$I = I_0 e^{-\mathcal{C}n}$, $\mathcal{C}n = 1$, $n = 4.5 \times 10^{15} = \frac{1}{\mathcal{C}}$ $\mathcal{C}n = \ln \frac{I_0}{I}$, $n = \frac{1}{\mathcal{C}} \ln \frac{I_0}{I} = 4.5 \times 10^{15} \ln \frac{I_0}{I}$

$I = I_0 (1 - \varepsilon)$, $\ln \frac{I_0}{I} = \ln \frac{1}{1-\varepsilon} \cong \varepsilon$, $n = 4.5 \times 10^{15} \times \varepsilon \ \frac{F\text{-centr}}{cm^2}$

$n_0 = \frac{n}{d} \cong 4.5 \times 10^{15} \frac{\varepsilon}{d} \ \frac{F\text{-centr}}{cm^3}$

$4.8 \times 10^{-10} \times \frac{1}{300} = 1.6 \times 10^{-12} erg \times 6 \times 10^{23} = 10 \times 10^{11} = 1 \times 10^{12} \frac{erg}{Mol} = 10^5 \cdot 0.239 \frac{cal}{Mol} = 24.000 \frac{cal}{Mol}$

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$14.4 \times \frac{18.7}{2.7} = 100$ $\quad e^{-100 \times 0.01} = e^{-1} = 0.37$ $\quad e^{-100 \times 0.025} = e^{-2.5} = 0.082$

$\mathcal{F} = \mathcal{C} d \, e^{-100d}$ $\quad d \ll \frac{1}{100}$ $\quad \mathcal{F} = \mathcal{C} . d (1-d)$

$\frac{\partial (d e^{-100d})}{\partial d} = e^{-100d} - 100d \, e^{-100d} = 0$, $1 = 100d$, $d = \frac{1}{100}$

$\mathcal{F} = \mathcal{F}_0 \int_0^{x_0} e^{-100x} dx = \frac{\mathcal{F}_0}{100} \int_0^{100x_0} e^{-y} dy = \frac{\mathcal{F}_0}{100} - e^{-y} \Big|_0^{100x_0} = \frac{\mathcal{F}_0}{100} (1 - e^{-100x_0})$

$$\frac{\frac{1}{10^{-8}}}{\frac{1}{\tau}} \times e^{-\frac{\varepsilon}{T}} = \frac{\tau}{10^{-8}} e^{+\frac{\varepsilon}{T}} = \mathscr{C} \times e^{+\frac{\varepsilon}{T}}$$

$$\mathscr{C} \times e^{\frac{\varepsilon}{150}} = 1 \quad \mathscr{C} \times e^{\frac{\varepsilon}{75}} = 100, \quad e^{\varepsilon\left(\frac{1}{75} - \frac{1}{150}\right)} = 100, \quad \varepsilon\left(\frac{1}{75} - \frac{1}{150}\right) = \frac{\varepsilon}{100}\left(\frac{4}{3} - \frac{2}{3}\right) = 4.6, \quad \varepsilon \cong 700$$

$$\mathscr{C} = e^{-\frac{\varepsilon}{150}} = e^{-\frac{700}{150}} = e^{-4.67} \simeq 1 \times 10^{-2} = \frac{\tau}{10^{-8}} \quad \tau \cong 10^{-10} \text{ sec}$$

$$-n_0 A + n_0 B = n \qquad \eta = \frac{B}{B+A} = \frac{1}{1+\frac{A}{B}} = \frac{1}{1+\frac{A}{B_0} e^{\frac{E}{kT}}} = \frac{1}{1+\mathscr{C} e^{+\frac{\varepsilon}{T}}}$$

