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Prodi : Pendidikan Fisika

Kelas : B

* Pemecahan Kasus Muatan Listrik

- 1). Seorang putri memakai cincin dari perak $^{107.9}_{47}\text{Ag}$ 4,2 gram dan dilapisi emas $^{197}_{79}\text{Au}$ 0,8 gr. Berapa jumlah elektron dalam cincin putri tsb.

Jawaban :

 $\Rightarrow$ Jumlah atom $\cdot N$

$$N = \frac{N_A \times \text{massa (gr)}}{M_r}$$

$$\begin{aligned} N_{\text{total}} &= \frac{N_A \times \text{Massa Ag}}{M_r \cdot \text{Ag}} + \frac{N_A \times \text{massa Au}}{M_r \cdot \text{Au}} \\ &= \frac{6,02 \cdot 10^{23} \times 4,2}{107,9} + \frac{6,02 \cdot 10^{23} \times 0,8}{197} \\ &= 2,34 \cdot 10^{22} + 2,44 \cdot 10^{21} \\ &= 2,58 \cdot 10^{22} \end{aligned}$$

 $\Rightarrow$ Muatan total (Q)

Karena : - Ag punya 47 elektron dan Au 79 elektron maka jumlah elektron atom tersebut 126 elektron :

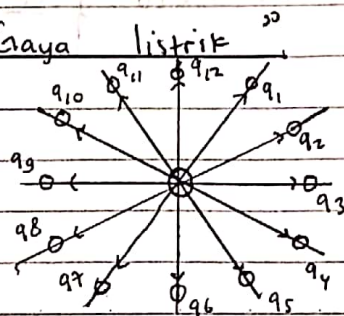
$$\begin{aligned} Q &= N \times \text{jumlah elektron} \times e \\ &= 2,58 \cdot 10^{22} \times 126 \times 1,6 \cdot 10^{-19} \\ &= 5,2 \cdot 10^5 \text{ C} \end{aligned}$$

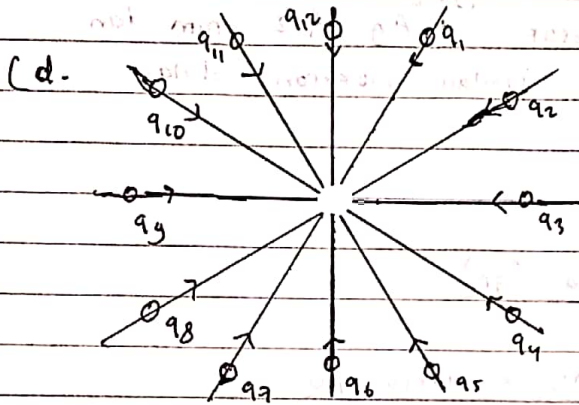
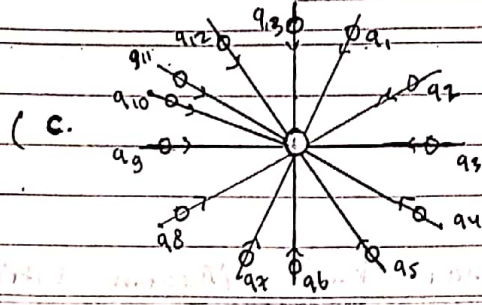
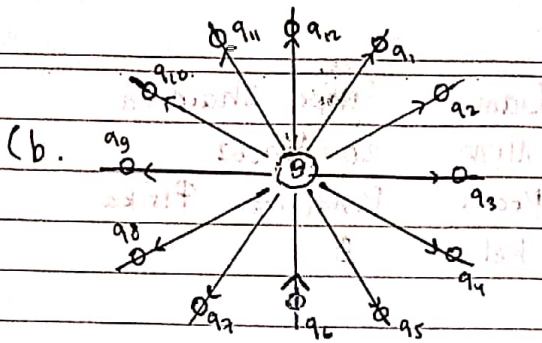
Jadi, untuk massa cincin 5 gr mempunyai muatan $5,2 \times 10^5 \text{ C}$ hal ini berarti dalam massa cincin 5 gr terdapat

$$\frac{5,2 \times 10^5}{1,6 \times 10^{-19}} = 3,25 \times 10^{24} \text{ elektron}$$

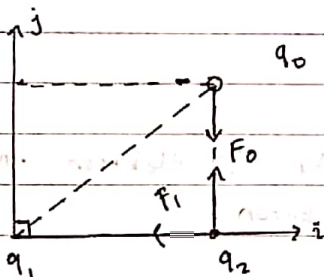
* Kasus Gaya Listrik

(a.)





