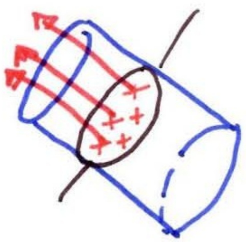
$\vec{E}_{TOT}$ at surface of a metal (ctd)



$$\oint \vec{E}\cdot\hat{n}\, dA = \int_{endcap} E\, dA$$

$= E$ on endcap

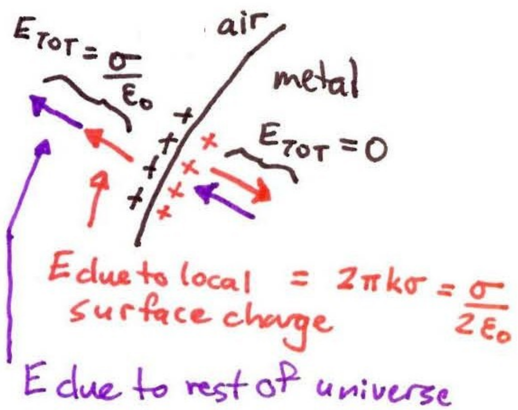
since E uniform over end cap, can take it out of the integral

$$\Rightarrow \int_{endcap} E\, dA = E \int_{endcap} dA = E \cdot \text{area of endcap}$$

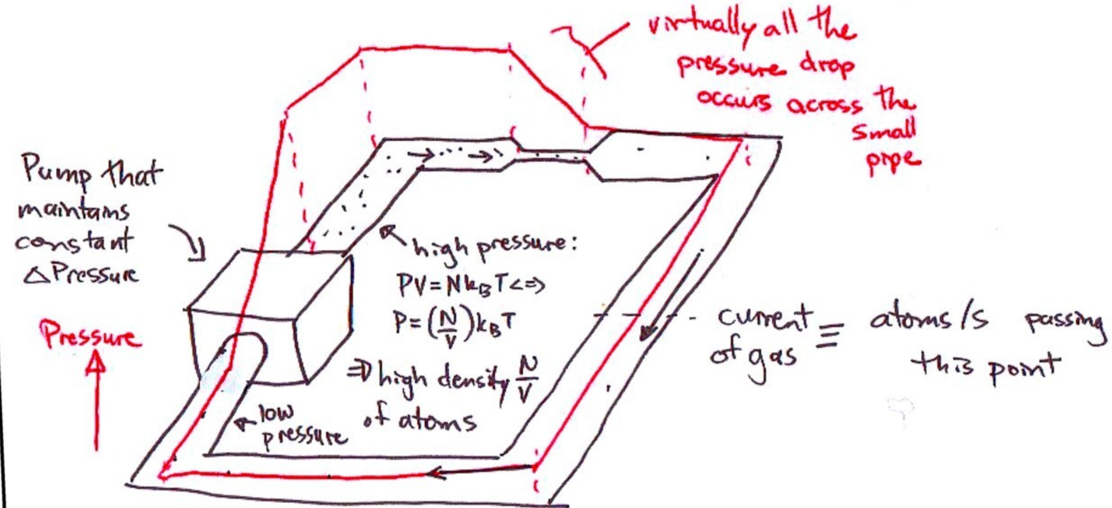
$$Q_{net\ encl} = \sigma \cdot \text{area of endcap}$$

Gauss's Law $\Rightarrow$ $E \cdot \text{area of endcap} = \dfrac{\sigma \cdot \text{area of encap}}{\varepsilon_0}$

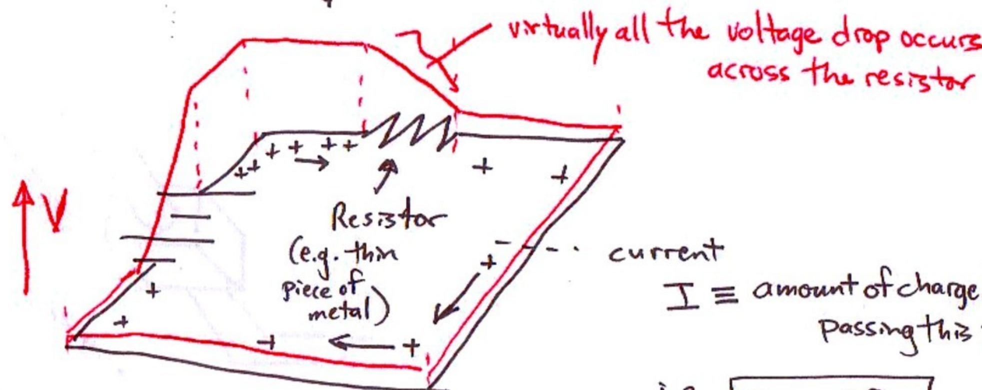
$$\Rightarrow \boxed{E_{TOT\ metal\ surface} = \frac{\sigma}{\varepsilon_0}}$$



Electric current



analogous to



current $I \equiv$ amount of charge/s passing this point

i.e. $\boxed{I \equiv \dfrac{\Delta Q}{\Delta t}}$

ΔQ = charge passing the point in time Δt

Ohm's "Law"

As ΔV across the resistor is increased,
I will increase.

For most metals, observe:

** MEM $\boxed{V = IR}$ ** MEM

Ohm's law: does not apply to all materials, empirical

R is the "resistance". It has units of $\frac{V}{A} \equiv \Omega$ "ohm"

Series & Parallel resistors

Putting resistors in series makes it harder for current to flow, i.e. increases resistance → ** $\boxed{R_{series} = R_1 + R_2}$ **

Putting resistors in parallel gives more paths for current to flow, i.e. resistance goes down → **

$$\frac{1}{R_{\parallel}} = \frac{1}{R_1} + \frac{1}{R_2}$$

<=>

$$R_{\parallel} = \frac{R_1 R_2}{R_1 + R_2}$$

**