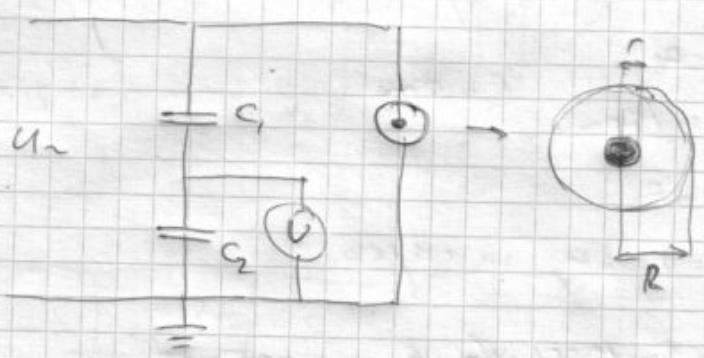
① 

$U_v = 50V$, $C_1 = 100nF$ $r = 0.5cm$

$C_2 = 10\mu F$ $R = 2.5cm$

$U = U_v\left(\frac{C_2}{C_1}+1\right) = 5050V = 5.05kV$

$E_{qI} = \frac{U}{r \ln\frac{R}{r}} = 6.275\ kV/cm$

② $r = \frac{14}{2} = 7mm$

$h = 30m$

$z = 1050m = 1.05km$

$m_v = 0.8$

$t_{1050} = 20 - \frac{1050}{2000}\cdot 20 = 9.5°C$

$p(z) = p_0 e^{-\frac{z}{H}} = p_0 \cdot e^{-\frac{z}{7.4km}} = 1013 \cdot e^{-\frac{1.05}{7.4}} = 878.9954\ hPa =$

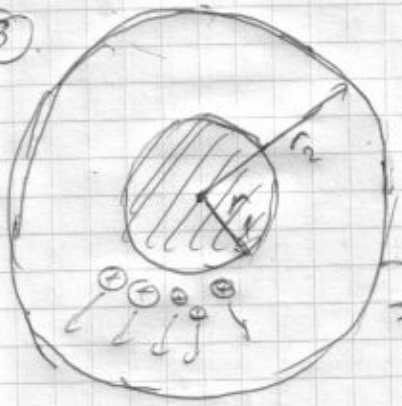
$= 87.89954\ kPa$

$\delta = \frac{2.89\cdot p}{273+t} = 0.89922$

$E_v = 30\cdot\delta\cdot m_v\left(1+\frac{0.3}{\sqrt{\delta r}}\right) = 29.74172\ kV/cm$ (r in cm)

$U_v = E_v \cdot r \cdot \ln\frac{D}{r} = E_v \cdot r \cdot \ln\frac{2h}{r} = 188.543kV$

(3)



ℓ-duljina

$r_1 = 1\,cm$, $r_2 = 2.5\,cm$

$\varepsilon_r = 3$

$\rho = \rho_1 \cdot \left(\frac{r_1}{r}\right)^2$, $\rho_1 = 12\,nAs/cm^3$

$$Q = \int_{r_1}^{r} \rho_1 \left(\frac{r_1}{r}\right)^2 \cdot 2\pi r \ell \, dr = D \cdot 2\pi r \ell$$

$$Q = \int_{r_1}^{r} \rho_1 \cdot \frac{r_1^2}{r^2} \cdot 2\pi \ell \, dr = \rho_1 r_1^2 \cdot 2\pi \ell \cdot \ln \frac{r}{r_1} = \varepsilon_0 \varepsilon_r E \cdot 2\pi \ell r$$

$$\Rightarrow E = \frac{\rho_1 r_1^2 \cdot \ln \frac{r}{r_1}}{\varepsilon_0 \varepsilon_r r}$$

$$\rho_1 - \underbrace{\rho_2}_{0} = \int_{r_1}^{r_2} \vec{E} \, d\vec{r} = \int_{r_1}^{r_2} \frac{\rho_1 r_1^2 \ln \frac{r}{r_1}}{\varepsilon_0 \varepsilon_r r} dr = \frac{\rho_1 r_1^2}{\varepsilon_0 \varepsilon_r} \cdot \int_{r_1}^{r_2} \frac{\ln \frac{r}{r_1}}{r} dr =$$

$$= \frac{\rho_1 r_1^2}{\varepsilon_0 \varepsilon_r} \left[\int_{r_1}^{r_2} \frac{\ln r}{r} dr - \ln r_1 \int_{r_1}^{r_2} \frac{dr}{r} \right] =$$

$$= \frac{\rho_1 r_1^2}{\varepsilon_0 \varepsilon_r} \left[\frac{1}{2} (\ln r)^2 \Big|_{r_1}^{2.5} \right] = \frac{\rho_1 r_1^2}{\varepsilon_0 \varepsilon_r} \cdot \frac{1}{2} \cdot \left[(\ln 2.5)^2 - \underbrace{(\ln 1)^2}_{0} \right] =$$

$$= 18.92\,kV$$