EECS 16A Designing Information Devices and Systems I
Spring 2022 Discussion 7A

1. Material Resistivity

(a) Recall the 1D resistive touch screen model introduced in class. In this model, the top layer can be thought of as a resistor, while the bottom layer can be thought of as a wire. When the top layer is touched, it flexes at the touch point and makes contact with the bottom layer. This results in a voltage divider.

Material	**Resistivity ρ (Ω cm)**	**Conductivity 1/ρ (Ω^{-1} cm^{-1})**
Silver	1.6×10^{-5}	6.3×10^{4}
Aluminum	2.7×10^{-5}	3.7×10^{4}
Carbon (graphite)	10×10^{-2}	10
Rubber	100×10^{12}	1×10^{-14}

Given the following list of materials and their resistivity/conductivity, which materials would be good to use as a top layer, and which would be good to use as a bottom layer? Why?

(b) Let's say you want to make your own **10 cm** long resistor out of **graphite**. You need the resistance to be **1** Ω. Recall the equation for resistance: $R = \rho \frac{L}{A} = \rho \frac{L}{W*H}$

i. What are some possible widths and heights of your resistor?

ii. Can you think of advantages of having a wide and thin resistor? How about advantages of a narrow and thick resistor?

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2. More Node Voltage Analysis!

Given $I_s = 1\,\text{A}$, $R_1 = 4\,\Omega$, $R_2 = 2\,\Omega$, $R_3 = 3\,\Omega$, and $R_4 = 10\,\Omega$, find the voltage across and the current through each of the resistors in the circuit below: