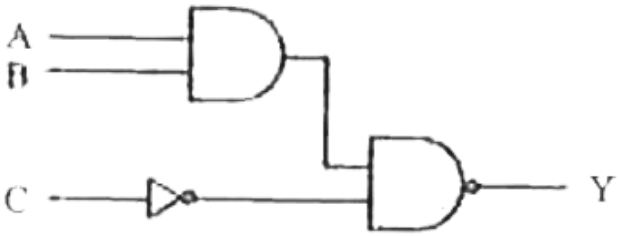
# PHYSICS

# BOOKS - SAI PHYSICS (TELUGU ENGLISH)

# SEMICONDUCTOR ELECTRONICS

Mcq

**1.** In the following circuit the output Y becomes zero for the input combinations




A. (a)A = 1, B = 0, X = 0

B. (b)A = 0, B = 1, X = 1

C. (c)A = 0, B = 0, X = 0

D. (d)A = 1, B = 1, X = 0

**Answer: D**

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**2.** A crystal of intrinsic silicon at room temperature has a carrier concentration of $1.6 \times 10^6 / m^3$. If the donor concentration level is $4.8 \times 10^{20} / m^3$, then the concentration of holes in the semiconductor is

A. $53 \times 10^{12} / m^3$

B. $4 \times 10^{11} / m^3$

C. $4 \times 10^{12} / m^3$

D. $5.3 \times 10^{11} / m^3$

**Answer: D**

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**3.** The output characteristics of an n-p-n transistor represent, ($I_C$ = Collector current, $V_{CE}$ = difference between collector and emitter, $I_B$ = base current, $V_{BB}$ = Voltage given to base, $V_{BE}$ = difference between base and emitter)

A. Changes in $I_C ana I_B$ and $V_{BB}$ are changed

B. Changes in $I_C$, with changes in $V_{CE}(I_B = cons\tan t)$

C. Changes in $l_B$ with changes in $V_{CE}$

D. Changes in $I_C as V_{BE}$ is changed

**Answer: B**

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**4.** In a transistor if $\frac{I_C}{I_E} = \alpha$ and $\frac{I_C}{I_B} = \beta$. If $\alpha$ varies between $\frac{20}{21}$ and $\frac{100}{101}$, then the value of $\beta$ lies between

A. (10)-(10)

B. 0.95-0.99

C. 20-100

D. 200-300

**Answer: C**

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**5.** The base current in a transistor circuit changes from $45\mu A$. Accordingly, the collector

current changes from 0.2 mA to 0.400 mA. The gain in current is

A. 9.5

B. 1

C. 40

D. 20

**Answer: D**

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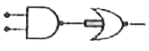
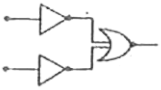
**6.** Of the following, NAND gate is

A. 

B. 

C. 

D. 

**Answer: C**

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**7.** In a p-n junction diode, the thickness of deplection layer is $2 \times 10^{-6} m$ and barrier potential is 0.3 V. The intensity of the electric field at the junction is

A. $0.6 \times 10^{-6} V m^{-1}$ from n to p side

B. $0.6 \times 10^{-6} V m^{-1}$ from p to n side

C. $1.5 \times 10^{5} V m^{-1}$ from n to p side

D. $1.5 \times 10^{5} V m^{-1}$ from p to n side

**Answer: C**

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**8.** A transistor having $a\beta$ equal to 80 has a change in base current of $250\mu A$, then the change in collector current is

A. 20,000 mA

B. 200 mA

C. 2000 mA

D. 20 mA

**Answer: D**

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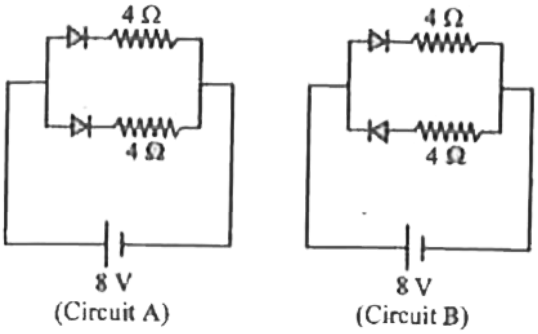
**9.** Currents flowing in each of the following circuits A and B respectively are




A. 1 A, 2 A

B. 2 A, 1 A

C. 4 A, 2 A

D. 2 A, 4 A

**Answer: C**

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**10.** Which of the following statements is correct when junction diode is in forward bias?

