Electronic Devices and Electronic Circuits

Questions:

1. At room temperature the current in an intrinsic semiconductor is due to

   A.holes

   B.electrons

   C.ions

   D.holes and electrons

2. Work function is the maximum energy required by the fastest electron at 0 K to escape from the metal surface.

   A.True

   B.False

3. The most commonly used semiconductor material is

   A.silicon

   B.germanium

   C.mixture of silicon and germanium

   D.none of the above

4. In which of these is reverse recovery time nearly zero?

   A.Zener diode

   B.Tunnel diode

   C.Schottky diode

   D.PIN diode

5. A transistor has a current gain of 0.99 in the CB mode. Its current gain in the CC mode is

   A.100

   B.99

   C.1.01

   D.0.99

6. The amount of photoelectric emission current depends on

   A.frequency of incident radiation

B. intensity of incident radiation

C. both frequency and intensity of incident radiation

D. none of the above

7. **Assertion (A):** A *p-n* junction has high resistance in reverse direction.

Reason (R): When a reverse bias is applied to *p-n* junction, the width of depletion layer increases.

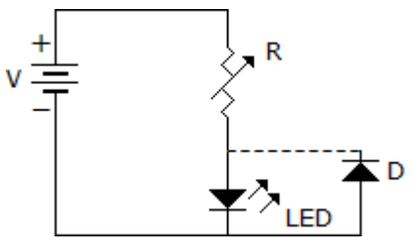
A. Both A and R are true and R is correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

8. In the circuit of figure the function of resistor R and diode D are



A. to limit the current and to protect LED against over voltage

B. to limit the voltage and to protect LED against over current

C. to limit the current and protect LED against reverse breakdown voltage.

D. none of the above.

9. At very high temperatures the extrinsic semi conductors become intrinsic because

A. drive in diffusion of dopants and carriers

B. band to band transition dominants over impurity ionization

C. impurity ionization dominants over band to band transition

D. band to band transition is balanced by impurity ionization

10. In a p type material the Fermi level is 0.3 eV above valence band. The concentration of acceptor atoms is increased. The new position of Fermi level is likely to be

A. 0.5 eV above valence band

B. 0.28 eV above valence band

C. 0.1 eV above valence band

D. below the valence band

.

11. In an n-p-n transistor, the majority carriers in the base are

A. electrons

B. holes

C. both holes and electrons

D. either holes or electrons

12. A silicon (PN) junction at a temperature of 20°C has a reverse saturation current of 10 pico Ampere. The reverse saturation current at 40°C for the same bias is approximately.

A. 30 pA

B. 40 pA

C. 50 pA

D. 60 pA

13. An amplifier without feedback has a voltage gain of 50, input resistance of 1 kΩ and output resistance of 2.5 kΩ. The input resistance of the current shunt *-ve* feedback amplifier using the above amplifier with a feedback factor of 0.2 is

A. 1/11 kΩ

B. 1/5 kΩ

C. 5 kW

D. 11 kW

14. As compared to an ordinary semiconductor diode, a Schottky diode

A. has lower cut in voltage

B. has higher cut in voltage

C. lower reverse saturation current

D. both (b) and (c)

15. As compared to an ordinary semiconductor diode, a Schottky diode

A. has higher reverse saturation current

B. has higher reverse saturation current and higher cut in voltage

C. has higher reverse saturation current and lower cut in voltage

D. has lower reverse saturation current and lower cut in voltage

16. Crossover distortion behaviour is characteristic of

A. class A O/P stage

B. class B O/P stage

C. class AB output stage

D. common pulse O/P state

17. If a_{ac} for transistor is 0.98 then β_{ac} is equal to

A. 51

B. 49

C. 47

D. 45

18. In an *n-p-n* transistor biased for operation in forward active region

A. emitter is positive with respect to base

B. collector is positive with respect to base

C. base is positive with respect to emitter and collector is positive with respect to base

D. none of the above

19. A particular green LED emits light of wavelength 5490, Å, the energy bandgap of the semiconductor material used there is .. $h = 6.6 \times 10^{-34}$ J sec.

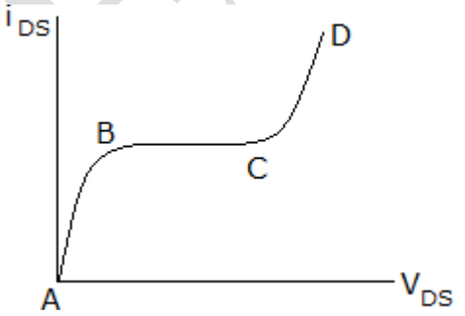
A. 2.26 eV

B. 1.98 eV

C. 1.17 eV

D. 0.74 eV

20. The *v-i* characteristics of a FET is shown in figure. In which region is the device biased for small signal amplification



A. AB

B. BC

C. CD

D. BD

21. A potential of 7 V is applied to a silicon diode. A resistance of 1 K ohm is also in series with the diode. The current is

A. 7 mA

B. 6.3 mA

C. 0.7 mA

D. 0

22. **Assertion (A):** The reverse saturation current in a semiconductor diode is 4nA at 20°C and 32 nA at 50°C.

Reason (R): The reverse saturation current in a semiconductor diode doubles for every 10°C rise in temperature.

A. Both A and R are true and R is correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

23. Calculate the stability factor and change in I_C from 25°C to 100°C for, $\beta = 50$, $R_B/ R_E = 250$, $\Delta I_{C0} = 19.9$ nA for emitter bias configuration.

