

Nama : Annisa Dirx

Npm : 2013022004

Kelas : B

Pemecahan Kasus Muatan Listrik

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, masa cincin tersebut 5 gram. Berapa jumlah elektron dalam cincin remaja Putri tersebut

Penyelesaian :

Diketahui

~~elektron~~ Ag : 47 elektron, dan masa 4,2 gram serta Mr = 107,9

~~elektron~~ Au : 79 elektron, dan masa 0,8 gram serta Mr = 197

$$N_A = 6,02 \cdot 10^{22}$$

$$N = \frac{N_A \times \text{massa (g)}}{Mr}$$

$$N_{\text{total}} = \frac{N_A \times \text{massa Ag}}{Mr_{\text{Ag}}} + \frac{N_A \times \text{massa Au}}{Mr_{\text{Au}}}$$

$$= \frac{6,02 \cdot 10^{22} \times 4,2}{107,9} + \frac{6,02 \cdot 10^{22} \times 0,8}{197}$$

$$= 2,34 \cdot 10^{22} + 2,44 \cdot 10^{21}$$

$$= 2,58 \cdot 10^{22}$$

Muatan total (Q)

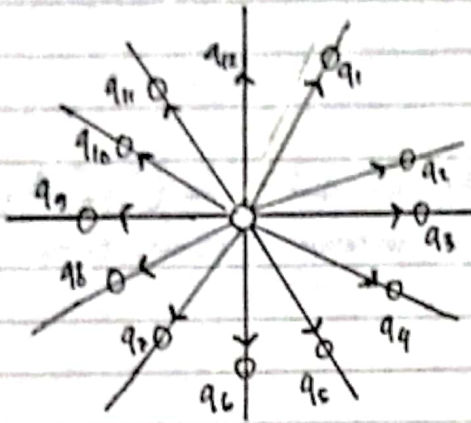
Karena Ag punya 47 elektron dan Au 79 elektron maka jumlah elektron atom tersebut 126 elektron.

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

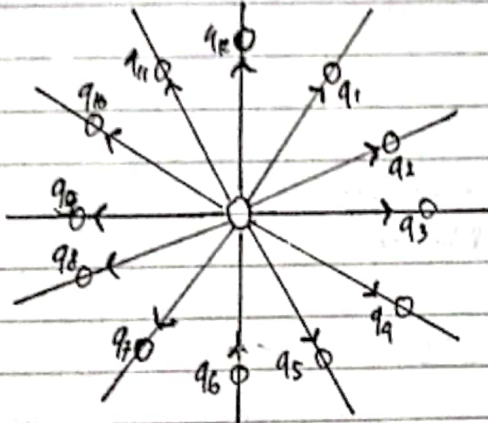
Jadi, pada cincin 5 gram terdapat muatan $5,2 \cdot 10^5 \text{ C}$, dimana pada cincin 5 gram terdapat $\frac{5,2 \cdot 10^5 \text{ C}}{1,6 \cdot 10^{-19}} = 3,25 \cdot 10^{24}$ elektron.

Kasus Bangun Licin

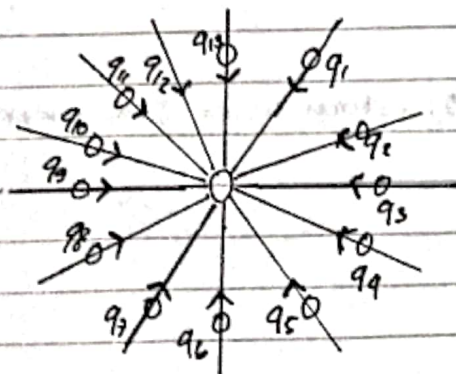
a.



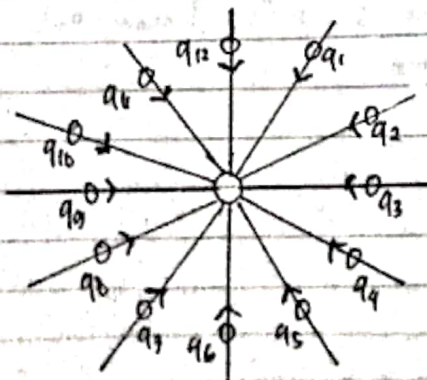
b.



c.



d.



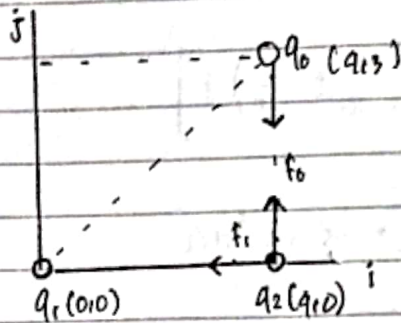
Jawabannya sama dengan kasus b.

$$E = \frac{1}{4\pi\epsilon_0} \frac{qQ}{r^2} \text{ dimana } r \text{ adalah}$$

Jarak dari pusat ke angka lainnya.
 E menuju arah angka yang hilang.

