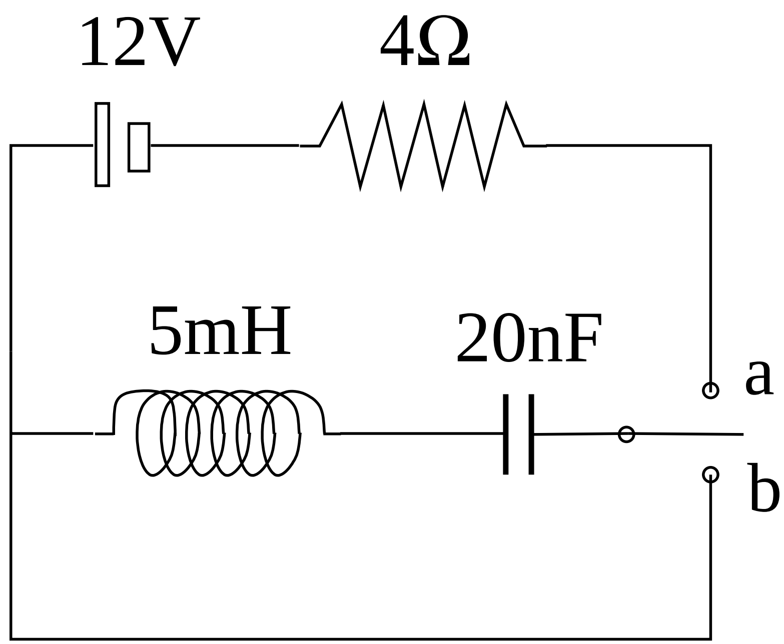
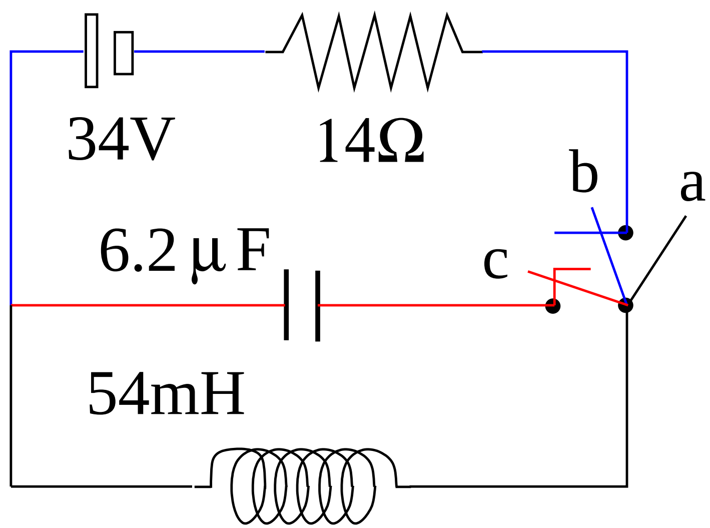
RLC Circuit: Application (1)

In the circuit shown the capacitor is without charge.
When the switch is closed to position a...
(a) find the initial rate dI/dt at which the current increases from zero,
(b) find the charge Q on the capacitor after a long time.
Then, when the switch is thrown from a to b...
(c) find the time t_1 it takes the capacitor to fully discharge,
(d) find the maximum current I_{max} in the process of discharging.



RLC Circuit: Application (2)

In the circuit shown the capacitor is without charge and the switch is in position a.
(i) When the switch is moved to position b we have an RL circuit with the current building up gradually: $I(t) = (\mathcal{E}/R)[1 - e^{-t/\tau}]$.
Find the time constant τ and the current I_{max} after a long time.
(ii) Then we reset the clock and move the switch from b to c with no interruption of the current through the inductor. We now have a an LC circuit: $I(t) = I_{max}\cos(\omega t)$.
Find the angular frequency of oscillation ω and the maximum charge Q_{max} that goes onto the capacitor periodically.



RLC Circuit: Application (3)

In the circuit shown the capacitor is without charge and the switch is in position a.
(i) When the switch is moved to position b we have an RC circuit with the capacitor being charged up gradually: $Q(t) = \mathcal{E}C[1 - e^{-t/\tau}]$.
Find the time constant τ and the charge Q_{max} after a long time.
(ii) Then we reset the clock and move the switch from b to c.
We now have a an LC circuit: $Q(t) = Q_{max}\cos(\omega t)$.
Find the angular frequency of oscillation ω and the maximum current I_{max} that flows through the inductor periodically.