Tuesday Reading Assessment: Unit 1, Capacitance

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1 Memory Bank

- $C = A\epsilon_0/d$ ... Capacitance of a parallel-plate capacitor.

- $\epsilon_0 = 8.85 \times 10^{-12}$ F/m

- $C_{tot}^{-1} = C_1^{-1} + C_2^{-1}$ ... Total capacitance of two capacitors in series.

- $C_{tot} = C_1 + C_2$ ... Total capacitance of two capacitors in parallel.

2 Capacitors

1. Suppose you have a parallel plate capacitor with $A = 1$ mm^2, and $d = 0.1$ mm. What is the capacitance?

2. Now suppose two identical capacitors from the previous problem are added *in series.* What is the total capacitance?

3. Same question, but they are added *in parallel.* What is the total capacitance?

4. Which of the following should be the formula for the capacitance of a coaxial cable of length L? The inner and outer radii are R_1 and R_2, respectively. *Think about the units of ϵ_0.*

   - A: $C = (2\pi\epsilon_0 R_1 L)/\ln(R_2/R_1)$.
   - B: $C = (2\pi\epsilon_0 L)/\ln(R_2/R_1)$.
   - C: $C = (2\pi\epsilon_0 R_1 R_2 L)/\ln(R_2/R_1)$.
   - D: $C = (2\pi\epsilon_0 L)$.