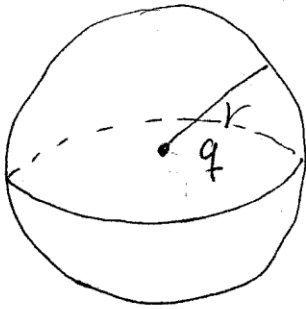


• Teorema de Gauss

▷ CAMPO ELÉCTRICO CREADO POR UNA CARGA PUNTUAL



$$\oint \vec{E} \cdot d\vec{s} = \frac{q_{enc}}{\epsilon_0}$$

$$E \oint d\vec{s} = \frac{q_{enc}}{\epsilon_0}$$

$$E \cdot S = \frac{q_{enc}}{\epsilon_0}$$

$$E = \frac{q}{4\pi r^2 \epsilon_0} = k \frac{q}{r^2}$$

$$\boxed{\vec{E} = k \frac{q}{r^2} \vec{u}_r}$$

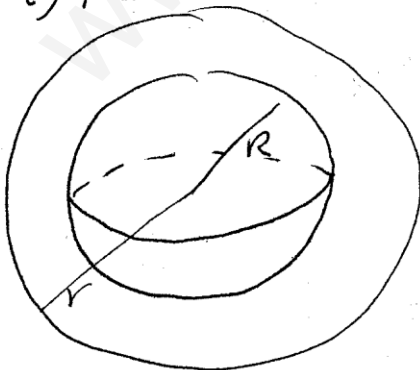


▷ CAMPO ELÉCTRICO CREADO POR UNA ESFERA

HUECA (Dielectric o conductor)

$$\epsilon = \frac{Q}{4\pi R^2} \left(\frac{C}{u^2} \right)$$

i) Fuera $r > R$

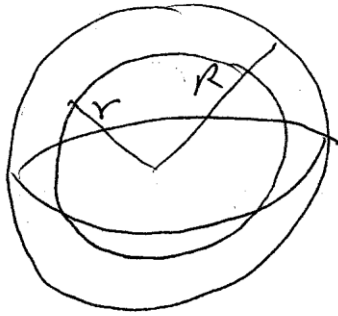


$$\oint \vec{E} \cdot d\vec{s} = \frac{q_{enc}}{\epsilon_0}$$

$$E \cdot S = \frac{Q}{\epsilon_0}$$

$$\boxed{\vec{E} = \frac{Q}{4\pi \epsilon_0 r^2} \vec{u}_r}$$

(i) Dentro : $r < R$



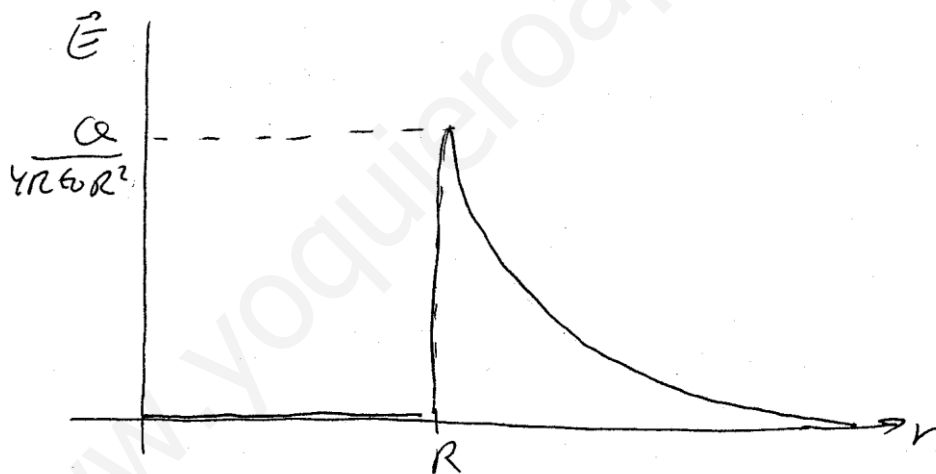
$$\oint \vec{E} d\vec{s} = \frac{q_{enc}}{\epsilon_0}$$

$$E \cdot S = \frac{q_{enc}}{\epsilon_0}$$

$$E = \frac{q_{enc}}{\epsilon_0 S} = \frac{0}{\epsilon_0 S} = 0$$

(ii) Superficie $r \rightarrow R$

$$E_{para} = \frac{Q}{4\pi\epsilon_0 r^2} \xrightarrow{r \rightarrow R} \frac{Q}{4\pi\epsilon_0 R^2}$$



▷ CAMPO ELECTRICO PARA UNA ESFERA MACIZA

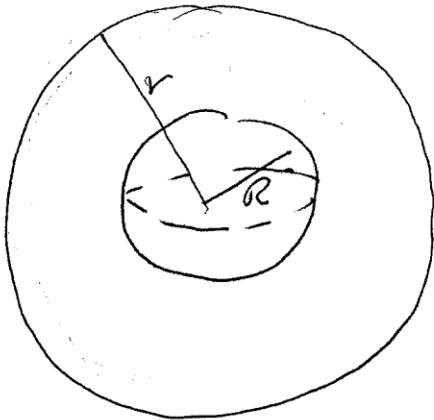
CONDUCTORA

$\vec{E} = \vec{E}_{hueca}$ porque al ser conductora la carga está repartida solo en superficie.

D CAMPO ELECTRICO DE UNA ESFERA MACIZA DIELECTRICA

i) Fuera $r > R$

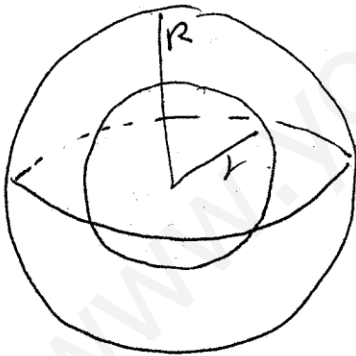
$$\rho = \frac{Q}{\frac{4}{3}\pi R^3}$$



$$\oint \vec{E} d\vec{s} = \frac{q_{enc}}{\epsilon_0}$$

$$\vec{E} = \frac{Q}{4\pi\epsilon_0 R^3} \vec{u}_r$$

ii) Dentro $r < R$



$$\oint \vec{E} d\vec{s} = \frac{q_{enc}}{\epsilon_0}$$

$$E \cdot S = \frac{\rho \cdot \frac{4}{3}\pi r^3}{\epsilon_0}$$

$$E = \frac{\rho \cdot \frac{4}{3}\pi r^3}{4\pi r^2 \epsilon_0} = \frac{Q}{\frac{4}{3}\pi R^3} \cdot \frac{\frac{4}{3}\pi r^3}{4\pi r^2 \epsilon_0}$$

$$E = \frac{Q \cdot \frac{r^3}{R^3}}{4\pi r^2 \epsilon_0} = \frac{Q r}{4\pi \epsilon_0 R^3}$$

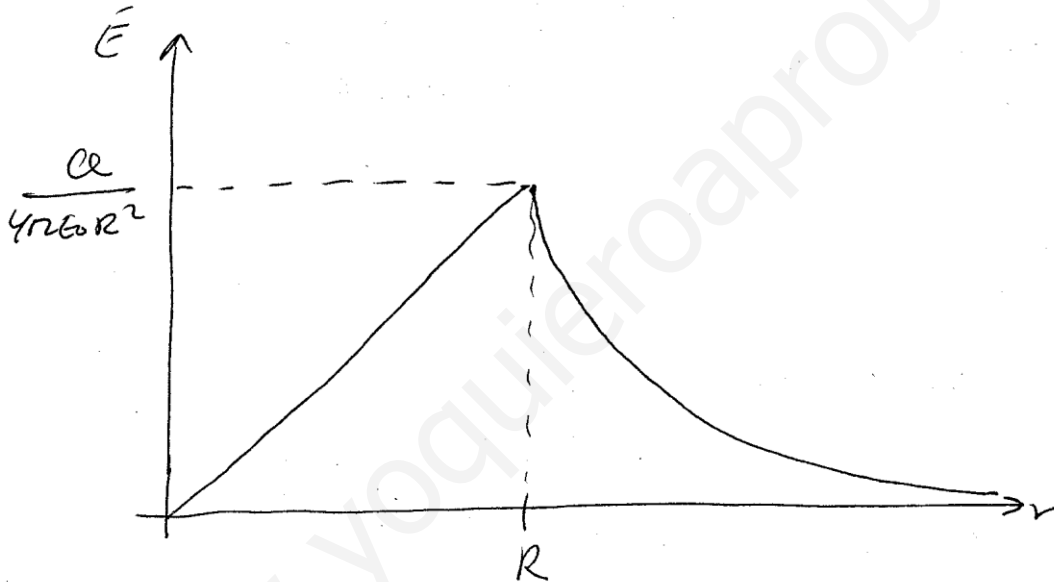
$$\vec{E} = \frac{Q r}{4\pi \epsilon_0 R^3} \vec{u}_r$$

(ii) Superfície $r \rightarrow R$.