A. The width of depletion region decreases.

B. Free electrons on n-side will move towards the junction.

C. Holes on p-side move towards the junction.

D. Electron on n-side and holes on p-side will move away from junction.

**Answer: A**

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**11.** In an n-type semiconductor, the fermi energy level lies

A. In the forbidden energy gap nearer to the conduction band

B. In the forbidden energy gap nearer to the valence band

C. In the middle forbidden energy gap

D. Outside the forbidden energy gap

**Answer: A**

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**12.** Consider a p-n junction as a capacitor, formed with p and n-materials acting as thin metal electrodes and depletion layer width acting as separation. between them. Biasing on this, assume that a n-p-n transistor is working as an amplifier in CE configuration. If $C_1$ and $C_2$ are the base-emitter and collector-emitter junction capacitance, then

A. $C_1 > C_2$

B. $C_1 < C_2$

C. $C_1 = C_2$

D. $C_1 = C_2 = 0$

**Answer: A**

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**13.** An n-p-n transistor power amplifier in C-E configuration gives

A. Voltage amplification only

B. Current amplification only

C. Both current and voltage amplifications

D. Only power gain of unity

**Answer: C**

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**14.** In n-p-n transistor, in CE configuration

(1) The emitter is heavily doped than the collector

(2) Emitter and collector can be interchanged

(3) The base region is very thin but is heavily doped

(4) The conventional current flows from base to emitter

A. (1) and (2) are correct

B. (1) and (3) are correct

C. (1) and (4) are correct

D. (3) and (2) are correct

**Answer: C**

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**15.** When n-p-n transistor is used as an amplifie

A. Electrons move from base to collector

B. Holes move from emitter to base

C. Holes move from collector to base

D. Holes move from base to emitter

**Answer: A**

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**16.** While a collector to emitter voltage is constant in a transistor, the collector current changes by 8.2 mA when the emitter current changes by 8.3 mA. The value of forward current ratio is

A. 82

B. 83

C. 8.2

D. 8.3

**Answer: A**

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**17.** In a transistor circuit, when the base current is incréased by $50\mu A$ keeping the collector voltage fixed at 2 V, the collector current increase by 1 mA. The current gain of the transistor is

A. 20

B. 40

C. 60

D. 80

**Answer: A**

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**18.** A common emitter transistor amplifier has a current gain of 50. If the load resistance is $4k\Omega$ and input resistance is $500\Omega$, the voltage gain of the amplifier is

A. 100

B. 200

C. 300

D. 400

**Answer: D**

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**19.** Consider the following statement A and B and identify the correct choice of the given answer.

A. The width of the depletion layer in a p-n

junction diode increases in forward bias.

B. In a intrinsic semiconductor the fermi energy level is exactly in the middle of the forbidden energy gap.

A. A is true and B is false

B. Both A and B are false

C. A is false and B is true

D. Both A and B are true

**Answer: C**

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**20.** In intrinsic semiconductor

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 and valence band is near about 1 eV

D. None of above

**Answer: C**

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**21.** The element that can be used as acceptor impurity to dope silicon is

A. Antimony

B. Arsenic

C. Boron

D. Phosphorus

**Answer: C**

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**22.** A hole is

A. A positively charged electron

B. An electron in the valence band

C. An unfulfilled covalent bond

D. An excess electron in covalent bond

**Answer: C**

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**23.** The potential in the depletion layer is due to

