HT No: 3

UNIVERSIDAD DE SAN CARLOS DE GUATEMALA
FACULTAD DE INGENIERIA
ESCUELA DE CIENCIAS
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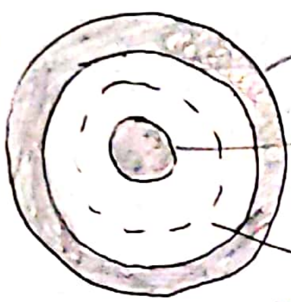
---------------------Puede iniciar su hoja de trabajo a partir de aquí ---------------------

Problema No. 1



$R_e = 10.0\,cm$ $\Phi_e = 5.65 \times 10^6\, N\cdot m^2/C$
$Q_e = ?$
$R_{ci} = 20.0\,cm$
$R_{ce} = 30.0\,cm$

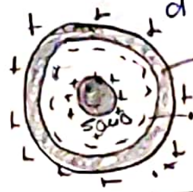
a) La carga neta que contiene la esfera conductora.

$$\Phi_e = \frac{Q_{enc}}{\varepsilon_0}$$

$$Q_{enc} = (5.65 \times 10^6)(8.85 \times 10^{-12})$$

$$Q_{enc} = 50\,\mu C$$

b) La carga neta del Cascaron esferico es $+80\,\mu C$. det la carga neta en la sup Int. y sup ext. del el coscaron esferico



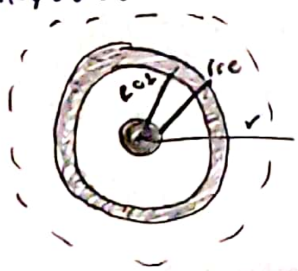
$Q = +80\,\mu C$

$Q_{coscaron\ Int} = -50\,\mu C$

$Q_{coscaron.\ Ex} = 80\,\mu C + 50\,\mu C = 130\,\mu C$

c) det. la magnitud del $\overline{E}$ a una distancia de 60.cm del centro de la configuracion

$r = 60.0\,cm$



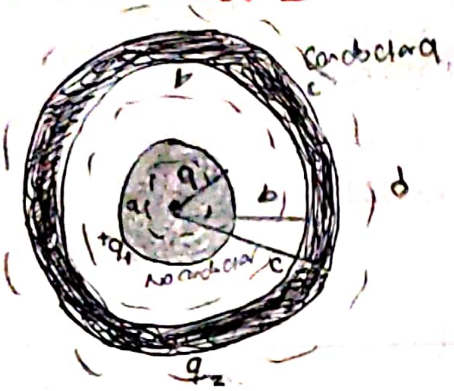
$$\oint \overline{E}\cdot d\overline{A} = \frac{Q_{enc}}{\varepsilon_0} \qquad Q_{enc} = Q_{coscaron\ Ext}$$

$$E\,[4\pi r^2] = \frac{Q_{coscaron\ Ext}}{\varepsilon_0}$$

$$E = K\,\frac{Q_{coscaron\ Ext}}{r^2} = K\,\frac{(130\,\mu)}{(0.6)^2}$$

$$E = 3.25 \times 10^6\ N/C$$

Problema no. 2



Esfera

$a = 5.00 cm$

$q_1 = 12.0 \mu C$

$b = 12.0 cm$

$c = 15.0 cm$

$q_2 = -15 \mu C$

a) La magnitud del $\bar{E}$, en un punto 4.00cm del centro de la configuracion.

$$\rho = \frac{Q}{Volumen}$$

$$\oint \bar{E} \cdot d\bar{A} = \frac{Q_{enc}}{\varepsilon_0}$$

$$E(4\pi r^2) = \frac{\left(\frac{Q}{4/3 \pi a^3}\right)\left[4/3 \pi r^3\right]}{\varepsilon_0}$$

$$E(4\pi r^2) = \frac{Q_{enc} r^3}{a^3 \varepsilon_0} \longrightarrow E = \frac{K(Q_{enc}\, r)}{a^3}$$

$$E = \frac{K(12\mu)(0.04)}{(0.05)^3} = 3.46 \times 10^7 \ N/C$$

b) " " del $\bar{E}$, situado a 10.0cm " ".

$$\oint \bar{E} \cdot d\bar{A} = \frac{Q_{enc}}{\varepsilon_0}$$

$$E(4\pi r^2) = \frac{Q_{enc}}{\varepsilon_0}$$

$$E = K\frac{Q_{enc}}{r^2} = \frac{K(12.0\mu)}{(0.1)^2}$$

$$E = 1.08 \times 10^7 \ N/C$$

c) " del $\bar{E}$, situado a 14.0 cm " ".

$$\oint \bar{E} \cdot d\bar{A} = \frac{Q_{enc}}{\varepsilon_0} \longrightarrow E(4\pi r^2) = \cancel{\frac{Q_{enc}^{\,0}}{\varepsilon_0}}$$

$Q_{enc} = Q_{esf} + Q_b = 12.0\mu C - 12.0 \mu C$

$Q_{enc} = 0$

$$E = 0 \ N/C$$

d) " del $\bar{E}$, situado a 24.0cm ".