A. 42.53, 0.85 μA

B. 40.91, 0.58 μA

C. 40.91, 0.58 μA

D. 41.10, 0.39 μA

24. A *p-n* junction diode has

A. low forward and high reverse resistance

B. a non-linear *v-i* characteristics

C. zero forward current till the forward voltage reaches cut in value

D. all of the above

25. The normal operation of JFET is

A. constant voltage region

B. constant current region

C.both constant voltage and constant current regions

D.either constant voltage or constant current region

26. The minority carrier life time and diffusion constant in a semiconductor material are respectively 100 microsecond and 100 cm^2/sec. The diffusion length is

A.0.1 cm

B.0.01 cm

C.0.0141 cm

D.1 cm

27. What is the correct sequence of the following step in the fabrication of a monolithic, Bipolar junction transistor?

1. Emitter diffusion
2. Base diffusion
3. Buried layer formation
4. E pi-layer formation

Select the correct answer using the codes given below:

A.3, 4, 1, 2

B.4, 3, 1, 2

C.3, 4, 2, 1

D.4, 3, 2, 1

28. Which of the following is used for generating time varying wave forms?

A. MOSFET

B. PIN diode

C. Tunnel diode

D. UJT

29. Calculate the resistivity of *n*-type semiconductor from the following data, Density of holes = 5 x 10^{12} cm^{-3}. Density of electrons = 8 x 10^{13} cm^{-3}, mobility of conduction electron = 2.3 x 10^4 cm^2/ V-sec and mobility of holes = 100 cm^2/V-sec.

A.0.43 Ω-m

B.0.34 Ω-m

C.0.42 Ω-m

D.0.24 Ω-m

30. In all metals

A.conductivity decreases with increase in temperature

B.current flow by electrons as well as by holes

C.resistivity decreases with increase in temperature

D.the gap between valence and conduction bands is small

31. **Assertion (A):** Two transistors one *n-p-n* and the other *p-n-p* are identical in all respects (doping, construction, shape, size). The *n-p-n* transistor will have better frequency response.

Reason (R): The electron mobility is higher than hole mobility.

A.Both A and R are true and R is correct explanation of A

B.Both A and R are true but R is not a correct explanation of A

C.A is true but R is false

D. A is false but R is true

32. Which of these has degenerate *p* and *n* materials?

A.Zener diode

B.PIN diode

C.Tunnel diode

D.Photo diode

33. Which of these has degenerate p and n materials?

A. Zener diode

B. PIN diode

C. Tunnel diode

D. Photo diode

34. In a piezoelectric crystal, applications of a mechanical stress would produce

A.plastic deformation of the crystal

B.magnetic dipoles in the crystal

C.electrical polarization in the crystal

D.shift in the Fermi level

35. In which of the following is the width of junction barrier very small?

A.Tunnel diode

B.Photo diode

C.PIN diode

D.Schottky diode

36. Measurement of Hall coefficient enables the determination of

A.recovery time of stored carrier

B.type of conductivity and concentration of charge carriers

C.temperature coefficient and thermal conductivity

D.Fermi level and forbidden energy gap

37. The carriers of *n* channel JFET are

A.free electrons and holes

B.holes

C.free electrons or holes

D.free electrons

38. **Assertion (A):** Silicon is preferred over germanium in manufacture of semiconductor devices.

Reason (R): Forbidden gap in silicon is more than that in germanium.

A.Both A and R are true and R is correct explanation of A

B.Both A and R are true but R is not a correct explanation of A

C.A is true but R is false

D.A is false but R is true

39. The intrinsic carrier concentration of silicon sample at 300 K is 1.5 x $10^{16}/m^3$. If after doping, the number of majority carriers is 5 x $10^{20}/m^3$. The minority carrier density is

A. 4.5 x $10^{11}/m^3$

B. 3.33 x $10^{4}/m^3$

C. 5 x $10^{20}/m^3$

D. 3 x $10^{-5}/m^3$

40. A diode is operating in forward region and the forward voltage and current are $v = 3 + 0.3 \sin \omega t$ (volts) and $i = 5 + 0.2 \sin \omega t$ (mA). The average power dissipated is

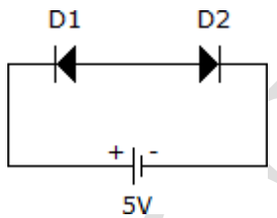
A. 15 mW

B. about 15 mW

C. 1.5 mW

D. about 1.5 mW

41. Two identical silicon diodes D_1 and D_2 are connected back to back shown in figure. The reverse saturation current I_s of each diode is 10^{-8} amps and the breakdown voltage V_{Br} is 50V. Evaluate the voltages V_{D1} and V_{D2} dropped across the diodes D_1 and D_2 assuming KT/q to be 25mV.



A. 4.983 V, 0.017 V

B. - 4.98 V, - 0.017 V

C. 0.17 V, 4.983 V

D. - 0.017 V, - 4.98 V

42. For BJT transistor. The maximum power dissipation is specified as 350 mW if ambient temperature is 25°C. If ambient temperature is 60°C the maximum power dissipation should be limited to about

A.100 mW

B.250 mW

C.450 mW

D.600 mW

43. Which of the following has highest conductivity?

A.Silver

B.Aluminium

C.Tungsten

D.Platinum

44. Compared to bipolar junction transistor, a JFET has

A.lower input impedance

B.high input impedance and high voltage gain

C.higher voltage gain

D.high input impedance and low voltage gain

45. As temperature increases

A.the forbidden energy gap in silicon and germanium increase

B.the forbidden energy gap in silicon and germanium decrease

C.the forbidden energy gap in silicon decreases while that in germanium decreases

D.the forbidden energy gap in silicon increases while that in germanium decreases

46. For an P-channel enhancement type MOSFET determine the drain current if K = 0.278 x 10-3A/V2, VGS = -4V, VT = -2V, Voltage equivalent at 27°C = 26 mV.

A.10 mA

B.1.11 mA

C.0.751 mA

D.46.98 mA

47. Which of the following elements act as donor impurities?

1. Gold
2. Phosphorus
3. Boron
4. Antimony
5. Arsenic
6. Indium

Select the answer using the following codes :

A.1, 2 and 3

B.1, 2, 4, and 6

C.3, 4, 5 and 6

D.2, 4 and 5

48. The number of valence electrons in a donor atom is

A.2

B.3

C.4

D.5

49. An electron rises through a voltage of 100 V. The energy acquired by it will be

A.100 eV

B. 100 joules

C. $(100)^{1.2}$ eV

D. $(100)^{1.2}$ joules

50. If the drift velocity of holes under a field gradient of 100 V/m in 5 m/s, their mobility (in SI units) is

A. 0.05

B. 0.5

C. 50

D. 500

51. **Assertion (A):** When reverse voltage across a *p-n* junction is increased, the junction capacitance decreases.

