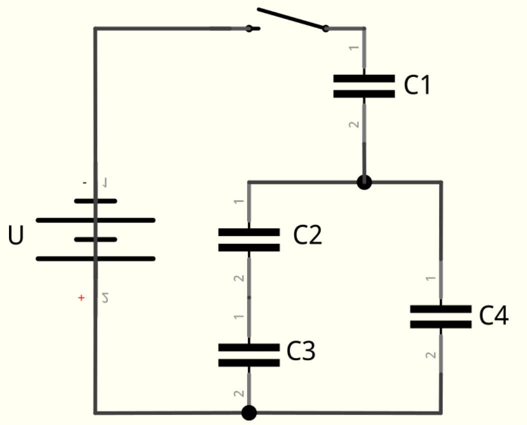
1. Kondensatornetzwerk

$C_1 = 450$ nF; $C_2 = 300$ nF; $C_3 = 600$ nF; $C_4 = 100$ nF; $U = 120$ V

$$C_{ges} = \frac{C_1\left(\frac{C_2C_3}{C_2+C_3}+C_4\right)}{C_1+\frac{C_2C_3}{C_2+C_3}+C_4} = 180 \text{ nF}$$

$$U_1 = U\frac{C}{C_1} = \underline{\underline{48 \text{ V}}}$$
$$U_2 = U_4\frac{C_3}{C_3+C_2} = \underline{\underline{48 \text{ V}}}$$
$$U_3 = U_4\frac{C_2}{C_2+C_3} = \underline{\underline{24 \text{ V}}}$$
$$U_4 = U - U1 = \underline{\underline{72 \text{ V}}}$$



2. Wickelkondensator

$k = \frac{1}{4\pi\epsilon_0}$; $d = 2.0 * 10^{-5}$ m; $b = 0.02$ m; $C = 100$ nF; $\epsilon = 2.3$

(a)

$$C = \frac{2\epsilon\epsilon_0 lb}{d} = 100 \text{ nF}$$
$$l = \frac{Cd}{2\epsilon\epsilon_0 b} = \underline{\underline{2.46 \text{ m}}}$$

(b)

$$V = r^2\pi b = ldb$$
$$r = \sqrt{\frac{ld}{\pi}} = \underline{\underline{4.0 * 10^{-3} \text{ m}}}$$

3. Ladungsträger

(a) $r = 1.85 * 10^{-4}$ m; $I = 1$ A

$$n = \frac{N_A \rho_{Cu}}{M_{Cu}}$$
$$v_D = \frac{I}{ne\pi r^2} = \underline{\underline{2.75 * 10^{-3} \text{ m/s}}}$$

(b) $L = 10$ m

$$t = \frac{L}{v} = \underline{\underline{3630.97 \text{ s}}}$$

(c) Since the Driftvelocity is proportinal to the Electric Field and a constant Potential implies a constant Electric Field; thus a constant Driftvelocity is reached.

(d) Driftvelocity sinks when the conductor gets heated because a higher temperature means higher resistance. On a microscopic level this means that the electrons bump into more Obstacles and their path is more obstructed.

(e) $I = \frac{U}{R} = \frac{UA}{\rho L}$

i. $I_1 = \frac{UA}{\rho L}$

ii. $I_2 = \frac{3}{4}\frac{UA}{\rho L}$

iii. $I_3 = \frac{UA}{\rho L}$

$\Rightarrow \underline{\underline{I_2 < I_1 = I_3}}$

4. Ladungstransport

$$L = 1 \text{ m}; \quad d = 0.001 \text{ m}; \quad I = 1 \text{ A}$$

(a) $R = \frac{L}{\sigma_{el} A} = \frac{U}{I}$; $\sigma_{el} = 6 * 10^7$ $1/(\Omega\,\text{m})$

$$R = \frac{4L}{\sigma_{el}\pi d^2} = \underline{\underline{0.021 \ \Omega}}$$
$$U = RI = \underline{\underline{0.021 \text{ V}}}$$

(b) $\rho = 9000\ \mathrm{kg/m^3}$; $\quad M = 0.064\ \mathrm{kg/mol}$; $\quad V = \frac{Ld^2\pi}{4}$

$$n = \frac{\rho N_A V}{M} = 6.62 * 10^{22}$$
$$n_{el} = n = \underline{\underline{6.62 * 10^{22}}}$$

$$v_D = \frac{IL}{n_{el} e} = \underline{\underline{9.43 * 10^{-5}\ \mathrm{m/s}}}$$

(c) $\sigma = \frac{J}{E}$; $\quad J = nq\mu E$; $\quad \mu = 2\ \mathrm{cm^2/Vs}$; $\quad n = 400\ 1/\mathrm{cm^3}$

$$\sigma = \frac{J}{E} = nq\mu = \underline{\underline{1.28 * 10^{-14}\ 1/(\Omega\,\mathrm{m})}}$$