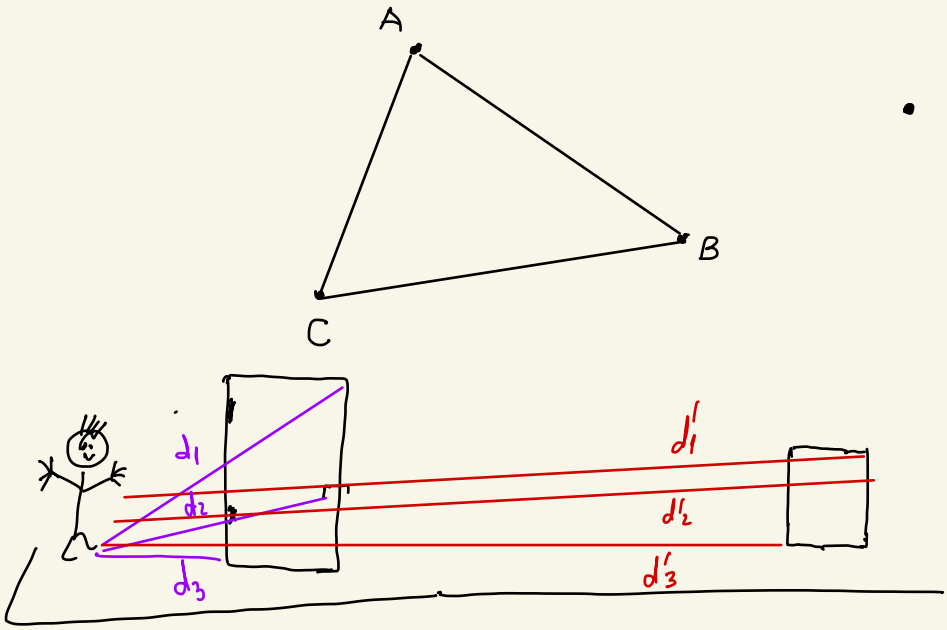
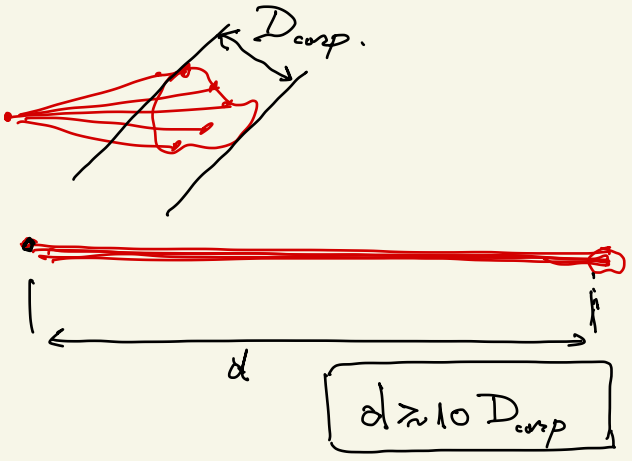
15 Decembrie 2021

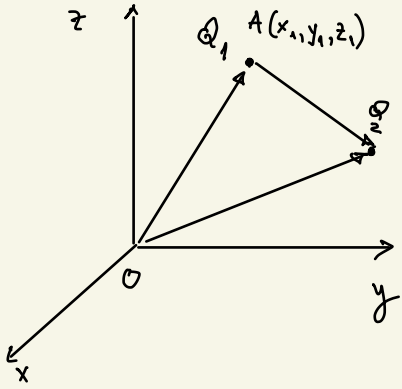
# Conceptul de punctiformitate.

Ce înseamnă că două corpuri sunt punctiforme?



