

RK VISION ACADEMY

PHYSICS

XII - SEMICONDUCTOR

SECTION A

- 1. The increase in the width of the depletion region in a p-n junction diode is due to
 - (1) forward bias only
 - (2) reverse bias only
 - (3) both forward bias and reverse bias
 - (4) increase in forward current
- 2. Out of the following which one is a forward biased diode?



3. For a p-type semiconductor, which of the following statements is true?

(1) Electrons are the majority carriers and pentavalent atoms are the dopants.

(2) Electrons are the majority carriers and trivalent atoms are the dopants.

(3) Holes are the majority carriers and trivalent atoms are the dopants.

(4) Holes are the majority carriers and pentavalent atoms are the dopants

4. An LED is constructed from a p-n junction diode using GaAsP. The energy gap is 1.0 eV. The wavelength of the light

emitted will be equal to

- (1) 10.4×10^{-26} m (2) 654 nm (3) 654 Å (4) 654 × 10⁻¹¹ m
- 5. Which one of the following represents forward bias diode?



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



7. In the given figure, a diode D is connected to an external resistance R = 100 ohm 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



- (2) 35 mA
- (3) 30 mA
- (4) 40 mA
- 8. The given graph represents V-I characteristic for a semiconductor device.



Which of the following statement is correct?

(1) It is V-I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current.

(2) It is for a solar cell and points A and B represent open circuit voltage and current, respectively.

(3) It is for a photodiode and points A and B represent open circuit voltage and current, respectively.

(4) It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively.

9. The barrier potential of a p-n junction depends on

i) type of semiconductor material

- ii) amount of doping
- iii) temperature

Which one of the following is correct?

(1) 'i' and 'ii' only

- (2) 'ii' only
- (3) 'ii' and 'iii' only
- (4) 'i', 'ii' and 'iii'

10. Two ideal diodes are connected to a battery as shown in the circuit. The current supplied by the battery is



11. C and Si both have same lattice structure;
having 4 bonding electrons in each.
However, C is insulator where as Si is
intrinsic semiconductor. This is because

(1) In case of C valence band is not completely filled at absolute zero temperature.

(2) In case of C the conduction band is partly

filled even at absolute zero temperature.

(3) The four bonding electrons in the case of C lie in the second orbit, whereas in the case of Si they lie in the third.

(4) The four bonding electrons in the case ofC lie in the third orbit, whereas for Si theylie in the fourth orbit.

12. In forward biasing of the p-n junction

 the positive terminal of the battery is connected to p-side and the depletion region becomes thick.

(2) the positive terminal of the battery is

connected to n-side and the depletion region becomes thin.

(3) the positive terminal of the battery is connected to n-side and the depletion region becomes thick.

(4) the positive terminal of the battery isconnected to p-side and the depletion regionbecomes thin.

13. If a small amount of antimony is added to germanium crystal

(1) it becomes a p-type semiconductor

(2) the antimony becomes an acceptor atom

(3) there will be more free electrons than holes in the semiconductor

(4) its resistance is increased

14. A Zener diode, having breakdown voltage equal to 15V, is used in a voltage regulator circuit shown in figure. The current through the diode is



- (2) 10 mA
- (3) 15 mA
- (4) 20 mA
- 15. In the following figure, the diodes which are forward biased, are

i) +5 V +10 V



16. Pure Si at 500 K has equal number of electron (ne) & hole (n_h) concentrations of 1.5×10¹⁶ m⁻³. Doping by indium increases 4.5×10²² m⁻³. The doped to nh semiconductor is of (Mains 2011) (1) p-type having electron concentration $ne = 5 \times 10^9 \text{ m}^{-3}$ (2) n-type with electron concentration $ne = 5 \times 10^{22} m^{-3}$ (3) p-type with electron concentration $ne = 2.5 \times 10^{10} m^{-3}$ (4) n-type with electron concentration $ne = 2.5 \times 10^{23} m^{-3}$

17. Which one of the following statement is false?

(1) Pure Si doped with trivalent impurities gives a p-type semiconductor.

(2) Majority carriers in a n-type semiconductor are holes.

(3) Minority carriers in a p-type semiconductor are electrons.

(4) The resistance of intrinisic semiconductor

decreases with increase of temperature.

- 18. 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?
 - (1) metallic bonding
 - (2) Van der Waal's bonding
 - (3) ionic bonding
 - (4) covalent bonding

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

- (1) junction diode
- (2) integrated circuit
- (3) junction transistor
- (4) zener diode
- 20. A p-n photodiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of wavelength
 - (1) 4000 nm
 - (2) 6000 nm
 - (3) 4000 Å
 - (4) 6000 Å
- 21. A cell of emf 4.5V is connected to a junction diode whose barrier potential is0.7V. If the external resistance in the circuit is 190 ohm, the current in the

- circuit is (1) 20 mA
- (2) 2 m A
- (3) 23 mA
- (4) 200 Ma
- 22. In the energy band diagram of a material shown below, the open circles and filled circles denote holes and electrons respectively. The material is
 - (1) an insulator
 - (2) a metal
 - (3) an n-type semiconductor
 - (4) a p-type semiconductor.
- 23. Choose the only false statement from the following.

(1) In conductors the valence and conduction

bands overlap.

(2) Substances with energy gap of the order of 10 eV are insulators.

(3) The resistivity of a semiconductor increases with increase in temperature.

(4) The conductivity of a semiconductor increases with increase in temperature.

