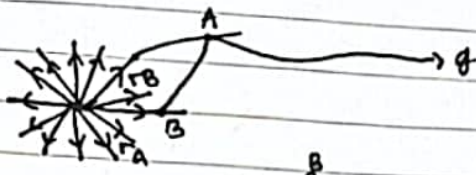


USAHA DAN ENERGI

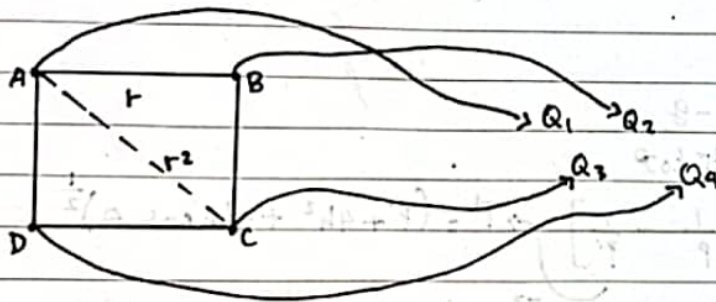
Pertemuan 9



$$W = \int_A^B \vec{F} \cdot d\vec{l}$$

$$= -q \int \vec{E} \cdot d\vec{l} \rightarrow dr$$

$$= -q \left[\int \frac{1}{4\pi\epsilon_0} \frac{q}{r^2} dr \right]$$



$$W_1 = q_1 \cdot V_1 = 0$$

$$W_2 = q_2 \cdot V_2 = q_2 \left[k \frac{q_1}{r_1} \right]$$

$$W_2 = q_2 \cdot V_2$$

$$W_3 = q_3 \cdot V_3$$

$$= q_3 \left[k \frac{q_1}{r_1} + k \frac{q_2}{r_2} \right]$$

$$= q_3$$

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

$$W_t = W_1 + W_2 + W_3 + W_4$$

$$= k \frac{q_1 q_2}{r} + k \frac{q_1 q_3}{r} + k \frac{q_2 q_3}{r} + \dots$$

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

$$W = \frac{1}{2} \sum_{i=1}^n q_i V_i$$

$$\bullet W = \frac{1}{2} \sum_{i=1}^n g_i v_i$$

$$\bullet W = \frac{1}{2} \int \lambda v dp$$

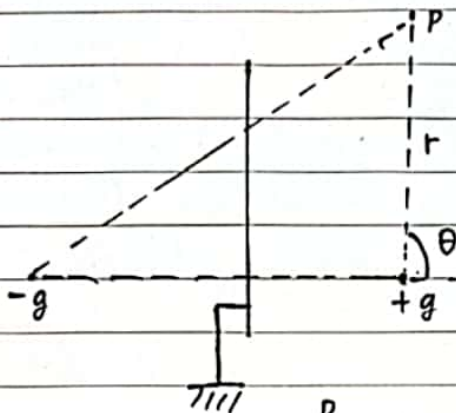
$$\bullet W = \frac{1}{2} \int \sigma v ds$$

$$\bullet W = \frac{1}{2} \int \rho v d\tau$$

$$\rho = \epsilon_0 (\nabla \cdot \vec{E})$$

$$\nabla \cdot \vec{E} = \frac{\rho}{\epsilon_0}$$

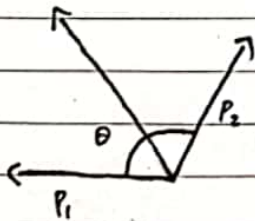
$$W = \frac{\epsilon_0}{2} \int \vec{E} \cdot d\vec{\tau}$$



$$P = \frac{1}{4\pi\epsilon_0} + \frac{-q}{4\pi\epsilon_0 r}$$

$$= \frac{q}{4\pi\epsilon_0} \left[\frac{1}{P} - \frac{1}{r'} \right] \rightarrow P' = (P^2 + 4h^2 + 4hr \cos \theta)^{\frac{1}{2}}$$

$$\vec{E}_P = \frac{dV}{dr} = k \left[\frac{1}{r} - \frac{1}{(r^2 + 4h^2 + 4hr \cos \theta)^{\frac{1}{2}}} \right]$$



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

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

