Source: [[KBhPHYS201IntroToElectrostaticsLN]] [[KBhPHYS201CircuitsIndex]]

1 | Resistance

So, let's figure out resistance.

We know that... $V = \frac{J}{C}$, per [[KBhPHYS201Voltage]], and we also know that resistance would equal a unit $\frac{Vs}{c}$ given that $I = \frac{C}{s} = \frac{\Delta V}{Resistance}$ (see [[KBhPHYS201Current]] Current). Plugging in the definition of voltage, we get that resistance is measured in $\frac{Js}{C^2}$. We call this unit Ohms, or Ω.

Definition 1 · **Resistance** Ω A value measured in $\frac{Js}{C^2}$ that measures the resistance to current

Calculating resistance

- So, let's think. With a wire of length L and with a wire of area A, if we increase L, the resistance in the wire would increase; if we increase area A, the resistance in the the wire would decrease.
- $Resistance = \frac{L}{A} * ResistivityOfMaterial$ with units $\frac{m}{m^2}(\Omega \times m)$.

Sometimes its easier to think about conductivity.

and, indeed, resistivity of materials are measured in $\Omega \times m$, which also makes sense intuitively.

Heat of resistance

$$I = \frac{C}{s} \qquad V = \frac{J}{C}$$

$$P = \frac{J}{s} \qquad IV = \frac{J}{S} = W\cancel{att}$$

Figure 1: [[KBe20phys250srcHeatFromResistors]].png

2 | Ohm

$$\Omega = \frac{\text{V}}{\text{A}} = \frac{1}{\text{S}} = \frac{\text{W}}{\text{A}^2} = \frac{\text{V}^2}{\text{W}} = \frac{\text{s}}{\text{F}} = \frac{\text{H}}{\text{s}} = \frac{\text{J·s}}{\text{C}^2} = \frac{\text{kg·m}^2}{\text{s·C}^2} = \frac{\text{J}}{\text{s·A}^2} = \frac{\text{kg·m}^2}{\text{s}^3\text{·A}^2}$$

(Wikipedia)