ONE PAGE NOTES OF PHYSICS

G SQUARE

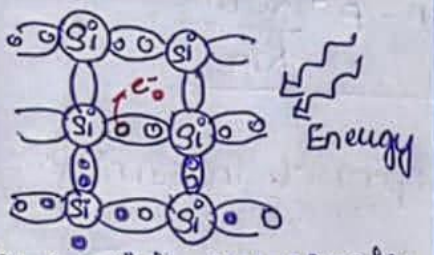
https://t.me/garimagoel007_g2

SEMI-CONDUCTORS

* [redacted] hole → VB
e⁻ → CB
balka

Insulator → Band gap > 3eV
Semi Conductor - Band ≈ 1eV
Conductor - Band gap = 0

Intrinsic semi con :-



Conductivity less ∵ no° of e⁻ is less

$n_e = n_h$ $\quad i = n_e A V_d$

$i = i_e + i_h$

$i = n_e e A V_{de} + n_h e A V_{dh}$

$n_e = n_h$

$\boxed{i = n_e e A (V_{de} + V_{dh})}$

current density $J = \frac{i}{A}$

$\boxed{j = n_e e (V_{de} + V_{dh})}$

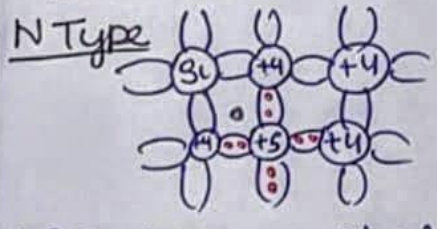
conductivity :- $\sigma = \frac{j}{\varepsilon}$

$\boxed{\sigma = n e (\mu_e + \mu_h)}$

Dopants :-

→ Pentavalent : As, Sb, Bi

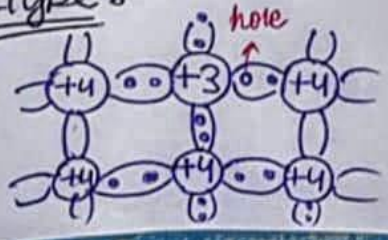
N Type



→ Room temp → $n_e >> n_h$
→ donor impurity

Trivalency :- B, Al, In

P-Type :-

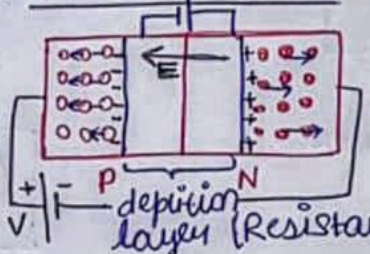


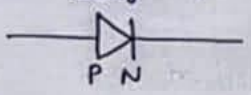
$n_h >> n_e$

mass action law :

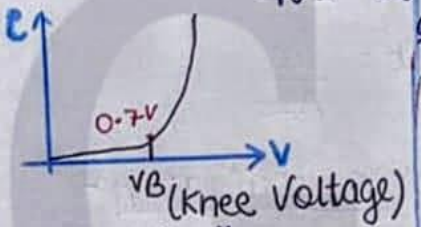
$n_e n_h = n_i^2$

PN - Junction :-



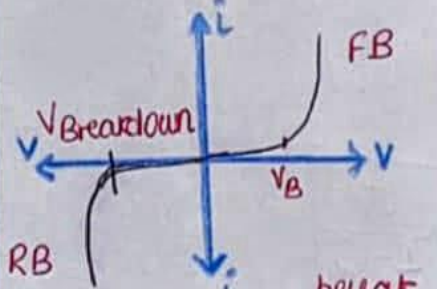


Forward Biasing → opposes V_{Barr}
→ depletion layer
→ R less
→ ideal R → 0 $\quad P \to +ve \quad N \to -ve$



Reverse biasing :
when potential is a same.
→ support the $V_{Barrier}$.
→ dep layer → Thick
→ R → more
$R_{ideal} = \infty$

P → -ve
N → +ve



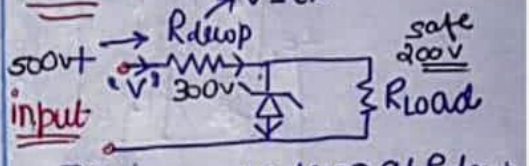
break

Zener break	Avalanche
when covalent bond of depletion layer, itself breaks → as a voltage regulator	Covalent bond are broken by collision of minorities → material knows

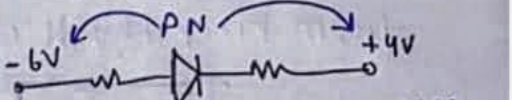
Ukhad k bahar ana → tut tut kaam se

Voltage regulator :-

Zener :-



zener increase the drop at Rdrop so that Rload remains safe in the circuit.

