DDS ACADEMY
Semiconductor
EXERCISE-1 Practice MCQs

1. In an intrinsic semicondutor
   a) $n_e = n_h$ b) $n_e > n_h$ c) $n_e < n_h$ d) none of these

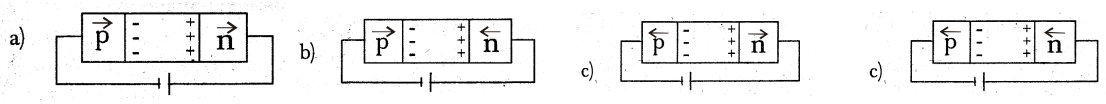
2. If the temperature of semiconductor is increased the number of electrons in the valence band will
   a) decrease b) remains same
   c) increase d) either increase or decrease

3. If a p-n junction diode is not connected to any circuit then
   a) the potential is same everywhere
   b) potential is not same and n-type side has lower potential than p-type side
   c) there is an electric field at junction directed from p-type side to n-type side
   d) there is an electric field at the junction directed from n-type side to p-type side

4. In an n-type semicondutor
   a) $n_e = n_h$ b) $n_e > n_h$ c) $n_e < n_h$ d) none of these

5. The forbidden gap in semiconductor is of the order of
   a) 0.01 eV b) 1 eV c) 10 eV d) 0.1 eV

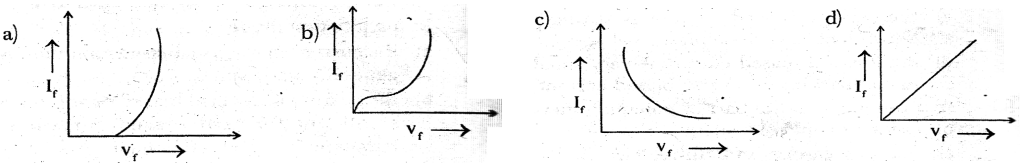
6. Show the correct figure which gives the direction of flow of carriers in case of reverse p-n junction



7. A solid having uppermost energy band, partically filled with electrons is called
   a) insulators b) conductors c) semiconductors d) all of these

8. The free electrons donated by donar impurity atoms in n-type semiconductor will have energy
   a) higher than electrons in valence band b) lower than electrons in valence band
   c) equal to electrons in valence band d) can not be related

9. Forward bias characteristics for p-n junction diode are



10. When a potential difference is applied across a intrintic semiconductor than a electric field is developed, the direction of this electric field will be
a) opposite to drift of conduction electron
b) same as drift of conduction holes
c) no electric field is developed
d) both 'a' and 'b'

11. At room temperature the number of electron hole pairs in pure Ge crystal are about
a) $6x10^{19}/m^3$ b) $5x10^{19}/m^3$ c) $4\ x10^{19}/m^3$ d) $7x10^{19}/m^3$

12. For p-n junction in reverse bias, which of the following is true
a) there is no current through p-n junction due to majority carriers from both regions
b) width of potential barriers is large and it offers high resistance
c) direction of reverse bias is same as that of internal potential barrier
d) all of these are true

13. The difference between a p-type Ge crystal and ordinary Ge crystal is that p-type crystal
a) is positively charged due to deficiency of electrons
b) is negatively charged due to surplus of electrons
c) contains impurity atoms of higher atomic number than Ge
d) contains impurity atoms of lower atomic number than Ge

14. The group of closely space energy levels of electrons in valence orbit is called
a) conduction band b) forbidden energy gap
c) valence band d) none of these

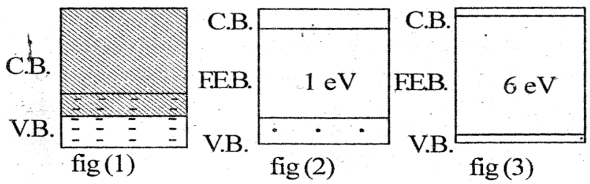
15. The value of forward voltage above which the current just start to flow through p-n junction is called as
a) cut in voltage b) knee voltage c) threshold voltage d) all of these

16. The number of bonds formed in p-type and n-type semiconductor are respectively
a) 4,5 b) 3, 4 c) 4,3 d) 5, 4

17. Which of the following statement is incorrect
a) energy of electrons in valence band is less than that in conduction band
b) energy of electrons in valence band is greater than that in conduction band
c) energy of electron in valence band is less than that in forbidden energy band
d) energy of electron in forbidden energy band is less than conduction band

18. If forward baised voltage v_f is more than the threshold voltage v_{th} of p-n junction then
a) it will offer low resistance b) the width of depletion region decreases
c) both 'a' and 'b' d) neither 'a' nor 'b'

19. In the following fig. energy band structure of solid is shown



using above figure which of the following statement are correct
a) fig. 1 represents energy band structure of metals
b) fig. 2 represents energy band structure of semiconductors
c) fig. 3 represents energy band structure of insulators
d) all are correct.

20. Concentration difference in case of p-n junction causes
a) holes to diffuse from p-side to n-side b) electrons to diffuse from n-side to p-side
c) both 'a' and 'b' d) neither 'a' nor 'b'

21. The energy required for an electron to jump from valence band to conduction band is called as
a) excitation energy b) ionisation energy
c) binding energy d) forbidden energy gap

22. At room temperature or above, pure crystals of semiconductor is conductor of electricity because
a) electrons jump from valence band to conduction band leaving behind holes
b) electrons from conduction band and electrons from valence band take part in conductivity
c) both 'a' and 'b' d) neither 'a' nor 'b'

23. With increase in temperature of metals number of free electrons in conduction band does not increase, but the amplitude of vibration of atoms in it increases this will result in increase of
a) resistance b) conductance c) conductivity d) none of these

24. The main distinction between conductors, semiconductors and insulators is concerned with
a) work function of free electron b) binding energy of free electron
c) temperature coefficient of resistance d) width of forbidden energy band

25. The depletion layer in p-n junction is caused by
a) diffusion of carriers b) drift of electrons
c) drift of holes d) none of these

26. Doping of a semiconductor changes the resistivity as follows
a) decreases b) increases c) does not alter
d) may increase or decrease depending upon dopant

27. A diode rectifies A.C. signal into
a) AC voltage of peak value b) DC voltage of constant value
c) AC of constant r.m.s. value
d) an unidirectional pulsating voltage that keeps on dropping to zero in between

28. Resistivity of good conductor, insulator and semiconductor are respectively of the order of
a) $10^{4}\Omega m$, $10^{-8}\ \Omega m$, $10^{-1}\ \Omega m$ b) $10^{-1}\Omega m$, $10^{4}\ \Omega m$, $10^{-8}\ \Omega m$
c) $10^{-8}\Omega m$, $10^{-1}\ \Omega m$, $10^{4}\ \Omega m$ d) $10^{-8}\Omega m$, $10^{7}\ \Omega m$, $10^{-1}\ \Omega m$

29. Depletion layer is the zone in which
a) holes act as majority carriers b) electrons act as majority carriers
c) holes and electrons are present in equal number
d) neither holes nor electrons i.e. no charged particles are present

30. At room temperature pure semi-conductor carries current due to the motion of
a) electrons only b) holes only
c) holes and electrons d) positive and negative ions

31. In a p-n junction diode holes diffuse from p-region to n-region because
a) n_h (n-region) > n_h (p-region) b) n_h (n-region) < n_h (p-region)
c) n_h (n-region) = n_h (p-region) d) none of these

32. A doped semiconductor is called
a) extrinsic semiconductor b) intrinsic semiconductor
c) p-type semiconductor d) n-type semiconductor

33. There is no hole current in good conductor because
a) they do not have valence band b) they do not have conduction band
c) their valence and conduction band overlap
d) there is very large forbidden energy gap

34. The forward biasing in a junction diode
a) increases the potential barrier b) decreases the potential barrier
c) is not alter the potential barrier d) both 'a' and 'b'

35. A pure semiconductor
a) has low resistance b) is an intrinsic semiconductor
c) allows adequate current to pass through it d) all of these

36. If the revese voltage in p-n junction diode is increased the width of depletion layer will
a) decreases b) increases c) does not change d) none of these

