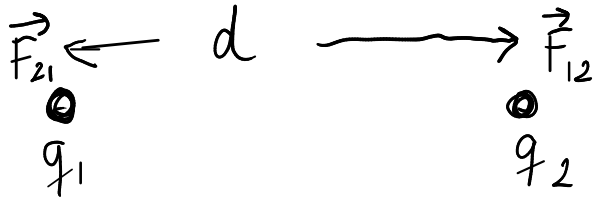
aula 2. 2020-09-23

Força elétrica



ação e reação

$\vec{F}_{12} = -\vec{F}_{21}$

$\Rightarrow F_{12} = F_{21} = k\dfrac{|q_1||q_2|}{d^2}$

Outra interpretação

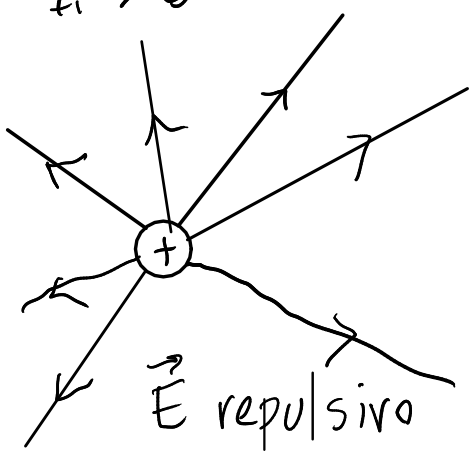
$\vec{E}_1$ = campo elétrico devido a q_1

↳ atua na carga q_2, produzindo a força $\vec{F}_{12} = q_2\vec{E}_1$

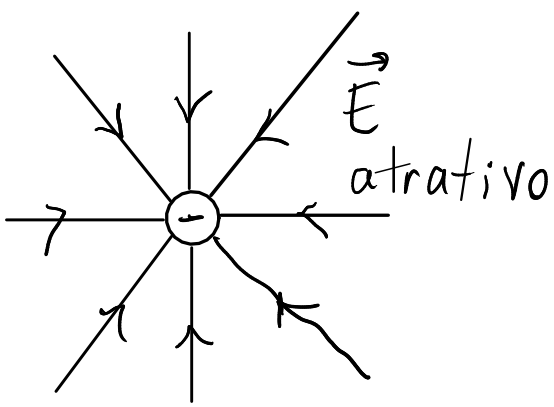
$\vec{F}_{21} = q_1\vec{E}_2$

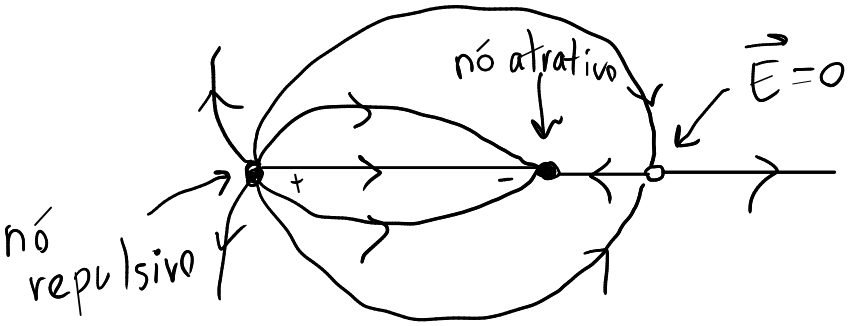
cargas pontuais q_i → $E_i = \dfrac{k|q_i|}{d^2}$

$q_i > 0$



$q_i < 0$





objetos complicados

$$\vec{E} = \sum_{i=1}^{n} \vec{E}_i$$

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

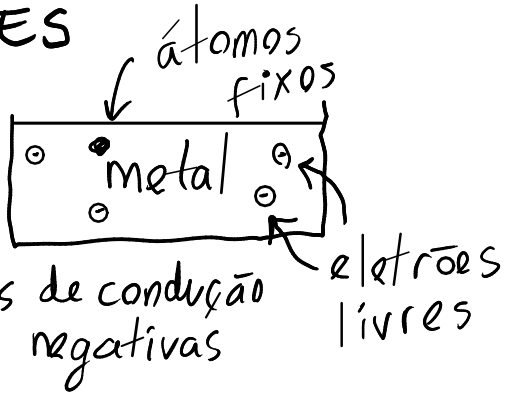
q (pontual) num ponto P:

$$\vec{F}_{\text{elétrica}} = \begin{cases} 0 \Rightarrow \vec{E}_P = \vec{0} \\ \vec{F}_{el.} \neq \vec{0} \Rightarrow \vec{E}_P = \dfrac{\vec{F}_{el}}{q} \end{cases}$$