Desde fora $E = \frac{Q}{4\pi\epsilon_0 r^2} \xrightarrow{r \rightarrow R} \frac{Q}{4\pi\epsilon_0 R^2}$

Desde dentro $E = \frac{Qr}{4\pi\epsilon_0 R^3} \xrightarrow{r \rightarrow R} \frac{Q}{4\pi\epsilon_0 R^2}$

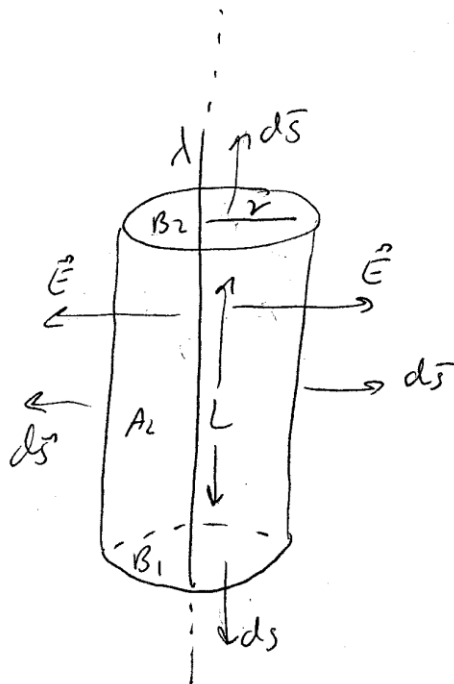
$$\vec{E} = \frac{Q}{4\pi\epsilon_0 R^2} \vec{u}_r$$



$$V = - \int \vec{E} d\vec{r} = - \int \frac{Q}{4\pi\epsilon_0 r^2} dr = \frac{Q}{4\pi\epsilon_0 r}$$

$$V_S = \frac{Q}{4\pi\epsilon_0 R}$$

D CAMPO ELETRICO CREADO POR UMA LINHA CARGADA INDEFINIDA



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

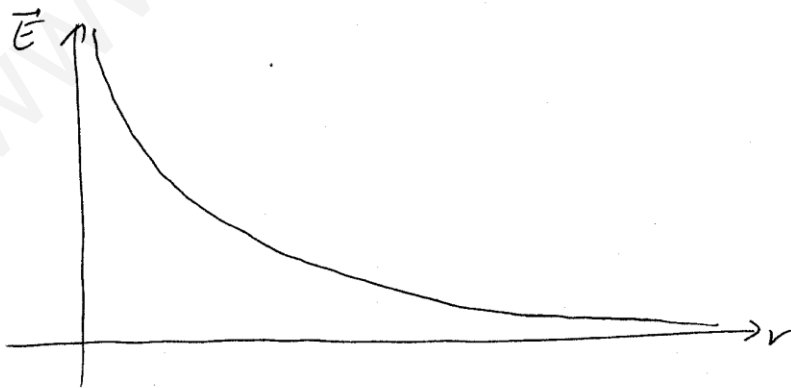
$$\oint \vec{E} \cdot d\vec{s} = \frac{q_{enc}}{\epsilon_0}$$

$$\oint \vec{E} \cdot d\vec{s} = \int_{A_L} \vec{E} \cdot d\vec{s} + \int_{B_1} \vec{E} \cdot d\vec{s} + \int_{B_2} \vec{E} \cdot d\vec{s}$$

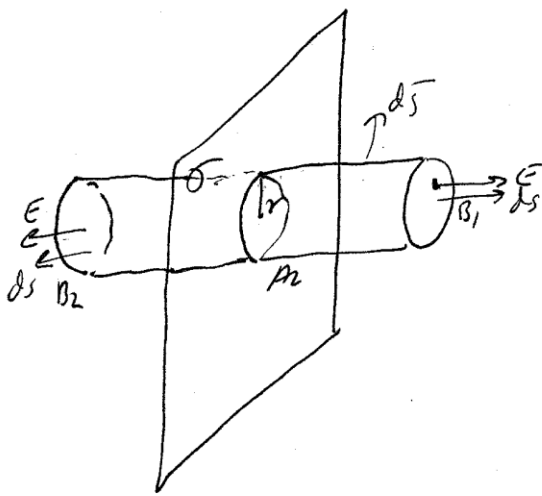
em B_1 e B_2 $\vec{E} \perp d\vec{s}$

$$\Rightarrow \oint \vec{E} \cdot d\vec{s} = \int_{A_L} \vec{E} \cdot d\vec{s} = E \cdot S = E \cdot 2\pi r \cdot L$$

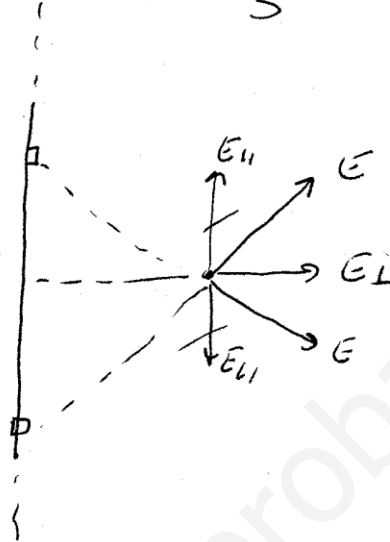
$$\Rightarrow E \cdot 2\pi r L = \frac{\lambda L}{\epsilon_0} \Rightarrow \boxed{\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r} \vec{u}_r}$$



