Anteriormente en Física 3 A

Potencial Electrostático

$$V(\vec{r}) = \frac{1}{4\pi\varepsilon_0} \iiint_V \rho(\vec{r}') \frac{1}{|\vec{r} - \vec{r}'|} dV'$$

Un campo vectorial queda unívocamente definido por el **flujo** y la **circulación**

Flujo a través de cualquier **superficie cerrada**

$$\oiint_{S(V)} \vec{E}(\vec{r})\, d\vec{S} = \frac{1}{\varepsilon_0} \iiint_V \rho(\vec{r}')\, dV'$$

$$\vec{\nabla} = \left(\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}\right)$$

Circulación a través de cualquier **curva cerrada**

$$\oint_C \vec{E}(\vec{r})\, d\vec{\ell} = 0$$

$$\oint_{\partial\Sigma} \mathbf{F} \cdot d\mathbf{r} = \iint_{\Sigma} (\nabla \times \mathbf{F}) \cdot d\mathbf{S}$$

Forma diferencial

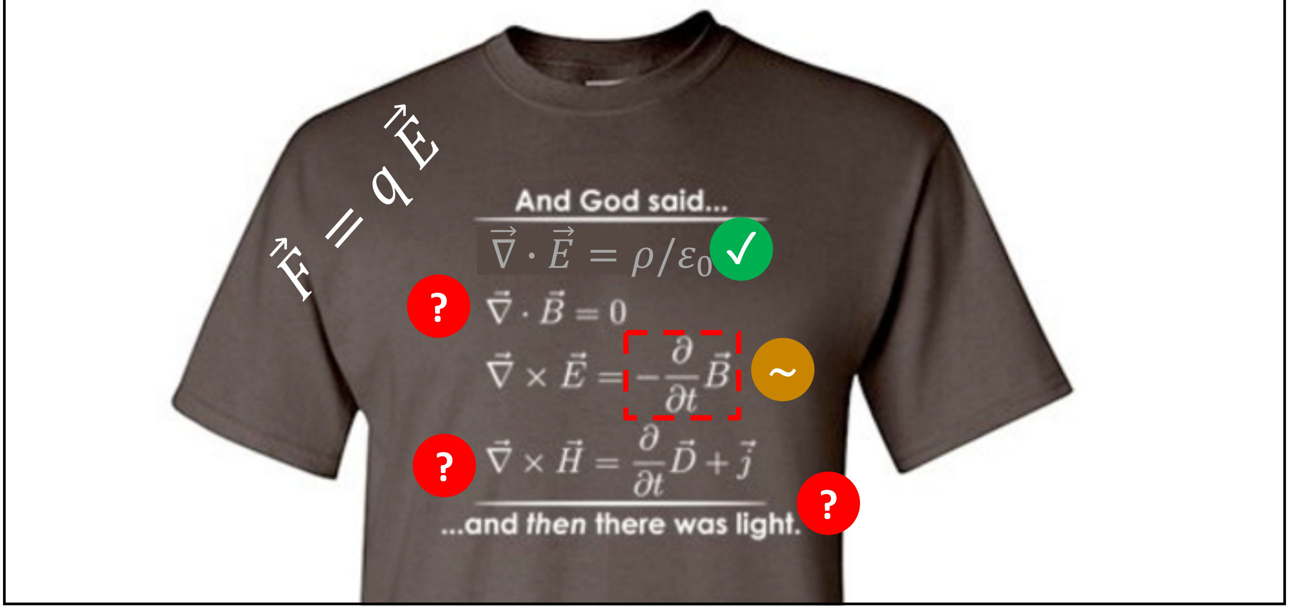
$$\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\varepsilon_0}$$

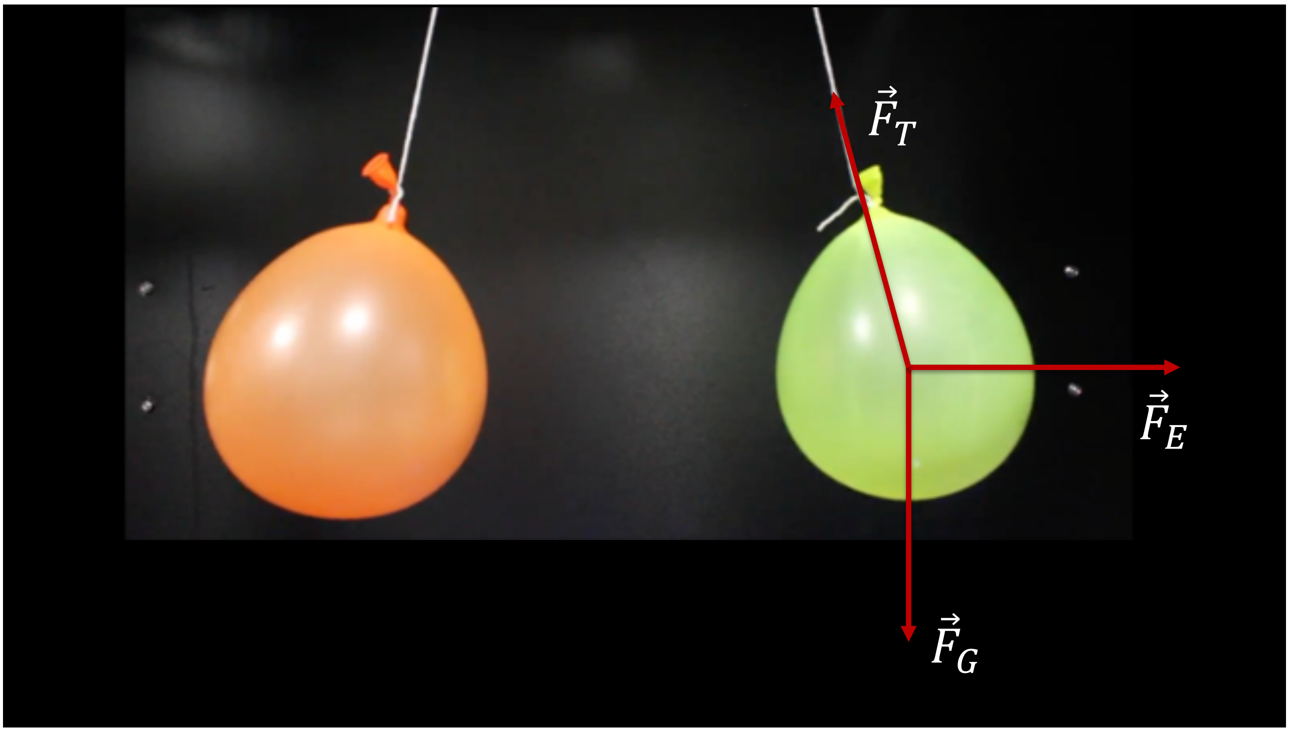
Divergencia del campo eléctrico

Rotor del campo eléctrico

$$\vec{\nabla} \times \vec{E} = 0$$

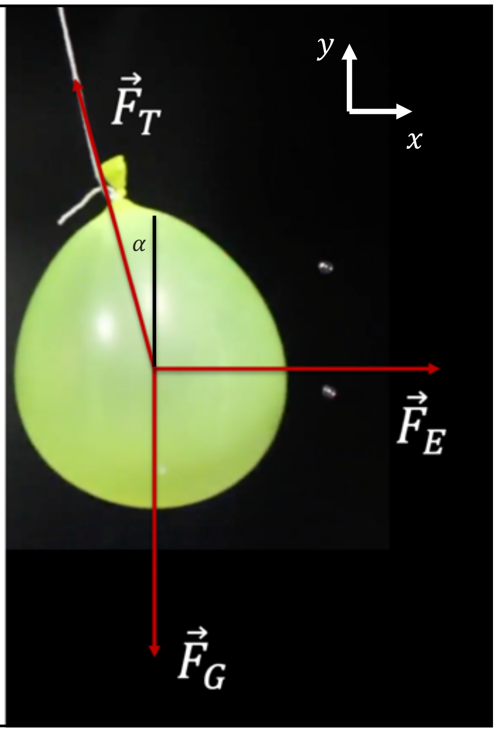
Una (extraña) hoja de ruta





Ecuaciones de Newton

Sobre el globo amarillo