Reason (R): Capacitance of any layer is inversely proportional to thickness.

A. Both A and R are true and R is correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

52. SCR can be turned on by

1. applying anode voltage at a sufficient fast rate
2. applying sufficiently large anode voltage
3. increasing the temperature of SCR to a sufficiently
4. applying sufficiently large gate current.

A. 1, 2, 4 only

B. 4 only

C. 1, 2, 3, 4

D. none

53. If for a silicon n-p-n transistor, the base to emitter voltage (VBE) is 0.7 V and the collector to base voltage VCB is 0.2 Volt, then the transistor is operating in the

A. normal active mode

B. saturation mode

C. inverse active mode

D. cut off mode

54. GaAs has an energy gap 1.43 eV the optical cut off wavelength of GaAs would lie in the

A. visible region of the spectrum

B. infrared region of the spectrum

C. ultraviolet region of the spectrum

D. for ultraviolet region of the spectrum

55. In a bipolar junction transistor $a_{dc} = 0.98$, $I_{CO} = 2\ \mu A$ and $1_B = 15\ \mu A$. The collector current I_C is

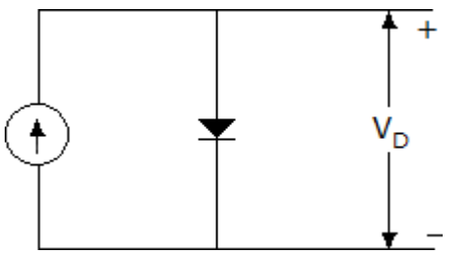
A.635 mA

B.735 mA

C.835 mA

D.935 mA

56. In given figure a silicon diode is carrying a constant current of 1 mA. When the temperature of the diode is 20°C, V_D is found to be 700 mV. If the temperature rises to 40°C, V_D becomes approximately equal to



A.747 mV

B.660 mV

C.680 mV

D.700 mV

57. When a p-n junction is reverse biased

A.holes and electrons move away from the junction

B.holes and electrons move towards the junction

C.holes move towards junction and electrons move away from junction

D.holes move away from junction and electrons move towards junction

58. Determine the transistor capacitance of a diffused junction varicap diode of a reverse potential of 4.2 V if C(0) = 80 pf and V_T = 0.7 V

A. 42 pf

B. 153.03 pf

C. 13.33 pf

D. Data inadequate

59. **Assertion (A):** In a BJT base current is very small.

Reason (R): In a BJT recombination in base region is high.

A. Both A and R are true and R is correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

60. A reverse voltage of 18 V is applied to a semiconductor diode. The voltage across the depletion layer is

A. 0 V

B. 0.7 V

C. about 10 V

D. 18 V

61. An extrinsic semiconductor sample has 6 billion silicon atoms and 3 million pentavalent impurity atoms. The number of electrons and holes is

A. 3 million each

B. 6 billion each

C. 3 million free electrons and very small number of holes

D. 3 million holes and very small number of free electrons

62. A JFET operates in ohmic region when

A. $V_{GS} = 0$

B. V_{GS} is less than pinch off voltage

C. V_{GS} = is Positive

D. $V_{GS} = V_{DS}$

63. The early effect in a BJT is caused by

A. fast turn on

B. fast turn off

C. large collector base reverse bias

D. large emitter base forward bias

64. In an integrated circuit the SiO_2 layers provide

A. electrical connection to external Ckt.

B. physical strength

C. isolation

D. conducting path.

65. The maximum power handling capacity of a resistor depends on

A. total surface area

B. resistance value

C. thermal capacity of the resistor

D. resistivity of the material used in the resistor

66. The maximum power handling capacity of a resistor depends on

A. total surface area

B. resistance value

C. thermal capacity of the resistor

D. resistivity of the material used in the resistor

67. Germanium and Si phosphorus have their maximum spectral response in the

A. infrared region

B. ultraviolet region

C. visible region

D.X-ray region

68. High purity copper is obtained by

A.rolling casting

B.casting

C.electrolytic refining

D.induction heating

69. For generating 1 MHz frequency signal, the most suitable circuit is

A.phase shift oscillator

B.weinbridge oscillator

C.colpitt's oscillator

D.clapp oscillator

70. In the fabrication of n-p-n transistor in an IC, the buried layer on the P-type substrate is

A.P^+ -doped

B.n^+ -doped

C.used to reduce the parasitic capacitance

D.located in the emitter region

71. When a ferromagnetic substance is magnetised, there are small changes in its dimensions. This phenomenon is called

A.hysteresis

B.magnetostriction

C.diamagnetism

D.bipolar relaxation

72. Gold is often diffused into silicon PN junction devices to

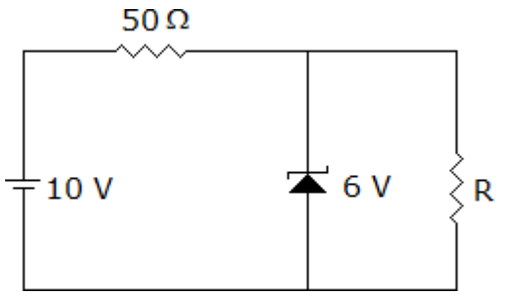
A.increase the recombination rate

B. reduce the recombination rate

C. make silicon a direct gap semiconductor

D. make silicon semimetal

73. The 6 *V* zener diode shown in figure has zero zener resistance and a knee current of 5 mA. The minimum value of R, so that the voltage across it does not fall below 6 V is



A. 1.2 *k*Ω

B. 80 Ω

C. 50 W

D. 0

74. Materials in order of decreasing electrical conductivity are

A. aluminium, silver, gold, copper

B. gold, silver, copper, aluminium

C. copper, silver, gold, aluminium

D. silver, copper, gold, aluminium

75. The sum of two or more arbitrary sinusoidal is

A. always periodic

B. periodic under certain conditions

C. never periodic

D. periodic only if all the sinusoidals are identical in frequency and phase

76. Lowest resistivity of the following is

A.constantan

B.german silver

C.manganin

D.nichrome

77. Lowest resistivity of the following is

A.constantan

B.german silver

C.manganin

D.nichrome

78. An n type semiconductor is illuminated by a steady flux of photons with energy greater than the band gap energy. The change in conductivity $\Delta\sigma$ obeys which relation?
[Here, e is the electron charge, μ_n electron mobility, μ_p hole mobility, Δ_n (Δ_p) is the excess electron (hole) density].

