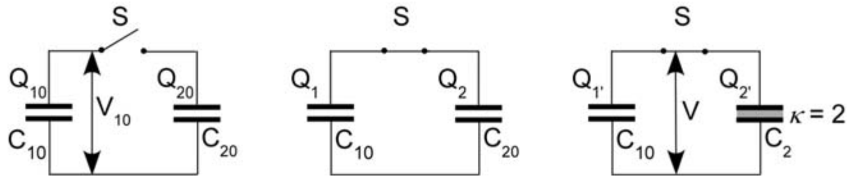
Physics 9C-A **Midterm Exam #2** **Winter of 2016**

1. Two air-gapped capacitors, $C_{10} = 8\ \mu F$ and $C_{20} = 4\ \mu F$ are connected through a switch *S*. Initially *S* is open, the potential drop across C_{10} is $V_{10} = 120V$, and there is no potential drop across C_{20}.

(a) (**5 points**) Find initial charges Q_{10} and Q_{20} on C_{10} and C_{20}, respectively;

(b) (**5 points**) After *S* is closed for a long time, find charges Q_1 and Q_2 on C_{10} and C_{20}, respectively;

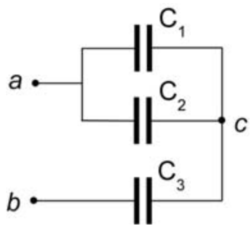
(c) (**10 points**) Now you insert a dielectric material with dielectric constant $\kappa = 2$ to *fill* the air-gap in the second capacitor. Find the potential drop across both capacitors now.



2. A potential difference $V_{ab} = 40$ volts is maintained across a system of capacitors in the figure below with $C_1 = 11\ \mu F$, $C_2 = 9\ \mu F$, and $C_3 = 5\ \mu F$.

(a) (**5 points**) Find the equivalent capacitance of the network C_{ab};

(b) (**10 points**) Find charges on all three capacitors.

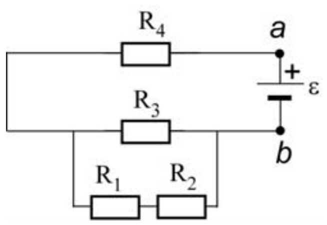


3. In the following circuit, $\varepsilon = +72V$. Let $R_1 = 3\Omega$, $R_2 = 9\Omega$, $R_3 = 24\Omega$, and $R_4 = 16\Omega$.

(a) (**5 points**) Find the network resistor R_{ab};

(b) (**5 points**) Find the power dissipated in the network resistor R_{ab}

(c) (**15 points)** Find powers dissipated in each of the four resistors and show that the sum of them adds up to the answer for Part (b).

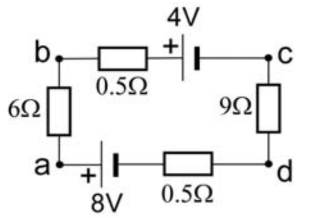


4. In the following circuit,

(a) (**10 points**) Find the magnitude and direction of the current through the circuit;

(b) (**5 points**) Find the potential difference $V_{ac} = V_a - V_c$;

(c) (**5 points**) Find the potential difference $V_{bd} = V_b - V_d$.



5. In the following circuit,

(a) (**15 points**) Find the current through all resistors;

(b) (**5 points**) Find the potential difference $V_{df} = V_d - V_f$.