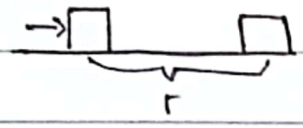
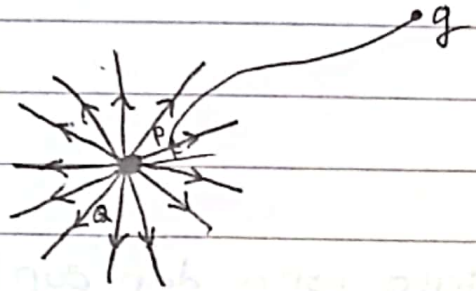
FISIKA MODERN

Date 22 APRIL 2024

Usaha dan Energi

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





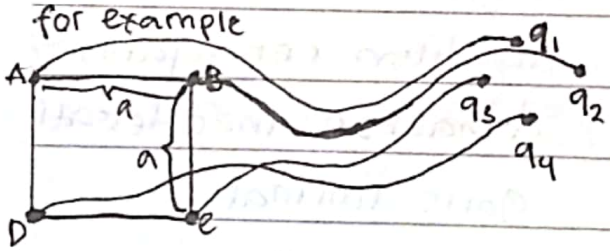
$W = \int F \cdot dr$

$= -q \int E\, dr$

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

$\boxed{W = qV}$

for example



$W_1 = q_1 V_1 = 0$

$W_2 = q_2 V_2$

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

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

$W_3 = q_3 V_3$

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

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

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

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

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

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

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

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

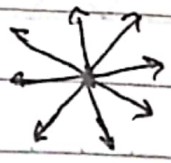
$\boxed{W = \frac{1}{2} \sum_{i=1}^{n} q \sum_{j \neq i}^{n} V_j} = \boxed{\frac{1}{2} \sum_{i=1}^{n} q_i \sum_{j \neq i}^{n} V_j}$

$W = \frac{1}{2} \int \rho V \, d\vec{l}$ → Potensial oleh muatan pada garis.

$W = \frac{1}{2} \int \sigma V d\vec{S}$ → Potensial oleh muatan pada permukaan

$W \frac{1}{2} \int \rho V d\delta$ → Volume.

$\rho = \varepsilon_0 \nabla \cdot \vec{E} \rightarrow \nabla \cdot \vec{E} = \frac{\rho}{\varepsilon_0}$



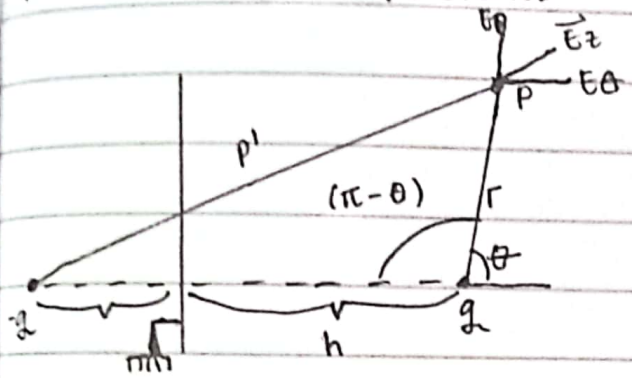
$\oint \varepsilon \vec{da} = \frac{Q}{\varepsilon_0}$

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

$W = \frac{\varepsilon_0}{2} \int E_\tau^2$

BAB 3

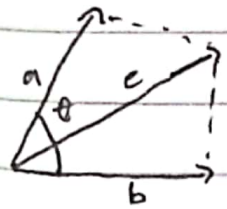
METODA PENENTUAN POTENSIAL



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

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

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



$\vec{E_p} = -\frac{\partial V}{\partial r}$

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

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

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

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

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