A.$\Delta\sigma = 0$

B.$\Delta\sigma = e(\sigma_n + \sigma_p)\,\Delta_n$

C.$\Delta\sigma = e(\mu_n\Delta_n - \mu_p\Delta_p)$

D.$\Delta\sigma = e\,\mu_n\Delta_n$

79. The amount of time between the creation and disappearance of a hole in an intrinsic semiconductor material is called

A.life cycle

B.recombination time

C.life time

D.half life

80. In which *n* type device does *p* substrate extend upto silicon dioxide layer?

A. JFET

B. Depletion type MOSFET

C. Enhancement type MOSFET

D. Both (b) and (c)

81. In a N-type semi-conductor, te concentration of minority carriers is mainly depends on

A. the number of acceptor atom

B. the number of donor atom

C. the extent of doping

D. the temperature of the material

82. Under low level injection assumption, the infected minority carrier current for an extrinsic semiconductor is essentially the

A. diffusion current

B. drift current

C. recombination current

D. induced current

83. Diffusion constants D_p, D_n mobility μ_p, μ_n and absolute temperature T are related as

A. $\frac{D_p}{\mu_p} = \frac{D_n}{\mu_n} = \frac{T}{11600}$

B. $\frac{D_p}{\mu_p} = \frac{D_n}{\mu_n} = \frac{11600}{T}$

C. $\frac{D_p}{\mu_p} = \frac{\mu_n}{D_n} = \frac{T}{11600}$

D. $\frac{D_n}{\mu_n} = \frac{\mu_p}{D_p} = \frac{T}{11600}$

84. The f_T of a BJT is related to its g_m, C_p and C_μ as follows.

A. $f_T = \frac{C_\pi + C_\mu}{g_m}$

B. $f_T = \frac{e\pi(C_\pi + C_\mu)}{g_m}$

C. $f_T = \frac{g_m}{C_\pi + C_\mu}$

D. $f_T = \frac{g_m}{2\pi(C_\pi + C_\mu)}$

85. Which of the following characteristics of a silicon *p-n* junction diode make it suitable for use as ideal diode?

1. It has low saturation current.
2. It has high value of cut in voltage.
3. It can withstand large reverse voltage.
4. When compared with germanium diode, silicon diode shows a lower degree of temperature dependence under reverse conditions.

Select the answer using the given below

A. 1 and 2

B. 1, 2, 3, 4

C. 2, 3, 4

D. 1, 3

86. Almost all resistors are made in a monolithic integrated circuit

A. during the entire diffusion

B. while growing the epitaxial layer

C. during the base diffusion

D. during the collector diffusion

87. An intrinsic semiconductor (intrinsic electron density = 10^{16} m^{-3}) is deped with donors to a level of 10^{22} m^{-3}. What is the hole density assuming all donors to be ionized?

A. 10^7 m^{-3}

B. 10^8 m^{-3}

C. 10^{10} m^{-3}

D. 10^6 m^{-3}

88. An intrinsic semiconductor (intrinsic electron density = 1016 m-3) is deped with donors to a level of 1022 m-3.

What is the hole density assuming all donors to be ionized?

A. $10^7\ m^{-3}$

B. $10^8\ m^{-3}$

C. $10^{10}\ m^{-3}$

D. $10^6\ m^{-3}$

89. The current gain of a bipolar transistor drops at high frequencies because of

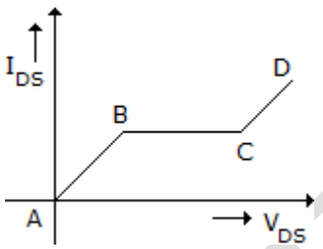
A. transistor capacitance

B. high current effects in the base

C. parasitic inductive elements

D. the early effect

90. The O/P char, of a FET is given in the figure. In which region is the device biased for small signal amplification?



A. *AB*

B. *BC*

C. *CD*

D. *BD*

91. Electric breakdown strength of a material depends on its

A. composition

B. moisture content

C. thickness

D. all of the above

92. In intrinsic semiconductor at 300 K, the magnitude of free electron concentration in silicon is about

A. 15×10^4 per cm^3

B. 5×10^{12} per cm^3

C. 1.45×10^{10} per cm^3

D. 1.45×10^6 per cm^3

93. E_G for silicon is 1.12 eV and that for germanium is 0.72 eV. Therefore it can be concluded that

A. more number of electron-hole pairs will be generated in silicon than in germanium at room temperature

B. less number of electron hole pairs will be generated in silicon than in germanium at room temperature

C. equal number of electron-hole pairs will be generated in both at lower temperatures

D. equal number of electron-hole pairs will be generated in both at higher temperatures

94. Introducing a resistor in the emitter of a common amplifier stabilizes the d.c. operating point against variations in

A. only the temperature

B. only β of the transistor

C. both temperature and β

D. none of these

95. Introducing a resistor in the emitter of a common amplifier stabilizes the d.c. operating point against variations in

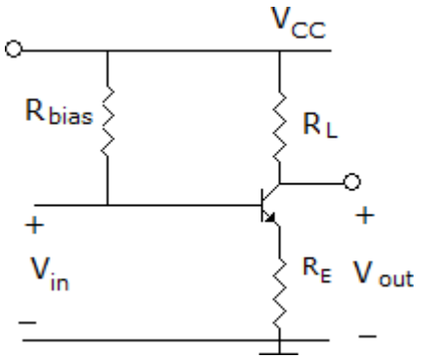
A. only the temperature

B. only β of the transistor

C. both temperature and β

D. none of these

96. In the BJT amplifier shown in the figure is the transistor is biased in the forward active region. Putting a capacitor across R_E will



A. decrease the voltage gain and decrease the I/P impedance

B. increase the voltage gain and decrease the I/P Impedance

C. decrease the voltage gain and Increase the I/P impedance

D. none of the above

97. Consider the following statements.

The functions of an oxide layer in an I_C device is to

1. mask against diffusion or ion implant
2. insulate the surface electrically
3. increase the melting point of silicon
4. produce a chemically stable protective layer of these statements.

