PHYSICS

BOOKS - DC PANDEY PHYSICS (HINGLISH)

SEMICONDUCTORS AND ELECTRONIC DEVICES

Only One Option Is Correct

1. A P-type semiconductor can be obtained by adding

A. arsenic to pure silicon

B. gallium to pure silicon

C. antimony to pure germanium

D. phosphorous to pure germanium

Answer: B

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2. The valance of the impurity atom that is to be added to germanium crystal so as to make it a N-type semiconductor, is

A. 6

B. 5

C. 4

D. 3

Answer: B

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3. A piece of copper and the other of germanium are cooled from the room temperature to 80 K, then which of the following would be wrong statements?

A. Resistance of each increases

B. Resistance of each decreases

C. Resistance of copper increases while that of germanium decreases

D. Resistance of copper decreases while that of germanium increases

Answer: D

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4. In an insulator, the forbidden energy gap between the valence band and conduction band is of the order of

A. 1 MeV

B. 0.1 MeV

C. 1 eV

D. 5 eV

Answer: D

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5. The energy band gap of Si is

A. 0.70 eV

B. 1.1 eV

C. between 0.70 eV to 1.1 eV

D. 5 eV

Answer: B

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6. In an semiconductor the separation between conduction band and valence band is of the order of

A. 100 eV

B. 10 eV

C. 1 eV

D. zero

Answer: C

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7. A piece of semiconductors is connected in sereis in an electric circuit. On increasing the temperautre, the current in the circuit will

A. decrease

B. remain uncharged

C. increase

D. stop flowing

Answer: C

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8. Intrinsic semiconductor is electrically neutral. Extrinsic semiconductor having large number of current carriers would be

A. positively charged

B. negatively charged

C. positively charged or negatively charged depending upon the type of impurity that has been added

D. electrically neutral

Answer: D

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9. Mobilities of electrons and holes in a sample of intrinsic germanium at room temperature are $0.36m^2/Vs$ and $0.17m^2/Vs$. The electron and hole densities are each equal to $2.5 \times 10^{19}m^{-3}$. The electrical conductivity of germanium is.

A. $0.47S/m$

B. $5.18S/m$

C. $2.12S/m$

D. $1.09S/m$

Answer: C

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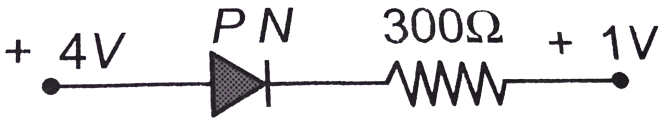
10. In the circuit given below, the value of the current is



A. zero

B. $10^{-2}A$

C. $10^{2}A$

D. $10^{-3}A$

Answer: B

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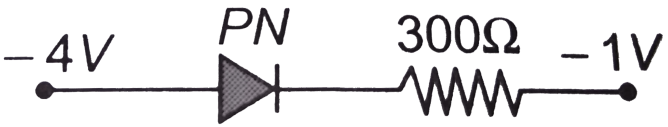
11. What is the current in the circuit shown below?



A. zero

B. $10^{-2}A$

C. $1A$

D. $0.10A$

Answer: A

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12. In a p-n junction depletion region has a thickness of the order of

A. 1 cm

B. 1 mm

C. $10^{-6}m$

D. $10^{-12}cm$

Answer: C

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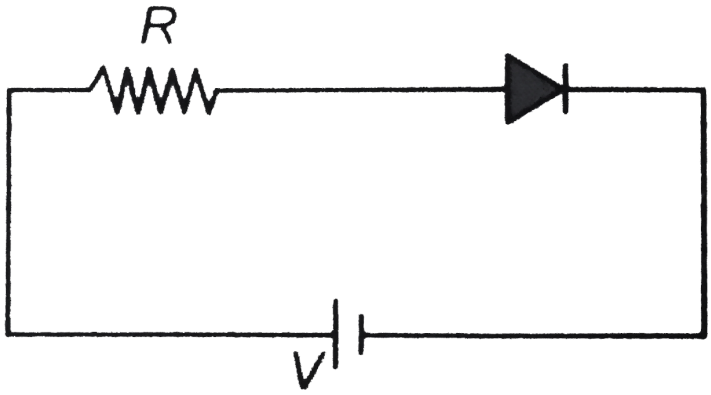
13. For the given circuit of PN-junction diode, which of the following statements is correct?



