Universidad de San Carlos de Guatemala
Facultad de Ingeniería, Departamento de Física
Primer Exámen Física 2, Segundo Semestre 2023.

Registro Académico: 201709088	CUI: 3636192320115
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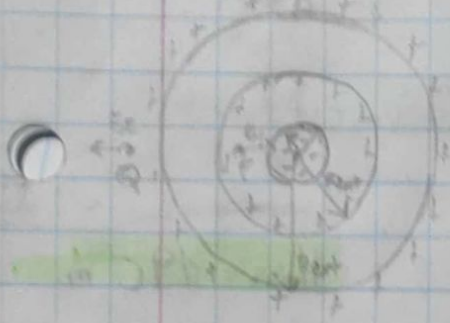
Catedrático: Ing. Claudia Contreras.	Sección: B+

Pregunta 1:

$R_{in} = 0.2m$ $R = 0.1m$
$R_{ex} = 0.3m$ $E_1 = 1\times10^4$ N/C $x_1 = 0.15$
$E_2 = 1\times10^4$ $x_2 = 0.35m$



a) $E = \frac{Kq}{r_p^2} \Rightarrow q_{enc} = \frac{E_1 x_1^2}{K}$

$r_p = x_1$

$q_{enc} = \frac{(1\times10^4)(0.15)^2}{K}$

$|q_{encl}| = 2.5\times10^{-8}$ C
$q_{enc} = -25\times10^{-9}$ C

Esfera Solida
$q_{enc} = -25$ nC.

b) $\oint E\cdot A = \frac{Q_{enc}}{\varepsilon_0} = q_{int} = -q_{esfera}$
$q_{int} = +25$ nC

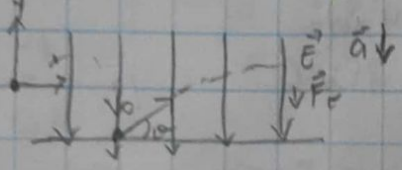
c) $E\cdot A\ \varepsilon_0 = Q_{enc}$
$Q_{enc} = (1\times10^4)\,4\pi(0.35)^2\,\varepsilon_0$
$Q_{enc} = 1.36\times10^{-7}$
$Q_{enc} = 136\times10^{-9}$ C

$Q_{encTotal} = q_{int} + q_{ext}$
$Q_{encTotal} - q_{int} = q_{ext}$
$(136\times10^{-9}) - (25nC) = q_{ext}$
$q_{ext} = 1.11\times10^{-7}$ C.
$q_{ext} = 111\times10^{-9}$ C.

$q_{ext} = 111$ nC
$q_{int} = 25$ nC.

Pregunta 2:

$m = 5.00g$
a) $q = 60$ mC
$V_o = 10 m/s$
$\theta = 20°$
$E = 3.00$ N/C $(-\hat{j})$



En x:
$V_{ox} = V_o \cos\theta$
$V_{fx} = V_{ox} = V_x$

En y:
$a = \frac{Eq}{m}$
$a = \frac{(-3)(6\times10^{-3})}{5\times10^{-3}}$
$a = -3.6\ m/s^2$

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$V_{fy} = V_{oy} + at$

$\frac{-V_{oy}}{a} = t \qquad t = \frac{-V_y \operatorname{Sen}\theta}{a}$

$t = \frac{-(108 \operatorname{Sen} 20°)}{-3.6} = 10.26\ s.$

$Y_f = Y_0 + V_{oy} t + \frac{1}{2} a t^2$

$Y_f = (108 \operatorname{Sen} 20°)(10.26) + \frac{1}{2}(-3.6)(10.26)^2$

$Y_f = 189.5\ m.$

$H_{max} = 190\ m.$

b) $t = 1.5\ s$

$V_{fy} = V_{oy} \operatorname{Sen} 20° + at$

$V_{fy} = (108 \operatorname{Sen} 20°) + (-3.6)(1.5)$

$V_{fy} = 31.53\ m/s.$

$V_{fx} = V_o \cos 20 + (-3.6)(1.5)$

$V_{fx} = 96.08\ m/s.$

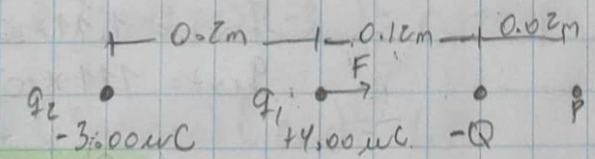
$V_f = \sqrt{(96.08)^2 + (31.53)^2} = 101.12\ m/s.$

