

Capacitor Lab 2

Equipment: One DC power supply, one digital multimeter, one 10 μF cap, one 22 μF cap, and one 47 μF cap. eight clip leads.

Part A - *****

1. With no wires attached, turn on the power supply. Turn the current knob all the way clockwise. Turn the voltage knob until the digital voltmeter on the PS reads about 6.0 V. It doesn't have to be exact since it isn't terribly accurate anyway. Turn the PS off.
2. Wire up the three small caps in series, being careful to hook the negative lead of one cap to the positive lead of the next cap. Negative is the side with the stripe on the case.
3. Now plug banana plugs into both the red (+) and black (-) jacks. Clip the positive to the free positive on the string of caps. Clip the negative to the free negative. There should be only one path running from the positive of the PS, through the first cap, through the second cap, through the third cap, and to the negative of the PS. Make sure the positive ends of the cap are toward the positive of the PS.
4. Have me look at the circuit before you turn it on. Then turn it on. The small caps will charge quickly. You may see a current on the digital ammeter on the PS.
5. Set your multimeter to 20 V DC. Clip a lead to each of its probes. Attach these first on the leads of the first cap and record the value. Do the same for the second and third caps. You don't have to worry about the polarity since the meter will show either positive or negative depending on how you hooked it up. We only need the magnitude. Then put it across the power supply and record. How are these values related? Calculate q_1 , q_2 , and q_3 . How do these compare? What is the equivalent capacitance of the three caps in series?
6. Turn off the PS and disassemble the circuit.

Part B - *****

7. Now wire the caps in parallel. Positives are all connected together. Negative are all connected together. Then attach the + of the PS to the positive of the end cap. Connect the - to the negative end cap.
8. Show me the circuit. Then turn it on.
9. Repeat steps 4 to 6 for this circuit.

Part C - *****

10. **What did you learn?** → (a) How do the potentials across caps in series relate to the potential of the PS? (b) How do the charges on each cap compare or relate to each other? (c) What is the equivalent capacitance of the three caps in series?

(d) How do the potentials across caps in parallel relate to the potential of the PS? (e) How do the charges on each cap compare or relate to each other? (f) What is the equivalent capacitance of the three caps in parallel?

(g) Does this all make sense compared to what you saw in the Electronics Workbench simulation?