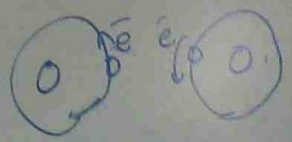


FERMI LEVEL (E_F)

TWO ELECTRONS OF EACH OF OPPOSITE SPIN AT LOW TEMPERATURE

THE ENERGY LEVEL OCCUPIED BY TWO ELECTRONS $\Rightarrow f(E) = \dfrac{1}{1 + e^{(E - E_f)/KT}}$

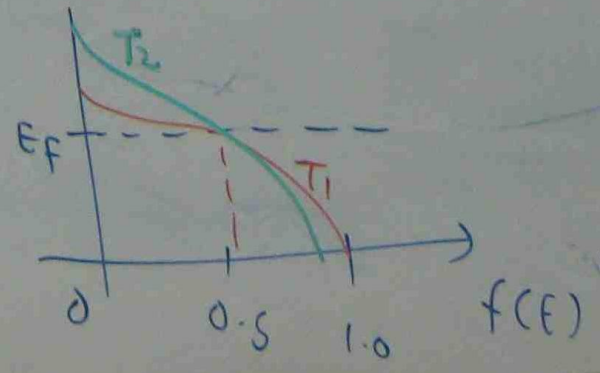
$f(E)$ - FERMI DIRECT DISTRIBUTION FUNCTION

E_F - FERMI LEVEL

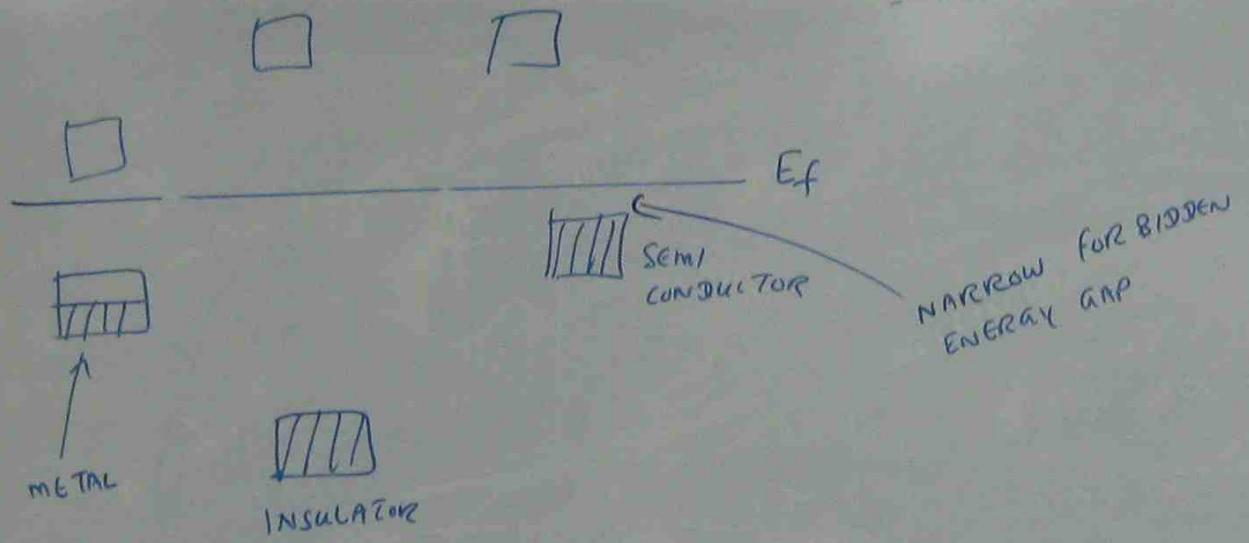
K = BOLTZMANN'S CONSTANT

T = ABSOLUTE TEMPERATURE

AS TEMPERATURE INCREASES, THE STATE OF ENERGY IS HIGHER THAN FERMI LEVEL



ENERGY



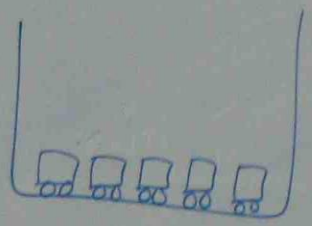
SEMI CONDUCTOR

A SEMI CONDUCTOR IS JUST AN INSULATOR WITH A NARROW FORBIDDEN ENERGY GAP. AT low TEMPERATURE, IT DOES NOT CONDUCT. AT HIGHER TEMPERATURE, THERE IS SUFFICIENT ENERGY LEVEL, THE ELECTRON IS IN CONDUCTION BAND.

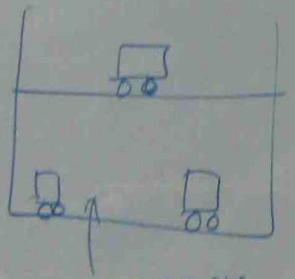
E_c

E_v

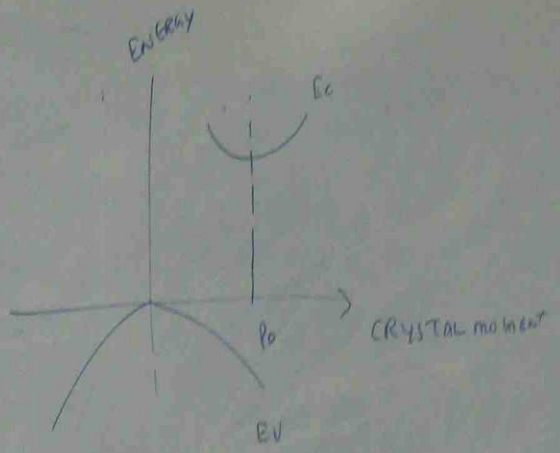
ELECTRONS AND HOLES



NO MOVEMENT POSSIBLE



MOVEMENT POSSIBLE IN BOTH UPPER & LOWER LEVEL



$$n = N_c \, e^{\frac{(E_F - E_c)}{KT}}$$

n = NUMBER OF ELECTRONS

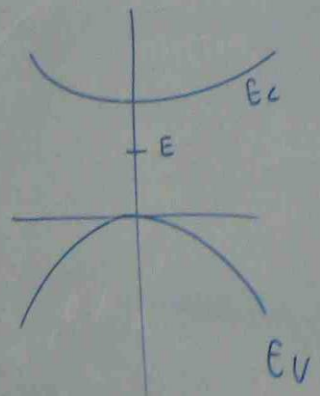
E_F = FERMI LEVEL ENERGY

E_c = CONDUCTION BAND ENERGY

K = BOLTZMANN'S CONSTANT

T = ABSOLUTE TEMPERATURE

N_c = CONSTANT



E_c = CONDUCTIONAL ENERGY

E_v = VACANCE ENERGY

$$E - E_v = \frac{p^2}{2 m_e}$$

m_e = ELECTRONS MASS

$$E_v - E = \frac{(p - p_o)^2}{2 m_h}$$

m_h = HOLE MASS

p = MOMENTUM

$$p = N_v \, e^{\frac{(E_v - E_F)}{KT}}$$

N_v = CONSTANT

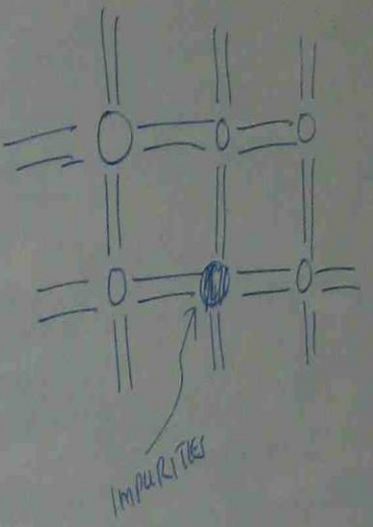