A. Electrons

B. Holes

C. Both (a) and (b)

D. Forbidden band

**Answer: C**

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**24.** The value indicated by fermi energy level in an intrinsic semiconductor is

A. The average energy of electrons and holes

B. The energy of electrons in conduction band

C. The energy of holes in valence band

D. The energy of forbidden region

**Answer: A**

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**25.** The two diodes A and B are biased as shown, then

-5V A -9V

-3V B -6V

A. The diodes A and B are reverse biased

B. The diode A is forward biased and B is reverse

C. The diode B is forward biased and A is reverse biased

D. The diodes A and B are forward biased

**Answer: D**

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**26.** Two pieces, one of germanium and the other of aluminium are cooled from $T_1K \rightarrow T_2K$. The resistance of

A. Aluminium increases and that of germanium decreases

B. Each of them decreases

C. Aluminium decreases and that of germanium increases

D. Each of them increases

**Answer: C**

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**27.** When a p-n junction diode is reverse biased, the thickness of the depletion layer

A. Increases

B. Decreases

C. Become zero

D. Remains constant.

**Answer: A**

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**28.** Energy band gap $E_g$ in an insulator is of the order of

A. 6 eV

B. 0.6 eV

C. $-6eV$

D. zero

**Answer: A**

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**29.** Indium impurity in germanium makes it into a

A. n-type semiconductor

B. p-type semiconductor

C. Insulator

D. Intrinsic semiconductor

**Answer: B**

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**30.** In an intrinsic semiconductor at room temperature number of electrons and holes are

A. Equal

B. Zero

C. Unequal

D. Infinity

**Answer: A**

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**31.** In forward bias in a p-n junction, the potential barrier

A. Decreases

B. Increases

C. Remains uncharged

D. Becomes zero

**Answer: A**

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**32.** In a reverse biased condition of a p-n junction

A. The potential barrier increases

B. The potential barrier decreases

C. The current flow increases

D. The potential barrier remains the same

**Answer: A**

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**33.** Which one of the following is an incorrect statement?

A. In an intrinsic semiconductor, the number of holes in the valence band is equal to numher of electrons in the conduction band

B. When heated the conductivity of an intrinsic semiconductor, increases

C. The fermi level lies near the valence band in an intrinsic semiconductor

D. The majority carries in a p-type semiconductor are holes

**Answer: A**

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**34.** Covalent bond exists in

A. Sodium chloride crystal

B. Germanium

C. Copper

D. Helium

**Answer: B**

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**35.** In a p-type semiconductor, the electrical conduction is due to

A. Only holes

B. Only electrons

C. A large number of holes and small number of electrons

D. A large number of electrons and small number of holes

**Answer: C**

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**36.** To obtain p-type extrinsic semiconductor, the impurity element to be added to germanium should be of valency

A. 2

B. 3

C. 4

D. 5

**Answer: B**

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**37.** If a battery is connected across a p-n junction with p-type connected to the negative terminal, the junction is said to be

A. Reverse biased

B. Forward biased

C. Unbiased

D. None of these

**Answer: A**

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**38.** The majority carriers in a p-type semiconductor are

A. Protons

B. Neutrons

C. Electrons

D. Holes

**Answer: D**

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**39.** If an intrinsic semiconductor a pentavalent element is added as impurity, one gets

A. p-type semiconductor

B. n-type semiconductor

C. Insulator

D. None of the above

**Answer: B**

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**40.** In an intrinsic semiconductor the charge carriers responsible for electrical conduction are

A. Electrons

B. Holes

C. Both electrons and holes

D. Neither electrons nor holes

**Answer: C**

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**41.** A semiconductor device which is used for detecting light intensity is called a

A. Solar cells

B. Zener diode

C. LED

D. Photodiode

**Answer: D**

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**42.** A piece of aluminium and germanium each are cooled from $T_1K$ to $T_2K$. The resistance of