Ecuaciones de Newton

Sobre el globo amarillo

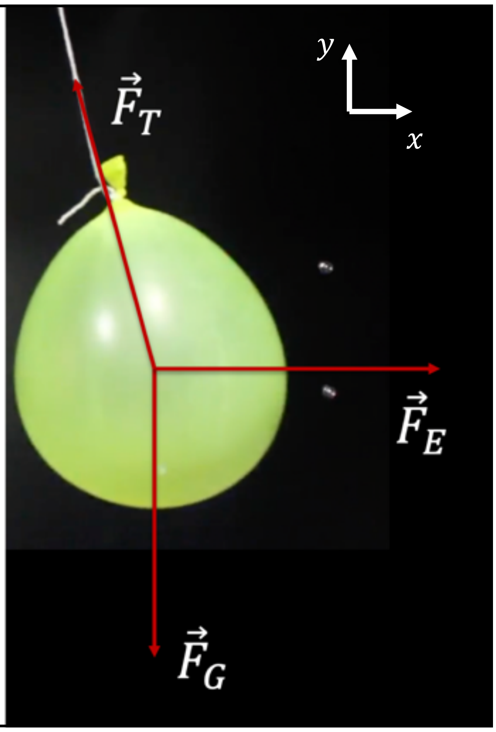
$$\hat{x} \quad -\frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{d^2} + F_T \sin\alpha = 0$$

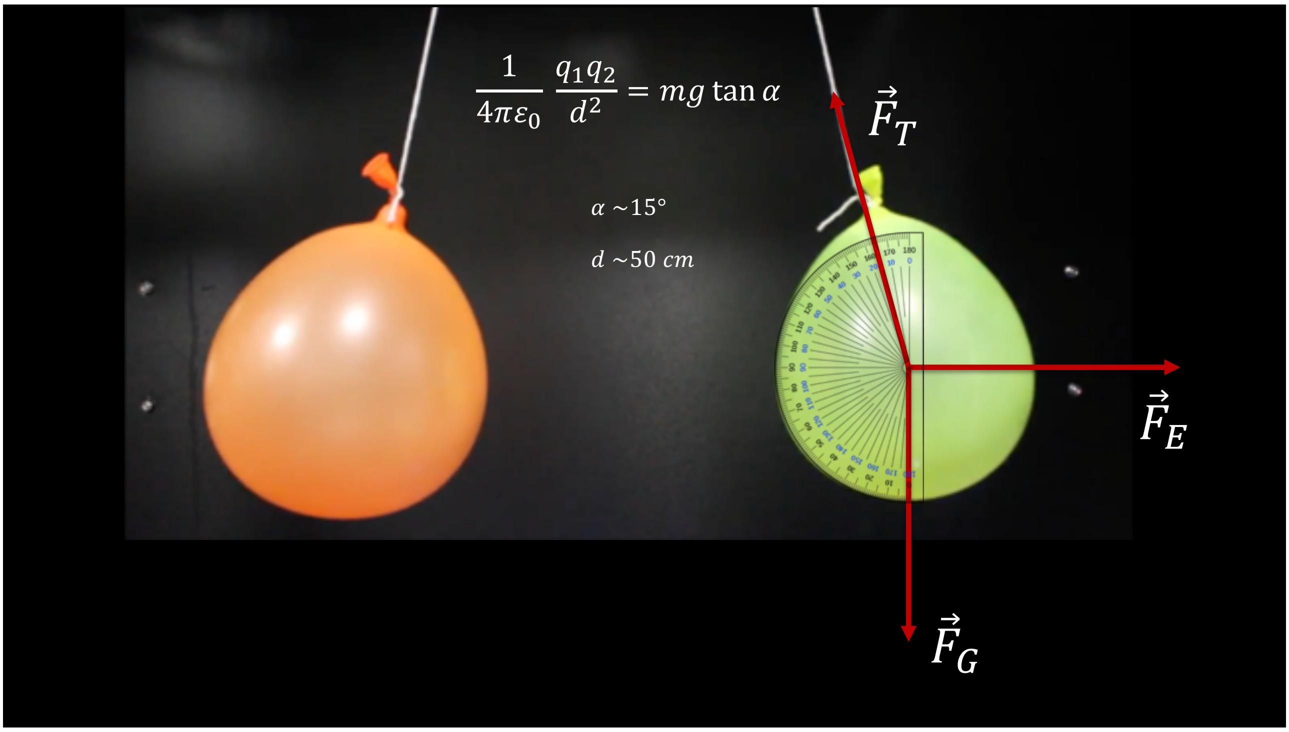
$$\hat{y} \quad -m\,g + F_T \cos\alpha = 0$$

