CHAPTER

27

Semiconductor Electronics

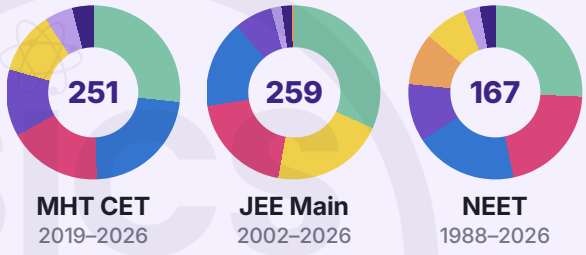
MHT CET · JEE · NEET Physics

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EXAM WEIGHTAGE



	CET	JEE	NEET
Logic Gates	67 (27%)	82 (32%)	43 (26%)
Junction Transistor	57 (23%)	42 (16%)	32 (19%)
P-N Junction Diode	44 (18%)	51 (20%)	35 (21%)
Special Purpose Diodes	29 (12%)	55 (21%)	13 (8%)
Intrinsic & Extrinsic Semiconductors	31 (12%)	18 (7%)	18 (11%)
Energy Bands in Solids	13 (5%)	5 (2%)	5 (3%)
Rectifiers & Filters	10 (4%)	5 (2%)	5 (3%)
Other / Mixed	0 (0%)	1 (0%)	16 (10%)

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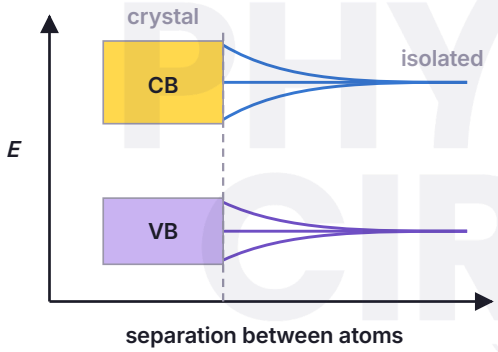
01 CONCEPT Energy Bands in Solids

IN ONE LINE

Atoms packed in a solid turn their sharp energy levels into **bands**. The gap between two bands decides whether the solid conducts.

27.1.1 How bands form

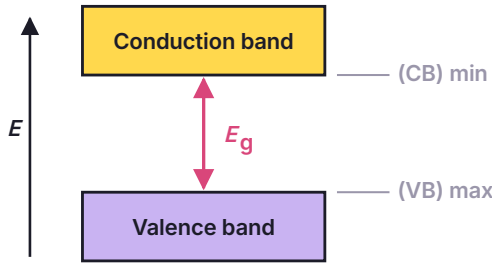
- An isolated atom has sharp, separate energy levels.
- In a crystal, atoms are close and their outer electrons interact.
- By Pauli's exclusion principle no two electrons can share a state, so each level spreads into a band.



Levels spread into bands as atoms come close

27.1.2 Valence band, conduction band, forbidden gap

- **Valence band (VB)**: band of valence electrons, highest filled band at 0 K. These electrons cannot carry current.
- **Conduction band (CB)**: next higher band. Its electrons are free and carry current.
- **Forbidden gap**: no electron can stay here.



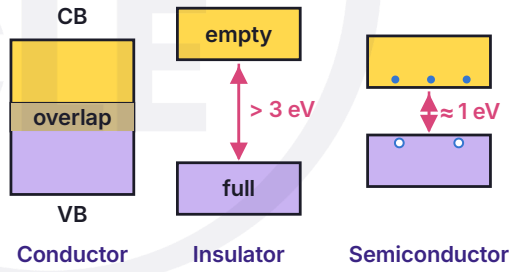
Energy gap between the two bands

$$E_g = (CB)_{min} - (VB)_{max}$$

- E_g falls very slightly as temperature rises.
- Light can lift an electron across only if $h\nu \geq E_g$.

$$\lambda_{max} = \frac{hc}{E_g} = \frac{1240}{E_g\ (eV)}\ nm$$

27.1.3 Conductor, insulator, semiconductor



The band gap sorts all solids

	Conductor	Insulator	Semiconductor
Bands	VB, CB overlap	VB full, CB empty	VB nearly full, CB nearly empty
E_g	zero	> 3 eV (diamond 6 eV)	about 1 eV
ρ (Ω m)	10^{-8} to 10^{-2}	10^{11} to 10^{19}	10^{-5} to 10^{6}
Carriers	free electrons	none	electrons, holes
Examples	Cu, Ag, Al	wood, glass, mica	Si, Ge, GaAs

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27.1.4 Band gaps to remember

Material	E_g
Ge	0.7 eV
Si	1.1 eV
GaAs	1.3 eV
Diamond (C)	6 eV

- So $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$.
- At room temperature a few electrons cross the gap in Si and Ge. Almost none cross in diamond.
- Good conductors have no hole current, because their bands overlap.

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Solved Examples 01 Energy Bands in Solids

SOLVED 1 AIEEE 2004

The manifestation of band structure in solids is due to

(a) Bohr's correspondence principle
(b) Pauli's exclusion principle
(c) Heisenberg's uncertainty principle
(d) Boltzmann's law

STEP 1 In a solid, the outer orbits of neighbouring atoms overlap.
STEP 2 No two electrons can occupy the same state, so each level splits into many closely spaced levels, which form a band.
STEP 3 **Pauli's exclusion principle (B)**

Answer: **(b)**

SOLVED 2 AIPMT 2005

Carbon, silicon and germanium atoms have four valence electrons each. Their valence and conduction bands are separated by energy band gaps represented by $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$ respectively. Which one of the following relationships is true in their case?

(a) $(E_g)_C > (E_g)_{Si}$ (b) $(E_g)_C < (E_g)_{Si}$
(c) $(E_g)_C = (E_g)_{Si}$ (d) $(E_g)_C < (E_g)_{Ge}$

STEP 1 Band gaps: C ≈ 5.4 eV, Si ≈ 1.1 eV, Ge ≈ 0.7 eV.
STEP 2 The gap falls as we go down the group, because the valence electrons are held less tightly.
STEP 3 **$(E_g)_C > (E_g)_{Si}$ (A)**

Answer: **(a)**

SOLVED 3 AIEEE 2005

The electrical conductivity of a semiconductor increases when electromagnetic radiation of wavelength shorter than 2480 nm is incident on it. The band gap in (eV) for the semiconductor is

(a) 2.5 eV (b) 1.1 eV
(c) 0.7 eV (d) 0.5 eV

STEP 1 The longest wavelength that works has photon energy just equal to the band gap.
STEP 2 $E_g = \frac{hc}{\lambda} = \frac{1240 \text{ eV nm}}{2480 \text{ nm}}$
STEP 3 **E_g = 0.5 eV (D)**

Answer: **(d)**

SOLVED 4 MHT CET 2021 · 24 Sep · Shift 2

Choose the correct statement. In conductors

(a) valence band and conduction band overlap each other.
(b) valence band and conduction band are separated by large energy gap.
(c) valence band and conduction band are separated by a small energy gap.
(d) a very small number of electrons are available for electrical conduction.

STEP 1 A conductor has no forbidden gap between its two bands.
STEP 2 Electrons move freely into empty levels, so very many are available for conduction.
STEP 3 **The two bands overlap (A)**

Answer: **(a)**

SOLVED 5 MHT CET 2026 · 16 Apr · Shift 2

Electrical conductivity of insulators is

(a) exactly zero (b) extremely large
(c) extremely small (d) sometimes small and sometimes large

STEP 1 An insulator has a very large band gap.
STEP 2 Only a tiny number of electrons cross it at ordinary temperature, so conductivity is not exactly zero.
STEP 3 **Extremely small (C)**

Answer: **(c)**

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Solved Examples 01 Energy Bands in Solids (contd.)

SOLVED 6 MHT CET 2026 · 11 Apr · Shift 2

In energy band diagram of insulators, a band gap and the conduction band is respectively

(a) very high, empty
(b) very low, empty
(c) very high, completely filled
(d) very low, partially filled

STEP 1 In an insulator, $E_g > 3$ eV, which is very high.
STEP 2 Electrons cannot cross such a gap, so no electrons reach the conduction band.
STEP 3 **Very high, empty (A)**

Answer: **(a)**

SOLVED 7 MHT CET 2021 · 22 Sep · Shift 2

Choose the correct statement. In semiconductors valence band and conduction band

(a) is separated by large energy gap.
(b) is separated by small energy gap.
(c) is almost empty.
(d) overlap each other.

STEP 1 A semiconductor has $E_g < 3$ eV, for example Si $\approx$ 1.1 eV and Ge $\approx$ 0.7 eV.
STEP 2 A large gap means an insulator; overlapping bands mean a conductor.
STEP 3 **Separated by a small energy gap (B)**

Answer: **(b)**

SOLVED 8 MHT CET 2026 · 15 May · Shift 1

In semiconductors, at room temperature the

(a) valence band is partially empty and the conduction band is partially filled.
(b) valence band is completely filled and the conduction band is partially filled.
(c) valence band is completely filled.
(d) conduction band is completely empty.

STEP 1 At room temperature, some valence electrons gain enough thermal energy to cross the small gap.
STEP 2 Each electron that crosses leaves a vacancy (hole) behind in the valence band.
STEP 3 **Valence band partially empty, conduction band partially filled (A)**

Answer: **(a)**

SOLVED 9 MHT CET 2026 · 13 May · Shift 1

There is no hole current in good conductors because they

(a) have large forbidden energy gap.
(b) have overlapping valence and conduction bands.
(c) are full of electrons.
(d) have no valence band.

STEP 1 A hole forms when an electron crosses a gap and leaves a vacancy in a filled valence band.
STEP 2 In a good conductor the bands overlap, so there is no gap to cross and no such vacancy.
STEP 3 **Overlapping valence and conduction bands (B)**

Answer: **(b)**

SOLVED 10 MHT CET 2021 · 22 Sep · Shift 1

Choose the FALSE statement from the following.

(a) Generally, in conductors the valence and conduction bands overlap.
(b) The resistivity of a semiconductor increases with increase in temperature.
(c) The conductivity of a semiconductor increases with increase in temperature.
(d) Substances with energy gap of the order of 10 eV are insulators.

STEP 1 Heating a semiconductor breaks more bonds and creates more electron-hole pairs.
STEP 2 So its conductivity rises and its resistivity falls; statements (A), (C), (D) are true.
STEP 3 **Statement (B) is false**

Answer: **(b)**

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02 CONCEPT Intrinsic & Extrinsic Semiconductors

IN ONE LINE

A pure semiconductor has **equal electrons and holes**. A tiny impurity makes one of them the majority, and conductivity jumps.

27.2.1 Pure semiconductor

- Si and Ge have 4 valence electrons, held in covalent bonds.
- Heat breaks some bonds. Each broken bond gives one free electron and one hole.
- Conduction due only to breaking of covalent bonds is **intrinsic**.
- At 0 K no bond is broken, so pure Si behaves as an insulator.

$$n_e = n_h = n_i$$

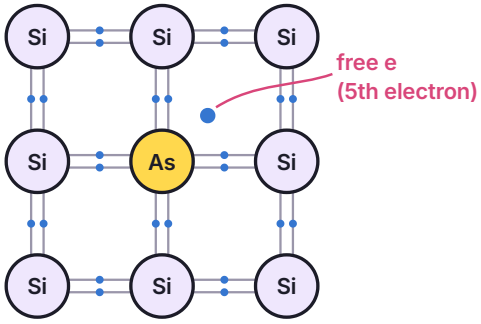
27.2.2 What a hole is

- A hole is a vacancy left by a missing electron.
- It acts like a positive charge +e, though no real positive particle moves.
- A neighbouring electron fills it, so the hole appears to move.
- Holes are slower than electrons: $v_e > v_h$.

27.2.3 Adding impurity

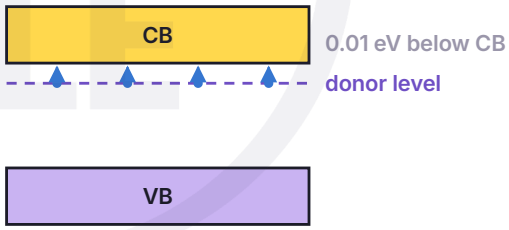
- Doping adds about 1 impurity atom per 10^6 to 10^8 host atoms.
- Generally it **decreases** the resistivity sharply.
- A doped semiconductor is called **extrinsic**, and $n_e \neq n_h$.

27.2.4 Pentavalent impurity



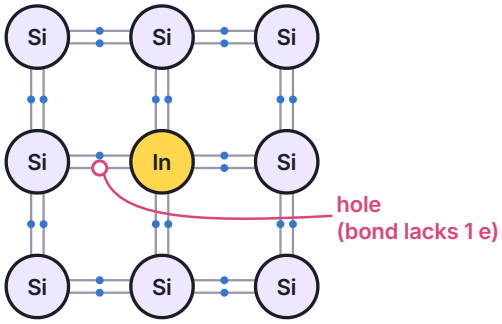
Four electrons of As bond; the fifth is free

- Dopants (5 valence electrons): P, As, Sb. They are **donors**.
- Majority carriers: electrons. Minority carriers: holes.
- $n_e \gg n_h$, and the crystal stays electrically **neutral**.
- Free electrons occupy the **donor level**, in the gap just below the CB.



Donor level just below the conduction band

27.2.5 Trivalent impurity



In has only 3 valence electrons, so one bond has a hole

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SEMICONDUCTOR

ELECTRONICS

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

298	27	8
questions	concepts	topics

CONTENTS

01	Energy Bands in Solids	Q 1–17	17 Qs
02	Intrinsic & Extrinsic Semiconductors	Q 18–68	51 Qs
03	P-N Junction Diode	Q 69–123	55 Qs
04	Rectifiers & Filters	Q 124–137	14 Qs
05	Special Purpose Diodes	Q 138–177	40 Qs
06	Junction Transistor	Q 178–245	68 Qs
07	Logic Gates	Q 246–289	44 Qs
08	Other / Mixed	Q 290–298	9 Qs
	Answer key		

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TOPIC 01

Energy Bands in Solids

17 PYQs · Easy 17 · Medium 0 · Difficult 0 | MHT CET 11 · NEET 4 · JEE 2

Concepts covered: Band formation & band gap (1) · Conductors, insulators & semiconductors (16)

LEVEL 1 · EASY 17 questions

◆ Band formation & band gap 1 Q

1. The manifestation of band structure in solids is due to
AIEEE 2004
(a) Bohr's correspondence principle
(b) Pauli's exclusion principle
(c) Heisenberg's uncertainty principle
(d) Boltzmann's law

◆ Conductors, insulators & semiconductors 16 Qs

2. In semiconductors, at room temperature the
MHT CET 2026 · 15 MAY · SHIFT 1
(a) valance band is partially empty and the conduction band is partially filled.
(b) valance band is completely filled and the conduction band is partially filled.
(c) valance band is completely filled.
(d) conduction band is completely empty.

3. Electrical conductivity of insulators is
MHT CET 2026 · 16 APR · SHIFT 2
(a) exactly zero
(b) extremely large
(c) extremely small
(d) sometimes small and sometimes large

4. In energy band diagram of insulators, a band gap and the conduction band is respectively
MHT CET 2026 · 11 APR · SHIFT 2
(a) very high, empty
(b) very low, empty
(c) very high, completely filed
(d) very low, partially filled

5. In semiconductors at room temperature,
MHT CET 2024 · 10 MAY · SHIFT 2
(a) the valence band is completely filled and the conduction band partially filled.
(b) the valence band is completely filled.
(c) the conduction band is completely filled.
(d) the valence band is partially empty and the conduction band partially filled.