37. A p-type germanium crystal is
a) negatively charged b) positively charged
c) electrically neutral d) sometimes positive, sometimes negative

38. A piece of metal and another of semiconductor are cooled from room temperature to 60^0K, then the resistance of
a) each of them decreases b) each of them increases
c) metal decreases and semiconductor increases
d) metal increases and semiconductor decreases

39. Short circuit current flows through solar cell when R_L is
a) infinite b) zero c) negative value d) none of these

40. Missing of electron in a semiconducting material is equivalent to
a) electron of negative charge b) electron of positive charge
c) hole of negative charge d) hole of positive charge

41. The resistance of a p-n junction in forward bias is
a) ∞ b) 0 c) very high d) low

42. When n-type semiconductor is heated
a) number of electrons and holes remains same
b) number of electrons increases while that of holes decreases
c) number of electrons decreases while that of holes increases
d) number of electrons and holes increases equally

43. The current of a p-n junction on increasing reverse bias to a large value, will
a) increases b) decreases c) remains same d) suddenly increases

44. A p-type semiconductor is
i) a Ge crystal doped with As impurity ii) a Ge crystal doped with AI impurity
iii) a Si crystal doped with B impurity iv) a Si crystal doped with P impurity
a) (i) and (ii) are correct b) (ii) and (iii) are correct
c) (i) and (iv) are correct d) only (i) is correct

45. In forward bias condition, p-n diode acts as
a) capacitor b) switch c) on switch d) all of these

46. A semiconductor in which holes and electrons concentration is 28×10^{18} cm and 15×10^{10} cm is
a) p-type b) n-type c) intrinsic d) both 'a' and 'b'

47. Pure semiconductor at ^{0}K has
a) high resistance like insulators b) low resistance like metals
c) high resistance but smaller than insulators
d) low resistance but smaller than metals

48. The cause of the potential barrier in a p-n junction diode is
a) concentration of positive charge near the junction
b) concentration of negative charge near the junction
c) both 'a' and 'b'
d) neither 'a' nor 'b'

49. With increase in temperature the electrical conductivity of
a) metal increases and semiconductor decreases
b) metal decreases and semiconductor increases
c) metal and semiconductor increases
d) metal and semiconductor decreases

50. If a piece of semiconductor is to be doped with an acceptor impurity, the foreign atom should be
a) teravalent b) pentavalent c) trivalent d) divalent

51. In forward bias the external field is greater than internal field and it is from
a) p to n side b) n to p side c) both 'a' and 'b' d) none of these

52. When Si is doped with In impurity the resultant extrinsic semiconductor is known as acceptor type semiconductor because
a) the impurity donates free electron to the Si crystal
b) the impurity accepts free electron from the Si crystal
c) the impurity donates holes to the Si crystal
d) the impurity accepts holes from the Si crystal

53. In -p-n junction diode
a) the current in reverse biased condition is generally very small
b) the current in reverse biased condition is small but forward biased current is indpendent of biased voltage
c) the reverse biased current is strongly dependent on applied biased voltage
d) the forward biased current is very small in comparison to reverse biased current

54. In an n-type semiconductor the concentration of minority carries mainly depend upon
a) doping technique b) number of donar atoms
c) temperature of materials d) none of these

55. The conduction electrons have greater mobility than that of holes because
a) they are negatively charged b) they need less energy for movement
c) they experience less collision d) they are lighter

56. In semiconductor, the mobility of holes is
a) less than that of electrons b) equal to that of electrons
c) greater than that of electrons d) not related to the movement of electrons

57. A semiconductor device, a battery and a resistance are connected in series then current I flows through the circuit. If the polarity of the battery is reverse then I reduces to zero approximately. The device may be
a) an intrinsic semiconductor b) a p-type semiconductor
c) an n-type semiconductor d) a semiconductor diode

58. Each atom of doped pentavalent impurity donates
a) five free electrons b) four free electrons
c) one free electrons d) two free electrons