A. Each of them decreases

B. Each of them increases

C. Aluminium increases and that of germanium decreases

D. Aluminium decreases and that of germanium increases

**Answer: D**

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**43.** The energy level stationed at the centre of forbidden energy gap of an intrinsic semiconductor is

A. Fermi level

B. Transition level

C. Neutral level

D. None of these

**Answer: A**

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**44.** The method of connecting the negative pole of battery to p-material and positive pole to n-material of a p-n junction is called

A. Forward bias connection

B. Reverse bias connection

C. Both (a) and (b)

D. Neither (a) nor (b)

**Answer: B**

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**45.** When boron is added as impurity to silicon, the resulting material is

A. p-type semiconductor

B. n-type semiconductor

C. Insulator

D. Intrinsic semiconductor

**Answer: A**

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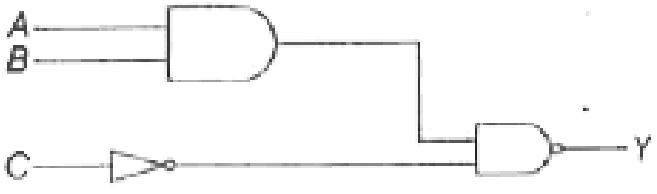
**46.** In the following circuit, the output Y becomes zero for the input combinations.




A. (a)A = 1, B = 0, X = 0

B. (b)A = 0, B = 1, X = 1

C. (c)A = 0, B = 0, X = 0

D. (d)A = 1, B = 1, X = 0

**Answer: D**

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**47.** A crystal of intrinsic silicon at room temperature has a carrier concentration of $1.6 \times 10^6 / m^3$. If the donor concentration level is $4.8 \times 10^{20} / m^3$, then the concentration of holes in the semiconductor is

A. $53 \times 10^{12} / m^3$

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**48.** The output characteristics of an n-p-n transistor represent, ($I_C$ = Collector current, $V_{CE}$ = difference between collector and emitter, $I_B$ = base current, $V_{BB}$ = Voltage given to base, $V_{BE}$ = difference between base and emitter)

A. Changes in $I_C ana I_B$ and $V_{BB}$ are changed

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**49.** In a transistor , the value of $\alpha$ veries between $\frac{20}{21}$ and $\frac{100}{101}$ . Then the value of $\beta$ varies between

A. (10)-(10)

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C. 20-100

D. 200-300

**Answer: C**

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A. 9.5

B. 1

C. 40

D. 20

**Answer: D**

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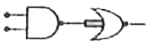
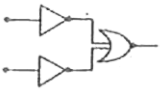
A. 

B. 

C. 

D. 

**Answer: C**

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**52.** In a p-n junction diode, the thickness of deplection layer is $2 \times 10^{-6} m$ and barrier potential is 0.3 V. The intensity of the electric field at the junction is

A. $0.6 \times 10^{-6} Vm^{-1}$ from n to p side

B. $0.6 \times 10^{-6} Vm^{-1}$ from p to n side

C. $1.5 \times 10^{5} Vm^{-1}$ from n to p side

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C. 2000 mA

D. 20 mA

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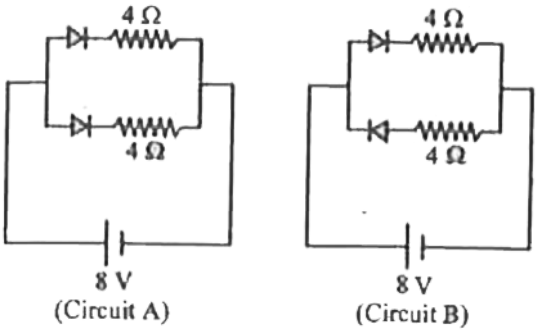


A. 1 A, 2 A

B. 2 A, 1 A

C. 4 A, 2 A

D. 2 A, 4 A

**Answer: C**

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**55.** Which of the following statements is correct when junction diode is in forward bias?

