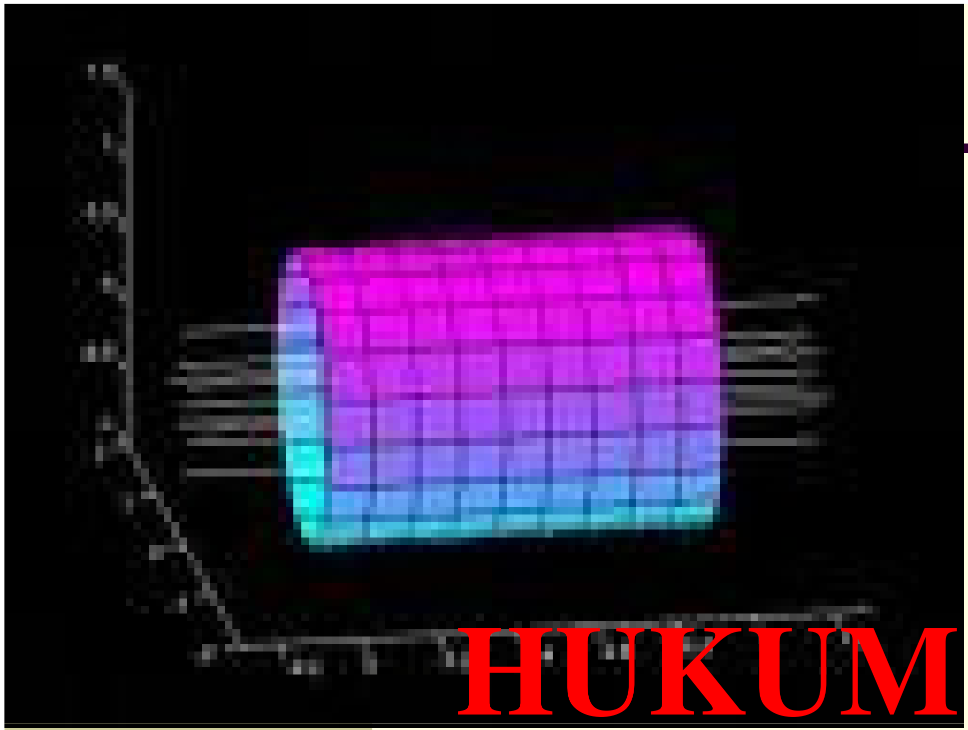


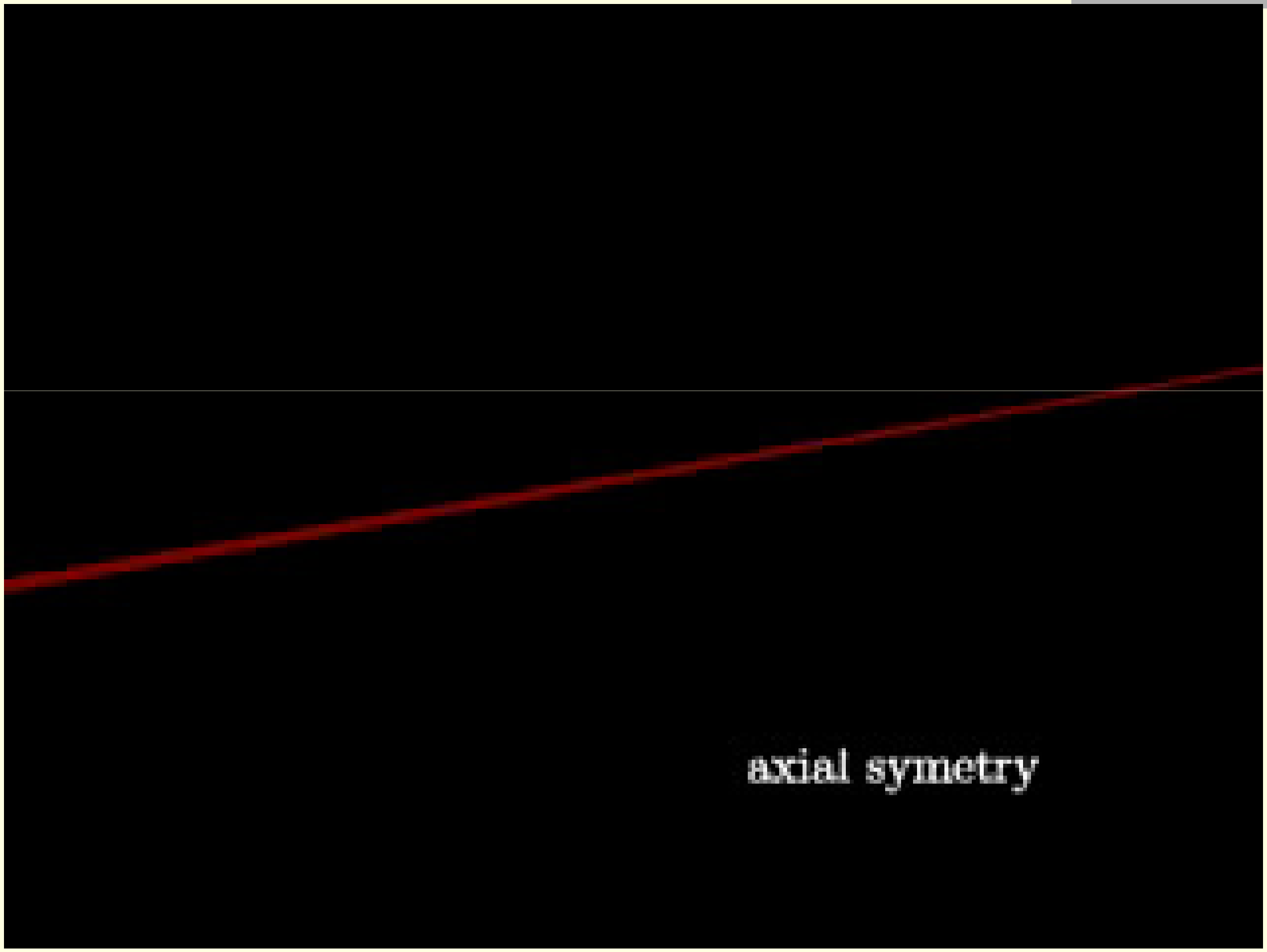
HUKUM GAUSS

Oleh :

Sabar Nurohman,M.Pd

Ke Menu Utama

Hukum Gaus

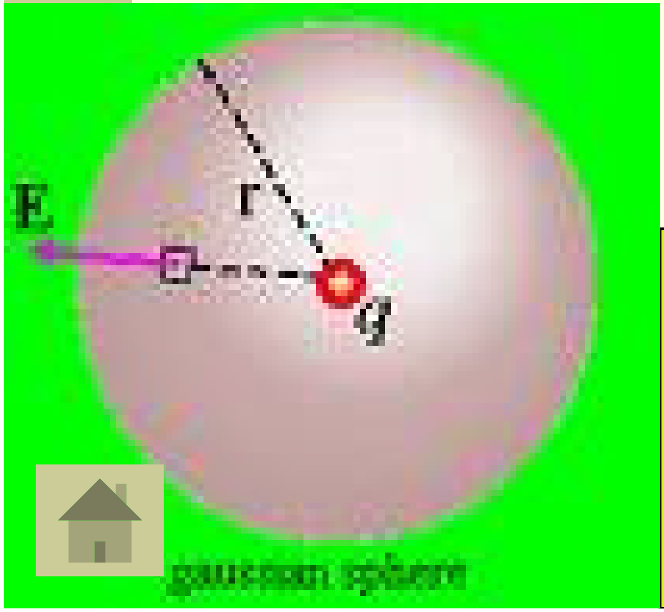


HUKUM GAUSS

$\Phi = EA$

Fluks Listrik

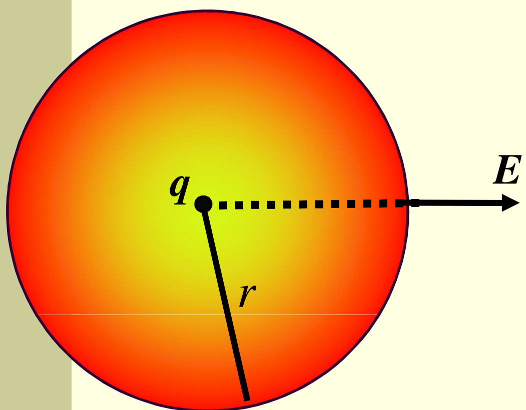
Menyatakan bahwa : Jumlah garis gaya yang keluar (fluks listrik total) dari suatu permukaan tertutup sebanding dengan jumlah muatan listrik yang dilingkupi oleh permukaan tertutup itu.



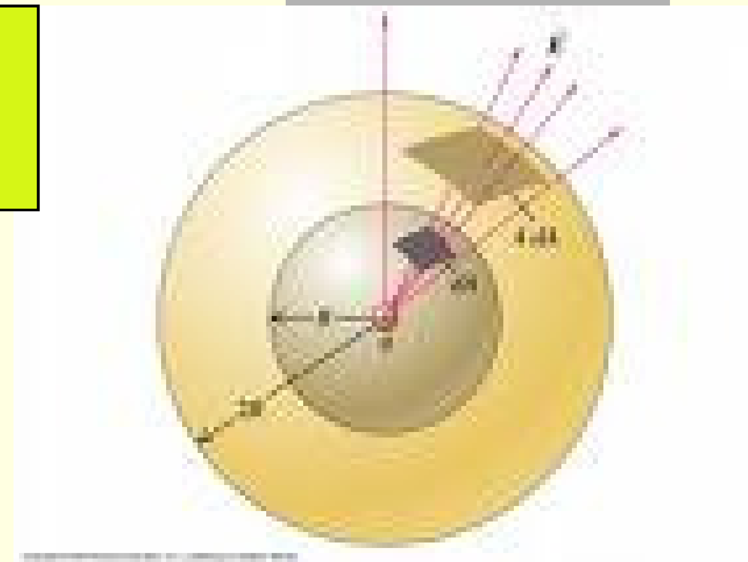
$$\Phi = \oint_s \vec{E}.d\vec{A} = \sum_i \frac{q_i}{\varepsilon_0} \qquad s = \text{permukaan tertutup}$$

$$\Phi = \oint_s \vec{D}.d\vec{A} = \sum_i q_i \qquad \vec{D} = \varepsilon_0 \vec{E}$$

MEDAN LISTRIK PADA PERMUKAAN BOLA



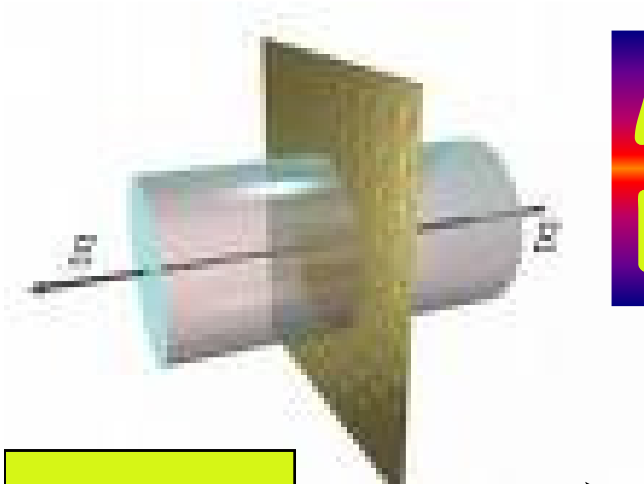
$$\Phi = \oint \vec{E}.d\vec{A} = \frac{q}{\varepsilon_0}$$