A. 1, 2, 3

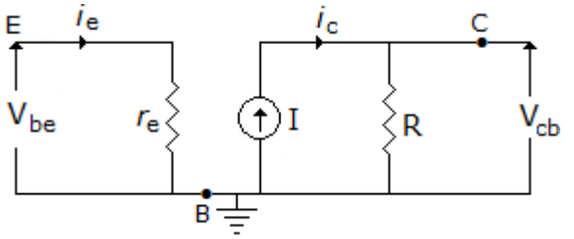
B. 1, 3, 4

C. 2, 3, 4

D. 1, 2, 4

98. Figure shows small signal common base transistor circuit.The current source I and resistor R on the output side are

.



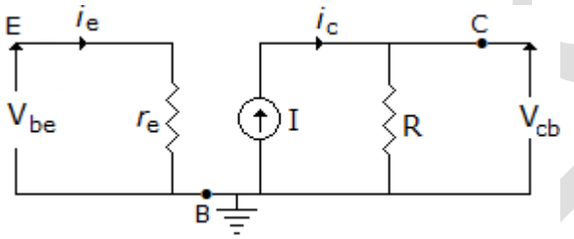
A. $\frac{\alpha}{1-\alpha}$ i_e and r_e

B. $\frac{\alpha}{1-\alpha}$ i_e and (1 - a)r_e

C.(1 - a)i_e and (1 - a)r_e

D.a i_e and r_e

99. Figure shows small signal common base transistor circuit.The current source I and resistor R on the output
. side are



A. $\frac{\alpha}{1-\alpha}$ i_e and r_e

B. $\frac{\alpha}{1-\alpha}$ i_e and (1 - a)r_e

C.(1 - a)i_e and (1 - a)r_e

D.a i_e and r_e

100. For signal diodes the PIV rating is usually in the range

A.1 V to 10V

B.10 V to 30V

C.30 V to 150V

D.150 V to 400V

101. The range of visible light is

A.300 to 2000 Å

B.200 - 4000 Å

C.4000 to 7700 Å

D.more than 10000 Å

102. In an *n* channel JFET, $V_{GS} = V_{GS(off)}$. Then

A.I_D is zero

B.I_D may be zero or positive

C.I_D is positive

D.I_D may be zero or negative

103. With increasing temperature, the electrical conductivity of metals

A.increases

B.decreases

C.increases first and then decreases

D.remains unaffected

104. The reverse saturation current in a semiconductor diode consists of

A.avalanche current

B.zener current

C.minority carrier current

D.minority carrier current and surface leakage current

105. The impurity added to extrinsic semiconductor is of the order of

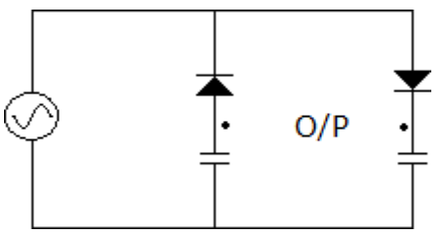
A.1 in 100

B.1 in 1000

C.1 in 100, 0000

D.1 in 100, 000, 000

106. The circuit shown in the figure is best described as a



A.bridge rectifier

B.ring modulator

C.frequency discriminator

D.voltage doubler

107. The atomic number of silicon is 14. It can be therefore concluded that

A.a silicon atom contains 14 protons

B.a silicon atom contains 14 neutrons

C.a silicon atom contains 14 electrons

D.all of the above

108. X-rays cannot penetrate through a thick sheet of

A.wood

B.paper

C.lead

D.aluminium

109. For the *n*-type semiconductor with $n = N_P$ and $P = \frac{n_i^2}{N_D}$, the hole concentration will fall below the intrinsic value because some of the holes

A.drop back to acceptor impurity states.

B.drop to donor impurity states

C.virtually leave the crystal

D.recombine with the electrons.

110. A Darlington emitter follower circuit is some times used in the output stage of a TTL gate in order to

A.increase its I_{QL}

B.reduce its I_{0H}

C.increase its speed of operation

D.reduce power dissipation

111. Piezoelectric materials serves as a source of

A.microwaves

B.ultrasonic waves

C.musical waves

D.resonant waves

112. Which of these is also called 'hot carrier diode'?

A.PIN diode

B. LED

C. Photo diode

D. Schottky diode

113. The Ebers Moll equation for I_E in CB configuration is given by

A. $I_E = a_n I_C I_{EC0}$

B. $I_E = a_I I_C + I_{C0}$

C. $I_E = a_n I_C + I_{C0}(e^{qVEB/KT-1})$

D. $I_E = a_I I_C + I_{E0}(e^{qV_{EB}/KT} - 1)$

114. The equivalent circuit of an ideal diode is

. A. a charging condenser

B. a discharging condenser

C. a switch

D. a resistor

115. Negative feedback in an amplifier

A. reduces gain

B. increase frequency and phase distortion

C. reduce bandwidth

D. increase noise

116. SCR turns of from conducting state to blocking state on

A. reducing gate current

B. reversing gate voltage

C. reducing anode current below holding current value

D. applying *ac* to the gate

117. With an ac input from 50 Hz power line, the ripple frequency is

A. 50 Hz in the dc output of half wave as well as full wave rectifier

B. 100 Hz in the dc output of half wave as well as full wave rectifier

C. 50 Hz in the dc output of half wave and 100 Hz in the dc output of full wave

D. 100 Hz in the dc output of half wave and 50 Hz in the dc output of full wave

118. The dipole moment per unit volume as a function of E in the case of an insulator is given by (symbols have the usual meaning).

