Semiconductor

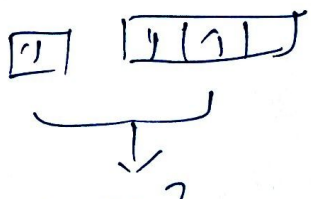
- Elemental
  - Intrinsic — Si, Ge
  - Extrinsic
    - P-Type
    - N-Type
- Non Elemental (compound)

III	IV	V
B	C	N
Al	Si	P
Ga		

P-Type – Doping done with III-group

N-Type – " " V-group

$B - 1s^2 2s^2 2p^1 \longrightarrow 1s^2 2s^1 2p^2$

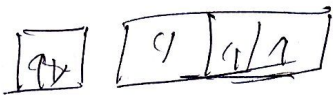


$4\ sp^3$

N-Type

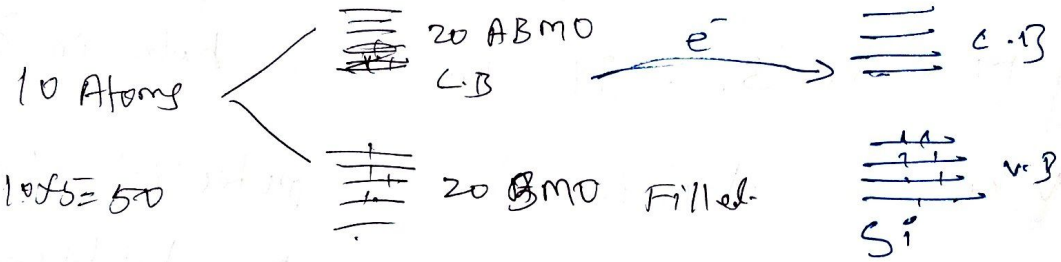
When 'Si' is doped with P or As.

P – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

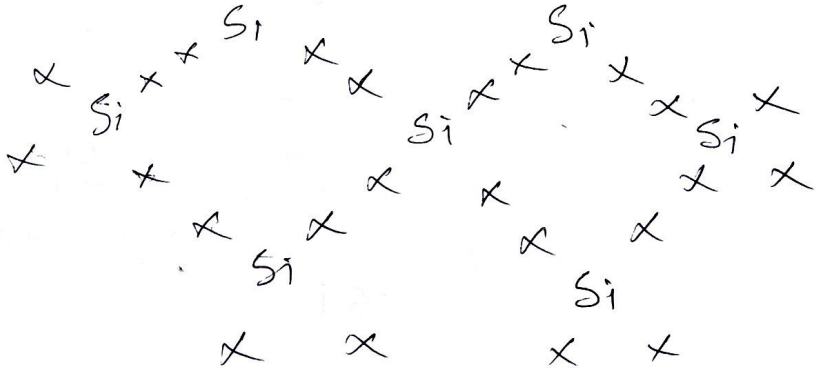


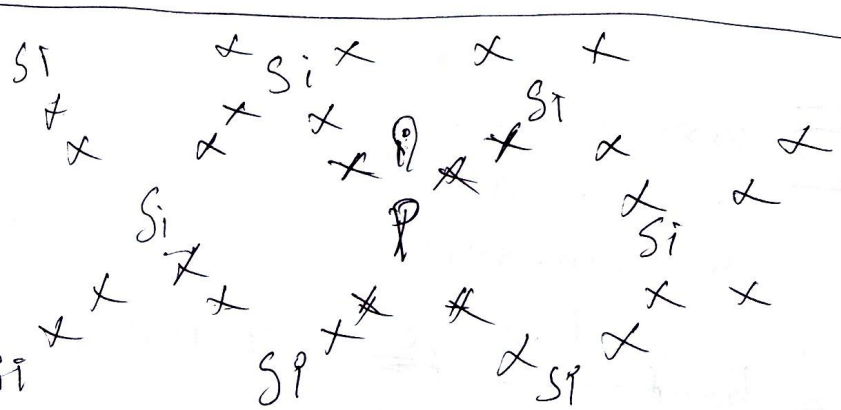
1s + 3p $\xrightarrow{\text{overlapp}}$ 4 MO (sp^3)

no of e⁻ → 5



Si Crystal





The non boned e⁻ of P/As. (00) The e⁻ of ABMO → very near to the

C.B of Si (or) almost equal to the CB (Si) Energy level. Hence the e^- of P/As can transfer to the C.B of Si without effort.

Non-Elemental (compound) semiconductor

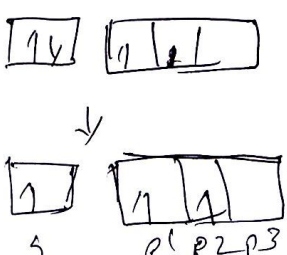
Mixing of two elements to achive a semiconduction properties.

The Choices/possibility

- Coupling III group & V group
- By coupling II group & VI group

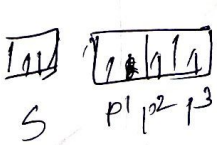
Ga – 31

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$



P – 15

$1s^2 2s^2 2p^6 3s^2 3p^3$



When the ratio of Ga to P is 1:1.

5 Ga + 5 P atoms

10 atoms = 10 × 4 = 40 MO

20 A.BMO

20 BMO

5×3 + 5×5

15 + 25 = 40 e⁻

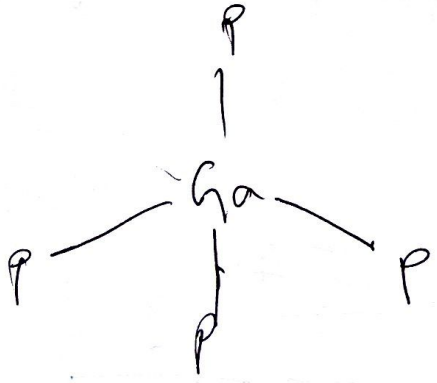
Hence BMO of the compound is filled

Empty } The gap 2.3 → 2.5 eV

Filled

GaP

Tetrahedral - Structure



Each P - surrounded by 4 Ga

Each Ga - surrounded by 4 P