Questions based on Energy band theory

Q.1 In conductors

(A) conduction band is completely empty but forbidden energy gap is small

(B) conduction and valence bands are overlapped

(C) valence band is completely filled but the conduction band is completely empty

(D) no energy band is present

Q.2 The forbidden energy gap of a germanium semiconductor is 0.75 eV. The minimum thermal energy of electrons reaching the conduction band from the valence band should be

(A) 0.5 eV (B) 0.75 eV
(C) 0.25 eV (D) 1.5eV

Q.3 The energy of a photon of sodium light (λ = 5890Å) equals the band gap of a semiconductor. The minimum energy required to create an electron-hole pair is

(A) 0.026 eV (B) 0.31 eV
(C) 2.1eV (D) 6.4 eV

Q.4 The forbidden energy band gap in conductors, semiconductors and insulators are EG_1, EG_2 and EG_3 respectively. The relation among them is -

(A) $EG_1 = EG_2 = EG_3$

(B) $EG_1 < EG_2 < EG_3$

(C) $EG_1 > EG_2 > EG_3$

(D) $EG_1 < EG_2 > EG_3$

Questions based on Properties of semiconductor

Q.5 On increasing temperature the specific resistance of a semiconductor

(A) decreases (B) increases
(C) remains constant (D) becomes zero

Q.6 Which of the following statements is not correct

(A) Resistance of semiconductor decreases with increase in temperature

(B) In an electric field, displacement of holes is opposite to the displacement of electrons

(C) Resistance of a conductor decreases with the increase in temperature

(D) n-type semiconductors are neutral

Q.7 Wires P and Q have the same resistance at ordinary (room) temperature. When heated, resistance of P increases and that of Q decreases. We conclude that -

(A) P and Q are conductors of different materials

(B) P is N-type semiconductor and Q is P-type semiconductor

(C) P is semiconductor and Q is conductor

(D) P is conductor and Q is semiconductor

Q.8 In a good conductor the energy gap between the conduction band and the valence band is -

(A) Infinite (B) Wide
(C) Narrow (D) Zero

Q.9 In a semiconducting material the mobilities of electrons and holes are μ_e and μ_h respectively. Which of the following is true -

(A) $\mu_e > \mu_h$ (B) $\mu_e < \mu_h$
(C) $\mu_e = \mu_h$ (D) $\mu_e < 0$; $\mu_h > 0$

Questions based on Type of semiconductor

Q.10 Those materials in which number of holes in valence band is equal to number of electrons in conduction band are called

(A) conductors
(B) Intrinsic semiconductors
(C) p-type semiconductors
(D) n-type semiconductors

Q.11 In p-type semiconductor holes move in

(A) forbidden region
(B) conduction band
(C) valence band
(D) all the above regions

Q.12 Which of the following statement is wrong

(A) Resistance of extrinsic semiconductors can be changed as required

(B) In n-type semiconductor the number of electrons increases in valence band

(C) In p-type semiconductors the number of holes increases in valence band

(D) In pure semiconductor fermi band is situated in between the valence band and conduction band

Q.13 P-type semiconductor is formed when -

A. As impurity is mixed in Si
B. Al impurity is mixed in Si
C. B impurity is mixed in Ge
D. P impurity is mixed in Ge

(A) A and C (B) A and D
(C) B and C (D) B and D

Q.14 In extrinsic semiconductors -

(A) The conduction band and valence band overlap

(B) The gap between conduction band and valence band is more than 16 eV

(C) The gap between conduction band and valence band is near about 1 eV
(D) The gap between conduction band and valence band will be 100 eV and more

Q.15 Fermi level of energy of an intrinsic semiconductor lies -
(A) In the middle of forbidden gap
(B) Below the middle of forbidden gap
(C) Above the middle of forbidden gap
(D) Outside the forbidden gap

