



FIG. 1: Figures A,B and C

1B quiz 4 version A

1. In Figure C, a wire and a 10 ohm resistor are used to form a circuit in the shape of a square, 20 cm by 20 cm. A uniform but non-steady magnetic field is directed into the plane of the circuit. The magnitude of the magnetic field is decreased from 0.90 T to 0.30 T in a time interval of 60 ms. The average induced current and its direction through the resistor, in this time interval, are closest to:

- a. 24 mA, from a to b
- b. 40 mA, from a to b
- c. 24 mA, from b to a
- d. 40 mA, from b to a

2. A 500-turn circular coil with an area of  $0.050 \text{ m}^2$  is mounted on a rotating frame, which turns at a rate of 20.0 rad/s in the presence of a 0.050 T uniform magnetic field that is perpendicular to the axis of rotation. What is the instantaneous emf in the coil at the moment that the normal to its plane (the vector that grows directly through there coil) is parallel to the field?

- a. 0
- b. 125 V
- c. 216 V
- d. 375 V

3. A bar magnet is falling through a loop of wire with constant velocity. The south pole enters first. As the north pole leaves the loop of wire, the induced current (as viewed from above) will be:
- a. clockwise.
  - b. counterclockwise.
  - c. zero.
  - d. Along the axis of the magnet
4. Consider the circuit drawn in Fig B consisting of several resistors, a battery and an inductor. What is the current in the  $4\Omega$  resistor immediately after the switch is closed?
- a. 2 A
  - b. 0 A
  - c. 1.33 A
  - d. 1.71 A
5. In the same circuit, what is the current in the  $4\Omega$  resistor after waiting a long time (i.e. once the currents have stopped changing)
- a. 0.0 A
  - b. 1.5 A
  - c. 1.71 A
  - d. 2.0 A
6. A 6.0 A current passes through an inductor. If the inductor stores 10 J of energy, what is the inductance?
- a. 60H
  - b. 180H
  - c. .56H
  - d. 1.8H

7. A current loop falls under the influence of gravity and starts to leave a region where there is a magnetic field of magnitude  $15\text{T}$  directed into the paper (see Figure A). If the loop has a  $5\text{ cm}$  side, a mass of  $.15\text{ kg}$ , and a resistance of  $2\Omega$ , find the loop's terminal velocity.
- a. cannot be determined from the information given
  - b.  $.3\text{ m/s}$
  - c.  $5.2\text{ m/s}$
  - d.  $300\text{ m/s}$
8. What is the significance of the minus sign in the equation  $\epsilon = -\frac{d\Phi}{dt}$
- a. Inductive effects always act in a sense to oppose the change which caused them.
  - b. The current and voltage in an inductive element are  $180^\circ$  out of phase.
  - c. An inductive element does not deliver energy to a circuit; instead it absorbs energy.
  - d. An inductive element does not absorb energy in a circuit; instead it delivers energy.