6. In semiconductors at room temperature,
MHT CET 2024 · 2 MAY · SHIFT 1
(a) the valence band is completely filled.
(b) the conduction band is completely empty.
(c) the conduction band is partially filled and the valence band is partially empty.
(d) the valence band is completely filled and conduction band is partially empty.

7. In semiconductors at room temperature,
MHT CET 2023 · 14 MAY · SHIFT 1
(a) the valence band is completely filled
(b) the conduction band is completely filled
(c) the condition band is partially filled and valence band is partially empty
(d) the valence band is completely filled and the conduction band is partially filled

8. In energy band diagram of insulators, a band gap and the conduction band is respectively
MHT CET 2023 · 11 MAY · SHIFT 1
(a) very low and partially filled.
(b) very high and completely filled.
(c) very high and empty.
(d) very low and empty.

9. In insulators
MHT CET 2023 · 10 MAY · SHIFT 1
(a) valence band is empty and conduction band is filled with electrons.
(b) conduction band is empty and valence band is completely filled with electrons.
(c) valence band is partially filled.
(d) conduction band is partially filled with electrons.

10. Choose the correct statement. In conductors
MHT CET 2021 · 24 SEP · SHIFT 2
(a) valance band and conduction band overlap each other.
(b) valance band and conduction band are separated by large energy gap.
(c) valancè band and conduction band are separated by a small energy gap.
(d) a very small number of electrons are available for electrical conduction.

11. Choose the correct statement. In semiconductors valance band and conduction band
MHT CET 2021 · 22 SEP · SHIFT 2
(a) is separated by large energy gap.
(b) is separated by small energy gap:
(c) is almost empty.
(d) overlap each other.

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12. In the case of insulators, a band gap and conduction band is respectively

MHT CET 2021 · 20 SEP · SHIFT 2

(a) very high empty.
(b) very low, partially filled
(c) very high, completely filled
(d) very low, empty.

13. On the basis of electrical conductivity, which one of the following materials has the smallest resistivity?

NEET 2023

(a) Germanium (b) Silver
(c) Glass (d) Silicon

14. Choose the only false statement from the following.

AIPMT 2005

(a) In conductors the valence and conduction bands overlap.
(b) Substances with energy gap of the order of 10 eV are insulators.
(c) The resistivity of a semiconductor increases with increase in temperature.
(d) The conductivity of a semiconductor increases with increase in temperature.

15. Carbon, silicon and germanium atoms have four valence electrons each. Their valence and conduction bands are separated by energy band gaps represented by (Eg)C, (Eg)si and (Eg)Ge respectively. Which one of the following relationships is true in their case?

AIPMT 2005

(a) (Eg)C > (Eg)Si (b) (Eg)C < (Eg)Si
(c) (Eg)C = (Eg)Si (d) (Eg)C < (Eg)Ge.

16. In semiconductors at a room temperature

AIPMT 2004

(a) the valence band is partially empty and the conduction band is partially filled
(b) the valence band is completely filled and the conduction band is partially filled
(c) the valence band is completely filled
(d) the conduction band is completely empty

17. The energy band gap is maximum in

AIEEE 2002

(a) metals (b) superconductors
(c) insulator (d) semiconductor

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TOPIC 02

Intrinsic & Extrinsic Semiconductors

51 PYQs · Easy 51 · Medium 0 · Difficult 0 | MHT CET 28 · NEET 15 · JEE 8

Concepts covered: Intrinsic semiconductors (6) · n-type & p-type doping (24) · Mass action law (7) · Effect of temperature (14)

LEVEL 1 · EASY 51 questions

◆ Intrinsic semiconductors 6 Qs

18. In an intrinsic semiconductor, at any ordinary temperature, the correct relation between the number of electrons per unit volume (n_e) and number of holes per unit volume (n_h) is
MHT CET 2026 · 14 MAY · SHIFT 2
(a) $n_e = n_h$ (b) $n_e > n_h$
(c) $n_e < n_h$ (d) $n_e = n_h = 0$

19. For intrinsic semiconductor, if n_h and n_e represent the number of holes per unit volume and the number of free electrons per unit volume respectively then
MHT CET 2026 · 18 APR · SHIFT 2
(a) $n_h < n_e$ (b) $n_h > n_e$ (c) $n_h = n_e$ (d) $n_h \neq n_e$

20. When the conductivity of a semiconductor is only due to breaking of covalent bonds, the semiconductor is called
MHT CET 2026 · 11 APR · SHIFT 1
(a) extrinsic. (b) intrinsic.
(c) p-type. (d) n-type.

21. When the conductivity of a semiconductor is only due to the breaking of the covalent bonds, the semiconductor is called
MHT CET 2023 · 14 MAY · SHIFT 2
(a) donor (b) intrinsic
(c) acceptor (d) extrinsic

22. For an intrinsic semiconductor (n_h and n_e are the number of holes per unit volume and number of electrons per unit volume respectively)
MHT CET 2023 · 9 MAY · SHIFT 1
(a) $n_h < n_e$ (b) $n_h = n_e$ (c) $n_h = \frac{n_c}{2}$ (d) $n_h > n_e$

23. In an intrinsic semiconductor, at an ordinary temperature, the correct relation between the number of electrons per unit volume n_e and number of holes per unit volume n_h.
MHT CET 2020 · 19 OCT · SHIFT 2
(a) $n_e = n_h$ (b) $n_e > n_h$
(c) $n_e < n_h$ (d) $n_e = n_h = 0$

◆ n-type & p-type doping 24 Qs

24. In the energy band diagram of a p-type semiconductor, the "Acceptor Energy Level" is located
MHT CET 2026 · 19 MAY · SHIFT 2
(a) exactly in the middle of the forbidden gap
(b) inside the conduction band
(c) just below the conduction band
(d) just above the valence band

25. At room temperature, a p-type semiconductor has
MHT CET 2026 · 15 MAY · SHIFT 2
(a) large number of holes and few electrons
(b) large number of free electrons and few holes
(c) equal number of free electrons and holes
(d) no electrons or holes

26. In the band structure of n-type semiconductor, the free electrons donated by impurity atoms occupy energy levels in
MHT CET 2026 · 20 APR · SHIFT 1
(a) the conduction band.
(b) the valence band.
(c) the band gap and are close to conduction band.
(d) the band gap and are close to valence band.

27. In n-type semiconductor
A) pentavalent impurity are dopants and holes are majority carriers.
B) trivalent impurity are dopants and electrons are minority carriers.
C) pentavalent impurity are dopants and electrons are majority carriers.
D) trivalent impurity are dopants and holes are majority carriers.
MHT CET 2026 · 19 APR · SHIFT 1
(a) A (b) C (c) B (d) D

28. When a small amount of impurity atoms are added to a semiconductor then generally its resistivity
MHT CET 2026 · 16 APR · SHIFT 1
(a) increases
(b) decreases
(c) does not change
(d) may increase or decrease depending upon the percentage of doping

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29. Which of the following statements is TRUE for n-type semiconductor?
MHT CET 2025 · 23 APR · SHIFT 1
(a) Holes are majority carriers and trivalent atoms are dopants.
(b) Electrons are majority carriers and trivalent atoms are dopants.
(c) Holes are minority carriers and pentavalent atoms are dopants.
(d) Electrons are minority carriers and pentavalent atoms are dopants.

30. In n-type semiconductor, free electrons donated by the impurity atoms occupy energy levels in
MHT CET 2025 · 22 APR · SHIFT 2
(a) the conduction band.
(b) the valence band.
(c) the band gap and are close to the conduction band.
(d) the band gap and are close to the valence band.

31. When a small amount of impurity atoms are added to semiconductor, then generally its resistivity
MHT CET 2024 · 16 MAY · SHIFT 2
(a) may increase or decrease depending upon the percentage of doping.
(b) increases.
(c) decreases.
(d) does not change.

32. In an extrinsic n-type semiconductor, the free electrons donated by the impurity atoms occupy energy levels in
MHT CET 2024 · 15 MAY · SHIFT 1
(a) the conduction band.
(b) the valance band.
(c) the band gap and are close to conduction band.
(d) the band gap and are close to valance band.

33. Which one of the following statements is true? A p-type semiconductor is doped with
MHT CET 2024 · 3 MAY · SHIFT 2
(a) trivalent impurity and electrons are majority carriers.
(b) pentavalent impurity and electrons are minority carriers.
(c) pentavalent impurity and holes are minority carriers.
(d) trivalent impurity and holes are majority carriers.

34. Doping of a semiconductor (with small impurity atoms) generally changes the resistivity as follows.
MHT CET 2023 · 13 MAY · SHIFT 2
(a) Decreases
(b) Does not change
(c) May increase or decrease depending on the dopant
(d) Increase

35. When a small amount of impurity atoms are added to a semiconductor, then generally its resistivity
MHT CET 2020 · 16 OCT · SHIFT 1
(a) may increase or decrease depending upon the percentage of doping
(b) increases
(c) decreases
(d) does not change

36. A p-type extrinsic semiconductor is obtained when Germanium is doped with:
NEET 2023
(a) Antimony (b) Phosphorous
(c) Arsenic (d) Boron

37. An intrinsic semiconductor is converted into n-type extrinsic semiconductor by doping it with
NEET 2020 · PHASE 2
(a) Germanium (b) Phosphorous
(c) Aluminium (d) Silver

38. For a p-type semiconductor, which of the following statements is true?
NEET 2019
(a) Holes are the majority carriers and trivalent atoms are the dopants.
(b) Holes are the majority carriers and pentavalent atoms are the dopants.
(c) Electrons are the majority carriers and pentavalent atoms are the dopants
(d) Electrons are the majority carriers and trivalent atoms are the dopants.

39. In a n-type semiconductor, which of the following statements is true?
NEET 2013
(a) Holes are minority carriers and pentavalent atoms are dopants.
(b) Holes are majority carriers and trivalent atoms are dopants.
(c) Electrons are majority carriers and trivalent atoms are dopants.
(d) Electrons are minority carriers and pentavalent atoms are dopants.

40. If a small amount of antimony is added to germanium crystal
AIPMT 2011 · PRELIMS
(a) it becomes a p-type semiconductor
(b) the antimony becomes an acceptor atom
(c) there will be more free electrons than holes in the semiconductor
(d) its resistance is increased

41. Which one of the following statement is false?
AIPMT 2010 · PRELIMS
(a) Pure Si doped with trivalent impurities gives a p-type semiconductor.
(b) Majority carries in a n-type semiconductor are

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holes.
(c) Minority carries in a p-type semiconductor are electrons.
(d) The resistance of intrinisic semiconductor decreases with increase of temperature.

42. Which of the following when added as an impurity into silicon produces n-type semiconductor?
AIPMT 1999
(a) P (b) Al (c) B (d) Mg

43. In a junction diode, the holes are due to
AIPMT 1999
(a) protons (b) extra electrons
(c) neutrons (d) missing electrons

44. In p-type semiconductor, the major charge carriers are
AIPMT 1999
(a) holes (b) electrons
(c) protons (d) neutrons

45. To obtain a p-type germanium semiconductor, it must be doped with
AIPMT 1997
(a) indium (b) phosphorus
(c) arsenic (d) antimony

46. When arsenic is added as an impurity to silicon, the resulting material is
AIPMT 1996
(a) n-type conductor (b) n-type semiconductor
(c) p-type semiconductor (d) none of these

47. Statement I: By doping silicon semiconductor with pentavalent material, the electrons density increases.
Statement II: The n-type semiconductor has net negative charge.
In the light of the above statements, choose the most appropriate answer from the options given below:
JEE MAIN 2021 · 26 AUG · SHIFT 1
(a) Statement - I is true but Statement - II is false.
(b) Statement - I is false but Statement - II is true.
(c) Both Statement I and Statement II are true.
(d) Both Statement I and Statement II are false.

◆ Mass action law 7 Qs

48. Pure silicon crystal at 300K has equal electron and hole concentration 2×10^{16} per m^3. Doping by indium increases hole concentration to 4×10^{22} per m^3. Electron concentration in doped silicon is
MHT CET 2026 · 12 MAY · SHIFT 2
(a) $5 \times 10^9/m^3$ (b) $10^{10}/m^3$
(c) $8 \times 10^{10}/m^3$ (d) $10^9/m^3$

49. A pure silicon crystal at temperature 300 K has electron and hole concentration (n_i) 10^{16} per m^3 each and 10^{21} phosphorus atoms (n_e) are added per cubic metre. The new hole concentration in silicon crystal is
MHT CET 2026 · 13 APR · SHIFT 2
(a) 10^{19} per m^3 (b) 10^{21} per m^3
(c) 10^5 per m^3 (d) 10^{11} per m^3

50. In a pure silicon crystal electron-hole concentration is 10^{16} per m^3 at 301 K. Now 10^{21} atoms of phosphorus are added per cubic metre. The new hole concentration in silicon is (in per m^3)
MHT CET 2025 · 22 APR · SHIFT 1
(a) 10^5 (b) 10^{11} (c) 10^{19} (d) 10^{21}

51. If ' n_e ' and ' n_h ' are the number of electrons and number of holes respectively in a semiconductor heavily doped with phosphorus then
MHT CET 2024 · 11 MAY · SHIFT 1
(a) $n_e \gg n_h$ (b) $n_e \ll n_h$ (c) $n_e \leqslant n_h$ (d) $n_e = n_h$

52. In a pure silicon, number of electrons and holes per unit volume are $1.6 \times 10^{16}\ m^{-3}$. If silicon is doped with Boron in a way that on doping hole density increases to $4 \times 10^{22}\ m^{-3}$. Then electron density in doped semiconductor will be
MHT CET 2021 · 21 SEP · SHIFT 1
(a) $6.4 \times 10^{-9}\ m^{-3}$ (b) $6.4 \times 10^{9}\ m^{-3}$
(c) $6.4 \times 10^{-10}\ m^{-3}$ (d) $6.4 \times 10^{10}\ m^{-3}$

53. Pure Si at 500 K has equal number of electron (ne) and hole (nh) concentrations of 1.5 × 1016 m−3. Doping by indium increases nh to 4.5 × 1022 m−3. The doped semiconductor is of
AIPMT 2011 · MAINS
(a) p-type having electron concentration ne = 5 × 109 m^{-3}
(b) n-type with electron concentration ne = 5 × 1022 m^{-3}
(c) p-type with electron concentration ne = 2.5 × 1010 m^{-3}
(d) n-type with electron concentration ne = 2.5 × 1023 m^{-3}

54. In a semiconductor, the number density of intrinsic charge carries at 27 °C is 1.5 × 1016/m3. If the semiconductor is doped with impurity atom, the hole density increases to 4.5 × 1022/m3. The electron density in the doped semiconductor is _____ × 109/m3.
JEE MAIN 2021 · 25 JUL · SHIFT 2 *(Numerical)*

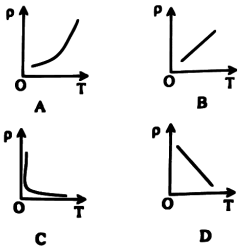
◆ Effect of temperature 14 Qs

55. A piece of semiconductor is connected in series in an electric circuit. On increasing the temperature, the current in the circuit will
MHT CET 2025 · 25 APR · SHIFT 2
(a) decrease. (b) remain unchanged.
(c) increase. (d) stop flowing.