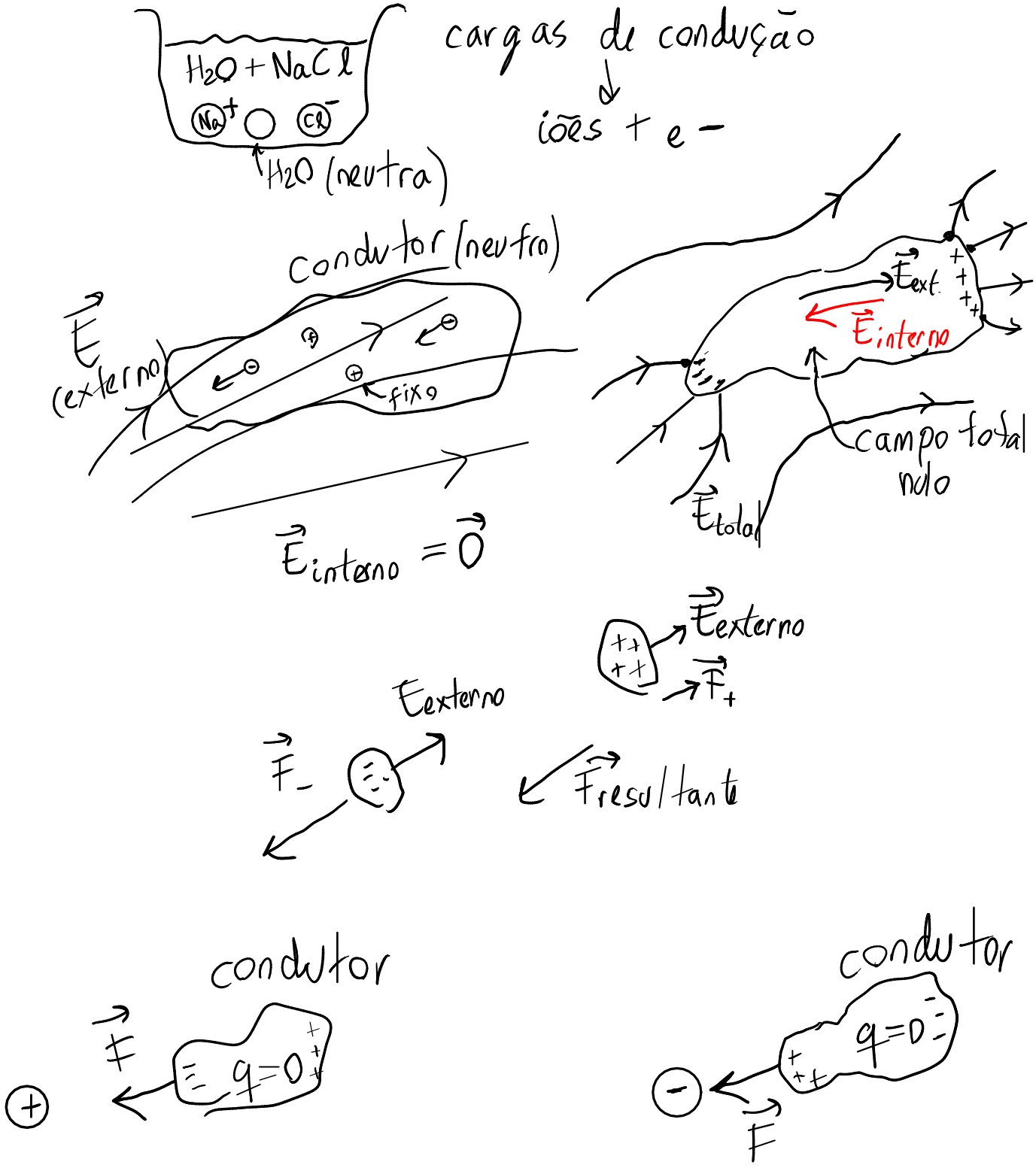
$$\boxed{\vec{F}_q = q\vec{E}}$$

CONDUTORES E ISOLADORES

1. <u>Condutores</u>
cargas livres de se deslocarem no material

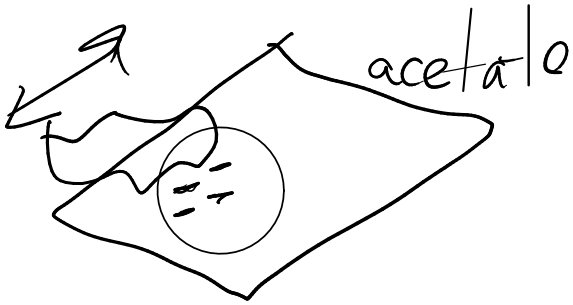


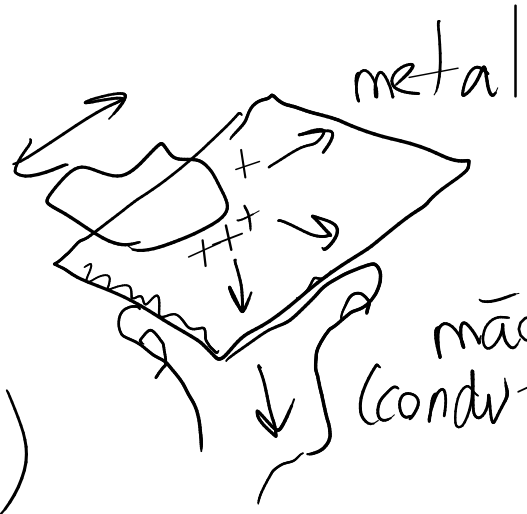
soluções

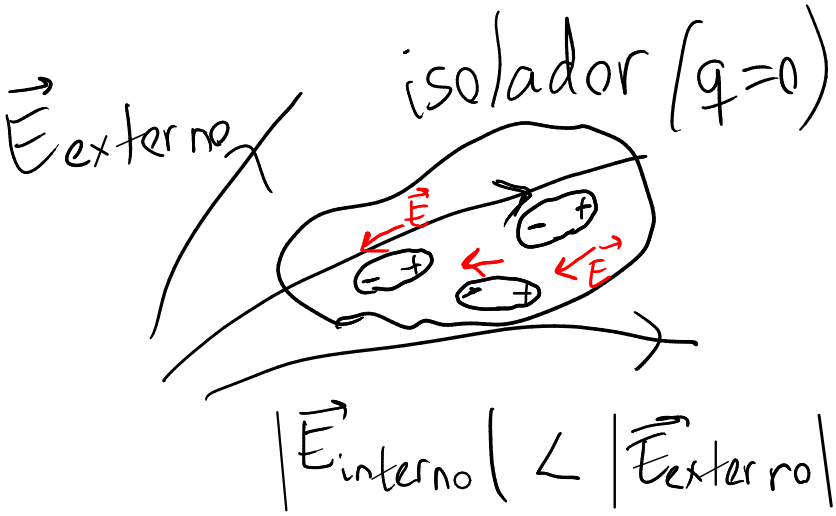


2. <u>Isoladores</u>. Não há cargas de condução

