



**CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY**

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<b>Project Title</b> <b>A Dielectric's Effect on Capacitance</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective is testing the effects of different dielectric materials on capacitance by building capacitors with different materials and physical dimensions. Tests were done by charging the capacitors in a basic resistor-capacitor circuit. <b>Methods/Materials</b> Five home-made capacitors (aluminum foil, a dielectric or insulating layer, and wire); voltage-current multimeter; 100 megohm resistor; 6-V battery; timer. Measured the time required to charge each capacitor and then applied fundamental physics theories to calculate the dielectric constant of each insulating material used in the capacitors. <b>Results</b> Repeated trials (20 per capacitor), in which I measured the current, allowed me to determine the time constant of the resistor-capacitor circuit. Following calculations found the capacitance of each capacitor, the electric permittivity of the dielectric, and finally the dielectric constant of each material. <b>Conclusions/Discussion</b> Because the capacitors were home-made, there was a significant leakage current through the capacitors. Inaccuracies in the current measurement led to some dielectric constants being apparently less than 1 (below the theoretical limit!). Despite this problem, I could measure the dielectric constant of the materials relative to each other.	
<b>Summary Statement</b> I showed that I could determine the relative dielectric constant of an insulator in a resistor-capacitor circuit.	
<b>Help Received</b> My father, whose background is electrical engineering, helped me with the construction of the capacitors.	