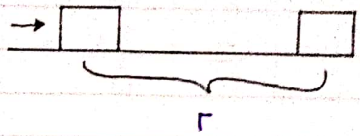
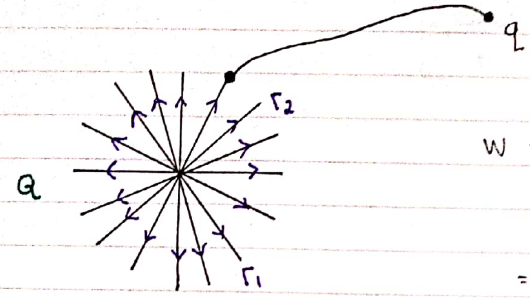
Kalisma

Senin 22 . 04 . 24

USAHA DAN ENERGI

$W = \int F \cdot dp \rightarrow dr$





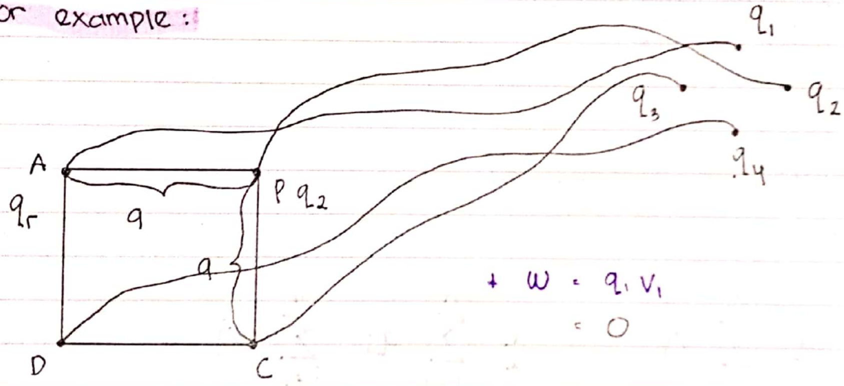
$$W = \int F \cdot dr$$

$$= -q \int E \, dr$$

$$= -q \left[-k \frac{Q}{r} \right]$$

$$W = qV$$

For example :



$+ \; W = q_1 V_1$

$= 0$

$+ \; W_2 = q_2 V_2$

$$V_2 = k \frac{q_1}{a}$$

$$W_2 = kq \frac{q_1}{a}$$

$$= k \frac{q_1 q_2}{a}$$

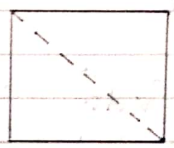
$+ \; W_3 = q_3 V_3$

$$V_3 = k \frac{q_1}{\sqrt{2}\, a} + k \frac{q_2}{a}$$

$$W_3 = k \left[\frac{q_1 q_3}{\sqrt{a}} + \frac{q_2 q_3}{a} \right]$$

$\sqrt{2}a \rightarrow a^2 = \sqrt{a^2 + a^2}$

$a = a\sqrt{2}$



$* \; W_4 = q_4 V_4$

$$V_4 = k\left[\frac{q_1}{a} + \frac{q_2}{\sqrt{2}a} + \frac{q_3}{a}\right]$$

$$W_4 = k\left[\frac{q_1 q_4}{a} + \frac{q_2 q_4}{\sqrt{2}a} + \frac{q_3 q_4}{a}\right]$$

$$W_{tot} = W_1 + W_2 + W_3 + W_4$$

$$= \sum_{i=1}^{n} \sum_{j \neq i}^{M} q_i \frac{q_j}{4\pi \varepsilon_0 r_{ij}}$$

$$= \frac{1}{8\pi\varepsilon_0} \sum_{i=1}^{n} q_i \sum_{j \neq i}^{n} \frac{q_j}{r_{ij}}$$

$$= \frac{1}{2} \sum_{i=1}^{n} q_i \sum \frac{1}{4\pi\varepsilon_0 r_{ij}} q_j$$

$$W = \frac{1}{2} \sum_{i=1}^{n} q_i \sum_{j \neq i}^{n} v_j = \frac{1}{2} \sum_{i=1}^{n} q_i \sum_{j \neq i}^{n} v_j$$