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

Carilah gaya total pada q_0 akibat q_1 dan q_2

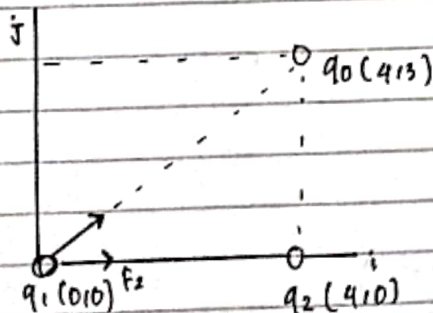


$$\vec{F} = q_0 k \left\{ \frac{q_1}{r_{q_1}^2} \hat{r}_{q_1} + \frac{q_2}{r_{q_2}^2} \hat{r}_{q_2} \right\}$$

$$= 10.9 \times 10^9 \left\{ \frac{25}{16} + \frac{(-10)}{16} (i) \right\}$$

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

Carilah gaya pada q_0

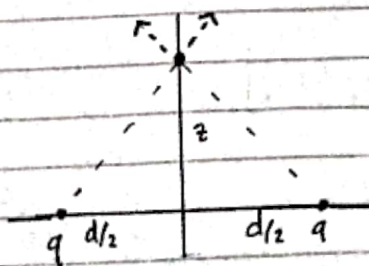


$$\vec{F} = q_0 k \left\{ \frac{q_1}{r_{q_1}^2} \hat{r}_{q_1} + \frac{q_2}{r_{q_2}^2} \hat{r}_{q_2} \right\}$$

$$= 20.9 \times 10^9 \left\{ \frac{25}{16} + \frac{(-15)}{16} (i) \right\}$$

Kuat medan listrik

a.

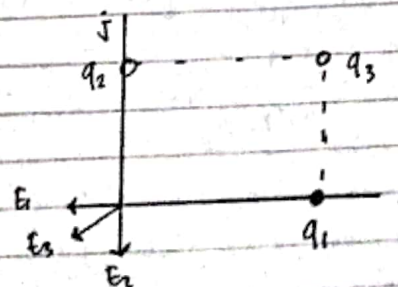


b. $q_1 (4,0) = 2\text{C}$

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

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

Medan listrik Posisi (0,0)



$$\vec{E} = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2} \hat{r}$$

$$\text{medan oleh } q_2 \vec{E}_2 = \frac{1}{4\pi\epsilon_0} \frac{5}{25} (1)$$

$$\text{medan oleh } q_1 \vec{E}_1 = \frac{1}{4\pi\epsilon_0} \frac{10}{25} \left(\frac{q_1 + 5j}{5} \right)$$

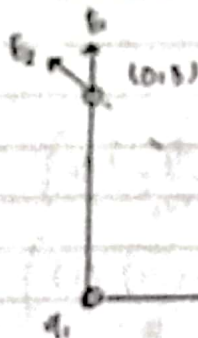
$$= \frac{1}{4\pi\epsilon_0} \left(\frac{40i}{125} + \frac{20j}{125} \right)$$

$$\text{medan total } \vec{E} = \frac{1}{4\pi\epsilon_0} \left[\left(\frac{5}{5} + \frac{40}{125} \right) i + \left(\frac{2}{5} + \frac{20}{125} \right) j \right]$$

$$\vec{E} = \frac{1}{4\pi\epsilon_0} \sqrt{(0.41)^2 + (0.18)^2} = 8.35 \times 10^3 \text{ N/C}$$

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

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



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

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

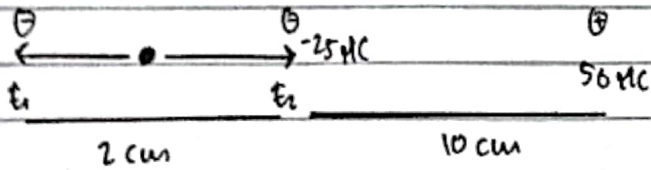
$$\text{medan oleh } q_2 \vec{E}_2 = \frac{1}{4\pi\epsilon_0} \frac{10}{16} (j)$$

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

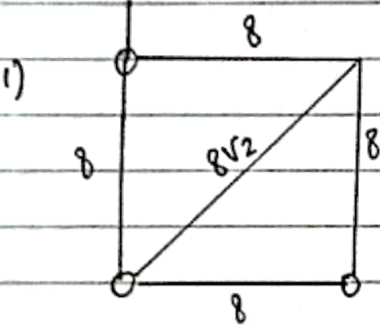
$$= \frac{1}{4\pi\epsilon_0} \sqrt{(0.16)^2 + (0.14)^2}$$

$$= \frac{1}{4\pi\epsilon_0} \sqrt{0.572}$$

d.



Potensial listrik



$$V_{\text{tot}} = \sum k \frac{q}{r}$$

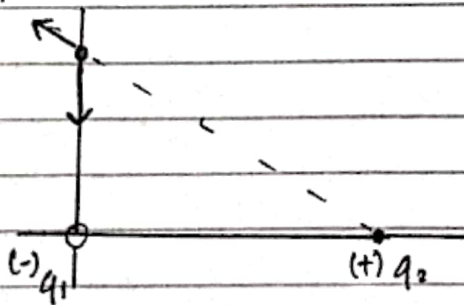
$$= 9 \cdot 10^9 \frac{5 \cdot 10^{-6}}{8} + \frac{5 \cdot 10^{-6}}{8} - 5 \cdot 10^9 \frac{4 \cdot 10^{-6}}{8\sqrt{2}}$$

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

$$= 17,6 \cdot 10^3$$

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

2)

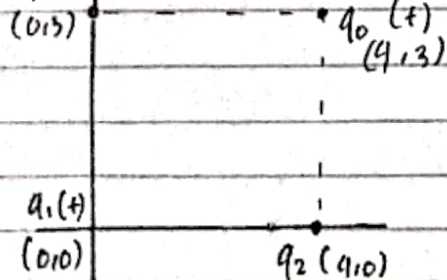


$$V = \frac{kq_1}{r_1} + \frac{kq_2}{r_2}$$

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

$$= 3,75 \times 10^7 \frac{\text{dyne cm}}{\text{qC}}$$

3)



$$q_1(0,10) = 25 \text{ nC}$$

$$q_2(q_{10}) = -15 \text{ nC}$$

$$q_3(q_{13}) = 20 \text{ nC}$$

Carilah titik (0,3)