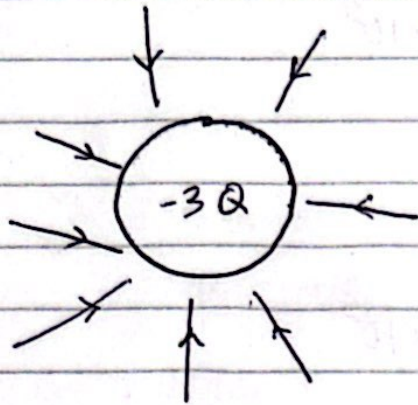


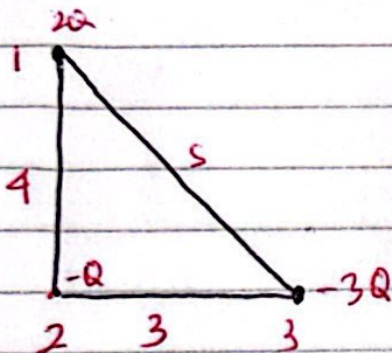
Nama - Alyana Atina
NPM = 2323022002

1. (a.)



Karena pada muatan $3Q$ bermuatan positif maka arah garis gaya listrik ke dalam.

(b.) Muatan $-3Q$ dipengaruhi $2Q$ dan $-Q$



$$\begin{aligned}
 F_{23} &= k \frac{Q_2 Q_3}{r^2} \\
 &= 9 \times 10^9 \frac{2Q \cdot 3Q}{5^2} \\
 &= \frac{(27 \times 10^9) Q^2}{25} \\
 &= 3 \times 10^9 Q
 \end{aligned}$$

$$\begin{aligned}
 F_{13} &= k \frac{Q_1 Q_3}{r^2} \\
 &= 9 \times 10^9 \frac{2Q \cdot 3Q}{4^2} \\
 &= \frac{9 \times 10^9 6Q^2}{16} \\
 &= \frac{(54 \times 10^9) Q^2}{16} \\
 &= 2,16 \times 10^9
 \end{aligned}$$

F pada muatan $-3Q$ adalah $(2,16 \times 10^9) + (3 \times 10^9)$
 $= 5,16 \times 10^9 \text{ N}$

(c)

$$E = \frac{F}{Q}$$

$$= \frac{5,16 \times 10^9}{3} = 1,72 \times 10^9$$

(d)

$$E = \frac{F}{Q}$$

$$= \frac{5,16 \times 10^9}{3} = 1,72 \times 10^9$$

(e)

$$V_p = V_{p1} + V_{p2}$$

$$= k \left(\frac{Q_1}{r} + \frac{Q_2}{r} \right)$$

$$= 9 \times 10^9 \left(\frac{2Q}{5} + \frac{(-Q)}{3} \right)$$

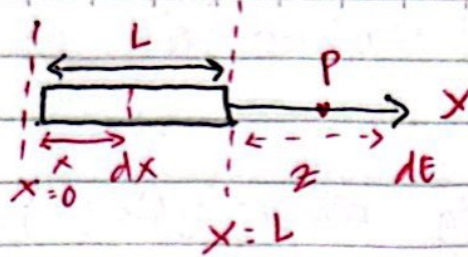
$$= 9 \times 10^9 \left(\frac{2Q}{5} - \frac{Q}{3} \right)$$

$$= 9 \times 10^9 \left(\frac{6Q - 5Q}{15} \right)$$

$$= 9 \times 10^9 \cdot 0,067$$

$$= 0,603 \times 10^9$$

2. (a)



$$\lambda = \frac{\text{muatan}}{\text{panjang}}$$

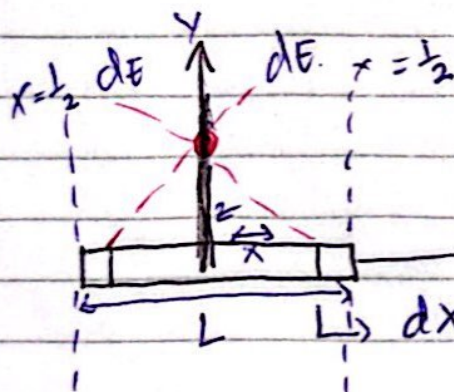
$$E = \int dE$$

$$dE = k \frac{dq}{r^2}, \quad dq = \lambda dx, \quad r = L + z - x$$

$$dE = k \frac{\lambda dx}{(L + z - x)^2}$$

$$E = k \lambda \int_0^L \frac{dx}{(L + z - x)^2}$$

(b)



Tinjau elemen (kanan)

$$E = \int dE_y = \int dE \sin \theta$$

$$dE = k \frac{dq}{r^2}, \quad dq = \lambda dx$$

$$r = \sqrt{x^2 + z^2}$$

$$dE_y = dE \sin \theta$$

$$= k \frac{\lambda dx}{(x^2 + z^2)^{3/2}}$$

$$E = k \lambda z \int_{-1/2}^{1/2} \frac{dx}{(x^2 + z^2)^{3/2}}$$

3. Rumus luas permukaan bola
 $= A = 4\pi r^2$

Untuk menghitung medan listrik (E) di luar bola:

$$\Phi = \frac{Q_{enc}}{\epsilon_0}$$

Untuk bola konduktor $Q_{enc} = Q$

karena muatan hanya terdistribusi pada permukaan

$$\Phi = \frac{Q}{\epsilon_0}$$

$$\Phi = E \cdot A = E \cdot 4\pi R^2$$

$$E = \frac{Q}{4\pi R^2 \epsilon_0}$$

$$E = \frac{Q}{4\pi \epsilon_0 R^2}$$

Substitusi dengan persamaan

$$E = \frac{Q \cdot 4\pi R^2}{4\pi \epsilon_0 R^2}$$

$$= \frac{Q}{\epsilon_0}$$

4. (a.) Hubungan rapat muatan dengan Medan listrik

$$\epsilon = \frac{\sigma}{\epsilon_0} \text{ dengan } \epsilon_0 = 8,85 \times 10^{-12} \text{ C/Vm}$$

sehingga

$$\sigma = \epsilon \cdot \epsilon_0$$

$$= kr^3 \hat{r} \cdot 8,85 \times 10^{-12}$$

$$= 9 \times 10^9 \cdot r^3 \cdot \hat{r} \cdot 8,85 \times 10^{-12}$$

$$= 79,65 \times 10^{-2} \cdot r^3 \cdot \hat{r}$$