DPP - Daily Practice Problems

Chapter-wise Sheets

Date : | Start Time : | End Time :

PHYSICS CP28

SYLLABUS : Semiconductor Electronics: Materials, Devices and Simple Circuits

Max. Marks : 180 **Marking Scheme :** (+4) for correct & (–1) for incorrect answer **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

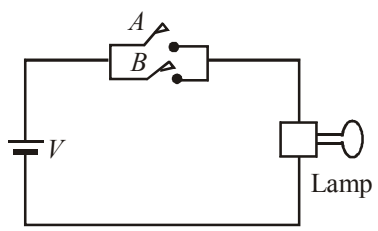
1. A change of 8.0 mA in the emitter current bring a change of 7.9 mA in the collector current. The values of parameters α and β are respectively
(a) 0.99, 90 (b) 0.96,79 (c) 0.97,99 (d) 0.99,79

2. A pure semiconductor has equal electron and hole concentration of 10^{16} m^{-3}. Doping by indium increases number of hole concentration n_h to 5×10^{22} m^{-3}. Then, the value of number of electron concentration n_e in the doped semiconductor is
(a) $10^6/m^3$ (b) $10^{22}/m^3$
(c) $2 \times 10^6/m^3$ (d) $2 \times 10^9/m^3$

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

4. A common emitter amplifier has a voltage gain of 50, an input impedance of 100Ω and an output impedance of 200Ω. The power gain of the amplifier is
(a) 1000 (b) 1250 (c) 100 (d) 500

5. Which logic gate with inputs A and B performs the same operation as that performed by the following circuit?



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

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

7. A silicon diode has a threshold voltage of 0.7 V. If an input voltage given by 2 sin(πt) is supplied to a half wave rectifier circuit using this diode, the rectified output has a peak value of
(a) 2V (b) 1.4V (c) 1.3V (d) 0.7V

RESPONSE GRID					
1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ
6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ			

Space for Rough Work

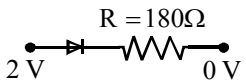
Get More Learning Materials Here : CLICK HERE www.studentbro.in

EBD_71

8. The current gain for a transistor working as common-base amplifier is 0.96. If the emitter current is 7.2 mA, then the base current is
(a) 0.29 mA (b) 0.35 mA (c) 0.39 mA (d) 0.43 mA

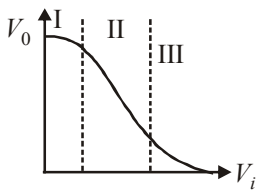
9. In a npn transistor 10^{10} electrons enter the emitter in 10^{-6} s. 4% of the electrons are lost in the base. The current transfer ratio will be
(a) 0.98 (b) 0.97 (c) 0.96 (d) 0.94

10. Assuming that the silicon diode having resistance of 20 Ω, the current through the diode is (knee voltage 0.7 V)



(a) 0 mA (b) 10 mA (c) 6.5 mA (d) 13.5 mA

11. Transfer characteristics [output voltage (V_0) vs input voltage (V_i)] for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used



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

12. A half-wave rectifier is being used to rectify an alternating voltage of frequency 50 Hz. The number of pulses of rectified current obtained in one second is
(a) 50 (b) 25 (c) 100 (d) 2000

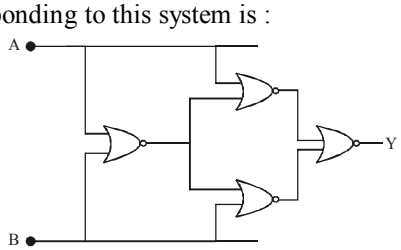
13. A diode having potential difference 0.5 V across its junction which does not depend on current, is connected in series with resistance of 20Ω across source. If 0.1 A current passes through resistance then what is the voltage of the source?
(a) 1.5 V (b) 2.0 V (c) 2.5 V (d) 5 V

14. In common emitter amplifier, the current gain is 62. The collector resistance and input resistance are 5 kΩ an 500Ω respectively. If the input voltage is 0.01V, the output voltage is
(a) 0.62 V (b) 6.2 V (c) 62 V (d) 620 V

