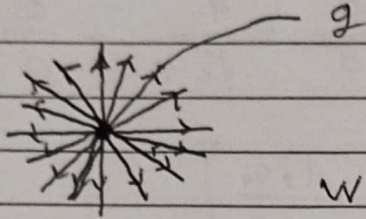
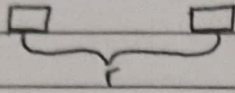


Usaha dan Energy

$$W = \int F \cdot dl = -q \int E \cdot dl$$



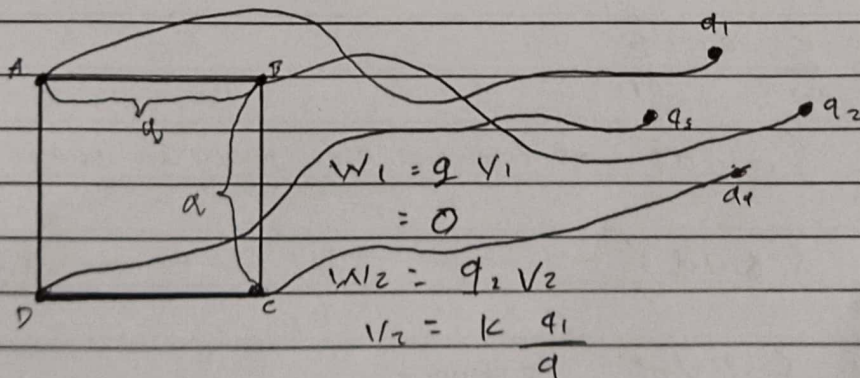
$$W = \int F \cdot dl$$

$$= -q \int E \cdot dl$$

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

$$W = qV$$

EXAMPLE



$$W_2 = k q_2 \frac{q_1}{a} = k \frac{q_1 q_2}{a}$$

$$W_3 = q_3 V_3$$

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

$$W_3 = k \left[\frac{q_1 q_3}{\sqrt{2}a} + \frac{q_2 q_3}{a} \right]$$

$$W_4 = q_4 V_4 \rightarrow V_4 = k \left[\frac{q_1}{a} + \frac{q_2}{\sqrt{2}a} + \frac{q_3}{a} \right]$$

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

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

$$= \sum_{i=1}^n \sum_{j \neq i}^n q_i \frac{q_j}{4\pi\epsilon_0 r_{ij}}$$

$$= \frac{1}{2} \sum_{i=1}^n q_i \sum_{j \neq i}^n \frac{q_j}{r_{ij}}$$

$$= \frac{1}{2} \sum_{i=1}^n q_i \sum_{j \neq i}^n \frac{1}{4\pi\epsilon_0 r_{ij}} q_j$$

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

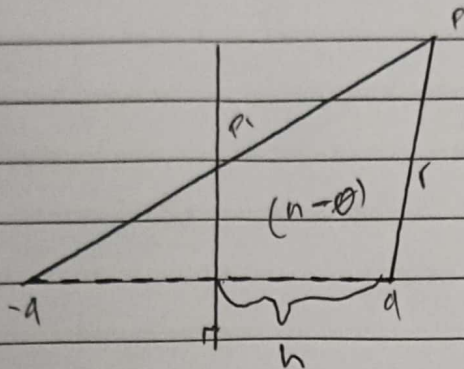
$$W = \frac{1}{2} \sum_{i=1}^n q_i \sum_{j \neq i}^n V_j$$

$$W = \frac{1}{2} \int \rho V d\vec{r} \rightarrow \text{Potensial oleh muatan pada garis.}$$

$$W = \frac{1}{2} \int \rho V d\vec{s} \rightarrow \text{Permukaan.}$$

$$W = \frac{1}{2} \int \rho V d\vec{G} \rightarrow \text{Volume}$$

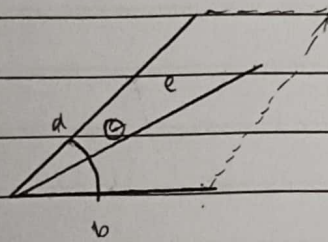
Metode Bayangan



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

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

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



$$E_P = - \frac{\partial V}{\partial P}$$

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

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

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