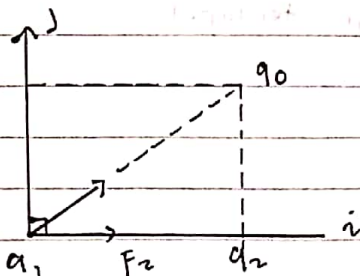
- (e.) $q_1 = 25 \text{ } \mu\text{C} \rightarrow (0,0) \text{ m}$
 $q_2 = -10 \text{ } \mu\text{C} \rightarrow (4,0) \text{ m}$
 $q_0 = 10 \text{ } \mu\text{C} \rightarrow (4,3) \text{ m}$



$$\vec{F} = q_0 k \cdot \left[\frac{q_1}{r_{q_1}^2} \hat{r}_{q_1} + \frac{q_2}{r_{q_2}^2} \hat{r}_{q_2} \right]$$

$$= 10 \cdot 9 \times 10^9 \left\{ \frac{25}{16} + \frac{(-10)}{16} (i) \right\}$$

- (f.) $q_1 = 25 \text{ } \mu\text{C} \rightarrow (0,0)$
 $q_2 = -15 \text{ } \mu\text{C} \rightarrow (4,0)$
 $q_0 = 20 \text{ } \mu\text{C} \rightarrow (4,3)$

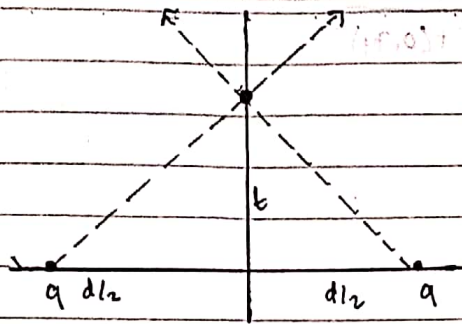


$$\vec{F} = q_0 k \left\{ \frac{q_1}{r_{q_1}^2} \hat{r}_{q_1} + \frac{q_2}{r_{q_2}^2} \hat{r}_{q_2} \right\}$$

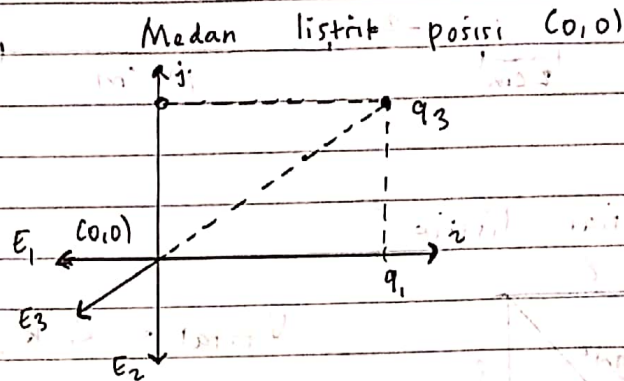
$$= 20 \cdot 9 \times 10^9 \left\{ \frac{25}{16} + \frac{(-15)}{16} (i) \right\}$$

* Kuat Medan Listrik

(a.



(b. $q_1 (4,0) = 2 \text{ C}$
 $q_2 (0,3) = 5 \text{ C}$
 $q_3 (4,3) = 10 \text{ C}$



$$\vec{E}_1 = \frac{1}{4\pi\epsilon_0} \cdot \frac{2}{16} \vec{j}$$

Medan oleh $q_2 \vec{E}_2 = \frac{1}{4\pi\epsilon_0} \cdot \frac{5}{9} (i)$

Medan oleh $q_3 \vec{E}_3 = \frac{1}{4\pi\epsilon_0} \cdot \frac{10}{25} \left(\frac{4i + 3j}{5} \right)$

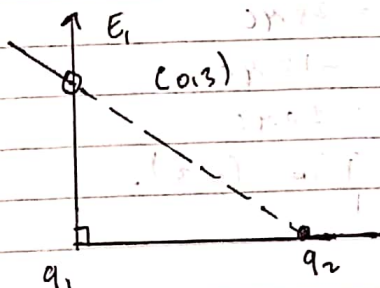
$$= \frac{1}{4\pi\epsilon_0} \left(\frac{40}{125} i + \frac{30}{125} j \right)$$

Medan Total = $\vec{E} = \frac{1}{4\pi\epsilon_0} \left[\left(\frac{5}{9} + \frac{40}{125} \right) i + \left(\frac{2}{16} + \frac{30}{125} \right) j \right]$

$$\vec{E} = \frac{1}{4\pi\epsilon_0} \sqrt{(0,47)^2 + (0,8)^2} = 8,35 \times 10^3 \text{ N/C}$$