ex: papel, madeira, plástico, acetato, ...







$|\vec{E}_{interno}| < |\vec{E}_{externo}|$

cada átomo forma um dipolo

$|q_1| = |q_2| \quad q_1 + q_2 = 0$

K = constante dielétrica

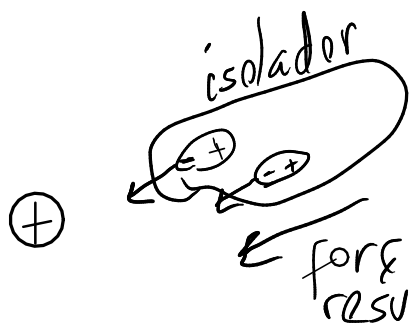
↓

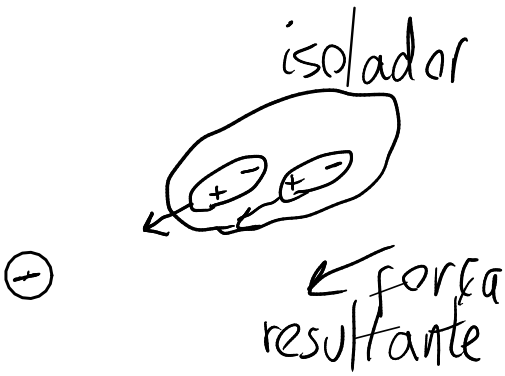
número (sem unidades) > 1

Campo de uma carga pontual q dentro de um isolador

óleo ou água destilada (isoladores)