A. The width of depletion region decreases.

B. Free electrons on n-side will move towards the junction.

C. Holes on p-side move towards the junction.

D. Electron on n-side and holes on p-side will move away from junction.

**Answer: A**

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**56.** In an n-type semiconductor, the fermi energy level lies

A. In the forbidden energy gap nearer to the conduction band

B. In the forbidden energy gap nearer to the valence band

C. In the middle forbidden energy gap

D. Outside the forbidden energy gap

**Answer: A**

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**57.** Consider a p-n junction as a capacitor, formed with p and n-materials acting as thin metal electrodes and depletion layer width acting as separation. between them. Biasing on this, assume that a n-p-n transistor is working as an amplifier in CE configuration. If $C_1$ and $C_2$ are the base-emitter and collector-emitter junction capacitance, then

A. $C_1 > C_2$

B. $C_1 < C_2$

C. $C_1 = C_2$

D. $C_1 = C_2 = 0$

**Answer: A**

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**58.** An n-p-n transistor power amplifier in C-E configuration gives

A. Voltage amplification only

B. Current amplification only

C. Both current and voltage amplifications

D. Only power gain of unity

**Answer: C**

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**59.** In n-p-n transistor, in CE configuration

(1) The emitter is heavily doped than the collector

(2) Emitter and collector can be interchanged

(3) The base region is very thin but is heavily doped

(4) The conventional current flows from base to emitter

A. (1) and (2) are correct

B. (1) and (3) are correct

C. (1) and (4) are correct

D. (3) and (2) are correct

**Answer: C**

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**60.** When n-p-n transistor is used as an amplifie

A. Electrons move from base to collector

B. Holes move from emitter to base

C. Holes move from collector to base

D. Holes move from base to emitter

**Answer: A**

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**61.** While a collector to emitter voltage is constant in a transistor, the collector current changes by 8.2 mA when the emitter current changes by 8.3 mA. The value of forward current ratio is

A. 82

B. 83

C. 8.2

D. 8.3

**Answer: A**

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**62.** In a transistor circuit, when the base current is incréased by $50\mu A$ keeping the collector voltage fixed at 2 V, the collector current increase by 1 mA. The current gain of the transistor is

A. 20

B. 40

C. 60

D. 80

**Answer: A**

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**63.** A common emitter transistor amplifier has a current gain of 50. If the load resistance is $4k\Omega$ and input resistance is $500\Omega$, the voltage gain of the amplifier is

A. 100

B. 200

C. 300

D. 400

**Answer: D**

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**64.** Consider the following statement A and B and identify the correct choice of the given answer.

A. The width of the depletion layer in a p-n

junction diode increases in forward bias.

B. In a intrinsic semiconductor the fermi energy level is exactly in the middle of the forbidden energy gap.

A. A is true and B is false

B. Both A and B are false

C. A is false and B is true

D. Both A and B are true

**Answer: C**

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**65.** In intrinsic semiconductor

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 and valence band is near about 1 eV

D. None of above

**Answer: C**

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**66.** The element that can be used as acceptor impurity to dope silicon is

A. Antimony

B. Arsenic

C. Boron

D. Phosphorus

**Answer: C**

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**67.** A hole is

A. A positively charged electron

B. An electron in the valence band

C. An unfulfilled covalent bond

D. An excess electron in covalent bond

**Answer: C**

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**68.** The potential in the depletion layer is due to

A. Electrons

B. Holes

C. Both (a) and (b)

D. Forbidden band

**Answer: C**

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**69.** The value indicated by fermi energy level in an intrinsic semiconductor is

A. The average energy of electrons and holes

B. The energy of electrons in conduction band

C. The energy of holes in valence band

D. The energy of forbidden region

**Answer: A**

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**70.** The two diodes A and B are biased as shown, then

-5V A -9V

-3V B -6V

A. The diodes A and B are reverse biased

B. The diode A is forward biased and B is reverse

C. The diode B is forward biased and A is reverse biased

D. The diodes A and B are forward biased

**Answer: D**

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**71.** A piece of aluminium and germanium each are cooled from $T_1K$ to $T_2K$. The resistance of