A. $P = \varepsilon_0 E (\varepsilon_r - E)$

B. $P = \varepsilon_0 E$

C. $P = \frac{E}{\varepsilon_0 \varepsilon_r}$

D. $P = \frac{E}{\varepsilon_0 (\varepsilon_r - 1)}$

119. The I/P impedance (Z_i) and the O/P impedance (Z_o) of an ideal trans conductance (Voltage controlled current source) amplifier are

A. $Z_i = 0, Z_o = 0$

B. $Z_i = 0, Z_o = \infty$

C. $Z_i = \infty, Z_o = 0$

D. $Z_i = \infty, Z_o = \infty$

120. In the equation $i = I_0 (e^{\eta V_T} - 1)$, $V_T =$

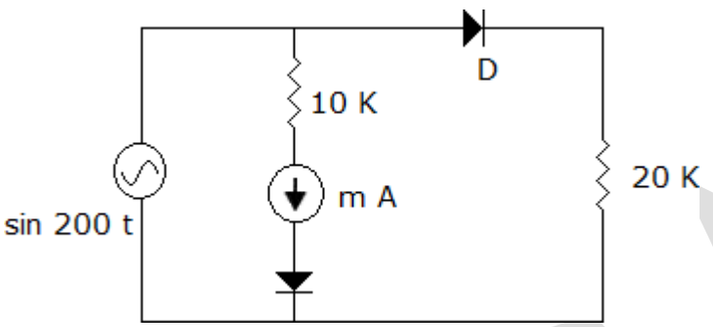
A. $\frac{11600}{T}$

B. $\frac{T}{11600}$

C. T x 11600

D. $\frac{11600}{T^2}$

121. The diode and the moving coil milliammeter of figure are assumed to be ideal. The meter reading is



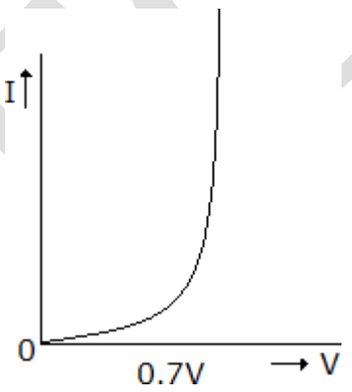
A. 0.1 mA

B. $\frac{0.2}{\pi}$ mA

C. $\frac{0.1}{2\pi}$ mA

D. $\frac{0.1}{\pi}$ mA

122. The V-I characteristic of a semi-conductor diode is shown in figure. From this figure it can be concluded that



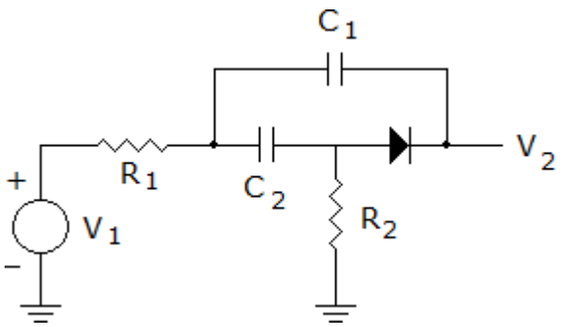
A. The diode is a silicon diode

B.The diode is a germanium diode

C.Break down voltage of the diode is 0.7 V

D.At 1 V rated current will pass through the diode

123. The network shown in the figure represents a



A.band pass filter

B.low pass filter

C.high pass filter

D.band stop filter

124. The emitter follower is widely used in electronic instrument because

A.its voltage gain is less than unity

B.its voltage gain is very high

C.its O/P Impedance is low and input impedance is high

D.its O/P Impedance is high and I/P impedance is low

125. Amplification of ultrasonic waves is possible in a piezoelectric semiconductor under applied electric field. The basic phenomenon involved is known as

A.electrostriction

B.acousto-optic interaction

C.acousto-electric interaction

D.stimulated Brillouin scattering

126. In a junction transistor biased for operation at emitter current 'IE' and collector current 'IC' the transconductance 'gm' is.

A. $\frac{KT}{qI_E}$

B. $\frac{qI_E}{KT}$

C. $\frac{I_C}{I_E}$

D. $\frac{I_E}{I_C}$

127. A CMOS amplifier when compared to an N-channel. MOSFET, has the advantage of

A.higher cut off frequency

B.higher voltage gain

C.higher current gain

D.lower current drain from the power supply, there by less dissipation

128. Voltage series feedback (Also called series-shunt feedback) results in

A.increase in both I/P and O/P impedances

B.decrease in both I/P and O/P impedances

C.increase in I/P impedance and decrease in O/P impedance

D.decrease in I/P impedance and increase in O/P impedance

129. Which of the following has highest resistivity?

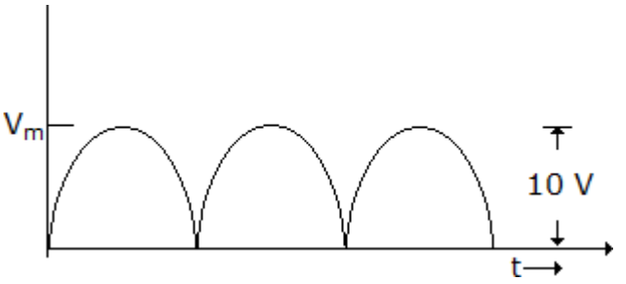
A.Mica

B.Paraffin wax

C.Air

D.Mineral oil

130. R.M.S. value of the waveform shown will be



A.3.53 V

B.1 V

C.7.07 V

D.8.56 V

131. For a UJT if

R1 = Resistor from emitter to the base 1

R2 = Resistor from emitter to the base 2 and RBB = R1 + R2, then the intrinsic stand off ratio (η) is

A. $\frac{R_1}{R_2}$

B. $\frac{R_1}{R_{BB}}$

C. $\frac{R_2}{R_1}$

D. $\frac{R_2}{R_{BB}}$

132. MOSFET can be used as a

A.current controlled capacitor

B.voltage controlled capacitor

C.current controlled inductor

D.voltage controlled inductor

133. An ideal Op-amp is an ideal

A.voltage controlled current source

B.voltage controlled voltage source

C.current controlled current source

D.current controlled voltage source

134. The mean free path of conduction electrons in copper is about 4 x 10-8 m. For a copper block, find the electric field which can give, on an average, 1 eV energy to a conduction electron

A.2.62 x 10^7 V/m

B.2.64 x 10^7 V/m

C.2.5 x 10^7 V/m

D.2.58 x 10^7 V/m

Answers:

1. Answer: Option D

Explanation: Intrinsic material has equal number of holes and electrons.

