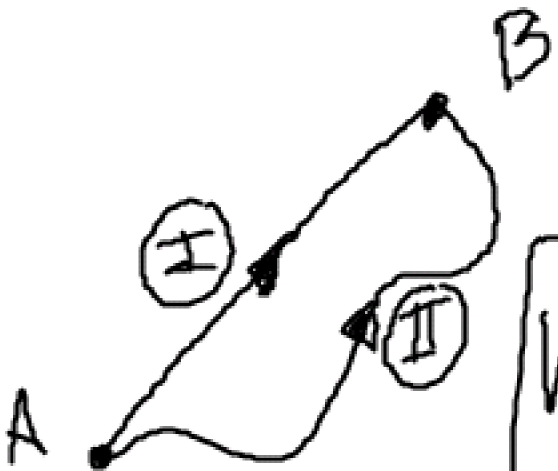
1- a) Campo Conservativo: Campo en el que el trabajo realizado por las fuerzas del campo para trasladar una partícula de un punto A a un punto B no depende del camino seguido.



$$W_I = W_{II}$$

$$W_I = E_{p_A} - E_{p_B} = \int_A^B \vec{F} \cdot d\vec{r}$$

En. Potencial: Forma de E en la que se almacena el W realizado contra las $\vec{F}$ del campo.

$$W = \oint \vec{F} \cdot d\vec{r} = 0 = \int_A^B \vec{F} \cdot d\vec{r} + \int_B^A \vec{F} \cdot d\vec{r} =$$

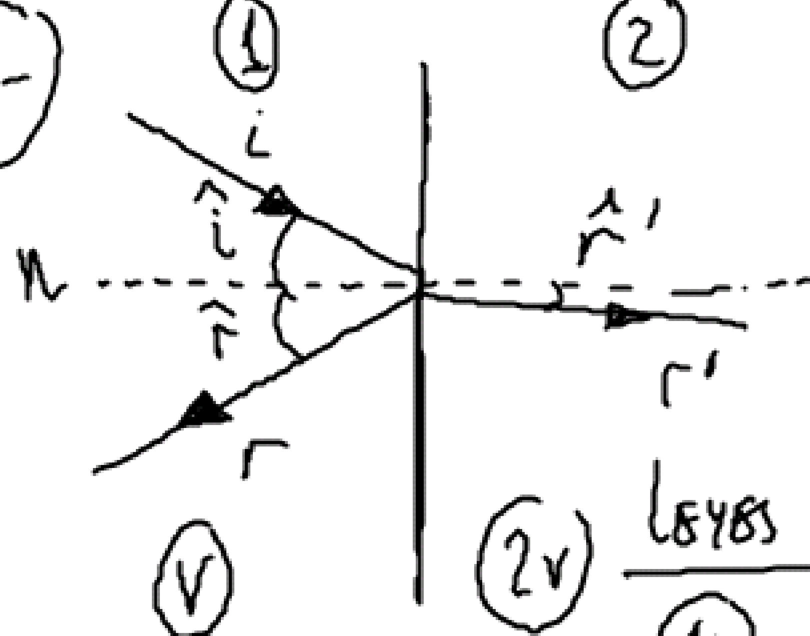
$$\int_A^B \vec{F} \cdot d\vec{r} - \int_A^B \vec{F} \cdot d\vec{r} = 0$$

En un campo conservativo se conserva E_m.

$$\left.\begin{array}{l} W_{AB} = -\Delta E_p \\ W_{AB} = \Delta E_c \end{array}\right\} \quad -\Delta E_p = \Delta E_c$$

$$E_{c_A} + E_{p_A} = E_{c_B} + E_{p_B}$$

2-



i → Rayo incidente

r → Rayo reflejado

r' → Rayo refractado

$$\left[n_{21} = \frac{V_1}{V_2} = \frac{V}{2V} = \frac{1}{2} \right]$$

Leyes Reflexión

1ª i, r y n están inscritos en el mismo plano.

