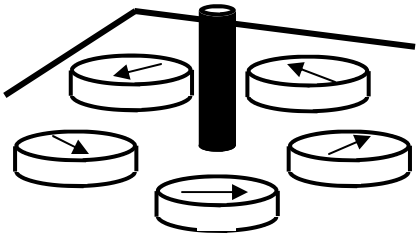
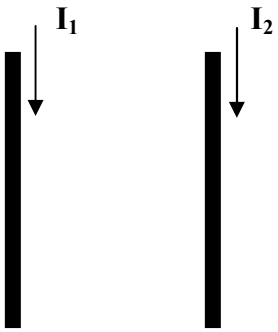
PreAP Magnetism 4

1. Compasses are placed around a wire. The current is then switched on and the compasses take the directions shown. Determine the direction of the current in the wire.





Two current carrying wires interact so that they either attract or repel. Just as a person standing on frictionless ice can't move themself across the ice, a wires can't move itself either.

2. Two wires have current flowing in them as shown.
   A. Using the circular RHR, draw B (the magnetic field) for wire 1 on the right side of wire 1. This is the magnetic field acting on wire 2.
   B. Using the flat RHR, determine the force on wire 2.
   C. So, do the currents attract or repel each other?

Notes: North poles of magnets are attracted to South poles of other magnets OR the North Pole of the earth. Why? A North pole of a magnet was first called "a North seeking pole", since it seeks out the North Pole of the earth, which must be the earth's South pole of its internal magnet.

Practice with Cardinal Directions (N, S, E, W). North is NOT to the top of the page: your page is most likely NOT facing north. When using absolute cardinal directions our six possible directions are: N, S, E, W, up (toward the sky), and down (to the ground). These are your only possible directions. Do not use "left" or "right".

3. * The magnetic field of the earth points north. A proton is moving up from the ground (*toward the sky*). Give the direction of the magnetic force on the proton using cardinal directions (N, S, E or W).

4. * An electron is moving east at the equator. You know the direction of the earth's magnetic field. Determine the direction of the force on the electron and describe the path it will take. Make sure your description explains your orientation. (*Ex. If I am facing *** the path is ****.)

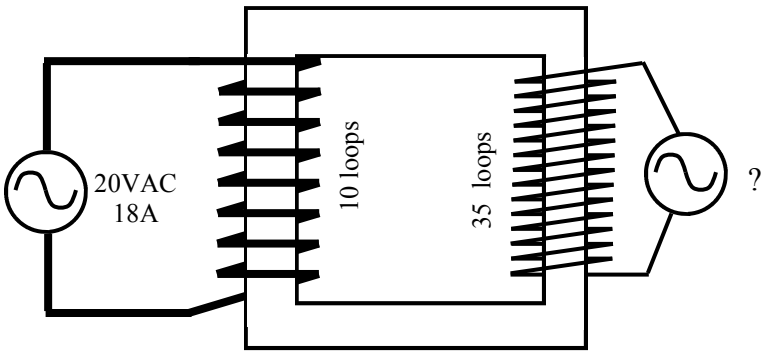
Using the "Transformer" notes. In the diagram below the curvy symbol in the circle stands for an alternating current source (like a battery for AC). Assume the left side is the input.

5. Left or Right side of the transformer at the right?

   A. ____ Most current.
   B. ____ Most voltage.
   C. ____ Most coils.
   D. ____Most power.
   E. ____Primary side.
   F. ____Secondary side.

   G. Calculate the voltage on the right side (output).

   H. Calculate the current on the right side.



6. What would happen if the transformer primary voltage source was DC?

Magnetic Force on a Moving Charge

Magnetic Force (*in N*) → $F_B = qvB$ ← Magnetic Field (*in Teslas*)

Charge (*in C*) → q

Velocity (*in m/s*) → v

7. A 5μC charge moving 180 m/s perpendicular to a magnetic field feels a 12 N force.
   A. What is the magnetic field strength?

   B. What will be the shape of the path of the charge?

8. A 1.5 T magnetic field is surrounding a 35 cm long wire that has 1.2 amperes running thru it. What is the force exerted on the wire?

9. A 1.6 meter long wire carrying 6 A creates a 0.5 T magnetic field. What is the magnetic force on the wire?

Magnetic Force on a Current Carrying Wire

External Magnetic Field (*in T*)

Magnetic Force (*in N*) → $F_B = BI\ell$ ← Length of wire in field (*in m*)

Current in wire (*in A*)

10. A 2 kg cube of iron is at 120ºC. It is placed into a bucket containing 5 kg of water at 50ºC.
    A. Which substance's atoms have greater average kinetic energy: water or iron?
    B. Which substance has more total internal energy: water or iron?
    C. Heat will travel from:
    D. They will eventually reach the same temperature, this is known as:
    E. This temperature will be: I) above 120ºC; II) below 50ºC; III) between the two temperatures but closer to 120ºC; IV) between the two temperatures but closer to 50ºC;

Q3) Fingers point N (direction of B); Thumb points up (direction q moves); find direction of palm.
Q4) Use left hand