Hukum Gauss and appluid

$$\oint_s \vec{E}\, d\vec{a} = \int_v (\nabla\cdot\vec{E})\, dE.$$

→ Sustance of Gauss

$$\oint \vec{E}\cdot da = \oint \frac{q}{4\pi\varepsilon_0 \cancel{r^2}} \cancel{r^2} \sin\theta\, d\theta\, d\phi$$

$$= \frac{q}{4\pi\varepsilon_0} \int_0^{\pi}\int_0^{\pi} \sin\theta\, d\theta\, d\phi$$

$$= \frac{4\pi q}{4\pi\varepsilon_0}$$

$\oint \vec{E}\cdot da = \frac{q}{\varepsilon_0}$ → Persamaan Gauss dalam bentuk diferensial

▸ Hukum Gauss 2 dalam bentuk differensial

$$\int_v (\nabla\cdot\vec{E})\, da$$

$$a = \rho \cdot da$$

$\int (\nabla\cdot\vec{E})\, da = \frac{Q}{\varepsilon_0}$ $\quad\quad$ $\oint_s \vec{E}\cdot d\vec{a} = \int(\nabla\cdot E)\, da$

Date

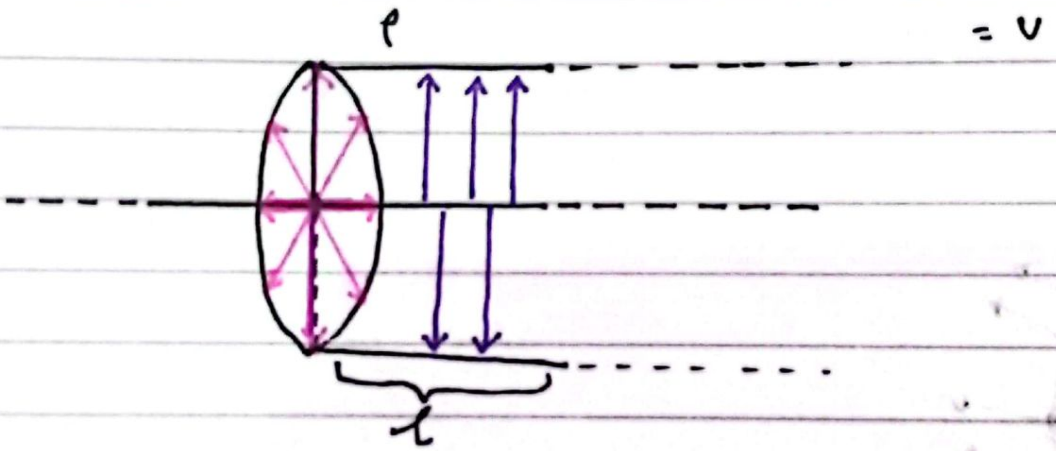
$$\nabla \cdot \vec{E} = \frac{1}{\varepsilon_0} \int \rho \cdot da$$

$$\nabla \cdot \vec{E} = \frac{1}{\varepsilon_0} \rho .$$

$$\boxed{\nabla \cdot \vec{E} = \frac{\rho}{\varepsilon_0}}$$ → H. Gauss dalam bentuk diferensial

$$\oint_s \vec{E} \cdot da = \int_v (\nabla \cdot E) d$$

Contoh.



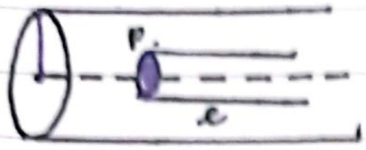
Peny.

$$\oint \vec{E}\, da = \frac{q}{\varepsilon_0} .$$

$$\vec{E}\,(2\pi z l) = \frac{\lambda \cdot l}{\varepsilon_0}$$

$$\vec{E} = \frac{\lambda}{2\pi \varepsilon_0 z} \hat{z}_0$$

Dipindai dengan CamScanner



Peny.

