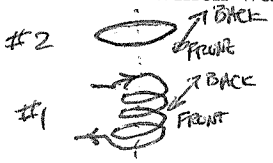
Physics 2611: General Physics II, Midterm III

NAME: _____

Circle all your final answers!

1) Quickies a) A typical sunspot has a field volume the size of the 10 earth's ($r = 6500$Km) and a magnetic field that is 2000 guass (1 gauss $= 10^{-4}$ T). If it takes 10 days to energize from zero field, what is the power, in watts, going into making the field during its formation. For comparison, all human energy production/consumption on earth is in the ballpark of 150 TW (that terrawatts, 1TW = ~~10^{12} W~~). 10^{12} W)

b) The coil as shown has initially current flowing through it as shown. The current is abruptly shut off!..which way does current subsequently flow in the second coil? Draw it clearly!!!



c) A coil of 2100 turns of radius 0.15m sits on a horizontal surface. The earths magnetic field is 0.48 gauss and makes an angle of 37 degrees from the vertical. The coils is flipped, 180 degrees, back into a horizontal position, in 0.067 seconds. Compute the average value of the voltage during the flip.

d) Two wires are 0.01 m apart and are 1.2m long. One carries 120 amps down and the other carries 67amp up. What is the **magnitude** and **direction** of the force between them?

e) How many turns do you need to wrap around a transformer core that is fed 120 VAC (wall voltage) through a second coil of 5400 turns if you need it to give you 0.37 VAC?

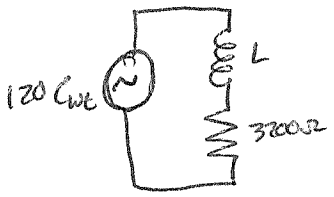
f) In problem #1.7 above, if the 0.37 volt output line is to supply 190 amps (like for a welder), how much current does the transformer draw from the wall? Will it blow a circuit breaker (15 amps)?

g) A coil has 1600 turns in it and is part of an LC circuit oscillating at 1.2 MHz. You want to change it by adding or reducing the turns on the coil so that the circuit now oscillates at 5.8 MHz. How many turns do you need to add/subtract or is the task impossible.

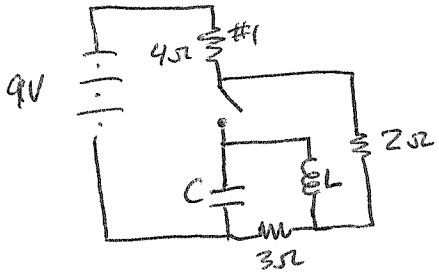
2) A coil is made of 2200 loops of wire wound on a cylinder of radius .005m and .03m in length. It is in series with a 3200 Ohm resistor to which is applied a AC voltage $V = 120\cos(\omega t)$. The frequency of the AC is 35 KHz. Compute

a) The RMS current in the circuit

b) The power dissipated in the circuit



3) For the circuit shown, what is (a) the current flowing in resistor #1 before the switch is closed and (b) the inrush current when the switch is first closed and (c) the power consumed by the circuit a long time after the switch is closed.



Extra Credit: A magnet, as shown, is held above a coil that is hooked up to an oscilloscope as shown. When the magnet is dropped completely through the hoop to the floor below, draw the waveform this generates on the oscilloscope corresponding to the total voltage drop around the hoop.