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Kesel:

1. B. The object has the lack of electrons

Alasan:

Objek jika kekurangan elektron maka akan

memiliki jumlah proton lebih banyak dari elektron

sehingga muatan positif

2. E 0,25

$$\begin{aligned} \frac{F_1}{F_2} &= \left(\frac{r_2}{r_1} \right)^2 \\ \frac{F_1}{F_2} &= \frac{(2 \times r_1)^2}{(r_1)^2} \\ F_1 &= \frac{2^2}{1^2} F_2 \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{aligned} F_1 &= \frac{4}{16} F_2 \\ F_2 &= \frac{1}{4} F_1 \end{aligned}$$

3. A 0,054 N

Alasan:

Diketahui: $k = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$

$q_1 = -9 \mu\text{C}$

$q_2 = +6 \mu\text{C}$

$r = 3 \text{ m}$

Ditanya: $F = ?$

Jawab: $F = k \frac{q_1 q_2}{r^2}$

$$F = 9 \times 10^9 \text{ Nm}^2/\text{C}^2 \cdot \frac{(9 \times 10^{-6}) (6 \times 10^{-6})}{3^2}$$

$$F = 9 \times 10^9 \text{ Nm}^2/\text{C}^2 \cdot \frac{9 \times 10^{-6} \text{ C} \times 6 \times 10^{-6} \text{ C}}{9}$$

$$F = 54 \times 10^{-3} \text{ N}$$

$$F = 0,054 \text{ N}$$

4. C. $F\sqrt{3}$

Diketahui: muatan A dan muatan B tidak meniadakan ($q_A = q_B$)

$$F_{AB} = k \frac{q_A q_B}{r^2}$$

$$F = k \frac{q^2}{r^2}$$

muatan A dan muatan C tidak meniadakan ($q_A = q_C$)

$$F_{AC} = k \frac{q_A q_C}{r^2}$$

$$F = k \frac{q^2}{r^2}$$

$$F_C^2 = F_{AB}^2 + F_{AC}^2 + 2 \times F_{AB} \times F_{AC} \times \cos 60^\circ$$

$$F_C^2 = F^2 + F^2 + 2 \times F \times F \times 1/2$$

$$F_C^2 = 3 F^2$$

$$F_C = F\sqrt{3}$$

5. C. 100 N

Diketahui : $q_1 = 24 \text{ nC}$

$\epsilon = 3$

$q_2 = 20 \text{ nC}$

$r = 12 \text{ cm} = 0,12 \text{ m}$

Ditanya : $F = ?$

$$F = k \frac{q_1 q_2}{r^2}$$

$$F = \frac{9 \times 10^9}{3} \times \frac{24 \times 10^{-6} \text{ C} \times 20 \times 10^{-6} \text{ C}}{(0,12)^2}$$

$$F = 10^2$$

$$F = 100 \text{ N}$$

$$F = \frac{9 \times 10^9}{3} \times \frac{24 \times 10^{-6} \times 2 \times 10^{-5}}{144 \times 10^{-4}}$$

$$F = 3 \times 10^9 \times \frac{48 \times 10^{-11}}{144 \times 10^{-4}}$$

6. B. 3,6 N move to left

Diketahui

$q_1 = -9 \text{ nC} = -9 \times 10^{-6} \text{ C}$

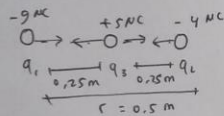
$q_2 = -4 \text{ nC} = -4 \times 10^{-6} \text{ C}$

$q_3 = +5 \text{ nC} = +5 \times 10^{-6} \text{ C}$

$r = 50 \text{ cm} = 0,5 \text{ m}$

Ditanya : $F = ?$

Jawab



$$F_1 = k \frac{q_1 q_3}{(r_{13})^2}$$

$$F_1 = 9 \times 10^9 \frac{9 \times 10^{-6} \times 5 \times 10^{-6}}{(0,25)^2}$$

$$F_1 = \frac{405 \times 10^{-3}}{625 \times 10^{-4}}$$

$$F_1 = 6,48 \text{ N}$$

$$F_2 = k \frac{q_2 q_3}{(r_{23})^2}$$

$$F_2 = 9 \times 10^9 \frac{4 \times 10^{-6} \times 5 \times 10^{-6}}{(0,25)^2}$$

$$F_2 = 9 \times 10^9 \frac{20 \times 10^{-12}}{0,0625}$$

$$F_2 = \frac{180 \times 10^{-3}}{625 \times 10^{-4}}$$

$$F_2 = 2,88 \text{ N}$$

$$F_3 = F_1 - F_2 = 6,48 - 2,88 = 3,6 \text{ N}$$

ke arah kiri ke q_2

8.

Diketahui: $q_A = -2 \mu C = -2 \times 10^{-6} C$
 $q_B = -8 \mu C = -8 \times 10^{-6} C$
 $q_C = +3 \mu C = +3 \times 10^{-6} C$