Questions based on Electrical conduction in semiconductor

Q.16 If n_e and v_d be the number of electrons and drift velocity in a semiconductor. When the temperature is increased -
(A) n_e increases and v_d decreases
(B) n_e decrases and v_d increases
(C) Both n_e and v_d increases
(D) Both n_e and v_d decreases

Q.17 The electron mobility in N-type germanium is 3900 cm^2/v.s and its conductivity is 6.24 mho/cm, then impurity concentration will be if the effect of cotters is negligible -
(A) 10^{15} cm^3 (B) $10^{13}/cm^3$
(C) $10^{12}/cm^3$ (D) $10^{16}/cm^3$

Q.18 In semiconductor the concentrations of electrons and holes are $8 \times 10^{18}/m^3$ and $5 \times 10^{18}/m^3$ respectively. If the mobilities of electrons and hole are 2.3 m^2/volt-sec and 0.01 m^2/volt-sec respectively, then semiconductor is
(A) N-type and its resistivity is 0.34 ohm-metre
(B) P-type and its resistivity is 0.034 ohm-metre
(C) N-type and its resistivity is 0.034 ohm-metre
(D) P-type and its resistivity is 3.40 ohm-metre

Q.19 A potential difference of 2V is applied betwee n the opposite faces of a Ge crystal plate of area 1 cm^2 and thickness 0.5 mm. If the concentration of electrons in Ge is $2 \times 10^{19}/m^3$ and mobilities of electrons and holes are 0.36 $\frac{m^2}{volt-sec}$ and 0.14 $\frac{m^2}{volt-sec}$ respectively, then the current flowing through the plate will be -
(A) 0.25 A (B) 0.45 A
(C) 0.56 A (D) 0.64 A

Questions based on P-N Junction

Q.20 A potential barrier of 0.50 V exists across a P-N junction. If the depletion region is 5.0×10^{-7} m wide, the intensity of the electric field in this region is -
(A) 1.0×10^6 V/m (B) $1.0 \times 10^{5\backslash}$ V/m
(C) 2.0×10^5 V/m (D) 2.0×10^6 V/m

Q.21 If no external voltage is applied across P-N junction, there would be -
(A) No electric field across the junction
(B) An electric field pointing from N-type to P-type side across the junction
(C) An electric field pointing from P-type to N-type side across the junction
(D) A temporary electric field during formation of P-N junction that would subsequently disappear

Q.22 No bias is applied to a P-N junction, then the current -
(A) Is zero because the number of charge carriers flowing on both sides is same
(B) Is zero because the charge carriers do not move
(C) Is non-zero
(D) None of these

Questions based on Biasing of P-N junction

Q.23 Just before the reverse breakdown in a semiconductor diode
(A) The forward current is much larger then the reverse current
(B) The forward current is much less then the reverse current
(C) The forward current is equal to the reverse current
(D) The reverse current is much large than the forward current

Q.24 The main cause of avalanche breakdown is
(A) collision ionisation
(B) high dopring
(C) recombination of electron and holes
(D) none of these

Q.25 The main cause of Zener breakdown is
(A) the base semiconductor being germanium
(B) production of electron-hole paris due to thermal exciation
(C) low doping
(D) high doping

Q.26 Which of the following statements is correct ?

(A) The deplection region of P-N junction diode increases with forward biasing

(B) The depletion region of P-N junction diode decreases with reverse biasing

(C) The depletion region of P-N junction diode does not change with biasing

(D) The deplection region of P-N junction diode decreases with forward biasing

Q.27 When reverse bias in a junction diode is increased, the width of depletion layer

(A) increase (B) decreases

(C) does not change (D) fluctuate

Q.28 A semiconductor device is connected in a series circuit with a battery and resistance. A current is found to pass through the circuit. If the polarity of the battery is reversed, the current drops almost to zero. The device may be -

(A) A P-type semiconductor

(B) An N-type semiconductor

(C) A PN-junction

(D) An intrinsic semiconductor

Q.29 The approximate ratio of resistances in the forward and reverse bias of the PN-junction diode is -

