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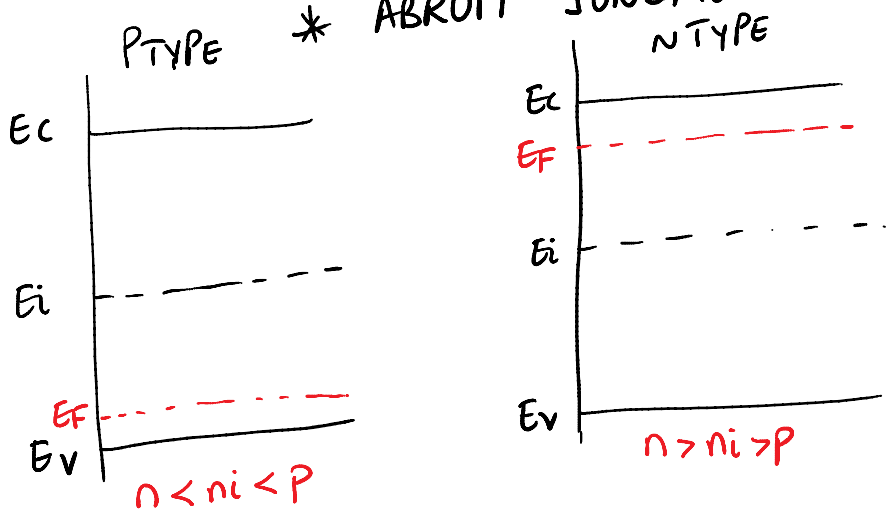
LECTURE -11

PN JUNCTION

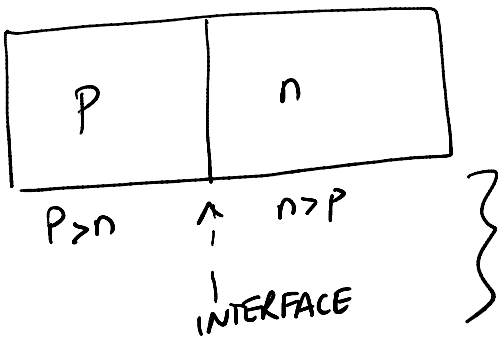
* ABRUPT JUNCTION



BEFORE JOINING

n MATERIAL → LARGE CONCENTRATION OF ELECTRONS AND FEW HOLES

P MATERIAL → LARGE CONCENTRATION OF HOLES AND FEW ELECTRONS



n (P SIDE) < n (n SIDE)
P (P SIDE) > P (n SIDE)
GRADIENT EXIST

∴ ELECTRONS FLOW FROM n TO P
HOLES FLOW FROM P TO n

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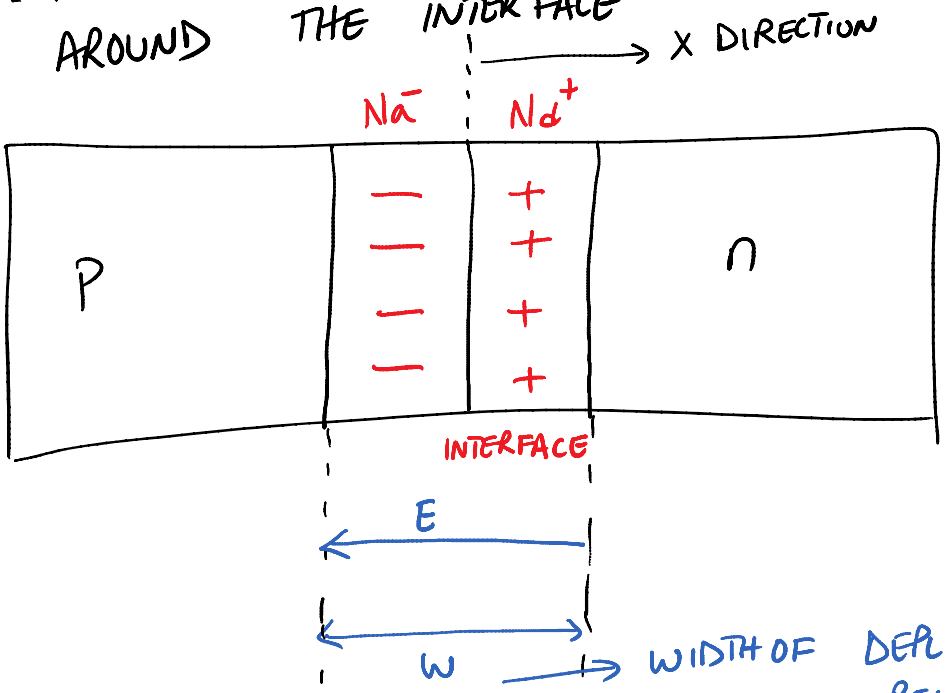
∴ DEPLETION REGION IS FORMED AROUND THE INTERFACE