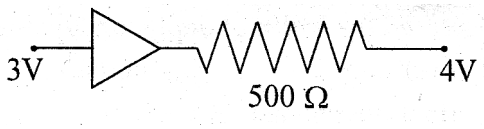
59. The pentavalent impurity elements are
a) arsenic b) antimony c) phosphorus d) all of these

60. A semiconductor is the substance which contains
a) a large number of free electrons
b) only one electron in the outer most orbit
c) only few electrons at room temperature
d) no free electron at 0^0K and atom forms covalent bond with neighbouring atom

61. In an intrinsic semiconductor
a) only electrons are responsible for the flow of current
b) only holes are responsible for the flow of current
c) both holes and electrons carry current and their number is same
d) both holes and electrons carry current but electrons are the majority carriers.

62. In a full rectifier the current in each of the diodes flow for
a) the complete cycle of the input signal b) half cycle of the input signal
c) only one fourth cycle of the input signal
d) less than half but more than one fourth cycle of input signal

63. Find the current in the figure shown below (assuming junction diode to be ideal)



a) 0.2 mA b) 20 mA c) 2 mA d) 2 A

64. Zener diode is different from p-n junction diode is
a) zener diode is heavily doped with p and n type than p-n junction diode.
b) p-n junction diode is heavily doped with p and n type than zener diode
c) zener diode and p-n junction diode are equally doped with p and n type
d) none of these

65. In avalanche breakdown, junction breakdown occurs due to
a) breaking of covalent bond b) due to collision of electrons
c) thick depletion layer d) all of these

66. Which of the following is true for voltage regulator using zener diode
a) output voltage always remains constant b) zener diode is reverse biased
c) input voltage may change d) all of these

67. In solar cell, electrons pushed into n region and holes pushed into p region due to
a) junction field b) increase in reverse biasing
c) increase in forward biasing d) both 'a' and 'c'

68. Light emitting diodes emits light when it is in
a) forward biased b) reverse biased
c) zero biasing d) infinite biasing

69. In LED's light energy is emitted when
a) electrons falls from conduction band into holes as valence band
b) electrons falls from valence band into holes is conduction band
c) electrons and holes recombine in forbidden energy gap
d) none of these

70. The nature of light emitted by LEDs depends upon
a) nature of material used in LEDs
b) the difference in energy levels of material used
c) both 'a' and 'b' d) neither 'a' nor 'b'

71. In LEDs GaAs and GaAsP releases energy in
a) infra red and visible region respectively b) visible and infra red region respectively
c) visible and ultra violet region respectively d) ultra violet and infra red region respectively

72. Solar cell based on the principle of
a) photo voltaic effect b) reverse biased effect
c) thermo electric effect d) none of these

73. Transistor stands for
a) transfer of voltage b) transfer of current
c) transfer of resistance d) transfer of power

74. Each type of transistor is
a) bipolar b) consists of two junction diode and two depletion zone
c) emitter base junction or emitter diode and base collector junction or collector diode
d) all of these

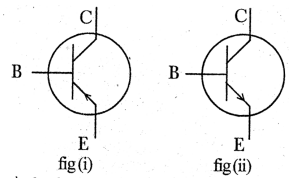
75. Emitter is heavily doped because
a) to produce a large number of majority carriers
b) to produce a small number of majority carriers
c) depends upon temperature
d) it is a semiconductor device

76. In the following question, Statement-1 (Assertion) is followed by Statement-2 (Reason). Question has four choices out of which only one choice is correct
Assertion : In transistor common emitter mode as an amplifier is preferred over common base mode.
Reason : In common emitter mode the input signal is connected in series with the voltage applied to the base emitter function.
a) Statement -1 is true, Statement-2 is true and Statement-2 is the correct explanation for Statement-1

b) Statement -1 is true, Statement -2 is true but Statement-2 is not the correct explanation for Statement-1.
c) Statement -1 is true ; Statement -2 is false
d) Statement -1 is false ; Statement -2 is true.