24. Zener diode is used for

- (1) amplification
- (2) rectification
- (3) stabilisation
- (4) producing oscillations in an oscillator.
- 25. Application of a forward bias to a p-n junction

(1) widens the depletion zone

(2) increases the potential difference across the depletion zone

(3) increases the number of donors on the n side

(4) decreases the electric field in depletion zone

- 26. 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? (2005)
 - (1) (Eg)C > (Eg)Si
 - (2) (Eg)C < (Eg)Si
 - (3) (Eg)C = (Eg)Si
 - (4) (Eg)C < (Eg)Ge.
- 27. In a p-n junction photo cell, the value of the photo-electromotive force produced by monochromatic light is proportional to

(1) The barrier voltage at the p-n junction.

(2) The intensity of the light falling on the cell.

(3) The frequency of the light falling on the cell.

(4) The voltage applied at the p-n junction

28. In semiconductors at a room temperature

(1) the valence band is partially empty and the conduction band is partially filled(2) the valence band is completely filled and the conduction band is partially filled

- (3) the valence band is completely filled
- (4) the conduction band is completely empty
- 29. The peak voltage in the output of a half wave diode rectifier fed with a sinusoidal signal without filter is 10 V. The d.c. component of the output voltage is (2004)
 - (1) 10/ 2 V
 - (2) $10/\pi V$
 - (3) 10 V
 - (4) $20/\pi V$
- 30. The reverse bias in a junction diode is changed from 5V to 15V then the value of current changes from 38 μA to 88 μA. The resistance of junction diode will be (1) 4 x 10⁵
 (2) 3 x10⁵
 - $(3) 2 \times 10^5$
 - (-)
 - $(4) 10^6$

31. Reverse bias applied to a junction diode

- (1) lowers the potential barrier
- (2) raises the potential barrier
- (3) increases the majority carrier current
- (4) increases the minority carrier current
- 32. If a full wave rectifier circuit is operating from 50 Hz mains, the fundamental frequency in the ripple will be
 - (1) 25 Hz
 - (2) 50 Hz
 - (3) 70.7 Hz
 - (4) 100 Hz

33. 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



- (1) OR gate
- (2) NOR gate
- (3) AND gate
- (4) NAND gate

34. The mobility of free electron is greater than that of free holes because

- (1) The carry negative charge
- (2) They are light
- (3) They mutually collide less

(4) They require low energy to continue their motion

- 35. When the reverse potential in a semiconductor diode are 10V and 20V, then the corresponding reverse currents are 25μA and 50μA respectively. The reverse resistance of junction diode will
 - be
 - (1) 40 ohm
 - (2) 4×10^5 ohm
 - (3) 40K ohm
 - (4) 4×10^{-5} ohm

SECTION B

36. The current in the circuit will be



37. In the circuit shown in figure the maximum output voltage V0 is



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



39. The Boolean expression for the gate circuit



40. The following configuration of gates is equivalent to



- (1) NAND gate
- (2) XOR gate
- (3) OR gate
- (4) NOR gate

41. Depletion layer consists of

- (1) mobile ions
- (2) protons
- (3) electrons
- (4) immobile ions

42. In the following circuit find I_1 and I_2



(1) 0, 0

(2) 5 mA, 5 mA

- (3) 5 mA, 0
- (4) 0, 5 mA
- 43. Which of the following, when added as an impurity into the silicon produces n type semiconductor?
 - (1) B
 - (2) Al
 - (3) P
 - (4) Mg
- 44. In the following circuit the output Y becomes zero for the inputs



45. The given electrical network is equivalent to



- (1) OR gate
- (2) NOR gate
- (3) NOT gate
- (4) AND gate

46. The output of OR gate is 1 (2004)

- (1) if both inputs are zero
- (2) if either or both inputs are 1
- (3) only if both inputs are 1



47. If current in diode is five times that in R₁. Breakdown voltage of diode

is 6 volt. Find the value of R.



- (1) 2000 ohm
- (2) 2000/ 3 ohm
- (3) 1000 ohm
- (4) 1000 / 3 ohm
- 48. The diode used in the circuit shown in the figure has a constant voltage drop at 0.5 V at all currents and a maximum power rating of 100 milli watts. What should be the value of the resistor R, connected in series with diode for obtaining maximum current?



- (1) 6.76 ohm
- (2) 20 ohm
- (3) 5 ohm
- (4) 5.6 ohm
- 49. In the case of forward biasing of p-n junction, which one of the following figures correctly depicts the direction of flow of carriers?



50. From the circuit shown below, the maximum and minimum values of zener diode current are



(1) 6mA, 5mA
 (2) 14mA, 5mA
 (3) 9 mA, 1mA
 (4) 3mA, 2mA

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	BINGLOG	33. 1	
	PHISICS	34. 4	
	AII - SEMICONDUCTOR	35. 2	
1 2	SECTION A		SE
$\begin{array}{c} 1, \ 2 \\ 2, \ \mathbf{A} \end{array}$		36. 2	
2. 4 3. 2		37. 2	
3. 5		38. 1	
4. 2 5 1		39. 3	
5. 4 6 1		40. 2	
0. 4 7 2		41. 4	
7. 3 9 1		42. 4	
0. 1		43. 3	
9. 4		44. 4	
10. 4		45. 2	Y
11. J		46. 2	
12. 4		47. 2	
13. 5		48. 2	
14. 1 15 2		49. 2	
15. 5		50. 3	
10. 1 17. 2			
1/. 2 10 1			
10. 1 10. 2			
19. 2 20. 2			
20. 5 21 1			
21. 1			
22. 4 73 3			
23.3			
2- . <i>3</i> 25 <i>A</i>	/		
2 5. 4 2 6 1			
20. 1 27 0			
2 1. 2 28 1			
20. 1 20. 2			
2 9. 2 30 2			
30. 3			
		1	

CTION B