

## Physics 142 – Fall 2008 – Workshop module 11

1. If I hook a large capacitor across an ordinary outlet in my house, will it blow a fuse?
2. Spaceman Spiff's transmorgarizer lies in a cavity between the poles of a permanent magnet. The B field produced by the magnet in a vacuum is EXACTLY the field necessary for the proper functioning of the transmorgarizer. Unfortunately, as everyone knows, transmorgarizers cannot be exposed to vacuum. Spaceman Spiff, having become a physicist extraordinaire in college, decides to surround the transmorgarizer with an atmosphere of air and methane. Why? What percentage of air and methane should Spiff use to insure a properly functioning transmorgarizer?
3. What is the impedance of a series LCR circuit at resonance?
4. A circuit consists of a resistor connected in series to a battery; the resistance is 5 ohms and the emf of the battery is 12 volts. The wires (of negligible resistance) connecting these circuit elements are laid out along a square of 20 cm x 20 cm. The entire circuit is placed face on in an oscillating magnetic field. The instantaneous value of the magnetic field is  $B=B_0\sin\omega t$ , with  $B_0=0.15$  T and  $\omega=360$  radians/s. a) Find the instantaneous current in the resistor. b) Find the average power dissipated in the resistor.
5. When a mariner's compass is installed aboard an iron ship, it must be "adjusted" by placing several small permanent "correcting" magnets in its vicinity. What is the purpose of these magnets?