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56. By increasing the temperature, the specific resistance of a conductor and a semiconductor respectively
MHT CET 2025 · 23 APR · SHIFT 2
(a) increases, increases.
(b) decreases, decreases.
(c) increases, decreases.
(d) decreases, increases.

57. Which graph shows correctly the temperature (T). dependence of resistivity (ρ) of a semiconductor?
MHT CET 2025 · 21 APR · SHIFT 1



(a) C (b) A (c) D (d) B

58. When the temperature of a semiconductor is increased, its resistance and electric conductivity respectively.
MHT CET 2021 · 23 SEP · SHIFT 2
(a) increases and decreases
(b) decreases and decreases
(c) increases and increases
(d) decreases and increases

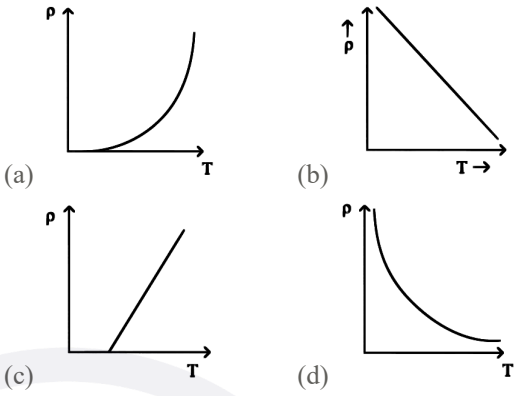
59. At absolute zero temperature, pure silicon behaves as
MHT CET 2020 · 16 OCT · SHIFT 2
(a) non-metal
(b) insulator
(c) metal
(d) extrinsic semiconductor

60. As the temperature increases, the electrical resistance
NEET 2022 · PHASE 1
(a) Increases for both conductors and semiconductors
(b) Decreases for both conductors and semiconductors
(c) Increases for conductors but decreases for semiconductors
(d) Decreases for conductors but increases for semiconductors

61. A piece of copper and other of germanium are cooled from the room temperature to 80 K, then
AIPMT 1992
(a) resistance of each will increase
(b) resistance of copper will decrease
(c) the resistance of copper will increase while that of germanium will decrease
(d) the resistance of copper will decrease while that of germanium will increase

62. At absolute zero, Si acts as
AIPMT 1988
(a) non metal (b) metal
(c) insulator (d) none of these

63. The resistivity (ρ) of semiconductor varies with temperature. Which of the following curve represents the correct behaviour:
JEE MAIN 2023 · 6 APR · SHIFT 1



64. The effect of increase in temperature on the number of electrons in conduction band (n_e) and resistance of a semiconductor will be as:
JEE MAIN 2023 · 31 JAN · SHIFT 1
(a) n_e decreases, resistance increases
(b) Both n_e and resistance increase
(c) n_e increases, resistance decreases
(d) Both n_e and resistance decrease

65. A piece of copper and another of germanium are cooled from room temperature to $77K$, the resistance of
AIEEE 2004
(a) copper increases and germanium decreases
(b) each of them decreases
(c) each of them increases
(d) copper decreases and germanium increases

66. A strip of copper and another of germanium are cooled from room temperature to $80K$. The resistance of
AIEEE 2003
(a) each of these decreases
(b) copper strip increases and that of germanium decreases
(c) copper strip decreases and that of germanium increases
(d) each of these increases

67. At absolute zero, Si acts as
AIEEE 2002
(a) non-metal (b) metal
(c) insulator (d) none of these

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68. By increasing the temperature, the specific resistance of a conductor and a semiconductor

AIEEE 2002

(a) increases for both (b) decreases for both
(c) increases, decreases (d) decreases, increases

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TOPIC 03

P-N Junction Diode

55 PYQs · Easy 55 · Medium 0 · Difficult 0 | MHT CET 24 · NEET 20 · JEE 11

Concepts covered: Depletion layer & barrier (14) · Forward & reverse bias (33) · I-V curve & dynamic resistance (1) · Diode circuits (7)

LEVEL 1 · EASY 55 questions

◆ Depletion layer & barrier 14 Qs

69. In the middle of the depletion region of reversed biased p-n junction the
MHT CET 2026 · 14 MAY · SHIFT 1
(a) electric field is zero
(b) potential is infinite
(c) electric field is maximum
(d) potential is zero

70. The depletion region of p-n junction
MHT CET 2026 · 20 APR · SHIFT 2
(a) increases if reverse biased.
(b) increases if forward biased.
(c) decreases if reverse biased.
(d) remains same in reverse and forward biasing.

71. In the depletion layer of reverse biased p-n junction, the
MHT CET 2025 · 19 APR · SHIFT 1
(a) electric field is very small.
(b) potential is maximum.
(c) electric field is maximum.
(d) potential is zero.

72. The depletion layer in p-n junction region is caused by
MHT CET 2024 · 4 MAY · SHIFT 2
(a) drift of electrons.
(b) migration of impurity ions.
(c) diffusion of charge carries.
(d) drift of holes.

73. The potential barrier in p-n junction diode is due to
MHT CET 2024 · 2 MAY · SHIFT 2
(a) depletion of positive charges near the junction.
(b) accumulation of positive charges near the junction.
(c) depletion of negative charges near the junction.
(d) accumulation of positive and negative charges near the junction.

74. In case of p-n junction diode, the width of depletion region is
MHT CET 2019 · 2 MAY · SHIFT 2
(a) decreased with heavy doping
(b) increased by reverse biasing
(c) decreased with light doping
(d) increased by forward biasing

75. The increase in the width of the depletion region in a p-n junction diode is due to:
NEET 2020 · PHASE 1
(a) reverse bias only
(b) both forward bias and reverse bias
(c) increase in forward current
(d) forward bias only

76. In an unbiased p-n junction, holes diffuse from the p-region to n-region because of
NEET 2013
(a) The attraction of free electrons of n-region.
(b) The higher hole concentration in p-region than that in n-region.
(c) The higher concentration of electrons in the n-region than that in the p-region.
(d) The potential difference across the p-n junction.

77. Depletion layer consists of
AIPMT 1999
(a) electrons
(b) protons
(c) mobile charge carriers
(d) immobile ions

78. The cause of the potential barrier in a p-n diode is
AIPMT 1998
(a) depletion of positive charges near the junction
(b) concentration of positive charges near the junction
(c) depletion of negative charges near the junction
(d) concentration of positive and negative charges near the junction

79. The depletion layer in the p-n junction region is caused by
AIPMT 1991
(a) drift of holes
(b) diffusion of charge carriers
(c) migration of impurity ions
(d) drift of electrons

80. In an unbiased n-p junction electrons diffuse from n - region to p - region because:
JEE MAIN 2015 · 10 APR · SHIFT 1
(a) holes in p - region attract them
(b) electrons travel across the junction due to potential difference
(c) electron concentration in n - region is more as compared to that in p - region
(d) only electrons move from n to p region and not the vice - versa

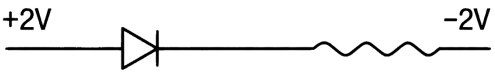
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81. In the middle of the depletion layer of a reverse-biased p-n junction, the
AIEEE 2003
(a) electric field is zero
(b) potential is maximum
(c) electric field is maximum
(d) potential is zero

82. If the potential barrier across a p-n junction is 0.6 V. Then the electric field intensity, in the depletion region having the width of 6×10^{-6} m, will be _____ $\times 10^5$ N/C.
JEE MAIN 2022 · 29 JUL · SHIFT 1 *(Numerical)*

◆ Forward & reverse bias 33 Qs

83. The forward biased diode connection is
MHT CET 2026 · 13 MAY · SHIFT 2

(a) 

(b) 

(c) 

(d) 

84. A diode and resistance are connected as shown in figures.

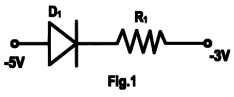


Fig.1

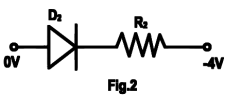


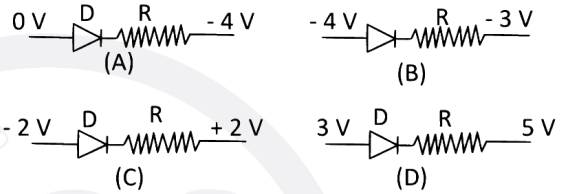
Fig.2

Out of the following statements, which one is true?
Diode in
A) fig (1) and fig (2) are both forward biased.
B) fig (1) and fig (2) are both reverse biased.
C) fig (1) is forward biased and in fig (2) is reverse biased.
D) fig (1) is reverse biased and in fig (2) is forward biased.
MHT CET 2026 · 18 APR · SHIFT 1
(a) D (b) B (c) A (d) C

85. For a p-n junction diode, breakdown voltage occurs when
MHT CET 2026 · 15 APR · SHIFT 1
(a) reverse bias is decreased
(b) reverse bias is not changed
(c) reverse-bias is increased
(d) forward bias is increased

86. If p-n junction diode is forward biased then
MHT CET 2026 · 15 APR · SHIFT 1
(a) width of depletion layer decreases.
(b) width of depletion layer increases.
(c) barrier voltage increases
(d) electric conduction is not possible

87. Which of the following figure represents forward bias diode?
MHT CET 2025 · 5 MAY · SHIFT 2



(a) A (b) C (c) D (d) B

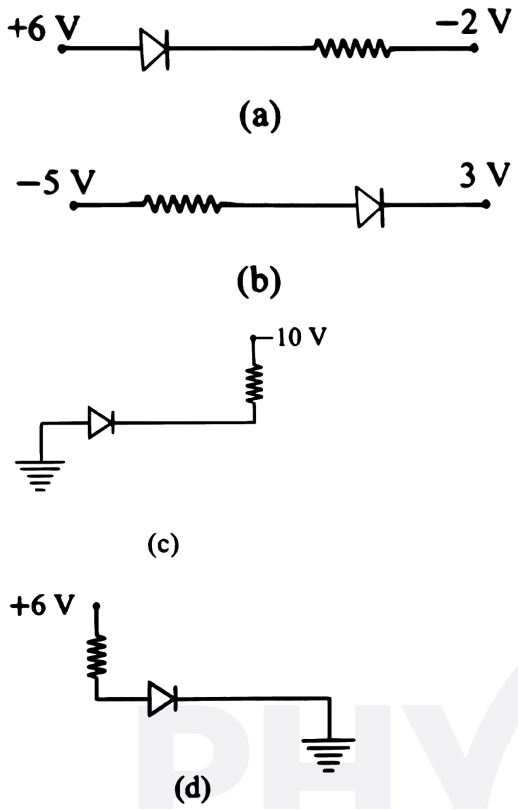
88. If p-n junction diode is forward biased, then
MHT CET 2025 · 26 APR · SHIFT 2
(a) electric conduction is not possible.
(b) width of depletion layer decreases.
(c) width of depletion layer increases.
(d) barrier voltage increases.

89. Applying forward bias to p-n junction, the potential barrier
MHT CET 2025 · 26 APR · SHIFT 1
(a) increases. (b) decreases.
(c) remains unchanged. (d) becomes zero.

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90. In which of the following figures, the p.n. junction diode is reverse biased?

MHT CET 2025 · 25 APR · SHIFT 1



(a) c (b) d (c) b (d) a

91. A p-n junction diode cannot be used

MHT CET 2024 · 11 MAY · SHIFT 1

(a) as a rectifier.
(b) for converting light energy to electrical energy.
(c) for getting light radiation.
(d) for increasing the amplitude of an a.c. signal.

92. A semiconductor device X is connected in series with a battery and a resistor. The current of 10 mA is found to pass through the circuit. If the terminals of X are connected in reverse manner, the current drops to almost zero. X may be

MHT CET 2024 · 4 MAY · SHIFT 1

(a) a zener diode
(b) a p-n junction diode
(c) an intrinsic semiconductor
(d) an extrinsic semiconductor

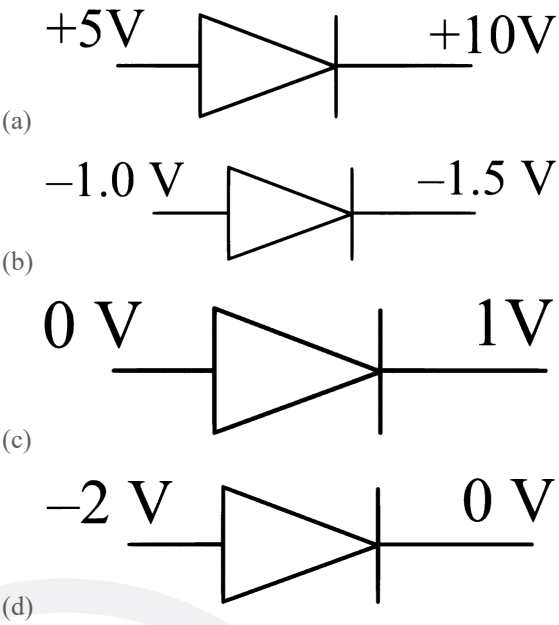
93. On increasing the reverse bias to a large value in a P-N junction diode, current

MHT CET 2023 · 13 MAY · SHIFT 1

(a) increase slowly. (b) remains fixed.
(c) suddenly increases. (d) decreases slowly.

94. In which figure, the junction diode is forward biased?

MHT CET 2023 · 12 MAY · SHIFT 2



95. When forward bias is applied to a p-n junction, then what happens to the potential barrier (V_B) and the width (X) of the depletion region?

MHT CET 2023 · 12 MAY · SHIFT 1

(a) V_B increase, X decreases
(b) V_B decreases, X increase
(c) V_B increase, X increase
(d) V_B decreases, X decreases

96. If p-n junction diode is in forward bias then

MHT CET 2023 · 11 MAY · SHIFT 2

(a) width of depletion layer increases
(b) electric conduction is not possible at all
(c) barrier voltage increases
(d) width of depletion layer decreases

97. In the reverse biasing of a p-n junction diode:

MHT CET 2023 · 9 MAY · SHIFT 2

(a) the width of the depletion layer decreases.
(b) the width of the depletion layer increases.
(c) the number of minority charge carriers increase.
(d) the number of majority charge carriers increase.

98. Two statements are given below:

A. When the forward bias voltage across a p-n junction diode increases above a certain threshold voltage, the diode current increases significantly.

B. This current is called reverse saturation current.

Choose the correct answer from the options given below:

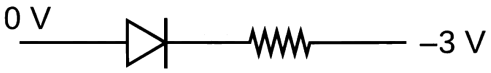
NEET 2026

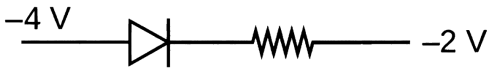
(a) Both Statements A and B are true
(b) Statement A is true, but Statement B is false
(c) Both Statements A and B are false
(d) Statement A is false, but Statement B is true

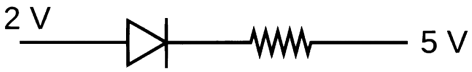
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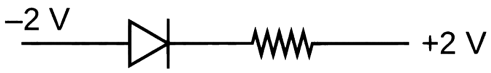
99. Out of the following which one is a forward biased diode?

NEET 2020 · PHASE 2

(a) 

(b) 

(c) 

(d) 

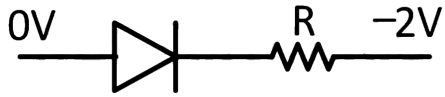
100. Which one of the following represents forward bias diode?

