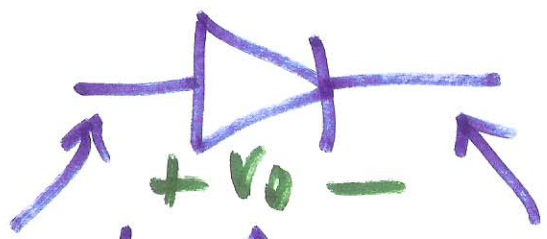
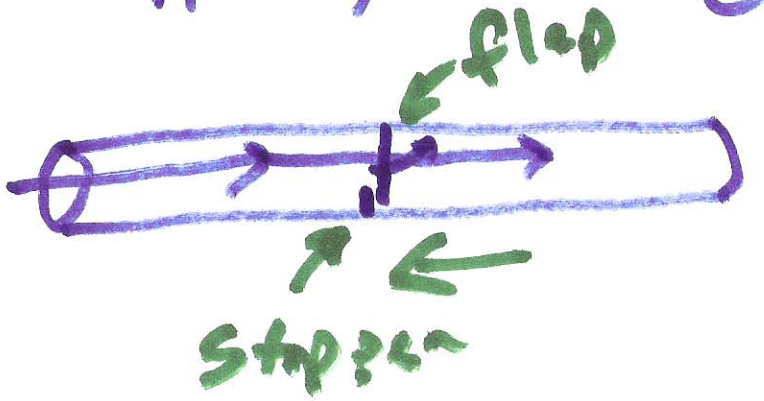
Lecture 7 EE 320

2/12/14

Diode ID

$V_D = V_{anode} - V_{cathode}$





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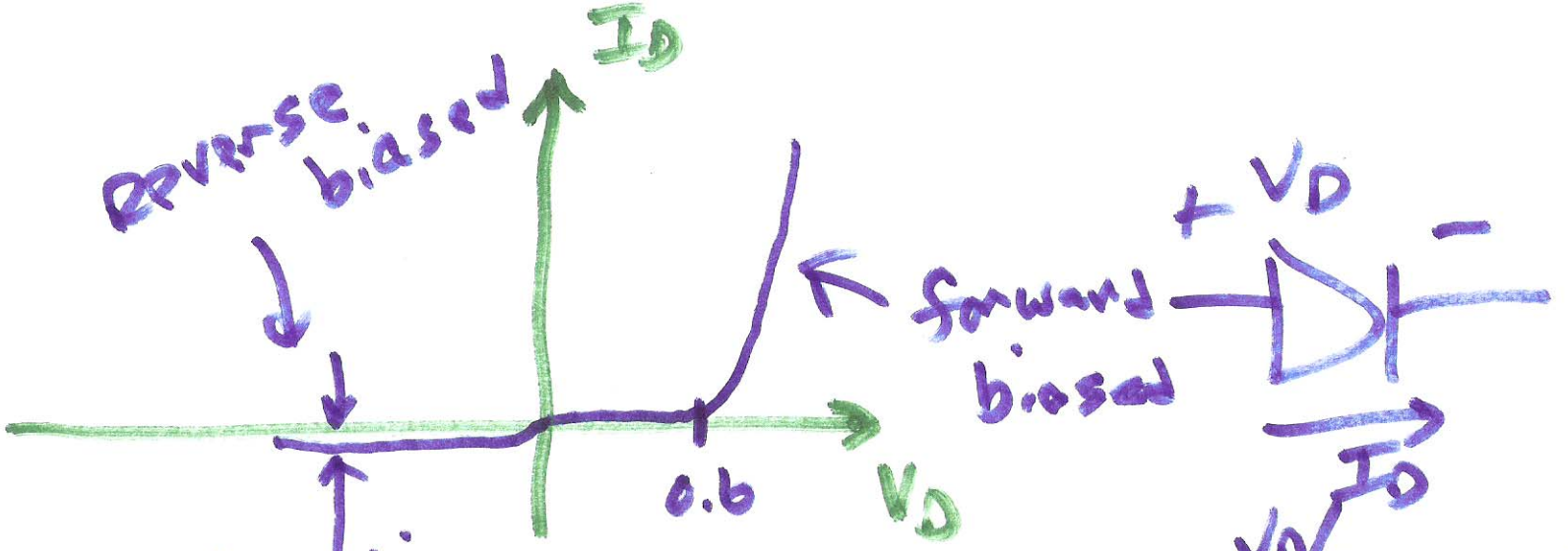