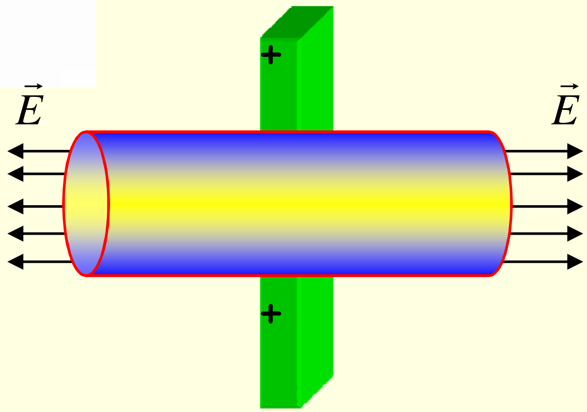
$$\oint \vec{E}.d\vec{A} = \frac{q}{\varepsilon_0} \quad ----> E(4\pi r^2) = \frac{q}{\varepsilon_0}$$

$$E = \frac{1}{4\pi r^2}\frac{q}{\varepsilon_0} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2} ---> \vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}\hat{r}$$

MEDAN DI SEKITAR BIDANG BERMUATAN



$$\sigma = \frac{q}{A}$$

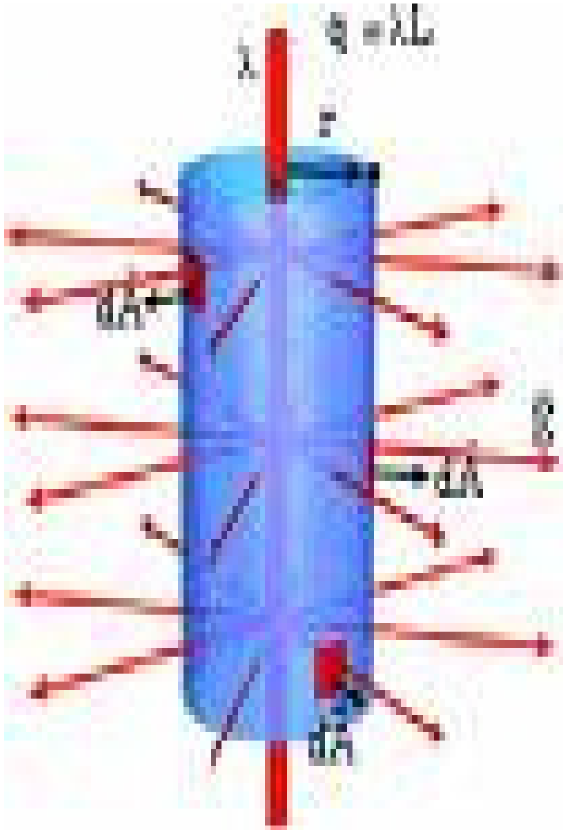


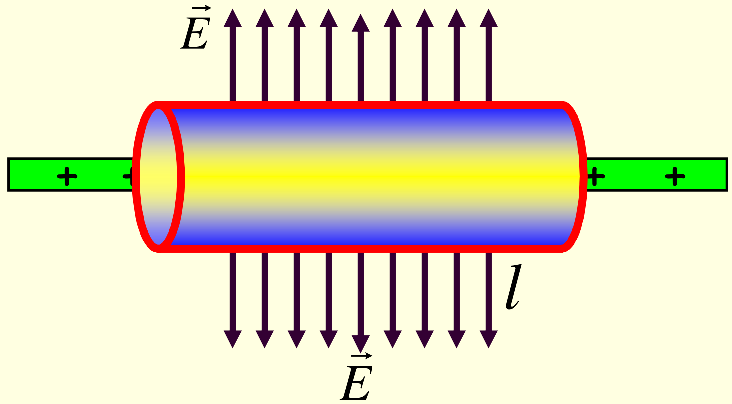
$$\oint \vec{E}.d\vec{A} = \frac{q}{\varepsilon_0} ----> \quad \sigma = \frac{q}{A}$$