NEET 2017

(a) 

(b) 

(c) 

(d) 

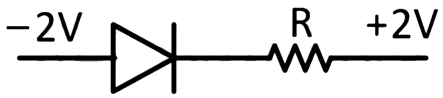
101. In forward biasing of the p-n junction

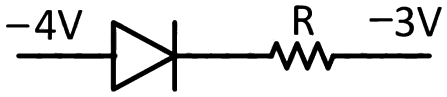
AIPMT 2011 · PRELIMS

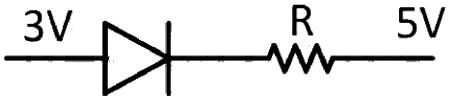
(a) the positive terminal of the battery is connected to p-side and the depletion region becomes thick.
(b) the positive terminal of the battery is connected to n-side and the depletion region becomes thin.
(c) the positive terminal of the battery is connected to n-side and the depletion region becomes thick.
(d) the positive terminal of the battery is connected to p-side and the depletion region becomes thin.

102. Which one of the following represents forward bias diode?

AIPMT 2006

(a) 

(b) 

(c) 

(d) 

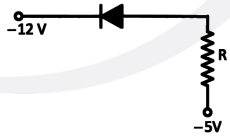
103. Application of a forward bias to a p-n junction

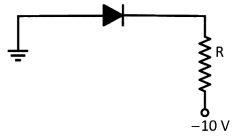
AIPMT 2005

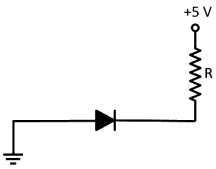
(a) widens the depletion zone
(b) increases the potential difference across the depletion zone
(c) increases the number of donors on the n side
(d) decreases the electric field in the depletion zone.

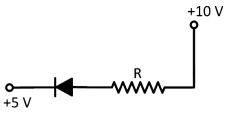
104. Of the diodes shown in the following diagrams, which one is reverse biased?

AIPMT 2004

(a) 

(b) 

(c) 

(d) 

105. Reverse bias applied to a junction diode

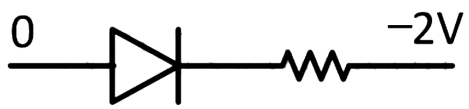
AIPMT 2003

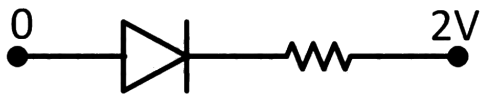
(a) lowers the potential barrier
(b) raises the potential barrier
(c) increases the majority carrier current
(d) increases the minority carrier current

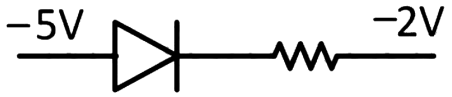
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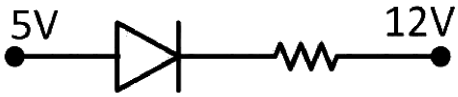
106. From the following diode circuit, which diode is in forward biased condition

AIPMT 2000

(a) 

(b) 

(c) 

(d) 

107. In forward bias the width of depletion layer in a p-n junction diode

AIPMT 1999

(a) increases
(b) decreases
(c) remains constant
(d) first increases then decreases

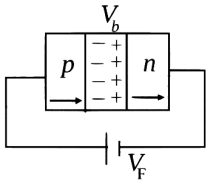
108. A semi-conducting device is connected in a series in circuit with a battery and a resistance. A current is allowed to pass through the circuit. If the polarity of the battery is reversed, the current drops to almost zero. The device may be

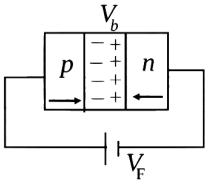
AIPMT 1998

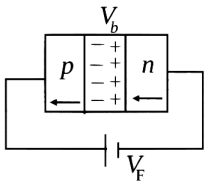
(a) a p-n junction
(b) an intrinsic semiconductor
(c) a p-type semiconductor
(d) an n-type semiconductor

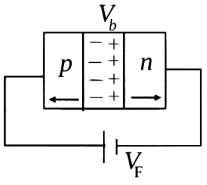
109. In the case of forward biasing of p-n junction, which one of the following figures correctly depicts the direction of flow of carriers?

AIPMT 1995

(a) 

(b) 

(c) 

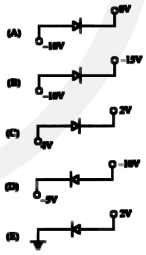
(d) 

110. p-n junction is said to be forward biased, when

AIPMT 1988

(a) the positive pole of the battery is joined to the p-semiconductor and negative pole to the n-semiconductor
(b) the positive pole of the battery is joined to the n-semiconductor and p-semiconductor
(c) the positive pole of the battery is connected to n-semiconductor and p-semiconductor
(d) mechanical force is applied in the forward direction

111. Which of the following circuits represents a forward biased diode?



Choose the correct answer from the options given below:

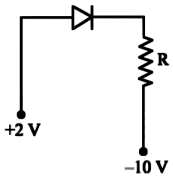
JEE MAIN 2025 · 22 JAN · SHIFT 1

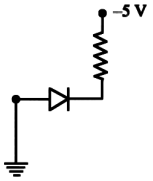
(a) (C) and (E) only
(b) (A) and (D) only
(c) (B), (D) and (E) only
(d) (B), (C) and (E) only

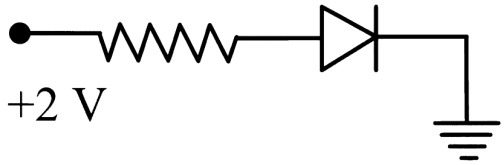
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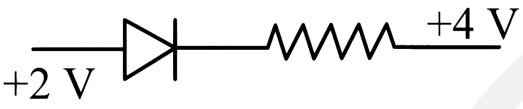
112. Which of the following circuits is reverse - biased?

JEE MAIN 2024 · 27 JAN · SHIFT 1

(a) 

(b) 

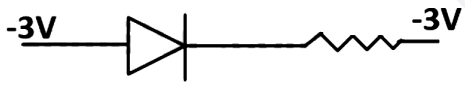
(c) 

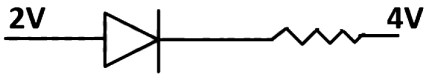
(d) 

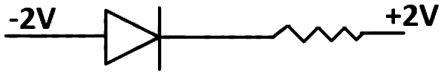
113. The forward biased diode connection is:

JEE MAIN 2014

(a) 

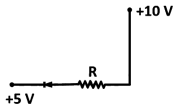
(b) 

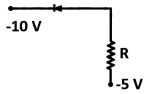
(c) 

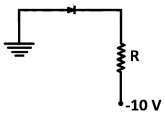
(d) 

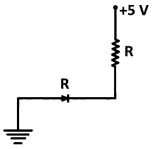
114. In the following, which one of the diodes is reverse biased?

AIEEE 2006

(a) 

(b) 

(c) 

(d) 

115. When p-n junction diode is forward biased then

AIEEE 2004

(a) both the depletion region and barrier height are reduced
(b) the depletion region is widened and barrier height is reduced
(c) the depletion region is reduced and barrier height is increased
(d) both the depletion region and barrier height are increased

◆ I-V curve & dynamic resistance 1 Q

116. For using a multimeter to identify diode from electrical components, choose the correct statement out of the following about the diode:

JEE MAIN 2022 · 28 JUN · SHIFT 1

(a) It is two terminal device which conducts current in both directions.
(b) It is two terminal device which conducts current in one direction only.
(c) It does not conduct current gives an initial deflection which decays to zero.
(d) It is three terminal device which conducts current in one direction only between central terminal and either of the remaining two terminals

◆ Diode circuits 7 Qs

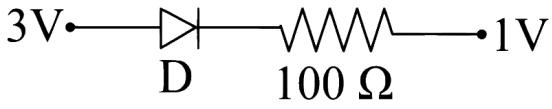
117. For an ideal diode, in forward and reverse biased condition the resistance is respectively

MHT CET 2025 · 20 APR · SHIFT 1

(a) infinite, zero. (b) infinite, infinite.
(c) zero, zero. (d) zero, infinite.

118. Assuming that junction diode is ideal, the current in arrangement shown in figure

MHT CET 2024 · 11 MAY · SHIFT 2

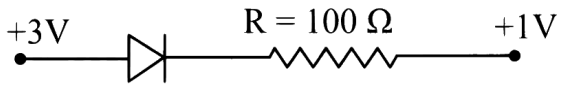


(a) 2 mA (b) 20 mA (c) 30 mA (d) 10 mA

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119. Assuming that the junction diode is ideal, the current in the arrangement shown in figure is

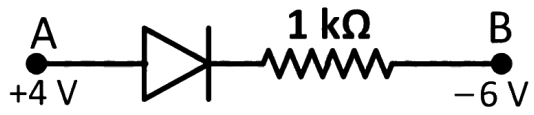
MHT CET 2019 · 2 MAY · SHIFT 1



(a) 30 mA (b) 40 mA (c) 20 mA (d) 10 mA

120. Consider the junction diode as ideal. The value of current flowing through AB is

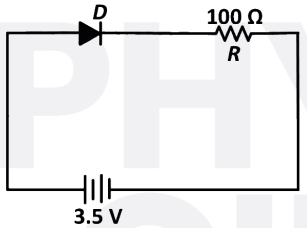
NEET 2016 · PHASE 1



(a) 10^{-1} A (b) 10^{-3} A (c) 0 A (d) 10^{-2} A

121. In the given figure, a diode D is connected to an external resistance R = 100 Ω and an e.m.f. of 3.5 V. If the barrier potential developed across the diode is 0.5 V, the current in the circuit will be

AIPMT 2015



(a) 20 mA (b) 35 mA (c) 30 mA (d) 40 mA

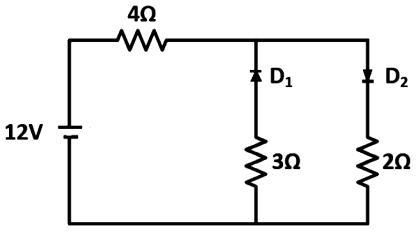
122. When a diode is forward biased, it has a voltage drop of 0.5 V. The safe limit of current through the diode is 10 mA. If a battery of emf 1.5 V is used in the circuit, the value of minimum resistance to be connected in series with the diode so that the current does not exceed the safe limit is

JEE MAIN 2020 · 3 SEP · SHIFT 1

(a) 50 Ω (b) 200 Ω (c) 300 Ω (d) 100 Ω

123. The circuit has two oppositively connected ideal diodes in parallel. What is the current following in the circuit?

AIEEE 2006



(a) 1.71 A (b) 2.00 A (c) 2.31 A (d) 1.33 A

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TOPIC 04

Rectifiers & Filters

14 PYQs · Easy 14 · Medium 0 · Difficult 0 | MHT CET 9 · NEET 3 · JEE 2

Concepts covered: Half-wave & full-wave rectifiers (12) · Filter & power supply (2)

LEVEL 1 · EASY 14 questions

◆ Half-wave & full-wave rectifiers 12 Qs

124. If an alternating voltage is applied across a diode in series with a load resistance then
MHT CET 2026 · 15 MAY · SHIFT 1
(a) a d.c. voltage appears across load
(b) an a.c. voltage appears across load
(c) a pulsating voltage appears across load
(d) no voltage appears across load

125. If an alternating voltage is applied across a p-n junction diode in series with a load then
MHT CET 2025 · 22 APR · SHIFT 1
(a) no voltage appears across load.
(b) a pulsating voltage appears across load.
(c) an a.c. voltage appears across load.
(d) a d.c. voltage appears across load which is not pulsating.

126. A p-n junction diode as a rectifier converts
MHT CET 2024 · 15 MAY · SHIFT 2
(a) a.c. to d.c.
(b) d.c. to a.c.
(c) high voltage to low voltage.
(d) low voltage to high voltage.

127. If the maximum efficiency of a full wave rectifier is $x\%$ and that of half-wave rectifier is $y\%$, then the relation between x and y is
MHT CET 2023 · 13 MAY · SHIFT 2
(a) $x = y$ (b) $x = 2y$ (c) $y = 2x$ (d) $y = 4x$

128. If the frequency of the input voltage is 50 Hz, applied to a (a) half wave rectifier and (b) full wave rectifier. The output frequency in both cases is respectively
MHT CET 2023 · 9 MAY · SHIFT 2
(a) 50 Hz, 50 Hz (b) 50 Hz, 100 Hz
(c) 100 Hz, 100 Hz (d) 100 Hz, 50 Hz

129. The input a.c. voltage of frequency 60 Hz is applied to half-wave rectifier and also to full-wave rectifier. The output frequency in case of half-wave rectifier and that in case of full wave rectifier is respectively.
MHT CET 2021 · 24 SEP · SHIFT 2
(a) 120 Hz, 60 Hz (b) 60 Hz, 120 Hz
(c) 60 Hz, 60 Hz (d) 120 Hz, 120 Hz

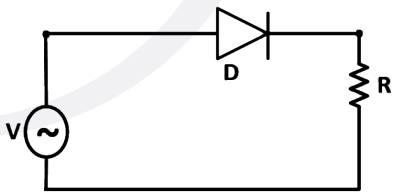
130. A rectifier is used to
MHT CET 2021 · 20 SEP · SHIFT 2
(a) convert a.c. to d.c.
(b) amplify a weak signal
(c) generate intermittent voltage
(d) convert d.c. to a.c.

131. The frequency of a given a.c. signal is 'N' Hz. When it is connected to a half wave rectifier, the number of output pulses given by the rectifier in 1 second is
MHT CET 2021 · 20 SEP · SHIFT 1
(a) $\frac{N}{4}$ (b) $\frac{N}{2}$ (c) N (d) 2N

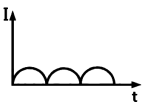
132. In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be
NEET 2022 · PHASE 1
(a) Zero (b) 30 Hz (c) 60 Hz (d) 120 Hz

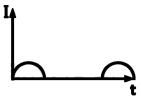
133. If a full wave rectifier circuit is operating from 50 Hz mains, the fundamental frequency in the ripple will be
AIPMT 2003
(a) 25 Hz (b) 50 Hz (c) 70.7 Hz (d) 100 Hz

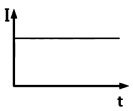
134. A p-n junction (D) shown in the figure can act as a rectifier. An alternating current source (V) is connected in the circuit.

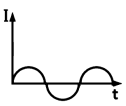


The current (I) in the resistor (R) can be shown by:
AIEEE 2009

(a) 

(b) 

(c) 

(d) 

135. In a full wave rectifier circuit operating from 50 Hz mains frequency, the fundamental frequency in the ripple would be
AIEEE 2005
(a) 25 Hz (b) 50 Hz (c) 70.7 Hz (d) 100 Hz

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◆ Filter & power supply 2 Qs

136. In the block diagram of simple rectifier circuit, from a variable a.c. voltage, constant d.c. voltage is obtained. The correct order of operation is

MHT CET 2024 · 10 MAY · SHIFT 1

(a) voltage regulator, diode rectifier, filter.
(b) diode rectifier, voltage regulator, filter.
(c) diode rectifier, filter, voltage regulator.
(d) filter, voltage regulator, diode rectifier.

