7-30-08

Comments on Exam 2 problems

(1.) a) - Be careful of instructions. Many people only labeled 1 end of the magnets

- Remember that each pole will feel the forces from both poles of the other magnet. The nearer will contribute more strongly, but both matter.

- Forces are represented by straight lines. Yes, the magnet will rotate, but we want the force at a given moment. That is just an arrow.

b) - Be careful of arrows on field lines. If you draw multiple arrows they must agree!

- Neighboring field lines from the same source won't generally oppose each other. In particular, inside a bar magnet.

- The field extends through the inside of the magnet.

- Remember to indicate the field directions!

(2) Double check you are using your right hand!

(3) - The forces will either be together or appart, they cannot both be in the same direction, or in circles, or any thing else.

- The forces must be equal and opposite.

(4) - I ask for the average $\frac{d\Phi}{dt}$ because we learned that this is

$$\frac{\Delta\Phi}{\Delta t} = \frac{\Phi(t_2) - \Phi(t_1)}{t_2 - t_1}$$

which avoids calculus while using the same concepts. If you calculate the $\Phi(t_0, t_1, t_2)$ correctly, and the lines t_1, t_2, just use algebra to find the result.

- The areas are the areas of squares, added up. Just multiply length and width for each, there is no need for vectors to find the magnitude of the area.

- I said there were no incorrect answers for the area direction. I meant that either into or out of the page was acceptable. Other directions don't fit how we use area directions.

- Φ isn't a vector: it is either + or −, but direction is given by the area.

- The flux is 0 once the loop is outside of the field. Calculate the time it takes for this to happen ($t = \frac{d}{v}$).

(5) - Remember that the inductor opposes changes in the current, thats what causes the back and forth.

- Energy is stored first in the capacitor, then the inductor, and transferred back and forth.

(6) - There is an $\vec{E}$ field and I ask for $\frac{d\Phi_E}{dt}$, so the flux you want is Φ_E, not Φ_B. If you calculate Φ_B, you should get 0.

- There is no current in our loop. Therefore we use Maxwell's correction to Ampère's law

- $\frac{d}{dt} E_o t = E_o \frac{d}{dt} t^1 = E_o (1) t^0 = E_o (1)(1) = \underline{E_o}$

- Be careful of circular reasoning in justifying the $\vec{B}$ field. It exists because of Maxwell's term w/o that term, Ampère's Law can lead to contradictions

- Φ is never a vector; $\vec{A}$ has a direction and Φ through it can either be + or −, but thats it.
- Know basic geometric details like the area of a circle.

(7) Since the field is uniform, you can find the flux by multiplying by the area, $\Phi = BA$

(8) Charged particles only feel a force from a $\vec{B}$ field if they have a non-zero velocity.