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Pemecahan kasus Muatan Listrik

1. Jumlah elektron dalam cincin yang terbuat dari Perak ($^{107,9}_{47}\text{Ag}$) dan dilapisi emas ($^{197}_{79}\text{Au}$) 0,8 gram, dengan massa cincin 5 gram.

$$\Rightarrow N = 4,2 \cdot \frac{6,02 \times 10^{23}}{107,9} = 2,34 \times 10^{22} \text{ atom} \rightarrow 23,4 \times 10^{21} \text{ atom}$$

$$N = 0,8 \cdot \frac{6,02 \times 10^{23}}{197} = 2,44 \times 10^{21} \text{ atom}$$

$$N_{\text{total}} = (23,4 + 2,44) \cdot 10^{21} \\ = 25,84 \times 10^{21} \text{ atom}$$

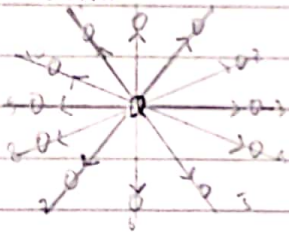
$$Q = (25,84 \times 10^{21})(176 e)(-1,60 \times 10^{-19} \text{ C/e}) \\ = 5,21 \times 10^5 \text{ C}$$

Jadi untuk 5gr cincin mempunyai muatan $5,21 \times 10^5 \text{ C}$. $\Rightarrow \frac{5,21 \times 10^5}{1,6 \times 10^{-19}} = 3,25 \times 10^{24}$ elektron

elektron atom Ag + elektron atom Au = 47 + 79 = 126

Kasus Gaya Listrik:

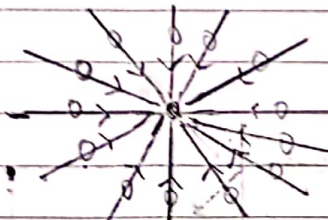
a.



b.

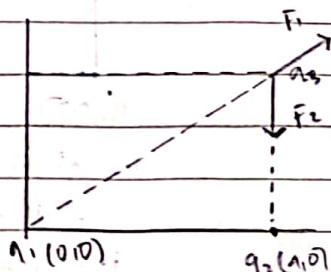


c.

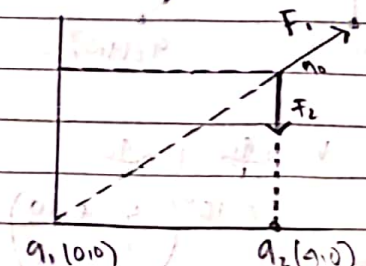


d.

e.



f.

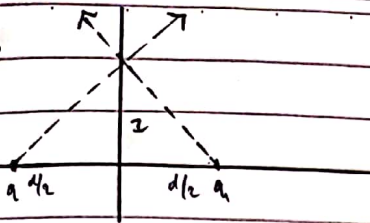


$$\vec{F} = q_0 k \left(\frac{q_1}{r_1^2} \hat{r}_1 + \frac{q_2}{r_2^2} \hat{r}_2 \right) = 10 \cdot 9 \times 10^{10} \left[\left(\frac{25}{25} \right) \left(\frac{4i+2j}{5} \right) + \frac{10}{16} (i) \right] \\ = 10 \cdot 9 \times 10^{10} \left(\frac{100}{125} + \frac{10i}{16} + \frac{75j}{125} \right) \\ = 9 \times 10^{11} (1,42i + 0,6j)$$

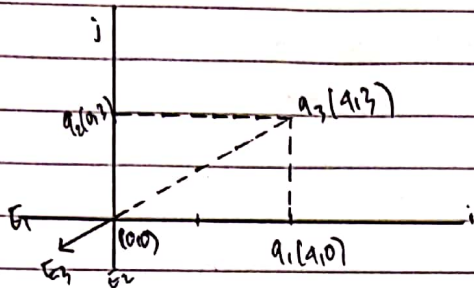
$$\vec{F} = 20 \cdot 9 \times 10^{10} \left[\left(\frac{25}{25} \right) \left(\frac{4i+2j}{5} \right) + \frac{10}{16} (i) \right]$$

Kasus Medan Listrik

a.



b.



$$q_1 = +2C$$

$$q_2 = +5C$$

$$q_3 = +10C$$

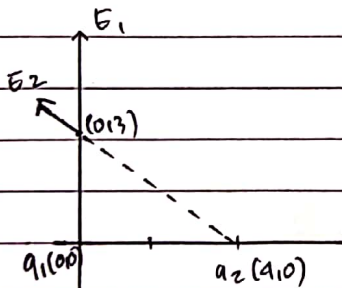
$$\text{Medan oleh } q_2 \vec{E}_2 = \frac{1}{4\pi\epsilon_0} \frac{5}{9} (i)$$

$$\text{Medan oleh } q_1 \vec{E}_1 = \frac{1}{4\pi\epsilon_0} \frac{2}{16} j$$

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

$$\begin{aligned} \text{Medan total } \vec{E} &= \frac{1}{4\pi\epsilon_0} \left[\left(\frac{5}{9} + \frac{40}{125} \right) i + \left(\frac{2}{16} + \frac{30}{125} \right) j \right] \\ &= \frac{1}{4\pi\epsilon_0} \sqrt{(6.47)^2 + (1.08)^2} \\ &= 8.35 \times 10^{-2} N/C \end{aligned}$$

c.



$$q_1 = -5 \mu C$$

$$q_2 = 10 \mu C$$

$$\text{Medan listrik oleh } q_1 \vec{E}_1 = \frac{1}{4\pi\epsilon_0} \frac{q_1}{r^2}$$

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

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

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

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

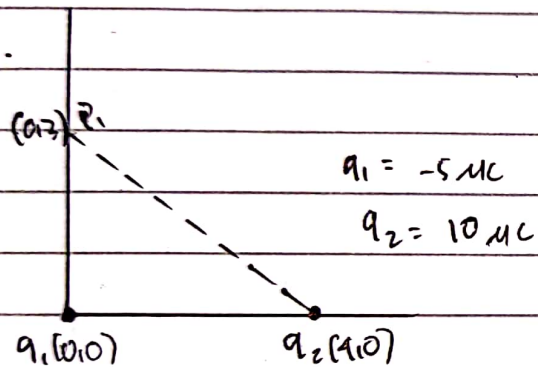
$$\text{Medan total } \vec{E} = -9 \cdot 10^9 \cdot \frac{20}{125} i + 9 \cdot 10^9 \left(\frac{30}{48} - \frac{5}{125} \right) j$$

d.

Potensial Listrik

1.

2.



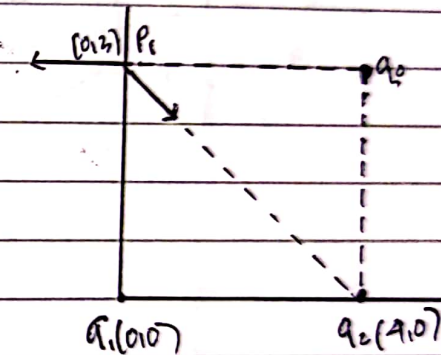
$$V = k \frac{q_1}{r} + k \frac{q_2}{r}$$

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

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

μC

3.



$q_1 = 25 \mu C$
 $q_2 = -10 \mu C$
 $q_0 = 20 \mu C$