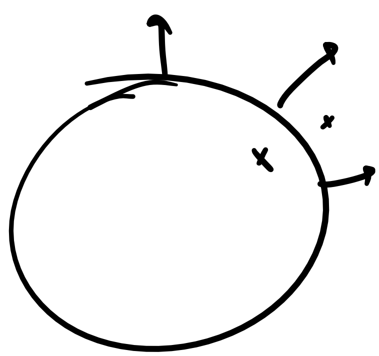
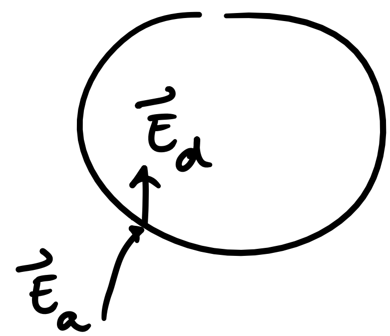
If I had more time, I would have written a shorter letter!

Marcus Cicero

BOUNDARY CONDITIONS

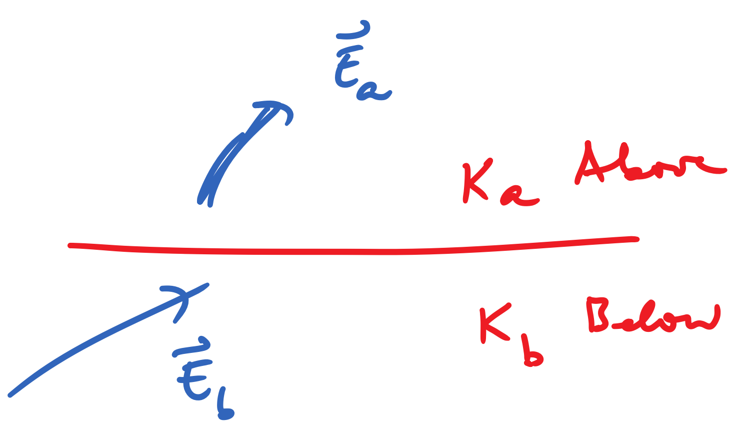


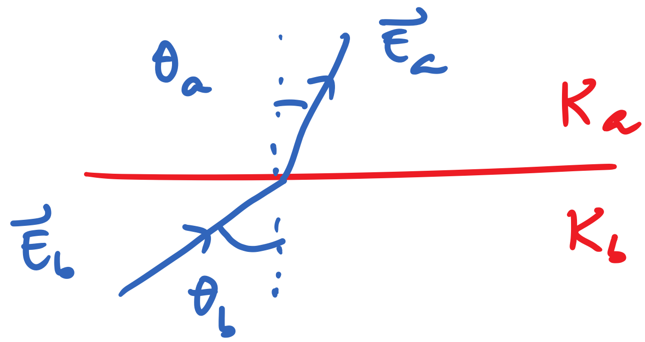


$$\oiint \vec{E} \cdot d\vec{a} = \frac{Q_{enc}}{\epsilon_0}$$

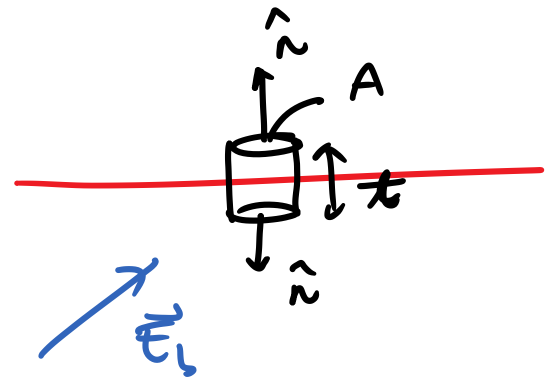
$$\oiint \vec{D} \cdot d\vec{a} = Q_{f\,enc}$$

$$\oint \vec{E} \cdot d\vec{l} = 0$$





$$\oiint \vec{E}\cdot d\vec{a} = \frac{Q_{enc}}{\epsilon_0}$$



$$-E_b^{\perp} A + E_a^{\perp} A = \frac{\sigma}{\epsilon_0} A$$

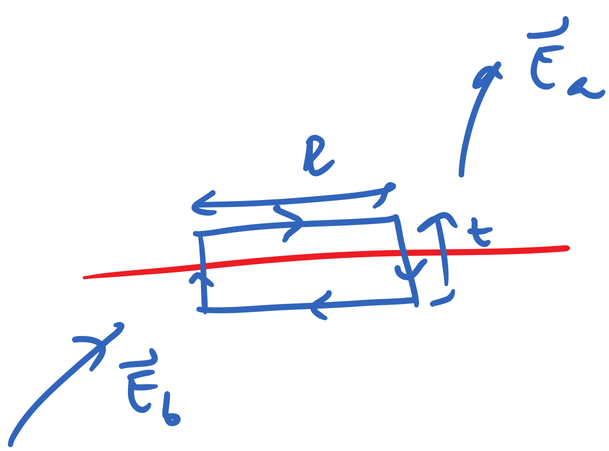
$$\boxed{E_a^{\perp} - E_b^{\perp} = \frac{\sigma}{\epsilon_0}}$$