$Q_{enc} = Q_{coraron} + Q_{esf}$

$Q_{enc} = -15\mu C + 12.0\mu C$

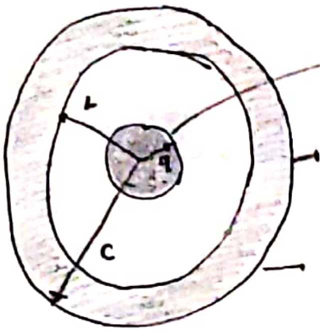
$Q_{enc} = -3 \mu C$

$$\oint \bar{E} \cdot d\bar{A} = \frac{Q_{enc}}{\varepsilon_0}$$

$$E(4\pi r^2) = \frac{Q_{enc}}{\varepsilon_0}$$

$$E = K\frac{Q_{enc}}{r^2} = \frac{K(3.0\mu)}{(0.24)^2} = 4.69 \times 10^5 \ N/C$$

Problema NO. 3



a) $\bar{E}$ para $r < a$

$$\oint \bar{E} \cdot d\bar{A} = \frac{Q_{enc}}{\varepsilon_0}$$

$$E[4\pi r^2] = \left(\frac{Q_{enc}}{\cancel{4/3\pi a^3}}\right)\cancel{[4/3\pi r^3]}$$

$$E[4\pi r^2] = \frac{Q_{enc}\, r^3}{\varepsilon_0\, a^3} \rightarrow E = \frac{\cancel{2}q\, \cancel{r^3}}{\cancel{4}\pi \cancel{r^2} \varepsilon_0\, a^3}$$

$$E = \frac{q\, r}{2\pi \varepsilon_0 a^3} \text{ N/C}$$

b) $\bar{E}$ para $a < r < b$

$$\oint \bar{E} \cdot d\bar{A} = \frac{Q_{enc}}{\varepsilon_0}$$

$$E(4\pi r^2) = \frac{2q}{\varepsilon_0}$$

$$E = \frac{q}{2\pi r^2 \varepsilon_0} \text{ N/C}$$

c) $\bar{E}$ para $b < r < c$

$$\oint \bar{E} \cdot d\bar{A} = \frac{\cancel{Q_{enc}}^{\,0}}{\varepsilon_0} \qquad Q_{enc} = 2q - 2q = 0$$

$$E = 0 \text{ N/C}$$

d) $\bar{E}$ para $r > c$

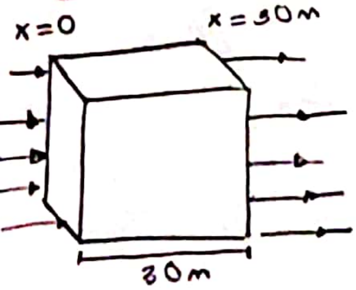
$$\oint \bar{E} \cdot d\bar{A} = \frac{Q_{enc}}{\varepsilon_0} \qquad Q_{enc} = 2q - 5q = -3q$$

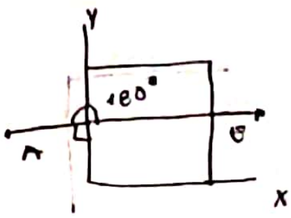
$$E[4\pi r^2] = \frac{3q}{\varepsilon_0}$$

$$E = \frac{3q}{4\pi r^2 \varepsilon_0}$$

Problema NO. 4

$E = (1200 + 100x)$ N/C $\hat{i}$



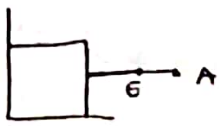


a) El flujo $\bar{E}$ en la cara izquierda del cubo.

$$\Phi = E\, A \cos_{EA}$$

$$\Phi = (1,200)(30)^2 \cos \cancel{180}^{\,-1} = -1.08 \cdot 10^6 \text{ N}\cdot\text{m}^2/\text{C}$$

b) El flujo $\bar{E}$ en la cara derecha del cubo.



$$\Phi = E A \cos_{EA}$$

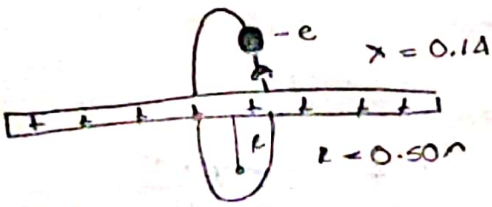
$$\Phi = (4,200)(30)^2 \cos \cancel{0}^{\,1} = 3.78 \cdot 10^6 \text{ N}\cdot\text{m}^2/\text{C}$$

c) La carga $\bar{E}$ encerrada en el cubo.

$$\Phi_{Total} = -1.08 \cdot 10^6 + 3.78 \cdot 10^6 = 2.7 \cdot 10^6 \text{ N}\cdot\text{m}^2/\text{C}$$

$$Q = \Phi_{Total} \cdot \varepsilon_0 = [2.7 \cdot 10^6](8.85 \cdot 10^{-12}) = 23.9\ \mu C$$

Problema No: 5



a) $\oint \vec{E} \cdot d\vec{A} = \frac{Q_{enc}}{\varepsilon_0}$

$E[2\pi r \cancel{L}] = \frac{\lambda \cancel{L}}{\varepsilon_0}$

$E = \frac{0.14\mu}{2\pi(0.5)\varepsilon_0} = 5,035$

$E = 5.4 \times 10^3$ N/C // hacia afuera

b) $E = \frac{F}{q} \rightarrow F = Eq$

$F = (5.04 \times 10^3)(1.60 \times 10^{-19})$

$F = 8.05 \times 10^{-16}$ // radial hacia adentro

c) $F = m_e a$

$a_t = \frac{F}{m_e} = \frac{8.05 \times 10^{-16}}{9.11 \times 10^{-31}}$

$a_t = \frac{v_t^2}{r}$

$v_t = \sqrt{r a_t}$

$v_t = \sqrt{(0.5)(8.8437 \times 10^{14})}$

$v_t = 21.0 \times 10^6$ m/s //