2. Answer: Option B

Explanation: Work function is the minimum energy required by the fastest electron at 0 K to escape from the metal surface.

3. Answer: Option A

Explanation: Germanium is rarely used.

4. Answer: Option C

Explanation: In schottky diode there is no charge storage and hence almost zero reverse recovery time.

5. Answer: Option A

Explanation: $\beta = \frac{\alpha}{1-\alpha} \Rightarrow \frac{0.99}{1-0.99} = 99 \Rightarrow$ Current gain = 1 + β = 100.

6. Answer: Option B

Explanation: Only the intensity of incident radiation governs the amount of photoelectric emission.

7. Answer: Option A

Explanation: The increase in reverse resistance is due to widening of depletion layer.

8. Answer: Option C

Explanation: Resistance limits current and diode is reverse connected and therefore protects LED against reverse breakdown.

9. Answer: Option B

Explanation: Covalent bonds are broken.

10. Answer: Option B

Explanation: Addition of acceptor atom brings Fermi level closer to valence band

11. Answer: Option A

Explanation: Emitter is n type and emits electrons which diffuse through the base.

12. Answer: Option B

Explanation: By increasing of temperature by 10°C, I_o become double so by increasing temperature 20°C, I_o become 4 time than initial value... and it is 40 PA

13. Answer: Option A

Explanation: Input Resistance with feedback for current shunt,. $R_i' = \frac{R_i'}{1 + \beta A}$

14. Answer: Option A

Explanation:

Cut in voltage in Schottky diode is about 0.3 V as compared to 0.7 V in ordinary semiconductor diode.

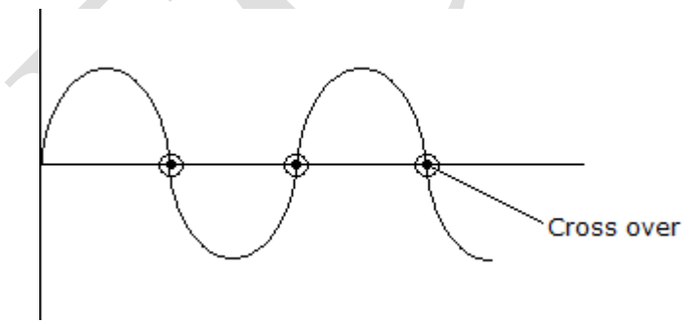
15. Answer: Option C

Explanation: This is due to high electron concentration in metals.

16. Answer: Option B

Explanation: It is a characteristics of class B output stage as the amplifier is biased in cut-off region.

In class B amplifier, two transistor are operated in such a way that one is amplify the half cycle and second is amplify -ve half cycle.



17. Answer: Option B

Explanation: $$\beta_{ac} = \frac{\alpha_{ac}}{1 - \alpha_{ac}} = \frac{0.98}{0.02} = 49$$

18. Answer: Option C

Explanation: In forward active mode emitter base junction is forward biased and base collector junction is reverse biased.

19. Answer: Option A

Explanation: From Plank equation $E = \frac{hc}{\lambda}$ joule

to convert it into electron volt it will be divided by 1.6×10^{-19}.

20. Answer: Option B

Explanation: Small signal amplifier operation is in constant current region of characteristics

21. Answer: Option B

Explanation: $I = \frac{7 - 0.7}{1000}$

22. Answer: Option A

Explanation: At 20°C, 4 *n*A, at 30°C, 8 *n*A, at 40°C, 16 *n*A, at 50°C, 32 *n*A.

23. Answer: Option A

Explanation:

$S_{ICO} = (1 + \beta).\frac{1 + R_B / R_1}{1 + \beta + R_B / R_E}$

$\Rightarrow 51.\frac{251}{301} = 42.53$

$\Delta I_C = (S_{ICO}).\Delta I_{CO}$

= 42.53 x 19.9 nA

= 0.85 μA.

24. Answer: Option D

Explanation: A *p-n* Junction has all these features.

25. Answer: Option B

Explanation: In major portion of drain characteristics I_D is constant.

26. Answer: Option A

Explanation: Diffusion length = $\sqrt{D\tau}$.

27. Answer: Option D

Explanation: It is always non-linear.

28. Answer: Option D

Explanation: Its output is used to trigger SCR.

29. Answer: Option B

Explanation: Resistivity(r) = $\frac{1}{\sigma}$. $\Rightarrow \sigma = e(n_e u_e + n_n u_n)$.

30. Answer: Option A

Explanation: In all metals conductivity decreases (and resistance increases) with increase in temperature.

31. Answer: Option A

Explanation: Therefore mostly *npn* transistors are used

32. Answer: Option C

Explanation: Tunnel diode has heavily doped *p* and *n* layers called degenerate *p* and *n* materials.

33. Answer: Option C

Explanation: Tunnel diode has heavily doped p and n layers called degenerate p and n materials.

34. Answer: Option C

Explanation: In piezoelectric materials mechanical stress produces electric polarization.

35. Answer: Option D

Explanation: Schottky diode has very small depletion layer.

36. Answer: Option B

Explanation: If a potential difference is developed across a current carrying metal strip when the strip is placed in transverse magnetic field. Hall effect is very weak in metals, but it is large semiconductors.

37. Answer: Option D

Explanation: In *n* type semiconductors carriers are electrons.

38. Answer: Option A

Explanation: Wider forbidden gap in silicon makes it less sensitive to temperature than germanium.

39. Answer: Option A

Explanation:

$$P = \frac{n_i^2}{n} \Rightarrow \frac{(1.5 \times 10^{16})^2}{5 \times 10^{20}} \Rightarrow 4.5 \times 10^{11}/m^3.$$

40. Answer: Option B

Explanation: The contribution of sine terms to power dissipation is zero.

41. Answer: Option B

Explanation: According to figure, D_2 is forward bias, D_1 is reverse biased. Reverse saturation current $I_0 = 10^{-8}$A. in clockwise direction.