A. In forward biasing the voltage across R is V

B. In forward biasing the voltage across R is V

C. In reverse biasing the voltage across R is

V

D. In reverse biasing the voltage across R is

2V

Answer: A

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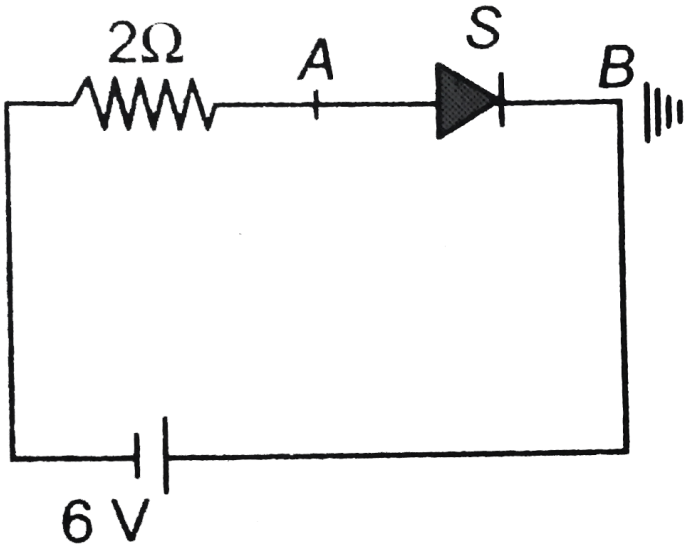
14. The diode shown in the circuit is a silicon diode. The potential difference between the

points A and B will be



A. 6 V

B. 0.6 V

C. 0.7 V

D. zero

Answer: A

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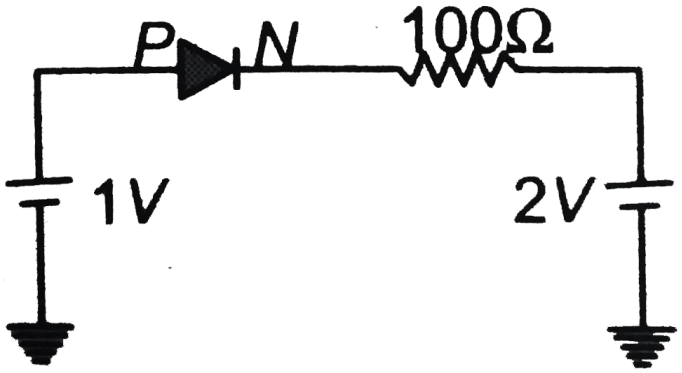
15. The current through an ideal PN-junction shown in the following circuit diagram will be



A. zero

B. 1 mA

C. 10 mA

D. 30 mA

Answer: A

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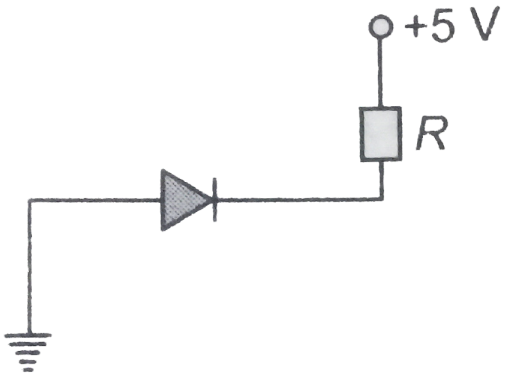
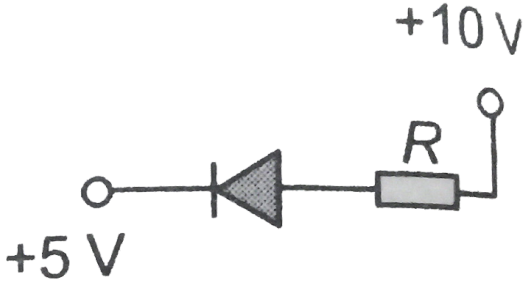
16. In the given figure, which of the diodes are forward biased?

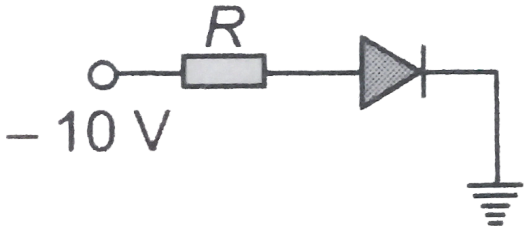
1.



