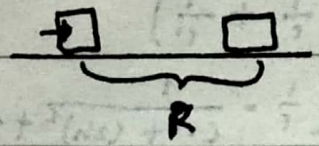
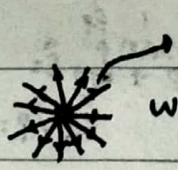
Kalisma No: Date: 22-09-2021

USAHA DAN ENERGI

$W = \int F \, dp \rightarrow d\vec{l}$





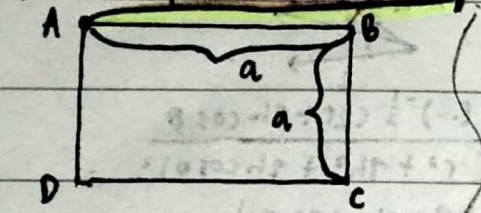
$W = \int F \, dl$

$= -Q \int \vec{E} \, dl$

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

$W = qV$

for example



$W_1 = q_1 V_1$ ($V_1 \rightarrow 0$)

$= 0$

$W_2 = q_2 V_2$

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

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

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

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

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

$= \frac{1}{2} \sum_{i=1}^{n} q_1 \sum \frac{1}{4\pi\varepsilon_0 r_{ij}} q_j$

$W_3 = q_3 V_3$

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

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

$W_4 = q_4 V_4$

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

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

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

$W = \frac{1}{2} \int \lambda \, d\vec{l}$ → potensial oleh muatan garis

$W = \frac{1}{2} \int \sigma V \, d\vec{s}$

$W = \frac{1}{2} \int \rho V \, dC$ → volume

$W = \frac{\varepsilon_0}{2} \int (\nabla . E) V \, dC$

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

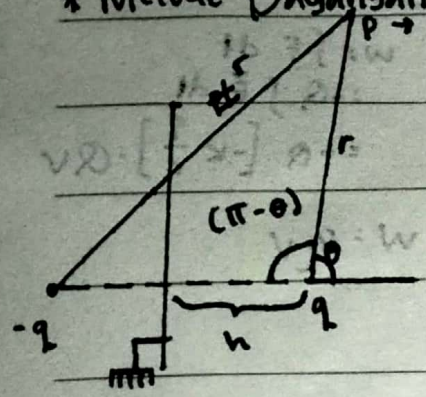
$\rho = \varepsilon_0 \nabla . \vec{E} \longrightarrow \nabla . \vec{E} = \frac{\rho}{\varepsilon_0}$

$\oint E \, da = \frac{Q}{\varepsilon_0}$

No: Date:

METODE PENENTUAN POTENSIAL

* Metode Bayangan



$\vec{E}_p$, $\vec{E}_2$

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

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

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

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

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

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

$E_\theta = \frac{\partial V}{\partial \theta}$

$= -kq\left[-\frac{\frac{1}{2}(\dots)^{-\frac{1}{2}} 4hr\sin\theta}{(\dots)'}\right]$

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