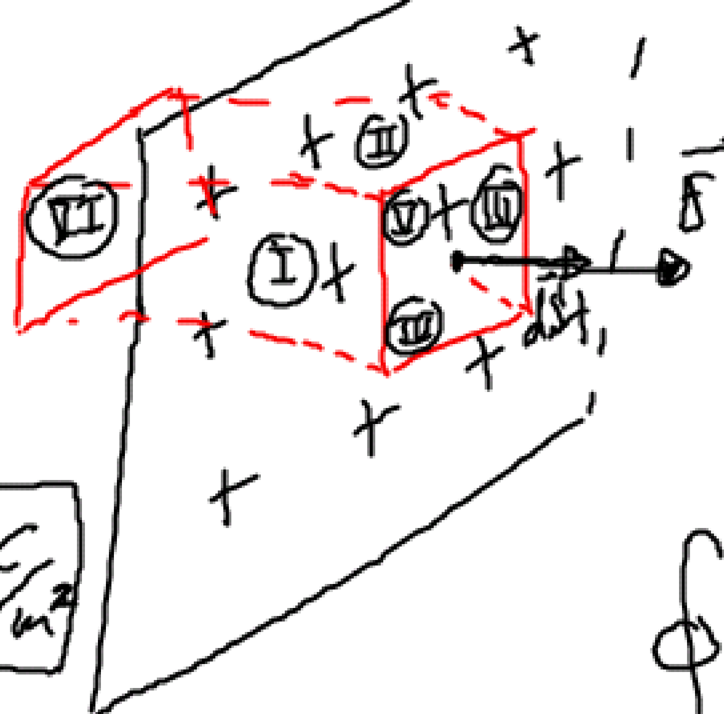
2ª $\hat{i} = \hat{r}$

Leyes Refracción

1ª i, r', n → mismo plano

Snell 2ª $\frac{\operatorname{sen} \hat{i}}{\operatorname{sen} \hat{r}'} = \frac{V_1}{V_2} = n_{21}$ (índice de refracción relativo)

3-



$$\boxed{\sigma = \epsilon \ C/m^2}$$

$$\Phi = \oint_{S'} \vec{E} \cdot d\vec{S}' = \frac{Q}{\epsilon}$$

$$\oint_{S'} \vec{E} \cdot d\vec{S}' = \sum_{i=1}^{6} \int_{(i)\,\text{CARAS}} \vec{E} \cdot d\vec{S}' =$$

$$= \int_{\text{IV}} \vec{E} \cdot d\vec{S}' + \int_{\text{VI}} \vec{E} \cdot d\vec{S}' =$$

En las caras laterales

$$\vec{E} \cdot d\vec{S}' = 0$$

$$\vec{E} \perp d\vec{S}'$$

En las caras V y VI

$$\vec{E} \cdot d\vec{S}' = E \cdot dS' \cdot \cos 0$$

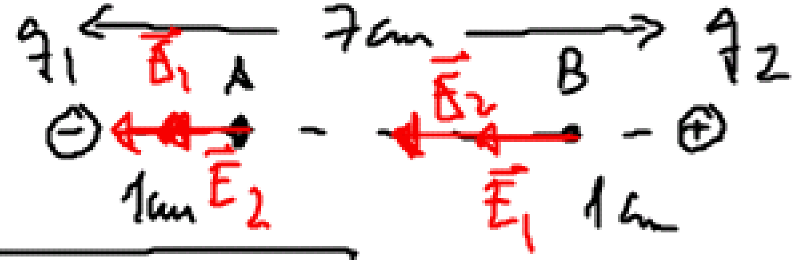
$$= 2\int_{S\ (\text{TAPAS})} E \cdot dS = 2E \cdot \int_{\text{TAPA}} dS = 2E \cdot S$$

$$\Phi = \frac{Q}{\epsilon} = 2E \cdot S$$

$$\sigma = \epsilon$$

$$\boxed{E = \frac{Q}{S} \cdot \frac{1}{2\epsilon} = \frac{1}{2}\ N/C}$$

4-



$\hat{u}_1 = \hat{i}$

$\hat{u}_2 = -\hat{i}$

$$\boxed{\vec{E} = \frac{KQ}{r^2}\,\hat{u}_r}$$

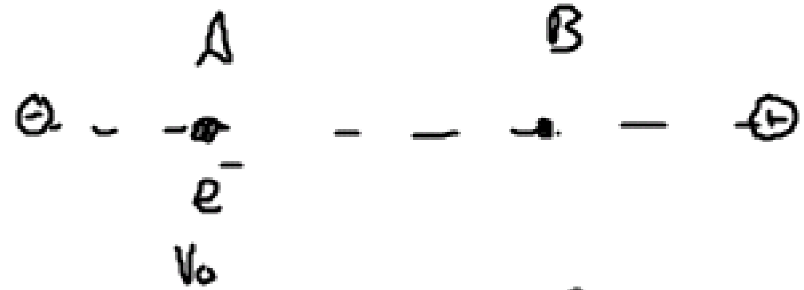
a) $$\vec{E}_A = \vec{E}_{1A} + \vec{E}_{2A} = \frac{8{,}99\cdot 10^{9}(-5)\cdot 10^{-9}}{(10^{-2})^2}\,\hat{i} + \frac{8{,}99\cdot 10^{9}\cdot(3)\cdot 10^{-9}}{(6\cdot 10^{-2})^2}(-\hat{i})$$

$$K = \frac{1}{4\pi\epsilon_0} = 8{,}99\cdot 10^{9}\ N\cdot m^2\cdot C^{-2}$$

$$\boxed{\vec{E}_A = -4{,}58\cdot 10^{5}\,\hat{i}\ N/C}$$

$$\boxed{\vec{E}_B = -2{,}83\cdot 10^{5}\,\hat{i}\ N/C}$$

b)