* DIFFUSION CURRENT CANNOT OCCUR INDEFINITELY
∴ OF E → ELECTRIC DIPOLE → PROVIDES A DRIFT CURRENT IN THE OPPOSITE DIRECTION

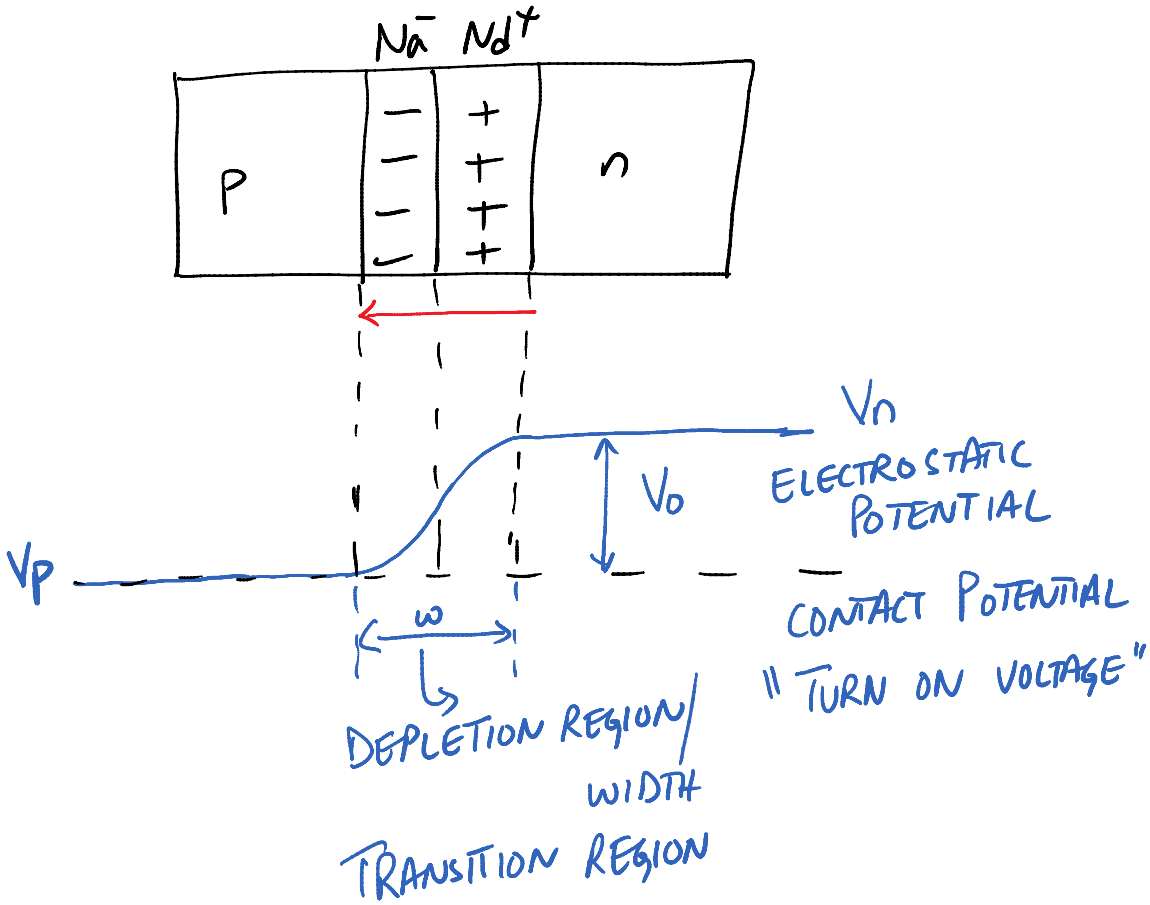
$\therefore$ DIFFUSION CURRENT = DRIFT CURRENT

$$J_n(x) = 0 = q\mu_n n_o(x) E(x) + q D_n \frac{dn}{dx}$$

$$J_p(x) = 0 = q\mu_p p_o(x) E(x) - q D_p \frac{dp}{dx}$$

NO NET CURRENT CAN FLOW ACROSS THE JUNCTION AT EQUILIBRIUM

* E FIELD IN THE REGION 'W' RESULTS IN A POTENTIAL DIFFERENCE V_o ACROSS W



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AT EQUILIBRIUM

V_o

$I = 0\ A$

$J = 0\ A/cm^2$

* FERMI LEVEL FOR P-N JUNCTION SHOULD BE AT THE SAME LEVEL