saturation current or scale current

I_S

forward biased

$I_D \simeq I_S e^{V_D/NV_T}$

$I_D = I_S\left(e^{V_D/NV_T} - 1\right)$

$V_T = \frac{KT}{q} = 0.025\,V$

Thermal

N = emission coefficient $\simeq 1$

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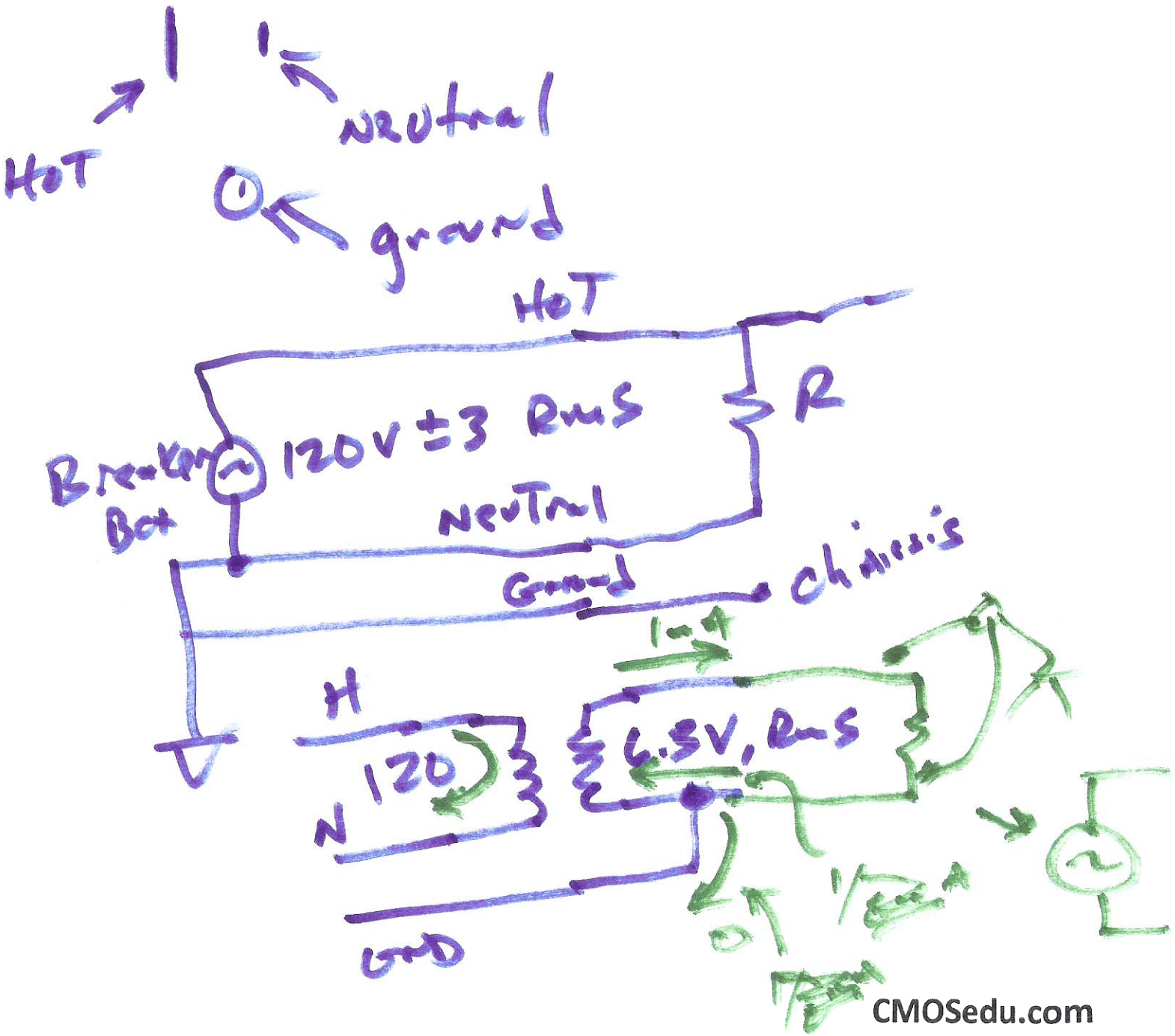

