

Nama : OKTAVIA SULISTYA HANDAYANI
NPM : 2013022052

Pemecahan Kasus Muatan Listrik

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- 1.) Seorang remaja putri menggunakan cincin yang terbuat dari perak ($^{107,9}_{47}\text{Ag}$) dan dilapisi emas ($^{197}_{79}\text{Au}$) 0,8 gram, massa cincin tersebut 5 gram. Berapa jumlah elektron dalam cincin remaja putri tersebut.

Jawaban:

$$\begin{aligned} N &= (5 - 0,8) \cdot \frac{6,02 \times 10^{23}}{107,9} + 0,8 \cdot \frac{6,02 \times 10^{23}}{197,9} \\ &= 4,2 \cdot \frac{6,02 \times 10^{23}}{107,9} + 0,8 \cdot \frac{6,02 \times 10^{23}}{197,9} \\ &= 23,4 \times 10^{21} + 2,4 \times 10^{21} \\ &= 25,8 \times 10^{21} \end{aligned}$$

$\Rightarrow$ Atom Ag mempunyai 47 elektron atom Au mempunyai 79 elektron maka jumlah kedua atom tersebut adalah $47 + 79 = 126$ elektron.

Jadi, jumlah medan total Q yaitu:

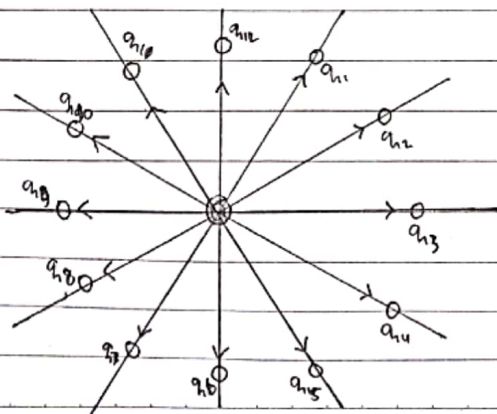
$$\begin{aligned} Q &= (25,8 \times 10^{21} \text{ atom}) (126 \text{ elektron/atom}) (1,60 \times 10^{-19} \text{ C/elektron}) \\ &= 52 \times 10^4 \text{ C} \end{aligned}$$

Jadi, untuk massa cincin 5gr mempunyai muatan ~~52 x 10⁴~~ ~~52 x 10⁴~~

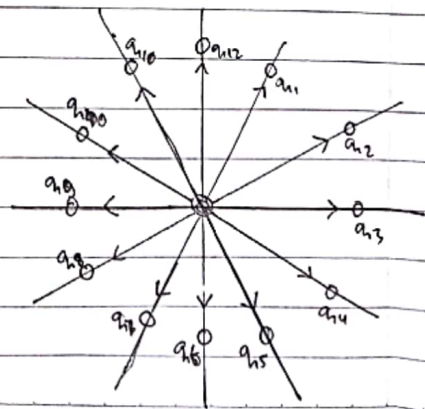
$52 \times 10^4 \text{ C}$ hal ini berarti dalam massa cincin 5gr terdapat $\frac{52 \times 10^4}{1,6 \times 10^{-19}} = 32,5 \times 10^{23}$ elektron

* Pemecahan Kasus Gaya Listrik

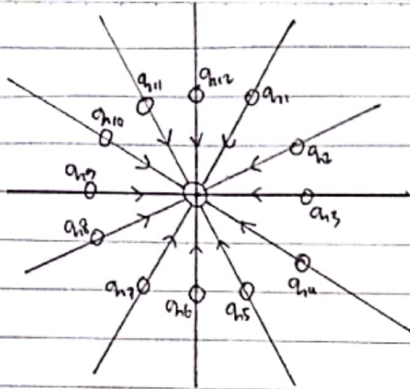
a.)



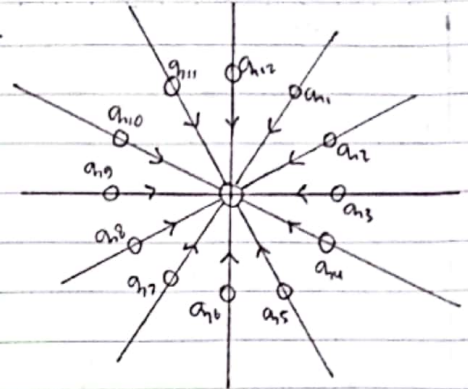
b.)



c.)



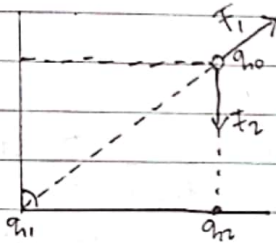
d.)



