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 matkul : Elektrodinamika

A. Multiple Choice

1. B. the object has the lack of electrons
2. E.

Dik :

$$r_1 = 2 \text{ m}$$

$$r_2 = 2r_1 = 4 \text{ m}$$

Ditanya : $F \dots ?$

Jawab

$$F_1 = \frac{k \cdot Q_1 \cdot Q_2}{r_1^2} = \frac{k \cdot Q_1 \cdot Q_2}{2^2} = \frac{1}{4} k Q_1 Q_2$$

$$F_2 = \frac{k \cdot Q_1 \cdot Q_2}{r_2^2} = \frac{k \cdot Q_1 \cdot Q_2}{4^2} = \frac{1}{16} k \cdot Q_1 Q_2$$

$$\frac{F_2}{F_1} = \frac{\frac{1}{16} k \cdot Q_1 \cdot Q_2}{\frac{1}{4} \cdot k \cdot Q_1 \cdot Q_2} = \frac{\frac{1}{16}}{\frac{1}{4}} = \frac{4}{16} = \frac{1}{4} = 0,25$$

$$F_2 = 0,25 F_1$$

3. A

Diketahui :

$$Q_1 = -9 \mu\text{C}$$

$$Q_2 = +6 \mu\text{C}$$

$$r = 3 \text{ m}$$

$$k = 9 \cdot 10^9 \text{ Nm}^2 \text{C}^{-2}$$

Ditanya : $F \dots ?$

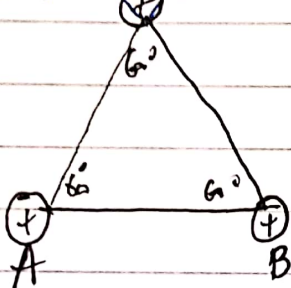
Jawab

$$F = \frac{k \cdot Q_1 \cdot Q_2}{r^2}$$

$$F = \frac{9 \cdot 10^9 \cdot 9 \cdot 10^{-6} \cdot 6 \cdot 10^{-6}}{3^2} = 54 \cdot 10^{-3} \text{ N} = 0,054 \text{ N}$$

4. E.

Diketahui:

Berapakah F pada C

$$F_C = \sqrt{F_{CA}^2 + F_{CB}^2 + 2 F_{CA} \cdot F_{CB} \cdot \cos 60}$$

$$= \sqrt{F^2 + F^2 + 2 \cdot F^2 \cdot \frac{1}{2}}$$

$$= \sqrt{3 F^2}$$

$$= F \sqrt{3} \text{ N}$$

5. C

Diketahui:

$$Q_1 = 24 \mu\text{C}$$

$$Q_2 = 20 \mu\text{C}$$

$$r = 12 \text{ cm}$$

$$\epsilon_r = 3$$

Ditanya: F ?

Jawab

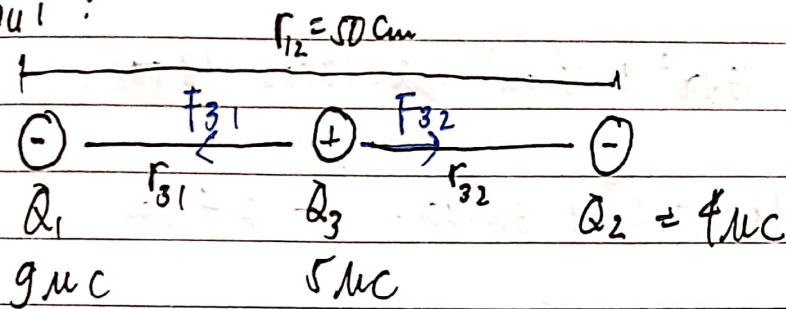
$$F = \frac{1}{\epsilon_r} \cdot \frac{k \cdot Q_1 \cdot Q_2}{r^2}$$

$$F = \frac{1}{3} \cdot \frac{9 \cdot 10^9 \cdot 24 \cdot 10^{-6} \cdot 20 \cdot 10^{-6}}{(12 \cdot 10^{-2})^2}$$

$$F = \frac{3 \cdot 10^9 \cdot 24 \cdot 20 \cdot 10^{-12}}{12 \cdot 12 \cdot 10^{-4}} = \frac{10 \cdot 10^{-3}}{10^{-4}} = 10 \cdot 10 = 100 \text{ N}$$

6. B

Diketahui :



$$F_{31} = \frac{k \cdot Q_3 \cdot Q_1}{r_{31}^2} = \frac{9 \cdot 10^9 \cdot 5 \cdot 10^{-6} \cdot 9 \cdot 10^{-6}}{(25 \cdot 10^{-2})^2} = \frac{9 \cdot 9 \cdot 5 \cdot 10^{-3}}{625 \cdot 10^{-4}} = 6,48 \text{ N}$$