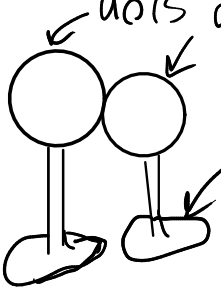
$$E = \frac{k|q|}{K d^2}$$





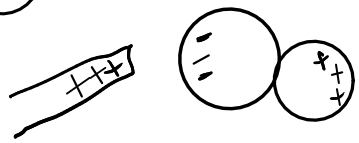
Eletrização por indução

Exemplo: (1)

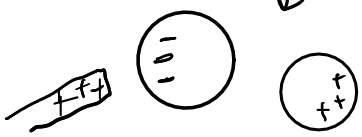


$(q_{inicial} = 0)$

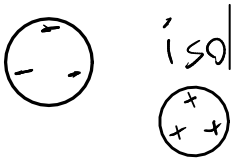
(2)



(3)



(4)



Todo ISOLADOR tem um campo máximo chamado:

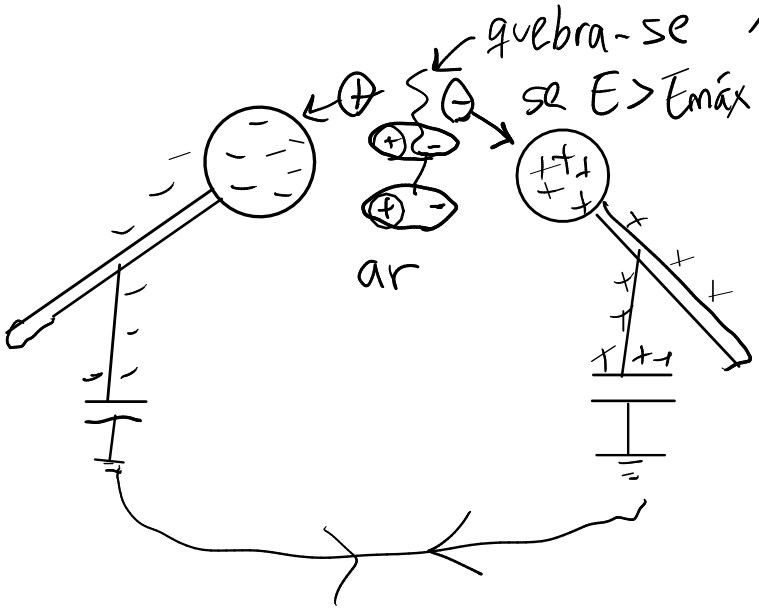
rigidez dielétrica

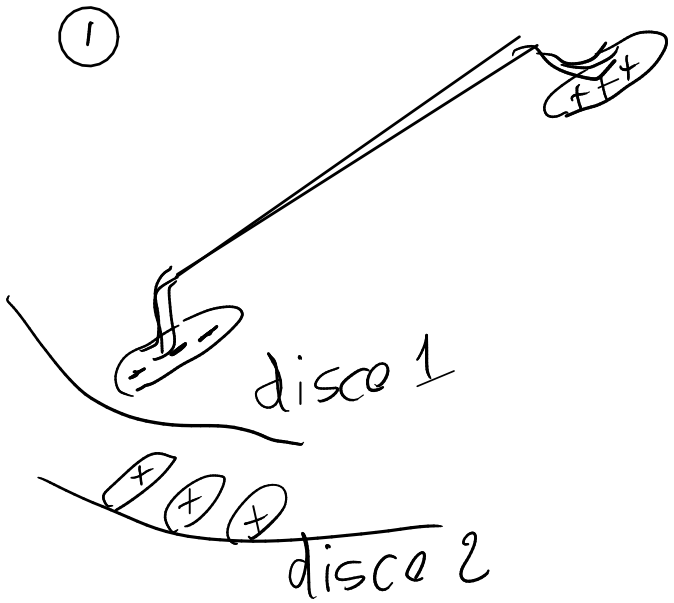
→ plasma = gás ionizado

