

PHYS 114 - Sixth Homework

1. Explain in your own words why an LC circuit without an external emf oscillates. What would be the influence of any resistance in the circuit on the amplitude and the frequency? (Do not use equations or solutions of any equations, and do not copy the explanation in the book):
2. The circuit of Figure 34.31a (H. C. Ohanian, Pg. 846) is oscillating with the switch S closed. The graph of current vs. time is shown in Figure 34.31b.
 - (a) At time t_1 , the switch S is suddenly opened. Is the frequency of oscillation increased, decreased or unchanged? Sketch the graph of the current after time t_1 .
 - (b) At time t_2 , the switch S is closed. Sketch the graph of current after this time.
(H. C. Ohanian, Ch. 34, Pr. 17, pg. 846)
3. Consider the circuit described in the previous problem. Suppose that in place of the switch S , you place an emf source with $\mathcal{E} = \mathcal{E}_0 \sin(\omega t)$. What will be the instantaneous current delivered from the emf source? What will be the currents passing through the resistor? the inductor? and the capacitor?
4. How would the Maxwell's equations be modified in a medium of magnetic permeability κ_m and dielectric constant κ ?
5. A parallel plate capacitor has circular plates of area A separated by a distance d . A thin straight wire of length d lies along the axis of the capacitor and connects the two plates; this wire has resistance R . The exterior terminals of the plates are connected to a source of alternating emf with a voltage $V = V_0 \sin(\omega t)$.
 - (a) What is the current in the thin wire?
 - (b) What is the displacement current through the capacitor?
 - (c) What is the current arriving at the outside terminals?
 - (c) What is the magnetic field between the capacitor plates at a distance r from the axis? Assume that r is less than the radius of the plates.
(H. C. Ohanian, "Physics," Ch. 35, Pg. 869, Pr. 8)