Name Answer Key Date _____

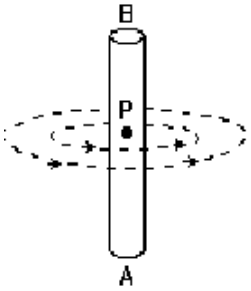
Honors Physics Magnetism WS #2H

Period _____ Mrs. Nadworny

Magnetic Force

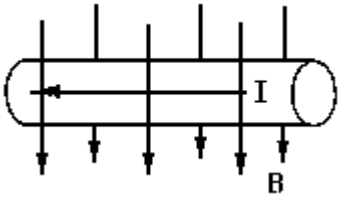
Directions: Read online textbook page 776 – 779. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. The diagram below represents the magnetic field around point P, at the center of a current carrying wire. What is the direction of conventional current flow in the wire?



(A) from A to B (B) from B to A (C) into the page (D) out of the page

2. The diagram below represents a conductor carrying conventional current in magnetic field B.

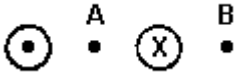


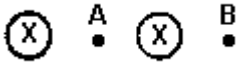
The direction of the magnetic force on the conductor is

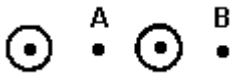
(A) into the page
(B) out of the page
(C) toward the top of the page
(D) toward the bottom of the page

3. The diagrams below show cross sections of conductors with conventional current flowing into or out of the page.

In which diagram below will the magnetic flux density at point A be greater than the magnetic flux density at point B?

(A)


(B)


(C)


(D)


Continued on next page

4. In 1964, a magnet at the Francis Bitter National Magnet Laboratory created a magnetic field with a magnitude of 22.5 T. Ten megawatts of power was required to generate this field. If a wire that is 15 cm long and carries a current of 0.092 A is placed in this field (which is going to the left) at a right angle to the field so that the current travels down the wire, calculate the force acting on the wire.

$$F_{magnetic} = BIl = (22.5T)(0.092A)(0.15m) = 0.31N \text{ into the page}$$

5. One of the subway platforms in downtown Chicago is 1066 m long. Suppose the current in one of the service wires below the platform is 0.76 A. Calculate Earth's magnetic field at that location if the field exerts a force of 0.063 N on the wire. (Assume the current is perpendicular to the field.)

$$B = \frac{F}{Il} = \frac{0.063N}{(0.76A)(1066m)} = 7.8\times10^{-5}T$$ toward geographic N / toward magnetic S

6. In February 1996, NASA extended a 21.0 km conducting tether from the space shuttle *Columbia* in order to see how much power could be generated by interacting with Earth's magnetic field. Suppose the magnetic field at the shuttle's location had a magnitude of 5.95 x 10^{-7} T. What current must be induced in the tether, located perpendicular to the field, to create a magnetic force of 0.0230 N?

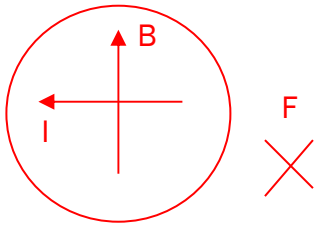
$$I = \frac{F}{Bl} = \frac{0.0230N}{(5.95\times10^{-7}T)(21{,}000m)} = 1.84A$$

7. A power line carries a 225 A current from east to west parallel to the surface of Earth.
   a. If the Earth's magnetic field is 5.0 x 10^{-5} T, what is the magnitude of the force acting on each meter of the wire?

$$F = BIl = (5.0\times10^{-5}T)(225A)(1.0m) = 0.011N$$

   b. What is the direction of the force?

The force would be directed into Earth.



Answers in size order: 7.8 x 10^{-5}, 0.011, 0.31, 1.84