(A) $10^2 : 1$ (B) $10^{-2} : 1$

(C) $1 : 10^{-4}$ (D) $1 : 10^4$

Q.30 The dominant mechanisms for motion of charge carriers in forward and reverse biased silicon P-N junctions are -

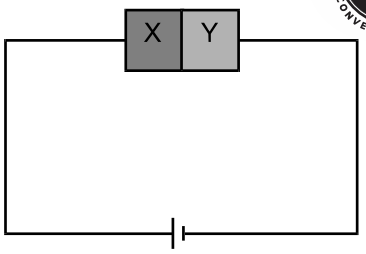
(A) Drift in forward bias, diffusion in reverse bias

(B) Diffusion in forward bias, drift in reverse bias

(C) Diffusion in both forward and reverse bias

(D) Drift in both forward and reverse bias

Q.31 A semiconductor X is made by doping a germanium crystal with arsenic (Z = 33). A second semiconductor Y is made by doping germanium with indium (Z = 49). The two are joined end to end and connected to a battery as shown. Which of the following statements is correct -



(A) X is P-type, Y is N-type and the junction is forward biased

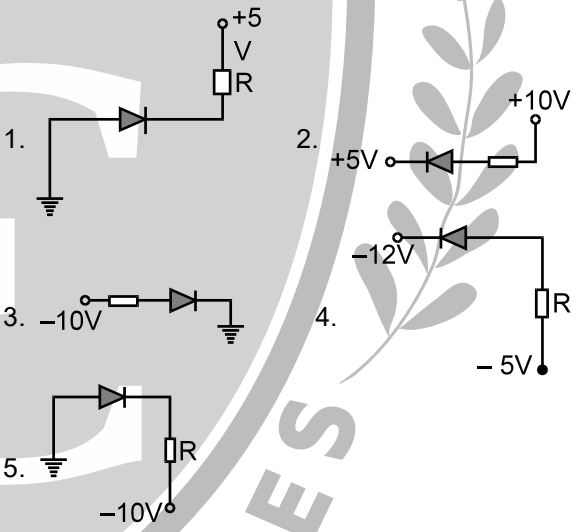
(B) X is N-type, Y is P-type and the junction is forward biased

(C) X is P-type, Y is N-type and the junction is reverse biased

(D) X is N-type, Y is P-type and the junction is revese biased

Questions based on Diode

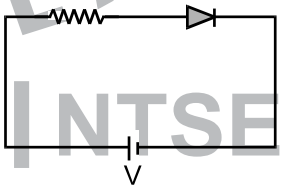
Q.32 In the given figure, which of the diodes are forward biased ?



(A) 1, 2, 3 (B) 2, 4, 5

(C) 1, 3, 4 (D) 2, 3, 4

Q.33 For the given circuit of PN-junction diode, which of the following statements is correct -



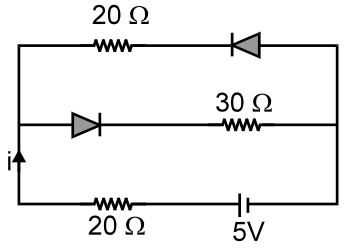
(A) In forward biasing the voltage across R is V

(B) In forward biasing the voltage across R is 2V

(C) In reverse biasing the voltage across R is V

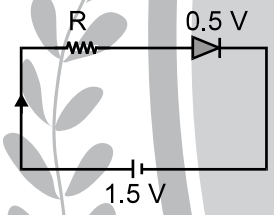
(D) In reverse biasing the voltage across R is 2V

Q.34 Current in the circuit will be -



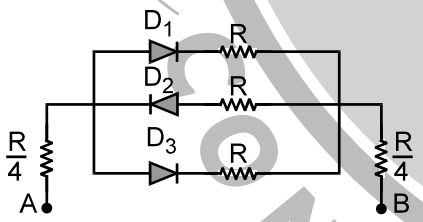
(A) $\frac{5}{40}$ A (B) $\frac{5}{50}$ A (C) $\frac{5}{10}$ A (D) $\frac{5}{20}$ A

