DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 8

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

1 **(c)**

If lattice constant of semiconductor is decreased, then E_c and E_v decrease, but E_g increases.

2 **(c)**

We know that resistance of conductor is directly proportional to temperature $(ie, R \propto \Delta t)$, while resistance of semiconductor is inversely proportional to temperature $\left(ie, R \propto \frac{1}{\Delta t}\right)$.

Therefore, it is clear that resistance of conductor decreases with decrease in temperature of $vice\text{-}versa$, while in case of semiconductor, resistance increase with decrease in temperature of $vice\text{-}versa$.

Since, copper is pure conductor and germanium is a semiconductor hence, due to decrease in temperature, resistance of conductor decreases while that of semiconductor increases.

3 **(a)**

Density $\rho = \frac{nA}{N(a)^3}$

where $n = 2$ for bcc structure, $A = 39 \times 10^{-3} kg$

$N = 6.02 \times 10^{23}$, $a = \frac{2}{\sqrt{3}} d = \frac{2}{\sqrt{3}} \times (4.525 \times 10^{-10}) m$

[$d =$ nearest neighbor distance $=$ distance between centres of two neighbouring atoms $= \frac{\sqrt{3}}{2} a$]

On putting the values we get $\rho = 907$

4 **(a)**

In p-type semiconductor holes are majority carriers and electrons are minority carriers.

5 **(b)**

It is the symbol of 'NOR' gate

6 **(c)**

For hexagonal crystal structure, $a = b \neq c$ and $\alpha = \beta = 90°$ but $\gamma = 120°$.

8 **(d)**

Arsenic has five valence electrons, so it a donor impurity. Hence X becomes N-type semiconductor. Indium has only three outer electrons, so it is an acceptor impurity. Hence Y becomes P-type semiconductor. Also N $(i.e.,X)$ is connected to positive terminal of battery and $P(i.e.,Y)$ is connected to negative terminal of battery so PN-junction is reverse

biased

9 **(b)**

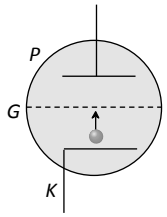
The difference in the variation of resistance with temperature in a metal and semiconductor is caused due to the difference in the variation of the number of charge carriers with temperature.

10 **(a)**

The potential of P-side is more negative that of N-side, hence diode is in reverse biasing. In reverse biasing it acts as open circuit, hence no current flows

11 **(b)**

When grid is given positive potential more electrons will cross the grid to reach the positive plate P. Hence current increases



13 **(b)**

This is operational or OP-inverting amplifier

$$A = \frac{V_0}{V_i} = -\frac{R_f}{R_i}$$

Given $V_i = 1V$, $R_f = 10k\Omega$, $R_i = 1k\Omega$

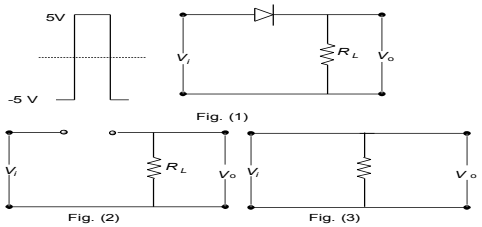
$$\therefore V_0 = -V_i\frac{R_f}{R_i} = -1 \times \frac{10}{1} \Rightarrow V_0 = -10\ V$$

V_0 is negative because V_{input} is $+1V$ (positive)

14 **(d)**

For $V_i < C$

the diode is reverse biased and hence offer infinite resistance, so circuit would be like as shown in Fig. (2) and $V_o = 0$.



For $V_i > 0$,the diode is forward biased and circuit would be as shown in Fig. (3) and $V_o = V_i$

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Hence, the optical (d) is correct.

15 **(b)**

Maximum load current $I_m = \frac{V_m}{r_f + R_L} = \frac{50\sqrt{2}\text{V}}{(20 + 980)\Omega}$

$= 70.7$ mA

$\therefore$ Mean load current. $I_{DC} = \frac{2I_m}{\pi} = \frac{2 \times 70.7}{\pi} = 45$ mA

16 **(a)**

The input of OR gate is A and $\overline{(A \cdot B)}$. Hence $Y = A + \overline{(A \cdot B)}$.

17 **(d)**

The given truth table follows a NAND gate whose output is 1 only if at least one of its input is zero. Its Boolean expression is

$Y = \overline{A \cdot B}$

So that $\overline{1 \cdot 1} = \overline{1} = 0$

$\overline{1 \cdot 0} = \overline{0} = 1$

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18 **(d)**

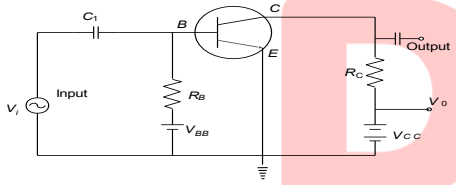
Tourmaline is the dichroic crystal

19 **(d)**

Ionic bond is a type of chemical bond based on electrostatic forces between two oppositely charged ions. Bond between NaCl, CsCl and LiF are ionic, while H_2O forms a covalent bond.

20 **(d)**

In CE amplifier, the input signal is applied across base-emitter junction as shown in the figure below.



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