▷ CAMPO ELECTRICO CREADO POR UN PLANO
CARGADO UNIFORMEMENTE INDEFINIDO



$$\sigma = \frac{Q}{S}$$

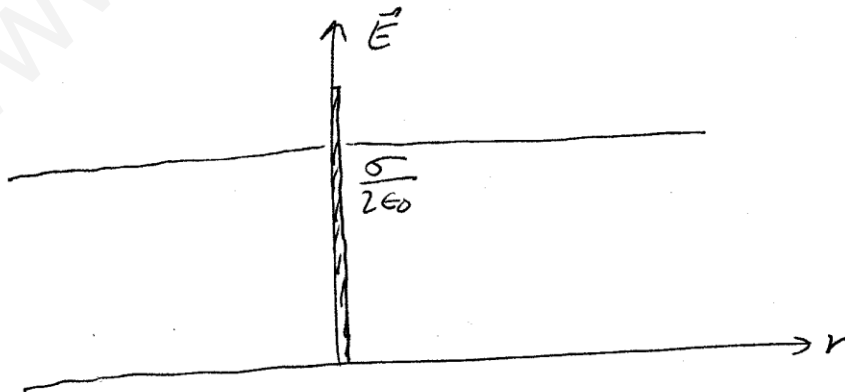


$$\oint \vec{E} d\vec{S} = \frac{q_{enc}}{\epsilon_0} \Rightarrow \oint \vec{E} d\vec{S} = \oint_{B_1} \vec{E} d\vec{S} + \int_{B_2} \vec{E} d\vec{S} + \int_{A \cup O} \vec{E} d\vec{S}$$

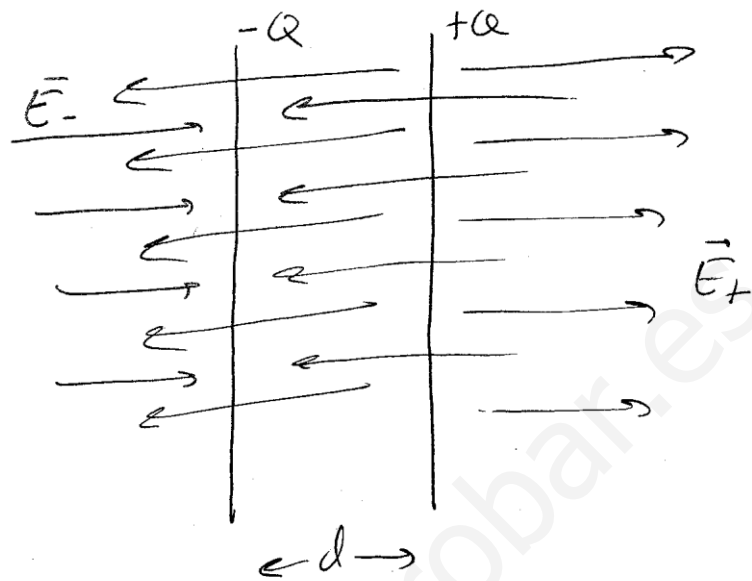
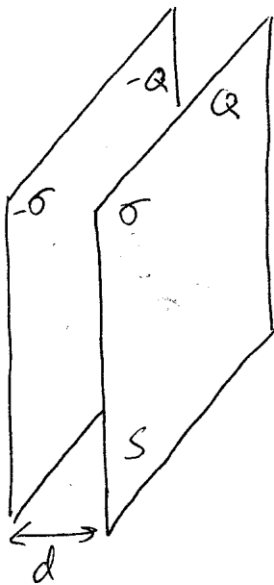
$$E S_{B_1} + E S_{B_2} = \frac{q_{enc}}{\epsilon_0}$$

$$2 E \pi r^2 = \frac{\sigma \pi r^2}{\epsilon_0}$$

$$\rightarrow \boxed{\vec{E} = \frac{\sigma}{2\epsilon_0} \vec{u}_{\perp}} \quad \text{cte}$$



D CAMPO ELECTRICO EN UN CONDENSADOR.



$$\vec{E}_{fuera} = \vec{E}_- + \vec{E}_+ = 0$$

$$\vec{E}_{dentro} = \vec{E}_+ + \vec{E}_- = 2 \vec{E} = 2 \frac{\sigma}{2\epsilon_0} = \frac{\sigma}{\epsilon_0}$$

dirigido de la placa negativa a la positiva.

$$\boxed{E = \frac{\sigma}{\epsilon_0}}$$

$$V = \frac{E}{d}$$