Q.35 The diode used in the circuit shown in the figure has a constant voltage drop of 0.5 V at all currents and a maximum power rating of 100 milliwatts. What should be the value of the resistor R, connected in series with the diode for obtaining maximum current -



(A) 1.5 Ω (B) 5 Ω (C) 6.67 Ω (D) 200 Ω

Q.36 In the following circuits PN-junction diodes D_1, D_2 and D_3 are ideal for the following potential of A and B, the correct increasing order of resistance between A and B will be -

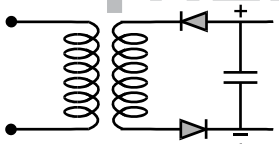


(i) – 10 V, – 5 V (ii) – 5V, – 10 V
(iii) – 4V, – 12 V
(A) (i) < (ii) < (iii) (B) (iii) < (ii) < (i)
(C) (ii) = (iii) < (i) (D) (i) = (iii) < (ii)

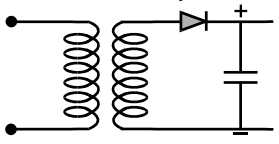
Questions based on **Application of Diodes as a rectifier**

Q.37 Which is the correct diagram of a half-wave reactifier -

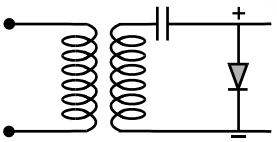
(A)



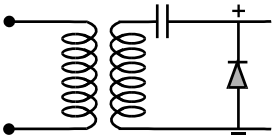
(B)



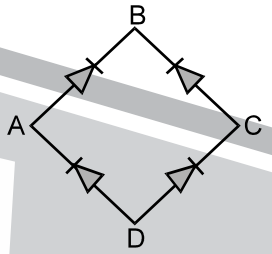
(C)



(D)



Q.38 In the diagram, the input is across the terminals A and C and the output is across the terminals B and D, then the output is -



(A) zero (B) same as input
(C) full wave rectifier (D) half wave rectifier

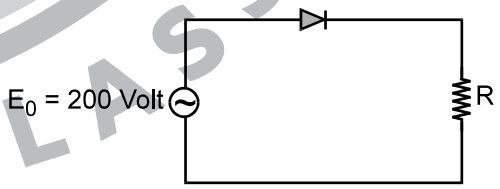
Q.39 If a full wave rectifier circuiit is operating from 50 Hz mains, the fundamental frequency in the ripple will be -

(A) 50 Hz (B) 70.7 Hz
(C) 100 Hz (D) 25 Hz

Q.40 In a full wave rectifiers, input ac current has a frequency ν. The output frequency of current is

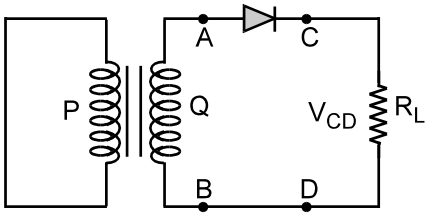
(A) $\nu/2$ (B) ν
(C) 2ν (D) None of these

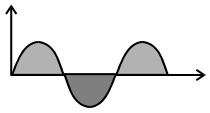
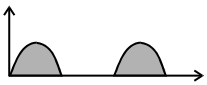
Q.41 A sinusoidal voltage of peak value 200 volt is connected to a diode and resistor R in the circuit shown so that half wave rectification occurs. If the forward resistance of the diode is negligible compared to R then rms voltage (in volt) across R is approximately -

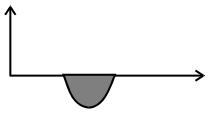
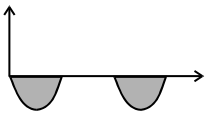


(A) 200 (B) 100 (C) $\frac{200}{\sqrt{2}}$ (D) 280

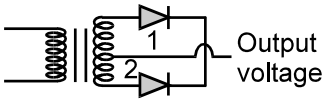
Q.42 In the half-wave rectifier circuit shown. Which one of the following wave forms is true for V_{CD}, the output across C and D?

