

As always, show all your work and circle your final answer. All numeric values are good to 3 significant figures.

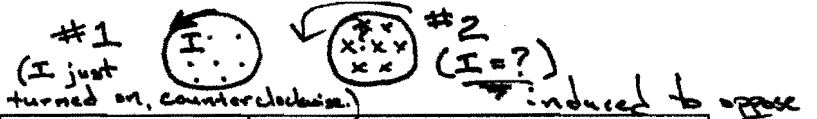
$$F = qvB \sin \theta, \quad F = I\ell B \sin \theta, \quad \mathcal{E} = B\ell v, \quad \Phi = BA \cos \phi, \quad \mathcal{E} = -N \frac{\Delta \Phi}{\Delta t}, \quad \mathcal{E} = NAB\omega \sin \omega t$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{I_s}{I_p}, \quad V_{RMS} = \frac{V_{max}}{\sqrt{2}}, \quad f_0 = \frac{\omega_0}{2\pi} = \frac{1}{2\pi\sqrt{LC}}, \quad V=IR, \quad P=IV$$

1. [3 pts.] A bar magnet with the 'N' pole pointing down and the 'S' pole pointing up is dropped through a loop of conducting wire. As the magnet is moving downward, towards the loop, in what direction does the magnet feel a force produced by the loop?

<input checked="" type="radio"/> A. Up; opposing the motion of the magnet.	<input type="radio"/> B. Down; the same direction as the motion of the magnet.	<input type="radio"/> C. Left; perpendicular to the motion of the magnet.	<input type="radio"/> D. Right; perpendicular to the motion of the magnet.	<input type="radio"/> E. None of these.
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2. [3 pts.] As shown at right, two coils of wire are side-by-side, and in the same plane as your piece of paper. In coil #1, the current is very quickly turned on. Which of the following occurs?



<input type="radio"/> A. A clockwise current is induced in coil #2	<input checked="" type="radio"/> B. A counter-clockwise current is induced in coil #2	<input type="radio"/> C. The magnetic field in coil #2 changes, but no current is produced	<input type="radio"/> D. The magnetic field in coil #2 does not change, and no current is produced	<input type="radio"/> E. 42
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3. [3 pts.] You know that a transformer is a device that is intended to be used with alternating current. But, you decide to supply a direct (constant) current to the primary coil. As a result, which of the following is most likely to happen?

<input checked="" type="radio"/> A. The primary coil eventually gets hot.	<input type="radio"/> B. The secondary coil eventually gets hot.	<input type="radio"/> C. Both A and B occur.	<input type="radio"/> D. Neither A nor B occur.	<input type="radio"/> E. 42
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4. [3 pts.] What is the resonant frequency of an AC circuit that has a resistor ($R = 1000 \text{ Ohms}$), a capacitor ($C = 5.00 \times 10^{-6} \text{ F}$), and an inductor ($L = 4.00 \times 10^{-2} \text{ H}$) in series with one another?

$$f = \frac{1}{2\pi \sqrt{LC}} = \frac{1}{2\pi \sqrt{(4 \times 10^{-2} \text{ H})(5 \times 10^{-6} \text{ F})}} = 356 \text{ Hz} \quad (\text{or } 2240 \frac{\text{rad}}{\text{s}})$$

5. [6 pts.] Suppose a single coil of wire lies in the plane of the page and originally has an area of 0.250 m^2 . There is a uniform magnetic field of 3.00 T pointing directly out of the page. What is the average magnitude of the induced voltage in the wire if it turns 90.0° (perpendicular to the plane of the page) in 0.100 s ?

$$\mathcal{E} = \frac{-N\Delta\Phi}{\Delta t} = \frac{-1 \Delta(BA)}{\Delta t} = \frac{-(3.00 \text{ T})(.250 \text{ m}^2 - 0 \text{ m}^2)}{.100 \text{ s}}$$

$$= 7.50 \text{ V}$$

6. [2 pts] How would your answer above change if the wire were wrapped with the same dimensions, but with 10 loops of the wire?

It would be 10 times as large: 75.0V