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"Pendidikan Fisika B"

Kasus Muatan Listrik

- ① Jumlah atom cincin yang terbuat dari perak ( $^{107.9}_{47}\text{Ag}$ ) dan dilapisi emas ( $^{197}_{79}\text{Au}$ ) 0,8 gram, maka cincin tersebut 5 gram. Berapa jumlah elektron dalam cincin remaja putri tersebut.

Penyelesaian:

$$\begin{aligned}
 N &= (5 - 0,8) \cdot \frac{6,02 \times 10^{23}}{107,9} + 0,8 \cdot \frac{6,02 \times 10^{23}}{197} \\
 &= 4,2 \cdot \frac{6,02 \times 10^{23}}{107,9} + 0,8 \cdot \frac{6,02 \times 10^{23}}{197} \\
 &= 4,46 \times 10^{20} + 2,49 \times 10^{21} \\
 &= 2,88 \times 10^{21}
 \end{aligned}$$

atom Ag mempunyai 47 elektron atom Au mempunyai 79 maka jumlahkan kedua atom =  $47 + 79 = 126$  elektron

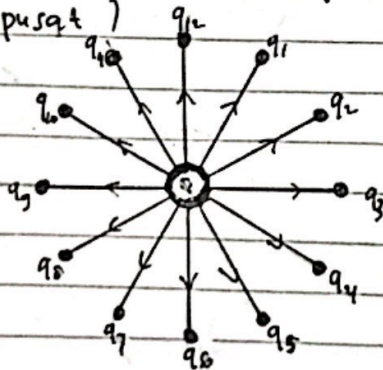
$$\begin{aligned}
 Q &= (2,88 \times 10^{21}) (126) (1,60 \times 10^{-19}) \\
 &= 5,8 \times 10^9 \text{ C}
 \end{aligned}$$

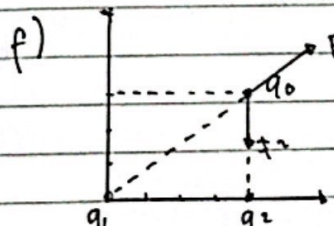
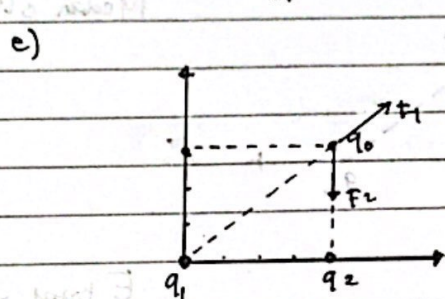
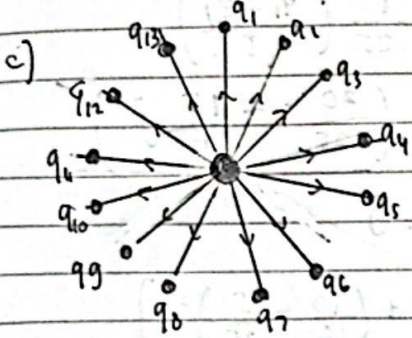
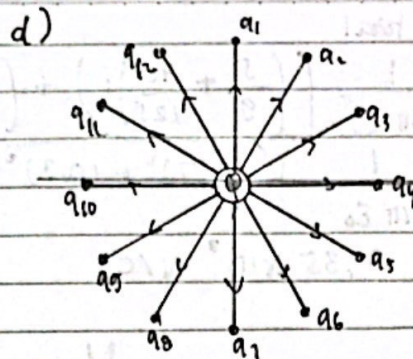
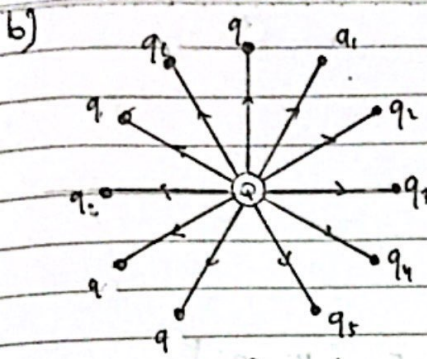
Jadi, untuk 5 gram cincin mempunyai muatan  $5,8 \times 10^9 \text{ C}$  hal ini berarti dalam 5 gr massa cincin terdapat  $5,8 \times 10^9$

$$\begin{aligned}
 &\frac{1,6 \times 10^{-19}}{5,8 \times 10^9} \\
 &= 3,62 \times 10^{23} \text{ elektron}
 \end{aligned}$$

Kasus Gaya Listrik

- a) Dua belas muatan sumber,  $q$ , yang terletak disudut-sudut polygon 12 sisi (tampak seperti angka pada jam) berapa gaya total pada muatan uji  $q$  di pusat?