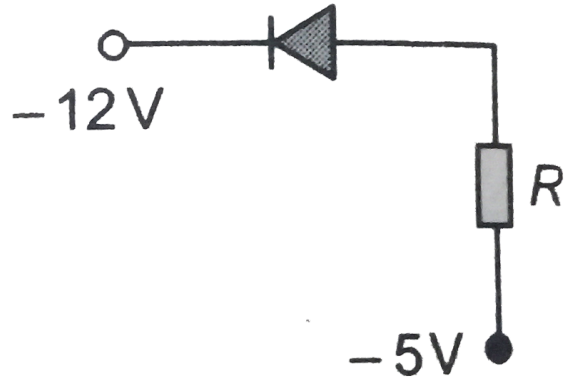
2.



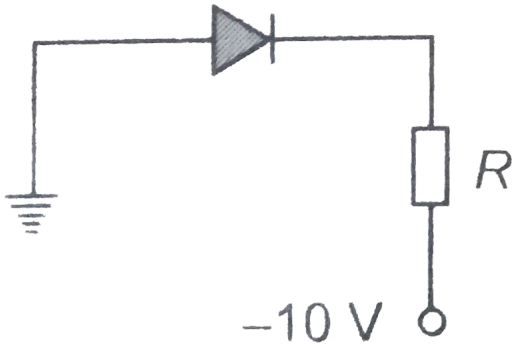
3.



4.



5.



A. 1, 2, 3

B. 2, 4, 5

C. 1, 3, 4

D. 2, 3, 4

Answer: B

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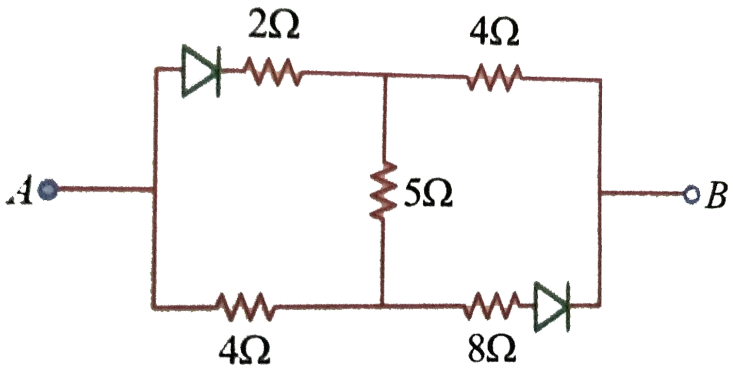
17. The equivalent resistance of the circuit across AB is given by



A. 4Ω

B. 13Ω

C. 4Ω or 13Ω

D. 4Ω or zero

Answer: C

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18. The width of depletion region in p-n junction diode is $500nm$ and an intrinsic electric field of $6 \times 10^5 Vm^{-1}$ is also found to exist in it. What is the kinetic energy which a conduction electron must have in order to diffuse from the n-side to p-side?

A. 0.30 V

B. 0.40 V

C. 3 V

D. 4 V

Answer: A

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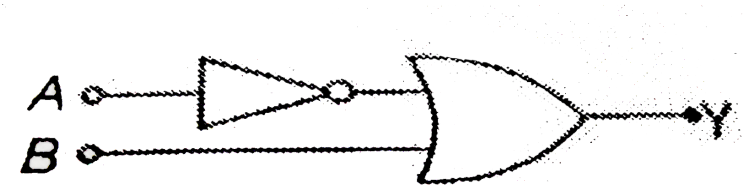
19. The Boolen expression for the circuit given in figure is



A. $Y = A + \overline{B}$

B. $Y = \overline{A + B}$

C. $Y = \left(\overline{A} + B\right)$

D. $Y = A + B$

Answer: C

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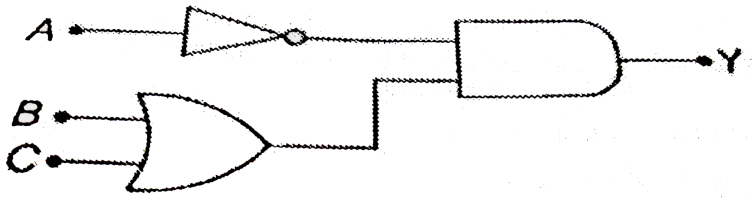
20. The Boolen expression for the circuit given in figure is



A. $Y = \overline{A}.B + C$

B. $Y = \overline{A}.\left(\overline{B} + \overline{C}\right)$

C. $Y = \overline{A}.\left(B + \overline{C}\right)$

D. $Y = \overline{A}.\left(B + C\right)$

Answer: D

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21. In the case of constant α and β of a transistor

