DPP
DAILY PRACTICE PRODUCTS

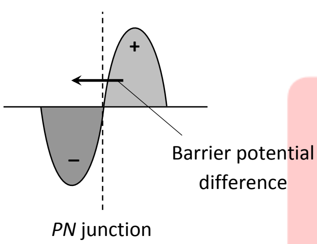
Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 3

Topic :- SEMICONDUCTOR ELECTRONICS: MATERIALS,DEVIES AND SIMPLE CIRCUITS

1 **(a)**
In the depletion layer of PN junction, stationary, positive ions exist in the N-side and stationary negative ions exist in the P-side



3 **(a)**
$\mu = r_p \times g_m = 2.5 \times 10^4 \times 2 \times 10^{-3} = 50$

4 **(c)**
From the graph it is clear that for $V_g = -4V$, $i_p = 0$, so cut off voltage is $-4\ volt$

5 **(b)**
Amplification with negative feedback is $A' = \frac{A}{1+\beta A}$
Where $\beta =$ fraction of output feedback to input
$\because \beta = \frac{9}{100} = 0.09$ and $A' = 10$
$\Rightarrow 10 = \frac{A}{1+0.09A} \Rightarrow A = 100$

7 **(c)**
Barrier potential does not depend on diode design while it depends on temperature doping density and forward biasing.

8 **(d)**
Ionic bonds come into being when atoms that have low ionization energies, and hence lose electrons rapidly, interact with other atoms to acquire excess electrons. The former atoms give up electrons to the latter and they there upon become positive and negative ions respectively

9 **(c)**
Hence, $(10111)B = 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 16 + 0 + 4 + 2 + 1 = 23$

10 **(c)**

$^{6}C = 1S^2, 2S^2\ 2P^2$

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

13 **(b)**

$$I_f = \frac{4-1}{300} = \frac{1}{100} = 10^{-2}\text{A}$$

14 **(d)**

Atomic radius for bcc structure,

$$r = \frac{a\sqrt{3}}{4} = \frac{3.6\sqrt{3}}{4} = 1.56\ \text{Å}$$

15 **(b)**

In figure 2, 4 and 5 P-crystals are more positive as compared to N-crystals

16 **(c)**

In space charge limited region, the plate current is given by Child's law $i_p = KV_p^{3/2}$

Thus, $\frac{i_{p2}}{i_{p1}} = \left(\frac{V_{p2}}{V_{p1}}\right)^{3/2} = \left(\frac{600}{150}\right)^{3/2} = (4)^{3/2} = 8$

Or $i_{p2} = i_{p1} \times 8 = 10 \times 8\ mA = 80\ mA$

17 **(d)**

In transistor emitter is heavily doped and base is lightly doped.

So, $D_e > D_c > D_b$

18 **(a)**

At $V_g = -3V$, $V_p = 300\ V$ and $I_p = 5mA$

At $V_g = -1V$, for constant plate current

i.e., $I_p = 5mA$

From $I_p = 0.125\ V_p - 7.5$

$\Rightarrow 5 = 0.125\ V_p - 7.5 \Rightarrow V_p = 100V$

$\therefore$ change in plate voltage $\Delta V_p = 300 - 100 = 200V$

Change in grid voltage $\Delta V_g = -1 - (-3) = 2V$

So, $\mu = \frac{\Delta V_p}{\Delta V_g} = \frac{200}{2} = 100$

19 **(c)**

$I_c = I_e - I_b = 90 - 1 = 89$ mA.

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	B	A	C	B	B	C	D	C	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	A	B	D	B	C	D	A	C	C