77. In any type of transistor, main function of collector is to collect
a) minority charge carriers through base
b) majority charge carriers through base
c) input voltage d) input resistance

78. The arrow head on the transistor symbol always points in the direction of
a) electrons flow in the emitter region b) holes flow in the emitter region
c) minority carrier in the emitter region d) majority carrier in the emitter region
Ans : (b) Arrow represent direction of current

79. 

a) both fig. represent n-p-n transistors
b) both fig. represent p-n-p transistors
c) fig (i) represent p-n-p and fig. (ii) n-p-n transistor
d) fig (i) represent n-p-n and fig. (ii) p-n-p transistor

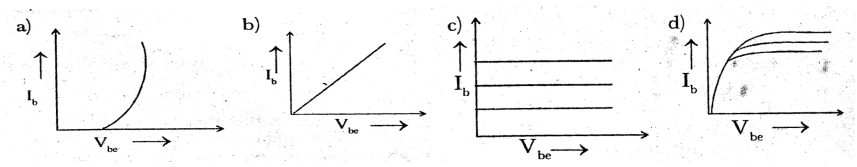
80. The input and output resistance of a transistor are respectively
a) high, low b) low, high c) ∞, 0 d) none of these

81. In a transistor
a) length of collector is equal to length of emitter
b) length of collector is greater than length of emitter
c) length of collector is less than length of emitter
d) both 'b' and 'c'

82. In n-p-n transistor current is directed from
a) base to emitter b) base to collector c) emitter to base d) emitter to collector

83. n-p-n transistor p-type semiconductor acts as
a) low cost b) low energy loss
c) electrons have high mobility than holes and hence high mobility of energy
d) none of these

84. The nature of output characteristic curve of a transistor is



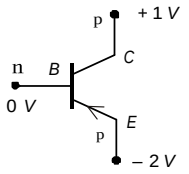
85. For a transistor in common base arrangement the current gain (α) is given by, such that V_C = constant

a) $\frac{\Delta I_C}{\Delta I_B}$ b) $\frac{\Delta I_B}{\Delta I_C}$ c) $\frac{\Delta I_C}{\Delta I_E}$ d) $\frac{\Delta I_E}{\Delta I_C}$

86. In the following question, Statement-1 (Assertion) is followed by Statement-2 (Reason). Question has four choices out of which only one choice is correct

Assertion : When *PN*-junction is forward biased then motion of charge carriers at junction is due to diffusion. In reverse biasing. The cause of motion of charge is drifting.

Reason : In the following circuit emitter is reverse biased and collector is forward biased.



a) Statement -1 is true, Statement-2 is true and Statement-2 is the correct explanation for Statement-1

b) Statement -1 is true, Statement -2 is true but Statement-2 is not the correct explanation for Statement-1.

c) Statement -1 is true ; Statement -2 is false

d) Statement -1 is false ; Statement -2 is true.

87. The voltage gain in common emitter mode of transistor is given by

a) Av = current gain x resistance gain b) Av = β x $\frac{R_L}{R_I}$

c) both 'a' and 'b' d) none of these

88. In a p-n-p transistor the base current is 2mA and collector current is 12 mA. The emitter current is

a) 14 mA b) 10 mA c) 12 mA d) 2 mA

89. For a common emitter current gain is 80. If the I_E = 9 mA, then base current will

a) 1/81 mA b) 8mA c) 1/8 mA d) 1/9 mA

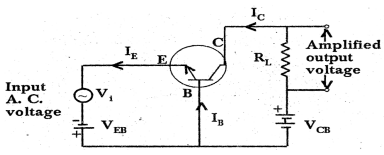
90. For a transistor I_C = 20mA, I_B = 1mA, the value of α is

a) $\frac{20}{21}$ b) $\frac{21}{20}$ c) $\frac{19}{15}$ d) 19

91. For a transistor α = 0.9, the value of β is

a) 1 b) 0.09 c) 0.9 d) 9

92. The fig. represents



a) CB amplifier (n-p-n) b) CE amplifier (n-p-n)
c) CC amplifier (n-p-n) d) none of these (n-p-n)

93. Which of the following is true for transistor
a) they are current operated devices
b) they can be operated at low voltage but not at high voltages
c) they do not require heating arrangement and are small and compact in size
d) all of these

94. In n-p-n transistor arrow on the emitter is
a) directed towards outside b) directed towards inside
c) no arrow present d) none of these