E_v = VACANCE BAND ENERGY

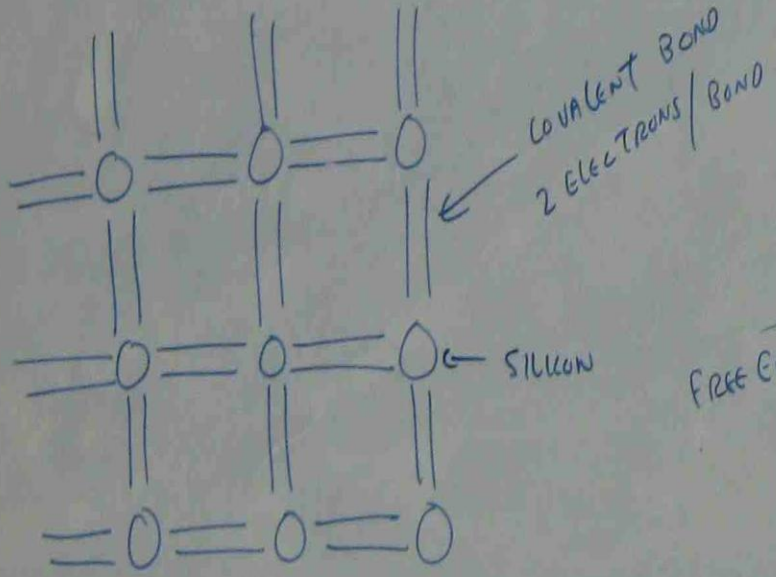
e = 2.718

$$E_F = \frac{E_c + E_v}{2} + \frac{KT}{2} \ln\left(\frac{N_V}{N_c}\right)$$

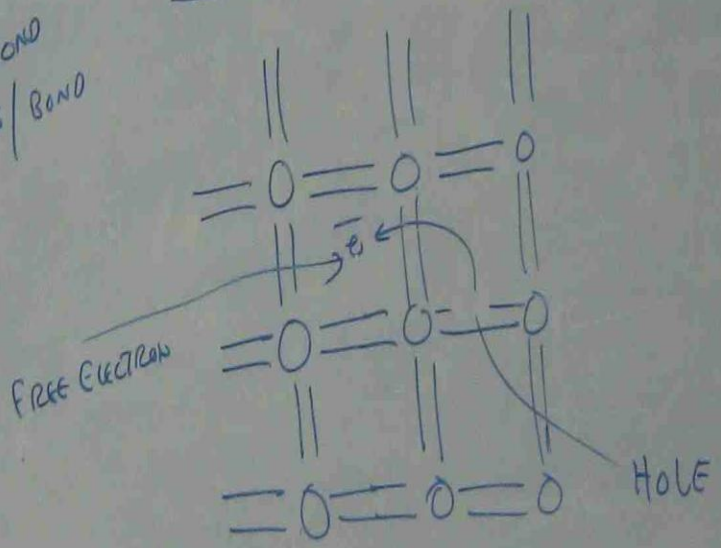
$\ln = \log_e$

$\log = \log_{10}$





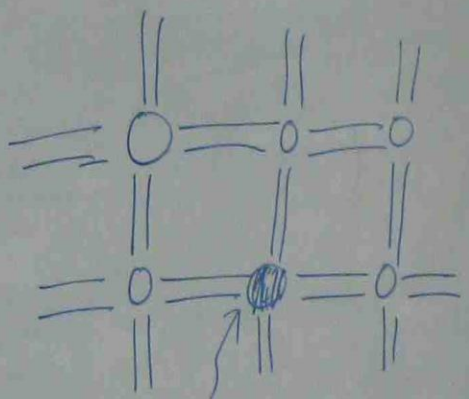
AT HIGHER TEMPERATURE



N_D = NO. OF DONOR ELECTRON

N_A = NO. OF ACCEPTOR ELECTRON

N_V = NO. OF VALANCE ELECTRON



IMPURITIES

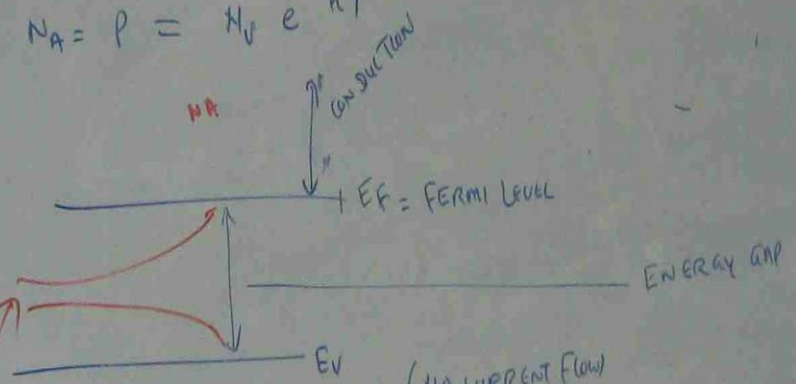
N_D = NO. OF DONOR ELECTRON

N_A = NO. OF ACCEPTOR ELECTRON

N_V = NO. OF VALANCE ELECTRON

$$N_D = n = N_V \, e^{\frac{E_F - E_C}{KT}}$$

$$N_A = p = N_V \, e^{\frac{E_V - E_F}{KT}}$$



NARROWER ENERGY BAND

$$U_a = \frac{1}{2} \frac{gt}{m} \mathcal{V}$$