15. On doping germanium with donor atoms of density 10^{17} cm^{-3} its conductivity in mho/cm will be
[Given : $\mu_e = 3800$ cm^2/V–s and $n_i = 2.5 \times 10^{13}$ cm^{-13}]
(a) 30.4 (b) 60.8 (c) 91.2 (d) 121.6

16. The voltage gain of an amplifier with 9% negative feedback is 10. The voltage gain without feedback will be
(a) 90 (b) 10 (c) 1.25 (d) 100

17. A system of four gates is set up as shown. The 'truth table' corresponding to this system is :



(a)

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

(b)

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

(c)

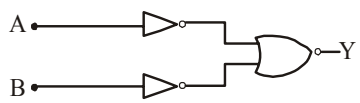
A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

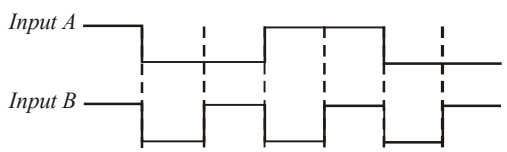
(d)

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

18. The intrinsic conductivity of germanium at 27° is 2.13 mho m^{-1} and mobilities of electrons and holes are 0.38 and 0.18 m^{2}V^{-1}s^{-1} respectively. The density of charge carriers is
(a) 2.37×10^{19} m^{-3} (b) 3.28×10^{19} m^{-3}
(c) 7.83×10^{19} m^{-3} (d) 8.47×10^{19} m^{-3}

19. The logic circuit shown below has the input waveforms '*A*' and '*B*' as shown. Pick out the correct output waveform



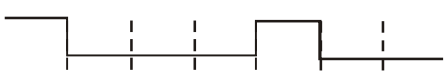


Output is

(a)


(b)


(c)


(d)


20. Pure Si at 500K has equal number of electron (n_e) and hole (n_h) concentrations of 1.5×10^{16} m^{-3}. Doping by indium increases n_h to 4.5×10^{22} m^{-3}. The doped semiconductor is of
(a) n–type with electron concentration $n_e = 5 \times 10^{22}$ m^{-3}
(b) p–type with electron concentration $n_e = 2.5 \times 10^{10}$ m^{-3}
(c) n–type with electron concentration $n_e = 2.5 \times 10^{23}$ m^{-3}
(d) p–type having electron concentration $n_e = 5 \times 10^{9}$ m^{-3}

21. Which of the following statements is incorrect?
(a) The resistance of intrinsic semiconductors decrease with increase of temperature
(b) Doping pure Si with trivalent impurities give *p*-type semiconductors
(c) The majority carriers in *n*-type semiconductors are holes
(d) A *p-n* junction can act as a semiconductor diode

RESPONSE GRID

8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ
13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ
18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ	

Space for Rough Work

Get More Learning Materials Here : CLICK HERE www.studentbro.in

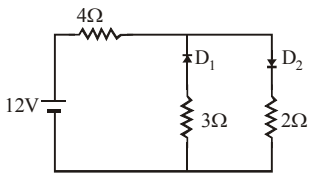
22. The relation between number of free electrons (n) in a semiconductor and temperature (T) is given by

(a) $n \propto T$ (b) $n \propto T^2$ (c) $n \propto \sqrt{T}$ (d) $n \propto T^{3/2}$

23. If a PN junction diode of depletion layer width W and barrier height V_0 is forward biased, then

(a) W increases, V_0 decreases
(b) W decreases, V_0 increases
(c) both W and V_0 increase
(d) both W and V_0 decrease

24. The circuit has two oppositively connected ideal diodes in parallel. The current flowing in the circuit is



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

25. For a transistor amplifier in common emitter configuration for load impedance of 1kΩ ($h_{fe} = 50$ and $h_{0e} = 25$) the current gain is

(a) −24.8 (b) −15.7 (c) −5.2 (d) −48.78

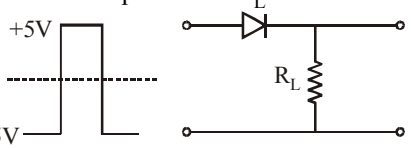
26. A PN-junction has a thickness of the order of

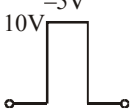
(a) 1 cm (b) 1mm (c) 10^{-6} m (d) 10^{-12} cm

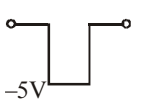
27. A working transistor with its three legs marked *P*, *Q* and *R* is tested using a multimeter. No conduction is found between *P* and *Q*. By connecting the common (negative) terminal of the multimeter to *R* and the other (positive) terminal to *P* or *Q*, some resistance is seen on the multimeter. Which of the following is true for the transistor?