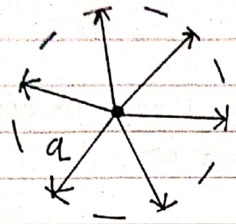
$W = \frac{1}{2} \int \lambda v \, d\vec{l} \rightarrow$ Potensial oleh muatan pada garis

$W = \frac{1}{2} \int \sigma v \, d\vec{s} \rightarrow$ Potensial oleh muatan pada permukaan

$W = \frac{1}{2} \int \rho v \, d\vec{\tau} \rightarrow$ Potensial oleh muatan pada volume

Dipindai dengan CamScanner

$$\rho = \varepsilon_0 \nabla \cdot \vec{E} \rightarrow \nabla \cdot \vec{E} = \frac{\rho}{\varepsilon_0} \Big\} \text{ Hukum Gauss bentuk diferensial}$$



$$\oint E \, d\vec{q} = \frac{Q}{\varepsilon_0}$$

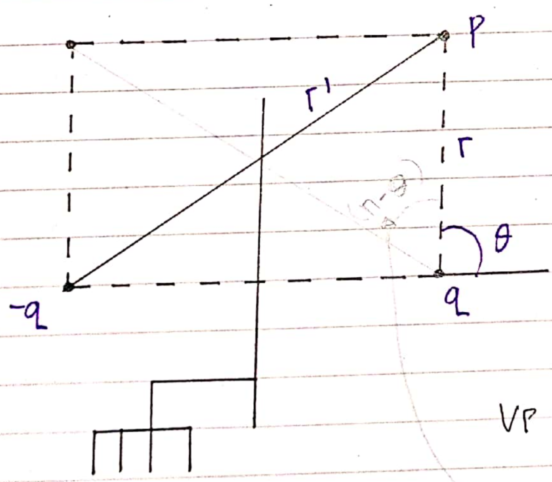
Sehingga :

$$W = \frac{\varepsilon_0}{2} \int (\nabla \cdot E) \, V \, d\tau_0$$

$$W = \frac{\varepsilon_0}{2} \int E^2 \, d\tau_0$$

BAB 3 " METODA PENENTUAN POTENSIAL "

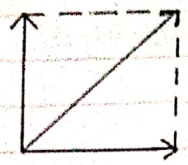
⁑ Metode Bayangan



$$V_P = k \left[\frac{q}{r} + \frac{-q}{r'} \right]$$

$$= kq \left[\frac{1}{r} - \frac{1}{\left(r^2 + (2h)^2 + 4hr\cos(\pi - \theta)\right)^{\frac{1}{2}}} \right]$$

$$V_P = kq \left[\frac{1}{r} - \frac{1}{\left(r^2 + 4h^2 + 4hr \cos\theta\right)^{\frac{1}{2}}} \right]$$



$$\vec{E}_r = -\frac{\partial V}{\partial r}$$

$$\vec{E}_r = -kq \left[-\frac{1}{r^2} - \frac{-\frac{V}{2}(r^2+4h^2+4hr\cos\theta)^{-\frac{1}{2}} - (2r+4h\cos\theta)}{(r^2+4h^2+4hr\cos\theta)^{1}} \right]$$

$$= kq \left[\frac{1}{r^2} - \frac{(r+2h\cos\theta)}{(r^2+4h^2+4hr\cos\theta)^{3/2}} \right]$$

$$\vec{E}_\theta = \frac{\partial V}{\partial \theta}$$

$$= -kq \left[- \frac{\frac{1}{2}(r^2+4h^2+4hr\cos\theta)^{-\frac{1}{2}}\, 4hr\sin\theta}{(r^2+4h^2+4hr\cos\theta)^{1}} \right]$$

$$= kq \left[\frac{2hr\sin\theta}{(r^2+4h^2+4hr\cos\theta)^{3/2}} \right]$$