Ditanya: $r_{AC} = ?$

$$F_{AC} = F_{CB}$$

$$k \frac{q_A q_C}{r_{AC}^2} = k \frac{q_C q_B}{r_{CB}^2}$$

$$k \frac{q_A}{(r_{AC})^2} = k \frac{q_B}{(r - r_{AC})^2}$$

$$\frac{2}{(r_{AC})^2} = \frac{8}{(r - r_{AC})^2}$$

$$\frac{1}{(r_{AC})^2} = \frac{4}{(r - r_{AC})^2}$$

$$\sqrt{\frac{1}{(r_{AC})^2}} = \sqrt{\frac{4}{(r - r_{AC})^2}}$$

$$\frac{1}{r_{AC}} = \frac{2}{r - r_{AC}}$$

$$r - r_{AC} = 2 r_{AC}$$

$$3 r_{AC} = r$$

$$r_{AC} = \frac{1}{3} r$$

r tidak diketahui di soal

9. D = 3 m

Diketahui: $q_1 = 5 \mu C$
 $q_2 = 5 \mu C$
 $F = 0,025 N$

Ditanya: $r = ?$

$$F = k \frac{q_1 q_2}{r^2}$$

$$0,025 = 9 \times 10^9 \times \frac{5 \times 10^{-6} \times 5 \times 10^{-6}}{r^2}$$

$$r^2 = \frac{9 \times 10^9 \times 25 \times 10^{-12}}{0,025}$$

$$r^2 = 9 \times 10^9 \times 1000 \times 10^{-12}$$

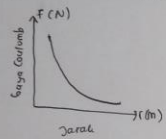
$$r^2 = 9$$

$$r = \sqrt{9}$$

$$r = 3 m$$

Essay

1. Grafik Pengaruh gaya Coulumb terhadap jarak



$$F = k \frac{q_1 q_2}{r^2} \rightarrow F \propto \frac{1}{r^2}$$

Gaya Coulumb berbanding terbalik dengan kuadrat jarak, sehingga jika jarak semakin jauh maka gaya Coulumb semakin mengecil, begitu sebaliknya semakin dekat jarak maka gaya Coulumb semakin besar.

2. Diketahui: $q_1 = +8 \mu C = +8 \times 10^{-6} C$
 $q_2 = -4 \mu C = -4 \times 10^{-6} C$
 $r = 2 m$

Ditanya: $F = ?$

$$F = k \frac{q_1 q_2}{r^2}$$

$$F = 9 \times 10^9 \frac{8 \times 10^{-6} \times 4 \times 10^{-6}}{2^2}$$

$$F = 9 \times 10^9 \frac{32 \times 10^{-12}}{4}$$

$$F = 9 \times 10^9 \times 8 \times 10^{-12}$$

$$F = 72 \times 10^{-3}$$

$$F = 0,072 N$$

3. Diketahui: $q_1 = 24 \mu C = 24 \times 10^{-6} C$

$q_2 = 18 \mu C = 18 \times 10^{-6} C$

$r = 12 \text{ m}$

Ditanya: A. F saat di udara

B. F saat di material dengan relative permittivity 2

Jawab:

A. $F = k \frac{q_1 q_2}{r^2}$

$$F = 9 \times 10^9 \frac{24 \times 10^{-6} \times 18 \times 10^{-6}}{12^2}$$

$$F = 9 \times 10^9 \frac{432 \times 10^{-12}}{144}$$

$$F = 9 \times 10^9 \times 3 \times 10^{-12}$$

$$F = 27 \times 10^{-3}$$

$$F = 0,027 \text{ N}$$

B. $F = k \frac{q_1 q_2}{r^2}$

$$F = \frac{9 \times 10^9}{2} \frac{24 \times 10^{-6} \times 18 \times 10^{-6}}{144}$$

$$F = 4,5 \times 10^9 \frac{432 \times 10^{-12}}{144}$$

$$F = 4,5 \times 10^9 \times 3 \times 10^{-12}$$

$$F = 13,5 \times 10^{-3}$$

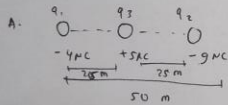
$$F = 0,0135 \text{ N}$$

5. Diketahui : $q_1 = -4 \mu\text{C} = -4 \times 10^{-6} \text{C}$
 $q_2 = -9 \mu\text{C} = -9 \times 10^{-6} \text{C}$
 $q_3 = +5 \mu\text{C} = +5 \times 10^{-6} \text{C}$
 $r_{23} = 50 \text{ m}$

Ditanya A : F_3 di tengah

B : Dimana muatan $+5 \mu\text{C}$ agar tidak terpengaruh gaya Coulomb

Jawab :



$$F_1 = k \frac{q_1 q_3}{r_{13}^2}$$

$$F_1 = 9 \times 10^9 \times \frac{4 \times 10^{-6} \times 5 \times 10^{-6}}{(25)^2}$$

$$F_1 = 9 \times 10^9 \times \frac{20 \times 10^{-12}}{25^2}$$

$$F_1 = 9 \times 10^9 \times 0,032 \times 10^{-12}$$

$$F_1 = 0,288 \times 10^{-3} \text{ N}$$

$$F_2 = k \frac{q_1 q_3}{(r_{13})^2}$$

$$F_2 = 9 \times 10^9 \times \frac{9 \times 10^{-6} \times 5 \times 10^{-6}}{(25)^2}$$

$$F_2 = 9 \times 10^9 \times \frac{45 \times 10^{-12}}{625}$$

$$F_2 = 9 \times 10^9 \times 0,072$$

$$F_2 = 0,648 \times 10^{-3} \text{ N}$$

$$F_3 = F_2 - F_1$$

$$F_3 = 0,648 \times 10^{-3} - 0,288 \times 10^{-3}$$

$$F_3 = 0,36 \times 10^{-3} \text{ N mendekati ke } q_2$$

8. $F_{13} = F_{23}$

$$k \frac{q_1 q_3}{r_{13}^2} = k \frac{q_2 q_3}{r_{23}^2}$$

$$\frac{q_1}{r_{13}^2} = \frac{q_2}{r_{23}^2}$$

$$\frac{4 \times 10^{-6}}{r_{13}^2} = \frac{9 \times 10^{-6}}{(r - r_{13})^2}$$

$$\frac{4}{(r_{13})^2} = \frac{9}{(r - r_{13})^2}$$

$$\frac{2}{r_{13}} = \frac{3}{r - r_{13}}$$

$$2r - 2r_{13} = 3r_{13}$$

$$5r_{13} = 2r$$

$$r_{13} = \frac{2}{5} r$$