Capacitors in Circuits Problems

1. Rank the Equivalent capacitances of the configurations below, with 1 the highest and 4 lowest:
2. Fill in the table for the Charges and Voltages for each capacitor:

|  |  |  |
| --- | --- | --- |
| **Capacitance (μF)** | **Applied Charge (μC)** | **Voltage (V)** |
| 2 |  |  |
| 4 |  |  |
| 6 |  |  |
| 8 |  |  |
| 10 |  |  |

HINT: (you have the total voltage, so start by finding the total capacitance of the circuit)

1. A capacitor of 0.10 F was charge by connecting it to a 5.9 V supply. When it was disconnected from the supply then connected to in parallel with another uncharged capacitor of unknown capacitance, the voltage across them fell to 0.71 V.
2. Calculate the charge on the 1st capacitor before the 2nd capacitor was connected. **(0.59 C)**
3. Determine the combined capacitance of the two capacitors in parallel. **(0.831 F)**
4. What was the unknown capacitance? **(0.731 F)**
5. The switch in the figure below has been set at a for a long time. The switch is then moved to b at t = 0 s. What is the charge of the capacitor and current through the resistor at t = 5.0 μs?

**(1.7 μC, 0.567 A)**

1. The current at the beginning of a capacitor discharge is 45.7 mA. If the capacitance is 470 μF and it is discharging through a 2.0 kΩ resistor.
2. What is the time constant for this circuit? **(0.94 sec)**
3. What will the current be after 1 second? After 2 seconds? **(15.77 mA, 5.44 mA)**
4. What was the initial voltage across the resistor (and capacitor)? **(91.4 V)**
5. The voltage across a 2000 μF capacitor is 12.4 V when it starts discharging through a 3250 Ω resistance. How long will it be before the voltage has fallen to exactly 1 V? **(16.365 seconds)**
6. In an experiment to determine the value of an unknown capacitor, a discharge current through it was found to fall to 10% of the previous value in a time of 39 seconds. If the discharge was through a resistor of value 57.6 kΩ, what was the unknown capacitance? **(294 μF)**