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UTS Elektrodinamika.

1.) B. Benda yang memiliki sedikit elektron

Alasan: Suatu benda dikatakan bermuatan listrik jika benda tersebut kekurangan atau kelebihan elektron. Benda dikatakan bermuatan positif jika benda tersebut kelebihan proton atau jika jumlah muatan positif (proton) lebih banyak daripada muatan negatif (elektron).

2) E. 0,25

Urutan:

Dik: $F_1 = 2 \text{ N}$; $F_2 = 2 \cdot r_1$

Dit: F_2 ?

Jawab:

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

$$\frac{F_1}{F_2} = \frac{k \cdot \frac{q_1 \cdot q_2}{r_1^2}}{k \cdot \frac{q_1 \cdot q_2}{r_2^2}}$$

$$\frac{F_1}{F_2} = \frac{r_2^2}{r_1^2}$$

$$\frac{F_1}{F_2} = \frac{(2r_1)^2}{r_1^2}$$

$$F_1 \cdot r_1^2 = F_2 \cdot 4r_1^2$$

$$F_2 = \frac{1}{4} F_1$$

$$F_2 = 0,25 \text{ (E)}$$

3.) A. 0,054 N

Urutan:

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

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

$$= 54 \cdot 10^9 \cdot 10^{-6} \cdot 10^{-6}$$

$$= 54 \cdot 10^{-3}$$

$$= 0,054 \text{ N (A)}$$

4.) E. $F\sqrt{3}$

Jawab:

Misalkan pita tinggaul muatan dititik A

Muatan A mengalami interaksi tolak menolak dengan muatan B dengan gaya sebesar

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

$$F = k \times q^2 / r^2$$

Muatan A mengalami interaksi tolak menolak dengan muatan B dengan gaya sebesar

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

$$F = k \times q^2 / r^2$$

Resultan gaya yang dialami muatan dititik A

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

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

$$F_c^2 = 3F^2$$

$$F_c = F\sqrt{3} \quad (E)$$

5.) C. 100 N

Jawab:

$$\text{Diket: } q_1 = 24 \mu\text{C} = 24 \cdot 10^{-6} \text{ C}$$

$$q_2 = 20 \mu\text{C} = 2 \cdot 10^{-5} \text{ C}$$

$$r = 12 \text{ cm} = 12 \cdot 10^{-2} \text{ m}$$

$$E = 3$$

Dit : F ?

Jawab :

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

$$F = \frac{9 \cdot 10^9}{3} \times \frac{2 \cdot 10^{-5} \times 24 \cdot 10^{-6}}{(12 \cdot 10^{-2})^2}$$

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

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

$$F = 10^2$$

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

6.) B. 3,6 N move to left

Uraian:

Diket: $q_2 = -9 \mu C = -9 \cdot 10^{-6} C$

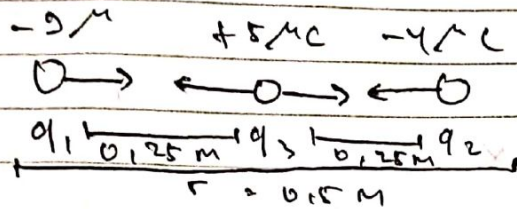
$q_3 = +5 \mu C = +5 \cdot 10^{-6} C$

$q_1 = -4 \mu C = -4 \cdot 10^{-6} C$

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

Dit: $F?$

Jawab:



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

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

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

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

$$F_2 = k \cdot \frac{q_2 \cdot q_1}{(r_{21})^2}$$

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

$$F_2 = \frac{9 \cdot 10^9 \cdot 20 \cdot 10^{-12}}{625 \cdot 10^{-4}}$$

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

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

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

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

7.) $F_c = 2,3 \text{ N}$

Uraian

$$F_{qc} = k \cdot \frac{q_b \cdot q_c}{r^2}$$

$$= 9 \cdot 10^9 \cdot \frac{60 \cdot 10^{-9} \cdot 30 \cdot 10^{-9}}{(2 \cdot 10^{-2})^2}$$

$$= \frac{16200 \cdot 10^{-9} \text{ N}}{4 \cdot 10^{-4}}$$

$$= 40,5 \cdot 10^{-3} \text{ N}$$

$$F_c = \sqrt{F_{(Ac)}^2 + F_{(Bc)}^2}$$

$$= \sqrt{13,5 \cdot 10^{-3} \text{ N} + 40,5 \cdot 10^{-3} \text{ N}}$$

$$= \sqrt{54 \cdot 10^{-3} \text{ N}}$$

$$= \sqrt{54 \cdot 10^{-2} \text{ N}}$$

$$= 2,3 \text{ N}$$

8.) $X = 0,33 \text{ r}$

Urutan:

Diket: $q_a = -2 \mu\text{C}$ $q_c = +3 \mu\text{C}$
 $q_b = -8 \mu\text{C}$

Dit: $r, a-c?$

Jawab:

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

$$F_{ca} = F_{cb}$$

$$k_{ac} \cdot \frac{q_a}{x^2} = k_{bc} \cdot \frac{q_b}{(r-x)^2}$$

$$\frac{q_a}{x^2} = \frac{q_b}{(r-x)^2}$$

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

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

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

$$\frac{1}{x} = \frac{2}{(r-x)}$$

$$2x = r - x$$

$$3x = r$$

$$x = \frac{1}{3} r$$

$$x = 0,33 \text{ r}$$

9.) D. 3 m

Urutan

Diket: $q_1 = 5 \mu\text{C}$ $q_2 = 5 \mu\text{C}$ $F = 0,025 \text{ N}$

$$q_2 = 5 \mu\text{C}$$

$$F = 0,025 \text{ N}$$

Jawab:

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

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

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

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

$$r^2 = 9$$

$$r = \sqrt{9}$$

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

10.) Diket: $q_1 = q_3 = 50 \mu\text{C} = 5 \cdot 10^{-5}$

$$q_2 = 40 \mu\text{C} = 4 \cdot 10^{-5}$$

Ditanya: $F?$

Jawab:

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

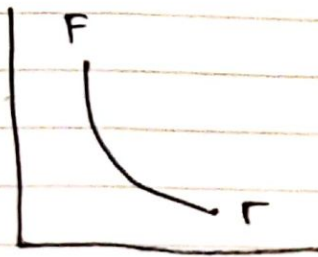
$$= 9 \cdot 10^9 \cdot \frac{5 \cdot 10^{-5} \cdot 4 \cdot 10^{-5}}{r^2}$$

$$= 9 \cdot 10^{-9} \cdot \frac{5 \cdot 10^{-5} \cdot 4 \cdot 10^{-5}}{r^2}$$

$$= \frac{180 \cdot 10^{-1}}{r^2}$$

Essay.

1.)



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

$$F = \frac{1}{r^2}$$

2.) Diket : $q_1 = +8 \text{ } \mu\text{C} = +8 \cdot 10^{-6} \text{ C}$
 $q_2 = -4 \text{ } \mu\text{C} = -4 \cdot 10^{-6} \text{ C}$
 $r = 2 \text{ m}$

Dit = F

Jawab.

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

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

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

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

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

$$F = 0,072 \text{ N}$$

3.1 Diket = $q_1 = 24 \mu C = 24 \cdot 10^{-6} C$
 $q_2 = 18 \mu C = 18 \cdot 10^{-6} C$
 $r = 12 m$

Dit :
 A. F di udara?
 B. F di relative permittivity?

Jawab

A.1 $F = k \cdot \frac{q_1 \cdot q_2}{r^2}$

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

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

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

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

$$F = 0,027 N$$

B.1 $F = \frac{k}{\epsilon} \cdot \frac{q_1 \cdot q_2}{r^2}$

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

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

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

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

$$F = 0,0135 N$$