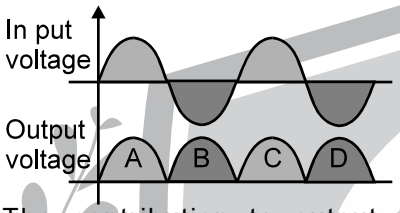


(A)  (B) 

(C)  (D) 

Q.43 A full wave rectifier circuit along with the input and output voltage is shown in the figure.

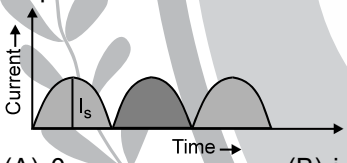




The contribution to output voltage from diode – 2 to -

(A) A, C (B) B, D
(C) B, C (D) A, D

Q.44 The output current versus time curve of a rectifier is shown in the figure. The average value of the output current in this case is -



(A) 0 (B) i_0/π
(C) $2i_0/\pi$ (D) i_0

Q.45 n-p-n transistors are preferred to p-n-p transistors because -

(A) they have low cost

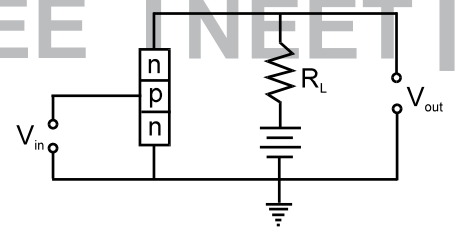
(B) they have low dissipation energy

(C) they are capable of handling large power

(D) electrons have high mobility than holes and hence high mobility of energy

Questions based on Transistors

Q.46 An n-p-n transistor circuit is arranged as shown in fig. It is -



(A) a common-base amplifier circuit

(B) a common-emitter amplifier circuit

(C) a common-collector amplifier circuit

(D) none of the above

Q.47 What is the voltage gain in a common-emitter amplifier, where input resistance is 3Ω and load resistance 24Ω ? Take $\beta = 0.6$ -

(A) 8.4 (B) 4.8 (C) 2.4 (D) 1.2

Q.48 Compared to CB amplifier, the CE amplifier has-

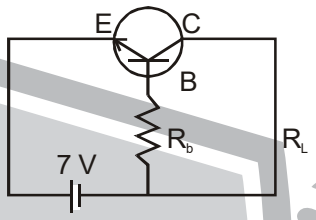
(A) lower input resistance

(B) higher output resistance

(C) lower current amplification

(D) higher output resistance

Q.49 In the given transistor circuit, the base current is 35 μA.The value of R_b is -



(A) 100 kΩ (B) 200 kΩ
(C) 300 kΩ (D) 400 kΩ

Q.50 I. In a P-N-P type common base amplifier the input and output are in same phase.

II. In a P-N-P common base amplifier input and output are out of phase.

III. In a N-P-N- common base amplifier the input and output are in same phase.

IV. In a N-P-N common base amplifier input and output are out of phase.

State if -

(A) I and III are correct

(B) II and III are correct

(C) I and IV are correct

(D) II and IV are correct

Q.51 In a transistor the base is made very thin and is lightly doped with an impurity because-

(A) to enable the collector to collect 95% of the holes or electrons coming from the emitter side

(B) to enable the emitter to emit small number of holes or electrons

(C) to save the transistor from higher current effects

(D) none of the above

Q.52 In an NPN transistor 10^{10} electrons enter the emitter in 10^{-6}s. 2% of the electrons are lost in the base. The current transfer ratio will be-