3)

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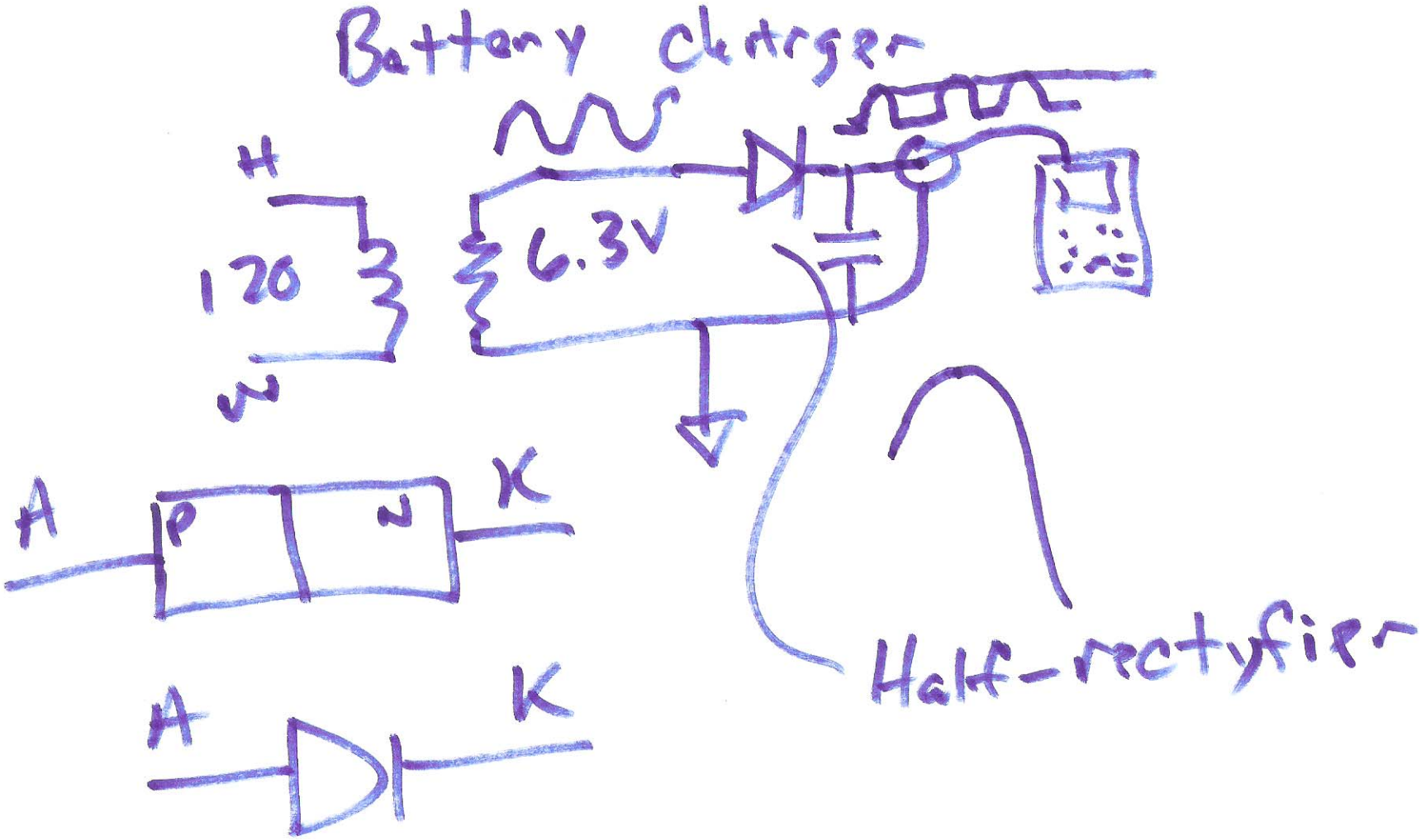

