1) $x_n \cong 0.1\,\mu m$

$$\frac{N_D}{N_A} = \frac{x_p}{x_n} \Rightarrow x_p = 0.1\,nm$$

$$V_0 = \frac{q}{2\varepsilon_0\varepsilon_r}\left[N_A x_p^2 + N_D x_n^2\right]$$

$$= 8.22\,mV$$

$$W_{dep} = x_p + x_n = 100.1\,nm$$

$$E_{max} = \frac{q}{\varepsilon_0\varepsilon_r} N_D x_n = 1.64\,kV/cm$$

Minority Concentrtn

$$n = p = 0.241 \times 10^{10}$$

$n, p \ll N_D$ & N_A

For $E_{Fn} - E_i = \frac{kT}{q} \ln\left(\frac{n}{n_i}\right)$

& $E_i - E_{Fp} = \frac{kT}{q} \ln\left(\frac{p}{n_i}\right)$

$E_{Fn} - E_V = E_{Fn} - E_i + \frac{E_g}{2} \cong 0.966$

$E_{FD} - E_V = (E_i - E_{FD}) + \frac{E_g}{2} \cong 0.153$

3

$L = \sqrt{D\tau}$

$D = \frac{kT}{q} \times \mu$

$E = V/L = \frac{1V}{1\mu m} = 10^4 V/cm$

$\tau_n = 3.24 \times 10^{-6}$ s

$\tau_p = 3.51 \times 10^{-6}$ s

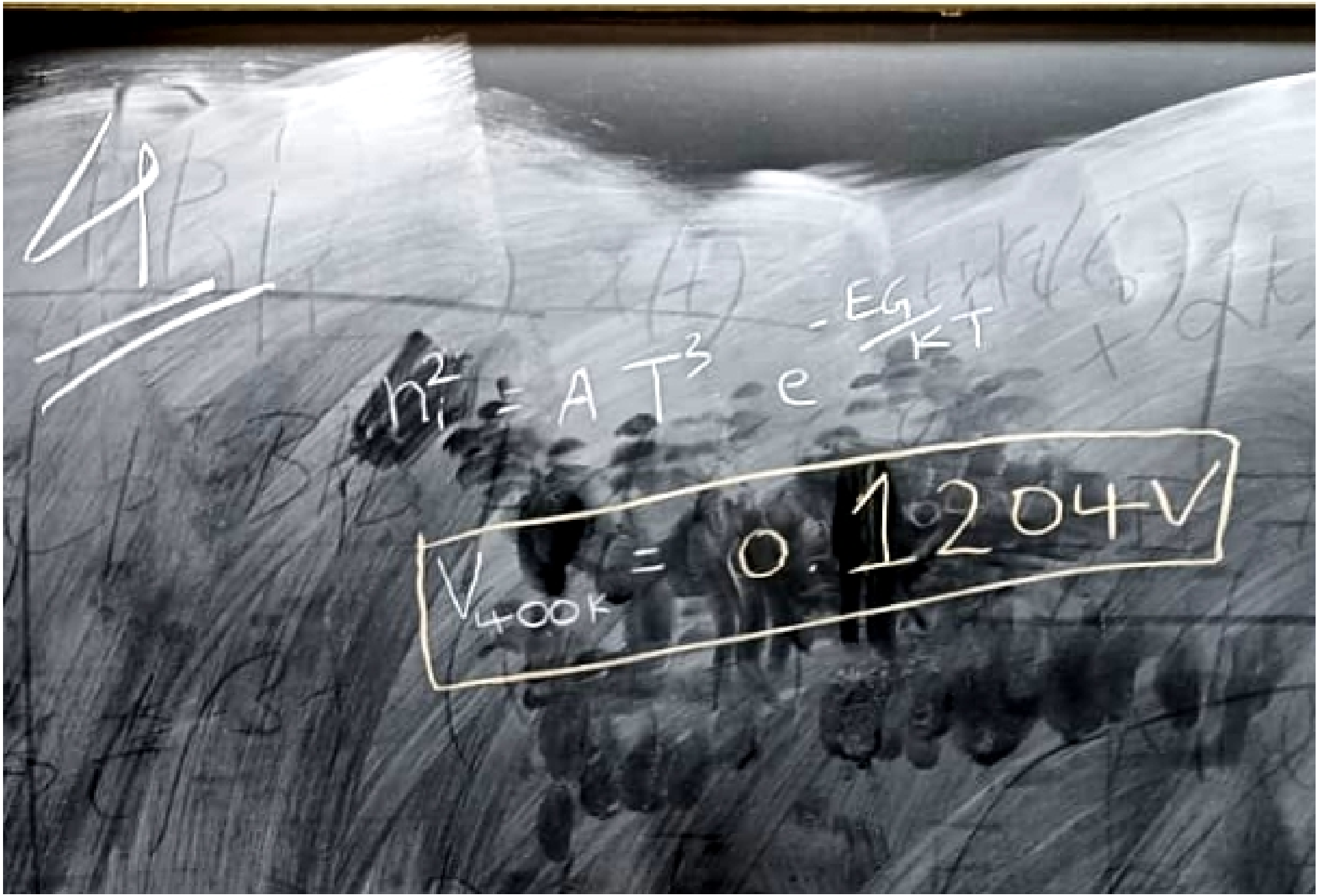
$\Delta n = G\tau_n = 3.24 \times 10^8 /cm^3$

$\Delta p = 3.51 \times 10^8 /cm^3$

$J_n = \Delta n q \mu_n E = 1.552 \times 10^{-4} A/cm^2$

$J_p = \Delta p q \mu_p E = 1.6848 \times 10^{-4} A/cm^2$

$J = 3.23 \times 10^{-4} A/cm^2$


$n_i^2 = AT^3 e^{-\frac{E_G}{KT}}$
$V_{400K} = 0.1204V$