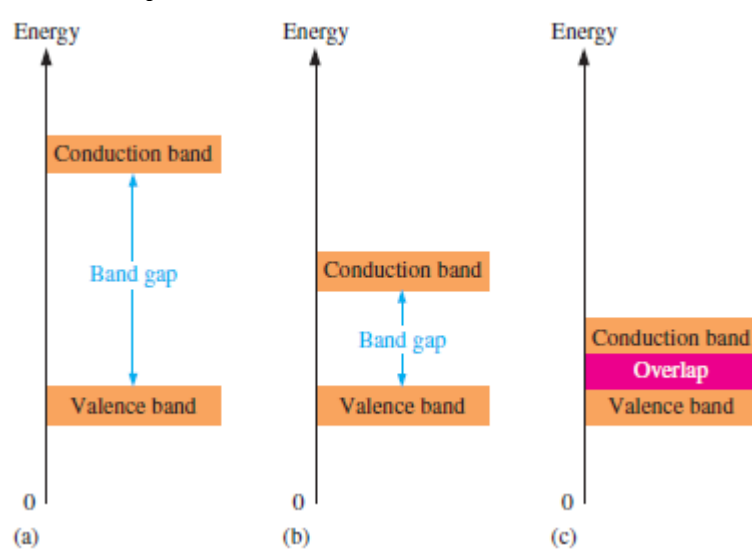
Electronic Circuits – Tutorial 02

Introduction to Electronics 02



#	Question	Answer
1	In a semiconductor crystal, the atoms are held together by (a) the interaction of valence electrons (b) forces of attraction (c) covalent bonds (d) answers (a), (b), and (c)	d
2	The difference between an insulator and a semiconductor is (a) a wider energy gap between the valence band and the conduction band (b) the number of free electrons (c) the atomic structure (d) answers (a), (b), and (c)	d
3	The energy band in which free electrons exist is the (a) first band (b) second band (c) conduction band (d) valence band	c
4	The atomic number of germanium is (a) 8 (b) 2 (c) 4 (d) 32	d
5	The valence shell in a silicon atom has the number designation of (a) 0 (b) 1 (c) 2 (d) 3	d
6	Each atom in a silicon crystal has (a) four valence electrons (b) four conduction electrons (c) eight valence electrons, four of its own and four shared (d) no valence electrons because all are shared with other atoms	c
7	The current in a semiconductor is produced by (a) electrons only (b) holes only (c) negative ions (d) both electrons and holes	d
8	Electron-hole pairs are produced by (a) recombination (b) thermal energy (c) ionization (d) doping	b
9	Recombination is when (a) an electron falls into a hole (b) a positive and a negative ion bond together (c) a valence electron becomes a conduction electron (d) a crystal is formed	a
10	A trivalent impurity is added to silicon to create (a) germanium (b) a <i>p</i> -type semiconductor (c) an <i>n</i> -type semiconductor (d) a depletion region	b
11	The purpose of a pentavalent impurity is to (a) reduce the conductivity of silicon (b) increase the number of holes (c) increase the number of free electrons (d) create minority carriers	c
12	The depletion region is created by (a) ionization (b) diffusion (c) recombination (d) answers (a), (b), and (c)	d
13	The depletion region consists of (a) nothing but minority carriers (b) positive and negative ions (c) no majority carriers (d) answers (b) and (c)	d

Essay:

<p>Q1</p>	<p>For each of the energy diagrams in Figure 1–21, determine the class of material based on relative comparisons.</p> 
<p>Sol 1</p>	<p>A: isolator B: semi conductor C: conductor</p>

<p>Q2</p>	<p>What happens when heat is added to silicon?</p>
<p>Sol 2</p>	<p>Electrons leave valence band to conduction band</p>

<p>Q3</p>	<p>In a silicon crystal, how many covalent bonds does a single atom form?</p>
<p>Sol 3</p>	<p>..... <input type="text" value="4"/></p>

<p>Q4</p>	<p>Name the two energy bands at which current is produced in silicon.</p>
<p>Sol 4</p>	<p>..... <input type="text" value="Conduction band and valence band"/></p>



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Q5	Describe the process of doping and explain how it alters the atomic structure of silicon.
Sol 5	Doping is adding pentavalent atom to silicon to become n-type or adding trivalent atom to silicon to become p-type.
Q6	Because of its barrier potential, can a diode be used as a voltage source? Explain
Sol 6	No. The barrier potential is a voltage drop