A. Aluminium increases and that of germanium decreases

B. Each of them decreases

C. Aluminium decreases and that of germanium increases

D. Each of them increases

**Answer: C**

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**72.** When a p-n junction diode is reverse biased, the thickness of the depletion layer

A. Increases

B. Decreases

C. Become zero

D. Remains constant.

**Answer: A**

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**73.** Energy band gap $E_g$ in an insulator is of the order of

A. 6 eV

B. 0.6 eV

C. $-6eV$

D. zero

**Answer: A**

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**74.** Indium impurity in germanium makes it into a

A. n-type semiconductor

B. p-type semiconductor

C. Insulator

D. Intrinsic semiconductor

**Answer: B**

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**75.** In an intrinsic semiconductor at room temperature number of electrons and holes are

A. Equal

B. Zero

C. Unequal

D. Infinity

**Answer: A**

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**76.** In forward bias in a p-n junction, the potential barrier

A. Decreases

B. Increases

C. Remains uncharged

D. Becomes zero

**Answer: A**

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**77.** In a reverse biased condition of a p-n junction

A. The potential barrier increases

B. The potential barrier decreases

C. The current flow increases

D. The potential barrier remains the same

**Answer: A**

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**78.** Which one of the following is an incorrect statement?

A. In an intrinsic semiconductor, the number of holes in the valence band is equal to numher of electrons in the conduction band

B. When heated the conductivity of an intrinsic semiconductor, increases

C. The fermi level lies near the valence band in an intrinsic semiconductor

D. The majority carries in a p-type semiconductor are holes

**Answer: A**

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**79.** Covalent bond exists in

A. Sodium chloride crystal

B. Germanium

C. Copper

D. Helium

**Answer: B**

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**80.** In a p-type semiconductor, the electrical conduction is due to

A. Only holes

B. Only electrons

C. A large number of holes and small number of electrons

D. A large number of electrons and small number of holes

**Answer: C**

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**81.** To obtain p-type extrinsic semiconductor, the impurity element to be added to germanium should be of valency

A. 2

B. 3

C. 4

D. 5

**Answer: B**

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**82.** If a battery is connected across a p-n junction with p-type connected to the negative terminal, the junction is said to be

A. Reverse biased

B. Forward biased

C. Unbiased

D. None of these

**Answer: A**

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**83.** The majority carriers in a p-type semiconductor are

A. Protons

B. Neutrons

C. Electrons

D. Holes

**Answer: D**

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**84.** If an intrinsic semiconductor a pentavalent element is added as impurity, one gets

A. p-type semiconductor

B. n-type semiconductor

C. Insulator

D. None of the above

**Answer: B**

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**85.** In an intrinsic semiconductor the charge carriers responsible for electrical conduction are

A. Electrons

B. Holes

C. Both electrons and holes

D. Neither electrons nor holes

**Answer: C**

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**86.** A semiconductor device which is used for detecting light intensity is called a

A. Solar cells

B. Zener diode

C. LED

D. Photodiode

**Answer: D**

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**87.** A piece of aluminium and germanium each are cooled from $T_1K$ to $T_2K$. The resistance of

A. Each of them decreases

B. Each of them increases

C. Aluminium increases and that of germanium decreases

D. Aluminium decreases and that of germanium increases

**Answer: D**

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**88.** The energy level stationed at the centre of forbidden energy gap of an intrinsic semiconductor is

A. Fermi level

B. Transition level

C. Neutral level

D. None of these

**Answer: A**

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**89.** The method of connecting the negative pole of battery to p-material and positive pole to n-material of a p-n junction is called

A. Forward bias connection

B. Reverse bias connection

C. Both (a) and (b)

D. Neither (a) nor (b)

**Answer: B**

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**90.** When boron is added as impurity to silicon, the resulting material is

A. p-type semiconductor

B. n-type semiconductor

C. Insulator

D. Intrinsic semiconductor

**Answer: A**

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