Name _____

Electromagnetism Review

1. What are the main parts do (a) an electric motor, (b) a speaker, (c) a microphone and (d) an electric generator have in common? Describe how the parts work together to make the different things work.

   A coil with a current and a magnetic field.

   a) electric motor – Electrical to mechanical

   A coil with a current is in a magnetic field. When the coil is perpendicular to the field, a force is placed on the coil causing it to rotate. As the coil rotates, the current must be flipped periodically in order to keep the force acting in the same direction.

   b) speaker

   An alternating current is sent through a coil that is placed in a magnetic field. The changing current in the coil results in a changing force. The changing force produces vibrations in the speaker resulting in sound waves.

   c) microphone – Mech. to elec.

   Sound waves vibrate a coil inside a magnetic field. This creates alternating current through the same process as a generator.

   d) generator Mechanical to electrical

   A changing magnetic field is sent through a coil. The coil in turn generates a changing current. (magnetic induction) This changing current is called alternating current (AC)

   e)Which of these four items are pairs?

   - A Motor and a Speaker, both convert electrical energy to mechanical energy
   - A Microphone and a generator both convert mechanical energy to electrical energy

   f) Which of these four items are opposites?

   - A Motor and a Generator
   - A Microphone and a Speaker

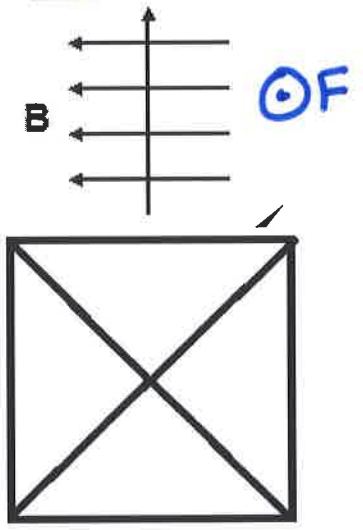
REVIEW RHR

For questions 1-9 use the following answers.

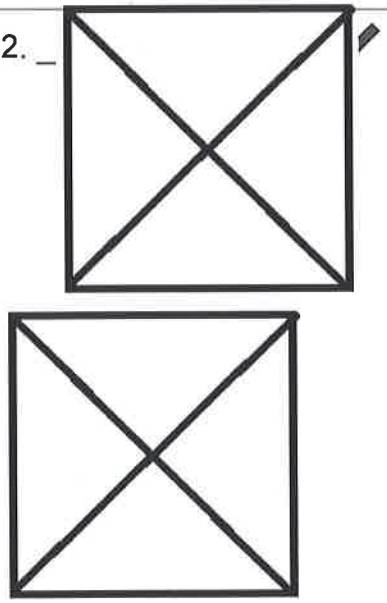
A = DOWN (Toward the Bottom of the page)
B = UP (Toward the Top of the page)
C = INTO THE PAGE
D = OUT OF THE PAGE
E = RIGHT
F = LEFT

For 1-5, find the direction of the force on the wire show as an arrow in its associated magnetic field. The current is in the direction of the tip of the arrow.

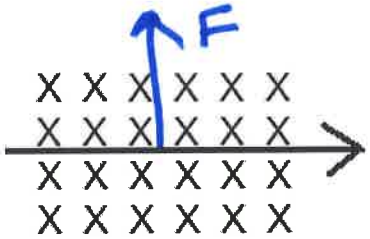
1. d



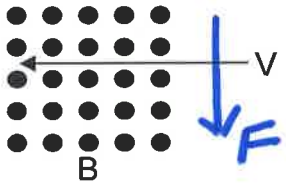
2. _



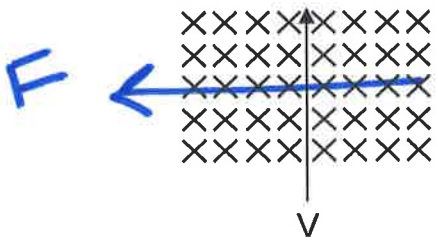
3. B



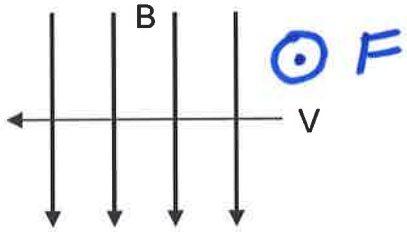
6. The force on an electron moving in the magnetic field as shown below would be A.



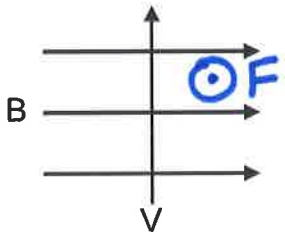
7. The force on a proton moving in the magnetic field as shown below would be F.



8. The force on a proton moving in the magnetic field as shown below would be d.



9. The force on an electron moving in the magnetic field as shown below would be d



Remember That an electron is "−" So the force is opposite!

Force Calculations Review:

1. An object is thrown to the east with a velocity of 25 m/s at the equator where the magnetic field strength is 1.5×10^{-2} T straight north. It is noticed that the object is deflected upwards when it has a charge of 2.25 coulombs.

   What is the magnetic force on the object?

   $V = 25\ m/s \rightarrow$

   $B = 1.5 \times 10^{-2}\ T$ ↑↑↑

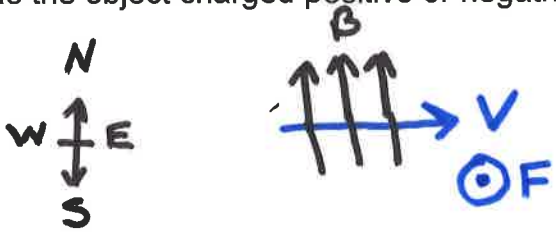
   $q = 2.25\ C$

   $F = BqV$

   $F = (1.5 \times 10^{-2})(2.25)(25)$

   $F = 0.84\ N$

   Is the object charged positive or negative? Support your answer with a diagram.

   The object is deflected up

2. A 1.5 meter long wire with a weight of 0.22 N is suspended in a magnetic field with strength of 0.665 T, What is the minimum current required to cause the wire to levitate?

   $L = 1.5\ m$

   $F = 0.22\ N$

   $B = 0.665\ T$

   $F = BIL$

   $0.22 = 0.665(1.5)I$

   $0.22 = 0.9975I$

   $I = \frac{0.22}{.9975} = 0.22\ Amps$

Transformer Review:

1. A transformer has 100 turns on its primary side and 1000 turns on its secondary side. The primary side is connected to a 120 volt power source. The secondary side is attached to a device that has 2400 ohms of resistance.

   a) In terms of voltage this is a (step-up) (step-down) transformer and in terms of current it is a (step-up) (step-down) transformer. (Circle the correct answer)

   b) Calculate the voltage supplied on the secondary side.

$$\frac{V_S}{V_P} = \frac{N_S}{N_P} \Rightarrow \frac{V_S}{120} = \frac{1000}{100} \qquad V_S = 1200 \text{ Volts}$$

   c) Calculate the current in both the secondary and primary sides

$$V_S = I_S R$$

$$I_S = \frac{V_S}{R} = \frac{1200}{2400} = 0.5 \text{ Amps}$$

$$I_P V_P = I_S V_S$$

$$I_P(120) = 0.5(1200)$$

$$I_P = 5.0 \text{ Amps}$$