

## Physics 114 – Practice Test for Midterm 2

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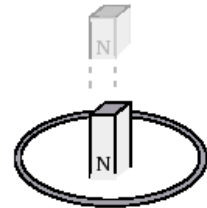
### Conceptual Question 1:

Explain the following:

- Is it possible for a charged particle to move through a magnetic field without experiencing a force?
- Is it possible for a charged particle to be at rest in the simultaneous presence of a magnetic and an electric field?
- Is it possible for such a particle to move through the fields without experiencing a force?
- What is the net force on a magnetic dipole in a uniform magnetic field?

### Conceptual Question 2:

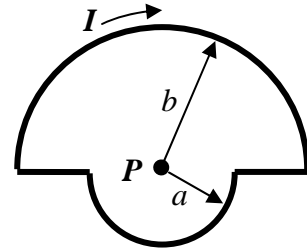
A bar magnet is dropped from above and falls through the loop of wire shown below. The north pole of the bar magnet points downward towards the page as it falls. Which statement is correct? Explain.



- The current in the loop always flows in a clockwise direction.
- The current in the loop always flows in a counterclockwise direction.
- The current in the loop flows first in a clockwise, then in a counterclockwise direction.
- The current in the loop flows first in a counterclockwise, then in a clockwise direction.
- No current flows in the loop because both ends of the magnet move through the loop.

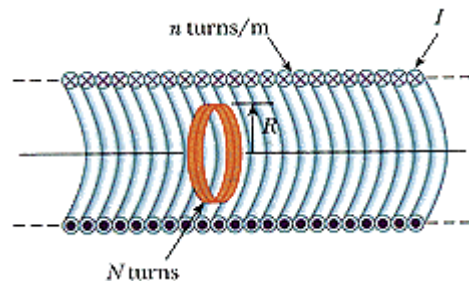
### Problem 1:

A length of wire is formed into a closed circuit with radii  $a$  and  $b$ , as shown in the figure, and carries a current  $I$ . What is the magnitude and direction of the magnetic field at  $P$ , the center of the two semi circles?



### Problem 2:

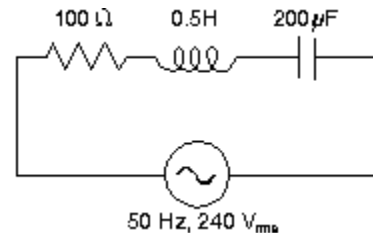
A long solenoid has 410 turns per meter and carries a current  $I = (25.5A)(1 - e^{-1.60t})$ . Inside the solenoid and coaxial with it is a coil that has a radius of 6.00 cm and consists of a total of 250 turns of fine wire (see figure). What emf is induced in the coil by the changing current? What is the direction of the induced emf?



### Problem 3:

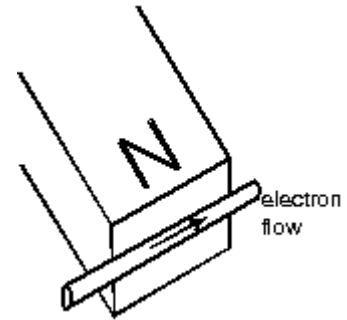
In the circuit shown,

- What is the total impedance of the circuit?
- What is the rms current of the circuit?
- How much power is transferred to the resistor?
- What should the capacitance be changed to for maximum power transfer to the resistor?



### Multiple Choice Questions:

1. The figure shows the motion of electrons in a wire which is near the N pole of a magnet. The wire will be pushed:
- toward the magnet
  - away from the magnet
  - downwards
  - upwards
  - along its length



2. The magnetic dipole moment of a current-carrying loop of wire is in the positive  $z$  direction. If a uniform magnetic field is in the positive  $x$  direction the magnetic torque on the loop is:
- 0
  - in the positive  $y$  direction
  - in the negative  $y$  direction
  - in the positive  $z$  direction
  - in the negative  $z$  direction
3. The magnetic properties of materials stem chiefly from:
- particles with north poles
  - particles with south poles
  - motions of protons within nuclei
  - proton spin angular momentum
  - electron magnetic dipole moments
4. In Ampere's law,  $\oint \vec{B} \cdot d\vec{s} = \mu_0 I$ , the integration must be over any:
- surface
  - closed surface
  - path
  - closed path
  - closed path that surrounds all the current producing  $\vec{B}$ .
5. A charged capacitor and an inductor are connected in series. At time  $t = 0$  the current is zero, but the capacitor is charged. If  $T$  is the period of the resulting oscillations, the next time, after  $t = 0$  that the energy stored in the electric field of the capacitor is a maximum is:
- $T$
  - $T/4$
  - $T/2$
  - $T$
  - $2T$