e) $q_{n1} = 25 \text{ MC} \rightarrow (0,0) \text{ m}$

$q_{n2} = -10 \text{ MC} \rightarrow (4,0) \text{ m}$

$q_{n0} = 10 \text{ MC} \rightarrow (4,3) \text{ m}$



$$\Rightarrow \vec{F} = q_{n0} k \left\{ \frac{q_{n1}}{r_1^2} \hat{r}_1 + \frac{q_{n2}}{r_2^2} \hat{r}_2 \right\}$$

$$= 10.9 \times 10^{10} \left\{ \frac{25}{25} \left(\frac{4i+3j}{5} \right) + \frac{10}{16} (i) \right\}$$

$$= 9 \times 10^{10} \left\{ \frac{100}{125} + \frac{75j}{125} + \frac{10i}{16} \right\}$$

$$= 9 \times 10^{10} (1.42i + 0.6j)$$

$$= 9 \times 10^{10} \sqrt{(1.42)^2 + (0.6)^2}$$

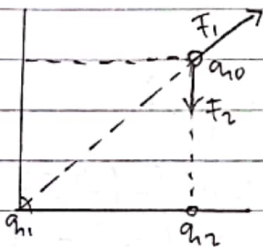
$$= 9 \times 10^{10} \cdot 2.02$$

$$\vec{F} = 18.18 \times 10^{10}$$

f.) $q_{n1} = 25 \text{ MC} \rightarrow (0,0) \text{ m}$

$q_{n2} = -15 \text{ MC} \rightarrow (4,0) \text{ m}$

$q_{n0} = 20 \text{ MC} \rightarrow (4,3) \text{ m}$



$$\Rightarrow \vec{F} = q_{n0} k \left\{ \frac{q_{n1}}{r_{n1}^2} \hat{r}_1 + \frac{q_{n2}}{r_{n2}^2} \hat{r}_2 \right\}$$

$$= 20.9 \times 10^{10} \left\{ \frac{25}{25} \left(\frac{4i+3j}{5} \right) + \frac{10}{16} (i) \right\}$$

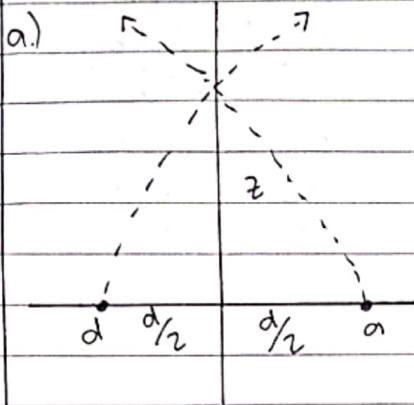
$$= 18 \times 10^{10} \left\{ \frac{100}{125} + \frac{75j}{125} + \frac{10i}{16} \right\}$$

$$= 18 \times 10^{10} \sqrt{(1.42)^2 + (0.6)^2}$$

$$= 18 \times 10^{10} \cdot 2.02$$

$$\vec{F} = 3.64 \times 10^{10}$$

* Pemecahan Kasus Medan Listrik

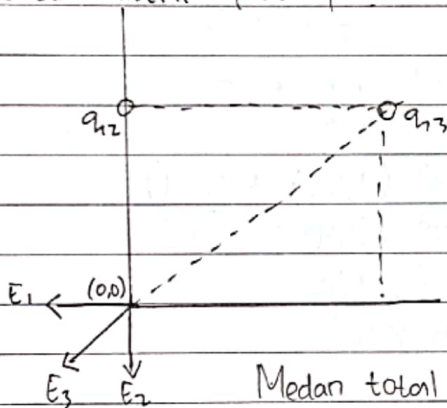


b.) $q_1 (4,0) = 2 \text{ C}$

$q_2 (0,3) = 5 \text{ C}$

$q_3 (4,3) = 10 \text{ C}$

Medan listrik pada posisi $(0,0)$



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

Medan oleh q_3 $\vec{E}_3 = \frac{1}{4\pi\epsilon_0} \frac{10}{25} \left(\frac{4\vec{i} + 3\vec{j}}{5} \right)$
 $= \frac{1}{4\pi\epsilon_0} \left(\frac{40}{125} \vec{i} + \frac{30}{125} \vec{j} \right)$

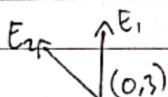
Medan total $\vec{E} = \frac{1}{4\pi\epsilon_0} \left[\left(\frac{5}{9} + \frac{40}{125} \right) \vec{i} + \left(\frac{2}{16} + \frac{30}{125} \right) \vec{j} \right]$

$= \frac{1}{4\pi\epsilon_0} \sqrt{(0,47)^2 + (0,8)^2}$

$\vec{E} = 8,35 \times 10^3 \text{ N/C}$

c.) $q_1 = -5 \text{ nC}$

$q_2 = 10 \text{ nC}$



$\Rightarrow$ Medan listrik oleh q_1 $\vec{E}_1 = k \frac{q_1}{r_1^2} \hat{r}_1$

$= 9 \cdot 10^9 \frac{5}{25} \left(\frac{-4\vec{i} - 3\vec{j}}{5} \right)$
 $= 9 \cdot 10^9 \left(\frac{-20}{125} \vec{i} - \frac{15}{125} \vec{j} \right)$

$\Rightarrow$ Medan listrik q_2 $\vec{E}_2 = 9 \cdot 10^9 \frac{10}{16} \left(\frac{3\vec{j}}{3} \right)$

$= 9 \cdot 10^9 \left(\frac{30\vec{j}}{48} \right)$

$\Rightarrow$ Medan total $\vec{E} = -9 \cdot 10^9 \cdot \frac{20}{25} \vec{i} + 9 \cdot 10^9 \left(\frac{30}{48} - \frac{5}{125} \right) \vec{j}$

$= 9 \times 10^9 \sqrt{(0,16)^2 + (0,58)^2}$

$= 6,7 \times 10^9$