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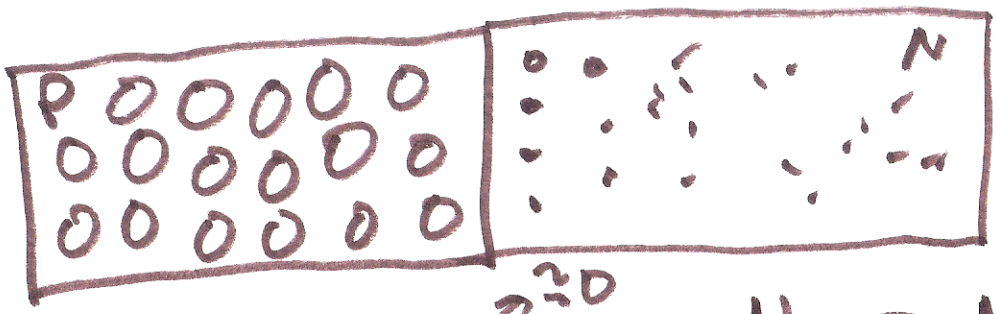
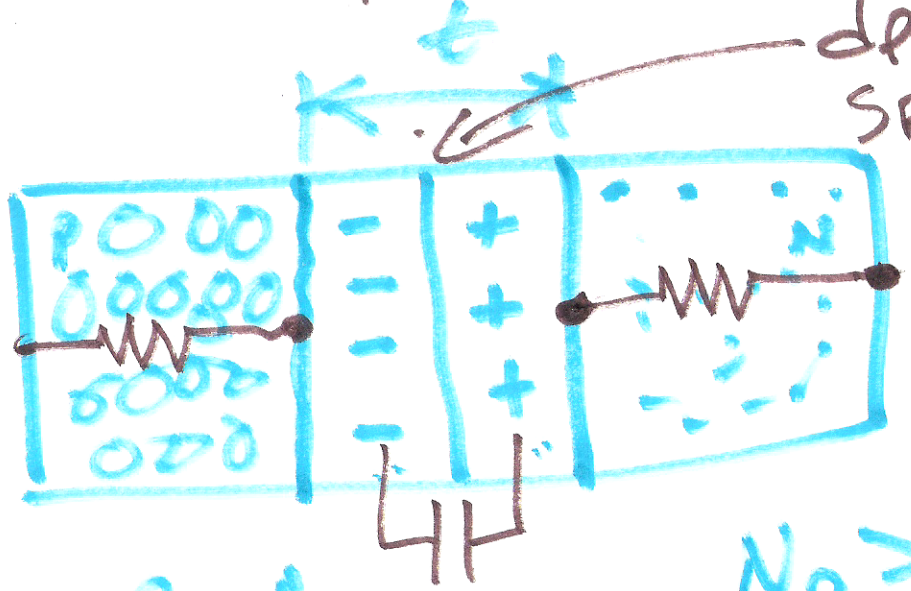