137. A full wave rectifier circuit consists of two p-n junction diodes, a centre-tapped transformer, capacitor and a load resistance. Which of these components remove the ac ripple from the rectified output?

NEET 2023

(a) p-n junction diodes
(b) Capacitor
(c) Load resistance
(d) A centre-tapped transformer

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TOPIC 05

Special Purpose Diodes

40 PYQs · Easy 40 · Medium 0 · Difficult 0 | MHT CET 20 · NEET 8 · JEE 12

Concepts covered: Zener basics (8) · LED (16) · Photodiode (9) · Solar cell & device identification (7)

LEVEL 1 · EASY 40 questions

◆ Zener basics 8 Qs

138. To use Zener diode of maximum power rating 1.0 W as a 4.0 V stabilized power supply, the maximum current flowing through Zener diode will

MHT CET 2026 · 19 MAY · SHIFT 2

(a) 0.25 mA (b) 25 mA (c) 250 mA (d) 2500 mA

139. When the Zener diode is used as a voltage regulator, it is connected in

MHT CET 2026 · 17 APR · SHIFT 1

(a) forward bias and in parallel with load.
(b) reverse bias and in series with load.
(c) forward bias and in series with load.
(d) reverse bias and in parallel with load.

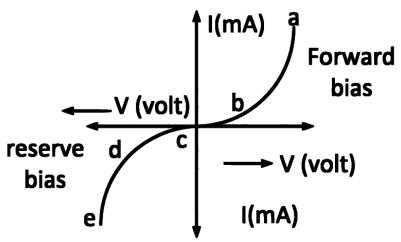
140. Choose the correct statement about Zener diode:

MHT CET 2026 · 13 APR · SHIFT 2

(a) It works as a voltage regulator in reverse bias and behaves like simple pn junction diode in forward bias.
(b) It works as a voltage regulator in both forward and reverse bias.
(c) It works a voltage regulator only in forward bias.
(d) It works as a voltage regulator in forward bias and behaves like simple pn junction diode in reverse bias.

141. The graph given below represents I-V characteristics of zener diode. The part of the characteristics curve that is most relevant for its operation as a voltage regulator is

MHT CET 2025 · 22 APR · SHIFT 2



(a) ab (b) bc (c) cd (d) de

142. The incorrect statement about the property of a Zener diode is:

NEET 2022 · PHASE 2

(a) p and n regions of Zener diode are heavily doped
(b) Zener voltage remains constant at breakdown
(c) It is designed to operate under reverse bias
(d) Depletion region formed is very wide

143. Consider the following statements (A) and (B) and identify the correct answer.
(A) A Zener diode is connected in reverse bias, when used as a voltage regulator. (B) The potential barrier of p-n junction lies between 0.1 V to 0.3 V.

NEET 2021

(a) (A) is incorrect but (B) is correct.
(b) (A) and (B) both are correct.
(c) (A) and (B) both are incorrect.
(d) (A) is correct and (B) is incorrect.

144. Zener diode is used for

AIPMT 2005

(a) amplification
(b) rectification
(c) stabilisation
(d) producing oscillations in an oscillator.

145. Choose the correct statement about Zener diode:

JEE MAIN 2023 · 1 FEB · SHIFT 2

(a) It works as a voltage regulator in reverse bias and behaves like simple pn junction diode in forward bias.
(b) It works as a voltage regulator in both forward and reverse bias.
(c) It works as a voltage regulator only in forward bias.
(d) It works as a voltage regulator in forward bias and behaves like simple pn junction diode in reverse bias.

◆ LED 16 Qs

146. A LED emits visible light when its

MHT CET 2026 · 12 MAY · SHIFT 1

(a) junction is hot.
(b) holes and electrons recombine.
(c) depletion region widens.
(d) junction is reverse biased.

147. Which one of the following statements is 'WRONG' regarding LED?

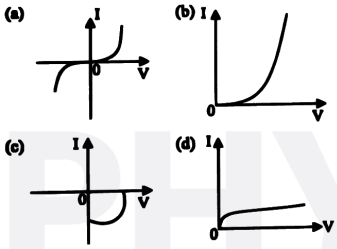
MHT CET 2026 · 18 APR · SHIFT 1

(a) LED's have long lifetime if properly manufactured.
(b) Colours produced by LED's do not fade out.
(c) LED's are energy efficient.
(d) Brightness of light emitted by LED cannot be controlled.

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148. Which of the following statement is NOT correct in the case of LED?
(A) It is a heavily doped p-n junction diode.
(B) It emits light only when it is forward biased.
(C) It emits light only when it is reverse biased.
(D) The energy of the light emitted is equal to or slightly less than the energy gap of the semiconductor used.
MHT CET 2026 · 16 APR · SHIFT 2
(a) A (b) B (c) C (d) D

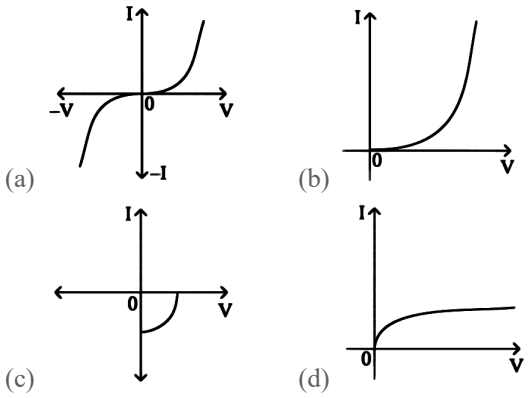
149. When LED is manufactured by using aluminium gallium arsenide (AlGaAs), it emits
MHT CET 2025 · 5 MAY · SHIFT 2
(a) ultra-violet light (b) infra red radiation
(c) green light (d) blue light

150. I – V characteristics of LED is shown correctly by graph
MHT CET 2025 · 23 APR · SHIFT 2

(a) d (b) b (c) a (d) c

151. For emission of light, a light emitting diode (LED) is
MHT CET 2023 · 14 MAY · SHIFT 1
(a) always used in reverse biased condition
(b) never used in forward or reserve biased condition
(c) used both in forward and reverse biased condition depending upon its application
(d) always used in forward biased condition

152. Which one of the following statements is WRONG regarding LED?
MHT CET 2023 · 12 MAY · SHIFT 2
(a) LEDs are energy efficient
(b) LEDs have long time if properly manufactured.
(c) Brightness of light emitted by LED cannot be controlled.
(d) Colours produced by LED do not fade out.

153. LED is manufactured using zinc selenide then it emits.
MHT CET 2021 · 21 SEP · SHIFT 2
(a) infrared radiations (b) yellow light
(c) blue light (d) green light

154. $V - I$ characterstics of LED is shown correctly by graph
MHT CET 2019 · 3 MAY · SHIFT 1

(a) (b) (c) (d)

155. An LED is constructed from a p-n junction diode using GaAsP. The energy gap is 1.9 eV . The wavelength of the light emitted will be equal to
NEET 2019
(a) 654×10^{-11} m (b) 10.4×10^{-26} m
(c) 654 nm (d) 654 Å

156. A light emitting diode (LED) is fabricated using GaAs semiconducting material whose band gap is 1.42 eV. The wavelength of light emitted from the LED is:
JEE MAIN 2024 · 9 APR · SHIFT 1
(a) 1243 nm (b) 875 nm (c) 650 nm (d) 1400 nm

157. Which one of the following statement is not correct in the case of light emitting diodes? A. It is a heavily doped p-n junction.
B. It emits light only when it is forward biased.
C. It emits light only when it is reverse biased.
D. The energy of the light emitted is equal to or slightly less than the energy gap of the semiconductor used.
Choose the correct answer from the options given below:
JEE MAIN 2023 · 29 JAN · SHIFT 1
(a) A (b) B (c) C and D (d) C

158. LED is constructed from Ga-As-P semiconducting material. The energy gap of this LED is 1.9 eV. Calculate the wavelength of light emitted and its colour.
[h = 6.63×10^{-34} Js and c = 3×108 ms $^{-1}$]
JEE MAIN 2021 · 26 FEB · SHIFT 1
(a) 654 nm and orange colour
(b) 654 nm and red colour
(c) 1046 nm and red colour
(d) 1046 nm and blue colour

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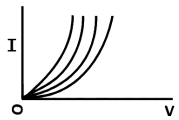
159. For LED's to emit light in visible region of electromagnetic light, it should have energy band gap in the range of:

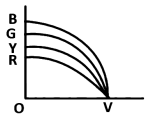
JEE MAIN 2014 · 12 APR · SHIFT 1

(a) 0.1 eV to 0.4 eV (b) 0.5 eV to 0.8 eV
(c) 0.9 eV to 1.6 eV (d) 1.7 eV to 3.0 eV

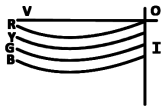
160. The I-V characteristic of an LED is

JEE MAIN 2013

(a) 

(b) 

(c) 

(d) 

161. The energy band gap of semiconducting material to produce violet (wavelength = 4000 $\mathring{A}$) LED is _____ eV. (Round off to the nearest integer).

JEE MAIN 2022 · 25 JUL · SHIFT 1 *(Numerical)*

◆ Photodiode 9 Qs

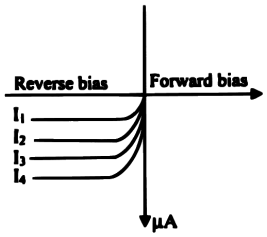
162. Photodiode is a device

MHT CET 2026 · 15 APR · SHIFT 1

(a) in which photocurrent is dependent on reverse bias.
(b) in which photocurrent is independent of incident radiation.
(c) which is always operated in forward bias.
(d) which is always operated in reverse bias.

163. I - V characteristics of photodiode for different illumination intensities I_1, I_2, I_3 and I_4 are drawn as follows. Then the maximum intensity among them is

MHT CET 2025 · 23 APR · SHIFT 2



(a) I_1 (b) I_2 (c) I_3 (d) I_4

164. For detecting light intensity we use

MHT CET 2024 · 15 MAY · SHIFT 2

(a) photodiode in reverse bias.
(b) photodiode in forwarded bias.
(c) LED in reverse bias.
(d) LED in forward bias.

165. In the working of photodiode, the reverse current depends on

MHT CET 2024 · 9 MAY · SHIFT 2

(a) concentration of majority carriers.
(b) concentration of minority carriers.
(c) applied voltage.
(d) recombination of holes and electrons.

166. A p-n photodiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of wavelength

AIPMT 2009

(a) 4000 nm (b) 6000 nm (c) 4000 $\mathring{A}$ (d) 6000 $\mathring{A}$

167. A p-n photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of the radiation that can be absorbed by the material is nearly

AIPMT 2008

(a) 1×1014 Hz (b) 20×1014 Hz
(c) 10×1014 Hz (d) 5×1014 Hz

168. Conductivity of a photodiode starts changing only if the wavelength of incident light is less than 660 nm. The band gap of photodiode is found to be $\left(\frac{X}{8}\right)$eV. The value of X is:
(Given, $h = 6.6 \times 10^{-34}$Js, $e = 1.6 \times 10^{-19}$C)

JEE MAIN 2024 · 1 FEB · SHIFT 2

(a) 11 (b) 13 (c) 15 (d) 21

169. Consider a situation in which reverse biased current of a particular P-N junction increases when it is exposed to a light of wavelength $\leq$ 621 nm. During this process, enhancement in carrier concentration takes place due to generation of hole-electron pairs. The value of band gap is nearly.

JEE MAIN 2021 · 22 JUL · SHIFT 2

(a) 1 eV (b) 4 eV (c) 0.5 eV (d) 2 eV

170. If a semiconductor photodiode can detect a photon with a maximum wavelength of 400 nm, then its band gap energy is:
Planck's constant h = 6.63 × 10–34 J.s. Speed of light c = 3 × 108 m/s

JEE MAIN 2020 · 3 SEP · SHIFT 2

(a) 1.5 eV (b) 2.0 eV (c) 3.1 eV (d) 1.1 eV

◆ Solar cell & device identification 7 Qs

171. The material used for solar cell should have band gap
(A) equal to zero.
(B) equal to 0.08 eV.
(C) between 1.0 eV to 1.8 eV.
(D) equal to 2 eV.

MHT CET 2026 · 19 APR · SHIFT 1

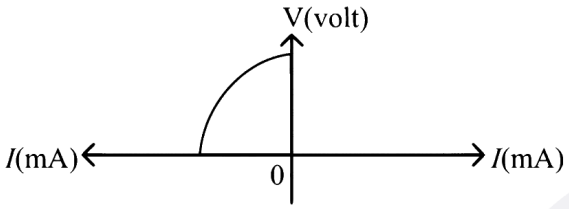
(a) D (b) A (c) C (d) B

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172. The material used for solar cell should have band gap
MHT CET 2025 · 26 APR · SHIFT 1
(a) equal to zero.
(b) less than 1.0 eV (non-zero).
(c) more than 1.8 eV.
(d) between 1.0 eV and 1.8 eV.

173. Identify the mismatch out of the following.
MHT CET 2023 · 10 MAY · SHIFT 1
(a) Zener diode - voltage regulator.
(b) Photodiode-optocouplers.
(c) Solar cell - Electrical energy into light.
(d) Light emitting diode - optical communication.

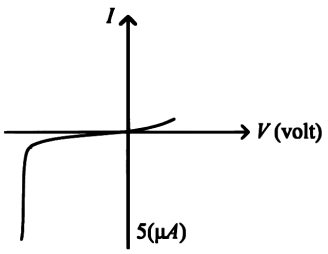
174.



The I-V characteristics shown above are exhibited by a
NEET 2024
(a) Light emitting diode (b) Zener diode
(c) Photodiode (d) Solar cell

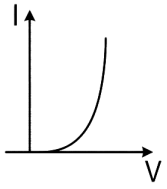
175. Given below are two statements:
Statement I: Photovoltaic devices can convert optical radiation into electricity.
Statement II: Zener diode is designed to operate under reverse bias in breakdown region. In the light of the above statements, choose the most appropriate answer from the options given below:
NEET 2023
(a) Both Statement I and Statement II are incorrect.
(b) Statement I is correct but Statement II is incorrect.
(c) Statement I is incorrect but Statement II is correct.
(d) Both Statement I and Statement II are correct

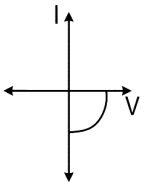
176. The I-V characteristics of an electronic device are shown in the figure. The device is:
JEE MAIN 2024 · 9 APR · SHIFT 2

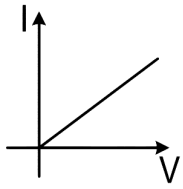


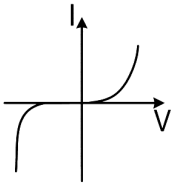
(a) a solar cell
(b) a transistor which can be used as an amplifier
(c) a diode which can be used as a rectifier
(d) a zener diode which can be used as a voltage regulator

177. Identify the solar cell characteristics from the following options:
JEE MAIN 2022 · 28 JUL · SHIFT 1

(a) 

(b) 

(c) 

(d) 

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TOPIC 06

Junction Transistor

68 PYQs · Easy 68 · Medium 0 · Difficult 0 | MHT CET 34 · NEET 18 · JEE 16

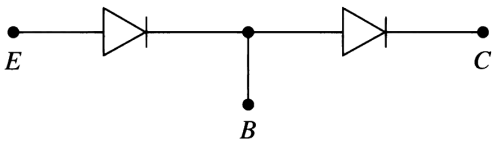
Concepts covered: Structure & biasing (11) · Current relations (30) · CE amplifier gains (23) · Switch & oscillator (4)

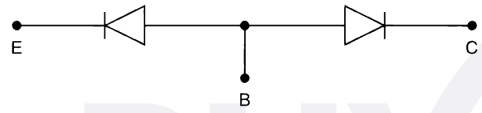
LEVEL 1 · EASY 68 questions

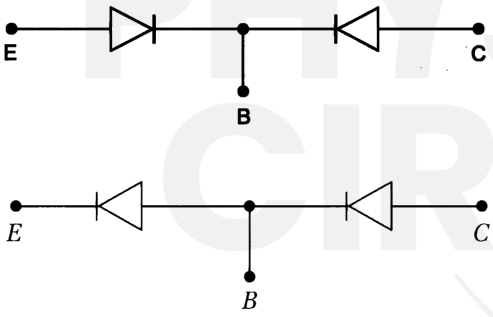
◆ Structure & biasing 11 Qs

178. An n-p-n transistor can be considered to be equivalent to two diodes connected. Which one of the following figure is correct?