# Expresia matematică a legii lui Coulomb. (Interacțiunea electrică dintre două corpuri punctiforme)




$$\vec{AB} = \vec{OB} - \vec{OA}$$

$$\vec{OA} = x_1\vec{i} + y_1\vec{j} + z_1\vec{k}$$

$$\vec{OB} = x_2\vec{i} + y_2\vec{j} + z_2\vec{k}$$

$$\vec{AB} = (x_2-x_1)\vec{i} + (y_2-y_1)\vec{j} + (z_2-z_1)\vec{k}$$

$$|\vec{AB}| = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2}$$

$$\vec{F}_{AB} = k\,\frac{Q_1Q_2}{|\vec{AB}|^3}\cdot\vec{AB}$$ ← Legea lui Coulomb în formă vectorială

$$|\vec{F}_{AB}| = k\cdot\frac{|Q_1Q_2|}{|\vec{AB}|^3}\cdot|\vec{AB}|$$

$$|\vec{F}_{AB}| = k\,\frac{|Q_1Q_2|}{|\vec{AB}|^2}$$ ← Legea lui Coulomb în formă scalară

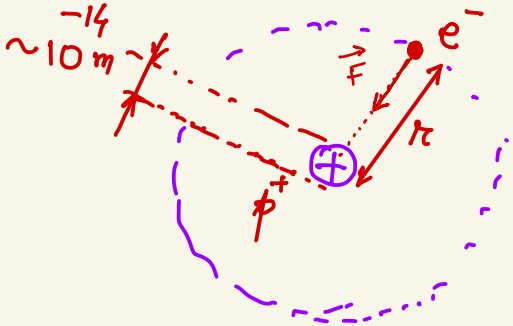
$$\vec{F}_{AB} = k\,\frac{Q_1Q_2}{\left(\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}\right)^3}\left[(x_2-x_1)\vec{i} + (y_2-y_1)\vec{j} + (z_2-z_1)\vec{k}\right]$$

$$= F_{ABx}\,\vec{i} + F_{ABy}\,\vec{j} + F_{ABz}\,\vec{k}$$

$$\begin{cases} F_{ABx} = k \dfrac{q_1 q_2 (x_2 - x_1)}{\left[(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2\right]^{3/2}} \\ F_{ABy} = k \dfrac{q_1 q_2 (y_2 - y_1)}{\left[(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2\right]^{3/2}} \\ F_{ABz} = k \dfrac{q_1 q_2 (z_2 - z_1)}{\left[(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2\right]^{3/2}} \end{cases}$$

$$\vec{F}_{AB} = k \frac{q_1 q_2}{|\vec{AB}|^3} \cdot \vec{AB}$$

**Ex.** 1) Cu ce forță se atrag electronul și protonul dintr-un atom de hidrogen?




$$|\vec{F}| = F = k \frac{|e(-e)|}{r^2} = \frac{ke^2}{r^2}$$

$$\begin{cases} k \simeq 9 \cdot 10^9 \ \frac{Nm^2}{C^2} \ SI \\ e \simeq 1{,}6 \cdot 10^{-19} \ C \\ r \simeq 5 \cdot 10^{-11} \ m \end{cases}$$

$$r = 0{,}5 \ \text{Å} = 0{,}5 \cdot 10^{-10} \ m = 5 \cdot 10^{-11} \ m$$

$$F = \frac{9 \cdot 10^9 \cdot (1{,}6 \cdot 10^{-19})^2}{(5 \cdot 10^{-11})^2} N = \frac{9 \cdot 10^9 \cdot 1{,}6^2 \cdot 10^{-38}}{25 \cdot 10^{-22}} N =$$

$$= \frac{9 \cdot 1{,}6^2}{25} 10^{9-38+22} N = \frac{9 \cdot 1{,}6^2}{25} \cdot 10^{-7} N =$$

$$= \frac{9 \cdot 2{,}56}{25} \cdot 10^{-7} N = \frac{9 \cdot 25{,}6 \cdot 10^{-1} \cdot 10^{-7}}{25} N$$

$$\simeq \frac{9 \cdot 10^{-8}}{25} N = \frac{90 \cdot 10^{-1} \cdot 10^{-8}}{25} N = \frac{90}{25} \cdot 10^{-9} N$$

$$= \frac{90 \cdot 4}{100} \cdot 10^{-9} N = 3{,}6 \cdot 10^{-9} N \; !!$$

$NaCl \xrightarrow{\text{aqua}} Na^+ + Cl^-$