For Diode $D_2 \Rightarrow I_s = I_0 \left(e^{\frac{qv_2}{kT}} - 1 \right)$

Here $I_s = I_0$

$\Rightarrow e^{qv2/kT} = 2$ or $e^{v_2/0.026} = 2$

$V_2 = 0.018$ V

Drop across $D_1 = V_1 = 5 - 0.018$

$\Rightarrow$4.98 V

By KVL in mesh, V_{D1} = -4.98 V, V_{D2} = 0.018 V.

42. Answer: Option B

Explanation: 350 - 2.5 (60 - 25) ~ 250 mW.

43. Answer: Option A

Explanation: Silver has highest conductivity (and lowest resistivity) in all metals.

44. Answer: Option D

Explanation: JFET is voltage controlled device. Therefore its input impedance is high. But voltage gain is lower than in BJT.

45. Answer: Option B

Explanation: Therefore, conductivity increases.

46. Answer: Option B

Explanation:

Drain current Id = k (|Vgs| - |VT|)^2

= 0.278 x 10-3(4 - 2)^2

= 1.11 mA.

47. Answer: Option D

Explanation: Only antimony, arsenic and phosphorous are pentavalent

48. Answer: Option D

Explanation: Therefore, it can donate one electron.

49. Answer: Option A

Explanation: When an electron rises through 1 V, energy = 1 eV.

50. Answer: Option A

Explanation: $\text{Mobility} = \frac{\text{drift velocity}}{\text{field gradient}}$.

51. Answer: Option A

Explanation: Increase in reverse voltage increases the width of depletion layer and decrease of capacitance of layer.

52. Answer: Option C

Explanation:

If we apply the anode voltage above break over voltage of SCR, SCR can be triggered. Also by sufficiently fast rate of rise of anode voltage and large gate current will trigger SCR on.

During forward blocking most of the applied voltage appears across reverse biased junction J2.

This voltage across J2 associated with leakage current may rise temperature of this junction.

With increase in temperature, leakage current through junction J2 further increases and this cumulative process may turn on the SCR at some high temperature.

53. Answer: Option A

Explanation: Transistor will operate in active mode because

V_{BE} = 0.7 volt, (Base emitter junction is forward biased)

V_{CB} = - VBC = - 0.2 V (Base to collector junction is reverse biased).

54. Answer: Option B

Explanation: GaAs has very large band gap and high carrier mobility.

55. Answer: Option B

Explanation:

$$I_c = +\alpha_{dc}\left(\frac{I_B}{1 - \alpha_{dc}}\right) + I_{co} \sim 735\ \text{mA}$$

56. Answer: Option A

Explanation:

$I_d = I_o(e^{V_D/\eta V_T} - 1)$

By considering $\frac{V_D}{\eta V_T} >> 1$, then

$$\Rightarrow \frac{I_d}{I_o} = e^{V_D/\eta V_T}$$

$$\Rightarrow \frac{V_D}{\eta V_T} = \ln \frac{I_d}{I_o}$$

I_d is constant according to question,

$$V_T = \frac{K_T}{11600} \Rightarrow V_D \text{ a } T$$

$$\Rightarrow \frac{V_{D1}}{V_{D2}} = \frac{T_1}{T_2} \Rightarrow V_{D2} = \frac{V_{D1} \cdot T_2}{T_1}$$

$$= \frac{700 \times 10^{-3} \times (273 + 40)}{(20 + 273)} = 747.78 \text{ mV}$$

57. Answer: Option A

Explanation: Holes and electrons move away from junction and therefore resistance increases to a high value.

58. Answer: Option A

Explanation:

$C_T = \frac{C(0)}{(1 + V_R / V_T)^n}$, Here $n = \frac{1}{3}$ for diffused junction

$$C_T = \frac{80 \times 10^{-12}}{\left(1 + \frac{4.2}{0.7}\right)^{\frac{1}{3}}} = \frac{80 \times 10^{-12}}{(7)^{\frac{1}{3}}} = 42 \text{ PF}$$

59. Answer: Option C

Explanation: Recombination in base region is very low.

60. Answer: Option D

Explanation: Almost whole of reverse voltage is across depletion layer.

61. Answer: Option C

Explanation: When pentavalent impurity is added, the number of fresh electrons is very large as compared to number of holes

62. Answer: Option B

63. Answer: Option C

64. Answer: Option C

65. Answer: Option C

66. Answer: Option C

67. Answer: Option B

68. Answer: Option C

69. Answer: Option C

70. Answer: Option C

71. Answer: Option B

72. Answer: Option C

73. Answer: Option B

74. Answer: Option D

75. Answer: Option D

76. Answer: Option B

77. Answer: Option B

78. Answer: Option B

79. Answer: Option C

80. Answer: Option C

81. Answer: Option D

82. Answer: Option A

83. Answer: Option A

84. Answer: Option D

85. Answer: Option B

86. Answer: Option A

87. Answer: Option D

88. Answer: Option D

89. Answer: Option A

90. Answer: Option B

91. Answer: Option D

92. Answer: Option C

93. Answer: Option B

94. Answer: Option C

95. Answer: Option C

96. Answer: Option B

97. Answer: Option D

98. Answer: Option D

99. Answer: Option D

100. Answer: Option C

101. Answer: Option C

102. Answer: Option A

103. Answer: Option B

104. Answer: Option D

105. Answer: Option B

106. Answer: Option D

107. Answer: Option D

108. Answer: Option C

109. Answer: Option D

110. Answer: Option C

111. Answer: Option B

112. Answer: Option D

113. Answer: Option D

114. Answer: Option C

115. Answer: Option A

116. Answer: Option C

117. Answer: Option C

118. Answer: Option A

119. Answer: Option D

120. Answer: Option B

121. Answer: Option D

122. Answer: Option A

123. Answer: Option A

124. Answer: Option C

125. Answer: Option C

126. Answer: Option B

127. Answer: Option A

128. Answer: Option C

129. Answer: Option C

130. Answer: Option C

131. Answer: Option D

132. Answer: Option B

133. Answer: Option B

134. Answer: Option C

Explanation: Work (Energy) = F x d

$\Rightarrow$1 eV = e.E x d

$\Rightarrow$ $E = \frac{1}{d} \Rightarrow \frac{1}{4 \times 10^{-8}}$

$\Rightarrow$2.5 x 107 V/m.