$$2AE = \frac{\sigma A}{\varepsilon_0} --- > E = \frac{\sigma}{2\varepsilon_0}$$

σ = muatan per satuan luas

Medan Listrik di Sekitar Kawat Bermuatan Merata





$$\frac{q}{l} = \lambda$$

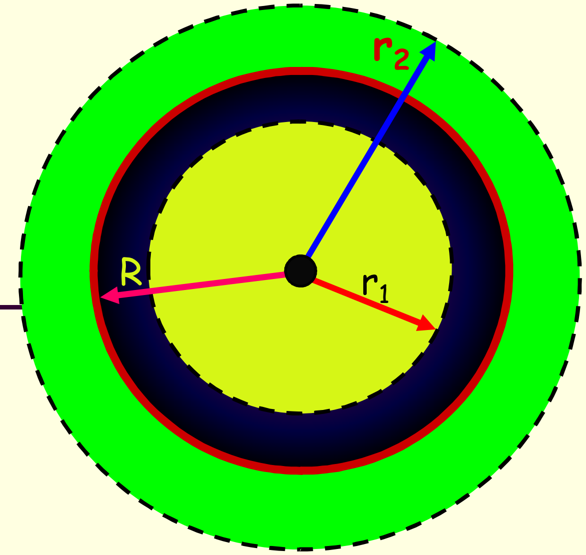
$$\oint \vec{E} . d\vec{A} = \frac{q}{\varepsilon_0}$$

$$E(2\pi r)l = \frac{q}{\varepsilon_0} \text{ - - - - > } \frac{q}{l} = \lambda$$

$$E = \frac{\lambda}{2\pi r \varepsilon_0} = \frac{1}{2\pi\varepsilon_0}\frac{\lambda}{r}$$

λ = muatan per satuan panjang

Medan Listrik Pada Bola Bermuatan



Bola isolator bermuatan merata dengan rapat muatan :

$$\rho = \frac{Q}{V} = \frac{Q}{(4/3)\pi R^3} = \frac{3Q}{4\pi R^3}$$

Di Dalam Bola

$$\oint_{s_1} \vec{E}.d\vec{A} = \frac{q}{\varepsilon_0} ---> q = \text{Muatan yang dilingkupi } s_1$$

$$---->q = \rho V_1 = \rho((4/3)\pi r_1^{\,3})$$

$$E(4\pi r_1^{\,2}) = \frac{\rho((4/3)\pi r_1^{\,3})}{\varepsilon_0}$$

$$E = \frac{\rho r_1}{3\varepsilon_0} -------> \rho = \frac{Q}{V} = \frac{3Q}{4\pi R^3}$$

$$E(r) = \frac{Q}{4\pi\varepsilon_0}\frac{r_1}{R^3} ---> \text{Untuk } r < R \text{ (di dalam bola)}$$

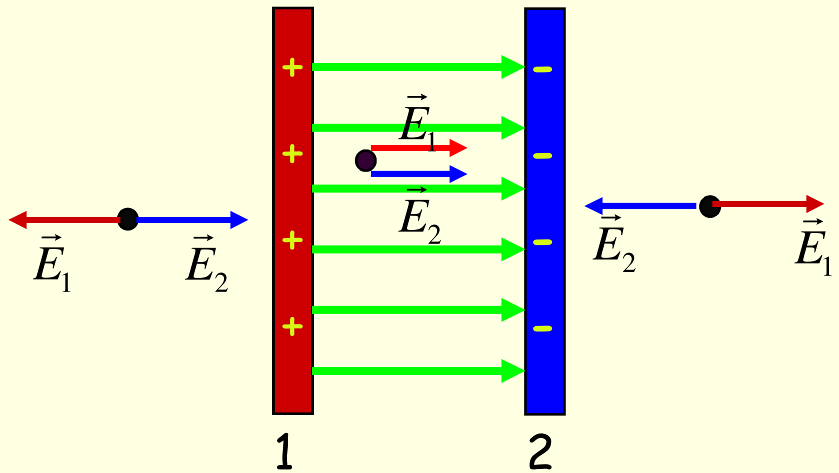
Di Luar Bola

$$\oint_{s_2} \vec{E}.d\vec{A} = \frac{Q}{\varepsilon_0}$$

$$E(4\pi r_2^2) = \frac{Q}{\varepsilon_0}$$

$$E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r_2^2}$$

MEDAN DI SEKITAR BIDANG BERMUATAN



$$\oint \vec{E}.d\vec{A} = \frac{q}{\varepsilon_0} \text{ ---> } \sigma = \frac{q}{A}$$

$$AE = \frac{\sigma A}{\varepsilon_0}$$

$$E = \frac{\sigma}{\varepsilon_0}$$

σ = muatan per satuan luas