

PHYS 212 Homework Assignment

Chapter 14

Problem 1 In an LC circuit with $C = 4.00 \mu\text{F}$, the maximum potential difference across the capacitor is 1.50 V and the maximum current through the inductor is 50 mA.

- (a) What is the inductance L ?
- (b) What is the frequency of oscillations?
- (c) How long does it take for the charge to rise from 0 to its maximum value?

Problem 4 A circuit is composed of two metal rails 8 cm apart, a resistor with $R = 1 \Omega$ connecting them, and a rod at the other end which moves at a speed of 0.45 m/s. A uniform magnetic field $B = 0.1 \text{ T}$ points perpendicular to the plane of the circuit.

- (a) Find the induced emf in the circuit.
- (b) Find the current in the circuit.
- (c) If the rod moved in the opposite direction, how would your answers change?

Problem 5 While upgrading the electronics in your car stereo, you calculate that you need to construct an LC circuit that oscillates at 20 Hz. If you have a 40 mH inductor, what capacitor do you need to buy from Radio Shack?

Problem 6 You have an LC circuit that includes a small, unavoidable resistance from the wires. The inductor is 1.5 mH and the capacitor is 3 mF. The capacitor is initially charged to $30 \mu\text{C}$. After 100 oscillations, the maximum charge on the capacitor is only $5 \mu\text{C}$.

- (a) What is the resistance of the circuit?
- (b) How much energy has been lost?
- (c) Where did this energy go?