(a) It is an npn transistor with *R* as base
(b) It is a pnp transistor with *R* as base
(c) It is a pnp transistor with *R* as emitter
(d) It is an npn transistor with *R* as collector

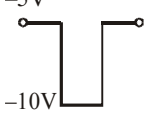
28. If in a p-n junction, a square input signal of 10 V is applied as shown, then the output across R_L will be



(a) 

(b) 

(c) 

(d) 

29. When *n*-type semiconductor is heated

(a) number of electrons increases while that of holes decreases
(b) number of holes increases while that of electrons decreases
(c) number of electrons and holes remain same
(d) number of electrons and holes increases equally.

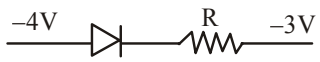
30. The ratio of electron and hole currents in a semiconductor is 7/4 and the ratio of drift velocities of electrons and holes is 5/4, then the ratio of concentrations of electrons and holes will be

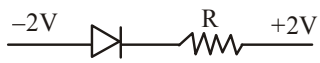
(a) 5/7 (b) 7/5 (c) 25/49 (d) 49/25

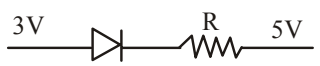
31. C and Si both have same lattice structure, having 4 bonding electrons in each. However, C is insulator whereas Si is intrinsic semiconductor. This is because :

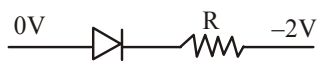
(a) In case of C the valence band is not completely filled at absolute zero temperature.
(b) In case of C the conduction band is partly filled even at absolute zero temperature.
(c) The four bonding electrons in the case of C lie in the second orbit, whereas in the case of Si they lie in the third.
(d) The four bonding electrons in the case of C lie in the third orbit, whereas for Si they lie in the fourth orbit.

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

(a) 

(b) 

(c) 

(d) 

33. An oscillator is nothing but an amplifer with

(a) positive feedback (b) negative feedback
(c) large gain (d) no feedback

34. The current gain in the common emitter mode of a transistor is 10. The input impedance is 20kΩ and load of resistance is 100kΩ. The power gain is

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

35. The input signal given to a CE amplifier having a voltage gain of 150 is $V_i = 2\cos\left(15t + \frac{\pi}{3}\right)$. The corresponding output signal will be :

(a) $75\cos\left(15t + \frac{2\pi}{3}\right)$ (b) $2\cos\left(15t + \frac{5\pi}{6}\right)$

(c) $300\cos\left(15t + \frac{4\pi}{3}\right)$ (d) $300\cos\left(15t + \frac{\pi}{3}\right)$

36. To use a transistor as an amplifier

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

RESPONSE GRID					
	22. (a)(b)(c)(d)	23. (a)(b)(c)(d)	24. (a)(b)(c)(d)	25. (a)(b)(c)(d)	26. (a)(b)(c)(d)
	27. (a)(b)(c)(d)	28. (a)(b)(c)(d)	29. (a)(b)(c)(d)	30. (a)(b)(c)(d)	31. (a)(b)(c)(d)
	32. (a)(b)(c)(d)	33. (a)(b)(c)(d)	34. (a)(b)(c)(d)	35. (a)(b)(c)(d)	36. (a)(b)(c)(d)

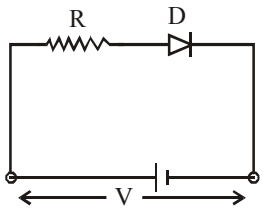
Space for Rough Work

Get More Learning Materials Here : CLICK HERE www.studentbro.in

EBD_71

37. A piece of copper and another of germanium are cooled from room temperature to 77K. The resistance of
(a) copper increases and germanium decreases
(b) each of them decreases
(c) each of them increases
(d) copper decreases and germanium increases