$N_A = P + N_i^{\nearrow \simeq 0}$

$N_D = N + N_i^{\nearrow \simeq 0}$

$N = \frac{N_i^2}{N_A}$

$P = \frac{N_i^2}{N_D}$



$N_D >> N_A$

$C = \frac{\epsilon \cdot A}{t}$

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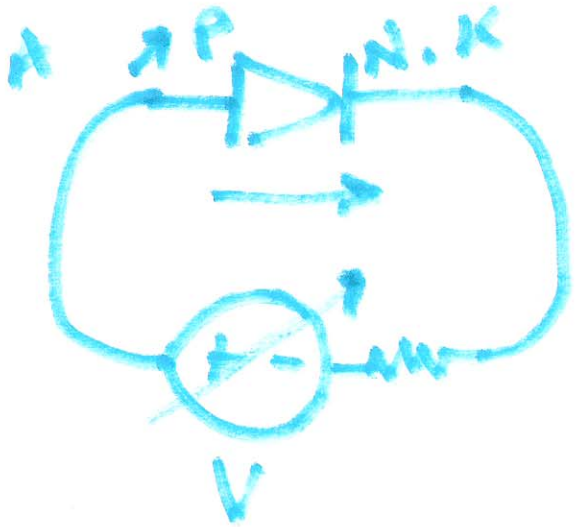
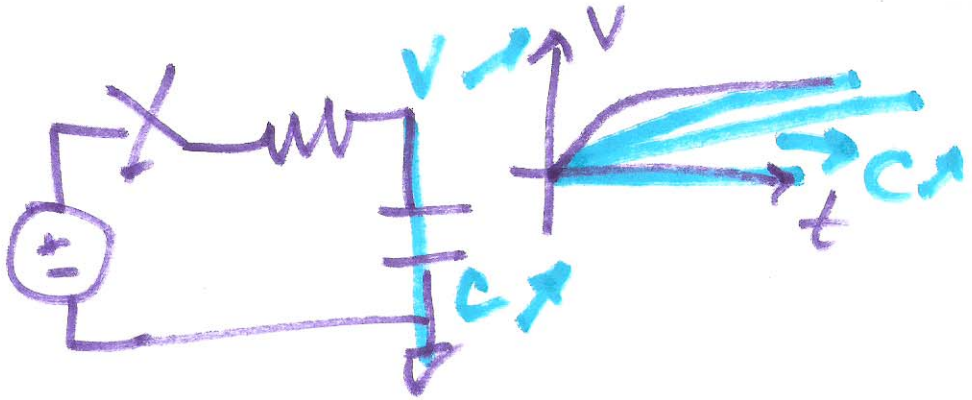
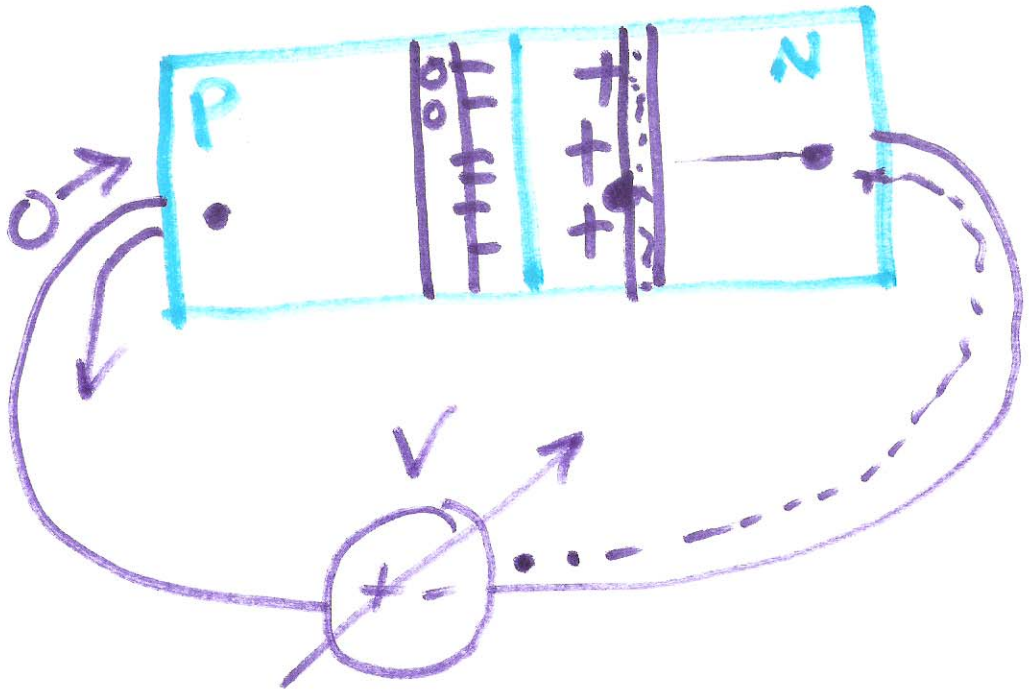
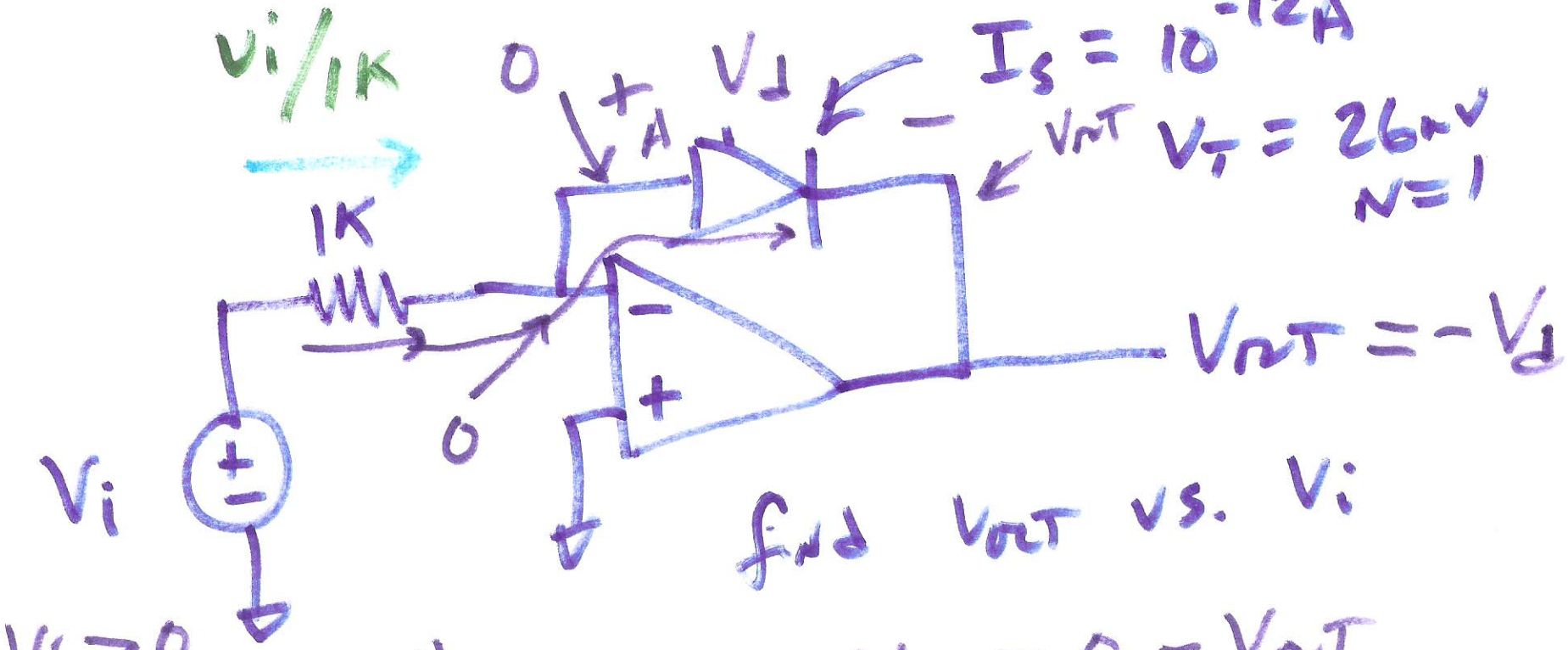