$V_f = 101\ m/s.$

+1

Problema 3:

a)



$F = 12.0\ N$

$F = \frac{K q_1 Q}{r^2}$

$\frac{r^2 F}{K q_1} = Q$

$Q = \frac{(0.12)^2(12)}{K(4\mu)} = 4.8 \times 10^{-6}\ C.$

$Q = -4.8\ \mu C.$

$Q = -4.8\ \mu C$

b) $E_p = E_1 + E_2 + E_Q$

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c) $V = \frac{kq}{r}$ $\quad Q = 2.00\ \mu C$

$V_1 = \frac{kq_1}{r_1} = \frac{k(4\mu)}{(0.14)} = 257142.85\ V$

$V_2 = \frac{kq_2}{r_2} = \frac{k(-3\mu)}{(0.34)} = -79411.76\ V.$

$V_3 = \frac{kQ}{r_3} = \frac{k(2\mu)}{(0.02)} = 900000\ V.$

$V_p = 257142.85 - 79411.76 + 900000 = 1077731.09\ V$

$V_p = 1077.7 \times 10^3\ V.$

d) $V = \frac{U}{q} \Rightarrow U = Vq.$

$U_1 = (257142.85)(4\mu) = 1.028\ J$

$U_2 = (-79411.76)(-3\mu) = 0.23825.$

$U_3 = (900000)(2\mu) = 1.8.$

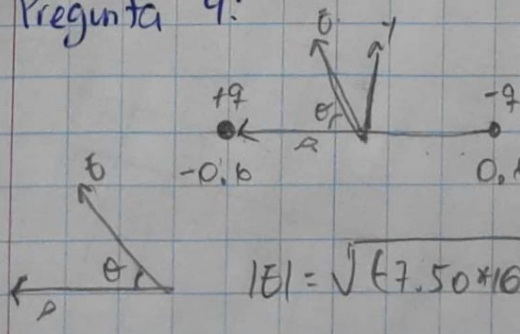
$U_{sist} = 1.028 + 0.2382 + 1.8$

$U_{sist} = 3.1212\ J.$

$U_{sist} = 3111.2 \times 10^{-3}\ J$

$U_{sist} = 3,111\ mJ.$

Pregunta 4:



$q = \pm 8.50\ \mu C.$

$E = (-7.50\hat{i} + 6.00\hat{j}) \times 10^6\ N/C$

$\theta = \tan^{-1}\left(\frac{6}{-7.5}\right) = -38.65°$

$|E| = \sqrt{(7.50 \times 10^6)^2 + (6 \times 10^6)^2}$

$|E| = 9.604 \times 10^6\ N/C$

$U = -pE\cos\theta.$

$P = \ell q$.

$\rho = (1.2)(8.5\ \omega)$

$\rho = 1.02 \times 10^{-5}\ \Omega m$

$U = -(1.02 \times 10^{-5})(9.604 \times 10^{6}) \cos(38.6)$

$U = -76.558\ J$

$U = -76.6\ J$.

b) $W_{AE} = U_E - U_A$

$U_A = -(1.02 \times 10^{-5})(9.604 \times 10^{6}) \cos(0)$

$U_A = -97.96\ J$.

$W_{AE} = -97.96 + 76.558 = -21.402\ J$.

$W_{AE} = -21.4\ J$.

Pregunta 5:

$V_i = 180\ V$.

$V_f = -60\ V$.

$q^+ = 1.6022 \times 10^{-19}$

$W = q\ V$.

$W = (1.6022 \times 10^{-19})(-60)$.

$W = -9.6 \times 10^{-18}$.

$W = -9.6 \times 10^{-18}$