~~...~~ 2. kol. 2024.

2

$a = 5\,cm$

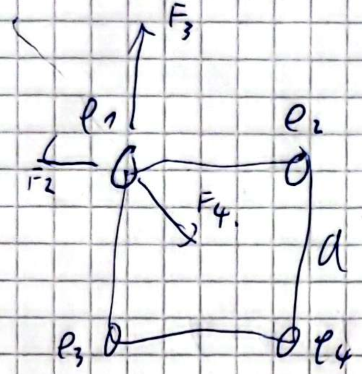
$e_1 = 5\,\mu As$

$e_2 = e_3 = 2e_1$

$e_4 = -3e_1$

a) $F_{e_1} = ?$

b) $W_{e_4} = ?$



$$E_{točkasto} = \frac{e}{4\pi\varepsilon_0 r^2}\frac{\vec{r}}{|\vec{r}|}$$

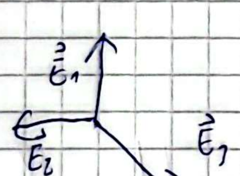
$$|F_2| = |F_3|$$

$$|E_2| = \frac{2e_1}{4\pi\varepsilon_0 a^2}$$

$$|E_{e_4}| = \frac{3e_1}{4\pi\varepsilon_0 \cdot 2a^2} = \frac{3e_1}{8\pi\varepsilon_0 a^2}$$

$$W_{e_4} = \frac{e_1 e_4}{4\pi\varepsilon_0 r_{14}} + \frac{e_2 e_4}{4\pi\varepsilon_0 r_{24}} + \frac{e_3 e_4}{4\pi\varepsilon_0 r_{34}}$$

$$W_e = e_4 \cdot U$$



$$\vec{E}_1 + \vec{E}_2 \parallel \vec{E}_3$$

$$\vec{E}_1 + \vec{E}_2 = \frac{e_1 \cdot \sqrt{2}}{2\pi\varepsilon_0 a^2}$$

$$\vec{E}_1 = \frac{e_1}{\pi\varepsilon_0 a^2}\left(\frac{\sqrt{2}}{2} - \frac{3}{8}\right)$$

$$\vec{F}_{e_1} = \frac{e_1^2}{\pi\varepsilon_0 a^2}\left(\frac{\sqrt{2}}{2} - \frac{3}{8}\right)$$

$$W_{e4} = E_k - 3e_1 \cdot \left(\frac{e_1}{4\pi\varepsilon_0 \sqrt{2}\, a} + \frac{2e_1}{4\pi\varepsilon_0 a} \cdot 2 \right)$$

$$W_{e4} = -\frac{3e_1^2}{4\pi\varepsilon_0 a} \left(\frac{1}{4\sqrt{2}} + 1 \right)$$

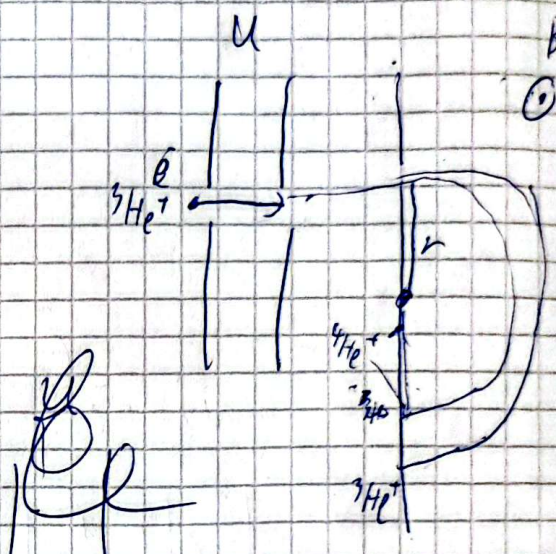
2024. 3. nal.

$^3He^+$ $m = 4{,}98 \cdot 10^{-26}$ kg

$^4He^+$ $m = 6{,}64 \cdot 10^{-26}$ kg

$U = 70\,kV$

$B = 1{,}1\,T$



a) $v_{^3He^+} = ?$

b) $r_{^3He^+} = ?$

c) $r_{^3He^+} - r_{^4He^+} = ?$

a) $W_{He} = eU = W_k =$

$= \frac{mv^2}{2}$

$v^2 = \frac{2eU}{m}$ $\quad v = \sqrt{\frac{2eU}{m}}$.

b) $F_m = e\vec{v} \times \vec{B} = evB$ = $F_{centr.}$

$$F = m\frac{v^2}{r}$$

$$evB = \frac{mv^2}{r}$$

$$r = \frac{mv}{eB}$$

2. kol. 2023 – malo modificirano

$I_3 - I_2 = I_1$

vezje:

$R_1 = 1\,\Omega$

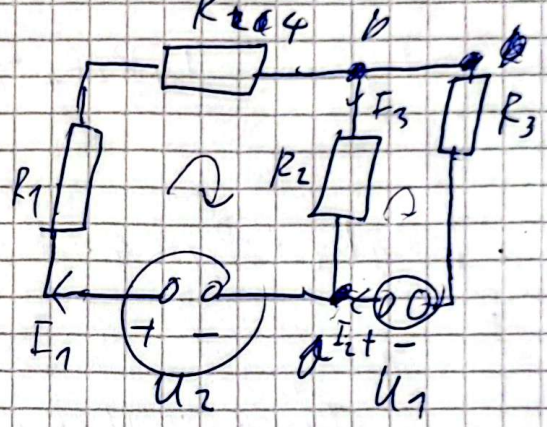
$R_2 = 2\,\Omega$

$R_3 = 3\,\Omega$

$R_4 = 4\,\Omega$

$U_1 = 4\,V$

$U_2 = 5\,V$



a) ~~V katero električno~~ Kirchoff 2 zanki.

~~Sol skozi R_2~~ na zaključeni zanki mora biti vsota napetosti 0.

napetost $U_{ab} = ?$

$I_{R_2} = ?$

$U_2 - I_1 R_1 - I_1 R_4 - I_2 R_2 + U_1 = 0$

$U_2 - I_1 R_1 - I_1 R_4 - (I_1 - I_2) R_3 =$

I_1 in I_2 neznanici poiščemo.

$U_2 - I_1 R_1 - I_1 R_4 - I_2 R_2 + U_1 = 0$ 2 enačbi z neznankama

$U_2 - I_1 R_1 - I_1 R_4 - (I_1 - I_2) R_3 = 0$

$$I_2 = \frac{U_1 + U_2 - I_1(R_1 + R_4)}{R_2} = 2,29\ A$$

$$U_2 - I_1 R_1 - I_1 R_4 - \left(I_1 - \frac{U_1 + U_2 - I_1(R_1 + R_4)}{R_2} \right) R_3 = 0 \quad / \cdot R_2$$

$$U_2 R_2 - I_1 R_1 R_2 - I_1 R_2 R_4 - I_1 R_3 R_2 + U_1 R_3 + U_2 R_3 - I_1 R_3 (R_1 + R_4) = 0$$

$$I_1 \left(R_1 R_2 + R_2 R_4 + R_3 R_2 + \cancel{R_1 R_4} + R_1 R_3 + R_3 R_4 \right) =$$

$$= U_2 R_2 + U_1 R_3 + U_2 R_3$$

$$I_1 = \frac{U_1 R_3 + U_2 R_2 + U_2 R_3}{(R_1 R_2 + R_2 R_4 + R_3 R_2 + R_1 R_3 + R_3 R_4)} = 1,493\ A$$

$$I_3 = I_1 - I_2 = -0,807$$

I_3 teče navzgor.