A
P
N, K
V


V
V
t
C
C


P
N
O
V



find V_{OUT} vs. V_i

$\frac{100mV}{25mV} = 4$

$V_d = V_A - V_K = 0 - V_{OUT}$

$I_D = I_S\left(e^{V_D/NV_T} - 1\right)$

$-V_{OUT}/NV_T$ for forward bias $V_D \gg 0$

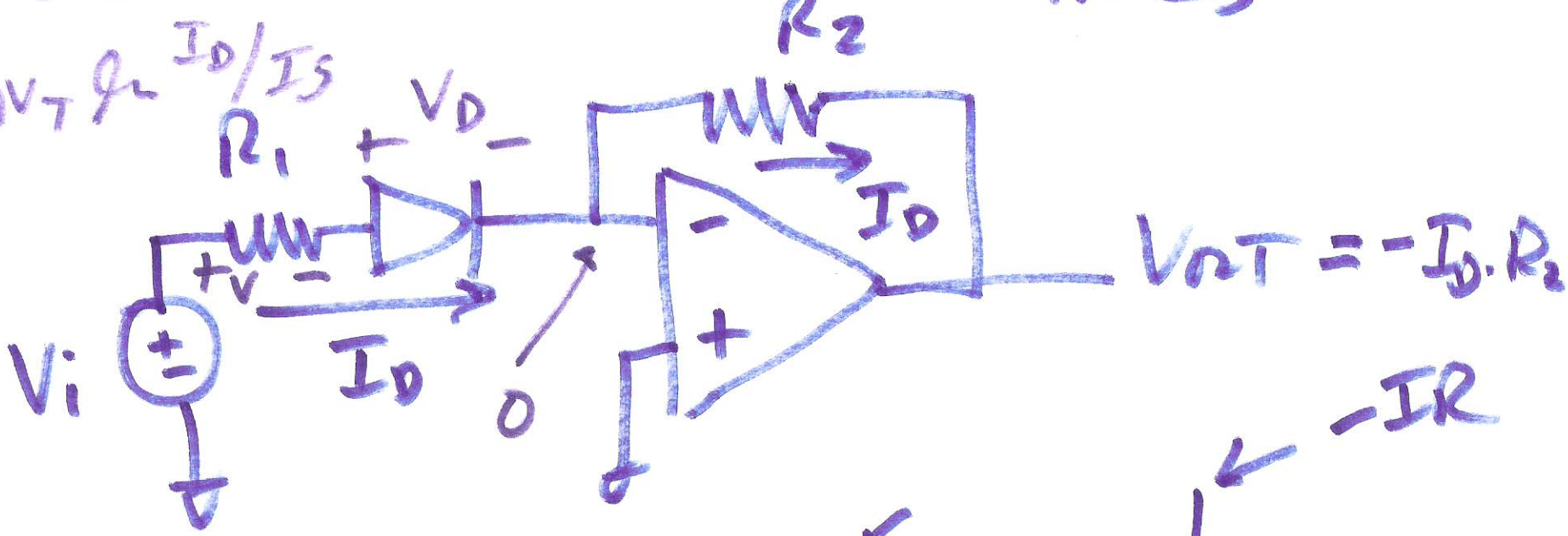
$\frac{V_i}{1K} = I_S e$

$I_D \simeq I_S e^{V_D/NV_T}$

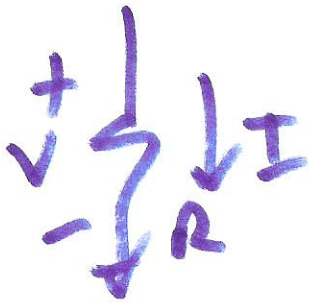
$\frac{V_i}{1K \cdot I_S} = e^{-V_{OUT}/NV_T}$

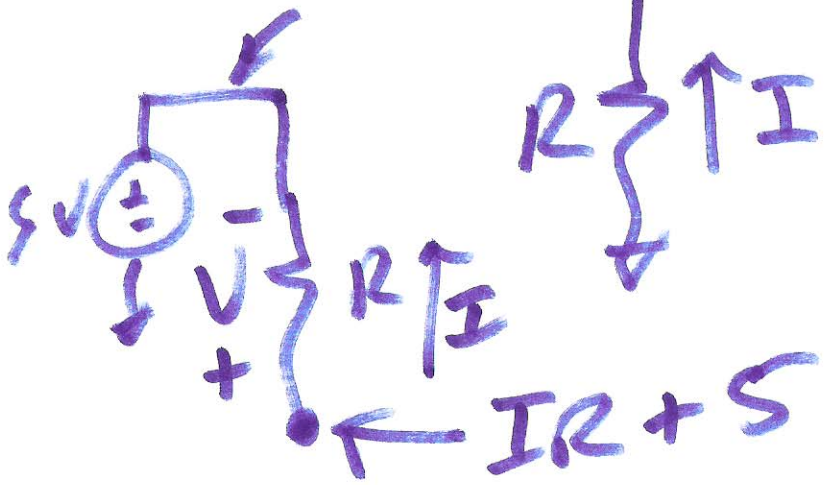
$I_D = I_S e^{\frac{V_D}{nV_T}}$ $V_{OUT} = -NV_T \ln \frac{V_i}{1K \cdot I_S}$

$V_D = NV_T \ln \frac{I_D}{I_S}$



$V_i = I_D \cdot R_1 + V_D$





VD