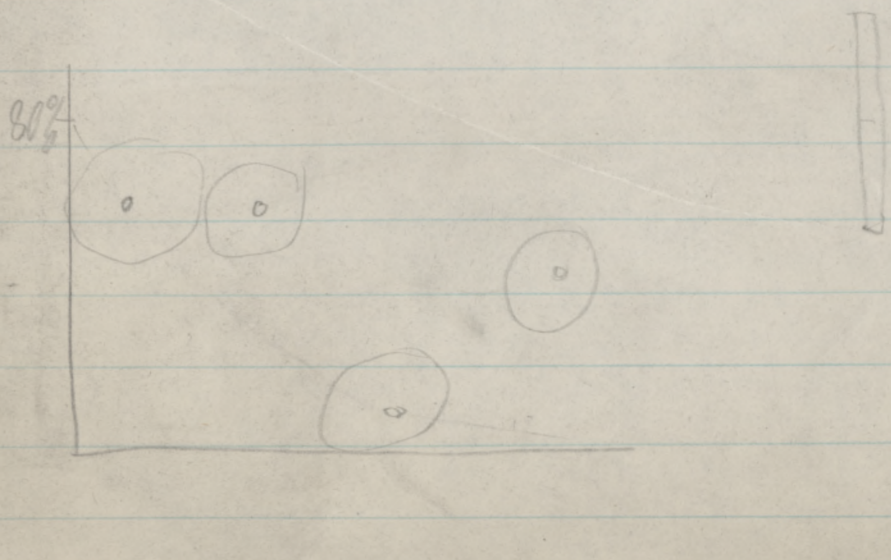
$$\frac{\eta_1}{\eta_2} = \frac{1+\mathscr{C} e^{\frac{\varepsilon}{75}}}{1+\mathscr{C} e^{\frac{\varepsilon}{150}}} = 100 \qquad \varepsilon = 750 \quad \frac{\varepsilon}{75} = 10 \quad \frac{\varepsilon}{150} = 5 \quad \frac{1+\mathscr{C} \times 148.4^2}{1+\mathscr{C} \times 148.4} = 100$$

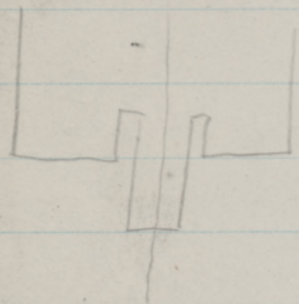
$$\mathscr{C} e^{\frac{\varepsilon}{75}} \cong 100 \quad \mathscr{C} e^{\frac{\varepsilon}{150}} \cong 1 \quad \mathscr{C} \sim 10^{-2} = \frac{A}{B_0} = \frac{\tau_{th}}{\tau_e} \quad \tau_{th} = 10^{-2} \times 10^{-8} = 10^{-10} \text{ sec}$$

$$k = 1.38 \times 10^{-16} \frac{\text{erg}}{\text{deg}} \quad 1 \text{ eV} = 4.8 \times 10^{-10} \cdot \frac{1}{300} = 1.6 \times 10^{-12} \text{ erg} \quad k = \frac{1.38 \times 10^{-16}}{1.6 \times 10^{-12}} = 0.863 \times 10^{-4} \frac{\text{eV}}{\text{deg}}$$

$$\frac{E}{k} = 700 \quad E = 700k = 6 \times 10^{-2} \text{ eV} = 0.06 \text{ eV}$$

$$u = \sqrt{\frac{E}{\rho}} = \sqrt{\frac{8 \times 10^{10}}{2}} = 2 \times 10^{5} \frac{\text{cm}}{\text{sec}} = 2000 \frac{\text{m}}{\text{sec}}$$





$\psi =$

$$\varrho = \frac{M}{2Nd^3}$$

$10^{-6} A = 6\times 10^{12} \times 10^{-5} = 6\times 10^{7} : 3.7\times 10^{7} \simeq 2$