U_a ← VELOCITY

$\mathcal{V}$ ← ENERGY PER UNIT AREA

μ_c = HOLE CARRIER MOBILITY

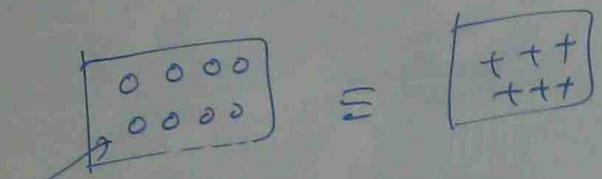
$$\mu_c = 65 + \frac{1265}{1 + \left(\frac{N}{8.5 \times 10^{16}}\right)^{0.72}} \; cm^2/VS$$

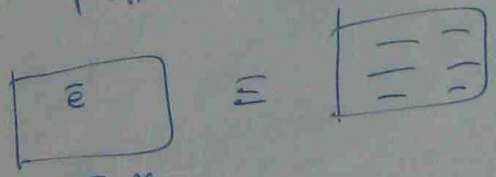
CONDUCTIVITY OF SEMI CONDUCTOR $= q\mu_c n + q\mu_n p$

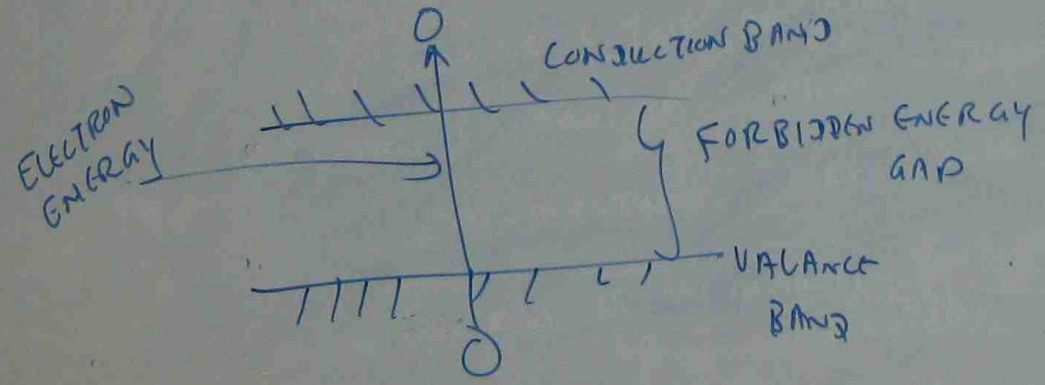
$$\mu_n = 47.7 + \frac{447.3}{1 + \left(\frac{N}{6.3 \times 10^{16}}\right)^{0.76}}$$

q = ELECTRICAL CHARGE (COULOMB)

SEMI CONDUCTOR & P-N JUNCTION







LOW TEMPERATURE

ENERGY BONDS ARE INTACT
ELECTRON BEHAVES AS INSULATOR

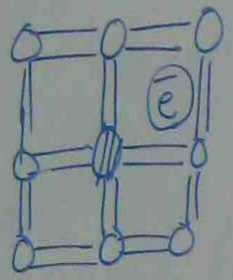
AT HIGH TEMPERATURE

ELECTRON FROM BROKEN BONDS MOVE IN TO NEIGHBOURING BONDS.

