Physics 1214 - General Physics II

Final Exam - 2015.05.04

Name: _____

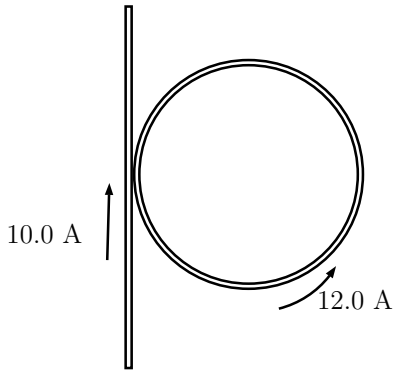
Instructions: In Part I, you are to to attempt each of problems 1 through 10, they are worth 20 points each, for a total of 200 points. In Part II, you are only required to attempt one problem, worth 20 points. Solving the other problem from Part II can earn you up to 20 extra points. It is not required that you attempt both problems from Part II. Please denote which problem you wish graded from Part II in the problems list below, and ON the actual problem page.

Problem	Points Possible	Points Earned
1	20	
2	20	
3	20	
4	20	
5	20	
6	20	
7	20	
8	20	
9	20	
10	20	
11 12		
Totals	220	

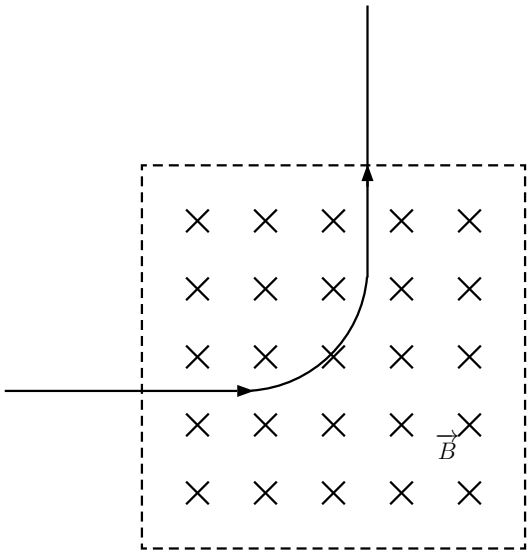
← Mark your problem from Part II.

Part I - Do all of problems 1–10

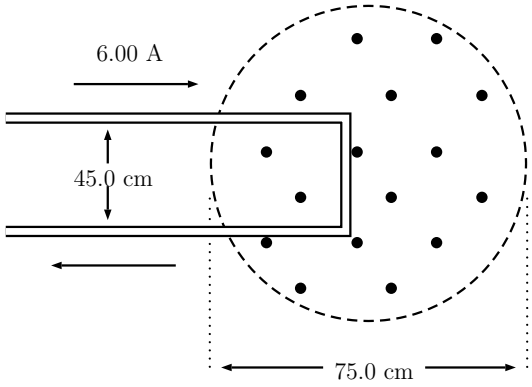
1. An insulated circular ring of diameter 6.50 cm carries a 12.0 A current and is tangent to a very long straight insulated wire carrying 10.0 A of current. Find the magnitude and direction of the magnetic field at the center of the ring due to this combination of wires.



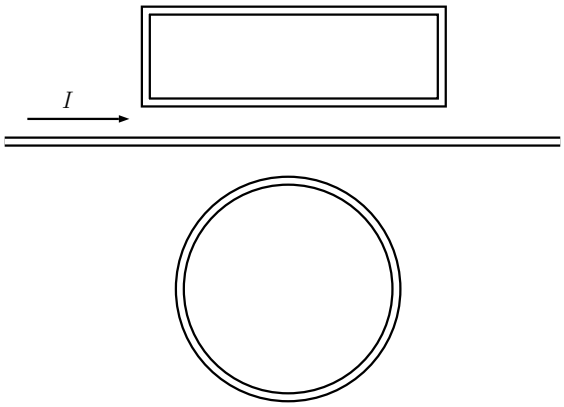
2. A beam of protons traveling at 1.20 km/s enters a uniform magnetic field, traveling perpendicular to the field. The beam exits the magnetic field in a direction perpendicular to its original direction. The beam travels a distance of 1.18 cm *while in the field*, its path being 1/4 of a circle. What is the magnitude of the magnetic field?



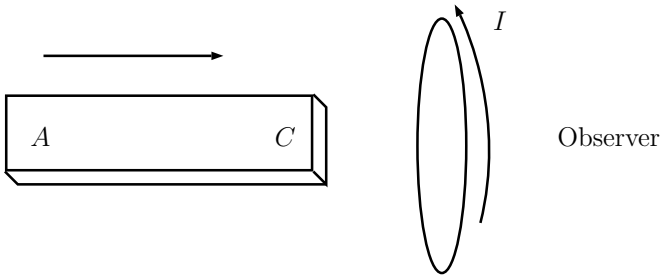
3. A long wire carrying 6.00 A of current reverses direction by means of two right-angle bends. The part of the wire where the bend occurs is in a magnetic field of 0.666 T confined to the circular region of diameter 75 cm as shown. Find the magnitude and direction of the *net* force that the magnetic field exerts on this wire.



4. Two closed loops, one rectangular and one circular, are close to a long wire carrying a current I. Find the direction (clockwise or counterclockwise) of the current induced in each of these loops if I is *steadily increasing*. Explain your answer fully!