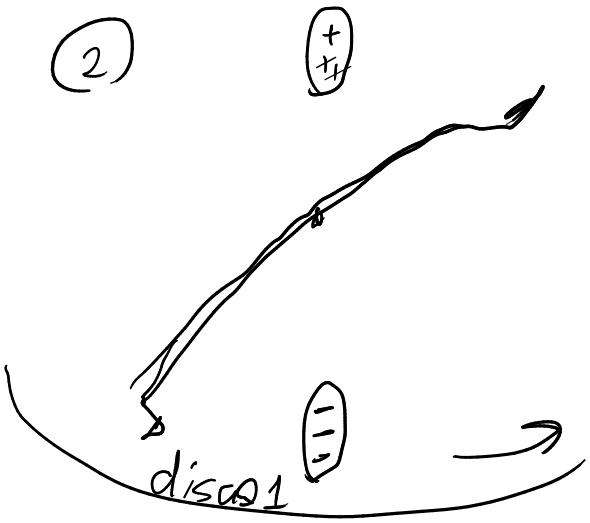
no caso do ar

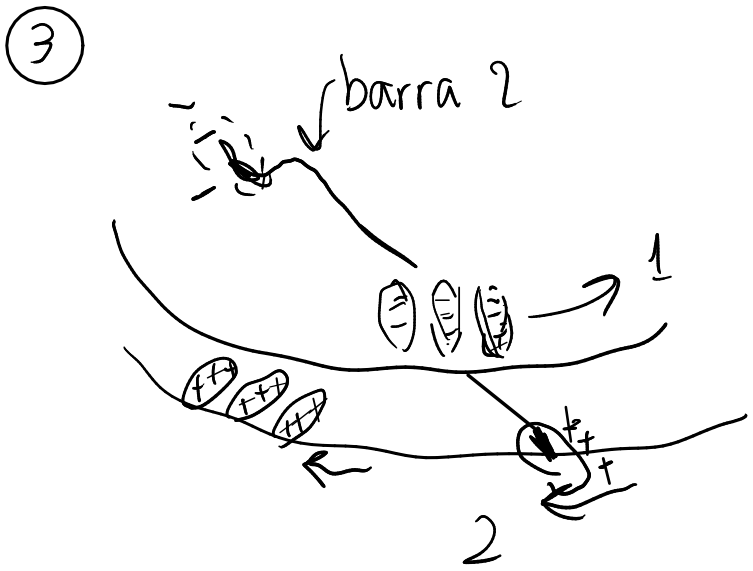
$E_{máx} = 3 \times 10^6 \frac{N}{C}$

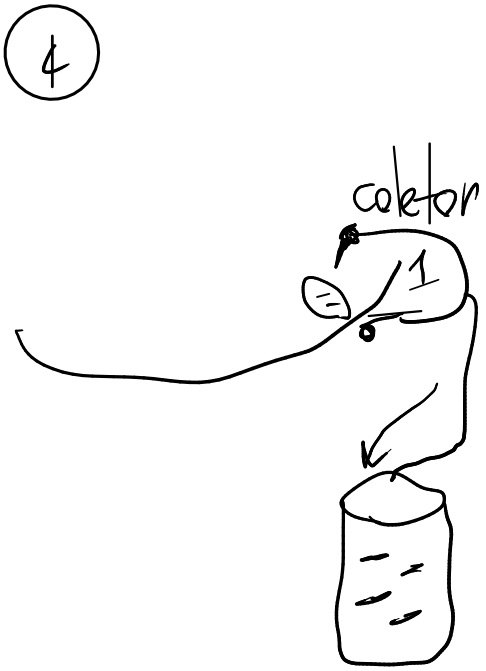
Gerador de Wimshurst

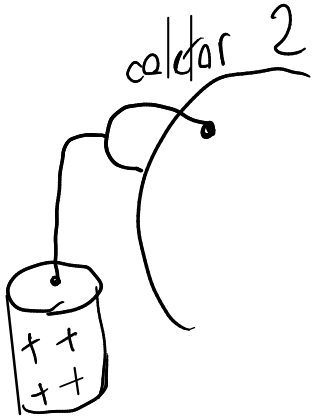












K: $K_{óleo} \approx 2.24$

$K_{ar\ seco} \approx 1.0005$ g

(vácuo $K_{vácuo} = 1$)

$K_{papel} \approx 3.7$

Erigidez do ar seco $= 3 \times 10^6 \frac{N}{C}$ ar húmido → rigidez menor