$1\,hr = 60\times 60 = 3.6\times 10^{3}\,sec = 60\,min$

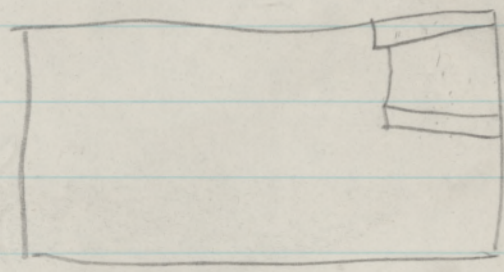
$1\,day = 24\times 3.6\times 10^{3} = 8.64\times 10^{4}\,sec = 1440\,min = 24\,hrs$

$1\,year = 365\times 8.64\times 10^{4} = 3.1536\times 10^{7}\,sec = 5.256\times 10^{5}\,min = 8.76\times 10^{3}\,hrs = 365\,days$

200 mg $= 10^{-3}$ Mol give $\sim 10^{10}$ per second

$10^{-3}\times \frac{6\times 10^{23}}{\sim 6\times 10^{10}} = 10^{10}$

60×24 | 1440×60 | 365×1440
240 | 86400 | 14600
1200 | | 146
1440 | | 365
 | | 525600×60
 | | 31536000



$$k^2\int_0^L \varphi^2\,dr = 1 \qquad \varphi = \Omega \sin\left(\frac{2\pi r}{\lambda} - \alpha\right)$$

$$x = \frac{2\pi r}{\lambda} - \alpha, \quad dx = \frac{2\pi}{\lambda}dr \qquad L = n\frac{\lambda}{2}$$

$$\frac{\lambda}{2\pi}\int_{-\alpha}^{\frac{2\pi L}{\lambda}-\alpha} \sin^2 x\,dx = \frac{\lambda}{2\pi} n \frac{\pi}{2} = \frac{L}{2} \quad k^2\Omega^2\frac{L}{2} = 1 \quad k = \sqrt{\frac{2}{L}}\frac{1}{\Omega} = \sqrt{\frac{2}{L}}\frac{1}{\sqrt{A^2+B^2\Delta^2}}$$

$$\lambda = \frac{h}{p} = \frac{h}{mv} = \frac{h}{\sqrt{2m\frac{1}{2}mv^2}}$$

$$L = \frac{n}{2}\lambda = \frac{n}{2}\frac{h}{\sqrt{2m(E_0+\Delta)}} \qquad n = \frac{2L}{h}\sqrt{2m(E_0+\Delta)} = \frac{2L}{h}\sqrt{2mE_0}\sqrt{1+\frac{\Delta}{E_0}} = \frac{2L}{h}\sqrt{2mE_0}\left(1+\frac{1}{2}\frac{\Delta}{E_0}\right)$$

$$dn = \frac{L}{h}\sqrt{\frac{2m}{E_0}}\,\Delta \qquad u_{r,t} = \sum c_\Delta u_\Delta = \sum c_\Delta k_\Delta \varphi_\Delta e^{-\frac{2\pi i}{h}(E_0+\Delta)t}$$

$$u_{r,0} = \sum c_\Delta k_\Delta \varphi_\Delta$$

$q = \dfrac{\rho_0}{V}\dfrac{a}{\pi r^2}$, $q_b = \dfrac{\rho b'}{V} = \dfrac{\rho_0}{V}\dfrac{a}{\pi r^2} b$, $\dfrac{\rho}{\rho_0} = \dfrac{a}{\pi r^2}\dfrac{b}{b'}$

$a = 4\times10^{-3} \times 3\times10^{-1} \cong 2\times10^{-3}$ $\pi r^2 = \pi\times5.3\times10^{2} = 1.64\times10^{3}$ $\dfrac{\rho}{\rho_0} \sim \dfrac{2\times10^{-3}}{2\times10^{3}}\dfrac{b}{b'} = 10^{-6}\cdot(b - b')$