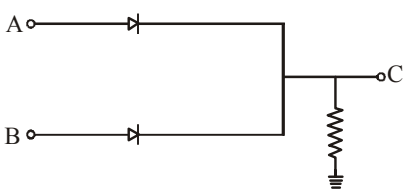
38. A d.c. battery of V volt is connected to a series combination of a resistor R and an ideal diode D as shown in the figure below. The potential difference across R will be



(a) 2V when diode is forward biased
(b) Zero when diode is forward biased
(c) 5V when diode is reverse biased
(d) 6V when diode is forward biased

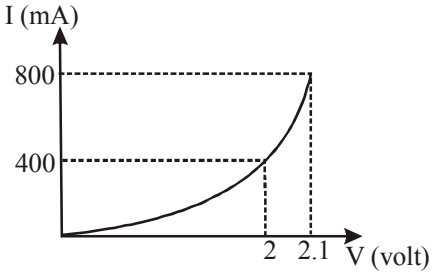
39. The current gain for a transistor working as common-base amplifier is 0.96. If the emitter current is 7.2 mA, then the base current is
(a) 0.29 mA (b) 0.35 mA (c) 0.39 mA (d) 0.43 mA

40. In the circuit given below, *A* and *B* represent two inputs and *C* represents the output.



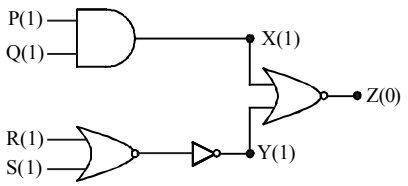
The circuit represents
(a) NOR gate (b) AND gate
(c) NAND gate (d) OR gate

41. The I-V characteristic of a P-N junction diode is shown below. The approximate dynamic resistance of the p-n junction when a forward bias voltage of 2 volt is applied is



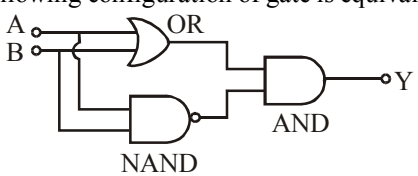
(a) 1 Ω (b) 0.25 Ω (c) 0.5 Ω (d) 5 Ω

42. The circuit diagram shows a logic combination with the states of outputs X, Y and Z given for inputs P, Q, R and S all at state 1. When inputs P and R change to state 0 with inputs Q and S still at 1, the states of outputs X, Y and Z change to



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

43. The following configuration of gate is equivalent to



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

44. 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
(a) 10×10^{14} Hz (b) 5×10^{14} Hz
(c) 1×10^{14} Hz (d) 20×10^{14} Hz

45. The average value of output direct current in a full wave rectifier is
(a) I_0/π (b) $I_0/2$ (c) $\pi I_0/2$ (d) $2 I_0/\pi$

RESPONSE GRID					
	37. ⓐ ⓑ ⓒ ⓓ	38. ⓐ ⓑ ⓒ ⓓ	39. ⓐ ⓑ ⓒ ⓓ	40. ⓐ ⓑ ⓒ ⓓ	41. ⓐ ⓑ ⓒ ⓓ
	42. ⓐ ⓑ ⓒ ⓓ	43. ⓐ ⓑ ⓒ ⓓ	44. ⓐ ⓑ ⓒ ⓓ	45. ⓐ ⓑ ⓒ ⓓ	

DAILY PRACTICE PROBLEM DPP CHAPTERWISE CP28 - PHYSICS			
Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	50	Qualifying Score	70
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

Get More Learning Materials Here : CLICK HERE www.studentbro.in

1. **(d)** $\Delta I_E = 8.0\,mA$

$\Delta I_C = 7.9\,mA$

$$\alpha = \frac{\Delta I_C}{\Delta I_E} = \frac{7.9}{8.0} = 0.9875 \simeq 0.99$$

Also, $\beta = \frac{\alpha}{1-\alpha} = \frac{0.9875}{(1-0.9875)} = 79$

2. **(d)** Here, $n_i = 10^{16}\,m^{-3}$, $n_h = 5 \times 10^{22}\,m^{-3}$

As $n_e n_h = n_i^2$

$$\therefore \quad n_e = \frac{n_i^2}{n_h} = \frac{(10^{16}\,m^{-3})^2}{5\times10^{22}\,m^{-3}} = 2\times10^{9}\,m^{-3}$$