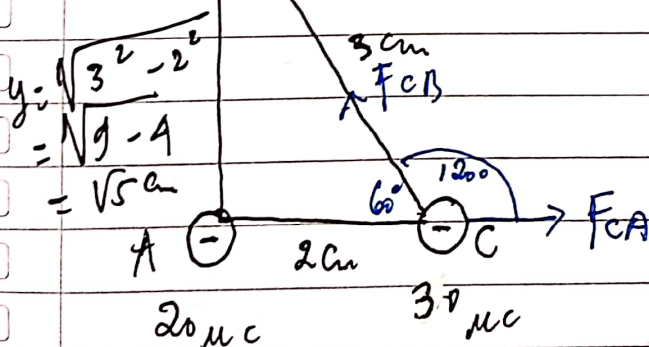
$$F_{32} = \frac{k \cdot Q_3 \cdot Q_2}{r_{32}^2} = \frac{9 \cdot 10^9 \cdot 5 \cdot 10^{-6} \cdot 4 \cdot 10^{-6}}{(25 \cdot 10^{-2})^2} = \frac{9 \cdot 5 \cdot 4 \cdot 10^{-3}}{625 \cdot 10^{-4}} = 2,88 \text{ N}$$

$$F = F_{31} - F_{32}$$

$$F = 6,48 - 2,88$$

$$F = 3,6 \text{ N move to left}$$

7. Diketahui:

B $\oplus 6 \mu\text{C}$ 

$$F_{CA} = \frac{k \cdot Q_C \cdot Q_A}{r_{CA}^2}$$

$$F_{CA} = \frac{9 \cdot 10^9 \cdot 30 \cdot 10^{-6} \cdot 20 \cdot 10^{-6}}{1 \cdot 10^{-4}}$$

$$F_{CA} = 13500 \text{ N}$$

$$F_{CB} = \frac{k \cdot Q_C \cdot Q_B}{r_{CB}^2}$$

$$F_{CB} = \frac{9 \cdot 10^9 \cdot 30 \cdot 10^{-6} \cdot 6 \cdot 10^{-6}}{9 \cdot 10^{-4}}$$

$$F_{CB} = 18000 \text{ N}$$

$$\begin{aligned}
 F &= \sqrt{F_{CA}^2 + F_{CB}^2 + 2 F_{CA} \cdot F_{CB} \cdot \cos 120} \\
 &= \sqrt{13500^2 + 18000^2 + 2 \cdot 13500 \cdot 18000 \cdot -\frac{1}{2}} \\
 &= \sqrt{18225 \cdot 10^4 + 32400 \cdot 10^4 - 24300 \cdot 10^4} \\
 &= \sqrt{25325 \cdot 10^4} \\
 &= 6224 \text{ N}
 \end{aligned}$$

8

(Jarak AB tidak diketahui)

Diketahui :

$$\begin{array}{ccccc}
 \ominus & \xrightarrow{r_{CA}} & \oplus & \xrightarrow{r_{CB}} & \ominus \\
 Q_A = 2 \mu\text{C} & & Q_C = 3 \mu\text{C} & & Q_B = 8 \mu\text{C}
 \end{array}$$

Ditanya : Jarak CA agar tidak merasakan gaya ?

Jawab

$$\begin{aligned}
 F_{CA} &= F_{CB} \\
 \frac{k \cdot Q_C \cdot Q_A}{r_{CA}^2} &= \frac{k \cdot Q_C \cdot Q_B}{r_{CB}^2}
 \end{aligned}$$

$$\frac{2 \cdot 10^{-6}}{r_{CA}^2} = \frac{8 \cdot 10^{-6}}{r_{CB}^2}$$

$$\left(\frac{r_{CB}}{r_{CA}} \right)^2 = \frac{8}{2}$$

$$\frac{r_{CB}}{r_{CA}} = \sqrt{4}$$

$$\frac{r_{CB}}{r_{CA}} = 2$$

$$r_{CA} = \frac{1}{2} r_{CB}$$

9. D

Diketahui

$$Q_1 = 5 \mu C$$

$$Q_2 = 5 \mu C$$

$$F = 0,025 N = 25 \cdot 10^{-3} N$$

Ditanya : $r \dots ?$

Jawab

$$F = K \cdot \frac{Q_1 \cdot Q_2}{r^2}$$

$$25 \cdot 10^{-3} = \frac{9 \cdot 10^9 \cdot 5 \cdot 10^{-6} \cdot 5 \cdot 10^{-6}}{r^2}$$

$$r^2 = \frac{9 \cdot 10^{-3}}{10^{-3}}$$

$$r^2 = 9$$

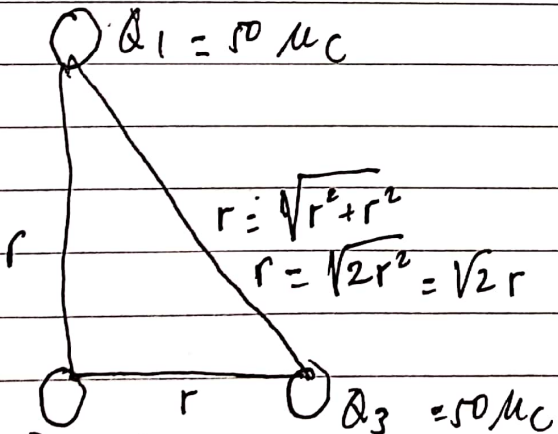
$$r = \sqrt{9} = 3 m$$

10.

(Nilai r tidak diketahui)

Dik :

$$Q_1 = 50 \mu C$$



$$Q_2 = 40 \mu C$$

$$Q_3 = 50 \mu C$$

Ditanya : F pada Q_2

Jawab :

$$F_{21} = K \cdot \frac{Q_2 \cdot Q_1}{r_{21}^2}$$

$$F_{21} = \frac{9 \cdot 10^9 \cdot 40 \cdot 10^{-6} \cdot 50 \cdot 10^{-6}}{r^2}$$