Test questions
Assignment 1

1. Which of the following statements is false?
   a). When atoms are packed closely together to form a crystal, the allowable energy levels broaden into bands of energy.
   b. Between adjacent energy bands are gaps or forbidden regions where there are no allowable energy levels
   c). The presence of electrons in the conduction band is crucial to the conduction process.
   d). The electrons in the valence band are free to move under an applied electric field

2. A semiconductor material has a _____ temperature coefficient of resistance, which means that as temperature increases its resistance _____

   a) Positive, increase
   b) Positive, decrease
   c) Negative, increase
   d) Negative, decrease

3. Intrinsic semiconductors are doped to increase their _____
   a) Resistance
   b) Conductance
   c) Inductance
   d) Reactance

4. The basic function of a semiconductor device in an electrical or electronic circuit is to:
   a) Control current
   b) Control voltage
   c) Increase the price of the equipment
   d) Both (a) and (b) are true

5. Consider the following statement – The n-carriers from the valence band are easily promoted to the acceptor level leaving behind holes that are very effective in carrying charge.- Which type of semiconductor is the above statement referring to?
   a). P-type semiconductor
   b). N-type semiconductor
   c). P-N junction
   d). None of the above

6. During the formation of a P-N junction the n side of the junction contains a net positive charge. Similarly in the p material, there will be a region close to the junction that is depleted of holes and contains a net negative charge. These charges are due to :
   a). The diffusion current
   b). The drift current
   c). bound charges associated with donor and acceptor atoms
   d). doping in the semiconductor

7. Which of the following statements about an intrinsic semiconductor is false?
   a). In a pure or intrinsic semiconductor, there are equal numbers of electrons and holes and these are thermally generated.

b). When an electric field is applied they move in opposite directions with the holes drifting opposite to the direction of the field

c). The mobility of an electron, its average velocity per unit electric field intensity is usually much greater than that of a hole.

d). At sufficiently low temperatures (0 K) all covalent bonds are intact and no free electrons are available to conduct electric current

8. Which of the following statements is false for a P-type semiconductor?

a). It is positively charged

b). It is electrically neutral

c). Majority charge carriers are holes and minority carriers are electrons

d). It is formed by a trivalent impurity

9. Which of the following statements is false for a P-N junction under open circuit conditions?

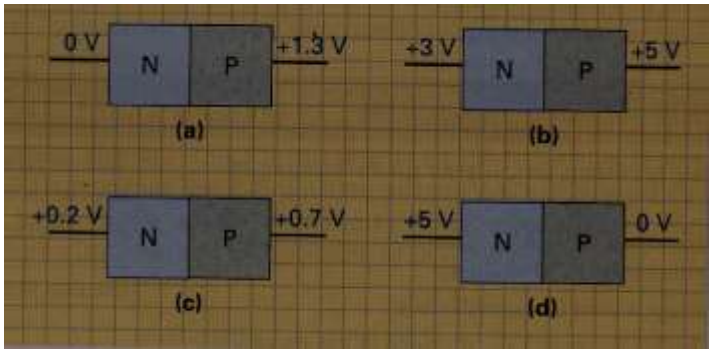
a). The direction of the drift current is from the N to the P-side.

b). The drift current is a strong function of temperature

c). The drift current is independent of the value of the depletion layer voltage

d). None of the above

10. Which of the silicon P-N junctions in the figure below are forward biased and which are reverse biased? Write the answer in the space provided.



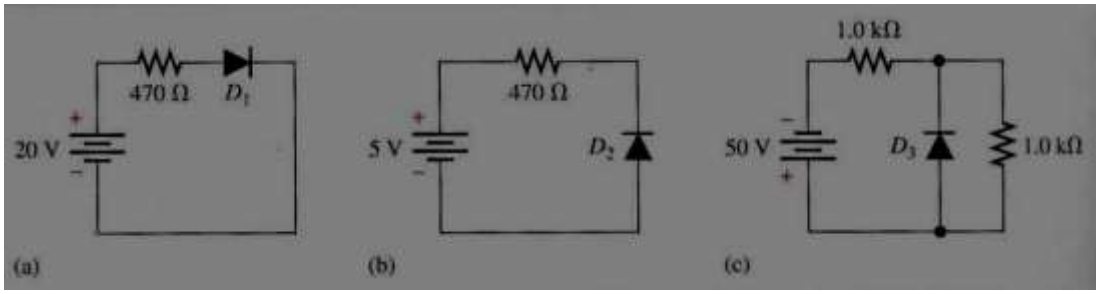
a)_____ Forward biased

b)_____Forward biased

c)_____Forward biased

d)_____ Reverse biased

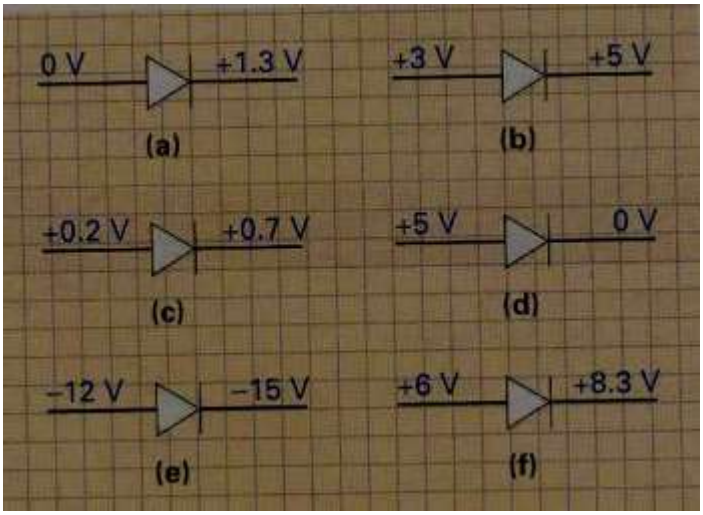
11. In the figure below, identify the forward-biased diode(s)



a) D_1
b) D_2
c) D_3
d) <u>D_1 and D_3</u>

12. When the positive lead of an analog ohmmeter is connected to the cathode of a diode and the negative lead is connected to the anode, the meter reads
a) a very low resistance
b) <u>an extremely high resistance or open</u>
c) a high resistance initially, decreasing to about 100 Ω
d) a gradually increasing resistance

13. Which of the silicon diodes in the figure below are forward biased and which are reverse biased? Write your answer in the space provided



A (a)_____ Reverse biased

B (b)_____Reverse biased

C (c)_____Reverse biased

D (d)_____ Forward biased

E (e)_____ Forward biased
F (f)_____Reverse baised

14 Use the energy band concept to distinguish between conductors, semiconductors and insulators

15. With the aid of well labeled diagrams, describe the behavior of a P-N junction under the following conditions:
    i. Open Circuit
    ii. Closed Circuit