3. **(d)** Energy band gap range is given by,

$$E_g = \frac{hc}{\lambda}$$

For visible region $\lambda = (4 \times 10^{-7} \sim 7 \times 10^{-7})m$

$$E_g = \frac{6.6\times10^{-34}\times3\times10^{8}}{7\times10^{-7}}$$

$$= \frac{19.8\times10^{-26}}{7\times10^{-7}}$$

$$= \frac{2.8\times10^{-19}}{1.6\times10^{-19}}$$

$E_g = 1.75\,eV$

4. **(b)** Voltage gain = $\beta \times$ Impedance gain

$$50 = \beta \times \frac{200}{100} = 2\beta \Rightarrow \beta = 25$$

and power gain $= \beta^2 \times \frac{200}{100} = 1250.$

5. **(b)** When either of *A* or *B* is 1 i.e. closed then lamp will glow.

In this case, Truth table

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

This represents OR gate.

6. **(c)** In p-region of p-n junction holes concentration > electrons concentration and in n-region electrons concentration > holes concentration.

7. **(c)** Peak value of rectified output voltage = peak value of input voltage – barrier voltage

$= 2 - 0.7 = 1.3\,V.$

8. **(a)** Current gain $(\alpha) = 0.96$

$I_e = 7.2\,mA$

$$\frac{I_c}{I_e} = \alpha = 0.96$$

$I_c = 0.96 \times 7.2\,mA = 6.91\,mA$

$I_e = I_c + I_b$

$\Rightarrow I_b = I_e - I_c = 7.2 - 6.91 = 0.29\,mA$

9. **(c)** No. of electrons reaching the collector,

$$n_C = \frac{96}{100}\times10^{10} = 0.96\times10^{10}$$

Emitter current, $I_E = \frac{n_E \times e}{t}$

Collector current, $I_C = \frac{n_C \times e}{t}$

$\therefore$ Current transfer ratio,

$$\alpha = \frac{I_C}{I_E} = \frac{n_C}{n_E} = \frac{0.96\times10^{10}}{10^{10}} = 0.96$$

10. **(c)** Here diode is forward biased with voltage $= 2 - 0 = 2\,V.$

$V_B = V_{knee} + IR$

$2 = 0.7 + I \times 200$

$(\therefore$ Total resistance $= 180 + 20 = 200\Omega)$

$$\therefore \quad I = \frac{1.3}{200} = 6.5mA$$

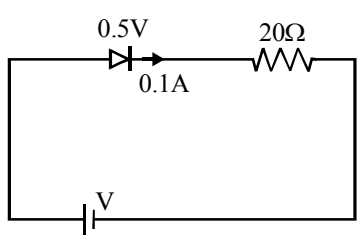
11. **(b)** I $\rightarrow$ ON

II $\rightarrow$ OFF

In IInd state it is used as a amplifier it is active region.

12. **(b)** In half wave rectifier only half of the wave is rectified.

13. **(c)** $V' = V + IR = 0.5 + 0.1 \times 20 = 2.5\,V$



14. **(b)** $$\frac{V_o}{V_{in}} = \frac{R_o}{R_{in}} \times \beta = \frac{5\times10^3 \times 62}{500} = 10 \times 62 = 620$$

$V_o = 620 \times V_{in} = 620 \times 0.01 = 6.2\,V$

$\therefore V_o = 6.2$ volt.

15. **(b)** Conductivity $\sigma = n_i e \mu_e = 10^{17} \times (1.6\times10^{-19}) \times 3800$

$= 60.8$ mho/cm

Get More Learning Materials Here : CLICK HERE www.studentbro.in

16. (d) Negative feedback is applied to reduce the output voltage of an amplifier. If there is no negative feedback, the value of output voltage could be very high. In the options given, the maximum value of voltage gain is 100. Hence it is the correct option.