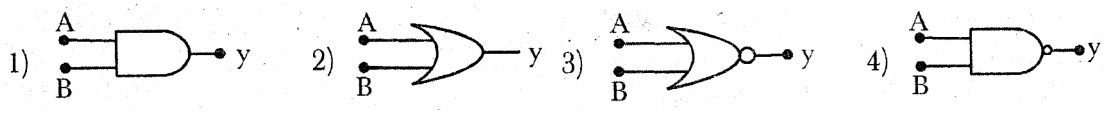
95. A logic is an electronic circuit which
a) allows electrons flow only in one direction b) allows holes flow only in one direction
c) make logic decisions d) alternate between 1 and 2 value

96. Emitter is heavily doped because
a) to produce a large number of majority carriers
b) to produce a small number of majority carriers
c) depends upon temperature
d) it is a semiconductor device

97. Which logic function has the output low when both input are low
a) AND gate b) NOR gate c) NAND gate d) all of these

98. A NOR gate is combination of
a) OR and NOT b) OR and AND c) AND and NOT d) NOT and NOT

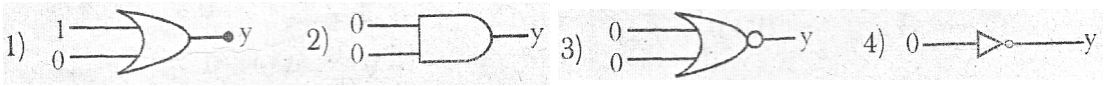
99. Given below are four logic gate symbols Those for OR, NOR and NAND are respectively,



a) 2, 3, 4 b) 1, 4, 2 c) 1, 4, 3 d) 3, 4, 1

100. In the following question, Statement-1 (Assertion) is followed by Statement-2 (Reason). Question has four choices out of which only one choice is correct
Assertion : NAND or NOR gates are called digital building blocks.
Reason : The repeated use of NAND (or NOR) gates can produce all the basic or complicated gates.
a) Statement -1 is true, Statement-2 is true and Statement-2 is the correct explanation for Statement-1
b) Statement -1 is true, Statement -2 is true but Statement-2 is not the correct explanation for Statement-1.
c) Statement -1 is true ; Statement -2 is false
d) Statement -1 is false ; Statement -2 is true.

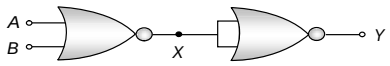
101. Which of the following have output high (1).



a) 1,3, 4 b) 1, 2, 4 c) 2 only d) 4 only

102. In the following question, Statement-1 (Assertion) is followed by Statement-2 (Reason). Question has four choices out of which only one choice is correct

Assertion : The following circuit represents 'OR' gate



Reason : For the above circuit $Y = \overline{X} = \overline{\overline{A+B}} = A+B$

a) Statement -1 is true, Statement-2 is true and Statement-2 is the correct explanation for Statement-1

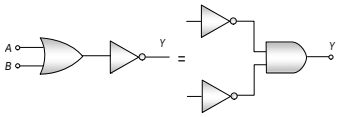
b) Statement -1 is true, Statement -2 is true but Statement-2 is not the correct explanation for Statement-1.

c) Statement -1 is true ; Statement -2 is false

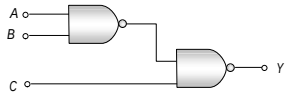
d) Statement -1 is false ; Statement -2 is true.

103. In the following question, Statement-1 (Assertion) is followed by Statement-2 (Reason). Question has four choices out of which only one choice is correct

Assertion : De-morgan's theorem $\overline{A+B} = \overline{A} \cdot \overline{B}$ may be explained by the following circuit



Reason : In the following circuit, for output one inputs *ABC* are 101



a) Statement -1 is true, Statement-2 is true and Statement-2 is the correct explanation for Statement-1

b) Statement -1 is true, Statement -2 is true but Statement-2 is not the correct explanation for Statement-1.

c) Statement -1 is true ; Statement -2 is false

d) Statement -1 is false ; Statement -2 is true.

104. Which of the following gates is an universal gate

a) OR b) NOR c) NAND d) both 'b' and 'c'