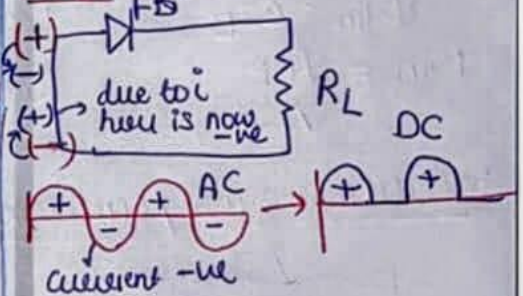


$V = iR \Rightarrow V = 0$ because $R_{ideal} = \infty$

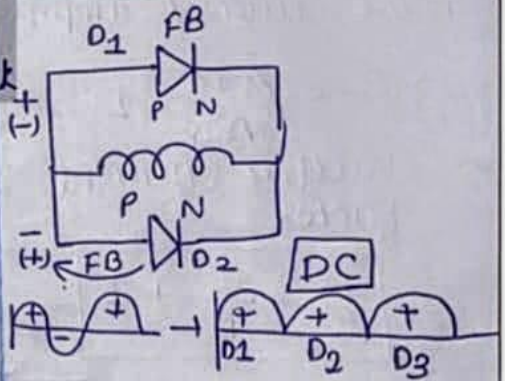
* HAIF WAVE RECTIFIER :-

to convert AC current to a DC current.

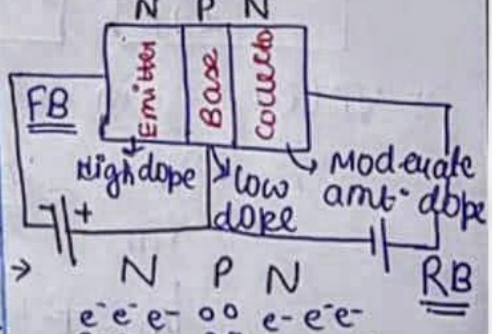
Half wave :-

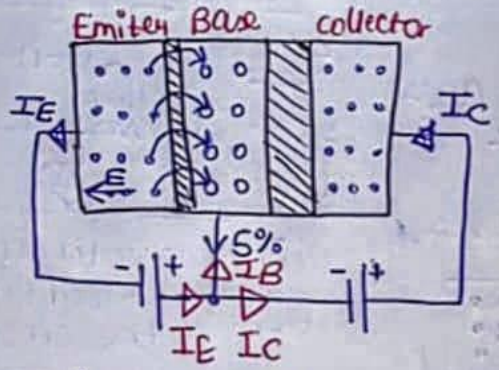


Full wave :-



TRANSISTORS :-





from Kirchoff voltage loop law :

$$I_E = I_B + I_C$$

$I_B = 5\% I_E \rightarrow$ input
$I_C = 95\% I_E \rightarrow$ output
} Amplification

* Common emitter amplifier :

$V_{in} = V_{BE}$
$i_{in} = \Delta I_B$
$R_{in} = \frac{V_{BE}}{\Delta I_B}$

$V_{out} = V_{CE}$
$i_{out} = \Delta I_C$
$R_{out} = \frac{V_{CE}}{\Delta I_C}$

Current gain / Current amplification :

$$\beta = \frac{\Delta I_C}{\Delta I_B} > 1 \qquad 20-100$$

Base current amplification factor

$$\alpha = \frac{\Delta I_C}{\Delta I_E} < 1 \qquad 0.95-0.99$$

→ emitter current amplification factor

$$\frac{1}{\alpha} = \frac{1}{\beta} + 1$$

$$\alpha = \frac{\beta}{1+\beta} \qquad \beta = \frac{\alpha}{1-\alpha}$$

* Voltage gain (A_V) :

$$A_V = \frac{V_{out}}{V_{in}} = \frac{\Delta I_C \cdot R_{out}}{\Delta I_B \cdot R_{in}}$$

