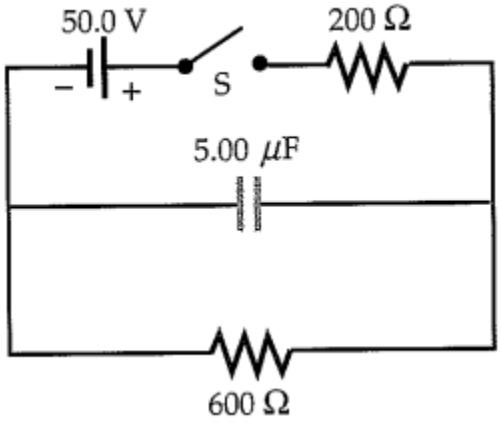
RC Circuit Problems for Practice

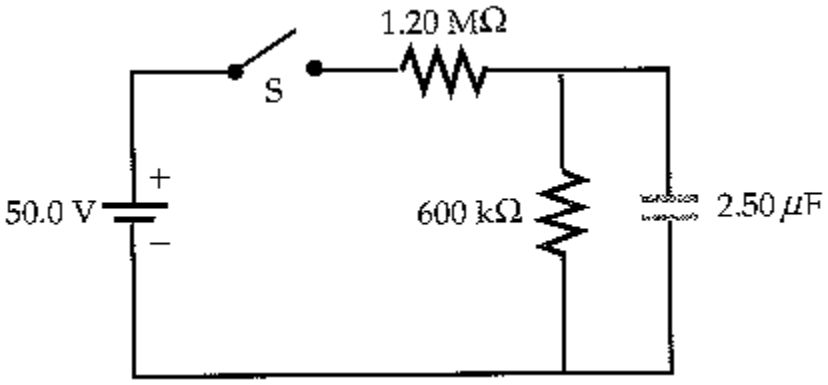
Answers will be posted on Wednesday

1) For the circuit shown below, switch S has been open for a long time. At time t = 0, the switch is then closed.



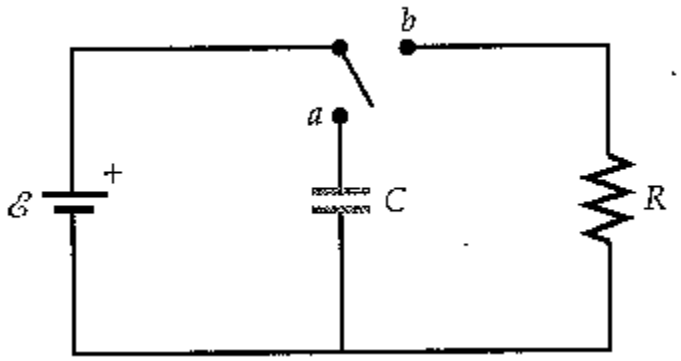
a) What is the battery current (current through the battery) just after the switch S is closed?
b) What is the battery current a long time after the switch is closed?
c) What is the current in the 600Ω resistor as a function of time?

2) For the circuit shown below switch S has been open for a long time. At time t = 0, the switch is then closed.



a) What is the current through the battery just after the switch S is closed?
b) What is the battery current a long time after the switch is closed?
c) The switch has been closed for a long time. At time t = 0, the switch is then opened. Find the current through the 600 kΩ resistor as a function of time.

The following three problems are based on the circuit below:



3) In the circuit above, C = 6.00μF, ε = 100V and R = 500Ω. After having been at contact 'a' for a long time, the switch throw is rotated to contact 'b'.

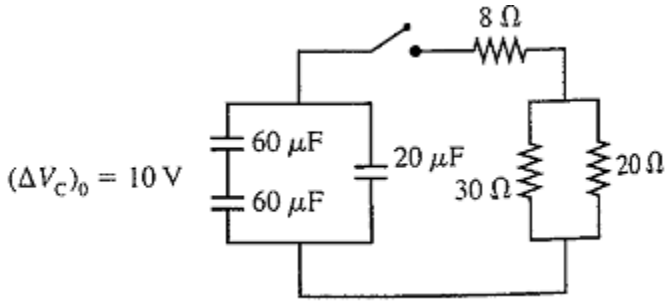
a) What is the charge on the upper plate of the capacitor just as the switch throw is moved to contact 'b'?
b) What is the initial current just after the switch throw is moved to contact 'b'?
c) What is the time constant of the circuit (switch throw on b)?
d) How much charge is on the upper plate of the capacitor 6.00ms after the switch throw is rotated to contact 'b'?

4) At t = 0 the switch throw in the figure above is rotated to contact 'b' after having been at contact 'a' for a long time.

   a) Find the energy stored in the capacitor before the switch throw is rotated away from contact a.
   b) Find the energy stored in the capacitor as a function of time.

5) For the circuit shown above, suppose the capacitance C = 0.120μF and ε = 100V. The switch throw is rotated to position 'b' after having been at contact 'a' for a long time, and 4.00s later the potential difference across the capacitor is equal to $\frac{1}{2}\varepsilon$. What is the value of R?

6) The capacitors in the figure below are charged and the switch closes at t = 0s. At what time has the current in the 8Ω resistor decayed to half the value it had immediately after the switch was closed?



7) The switch in the figure below has been closed for a very long time.

   a) What is the charge on the capacitor?
   b) The switch is opened at t = 0s. At what time has the charge on the capacitor decreased to 10% of its initial value?