DOPING

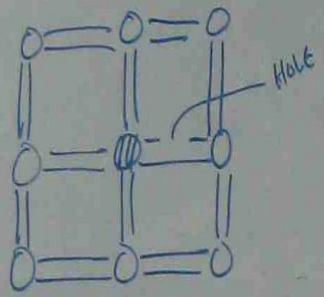
SHIFT THE VALANCE OF ELECTRONS & HOLES IN SILICON CRYSTAL LATTICE BY DOPING OTHER ATOMS

N TYPE



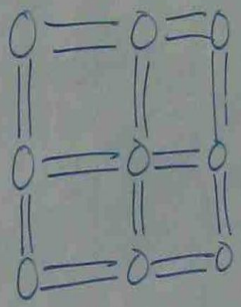
PHOSPHROUS

P TYPE



BORON

POLY CRYSTALLINE SILICON

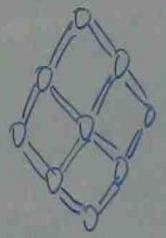


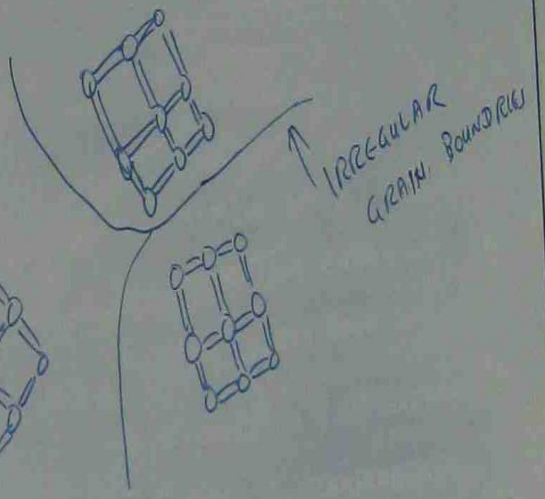
CRYSTALLINE

ORDERED STRUCTURE

PREDICATABLE UNIFORM BEHAVIOUR

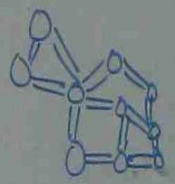
MORE EXPENSIVE



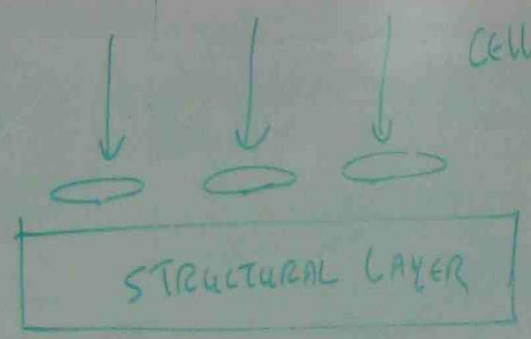


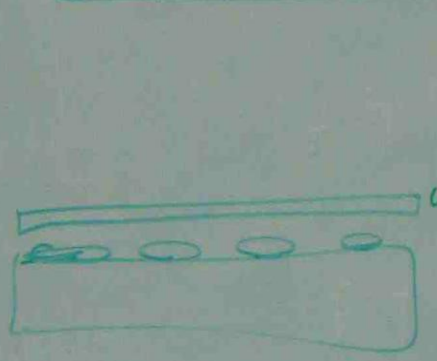
MULTI CRYSTALLINE

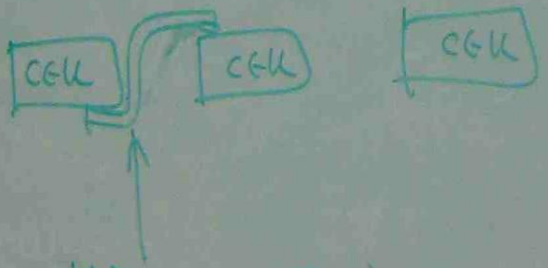
AMOR PHOUS



SIMILAR TO LIQUID STRUCTURE







MODULE DEGRADATION

- BREAKAGE OF CELLS DUE TO EXCESSIVE MECHANICAL STRESS
- CORROSION
- DELAMINATION OF DIFFERENT LAYERS OF ENCAPSULATION
- DISCOLORING
- ACCUMULATION OF DIRT OF MODULES
- BREAKAGE OF INTERCONNECTION DUE TO INADEQUATE STRESS RELIEF