$$A_V = -\beta \frac{R_{out}}{R_{in}}$$

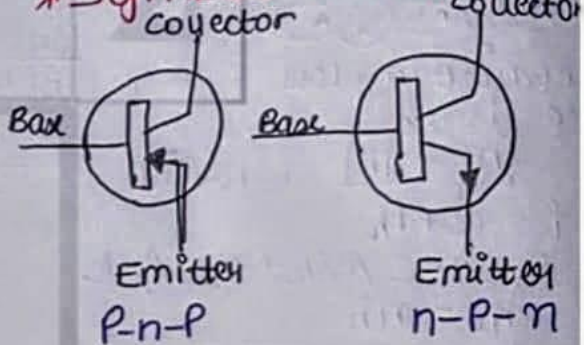
* Power gain (A_P) :

$$V_P = \frac{V_{out}}{V_{in}} = i^2 R$$

$$\frac{(\Delta I_C)^2 R_{out}}{(\Delta I_B)^2 R_{in}}$$

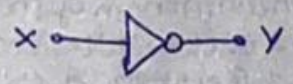
$$A_P = \beta^2 \frac{R_{out}}{R_{in}}$$

* Symbol Transmitter :



LOGIC GATES

#NOT gate :-



x	y
0	1
1	0

input = A output $\bar{A}$

AND GATE

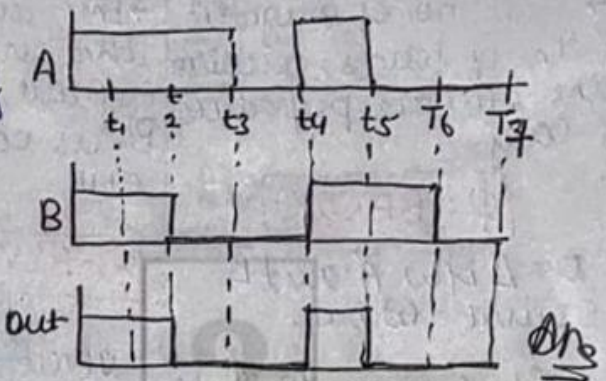


output high only if both inputs are high.

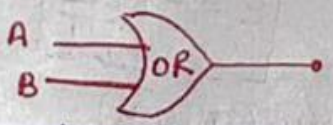
A	B	out
0	0	0
1	0	0
1	1	1

out = A·B

Q Type; WAVE forms :- for AND gate?

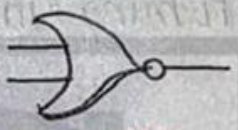


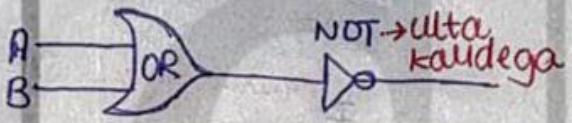
#OR GATE



A	B	out
0	0	0
1	0	1
0	1	1
1	1	1

NOR gate →

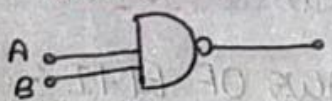




A	B	OR	NOR
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

out = $\overline{A+B}$

NAND GATE

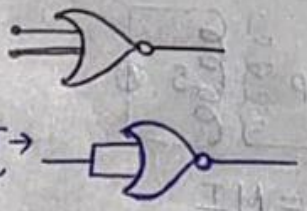


A	B	AND	NAND
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

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

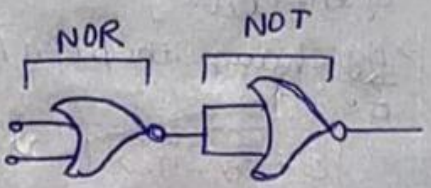
"NOR and NAND- are universal gate"

NOR

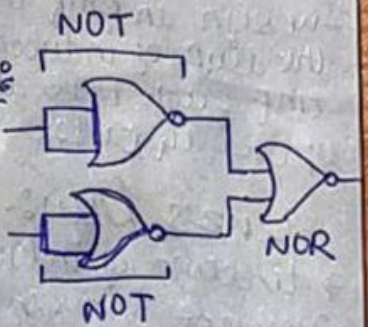


NOT →

OR →



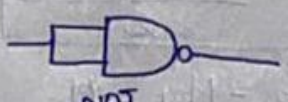
AND :-



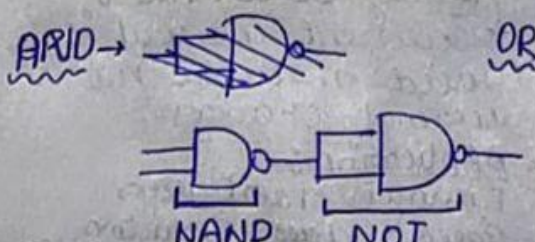
NAND



NOT →



AND →



OR →

