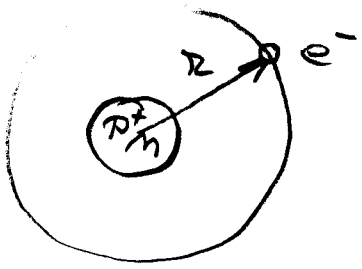
177/3

$r = 0{,}53\,10^{-10}\ m$

$F_C = ?$



$$F_C = \frac{1}{4\pi\varepsilon}\,\frac{Q_1 Q_2}{r^2}$$

neutron je bez náboje

$Q_1 = e^-$

$Q_2 = p^+$

e^- – záporný náboj

p^+ – kladný náboj

Elektron je nositelem náboje o velikosti elementárního náboje.

Velikost je $1{,}602\ 10^{-19}\ C$

Atom je na venek el. neutrální.

$Q_1 = -1{,}602.10^{-19}$

$Q_2 = +1{,}602.10^{-19}$

$\varepsilon = \varepsilon_r\,\varepsilon_0$

ε_r prostředí je 1,000

$\varepsilon_0 = 8{,}854.10^{-12}\ C^2 N^{-1} m^{-2}$

$$F_C = \frac{1}{4\pi\ 1{,}000 . 8{,}854 . 10^{-12}}\,\frac{-1{,}602\ 10^{-19} + 1{,}602.10^{-12}}{(0{,}53\ 10^{-10})^2}$$

$$F_C = -8{,}21.10^{-8}\ N$$

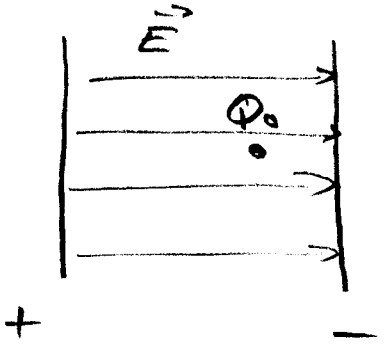
Znaménko – značí, že p^+ a e^- přitahují.

179/2

$E = 200\,kV\,m^{-1}$

$Q_0 = 3.10^{-8}\,C$

$F = ?$



$$\vec{E} = \frac{\vec{F}}{Q} \Rightarrow F = Q \cdot E$$

$$F = 200.10^3 . 3.10^{-8} = \underline{6.10^{-3}\,N}$$

181/2

$Q = 3.10^{-6}\,C$

$W = 6.10^{-4}\,J$

$$\varphi = \frac{W}{Q}$$

$$\varphi_A - \varphi_B = U_{AB}$$

$$\varphi_A = \frac{W_A}{Q}$$

$$\varphi_B = \frac{W_B}{Q}$$

$$\frac{W_A}{Q} - \frac{W_B}{Q} = U_{AB}$$

$$\frac{1}{Q}(W_A - W_B) = U_{AB} \qquad W_A - W_B = W \equiv 6.10^{-4}\,J$$

$$U_{AB} = \frac{1}{3.10^{-6}} \cdot 6.10^{-4} = \underline{200\,V}$$

183 | 3

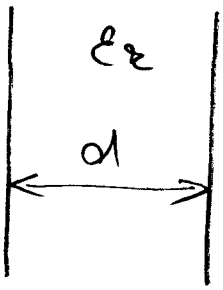
$S = 100\ cm^2$

$d = 0{,}5\ mm$

$\varepsilon_{r1} = 1{,}000$

$\varepsilon_{r2} = 7{,}000$

$C_1, C_2 = ?$



$$C = \varepsilon \frac{S}{d}$$

$$C_1 = \varepsilon_{r1}\,\varepsilon_0 \frac{S}{d} = 1 \cdot 8{,}854 \cdot 10^{-12} \cdot \frac{100 \cdot 10^{-5}}{0{,}5 \cdot 10^{-3}}$$

$$C_1 = 1{,}770 \cdot 10^{-11}\ F$$

$$C_2 = \varepsilon_{r2}\,\varepsilon_0 \frac{S}{d} = 7 \cdot 8{,}854 \cdot 10^{-12} \cdot \frac{100 \cdot 10^{-5}}{0{,}5\ 10^{-3}}$$

$$C_2 = 1{,}239 \cdot 10^{-10}\ F$$

188/2

$t = 1{,}5\ h$

$Q = 6480\ C$

$I = ?$

$$I = \frac{Q}{t} = \frac{6480}{1{,}5 \cdot 60 \cdot 60}$$

$$I = 1{,}2\ A$$

188/3

$t = 1\ s$

$I = 1\ A$

$n = ?$

$$\frac{Q}{t} = I$$

$$Q = I \cdot t$$

Velikost náboje je celočíselným násobkem elementárního náboje.

$$Q = n \cdot e$$

$$e = 1{,}602 \cdot 10^{-19}\ C$$

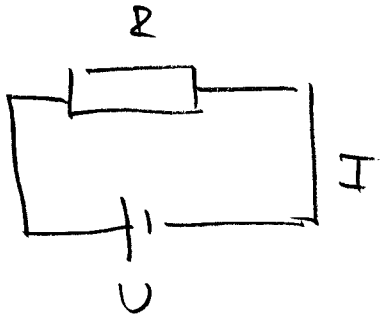
$$n = \frac{I \cdot t}{e} = \frac{1 \cdot 1}{1{,}602 \cdot 10^{-19}} = 6{,}24 \cdot 10^{18}\ \text{částic}$$