$$\frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{d^2} = mg\tan\alpha$$

$\alpha \sim 15°$ $\quad \sin\alpha \sim 0.25$

$\cos\alpha \sim 0.96$





python

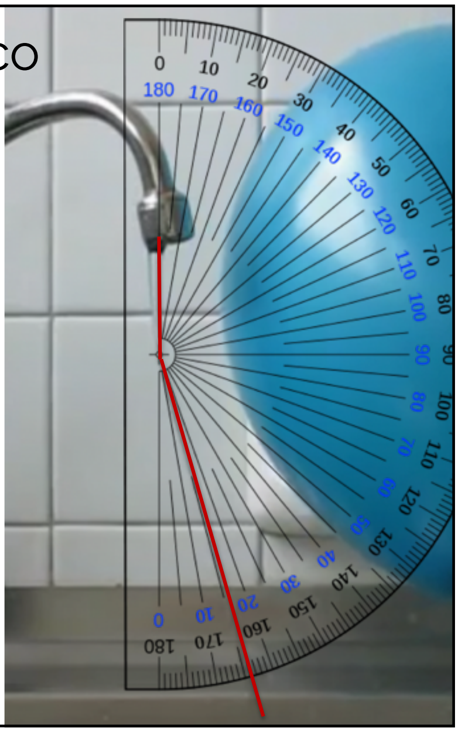
https://colab.research.google.com/drive/1WrKnSbczwLrovZeKXtnXQFTo6HNEPi1M?usp=sharing

Fuerza **sobre** un monopolo eléctrico

$\vec{E}(\vec{r}_+)$

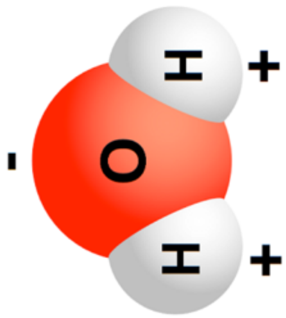
$$\vec{F}_E = q\vec{E}$$

$$\frac{|\vec{F}_E|}{|\vec{F}_G|} = \tan\alpha = \frac{|q|\left|\frac{1}{4\pi\varepsilon_0} Q \frac{1}{d^2}\right|}{m\, g}$$



Fuerza **sobre** un dipolo eléctrico

$\vec{E}(\vec{r}_-)$ $\vec{E}(\vec{r}_+)$



$$\vec{F}_E = q\left(\vec{E}(\vec{r}_+) - \vec{E}(\vec{r}_-)\right)$$

$$= q\left(\vec{E}(\vec{r}_- + \Delta\vec{r}) - \vec{E}(\vec{r}_-)\right)$$

$$= Q\Delta\vec{r}\,\frac{\vec{E}(\vec{r}_- + d\vec{r}) - \vec{E}(\vec{r}_-)}{|\Delta\vec{r}|}$$

$$= \vec{p}\,\vec{\nabla}\vec{E}$$

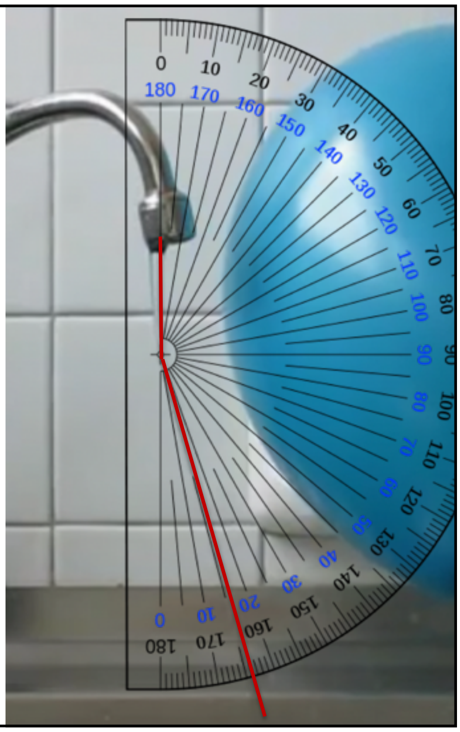
Fuerza **sobre** un dipolo eléctrico

$\vec{E}(\vec{r}_-)$ $\vec{E}(\vec{r}_+)$

$$\vec{F}_E = \vec{p}\,\vec{\nabla}\vec{E}$$

$$|\vec{\nabla}\vec{E}| = \frac{1}{4\pi\varepsilon_0} q\,\frac{-2}{d^3}$$

$$\frac{|\vec{F}_E|}{|\vec{F}_G|} = \tan\alpha = \frac{|\vec{p}|\left|\frac{1}{4\pi\varepsilon_0} q\,\frac{-2}{d^3}\right|}{m\,g}$$



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