$q_e = -e$

$$V = \frac{KQ}{r}$$

$$V_A = V_{1A} + V_{2A} = -4{,}05 \cdot 10^3\ V$$

$$V_B = V_{1B} + V_{2B} = 1{,}95 \cdot 10^3\ V$$

$$\Delta V = V_B - V_A = 6000\ V$$

$$\Delta E_m = 0$$

$$-\Delta E_p = \Delta E_c$$

$$-q\,\Delta V = E_{c_f} - \cancel{E_{c_0}}^{\,0}$$

$$e\,\Delta V = \frac{1}{2} m_e v^2$$

$$v = \sqrt{\frac{2e\,\Delta V}{m_e}} = 4{,}59 \cdot 10^7\ m/s$$

5-

MCU

$h = 390\ km$

$m = 415\ t$

$G = 6{,}67 \cdot 10^{-11}\ N \cdot m^2 \cdot kg^{-2}$

$R_T = 6370\ km$

$M_T = 5{,}98 \cdot 10^{24}\ kg$

a) $T = \frac{2\pi r}{v} = 5530\ s \cdot \frac{1\ min}{60\ s} = \boxed{92{,}2\ min}$

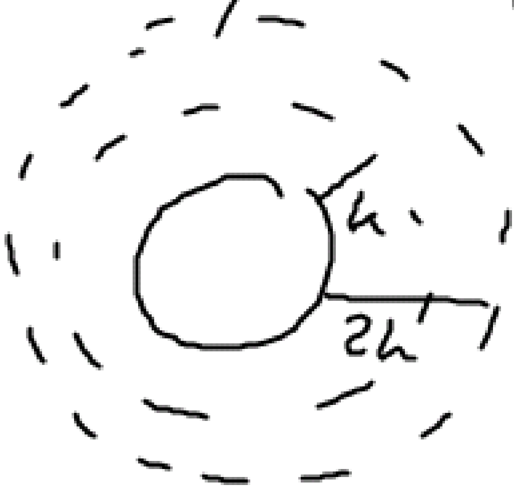
$F_c = F_g$

$\frac{m v^2}{r} = \frac{G M m}{r^2}$

$v = \sqrt{\frac{G M_T}{r}} = \boxed{7{,}68 \cdot 10^3\ m/s}$

$r = R_T + h = \underline{6{,}76 \cdot 10^6\ m}$

b)



$$E_m = E_c + E_p = \frac{1}{2} m v^2 - \frac{GMm}{r} =$$

$$v = \sqrt{\frac{GM}{r}}$$

$$= \frac{1}{2}\frac{GMm}{r} - \frac{GMm}{r} = \boxed{-\frac{1}{2}\frac{GMm}{r}}$$

$$\Delta E_m = E_{m_f} - E_{m_0} = -\frac{1}{2}\frac{GMm}{r_2} - \left(-\frac{1}{2}\frac{GMm}{r_1}\right) =$$

$$= -\frac{1}{2} GMm \left(\frac{1}{r_2} - \frac{1}{r_1}\right) = \boxed{6{,}68 \cdot 10^{11}\ J}$$

$r_2 = R_T + 2h = 7{,}15 \cdot 10^6\ m$

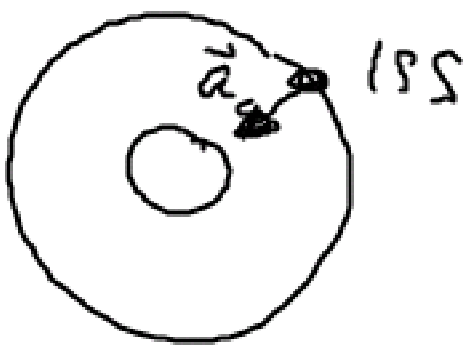
$m = 5{,}15 \cdot 10^5\ kg$

c) $T = \dfrac{2\pi r}{v}$

$T = \dfrac{2\pi r}{\sqrt{\dfrac{GM}{r}}}$ → $\boxed{T^2 = \dfrac{4\pi^2}{GM} r^3}$

$T = 6015\ \mathrm{s} = 100\ \mathrm{min}$

d)



$a_c = \dfrac{v^2}{\rho} = \dfrac{v^2}{r} = \dfrac{GM}{r^2} = 7{,}8\ \mathrm{m/s^2}$

$\vec{F}_c = m\vec{a}_c = m\vec{g}$

$\boxed{\vec{a}_c = \vec{g}}$