MHT CET 2026 · 13 MAY · SHIFT 1

(a) 

(b) 

(c) 

(d)

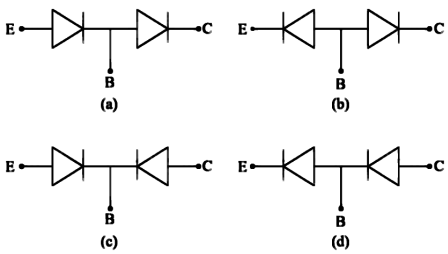
179. In a transistor, comparing the doping of emitter, base and collector, the part which is heavily doped and that which is lightly doped are respectively

MHT CET 2026 · 19 APR · SHIFT 2

(a) collector and emitter (b) emitter and base
(c) collector and base (d) emitter and collector

180. An n-p-n transistor can be considered to be equivalent to two diodes connected. The correct figure out of the following is

MHT CET 2024 · 3 MAY · SHIFT 1



(a) a (b) b (c) c (d) d

181. Which of the following regions of a transistors are, respectively, heavily dopped and lightly dopped?

MHT CET 2019 · 3 MAY · SHIFT 1

(a) Collector and emitter (b) Base and emitter
(c) Emitter and base (d) Emitter and collector

182. The part of the transistor which is heavily doped to produce large number of majority carriers is

AIPMT 1993

(a) emitter
(b) base
(c) collector
(d) any of the above depending upon the nature of transistor

183. For transistor action, which of the following statements is correct?

NEET 2020 · PHASE 1 *(Not in current JEE/NEET syllabus)*

(a) Base, emitter and collector regions should have same size.
(b) Both emitter junction as well as the collector junction are forwarded biased.
(c) The base region must be very thin and lightly doped.
(d) Base, emitter and collector regions should have same doping concentrations.

184. For transistor action

(1) Base, emitter and collector regions should have similar size and doping concentrations. (2) The base region must be very thin and lightly doped.

(3) The emitter-base junction is forward biased and base-collector junction is reverse biased. (4) Both the emitter-base junction as well as the base-collector junction are forward biased. Which one of the following pairs of statements is correct?

AIPMT 2010 · MAINS *(Not in current JEE/NEET syllabus)*

(a) (4) and (1) (b) (1) and (2)
(c) (2) and (3) (d) (3) and (4)

185. A n-p-n transistor conducts when

AIPMT 2003 *(Not in current JEE/NEET syllabus)*

(a) both collector and emitter are positive with respect to the base
(b) collector is positive and emitter is negative with respect to the base
(c) collector is positive and emitter is at same potential as the base
(d) both collector and emitter are negative with respect to the base

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186. Given below are two statements:

Statement I: In a typical transistor, all three regions emitter, base and collector have same doping level.

Statement II: In a transistor, collector is the thickest and base is the thinnest segment. In the light of the above statements, choose the most appropriate answer from the options given below.

JEE MAIN 2023 · 31 JAN · SHIFT 2 *(Not in current JEE/NEET syllabus)*

(a) Statement I is correct but Statement II is incorrect
(b) Both Statement I and Statement II are incorrect
(c) Statement I is incorrect but Statement II is correct
(d) Both Statement I and Statement II are correct

187. When npn transistor is used as an amplifer

AIEEE 2004 *(Not in current JEE/NEET syllabus)*

(a) electrons move from collector to base
(b) holes move from emitter to base
(c) electrons move from base to collector
(d) holes move from base to emitter

188. The part of a transistor which is most heavily doped to produce large number of majority carriers is

AIEEE 2002 *(Not in current JEE/NEET syllabus)*

(a) emmiter
(b) base
(c) collector
(d) can be any of the above three

◆ Current relations 30 Qs

189. For a transistor, the current ratio $\alpha_{DC} = \frac{69}{70}$. The current gain β_{DC} is

MHT CET 2026 · 14 MAY · SHIFT 1

(a) 66 (b) 67 (c) 69 (d) 71

190. If transistor having $\alpha = 0.9$, is used in CE configuration, then for a change of 0.4 mA in base current, what will be the change in collector current?

MHT CET 2026 · 13 APR · SHIFT 2

(a) 3.6 mA (b) 4 mA (c) 0.9 mA (d) 36 mA

191. In transistor amplifier, base emitter junction is forward biased and collector base junction is reversed biased. The current gain is

MHT CET 2026 · 13 APR · SHIFT 1

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

192. For a transistor, α_{dc} and β_{dc} are the current ratios, then the value of $\frac{\beta_{dc}-\alpha_{dc}}{\alpha_{dc}\times\beta_{dc}}$

MHT CET 2025 · 26 APR · SHIFT 2

(a) 2.5 (b) 2 (c) 1.5 (d) 1

193. In a common emitter transistor amplifier circuit, the current gain $\alpha = 0.8$. If the base current changes by 3μ A then the collector current changes by

MHT CET 2025 · 23 APR · SHIFT 1

(a) 4μ A (b) 12μ A (c) 6μ A (d) 24μ A

194. In the case of common emitter transistor amplifier, the ratio of collector current to emitter current is 0.96, then the current gain (β) of the amplifier is

MHT CET 2025 · 23 APR · SHIFT 1

(a) 6 (b) 48 (c) 24 (d) 12

195. For a common emitter transistor, if $\frac{I_C}{I_E} = 0.95$, then the current gain is

MHT CET 2025 · 19 APR · SHIFT 1

(a) 47.5 (b) 44 (c) 19 (d) 15

196. In the case of constant ' α ' and ' β ' of a transistor (α and β are current ratios)

MHT CET 2025 · 19 APR · SHIFT 1

(a) $\beta < 1, \alpha > 1$ (b) $\beta > 1, \alpha < 1$
(c) $\alpha = \beta$ (d) $\alpha = \beta^2$

197. For a transistor, current gain $(\beta) = 50$. To change the collector current by 350μ A, the base current should be changed by

MHT CET 2024 · 15 MAY · SHIFT 1

(a) $\left(\frac{50}{350}\right)\mu$A (b) $(350-50)\mu$A
(c) $(350+50)\mu$A (d) $\left(\frac{350}{50}\right)\mu$A

198. For a common emitter configuration, if 'α' and 'β' have their usual meanings, the incorrect relation between 'α' and 'β' is

MHT CET 2023 · 14 MAY · SHIFT 1

(a) $\frac{1}{\alpha} = \frac{1}{\beta} + 1$ (b) $\alpha = \frac{\beta}{1-\beta}$
(c) $\alpha = \frac{\beta}{1+\beta}$ (d) $\frac{1}{\beta} = \frac{1}{\alpha} - 1$

199. In the study of transistor as an amplifier if $\alpha = \frac{I_C}{I_E} = 0.98$ and $\beta = \frac{I_C}{I_B} = 49$, where I_C, I_B and I_E are collector, base and emitter current respectively then $\left(\frac{1}{\alpha} - \frac{1}{\beta}\right)$ is equal to

MHT CET 2023 · 11 MAY · SHIFT 2

(a) zero (b) $\frac{1}{2}$ (c) 2 (d) 1

200. For a transistor, the current ratio $\alpha_{dc} = \frac{69}{70}$, the current gain β_{dc} is

MHT CET 2021 · 24 SEP · SHIFT 2

(a) 67 (b) 69 (c) 71 (d) 66

201. For a transistor, $\frac{1}{\alpha_{DC}} - \frac{1}{\beta_{DC}}$ is equal to [α_{DC} and β_{DC} are current amplification factors]

MHT CET 2021 · 21 SEP · SHIFT 1

(a) three (b) two (c) zero (d) one

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202. A transistor having $\alpha = 0.8$ is connected in common emitter configuration. When the base current changes by 6 mA, then the change in collector current is

MHT CET 2020 · 19 OCT · SHIFT 2

(a) 12 mA (b) 24 mA (c) 0.66 mA (d) 1.5 mA

203. In the study of transistor as an amplifier, the ratio of collector current to emitter current is 0.98 then the ratio of collector current to base current will be

MHT CET 2019 · 2 MAY · SHIFT 2

(a) 99 (b) 49 (c) 50 (d) 98

204. . For a transistor, the current ratio ' β_{dc} ' is defined as the ratio of

MHT CET 2019 · 2 MAY · SHIFT 1

(a) collector current to emitter current.
(b) collector current to base current.
(c) base current to collector current.
(d) emitter current to collector current.

205. The correct relationship between the two current gains α and β in a transistor is

AIPMT 1997

(a) $\alpha = \frac{\beta}{1+\beta}$ (b) $\alpha = \frac{1+\beta}{\beta}$
(c) $\beta = \frac{\alpha}{1+\alpha}$ (d) $\beta = \frac{\alpha}{\alpha-1}$

206. A transistor is operated in common emitter configuration at VC = 2 V such that a change in the base current from 100 μA to 300 μA produces a change in the collector current from 10 mA to 20 mA. The current gain is

AIPMT 2011 · PRELIMS *(Not in current JEE/NEET syllabus)*

(a) 50 (b) 75 (c) 100 (d) 25

207. A transistor is operated in common-emitter configuration at VC = 2V such that a change in the base current from 100 μA to 200 μA produces a change in the collector current from 5 mA to 10 mA. The current gain is

AIPMT 2009 *(Not in current JEE/NEET syllabus)*

(a) 100 (b) 150 (c) 50 (d) 75

208. A transistor is operated in common emitter configuration at constant collector voltage VC = 1.5 V such that a change in the base current from 100 μA to 150 μA produces a change in the collector current from 5 mA to 10 mA. The current gain β is

AIPMT 2006 *(Not in current JEE/NEET syllabus)*

(a) 50 (b) 67 (c) 75 (d) 100

209. For a transistor $\frac{I_C}{I_E}$ = 0.96, then current gain for common emitter is

AIPMT 2002 *(Not in current JEE/NEET syllabus)*

(a) 12 (b) 6 (c) 48 (d) 24

210. For a common base circuit if $\frac{I_C}{I_E}$ = 0.98 then current gain for common emitter circuit will be

AIPMT 2001 *(Not in current JEE/NEET syllabus)*

(a) 49 (b) 98 (c) 4.9 (d) 25.5.

211. The correct relation for α, β for a transistor

AIPMT 2000 *(Not in current JEE/NEET syllabus)*

(a) $\beta = \frac{1-\alpha}{\alpha}$ (b) $\beta = \frac{\alpha}{1-\alpha}$ (c) $\alpha = \frac{\beta-1}{\beta}$ (d) $\alpha\beta = 1$

212. In an n-p-n common emitter (CE) transistor the collector current changes from 5 mA to 16 mA for the change in base current from 100 μA and 200 μA, respectively. The current gain of transistor is _____.

JEE MAIN 2023 · 12 APR · SHIFT 1 *(Not in current JEE/NEET syllabus)*

(a) 210 (b) 0.9 (c) 9 (d) 110

213. For a constant collector-emitter voltage of 8 V, the collector current of a transistor reached to the value of 6 mA from 4 mA, whereas base current changed from 20 μA to 25 μA value. If transistor is in active state, small signal current gain (current amplification factor) will be:

JEE MAIN 2022 · 27 JUL · SHIFT 2 *(Not in current JEE/NEET syllabus)*

(a) 240 (b) 400 (c) 0.0025 (d) 200

214. For a transistor α and β are given as $\alpha = \frac{I_C}{I_E}$ and $\beta = \frac{I_C}{I_B}$. Then the correct relation between α and β will be:

JEE MAIN 2021 · 27 AUG · SHIFT 2 *(Not in current JEE/NEET syllabus)*

(a) $\alpha = \frac{1-\beta}{\beta}$ (b) $\beta = \frac{\alpha}{1-\alpha}$ (c) $\alpha\beta = 1$ (d) $\alpha = \frac{\beta}{1-\beta}$

215. The correct relation between α (ratio of collector current to emitter current) and β (ratio of collector current to base current) of a transistor is:

JEE MAIN 2021 · 18 MAR · SHIFT 2 *(Not in current JEE/NEET syllabus)*

(a) $\beta = \frac{\alpha}{1+\alpha}$ (b) $\alpha = \frac{\beta}{1-\alpha}$ (c) $\alpha = \frac{\beta}{1+\beta}$ (d) $\beta = \frac{1}{1-\alpha}$

216. If an emitter current is changed by 4 mA, the collector current changes by 3.5 mA. The value of β will be:

JEE MAIN 2021 · 24 FEB · SHIFT 1 *(Not in current JEE/NEET syllabus)*

(a) 0.875 (b) 0.5 (c) 3.5 (d) 7

217. In a common base mode of a transistor, the collector current is 5.488 mA for an emitter current of 5.60mA. The value of the base current amplification factor (β) will be

AIEEE 2006 *(Not in current JEE/NEET syllabus)*

(a) 49 (b) 50 (c) 51 (d) 48

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218. For a common emitter configuration, if α and β have their usual meanings, the incorrect relationship between α and β is:

JEE MAIN 2016 *(Not in current JEE/NEET syllabus)*

(a) $\alpha = \frac{\beta}{1+\beta}$ (b) $\alpha = \frac{\beta^2}{1+\beta^2}$

(c) $\frac{1}{\alpha} = \frac{1}{\beta} + 1$ (d) $\alpha = \frac{\beta}{1-\beta^2}$

◆ CE amplifier gains 23 Qs

219. The current gain in the common emitter mode of a transistor is 10. The input impedance is 20 $k\Omega$ and load resistance 100 $k\Omega$. The power gain is

MHT CET 2026 · 14 MAY · SHIFT 2

(a) 300 (b) 500 (c) 200 (d) 100

220. β, R_L and r are the a.c. current gain, load resistance and the input resistance of a transistor respectively in common emitter configuration, the voltage gain and the power gain are respectively

MHT CET 2026 · 14 MAY · SHIFT 1

(a) $\beta(R_L/r)$ and $\beta^2(R_L/r)$

(b) $\beta(r/R_L)$ and $\beta^2(r/R_L)$

(c) $\beta(R_L/r)$ and $\beta(R_L/r)^2$

(d) $\beta(r/R_L)$ and $\beta(r/R_L)^2$

221. In common emitter amplifier, using output resistance 5000 Ω and input resistance 2000 Ω, if the peak value of input signal voltage is 10 mV and $\beta = 50$, then peak value of output voltage is

MHT CET 2026 · 13 MAY · SHIFT 1

(a) 5×10^{-6} V (b) 12.50×10^{-6} V

(c) 1.25 V (d) 125.0 V

222. In a common emitter transistor amplifier, AC current gain is 65, the load resistance is 5400 Ω and input resistance of the transistor is 450 Ω. The voltage gain is

MHT CET 2026 · 20 APR · SHIFT 1

(a) 460 (b) 540 (c) 780 (d) 7800

223. In common emitter configuration of transistor amplifier, r_i, R_L and β represent the input resistance, load resistance and the a.c. current gain respectively. The voltage gain A_V and power gain A_P are represented in magnitude respectively by

MHT CET 2026 · 17 APR · SHIFT 2

(a) $\beta\left(\frac{r_i}{R_L}\right), \beta^2\left(\frac{r_i}{R_L}\right)$ (b) $\beta\left(\frac{R_L}{r_i}\right), \beta\left(\frac{R_L}{r_i}\right)^2$

(c) $\beta\left(\frac{R_L}{r_i}\right), \beta^2\left(\frac{R_L}{r_i}\right)$ (d) $\beta\left(\frac{r_i}{R_L}\right), \beta\left(\frac{r_i}{R_L}\right)^2$

224. In a common emitter transistor amplifier, the output voltage and input voltage have a phase difference of

MHT CET 2025 · 22 APR · SHIFT 1

(a) 0^c (b) $\frac{\pi^c}{2}$ (c) $\frac{3\pi^\circ}{4}$ (d) π^c

225. In common emitter mode of a transistor, the current gain is 8. The input impedance is 25kΩ and load resistance is 75kΩ. The power gain is

MHT CET 2025 · 21 APR · SHIFT 2

(a) 192 (b) 112 (c) 316 (d) 224

226. When an n-p-n junction transistor is used as an amplifier in common emitter mode,

MHT CET 2025 · 20 APR · SHIFT 1

(a) the base emitter junction is reverse biased.

