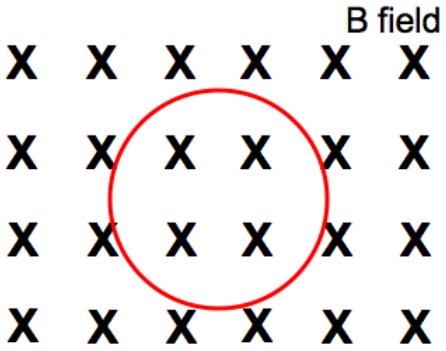
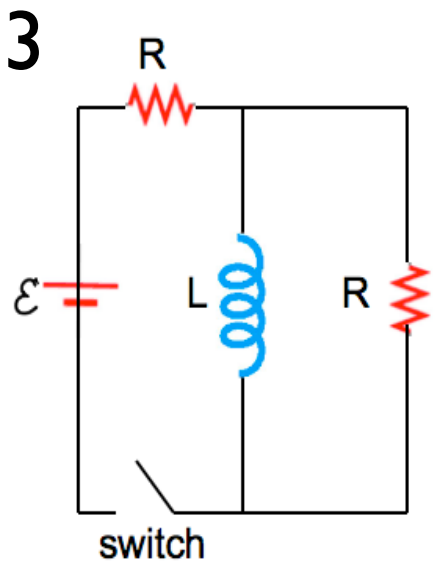
*Closed book. No work needs to be shown for multiple-choice questions.*

1. A circular coil of wire is positioned perpendicular to an external magnetic field. The magnetic field is directed into the board. It is thus parallel to the normal on the coil's area. The area of the coil is then suddenly decreased. What direction in the wire will the resulting current flow when looking on the coil into the direction of the B field.

a) clockwise
b) counterclockwise
c) out of the board
d) into the board
e) there will be no current induced in the wire.




2. What is the current in the circuit labeled "3" below a long time after the switch is closed?




a) I = EMF/(2R)
b) I = EMF/R
c) I = 2EMF/R
d) There will be no current flowing a long time after the switch is closed.
e) I = 3EMF/R

3. *A uniform 4.50 T magnetic field passes through the plane of a wire loop 0.100 $m^2$ in area. What magnetic flux passes through the loop when the direction of the 4.50 T field is at a 30.0° angle to the normal of the loop plane?*

a. 5.00 $T \cdot m^2$.
b. 0.520 $T \cdot m^2$.
c. 0.390 $T \cdot m^2$.
d. 0.225 $T \cdot m^2$.
e. 1.22 $T \cdot m^2$.

**4.** A henry is the same as:

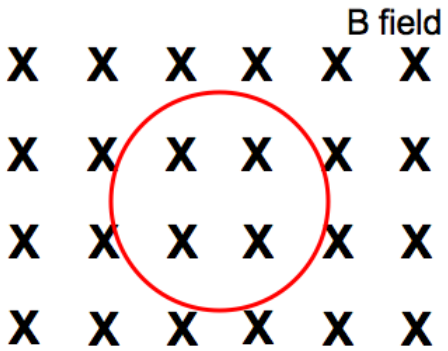
a. $1 \frac{\text{Volt} \cdot \text{sec}}{\text{Amp}}$.
b. $1 \frac{\text{Volt}}{\text{sec}}$.
c. 1 Ω.
d. $1 \frac{\text{Volt} \cdot \text{Amp}}{\text{sec}}$.
e. $1 \frac{\text{Amp} \cdot \text{sec}}{\text{Volt}}$.

**5.** The inductance, $L$, of an inductor placed in an $RL$ circuit with a battery with a potential difference, $\mathcal{E}$, depends upon:

a. The amount of current, $I$, present in the inductor.
b. The time rate of change of the current, $\Delta I/\Delta t$, in the inductor.
c. The geometry of the inductor.
d. The emf, $\mathcal{E}$, of the battery.
e. The overall resistance of the circuit, $R$.

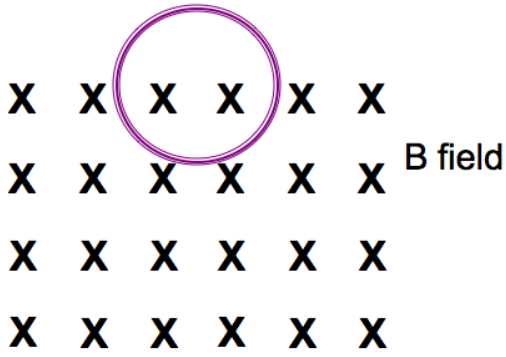
**6**. A flat coil of wire consisting of 20 turns, each turn with an area of 50 $cm^2$, is positioned perpendicularly to a uniform magnetic field that increases its magnitude at a constant rate from 2.0 T to 6.0 T in 2.0 s. If the coil has a total resistance of 0.40 Ω, what is the magnitude of the induced current in the flat coil?

a. 140 mA.
b. 70 mA.
c. 250 mA.
d. 800 mA.
e. 500 mA.



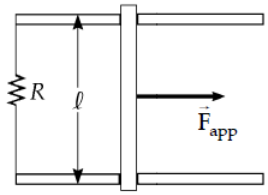

**7**. A circular loop of wire is positioned half in and half out of a square region of constant uniform magnetic field directed into the page, as shown to the right. To induce a counterclockwise current in this loop:

a. move it slightly to the right.
b. move it slightly to the left.
c. move it up toward the top of the page.
d. move it down toward the bottom of the page.
e. decrease the strength of the magnetic field.



8. Consider the arrangement below. Assume R=6.0 Ohm, length l=1.2m, and a uniform magnetic field of 2.5T is directed into the page. At what speed should the bar be moved to produce a current of 0.5A ?

a) 1m/s
b) 2m/s
c) 3m/s
d) 4m/s
e) 5m/s




9. Consider again the bar sliding without friction to induce a current. Assume R=6.0 Ohm, length l=1.2m, and a uniform magnetic field of 2.5T is directed into the page. What force needs to be applied to keep the bar moving to the right at a speed of 2m/s ?

a) 1N
b) 2N
c) 3N
d) 4N
e) 5N

10. Faraday's law states that an induced emf, $\mathcal{E}$, is proportional to:

a. the time rate of change of the magnetic field.
b. the time rate of change of the electric field.
c. the time rate of change of the magnetic flux.
d. the time rate of change of the electric flux.
e. zero.