Date_____Pd____

E&M Unit 2- Worksheet 4

Do not consider the magnetic field of the Earth in your answers.

For questions 1-4, sketch vectors to represent the strength and direction of the magnetic field at the designated places due to the current in the wire(s).



For each diagram representing a magnet or current-carrying conductor below, draw in the associated magnetic field lines. If the lines are in the plane of the paper, represent them with arrows in the appropriate direction. If the field lines are coming out of the plane of the paper, represent them with O; if they are going into the paper, represent them with crosses O.

5.



6.





The following diagrams show a charged particle or a current carrying wire in a magnetic field. For each diagram use the right-hand rule to draw an arrow on the object that shows the direction of the magnetic force. Remember that a \otimes means the direction is into the page and a \bullet means the direction is out of the page towards you.





19. A proton moving horizontally at speed \mathbf{v} enters a uniform magnetic field. Determine the direction of the magnetic force on the proton and represent it as a vector originating on the proton. Place a dot a couple of centimeters beyond the original position where you think the proton will be relative to the dashed line. Label this position (2). Estimate the direction of the velocity of the particle at position (2), then draw the vector representing the magnetic force acting on the proton. Continue this process until you can decide the general shape of the path taken by the proton.

X	X	X	X	X	X	X	X	X
x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x
X (1) —	x	x	x	x	x	x	x	x
(I) U X	x	X	X	x	X	x	X	X
x	x	x	x	x	x	x	x	x

20. Does the speed of the proton change as it moves along its path? Explain.

21. A straight wire 50 cm long conducts a 6.0 A current directed up out of the page. If the wire experiences a force of 0.24 N to the right due to a magnetic field perpendicular to its length, what is the magnitude and direction of the magnetic field?

- 22. A horizontal magnetic field of 2.0×10^{-3} T forms a 30° angle with a 0.75 m length of wire carrying a 15.0 A current. What is the force acting on the wire?
- 23. A proton from a particle accelerator enters a uniform magnetic field of 0.080 T oriented perpendicular to its path and follows a circular path with radius of 2.0 m. What is its velocity? Sketch a diagram.