A. $\alpha = \beta$

B. $\beta < 1, \alpha > 1$

C. $\alpha\beta = 1$

D. $\beta > 1, \alpha < 1$

Answer: D

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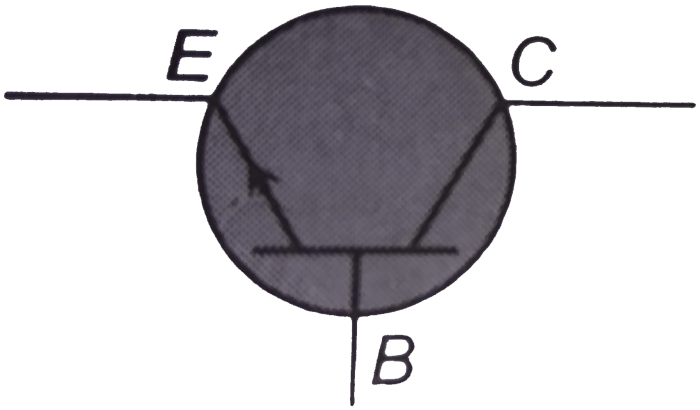
22. The symbol given in figure represents



A. n-p-n transistor

B. p-n-p transistor

C. forward biased p-n junction diode

D. reverse biased n-p junction diode

Answer: A

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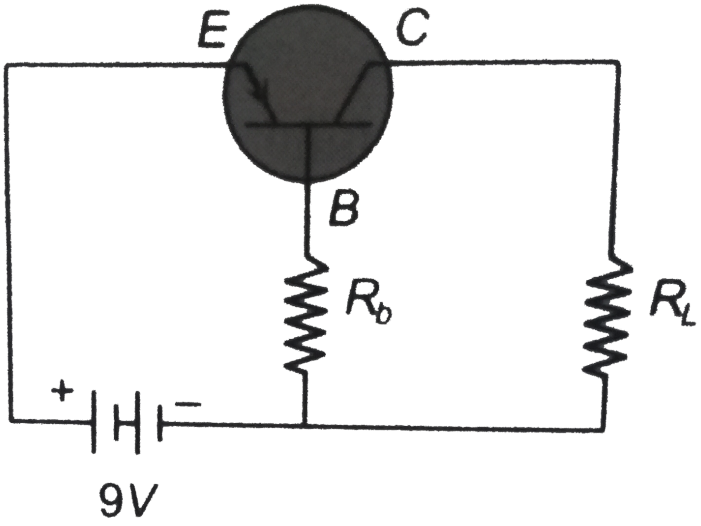
23. In a transistor circuit shown here the base current is $35\mu A$. The value of the resistor R_b is



A. $124k\Omega$

B. $257k\Omega$

C. $352k\Omega$

D. None of these

Answer: B

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24. In a common base transistor circuit, the current gain is 0.98. On changing the emitter current by 5.00 mA, the change in collector current is

A. 0.196 mA

B. 2.45 mA

C. 4.9 mA

D. 5.1 mA

Answer: C

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25. The transfer ration of a transistor is 50. The input resistance of the transistor when used in the common -emitter configuration is $1k\Omega$.

The peak value for an $A.C.$ input voltage of $0.01V$ peak is

A. $100\mu A$

B. $0.01\mu A$

C. $0.25\mu A$

D. $500\mu A$

Answer: D

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26. To use a transistor as an amplifier

A. both junctions are forward biased

B. both junctions are reverse biased

C. the emitter base junction is forward biased and the collector base junction is reverse biased

D. no biasing voltages are required

Answer: C

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27. A transistor has three impurity regions , emitter , base and collector. Arrange them in order of increasing doping levels.

A. emitter, base and collector

B. collector, base and emitter

C. base, emitter and collector

D. base, collector and emitter

Answer: D

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28. What is β value for transistor whose $\alpha = 0.98$?

A. 29

B. 38

C. 49

D. 56

Answer: C

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29. When the emitter current of a transistor is changed by 1 mA, its collector current changes by 0.990 mA. In the common base circuit, current gain for the transistor is

A. 0.099

B. 1.01

C. 1.001

D. 0.99

Answer: D

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30. Choose the corrector relation between the transistor parameters α and β.