(b) the input impedance is high and the output impedance is low.

(c) input signal is applied between the base and emitter and the output is obtained between collector and emitter.

(d) the input voltage and the output voltage are in phase.

227. In a transistor amplifier, AC current gain is 64, the load resistance is 5400Ω and the input resistance of the transistor is 540Ω. The voltage gain is

MHT CET 2025 · 19 APR · SHIFT 2

(a) 540 (b) 600 (c) 640 (d) 6400

228. The input signal given to C.E. amplifier having a voltage gain of 126 is $V_i = 2\cos\left(12t + \frac{\pi}{3}\right)$. The corresponding output signal will be

MHT CET 2024 · 16 MAY · SHIFT 1

(a) $252\cos\left(12t + \frac{4\pi}{3}\right)$ (b) $252\cos\left(12t + \frac{\pi}{3}\right)$

(c) $63\cos\left(12t + \frac{2\pi}{3}\right)$ (d) $2\cos\left(12t + \frac{5\pi}{3}\right)$

229. When n-p-n junction transistor is used as an amplifier in common emitter mode,

MHT CET 2024 · 11 MAY · SHIFT 2

(a) the input impedance is high and the output impedance is low.

(b) the base emitter junction is reverse biased.

(c) input signal is applied between the base and emitter and output is obtained between collector and emitter.

(d) the input voltage and output voltage are in phase.

230. In common emitter transistor amplifier, load resistance is 6.5kΩ and an input resistance is 1.3kΩ. If the current gain is 78, the voltage gain is

MHT CET 2024 · 3 MAY · SHIFT 1

(a) 780 (b) 390 (c) 260 (d) 50

231. In a transistor, in common emitter configuration, the ratio of power gain to voltage gain is

MHT CET 2023 · 9 MAY · SHIFT 2

(a) α (b) $\frac{\beta}{\alpha}$ (c) $\beta\alpha$ (d) β

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232. For a common-emitter amplifier, the voltage gain is 40. Its input and output impedances are 100Ω and 400Ω, respectively. The power gain of the CE amplifier will be

MHT CET 2021 · 22 SEP · SHIFT 2

(a) 450 (b) 400 (c) 300 (d) 500

233. A common emitter amplifier has a voltage gain of 50, an input impedance of 100 Ω and an output impedance of 200 Ω. The power gain of the amplifier is

AIPMT 2007

(a) 1000 (b) 1250 (c) 100 (d) 500

234. When npn transistor is used as an amplifier, then

AIPMT 1996

(a) electrons move from collector to base
(b) holes move from base to emitter
(c) electrons move from base to collector
(d) electrons move from emitter to base

235. To use a transistor as an amplifier

AIPMT 1991

(a) the emitter base junction is forward biased and the base collector junction is reversed biased
(b) no bias voltage is required
(c) both junction are forward biased
(d) both junction are reverse biased

236. In a common base amplifier the phase difference between the input signal voltage and the output voltage is

AIPMT 1990

(a) 0 (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) π

237. A common emitter amplifier has a voltage gain of 50, an input impedance of 100 Ω and an output impedance of 200 Ω. The power gain of the amplifier is

AIPMT 2010 · PRELIMS *(Not in current JEE/NEET syllabus)*

(a) 500 (b) 1000 (c) 1250 (d) 50

238. For a transistor in CE mode to be used as an amplifier, it must be operated in:

JEE MAIN 2021 · 27 AUG · SHIFT 1 *(Not in current JEE/NEET syllabus)*

(a) Both cut-off and Saturation
(b) Saturation region only
(c) Cut-off region only
(d) The active region only

239. In a common emitter configuration with suitable bias, it is given that R_L is the load resistance and R_{BE} is small signal dynamic resistance (input side). Then, voltage gain, current gain and power gain are given, respectively, by:

β is current gain, I_B, I_C and I_E are respectively base, collector and emitter currents.

JEE MAIN 2018 · 15 APR · SHIFT 1 *(Not in current JEE/NEET syllabus)*

(a) $\beta\frac{R_L}{R_{BE}}, \frac{\Delta I_C}{\Delta I_B}, \beta^2\frac{R_L}{R_{BE}}$ (b) $\beta\frac{R_L}{R_{BE}}, \frac{\Delta I_E}{\Delta I_B}, \beta^2\frac{R_L}{R_{BE}}$
(c) $\beta^2\frac{R_L}{R_{BE}}, \frac{\Delta I_C}{\Delta I_E}, \beta^2\frac{R_L}{R_{BE}}$ (d) $\beta^2\frac{R_L}{R_{BE}}, \frac{\Delta I_C}{\Delta I_B}, \beta\frac{R_L}{R_{BE}}$

240. In a common emitter amplifier circuit using an n-p-n transistor, the phase difference between the input and the output voltages will be:

JEE MAIN 2017 *(Not in current JEE/NEET syllabus)*

(a) 180° (b) 45° (c) 90° (d) 135°

241. In a common base amplifier, the phase difference between the input signal voltage and output voltage is

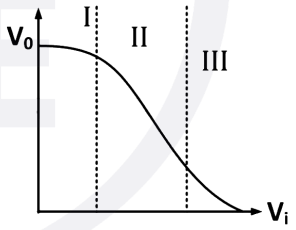
AIEEE 2005 *(Not in current JEE/NEET syllabus)*

(a) π (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) 0

◆ Switch & oscillator 4 Qs

242. Transfer characteristics [output voltage (V0) vs input voltage (Vi)] for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used

AIPMT 2012 · PRELIMS *(Not in current JEE/NEET syllabus)*



(a) in region III
(b) both in region (I) and (III)
(c) in region II
(d) in region I

243. Radiowaves of constant amplitude can be generated with

AIPMT 1989 *(Not in current JEE/NEET syllabus)*

(a) FET (b) filter
(c) rectifier (d) oscillator

244. For a transistor to act as a switch, it must be operated in

JEE MAIN 2022 · 27 JUN · SHIFT 2 *(Not in current JEE/NEET syllabus)*

(a) Active region.
(b) Saturation state only.
(c) Cut-off state only.
(d) Saturation and cut-off state.

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245. The positive feedback is required by an amplifier to act an oscillator. The feedback here means:

JEE MAIN 2022 · 26 JUN · SHIFT 2 ***(Not in current JEE/NEET syllabus)***

(a) External input is necessary to sustain ac signal in output.

(b) A portion of the output power is returned back to the input.

(c) Feedback can be achieved by LR network.

(d) The base-collector junction must be forward biased.

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TOPIC 07

Logic Gates

44 PYQs · Easy 44 · Medium 0 · Difficult 0 | MHT CET 22 · NEET 19 · JEE 3

Concepts covered: Basic gates & truth tables (23) · NAND, NOR & XOR (13) · Boolean output of a circuit (1) · Equivalent gate & universal gates (3) · Waveforms (4)

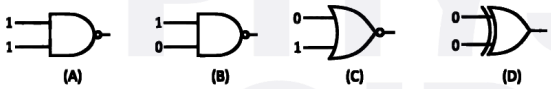
LEVEL 1 · EASY 44 questions

◆ Basic gates & truth tables 23 Qs

246. In a two input logic gate, when one input is '1' and the other is '0' (zero), the output is '1'. But even if both inputs are '0' (zero), the output is '1'. The logic gate is
MHT CET 2026 · 20 MAY · SHIFT 1
(a) an AND gate. (b) an X-OR gate.
(c) a NAND gate. (d) a NOR gate.

247. For a two input logic gate, when the inputs are 'zero' and 'zero' the output is 'one'. When the inputs are 'one' and 'zero' the output is 'zero'. The type of logic gate is
MHT CET 2026 · 19 APR · SHIFT 1
(a) NAND (b) OR (c) NOR (d) XOR

248. Which of the following logic gates will have an output of '1' (one) for the given inputs?
MHT CET 2026 · 18 APR · SHIFT 1



(a) D (b) B (c) A (d) C

249. In a certain 2 -inputs logic gate, when inputs $A = 0$ and $B = 0$, then output $C = 1$. And also when inputs $A = 0$, $B = 1$, then again output $C = 1$. The gate must be
MHT CET 2025 · 26 APR · SHIFT 2
(a) OR (b) AND (c) NAND (d) NOR

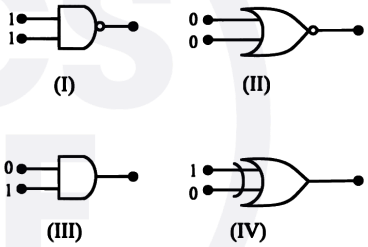
250. Two different logic gates giving output ' 1 ' for the inputs $(1, 0)$ and then for $(0, 1)$ are
MHT CET 2024 · 15 MAY · SHIFT 1
(a) 'AND', 'OR' (b) 'OR', 'NOR'
(c) 'NAND', 'NOR' (d) 'NAND', 'OR'

251. For a two input AND gate, the four entries are shown in the truth table. Identify the correct ones out of these (A, B = input, Y = output)
MHT CET 2021 · 23 SEP · SHIFT 2

Entry	A	B	Y
1	0	1	0
2	1	0	0
3	1	1	1
4	0	0	1

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

252. Which of the following gates will give an output '1' for the given inputs?
MHT CET 2021 · 22 SEP · SHIFT 2



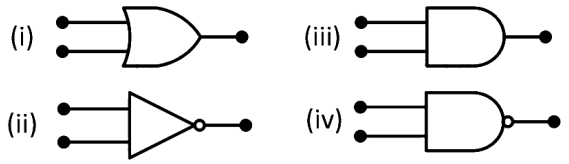
(a) II and III (b) I and IV
(c) I and III (d) II and IV

253. The output of an 'OR' gate is 'one'
MHT CET 2021 · 20 SEP · SHIFT 2
(a) only when both inputs are 'one'.
(b) only when both inputs are 'zero'.
(c) only when either input is 'zero'.
(d) if either or both inputs are 'one'.

254. Two different logic gates moving output '0' for the inputs (0, 1) and then for (1, 0) are
MHT CET 2021 · 20 SEP · SHIFT 1
(a) 'AND', 'NAND' (b) 'NAND', 'NOR'
(c) 'OR', 'AND' (d) 'NOR', 'AND'

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255. Symbolic representation of four logic gates are shown as

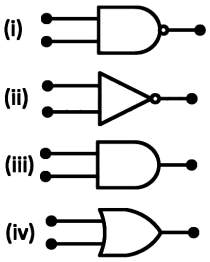


Pick out which ones are for AND, NAND and NOT gates, respectively

AIPMT 2011 · PRELIMS

(a) (ii), (iii) and (iv) (b) (iii), (ii) and (i)
(c) (iii), (ii) and (iv) (d) (iii), (iv) and (ii)

256. The symbolic representation of four logic gates are given below



The logic symbols for OR, NOT and NAND gates are respectively

AIPMT 2009

(a) (iv), (i), (iii) (b) (iv), (ii), (i)
(c) (i), (iii), (iv) (d) (iii), (iv), (ii)

257. The output of OR gate is 1

AIPMT 2004

(a) if both inputs are zero
(b) if either or both inputs are 1
(c) only if both inputs are 1
(d) if either inputs is zero

258. The given truth table is for which logic gate

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

AIPMT 2002

(a) NAND (b) XOR (c) NOR (d) OR.

259. The given truth table is for which logic gate

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

AIPMT 2001

(a) NAND (b) XOR (c) NOR (d) OR

260. The truth table given below

Inputs		Output
A	B	Y
0	0	0
1	0	0
0	1	0
1	1	1

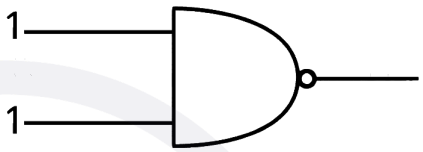
represents

AIPMT 2000

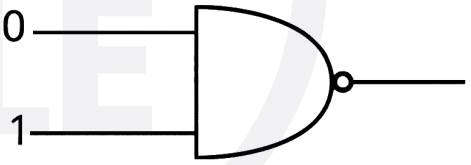
(a) AND gate (b) NOR gate
(c) OR gate (d) NAND gate

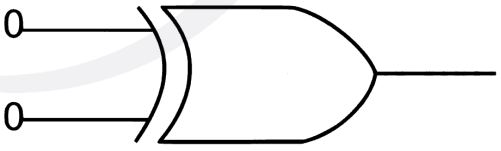
261. Which one of the following gates will have an output of 1?

AIPMT 1998

(a)


(b)


(c)


(d)


262. The truth table given below is for which gate?

AIPMT 1998

Input		Output
A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

(a) XOR (b) OR (c) AND (d) NAND

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263. The following truth-table belongs to which one of the following four gates?

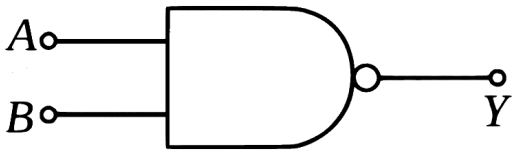
AIPMT 1997

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

(a) XOR (b) NOR (c) OR (d) NAND

264. This symbol represents

AIPMT 1996



(a) AND gate (b) NOR gate
(c) NAND gate (d) OR gate

265. The following truth-table belongs to which one of the following four gates?

AIPMT 1995

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

(a) XOR (b) NOR (c) OR (d) NAND

266. The given truth table is for which logic gate?

AIPMT 1994

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

(a) NAND (b) XOR (c) NOR (d) OR

267. The following truth table corresponds to the logical gate

AIPMT 1991

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

(a) NAND (b) OR (c) AND (d) XOR

268. The truth table given in fig. represents:

JEE MAIN 2016 · 9 APR · SHIFT 1

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

(a) AND - Gate (b) OR - Gate
(c) NAND - Gate (d) NOR - Gate

◆ NAND, NOR & XOR 13 Qs

269. If two inputs of a NOR gate are shorted, the resulting gate is

MHT CET 2026 · 19 MAY · SHIFT 1

(a) a NAND gate. (b) an OR gate.
(c) an AND gate. (d) a NOT gate.

