Name: Date: Period:

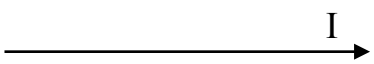
Magnetism Review WS 4

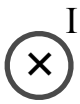
Answer the following questions *on a separate sheet of paper*.

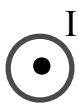
1. What produces a magnetic field?
2. What is a domain?
3. In terms of domains, what separates a magnet and non-magnet?
4. What produces the Earth's magnetic field? What's appears to be happening to the field as time goes on? What do scientists predict will happen to Earth's magnetic field in the not-so-distant future?
5. Redraw following diagrams on your own paper and included the magnetic field lines:

a. 

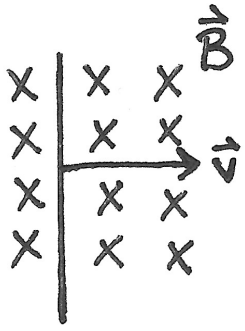
b. 

c. 

d. 

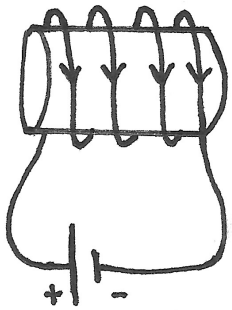
e. 

6. What is Faraday's Law?
7. Define *induction*.
8. An electron traveling to the left passes through a magnetic field and experiences a *force* into the page. What direction must the magnetic field be oriented? If a proton followed after the electron into the same magnetic field, what direction would the magnetic *force* push on it?
9. Define *flux*.
10. What is an electromagnet? List four ways to increase the strength of the magnetic field produced by an electron magnet.
11. The diagram below shows a wire moving to the right at speed v through a uniform magnetic field that is directed into the page. As the speed of the wire is increased, what will happen to the induced potential difference?

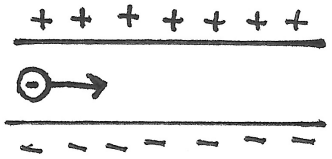


12. The current in a long-straight wire is 2 A. What is the magnetic field strength a distance of 0.1 m from the wire?

13. Which ends are the north and south poles of the following electromagnet.



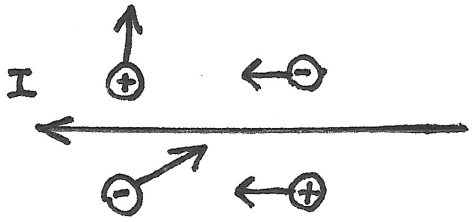
14. An electron is shot through two oppositely charged, parallel plates at a velocity of 4.5×10^6 m/s. The plates are separated by a distance of 4 cm and have a voltage of 10,000 V applied to them (dust off your electrostatics!)



a. What is the electric field strength between the plates?
b. What is the magnitude and direction of the electric force on the electron?
c. If there is also a magnetic field in the region between the plates, it will also enact a magnetic force on the electron. If that force is equal and opposite the electric force, the electron can pass between the plates undeflected. What is the magnitude and direction of a magnetic field that would allow this to happen? (Remember your right hand rule. Also, remember this is an electron)

15. What does a transformer actually transform? How does it work?

16. Redraw the following diagram of a current-carrying wire surrounded by the four charges with velocities as depicted. Show the magnetic field lines around the wire and the direction of the magnetic *force* on each of the particles.



17. What's the difference between DC and AC current? Why does the power company supply our homes with AC current and not DC?

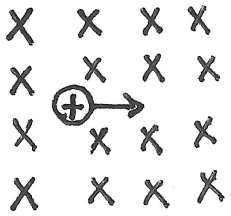
18. What voltage is supplied to all standard American power outlets? What about European outlets? Chinese? Why did my American-made electric razor burn out when I plugged it into a Chinese power outlet?

19. How much current is flowing through a 6.3 m long wire if it experiences a force of 0.90 N when placed in a uniform 0.088 T field?

20. Let's assume the electron in a hydrogen atom orbits the nucleus like a planet in held in a circular orbit with a radius of 5.3×10^{-11} m by the electric force.
    a. What is the the magnitude of the electric force on the electron?
    b. What is the orbital period? (Remember what you know about circular motion)
    c. Current in a wire is just the flow of electrons. Think of the orbital path as a circular loop. What is the current through that loop?
    d. The magnetic field near the center of a single circular loop of radius r, carrying current I, is given by $B = \mu_0 I/2r$. What magnitude of magnetic field would the orbiting electron produce at the nucleus?

21. A 23 loop coil of wire is placed in a magnetic field the oscillates between 1.92 T and 9.66 T every 4.0s. The coil has a radius of 6.5 cm and a resistance of 10 Ω.
    a. What is the change in flux through the coil?
    b. What is the induced voltage across the coil?
    c. How much current is pushed through the coil?

22. A proton enters a uniform magnetic field with a velocity of 9.8×10^{7} m/s to the right.



    a. If the magnetic field is 4.6 T into the page, what is the magnitude and direction of the magnetic force on the proton?
    b. The magnetic force will steer the motion of the proton into a circular path with the magnetic force acting as a centripetal force. What is the radius of that path? Will the proton travel clockwise or counterclockwise?
    c. If the proton were replaced with an electron, the magnetic force will also cause the electron to move in a circle. However, the radius of the path will be much smaller because it is lighter. What is the new radius of the path? Will the electron move clockwise or counterclockwise?