A. $\beta = \frac{\alpha + 1}{\alpha}$

B. $\beta = \frac{\alpha - 1}{\alpha}$

C. $\beta = \frac{\alpha}{1 - \alpha}$

D. $\beta = \frac{\alpha}{1 + \alpha}$

Answer: C

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31. In a transistor, the current amplification factor α is 0.9. The transistor is connected in common base configuration. The change in collector current when base current changes by 4 mA is

A. 4 mA

B. 12 mA

C. 24 mA

D. 36 mA

Answer: D

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32. Given below are four logic gates 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

Answer: C

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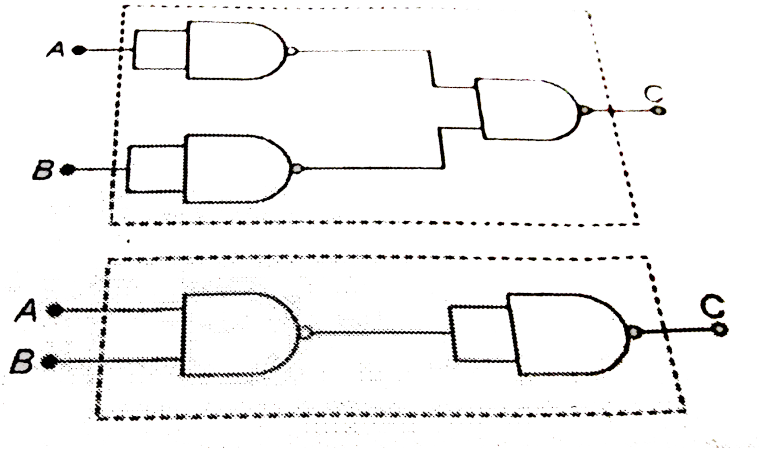
33. The combination of gates shown here are equivalent to



A. OR gate and an AND gate respectively

B. AND gate and a NOT gate respectively

C. AND gate and an OR gate respectively

D. OR gate and a NOT gate respectively

Answer: A

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34. Give Boolean expression and Truth table for NOR gate.

A. $C = A + B$

B. $C = \overline{A + B}$

C. $C = A.B$

D. $C = \overline{A.B}$

Answer: B

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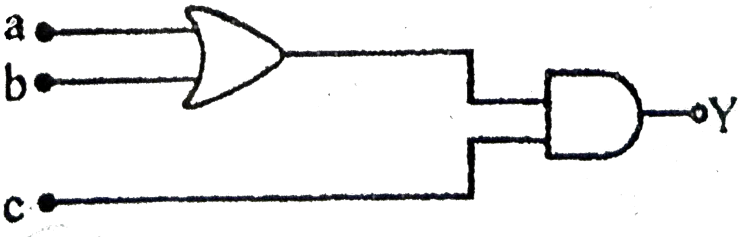
35. To get an output of 1 form the circuit shown in figure the input must be :-



A. A=0, B=1, C=0

B. A=1, B=0, C=0

C. A=1, B=0, C=1

D. A=1, B=1, C=0

Answer: C

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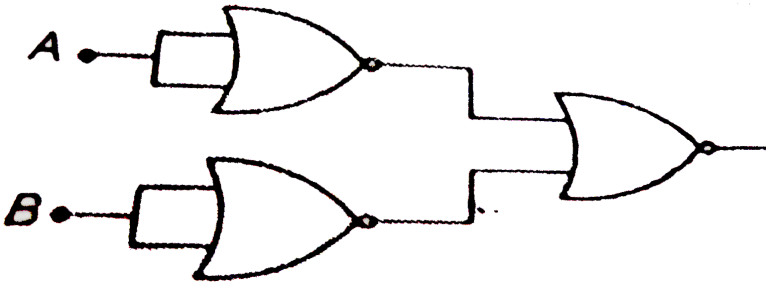
36. The combination of the gates shown in the figure produces



A. NOR gate

B. OR gate

C. AND gate

D. XOR gate

Answer: C

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37. The following truth table corresponds to the logic gate

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

A. NAND

B. OR

C. AND

D. XOR

Answer: B

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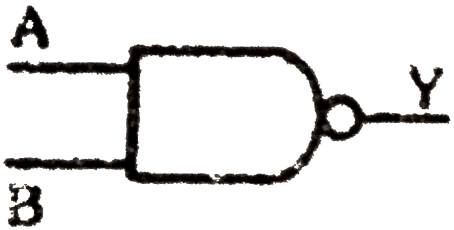
38. The symbol represents :-



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39. The conductivity of a semiconductor increases with increase in temperature because

A. number density of free current carriers increases

B. relaxation time increases

C. both number density of carriers and relaxation time decreases but effect of

decrease in relaxation time is much less than increase in number density.