$$\oiint \vec{D}\cdot d\vec{a} = Q_{f\,enc}$$

$$-D_b^{\perp} A + D_a^{\perp} A = \sigma_f A$$

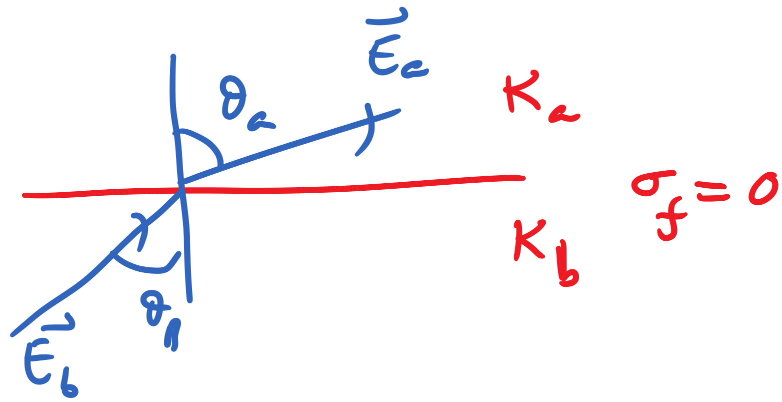
$$\boxed{D_a^{\perp} - D_b^{\perp} = \sigma_f}$$

$$\oint \vec{E}\cdot d\vec{l} = 0$$



$$-E_b^{\parallel} \cdot l + E_a^{\parallel} l = 0$$

$$\boxed{E_a^{\parallel} = E_b^{\parallel}}$$



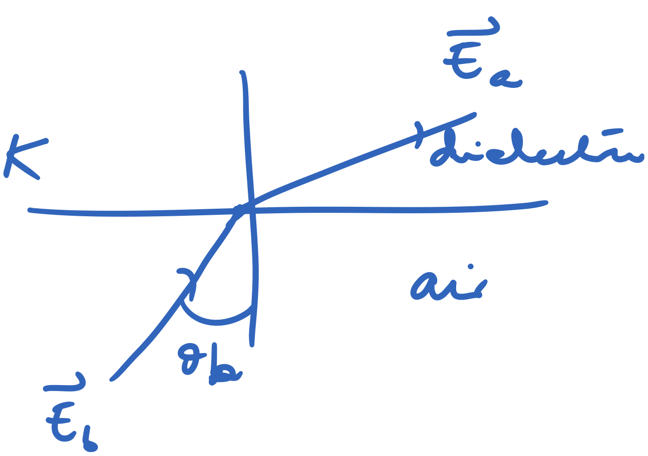
$$E_a^{\parallel} = E_b^{\parallel}$$

$$D_a^{\perp} = D_b^{\perp}$$

$$E_a \sin\theta_a = E_b \sin\theta_B$$

$$\epsilon_0 K_a E_a \cos\theta_a = \epsilon_0 K_b E_b \cos\theta_B$$

$$\boxed{\frac{\tan\theta_a}{K_a} = \frac{\tan\theta_B}{K_b}}$$



$K_a = K$

$K_b = 1$

$$\tan\theta_a = \frac{K_a}{K_b}\tan\theta_b$$

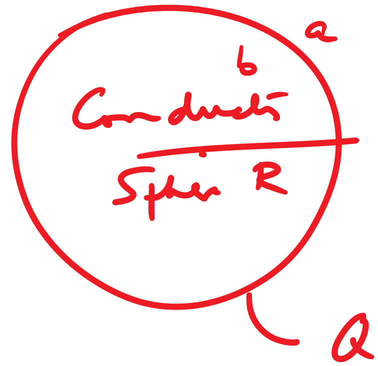
$$= K \tan\theta_b$$

$$\theta_a > \theta_b$$

Example

$\vec{E}_{in} = 0$

$\vec{E}_{out} = \frac{Q}{4\pi\epsilon_0 R^2}\hat{r}$ at $r = R$

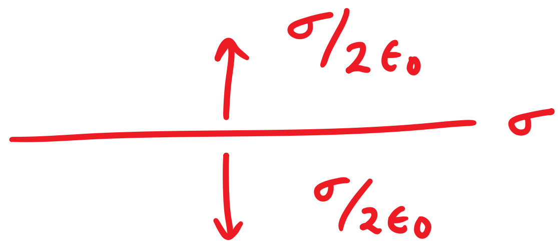


$$\boxed{E_a^{\perp} - E_b^{\perp} = \frac{\sigma}{\epsilon_0}}$$

$E_a^{\perp} = \frac{Q}{4\pi\epsilon_0 R^2} = \frac{\sigma}{\epsilon_0}$

$E_b^{\perp} = 0$

Ex 2



$$\boxed{\begin{aligned} E_a^{\parallel} &= E_b^{\parallel} \\ E_a^{\perp} - E_b^{\perp} &= \frac{\sigma}{\epsilon_0} \\ D_a^{\perp} - D_b^{\perp} &= \sigma_f \end{aligned}}$$

Laboratory

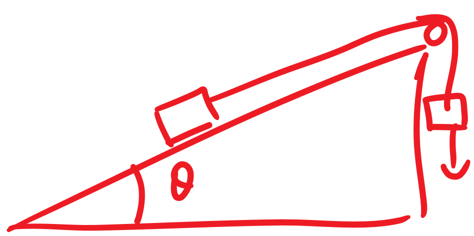
1. Error measurements : Vernier Calipers
   Screw Gauge

$49 \text{ MSD} = 50 \text{ VSD}$

$1 \text{ MSD} = 1\text{mm}$

$LC = ? = \left(1 - \frac{49}{50}\right) \times 1\text{mm} = \frac{1}{50}\text{mm} = 0.02\text{mm}$

2) Friction : To measure coeff of friction



3) Moment of Inertia of a flywheel

4) Viscosity of liquid

5) Young's modulus : Y