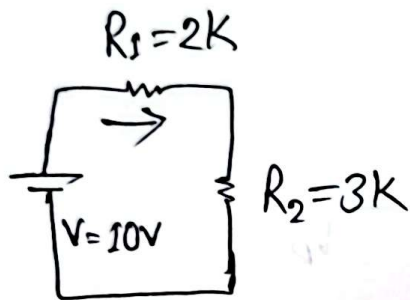


# Analyze and design of circuit. consisting of electronic device

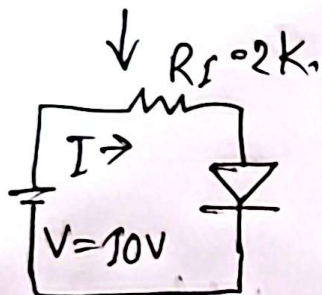


$$I = \frac{V}{R_1 + R_2}$$

$$= \frac{10}{5} = 2mA$$

$$V_{R_2} = I R_2$$

$$= 2 \times 3 = 6V$$



$$\rightarrow I = \frac{V}{R_1 + D} \times$$

# 3 types of electronic device

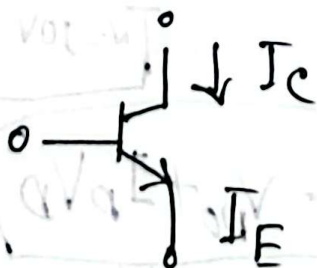
1) PN junction diode



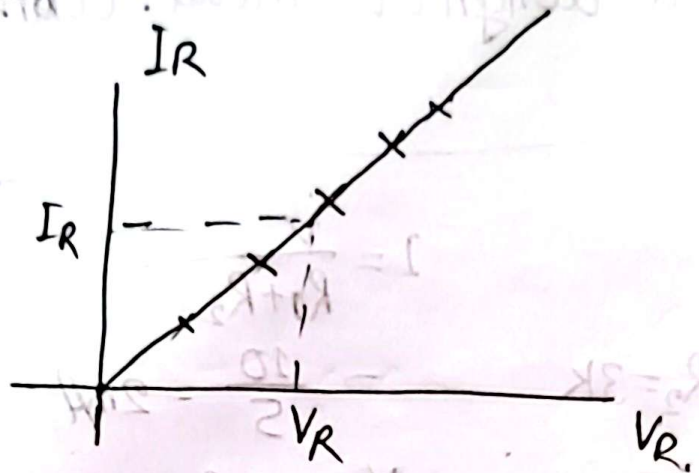
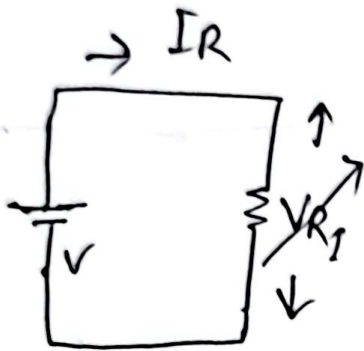
2) MOSFET



3) BJT

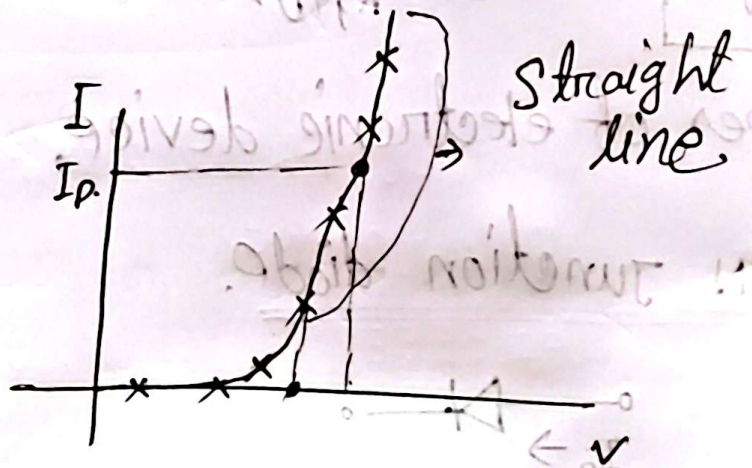
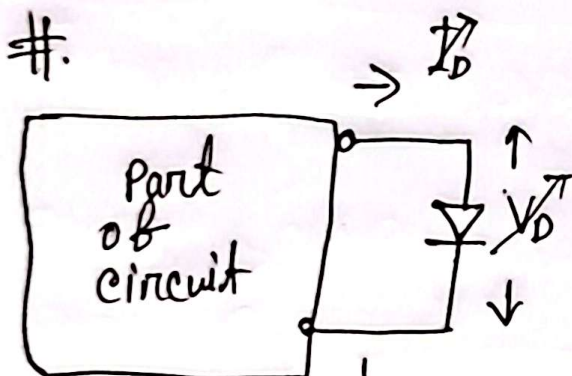