D. number density of current carriers increases, relaxation time decreases but effect of decrease in relaxation time is much less than increase in number density

Answer: D

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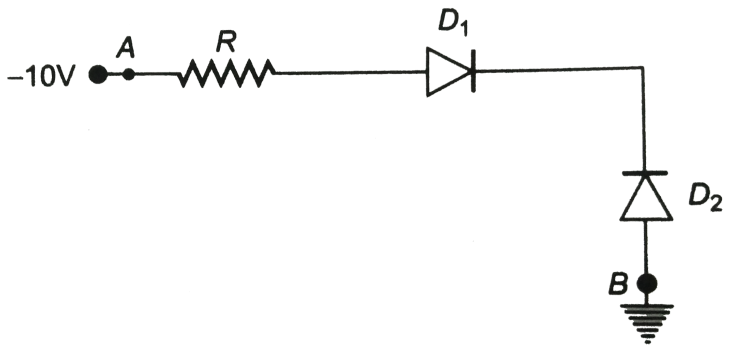
40. In figure , assuming the diodes to be ideal ,



A. D_1 is forward biased, D_2 is reverse biased and hence current flows from A to B

B. D_2 is forward biased, D_1 is reverse biased and hence no current flows from B to A and vice-versa

C. D_1 and D_2 are both forward biased and hence current flows from A to B

D. D_1 and D_2 are both reverse biased and hence no current flows from A to B and vice-versa

Answer: B

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41. Hole is

A. an anti-particle of electron

B. a vacancy created when an electron leaves a covalent bond

C. absence of free electrons

D. an artificially created particle

Answer: B

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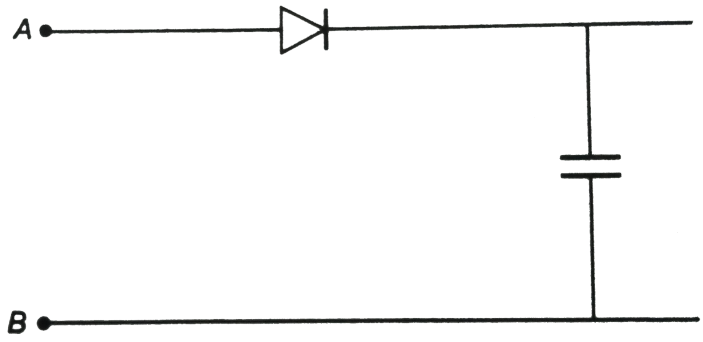
42. A 220 V AC supply is connected between points A and B . What will be the potential difference V across the capacitor ?



A. 220V

B. 110V

C. 0V

D. $220\sqrt{2}V$

Answer: D

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43. In a common emitter transistor, the current gain is 80. What is the change in collector current, when the change in base current is $250\mu A$?

A. $80 \times 250\mu A$

B. $(250 - 80)\mu A$

C. $(250 + 80)\mu A$

D. $250\mu A$

Answer: A

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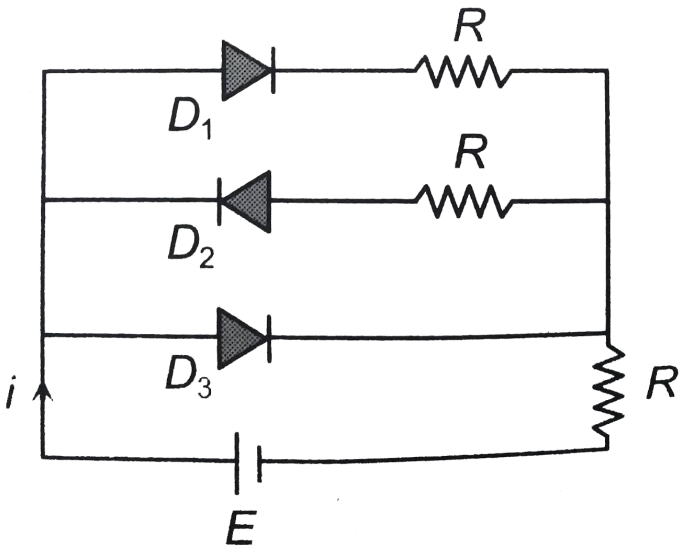
44. In the following circuit of PN junction diodes D_1, D_2 and D_3 are ideal then i is