194/2

$R = 3\,k\Omega$

$I = 40\,mA$

$U = ?$



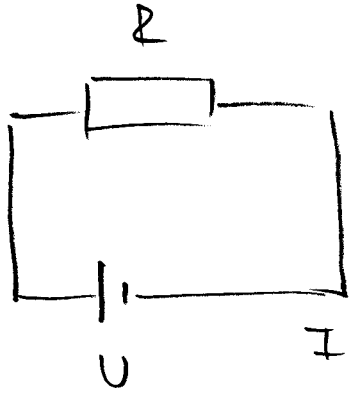
$$R = \frac{U}{I} \Rightarrow U = R\,I = 3.10^{3}.40.10^{-3} = \underline{120V}$$

194/3

$I = 40\,mA$

$R = 1\,k\Omega$

$U = ?$



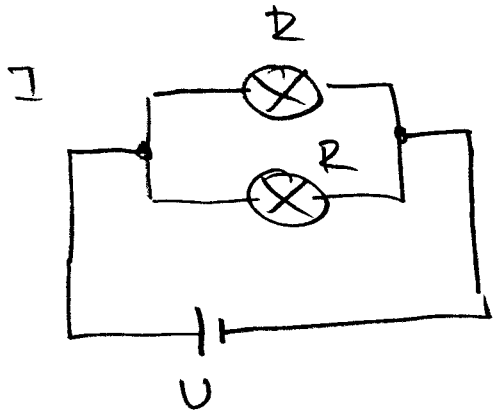
$$R = \frac{U}{I} \Rightarrow U = R.I = 1\,10^{3}\;40\;10^{-3} = \underline{40V}$$

196/1

$U = 220\,V$

$I = 0{,}275\,A$

$R = ?$



$$R_c = \frac{U}{I_c}$$

$$\frac{1}{R_c} = \frac{1}{R} + \frac{1}{R}$$

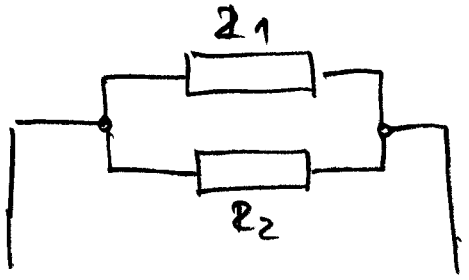
R_c ⇐ celkový odpor žárovek

Pro jednu žárovku $R = \frac{U}{I} = \frac{220}{0{,}275} = 800\,\Omega$

$R_c = 400\,\Omega$ $\qquad I_c = \frac{U}{R_c} = \frac{220}{400} = 0{,}55\,A$

196/2

$R_1 = 40\,\Omega$



$$\frac{1}{R_c} = \frac{1}{R_1} + \frac{1}{R_2} \qquad R_c = \frac{1}{5} R_1$$

$$\frac{5}{R_1} - \frac{1}{R_1} = \frac{1}{R_2} \Rightarrow R_2 = 10\,\Omega$$

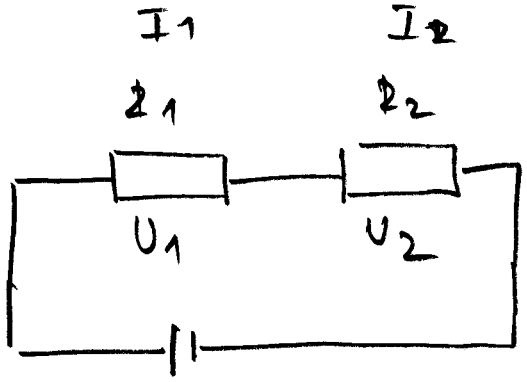
197/3

$R_1 = 36\ \Omega$

$R_2 = 24\ \Omega$

$U_1 = 132\ V$

$U_2 = ?$



Platí, že $I_1 = I_2$

$$R = \frac{U}{I} \Rightarrow I_1 = \frac{U_1}{R_1} = \frac{132}{36} = 3{,}67\ A$$

$$U_2 = R_2 I_2 = 24 \cdot 3{,}67 \doteq 88\ V$$

199/1

$P_{\check{z}} = 1{,}6\ kW$

$t = 1{,}5\ h$

$$P_c = 1{,}6\ 10^3 \cdot 1{,}5 = 2{,}4\ kW$$

199/2

$P_{\check{z}} = 5\ kW$

$U = 220\ V$

$I = ?$

$$P = U \cdot I$$

$$I = \frac{P}{U} = \frac{5\ 10^3}{220} = 22{,}7\ A$$

2001/3

$t = 30$ minut

$Q = 3600\,kJ$

$P = ?$

$Q = U \cdot I\, t$

$P = U \cdot I$

$\Rightarrow P = \frac{Q}{t} = \frac{3600 \cdot 10^3}{30 \cdot 60}$

$P = 2 \perp W$

2001/4

$P = 1200\,W$

$V = 2\,l$

$t_1 = 16^\circ C$

$t = ?$ Celsius

$Q = m \cdot c \cdot \Delta t$

$Q = m \cdot c\,(100 - 16)$

$Q = m \cdot c\ 84$

$Q = 2 \cdot 4{,}2 \cdot 10^3\ 84$

$Q = 7{,}1 \cdot 10^5\,J$

$P = U \cdot I$

$P = \frac{W}{t} \Rightarrow$

$t = \frac{W}{P} = \frac{7{,}1\ 10^5}{1{,}2 \cdot 10^3} \doteq 592\ s$