270. An AND gate is followed by a NOT gate in series. With two input A and B, the Boolean expression for the output Y will be

MHT CET 2026 · 15 MAY · SHIFT 2

(a) $\overline{A+B}$ (b) $\overline{A \cdot B}$
(c) $A \cdot B$ (d) $A+B$

271. In which of the logic gate the following statement is true? "The output is high when either of the inputs is high but not if both inputs are high"

MHT CET 2026 · 16 APR · SHIFT 2

(a) NAND (b) NOR (c) X-OR (d) OR

272. In the case of NAND gate, if A and B are inputs and Y is the output then

MHT CET 2026 · 11 APR · SHIFT 2

(a) $Y=\overline{A+B}$ (b) $Y=A \cdot B$
(c) $Y=\overline{A \cdot B}$ (d) $Y=A+B$

273. An AND gate is followed by a NOT gate in series. With two inputs ' A ' and ' B ', the Boolean expression for the output ' Y ' will be

MHT CET 2025 · 5 MAY · SHIFT 2

(a) $\overline{\mathrm{A}+\mathrm{B}}$ (b) $\overline{\mathrm{A} \cdot \mathrm{B}}$
(c) $\mathrm{A} \cdot \mathrm{B}$ (d) $\mathrm{A}+\mathrm{B}$

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274. The logic gate for which the output goes 'HIGH' or ' 1 ' only when an odd number of 'HIGH' or ' 1 ' are at its input, is

MHT CET 2025 · 25 APR · SHIFT 1

(a) OR gate (b) NAND gate
(c) Ex-OR gate (d) NOR gate

275. The Boolean expression for 'X-OR' gate $C = (A \oplus B)$ is equal to

MHT CET 2024 · 3 MAY · SHIFT 2

(a) $(\mathrm{A} \cdot \mathrm{B}) + (\overline{\mathrm{A}} \cdot \overline{\mathrm{B}})$ (b) $\mathrm{A} + (\overline{\mathrm{A}} \cdot \overline{\mathrm{B}})$
(c) $(\mathrm{A} \cdot \mathrm{B}) + \overline{\mathrm{B}}$ (d) $(\overline{\mathrm{A}} \cdot \mathrm{B}) + (\mathrm{A} \cdot \overline{\mathrm{B}})$

276. If two inputs of a NAND gate are shorted, the resulting gate is

MHT CET 2023 · 13 MAY · SHIFT 1

(a) an OR gate (b) an AND gate
(c) a NOT gate (d) a NOR gate

277. In the case of NAND gate, if A and B are the inputs and Y is the output then

MHT CET 2023 · 11 MAY · SHIFT 1

(a) $\mathrm{Y} = \mathrm{A} \cdot \mathrm{B}$ (b) $\mathrm{Y} = \overline{\mathrm{A} - \mathrm{B}}$
(c) $\mathrm{Y} = \overline{\mathrm{A} + \mathrm{B}}$ (d) $\mathrm{Y} = \overline{\mathrm{A} \cdot \mathrm{B}}$

278. For a NAND gate, the inputs and outputs are given below.

Input A	Input B	Output Y
0	1	C
0	0	D
1	0	E
1	1	F

The values taken by C, D, E, F are respectively

MHT CET 2022 · 11 AUG · SHIFT 2

(a) 0, 1, 0, 0 (b) 1, 1, 1, 0
(c) 1, 0, 1, 1 (d) 0, 1, 0, 1

279. A logic gate which gives output 'HIGH' only when its two input terminals are at different logic levels with respect to each other is

MHT CET 2021 · 22 SEP · SHIFT 1

(a) NOR gate (b) OR gate
(c) AND gate (d) X-OR gate

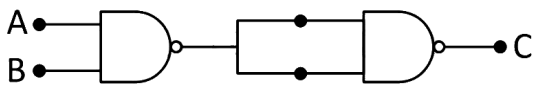
280. When the output of an OR gate is applied as input to a NOT gate, then the combination acts as a

NEET 2024

(a) NAND gate (b) NOR gate
(c) AND gate (d) OR gate

281. The output from a NAND gate is divided into two in parallel and fed to another NAND gate. The resulting gate is a

NEET 2013



(a) AND gate (b) NOR gate (c) OR gate (d) NOT gate

◆ Boolean output of a circuit 1 Q

282. In Boolean expression $A + B = Y$ implies that

MHT CET 2026 · 20 APR · SHIFT 2

(a) Y exists when A or B exists but not when both A and B exist.
(b) Y exists only when A and B both exist.
(c) Y exists when both A and B do not exist.
(d) Y exists when A exists or B exists or both A and B exist

◆ Equivalent gate & universal gates 3 Qs

283. Which of the following logic gates is called as Universal gate?

MHT CET 2025 · 21 APR · SHIFT 1

(a) OR (b) X-OR (c) AND (d) NAND

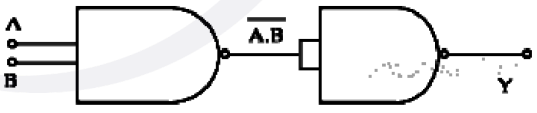
284. Which of the following gate is called universal gate?

NEET 2020 · PHASE 2

(a) NOT gate (b) OR gate
(c) AND gate (d) NAND gate

285. Identify the gate and match A, B, Y in bracket to check.

JEE MAIN 2014 · 9 APR · SHIFT 1



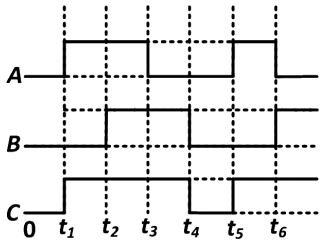
(a) AND (A= 1, B = 1, Y = 1)
(b) OR (A = 1, B = 1, Y = 0)
(c) NOT (A = 1, B = 1, Y = 1)
(d) XOR (A = 0, B = 0, Y = 0)

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◆ Waveforms 4 Qs

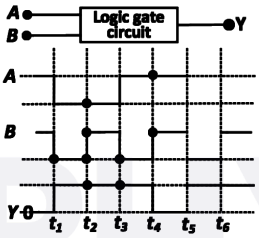
286. The figure shows a logic circuit with two inputs A and B and the output C. The voltage wave forms across A, B and C are as given. The logic circuit gate is

AIPMT 2012 · PRELIMS



(a) OR gate (b) NOR gate
(c) AND gate (d) NAND gate

287. The following figure shows a logic gate circuit with two inputs A and B and the output Y. The voltage waveforms of A, B and Y are as given.



The logic gate is

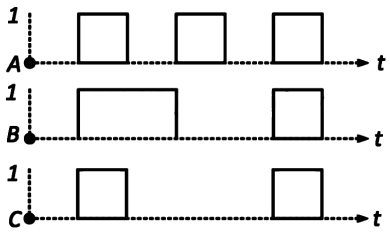
AIPMT 2010 · MAINS

(a) NOR gate (b) OR gate
(c) AND gate (d) NAND gate

288. The following figure shows a logic gate circuit with two inputs A and B and the output C.



The voltage waveforms of A, B and C are as shown below.

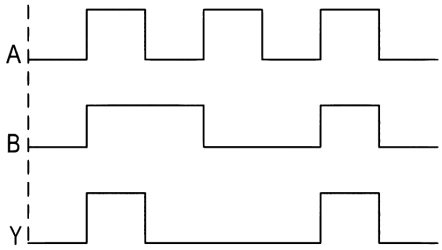


The logic circuit gate is

AIPMT 2006

(a) OR gate (b) AND gate
(c) NAND gate (d) NOR gate

289. A logic gate circuit has two inputs A and B and output Y. The voltage waveforms of A, B and Y are shown below.



The logic gate circuit is:

JEE MAIN 2022 · 27 JUL · SHIFT 1

(a) AND gate (b) OR gate
(c) NOR gate (d) NAND gate

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TOPIC 08

Other / Mixed

9 PYQs · Easy 9 · Medium 0 · Difficult 0 | MHT CET 0 · NEET 9 · JEE 0

Concepts covered: Crystal structure & bonding (5) · Valves & IC (4)

LEVEL 1 · EASY 9 questions

◆ Crystal structure & bonding 5 Qs

290. Which one of the following bonds produces a solid that reflects light in the visible region and whose electrical conductivity decreases with temperature and has high melting point?

AIPMT 2010 · PRELIMS

(a) metallic bonding
(b) van der Waal's bonding
(c) ionic bonding
(d) covalent bonding

291. For a cubic crystal structure which one of the following relations indicating the cell characteristics is correct?

AIPMT 2007

(a) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90°$
(b) $a = b = c$ and $\alpha \neq \beta \neq \gamma = 90°$
(c) $a = b = c$ and $\alpha = \beta = \gamma = 90°$
(d) $a \neq b \neq c$ and;$\alpha \neq \beta \neq$ and $\gamma = 90°$

292. Number of atom per unit cell in B.C.C.

AIPMT 2002

(a) 9 (b) 4 (c) 2 (d) 1

293. Diamond is very hard because

AIPMT 1993 *(Not in current JEE/NEET syllabus)*

(a) it is covalent solid
(b) it has large cohesive energy
(c) high melting point
(d) insoluble in all solvents

294. Which one of the following is the weakest kind of the bonding in solids?

AIPMT 1992 *(Not in current JEE/NEET syllabus)*

(a) ionic (b) metallic
(c) van der Waals (d) covalent

◆ Valves & IC 4 Qs

295. The device that can act as a complete electronic circuit is

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(a) junction diode (b) integrated circuit
(c) junction transistor (d) zener diode

296. When using a triode, as an amplifier, the electrons are emitted by

AIPMT 1996 *(Not in current JEE/NEET syllabus)*

(a) grid and collected by cathode only
(b) cathode and collected by the anode only
(c) anode and collected by cathode only
(d) anode and collected by the grid and by cathode

297. For amplification by a triode, the signal to be amplified is given to

AIPMT 1992 *(Not in current JEE/NEET syllabus)*

(a) the cathode (b) the grid
(c) the glass envelope (d) the anode

298. When a triode is used as an amplifier the phase difference between the input signal voltage and the output is

AIPMT 1990 *(Not in current JEE/NEET syllabus)*

(a) 0 (b) π (c) $\pi/2$ (d) $\pi/4$

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ANSWER KEY

Shaded by level: **Easy**

01 Energy Bands in Solids

1. (b)	2. (a)	3. (c)	4. (a)	5. (d)	6. (c)	7. (c)	8. (c)	9. (b)	10. (a)
11. (b)	12. (a)	13. (b)	14. (c)	15. (a)	16. (a)	17. (c)			

02 Intrinsic & Extrinsic Semiconductors

18. (a)	19. (c)	20. (b)	21. (b)	22. (b)	23. (a)	24. (d)	25. (a)	26. (c)	27. (b)
28. (b)	29. (c)	30. (c)	31. (c)	32. (c)	33. (d)	34. (a)	35. (c)	36. (d)	37. (b)
38. (a)	39. (a)	40. (c)	41. (b)	42. (a)	43. (d)	44. (a)	45. (a)	46. (b)	47. (a)
48. (b)	49. (d)	50. (b)	51. (a)	52. (b)	53. (a)	54. 5	55. (c)	56. (c)	57. (a)
58. (d)	59. (b)	60. (c)	61. (d)	62. (c)	63. (d)	64. (c)	65. (d)	66. (c)	67. (c)
68. (c)									

03 P-N Junction Diode

69. (c)	70. (a)	71. (c)	72. (c)	73. (d)	74. (b)	75. (a)	76. (b)	77. (d)	78. (d)
79. (b)	80. (c)	81. (c)	82. 1	83. (a)	84. (a)	85. (c)	86. (a)	87. (a)	88. (b)
89. (b)	90. (c)	91. (d)	92. (b)	93. (c)	94. (b)	95. (d)	96. (d)	97. (b)	98. (b)
99. (a)	100. (d)	101. (d)	102. (d)	103. (d)	104. (c)	105. (b)	106. (a)	107. (b)	108. (a)
109. (b)	110. (a)	111. (d)	112. (d)	113. (a)	114. (d)	115. (a)	116. (b)	117. (d)	118. (b)
119. (c)	120. (d)	121. (c)	122. (d)	123. (b)					

04 Rectifiers & Filters

124. (c)	125. (b)	126. (a)	127. (b)	128. (b)	129. (b)	130. (a)	131. (c)	132. (c)	133. (d)
134. (b)	135. (d)	136. (c)	137. (b)						

05 Special Purpose Diodes

138. (c)	139. (d)	140. (a)	141. (d)	142. (d)	143. (d)	144. (c)	145. (a)	146. (b)	147. (d)
148. (c)	149. (b)	150. (b)	151. (d)	152. (c)	153. (c)	154. (b)	155. (c)	156. (b)	157. (d)
158. (b)	159. (d)	160. (a)	161. 3	162. (d)	163. (d)	164. (a)	165. (b)	166. (c)	167. (d)
168. (c)	169. (d)	170. (c)	171. (c)	172. (d)	173. (c)	174. (d)	175. (d)	176. (d)	177. (b)

06 Junction Transistor

178. (b)	179. (b)	180. (b)	181. (c)	182. (a)	183. (c)	184. (c)	185. (b)	186. (c)	187. (c)
188. (a)	189. (c)	190. (a)	191. (a)	192. (d)	193. (b)	194. (c)	195. (c)	196. (b)	197. (d)
198. (b)	199. (d)	200. (b)	201. (d)	202. (b)	203. (b)	204. (b)	205. (a)	206. (a)	207. (c)
208. (d)	209. (d)	210. (a)	211. (b)	212. (d)	213. (b)	214. (b)	215. (c)	216. (d)	217. (a)
218. (b,d)	219. (b)	220. (a)	221. (c)	222. (c)	223. (c)	224. (d)	225. (a)	226. (c)	227. (c)
228. (a)	229. (c)	230. (b)	231. (d)	232. (b)	233. (b)	234. (c)	235. (a)	236. (a)	237. (c)
238. (d)	239. (a)	240. (a)	241. (d)	242. (b)	243. (d)	244. (d)	245. (b)		

07 Logic Gates

246. (c)	247. (c)	248. (b)	249. (c)	250. (d)	251. (b)	252. (d)	253. (d)	254. (d)	255. (d)
256. (b)	257. (b)	258. (a)	259. (a)	260. (a)	261. (c)	262. (d)	263. (b)	264. (c)	265. (b)
266. (a)	267. (b)	268. (b)	269. (d)	270. (b)	271. (c)	272. (c)	273. (b)	274. (c)	275. (d)
276. (c)	277. (d)	278. (b)	279. (d)	280. (b)	281. (a)	282. (d)	283. (d)	284. (d)	285. (a)
286. (a)	287. (d)	288. (b)	289. (a)						

08 Other / Mixed

290. (a)	291. (c)	292. (c)	293. (b)	294. (c)	295. (b)	296. (b)	297. (b)	298. (b)	

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

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