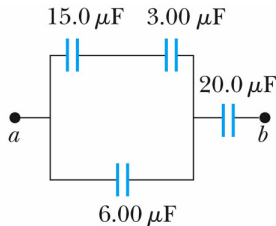


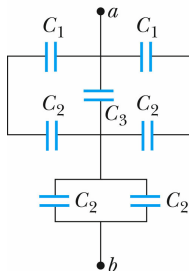
## Homework 5

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1. Four capacitors are connected as shown in the figure. (a) Find the equivalent capacitance between points  $a$  and  $b$ . (b) Calculate the charge on each capacitor, taking  $\Delta V_{ab} = 15.0$  V.



2. Find the equivalent capacitance between points  $a$  and  $b$  for the group of capacitors connected as shown in the figure. Take  $C_1 = 5.00 \mu\text{F}$ ,  $C_2 = 10.00 \mu\text{F}$ , and  $C_3 = 2.00 \mu\text{F}$ .



3. Two capacitors,  $C_1 = 25.00 \mu\text{F}$  and  $C_2 = 5.00 \mu\text{F}$ , are connected in parallel and charged with a 100 V power supply. (a) Draw a circuit diagram and calculate the energy stored in each capacitor. (b) Re-connect the two capacitors in series and connect them back to the same power supply, compare the total energy drawn from the power supply in these two cases (a) and (b).
4. A 500 W heating coil designed to operate from 110 V is made of Nichrome wire 0.500 mm in diameter. (a) Assume the resistivity of the Nichrome remains constant at its  $20.0^\circ\text{C}$  value, find the length of the wire used. (b) Now consider the variation of resistivity with temperature. What power is delivered to the coil of part (a) when it is warmed up to  $1200^\circ\text{C}$ ?
5. A conductor of radius  $r$ , length  $l$  and resistivity  $\rho$  has resistance  $R$ . Connected to a power supply of voltage  $\Delta V$  at the ends of its length, what are the current and current density in the conductor? Now the conductor is stretched to 4 times its original length, what is the new resistance? Connected to the same power supply at the ends of its length, what are the current and current density now?