17. (a) In the given system all four gate is NOR gate

Truth Table

A	B	$(y' = \overline{A+B})$	$y'' = (\overline{A+y'})$	$y''' = (A+y'')$	$y = \overline{y''+y'''}$
0	0	1	0	0	1
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

i.e.,

A	B	y
0	0	1
0	1	0
1	0	0
1	1	1

18. (a) Conductivity, $\sigma = \frac{1}{\rho} = e(n_e\mu_e + n_h\mu_h)$

$2.13 = 1.6 \times 10^{-19}(0.38 + 0.18)\, n_i$

(Since in intrinsic semi-conductor, $n_e = n_h = n_i$)

$\therefore$ density of charge carriers, n_i

$$= \frac{2.13}{1.6 \times 10^{-19} \times 0.56} = 2.37 \times 10^{19}\ m^{-3}$$

19. (d) Here $Y = (\overline{\overline{A} + \overline{B}}) = \overline{\overline{A.B}} = A \cdot B$. Thus, it is an AND gate for which truth table is

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

20. (d) $n_i^2 = n_e n_h$

$(1.5 \times 10^{16})^2 = n_e (4.5 \times 10^{22})$

$\Rightarrow \quad n_e = 0.5 \times 10^{10}$

or $\quad n_e = 5 \times 10^9$

Given $\quad n_h = 4.5 \times 10^{22}$

$\Rightarrow n_h >> n_e$

$\therefore$ Semiconductor is p-type and

$n_e = 5 \times 10^9\ m^{-3}$.

21. (c) In *n*-type semiconductors, electrons are the majority charge carriers.

22. (d) For semiconductor, $n = AT^{3/2} e^{-\frac{E_g}{2KT}}$;

so $n \propto T^{3/2}$

23. (d) When PN junction diode is forward biased both depletion layer width W and barrier height V_0 decrease and current due to molarity carrier increases.

24. (b) D_2 is forward biased whereas D_1 is reversed biased.

So effective resistance of the circuit

$R = 4 + 2 = 6\Omega$

$\therefore i = \frac{12}{6} = 2\ A$.

25. (d) In common emitter configuration current gain

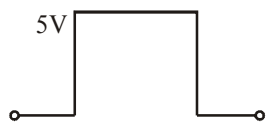
$$A_i = \frac{-hf_e}{1 + h_{oe}R_L} = \frac{-50}{1 + 25 \times 10^{-6} \times 1 \times 10^3} = -48.78$$

26. (c)

27. (b) It is a *p-n-p* transistor with *R* as base.

28. (c) Here P-N junction diode rectifies half of the ac wave i.e., acts as half wave rectifier. During + ve half cycle

Diode $\rightarrow$ forward biased output across will be



During –ve half cycle Diode $\rightarrow$ reverse biased output will not obtained.

29. (d) Due to heating, when a free electron is produced then simultaneously a hole is also produced.

30. (b) $I = nA\, ev_d$ or $I \propto nv_d$

$$\therefore \quad \frac{I_e}{I_h} = \frac{n_e v_e}{n_h v_h} \text{ or } \frac{n_e}{n_h} = \frac{I_e}{I_h} \times \frac{v_h}{v_e} = \frac{7}{4} \times \frac{4}{5} = \frac{7}{5}$$

31. (c) Electronic configuration of ^6C

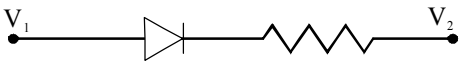
$^6C = 1s^2, 2s^2\, 2p^2$

The electronic configuration of ^{14}Si

$^{14}Si = 1s^2, 2s^2\, 2p^6, 3s^2\, 3p^2$

As they are away from Nucleus, so effect of nucleus is low for Si even for Sn and Pb are almost mettalic.

32. (d)



In forward bias, $V_1 > V_2$ i.e., in figure (d) p-type semiconductor is at higher potential w.r.t. n-type semiconductor.

33. (a) A positive feed back from output to input in an amplifier provides oscillations of constant amplitude.

34. (b) The power gain in case of CE amplifier,

Power gain = $\beta^2 \times$ Resistance gain

$$= \beta^2 \times \frac{R_o}{R_i}$$

$= (10)^2 \times 5 = 500$.

35. (c) **Given :** Voltage gain $A_V = 150$

$V_i = 2\cos\left(15t + \frac{\pi}{3}\right)$; $V_0 = ?$

For CE transistor phase difference between input and output signal is $\pi = 180°$

Using formula, $A_V = \frac{V_0}{V_i}$

$\Rightarrow V_0 = A_V \times V_i$

$= 150 \times 2\cos\left(15t + \frac{\pi}{3}\right)$

Get More Learning Materials Here : CLICK HERE www.studentbro.in

or $V_0 = 300\cos\left(15t + \frac{\pi}{3} + \pi\right)$

$V_0 = 300\cos\left(15t + \frac{4}{3}\pi\right)$

36. **(a)** To use a transistor as an amplifier the emitter base junction is forward biased while the collector base junction is reverse biased.

37. **(d)** Copper is a conductor, so its resistance decreases on decreasing temperature as thermal agitation decreases; whereas germanium is semiconductor therefore on decreasing temperature resistance increases.

38. **(b)** In forward biasing, the diode conducts. For ideal junction diode, the forward resistance is zero; therefore, entire applied voltage occurs across external resistance R i.e., there occurs no potential drop, so potential across R is V in forward biased.

39. **(a)** Current gain $(\alpha) = 0.96$

$I_e = 7.2\,\text{mA}$

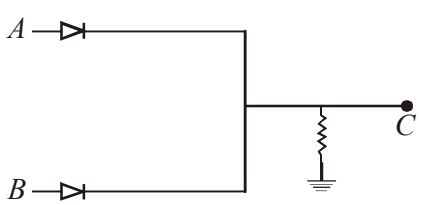
$\frac{I_c}{I_e} = \alpha = 0.96$

$I_c = 0.96 \times 7.2\,\text{mA} = 6.91\ \text{mA}$

$I_e = I_c + I_b$

$\Rightarrow I_b = I_e - I_c = 7.2 - 6.91 = 0.29\,\text{mA}$

40. **(d)**



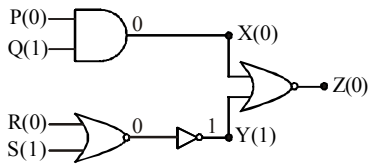
The truth table for the above logic gate is :

A	B	C
1	1	1
1	0	1
0	1	1
0	0	0

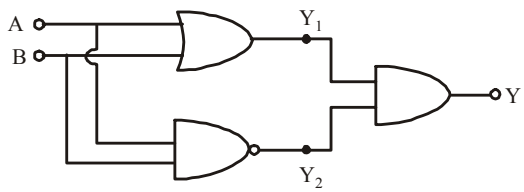
This truth table follows the boolean algebra $C = A + B$ which is for OR gate

41. **(b)** $R = \frac{\Delta V}{\Delta I} = \frac{2.1 - 2}{(800 - 400) \times 10^{-3}} = \frac{1}{4} = 0.25\ \Omega$

42. **(c)**



43. **(b)**



$Y_1 = A + B,\ Y_2 = \overline{A.B}$

$Y = (A + B)\bullet\overline{AB} = A\bullet\overline{A} + A\bullet\overline{B} + B\bullet\overline{A} + B\bullet\overline{B}$

$= 0 + A\bullet\overline{B} + B\bullet\overline{A} + 0 = A\bullet\overline{B} + B\bullet\overline{A}$ (XOR gate)

44. **(b)** $E_g = 2.0\,\text{eV} = 2 \times 1.6 \times 10^{-19}\,\text{J}$

$E_g = h\nu$

$\therefore\ \nu = \frac{E_g}{h} = \frac{2 \times 1.6 \times 10^{-19}\,\text{J}}{6.62 \times 10^{-34}\,\text{Js}}$

$= 0.4833 \times 10^{15}\,\text{s}^{-1} = 4.833 \times 10^{14}\,\text{Hz}$

$\simeq 5 \times 10^{14}\,\text{Hz}$

45. **(d)** The average value of output direct current in a full wave rectifier = (average value of current over a cycle)

$= (2I_0/\pi) = \frac{2I_0}{\pi}$

Get More Learning Materials Here : CLICK HERE www.studentbro.in