# IV characteristics



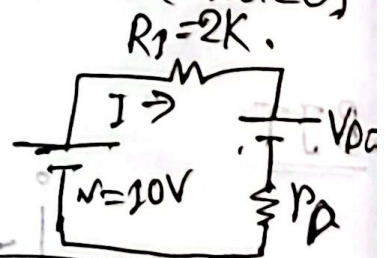
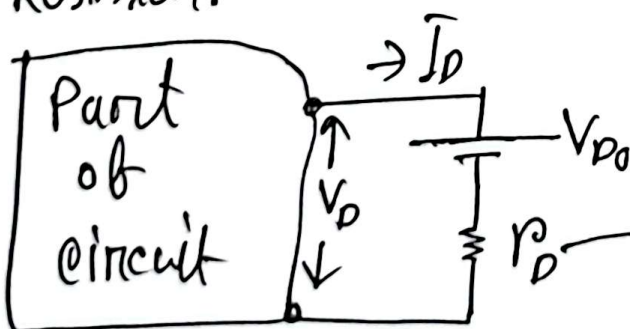
$$I_R = \frac{V_R}{R} \Rightarrow I_R = \frac{1}{R} V_R$$

$\downarrow$                        $\downarrow$   
 $y = mx + c$



For diode

The curve will be similar.  
 ⇒ straight line indicates the characteristics of resistor.



$$V_D = V_{D0} + I_D V_D$$

$$I = \frac{V - V_{D0}}{R_1 + R_D}$$



## conductor

Material  $\rightarrow$  basis of the conductivity.

- $\rightarrow$  Has free electron. flow of electron.
- $\rightarrow$  Supports flow of electron.



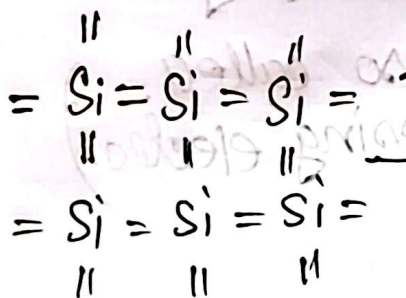
#. semiconductor: conductivity can be easily modified.



#. Insulator: No free electron.

$\rightarrow$  Don't support the flow of  $e^-$ .

#1



$\rightarrow$  Intrinsic (Pure)

semiconductor.

when it is pure 99.99% of Si bond.

$\rightarrow$  There is no free  $e^-$ .

Case 1:  $T = 0\text{ K}$

No  $e^- \rightarrow$  No flow.

$\Rightarrow$  Behave like a insulator.

## Case-2

$T = 300\text{K} (27^\circ\text{C})$

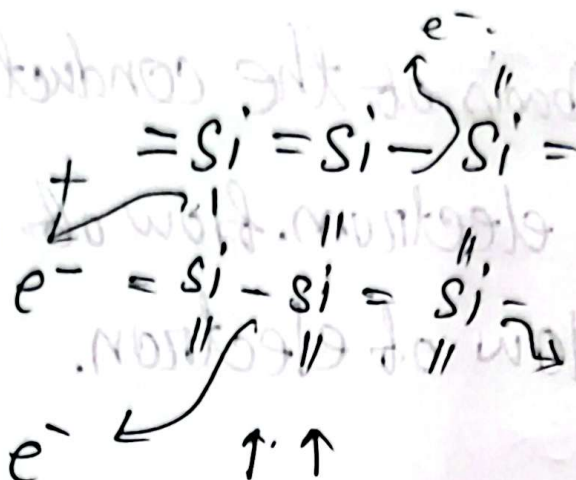
bonds are broken

and  $e^-$  become free  $\rightarrow$  flow happens.

$\rightarrow$  Become a conductor.

$27^\circ\text{C}$

Thermal Gen

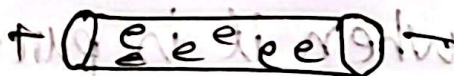


empty space :- carries <sup>(+ve)</sup> charge.

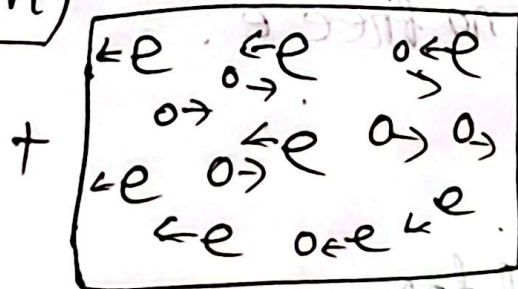
Capable of moving.

empty space is also a charge carrying particle.

Hole (p)



Electron (n)



$I_h \rightarrow$

$$I = I_h + I_n$$

also called (missing electron)

In Thermal gen. electrons and holes are generated in pairs.

$n = P$  for 10V, 10n and 10p are generated



## EHP. Gen.



$$[n = p = n_i]$$

$[n_i = \text{Intrinsic}]$  <sup>conduction.</sup>

$T = 300\text{K}$  Si,  $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$   
 $n_{\text{Si}} \approx 10^{20} / \text{cm}^3$

Bond Reformation takes place EHP Recombination. leads the disappearance of electron and hole from the sense.

$\rightarrow 10^{10} \text{ Si} \rightarrow 1 \text{ free electron.}$

# To increase the conductivity of semiconductor; we can increase the number of free e on the number of hole.

## # Doping.

Extrinsic semiconductor. (Impure)

N-Type ( $n > p$ )

P-Type ( $p > n$ )