(A) 0.95 (B) 0.96 (C) 0.97 (D) 0.98

Q.53 In an NPN transistor the values of base current and collector current are 100μA and 9 mA respectively, the emitter current will be-

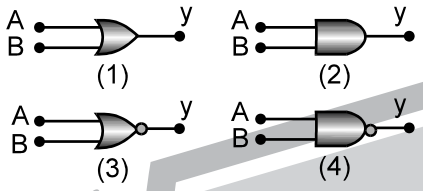
(A) 9.1mA (B) 18.2mA (C) 9.1μA (D) 18.2μA

Q.54 For a common base amplifier, the values of resistance gain and voltage gain are 3000 and 2800 respectively. The current gain will be -

(A) 0.93 (B) 0.83 (C) 0.73 (D) 0.63

Questions based on **Logic Gates**

Q.55 Given below are four logic gate symbol (figure). Those for OR, NOR and NAND are respectively



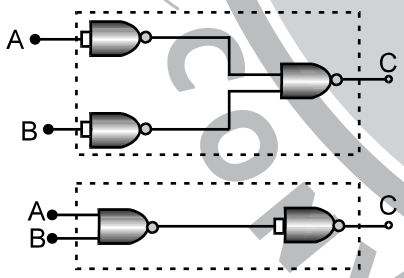
(A) 1, 4, 3 (B) 4, 1, 2
(C) 1, 3, 4 (D) 4, 2, 1

Q.56 The following truth table corresponds to the logic gate -

A	0	0	1	1
B	0	1	0	1
X	0	1	1	1

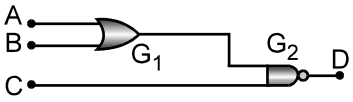
(A) NAND (B) OR
(C) AND (D) XOR

Q.57 The combination of 'NAND' gates shown here under (figure) are equivalent to -



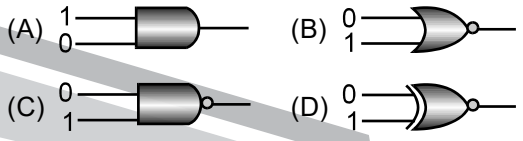
(A) An OR gate and an AND gate respectively
(B) An AND gate and a NOT gate respectively
(C) An AND gate and an OR gate respectively
(D) An OR gate and a NOT gate respectively

Q.58 For the given combination of gates, if the logic states of inputs A, B, C are as follows A = B = C = 0 and A = B = 1, C = 0 then the logic states of output D are -

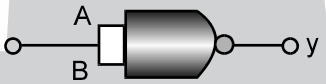


(A) 0, 0 (B) 0, 1
(C) 1, 0 (D) 1, 1

Q.59 Which of the following gates will have an output of 1 -



Q.60 This symbol represents -

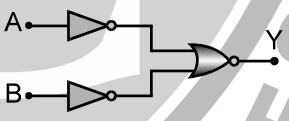


(A) NOT gate (B) OR gate
(C) AND gate (D) NOR gate

Q.61 The output of a NAND gate is 0 -

(A) If both inputs are 0
(B) If one input is 0 and the other input is 1
(C) If both inputs are 1
(D) Either if both inputs are 1 or if one of the inputs is 1 and the other 0

Q.62 Which logic gate is represented by the following combination of logic gates -



(A) OR (B) NAND
(C) AND (D) NOR

Q.63 The output of OR gate is 1 -

(A) If both inputs are zero
(B) If either or both inputs are 1
(C) Only if both input are 1
(D) If either input is zero

ANSWER SHEET

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	B	B	C	B	A	C	D	D	A	B	C	B	C	C	A	A	D	A	D	A
Q.No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	B	B	A	A	B	D	A	C	D	B	D	B	A	B	B	C	B	C	C	C
Q.No.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	B	B	B	A	D	B	C	D	B	A	A	D	A	A	C	B	A	D	C	A
Q.No.	61	62	63																	
Ans.	C	C	B																	