A. E/R

B. $E/2R$

C. $2E/3R$

D. zero

Answer: A

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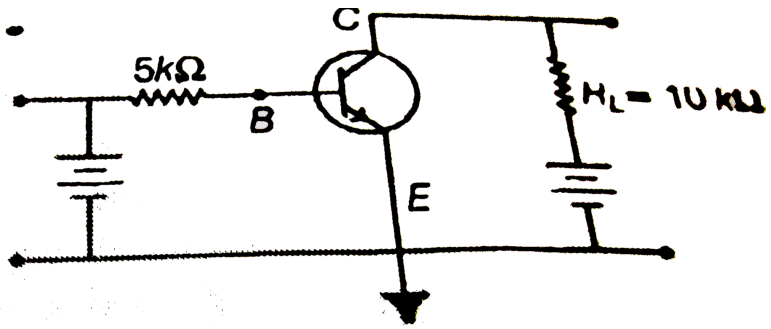
45. The adjoining diagram shows the biasing of an npn-transistor in common emitter configuration used in an amplifer. The design of the transistor is such that 98% of the charge carries passing through the emitter reach the collector. If base current changes from $50\mu A$ to $100\mu A$, then the corresponding change in the voltage across the load

resistance R_L will be



A. 0.25 V

B. 0.5 V

C. 24.5 V

D. 49.0 V

Answer: C

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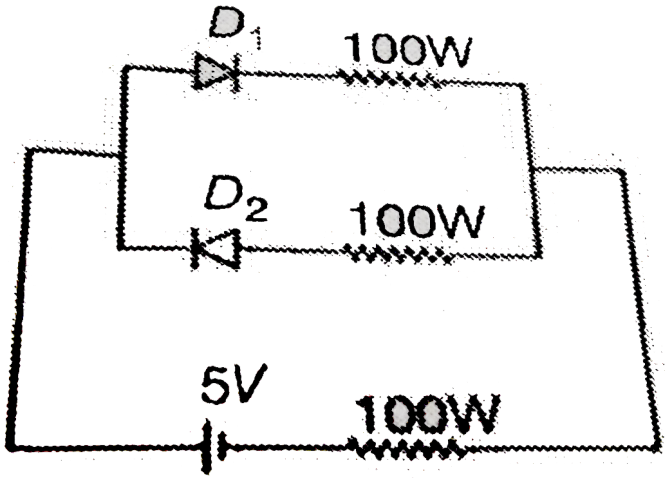
46. Two ideal diodes D_1 and D_2 are connected with the battery of 5 volt as shown in figure. Then the current through diode D_1 is



A. 12.5 mA

B. 25 mA

C. zero

D. 50 mA

Answer: B

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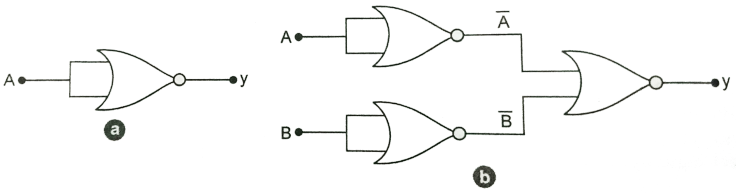
47. Write the truth table for the circuit given in Fig., consisting of NOR gates only. Identify the logic operations (OR, AND, NOT) performed

by two circuits.



A. NOT

B. AND

C. OR

D. None of these

Answer: A

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48. In half - wave rectification, what is the output frequency, if the

input frequency is 50 Hz ? What is the output frequency of a full - wave rectifier

for the same input frequency ?

A. 25 Hz

B. 50 Hz

C. 75 Hz

D. 100 Hz

Answer: B

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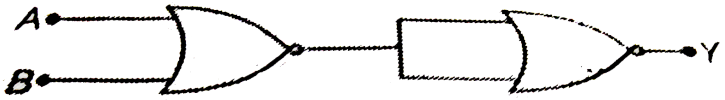
49. The circuit shown in the figure acts as



A. OR gate

B. AND gate

C. NOT gate

D. NAND gate

Answer: A

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50. The current gain for common emitter amplifier is 69. If the emitter current is $7.0mA$, find (i) base current and (ii) collector current.