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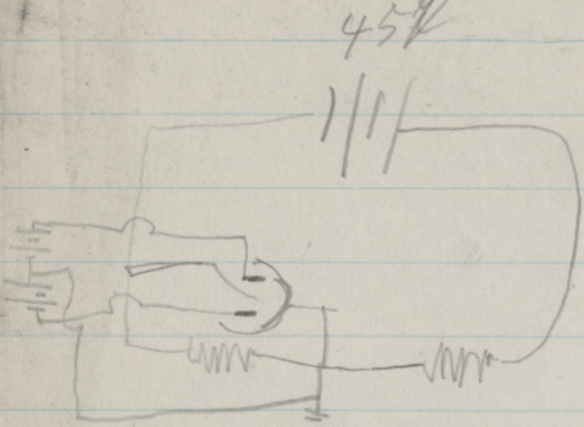
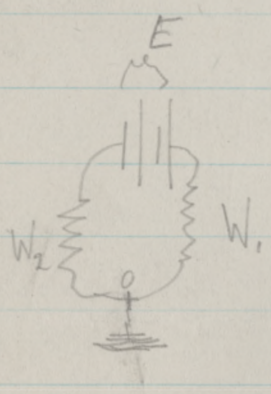
$\dfrac{I}{I_0} = e^{-\sigma n d}$ $\ln\dfrac{I_0}{I} = \sigma n d$, $1 = \sigma\times10^{15}\times4.5$, $n = \dfrac{1}{\sigma}\dfrac{1}{d}\ln\dfrac{I_0}{I} = \dfrac{4.5\times10^{15}}{d}\ln\dfrac{I_0}{I}$

$d = 1\times10^{-4}$ $n = 4.5\times10^{19}\ln\dfrac{I_0}{I}$ $nd = 4.5\times10^{15}\ln\dfrac{I_0}{I}$

$$m\ddot{x} = f \quad m\int_0^t \frac{d^2x}{dt^2}\,dt = f\int_0^t dt, \quad m\dot{x}_t = ft \quad \dot{x}_t = \frac{ft}{m} \quad t = c\sqrt{m} \quad \dot{x}_t \sim \frac{1}{\sqrt{m}}$$

$$f = 10^6\,\mathrm{Atm} \times 1\,\mathrm{cm}^2 = 10^{12}\,\mathrm{dyn} \quad m = 7\,\mathrm{g} \quad t \approx 7 \times 10^{-6}\,\mathrm{sec} \quad \dot{x}_t = \frac{10^{12} \times 7 \times 10^{-6}}{7} = 10^6\,\frac{\mathrm{cm}}{\mathrm{sec}}$$





$$i = \frac{E_1}{W_1} = \frac{E_2}{W_2} \qquad E_1 + E_2 = E$$

$$\frac{W_1}{W_2} = \frac{E_1}{E_2} \qquad W_1 = W_2 \frac{E_1}{E_2} = W_2\left(\frac{E - E_2}{E_2}\right) = W_2\left(\frac{E}{E_2} - 1\right)$$

$c = 2.998 \times 10^{10} \frac{cm}{sec}$ $h = 6.62 \times 10^{-27} erg \times sec$ $1 eV = 1.602 \times 10^{-12} erg$

$$\nu = \frac{c}{\lambda} \quad h\nu = \frac{hc}{\lambda} = \frac{19.86 \times 10^{-17}}{\lambda} = \frac{1.986 \times 10^{-8}}{\lambda_{Å}} erg = \frac{1.986 \times 10^{-8}}{1.602 \times 10^{-12}} \frac{1}{\lambda_{Å}} = \frac{1.24}{\lambda_{Å} \times 10^{-4}} eV$$

$\lambda = 4700 Å$ $h\nu = \frac{1.24}{0.47} = 2.64 eV$

$\lambda = 4900 Å$ $h\nu = \frac{1.24}{0.49} = 2.53 eV$

$\lambda = 2350 Å$ $h\nu = \frac{1.24}{0.235} = 5.28 eV$

$\lambda = 2950 Å$ $h\nu = \frac{1.24}{0.295} = 4.21 eV$