$$q_1 = +25 \mu C$$

$$q_2 = -15 \mu C$$

$$q_0 = +20 \mu C$$

$$q_1 = +25 \mu C$$

$$q_2 = -10 \mu C$$

$$q_0 = +10 \mu C$$

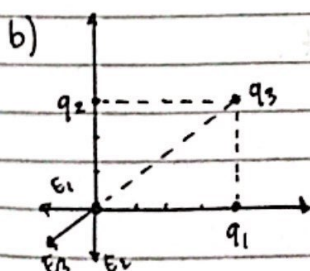
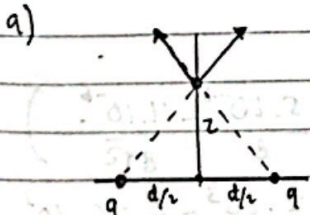
$$\vec{F} = k q_0 \left[ \frac{q_1}{r_{q_1}^2} \hat{r}_{q_1} + \frac{q_2}{r_{q_2}^2} \hat{r}_{q_2} \right]$$

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

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

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

### Kasus Medan Listrik



$$q_1 = 2C$$

$$q_2 = 5C$$

$$q_3 = 10C$$

$$E_1 = \frac{1}{4\pi\epsilon_0} \cdot \frac{2}{(4)^2} \hat{j} = \frac{1}{4\pi\epsilon_0} \cdot \frac{2}{16} \hat{j}$$

$$E_2 = \frac{1}{4\pi\epsilon_0} \cdot \frac{5}{(3)^2} \hat{i} = \frac{1}{4\pi\epsilon_0} \cdot \frac{5}{9} \hat{i}$$

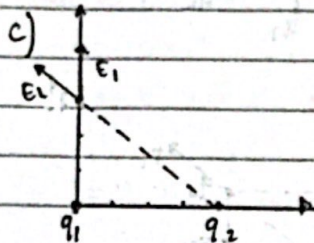
$$E_3 = \frac{1}{4\pi\epsilon_0} \cdot \frac{10}{25} \left( \frac{4\hat{i} + 3\hat{j}}{5} \right) = \frac{1}{4\pi\epsilon_0} \left( \frac{40\hat{i} + 30\hat{j}}{125} \right)$$

Medan total

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

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

$$= 8,35 \times 10^9 \text{ N/C}$$



Medan oleh  $q_1$   $E_1 = \frac{1}{4\pi\epsilon_0} \frac{5}{25} \left( \frac{4i+3j}{5} \right)$

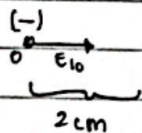
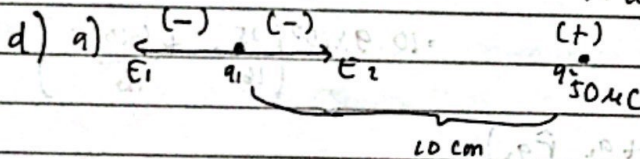
$$= \frac{1}{4\pi\epsilon_0} \left( \frac{20}{125} i + \frac{15}{125} j \right)$$

$$E_2 = \frac{1}{4\pi\epsilon_0} \frac{10}{16} j$$

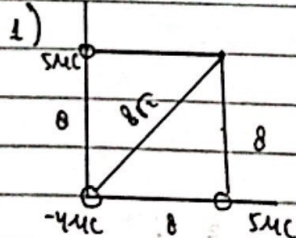
$$E_{\text{total}} = \frac{1}{4\pi\epsilon_0} \left[ \left( \frac{20}{125} i \right) + \left( \frac{10}{16} + \frac{15}{125} \right) j \right]$$

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

$$= \frac{1}{4\pi\epsilon_0} \sqrt{0,5732}$$



Potensial Listrik



$$V_{\text{tot}} = \sum k \cdot \frac{q}{r} = 9 \times 10^9 \cdot \left( \frac{5 \cdot 10^{-6}}{8} + \frac{5 \cdot 10^{-6}}{8} - \frac{4 \cdot 10^{-6}}{8\sqrt{2}} \right)$$

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

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

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

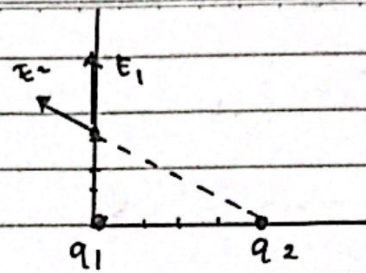
②  $V = \frac{kq_1}{r_1} + \frac{kq_2}{r_2}$

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

$$= \left( \frac{-45}{3} + \frac{90}{5} \right) 10^9$$

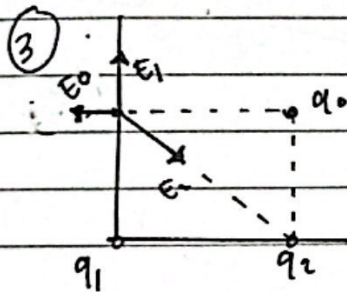
$$= (-15 + 18) 10^9$$

$$= 3 \times 10^9$$



$$q_1 = -5 \mu C$$

$$q_2 = 10 \mu C$$



$$q_1 = 25 \mu C$$

$$q_2 = -15 \mu C$$

$$q_0 = 20 \mu C$$