A. 4 mA

B. 4.4 mA

C. 3.8 mA

D. zero

Answer: A

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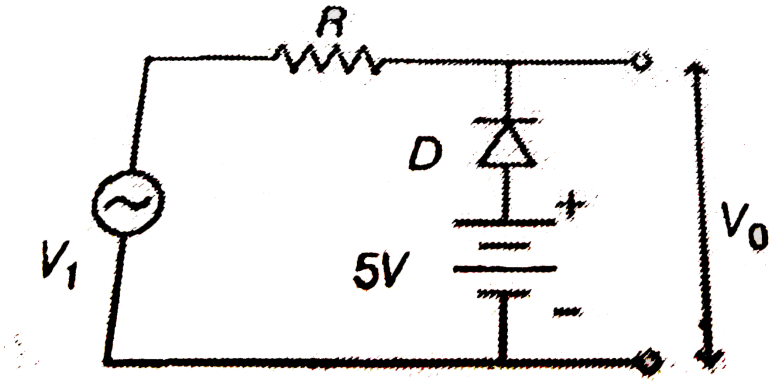
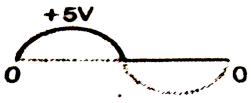
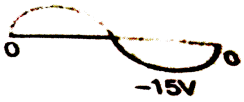
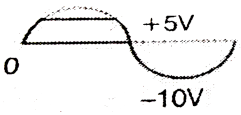
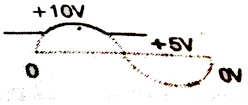
51. In the figure, D is an ideal diode and an alternating voltage of peak value 10 volts si connected as input V_1. Which of the following figures represents the correct waveform of output voltage V_0 ?



A. 

B. 

C. 

D. 

Answer: D

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52. Regarding transistor what is not correct.

A. For transistor to act as an amplifier, EB junction should be forward biased and CB junction should be reverse biased

B. $l_E = l_B + l_C$ in any configuration and for any transistor

C. $\alpha = \frac{\beta}{1+\beta}$ where α and β are transistor parameters

D. $\beta = \frac{\alpha}{1+\alpha}$

Answer: D

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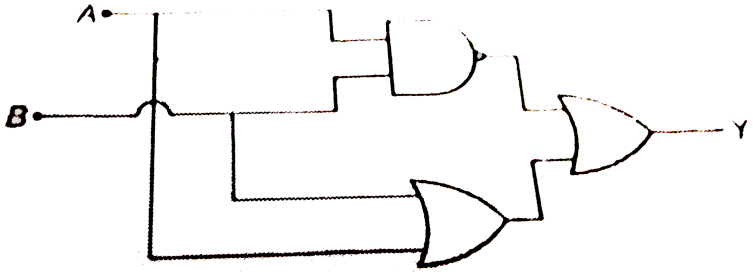
53. The truth table for the circuit shown in the figure is



A.

A	B	Y
1	1	1
0	1	0
1	0	0
0	0	1

B.

A	B	Y
1	1	0
0	0	1
1	0	0
0	1	1

C.

A	B	Y
1	1	0
0	1	0
1	0	0
0	0	0

D.

A	B	Y
1	1	1
0	1	1
1	0	1
0	0	1

Answer: D

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54. The diode D shown in the circuit is governed by the V-I relation $V = (0.7 + 100I)$

Volt. The current supplied by the battery is

A. 0.3 A

B. 0.2 A

C. 0.15 A

D. 0.1 A

Answer: D

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55. A sample of n-type silicon

A. Contains an excess of free electrons therefore it is negatively charged

B. Contains an excess of free electrons and it is electrically neutral

C. Predominantly contains trivalent impurities

D. Contains only pentavalent element

Answer: B

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More Than One Option Is Correct

1. When an electric field is applied across a semiconductor,

A. electrons move from lower energy level to higher energy level in the conduction band

B. electrons move from higher energy level to lower energy level in the conduction band

C. holes in the valence band move from higher energy level to lower energy level

D. holes in the valence band move from lower energy level to higher energy level

Answer: A::C

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2. Consider an n-p-n transistor with its base - emitter junction forward biased and collector base junction reverse biased . Which of the following statements are true?

A. Electrons crossover from emittor statements are true?

B. Holes move from base to collector

C. Electrons move from emittor to base

D. Electrons from emitter move out of base without going to the collector

Answer: A::C

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3. In an n-p-n transistor circuit , the collector currents is 10mA . If 95 per cent of the electrons emitted reach the collector, which of the following statements are true?

A. The emitter current will be 8 mA

B. The emitter current will be 10.53 mA

C. The base current will be 0.53 mA

D. The base current will be 2mA

Answer: B::C

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