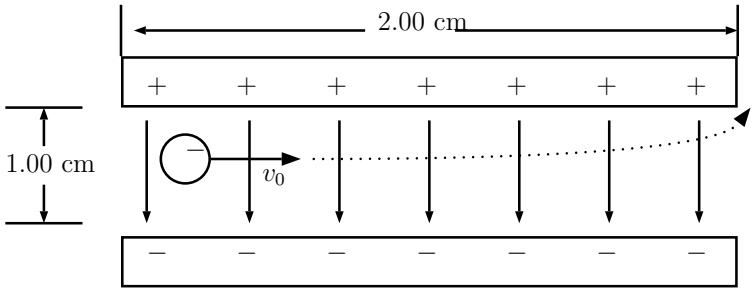


5. A bar magnet is close to a metal loop. When the magnet is suddenly moved to the right *towards* the loop, as depicted, a counterclockwise current is induced in the coil, as viewed by an observer looking through the coil *towards* the magnet. Identify the north and south poles. Explain your answer fully!

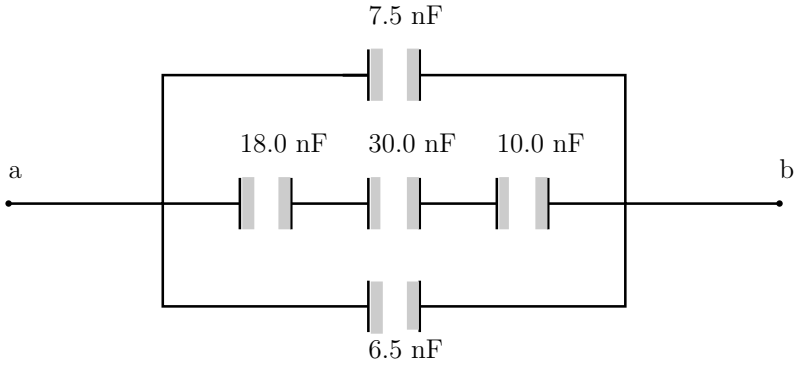


6. A 100 Ω resistor is in series with a 0.200 H inductor and a 0.750μF capacitor. Compute the impedance of the circuit and draw a phasor diagram at a frequency of 1500 Hz. Be sure to compute the phase angle of the source voltage with respect to the current and state whether the source voltage lags or leads the current.

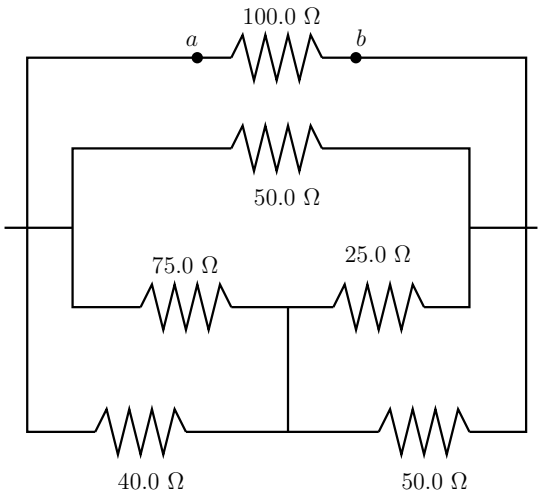
7. An electron is projected with an initial speed $v_0 = 5.00 \times 10^6$ m/s into the uniform field between the parallel plates as depicted. The direction of the field is vertically downward, and the field is zero except in the space between two parallel plates. The electron enters the field from the left at a point midway between the plates. If the electron just misses the upper plate as it emerges from the field, find the magnitude of the electric field.



8. For the system of capacitance shown below, a potential difference of 25 V is maintained across ab. (a) What is the equivalent capacitance of this system between a and b? (b) How much charge is stored in this system? (c) How much charge does the 6.5 nF capacitor store?



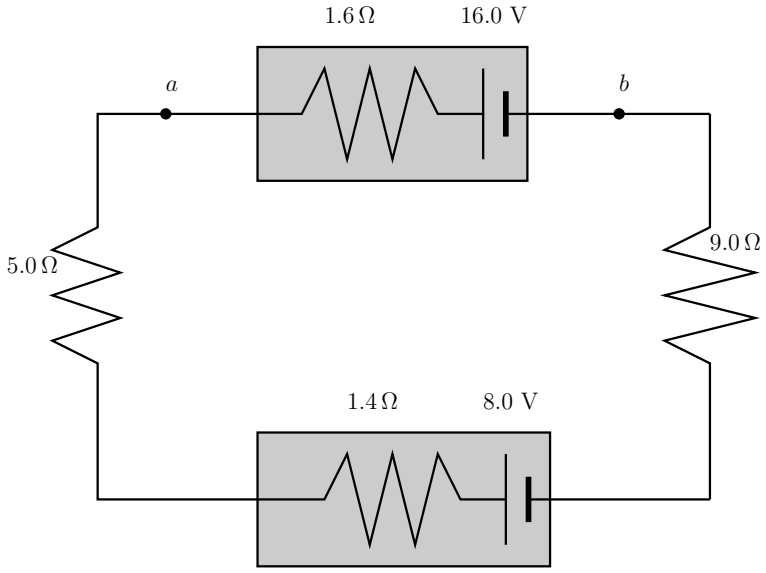
9. If an ohmmeter is connected between points a and b in the circuit below, what will it read?



10. An electron is to be accelerated from 3.00×10^6 m/s to 8.00×10^6 m/s. Through what potential difference must the electron pass to accomplish this?

Part II - Do at least one of problems 11 and 12.

11. The circuit below contains two batteries, each with an emf and an internal resistance, and two resistors. Find (a) the current in the circuit (magnitude and direction) and (b) the terminal voltage V_{ab} of the 16.0 V battery.



12. A circular coil of wire with average radius 0.0500 m and 30 turns lies in a horizontal plane. It carries a current of 5.00 A in a counterclockwise sense when viewed from above. The coils is in a uniform magnetic field directed toward the right, with magnitude 1.20 T. (a) Find the magnetic moment and the torque on the coil. (b) Which way does the coil tend to rotate? (c) What is the stable equilibrium orientation of this coil in the magnetic field?