(c. $q_1 = -5 \mu\text{C} \rightarrow (0,0)$

$q_2 = 10 \mu\text{C} \rightarrow (4,0)$



Medan oleh $q_1 \vec{E}_1 = \frac{1}{4\pi\epsilon_0} \cdot \frac{5}{25} \left(\frac{4i + 3j}{5} \right)$

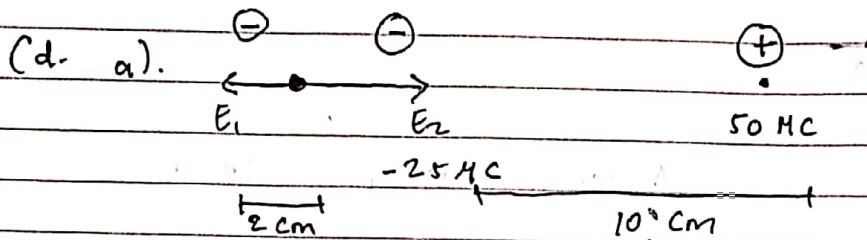
$$= \frac{1}{4\pi\epsilon_0} \left(\frac{20}{125} i + \frac{15}{125} j \right)$$

oleh $q_2 \vec{E}_2 = \frac{1}{4\pi\epsilon_0} \cdot \frac{10}{16} (j)$

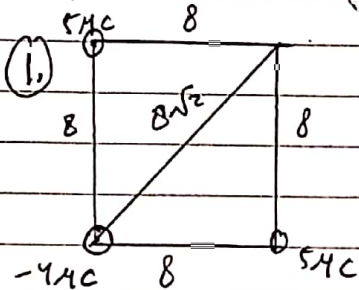
Total $\vec{E} = \frac{1}{4\pi\epsilon_0} \left[\left(\frac{20}{125} (i) + \left(\frac{10}{16} + \frac{15}{125} \right) j \right) \right]$

$$= \frac{1}{4\pi\epsilon_0} \sqrt{(0,16)^2 + (0,74)^2}$$

$$= \frac{1}{4\pi\epsilon_0} \sqrt{0,5752}$$



* "Potential Listrik"



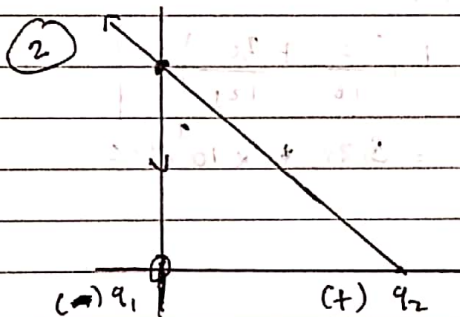
$$V_{total} = \sum k \frac{q}{r}$$

$$= \frac{9 \cdot 10^9 \cdot 5 \cdot 10^{-6}}{8} + \frac{9 \cdot 10^9 \cdot 8 \cdot 10^{-6}}{8\sqrt{2}} - \frac{9 \cdot 10^9 \cdot 4 \cdot 10^{-6}}{8} + \frac{9 \cdot 10^9 \cdot 5 \cdot 10^{-6}}{8}$$

$$= 5,62 \cdot 10^3 + 5,62 \cdot 10^3 - 6,36 \cdot 10^3$$

$$= 17,4 \cdot 10^3$$

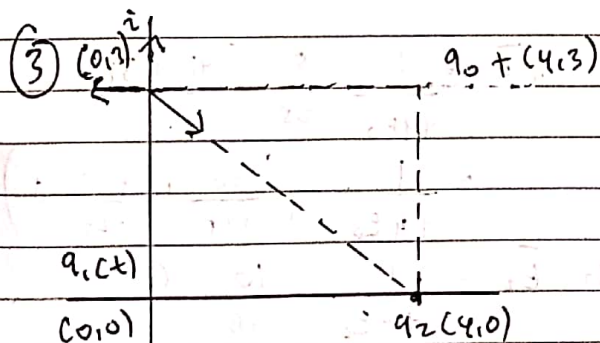
$$= 1,76 \cdot 10^4 \text{ volt}$$



$$V = \frac{kq_1}{r_1} + \frac{kq_2}{r_2}$$

$$= 9 \cdot 10^6 \left(\frac{5}{3} + \frac{10}{4} \right)$$

$$= 3,75 \times 10^4 \text{ dyne cm}$$



$$q_1(0,1) = 25 \text{ MC}$$

$$q_2(4,0) = -15 \text{ MC}$$

$$q_0(4,3) = 20 \text{ MC}$$

Carilah titik (0,3).