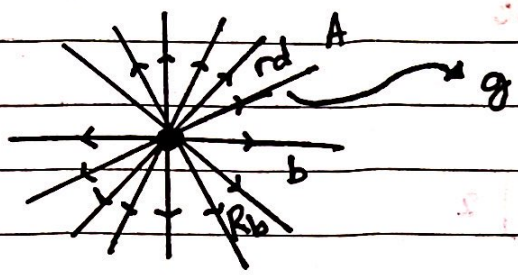
No Senin, 22/09 2024
Date

Kelistrikan dan Kemagnetan

Usaha dan Energi



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

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

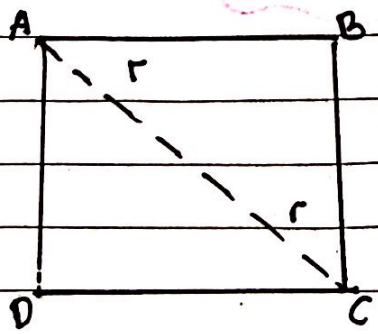
$$= -q \left[\int \frac{1}{4\pi\varepsilon_0} \frac{q}{\rho^2} d\rho \right]$$

$$W = -q \left[-\frac{q}{4\pi\varepsilon_0 \rho} \right]$$

$$= Q\,[V]$$

$$W = QV$$

Contoh soal :



$q_1 = A$

$q_2 = B$

$q_3 = C$

$q_4 = D$

$W_1 = q_1 V_1 = 0$

$W_2 = q_2 V_2 = q_2 \left[K\, q_1 / r_1 \right]$

$W_2 = q_2 V_2$

$W_3 = q_3 V_3$

$= q_3 \left[K\, q_1 / r_1 + K\, q_2 / r_2 \right]$

$= q_3 \left[$

$W_4 = q_4 V_4 = q_4 \left[K\, q_1 / r + K\, q_2 / \sqrt{2} r + K\, q_3 / r \right]$

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Solusi :

$W_1 = q_1 V_1 = 0$

$W_2 = W_2 q_2 = \left[k \frac{q_1}{r_{ab}} q_2 \right] = 1 \cdot \frac{2}{10} 2 = 0.4$ dyne.cm

$W_3 = V_3 q_3 = \left[k \frac{q_1}{r_{ac}} + k \frac{q_2}{r_{bc}} \right] q_3$

$= \left[1\ ^2/_{10} + 1\ ^2/_{10\sqrt{2}} \right] 2$

$= 0.683$ dyne.cm

$W_4 = V_4 q_4 = \left[k\ ^{q_1}/_{rad} + k\ ^{q_2}/_{rbd} + k\ ^{q_3}/_{rcd} \right] q_4$

$= \left[1\ ^2/_{10\sqrt{2}} + 1\ ^2/_{10} + 2/10 \right] . 2$

$= 1.08$ dyne.cm

$W = W_1 + W_2 + W_3 + W_4$

$= 0 + 0,4 + 0,683 + 1,08$

$= 2,165$ dyne.cm

$W = {}^1/_2 \sum_{i=1}^{n} q_i V_i$

$W = \frac{1}{4\pi\varepsilon_0} \sum_{i=1}^{n} \left[\sum_{j \neq i}^{m} \frac{q_i q_j}{r_{ij}} \right.$

$W = {}^1/_2 \int x V \, dp$

$W = {}^1/_2 \int \gamma V \, \delta 5$

$W = {}^1/_2 \int \rho V \, d\sigma$

$W = {}^1/_2 \sum_{i=1}^{n} q_i V_i$

$\rho = \varepsilon_0 (\nabla . \vec{E})$

$\nabla . \vec{E} = \rho / \varepsilon_0$

$W = \varepsilon_0 / 2 \int \vec{E} \, d\sigma$

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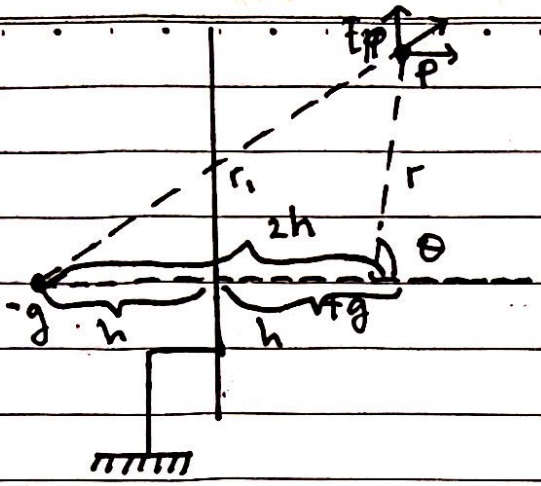

$$V = V_1 + V_2 = \frac{1}{4\pi\varepsilon_0}\frac{q}{r} + \frac{-q}{4\pi\varepsilon_0 r'}$$

$$V = \frac{q}{4\pi\varepsilon_0}\left[\frac{1}{r} - \frac{1}{r'}\right]$$

$$r' = (r^2 + 4h^2 + 4hr\cos\theta)^{1/2}$$

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

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

$$\frac{(2r+4h\cos\theta)}{(r^2+4h+4h\cos\theta)}$$