Phys 222 SI Session #29

**Topics:** Transformers, Driven RLC circuits

Intro discussion: Are there any advantages to drinking bottled water?

1. An oscillating voltage of fixed amplitude is applied across a circuit element. If the frequency of this voltage is increased, the amplitude of the current will
   A. increase if the circuit element is either an inductor or a capacitor.
   B. decrease if the circuit element is either an inductor or a capacitor.
   C. increase if the circuit element is an inductor but decrease if the circuit element is a capacitor.
   D. decrease if the circuit element is an inductor but increase if the circuit element is a capacitor.
   E. will stay the same if the circuit element is either an inductor or a capacitor.

2. The diagram at right is for an AC circuit consisting of a capacitor \( C = 7.0 \, \text{nF} \), an inductor \( L = 2.5 \, \mu\text{H} \) and a resistor \( R = 15 \, \Omega \) connected in series with an AC voltage source \( V(t) = V_0 \cos(\omega t) \) where \( V_0 = 3.0 \, \text{V} \). The frequency of the source is tuned so that the current amplitude in the circuit is maximum. What is the RMS (root mean square) voltage across the capacitor for this choice of the frequency?

![AC circuit diagram]

3. If the primary of a transformer were connected to a DC (Direct Current) power source, when would the transformer have a voltage output?

4. An AC circuit has a voltage source with a maximum voltage of 24 V connected to a 170-\( \Omega \) resistor. What is the average power expended in the resistor, in W?

5. In an ideal transformer, the primary coil carries a current of 4.00A. The voltage across the primary coil is 110V. Values are all in RMS. What is the power output of the secondary coil?

6. Consider a transformer whose primary coil has 2400 turns and secondary coil has 3600 turns. The transformer transforms electricity with 100% efficiency. What is the ratio of the induced current in the secondary coil to the current in the primary coil?

7. An ideal transformer consists of a 500-turn primary coil and a 2000-turn secondary coil. If the current in the secondary is 3.0 A, what is the current in the primary?