

Perhitungan Kasus Muatan Listrik

1. Muatan : $\left(\begin{smallmatrix} 107,9 \\ 47 \text{ Ag} \end{smallmatrix} \right)$ dan $\left(\begin{smallmatrix} 197 \\ 79 \text{ Au} \end{smallmatrix} \right)$, massa timah = 5 gr

$$N = \frac{(5 - 0,8) \cdot 6,02 \times 10^{23}}{107,9} + \frac{0,8 \cdot 6,02 \times 10^{23}}{197}$$

$$= \frac{4,2 \cdot 6,02 \times 10^{23}}{107,9} + \frac{0,8 \cdot 6,02 \times 10^{23}}{197}$$

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

$$= 2,58 \times 10^{22} \text{ atom}$$

*) Dimana atom Ag memiliki 47 elektron dan atom Au memiliki 79 elektron, sehingga $47 + 79 = 126$ elektron atomnya jumlah elektron kedua atom.

*) Jumlah muatan total nyai adalah :

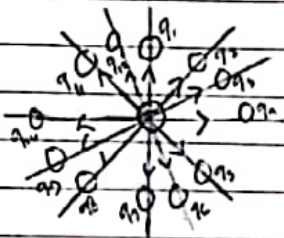
$$Q = (2,58 \times 10^{22} \text{ atom}) (126 \text{ elektron}) (1,60 \times 10^{-19} \text{ C/electron})$$

$$= 5,2 \times 10^5 \text{ C}$$

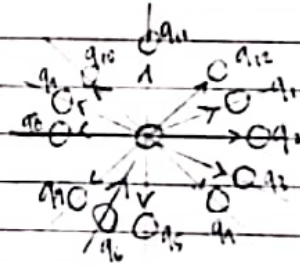
*) Jadi, untuk 5 gr timah mempunyai muatan $5,2 \times 10^5 \text{ C}$. Hal ini berarti dalam 5 gr mass timah terdapat $= \frac{5,2 \times 10^5 \text{ C}}{1,6 \times 10^{-19}} = 3,25 \times 10^{24} \text{ elektron}$

Kasus Gaya Listrik

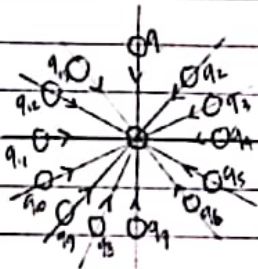
a)



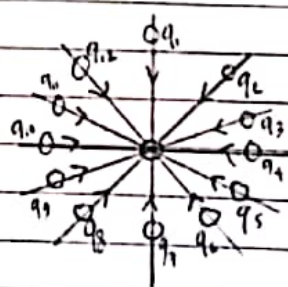
b)



c)



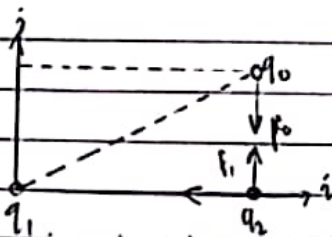
d)



e) $q_1 = 25 \text{ HC}$ $(0,0) \text{ m}$

$q_2 = -10 \text{ HC}$ $(4,0) \text{ m}$

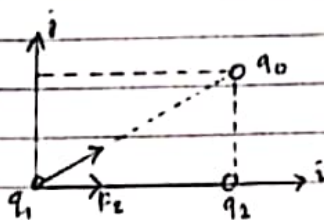
$q_0 = 10 \text{ HC}$ $(4,3)$



$$F = k_e \left\{ \frac{q_1}{r_1^2} \cdot \hat{r}_1 + \frac{q_2}{r_2^2} \cdot \hat{r}_2 \right\}$$

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

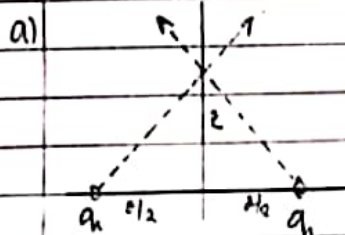
f) $q_1 = 25 \text{ nC } (0,0) \text{ m}$
 $q_2 = -15 \text{ nC } (4,0) \text{ m}$
 $q_3 = 20 \text{ nC } (4,3) \text{ m}$



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

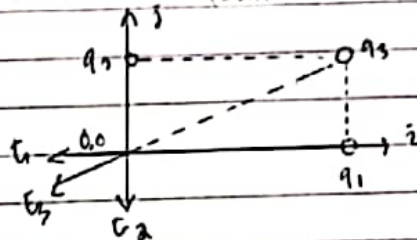
$$= 20 \cdot 9 \times 10^9 \left\{ 25 + \frac{(-15)}{16} (i) \right\}$$

Kuat 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 Positif (0,0)



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

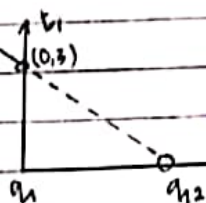
Medan oleh $q_2 \Rightarrow E_2 = \frac{1}{4\pi\epsilon_0} \frac{5}{9} (i)$

Medan oleh $q_1 \Rightarrow E_3 = \frac{1}{4\pi\epsilon_0} \frac{10}{25} \left(\frac{4i+j}{5} \right)$

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

$$= \frac{1}{4\pi\epsilon_0} \sqrt{(0,49)^2 + (0,9)^2} = 8,35 \times 10^3 \text{ N/C}$$

c) $q_1 = -5 \text{ nC } (0,0)$
 $q_2 = 10 \text{ nC } (4,0)$



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

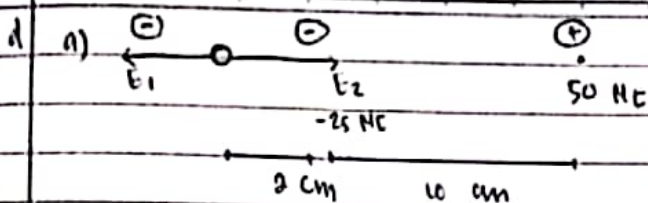
$= \frac{1}{4\pi\epsilon_0} \left(\frac{20}{125} i + \frac{15}{125} j \right)$

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

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

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

$= \frac{1}{4\pi\epsilon_0} \sqrt{0,593}$



Potensial Listrik

1.

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

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

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

$$= 1,76 \cdot 10^6$$

$$= 1,76 \cdot 10^6 \text{ Volt}$$

2.

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

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

$$= 3,75 \times 10^9 \frac{\text{dyne cm}}{\text{HC}}$$

3.

$$q_1(0,3) = 25 \text{ HC}$$

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

$$q_3(4,3) = 20 \text{ HC}$$