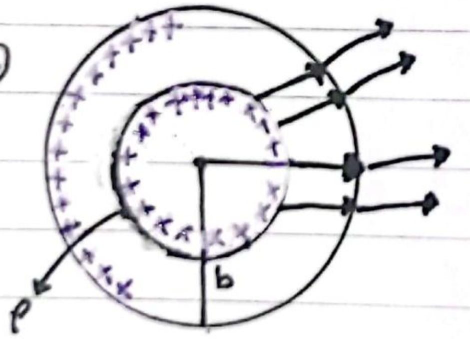
$$\oint \vec{E} \cdot d\vec{a} = \frac{Q}{\varepsilon_0}$$

$$\vec{E}(2\pi r \cdot l) = \frac{Q}{\varepsilon_0}$$

$$\vec{E} = \frac{Q}{2\pi \varepsilon_0 \rho l} \hat{r_0}$$

soal

(1.)



Calculate of $\vec{E}$

1.) $\rho < a$

2) $a < \rho < b$

3) $\rho < b$

Date

Peny.

$\vec{E} = 0$

② $\oint \vec{E} \cdot da = \dfrac{Q}{\varepsilon_0}$

$\oint \vec{E}\, da$

$\vec{E}\,(4\pi r^2) = \dfrac{1}{\varepsilon_0} \iiint \rho\, dG$

$= \dfrac{1}{\varepsilon_0} \int_0^a \int_0^{2\pi} \int_0^{\pi} \rho\, r^2 \sin\theta\, d\theta\, d\phi\, d\rho$

$= \dfrac{4\pi\rho}{\varepsilon_0} \int_0^a r^2\, dr$

$\int_0^{\pi} \int_0^{2\pi} \sin\theta\, d\theta\, d\phi = 4\pi$

$\vec{E} = \dfrac{4\pi}{\varepsilon_0} \left(\dfrac{1}{3} r^3 \Big|_0^a \right)$

3.) $\rho > b$

$\oint \vec{E} \cdot da = \dfrac{1}{\varepsilon_0} \iiint \rho\, dG$

X

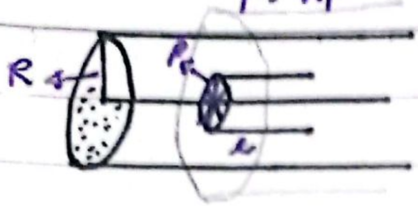
$= \dfrac{1}{\varepsilon_0} \iiint \rho\, r^2 \sin\theta\, d\theta\, d\phi\, dr$

$= \dfrac{4\pi\rho}{\varepsilon_0} \int_a^b \rho^2\, dr$

X

$= \dfrac{4\pi}{\varepsilon_0} \Big(\dfrac{1}{3}$

$\rho = k\rho^2$



1.) $r < R$

2) $r > R$

Peny.

1.) $r < R$

$$\oint \vec{E}\, da = \frac{1}{\varepsilon_0} \iiint (kr^2)\, r\, d\theta\, dz\, dr$$

$$= \frac{2\pi k}{\varepsilon_0} \int_0^{P} dz \int_0^{R} r^3\, dr$$

2.) $r > R$

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

$$\vec{E}\,(2\pi r l) = \frac{1}{\varepsilon_0} \int_0^{R} \int_0^{\pi}$$

$w = F.s$

$$V = \frac{w}{q} = \frac{F.s}{q} = \frac{k\frac{q.q}{r}.s}{q}$$

$$dv = -\int_{r_1}^{r_2} \vec{E}\,dr$$

$$= -\int_{r_1}^{r_2} \vec{E}\,dr$$

$$V_1 - V_2 = -\int_{\cdot}^{\cdot} \vec{E}\,dr$$

$$\Delta V = -\int_{r_1}^{r_2} \frac{q}{4\pi\varepsilon_0 r^2}\,dr$$

$$= -\frac{r_1 a}{4\pi\varepsilon_0}\int_{r_1}^{r_2} r^2 ar$$

$$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$$

$$V = k\frac{q}{r}$$