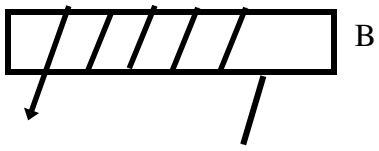
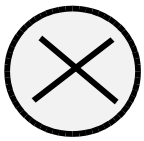
Magnetism Problems

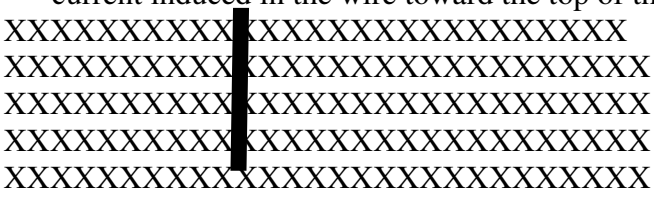
Right Hand Rules

1. Where is the north pole? (A or B) A  B

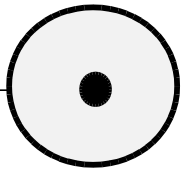
2. The magnetic field above this wire would be ____. 

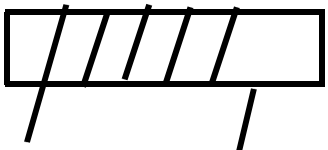
3. The magnetic field associated with this wire will be _____. 

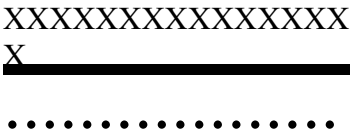
4. The wire is moving through the magnetic field from left side of the page to the right side of the page, is the current induced in the wire toward the top of the page or the bottom of the page?



5. The magnetic field associated with this current carrying wire will be _____. 

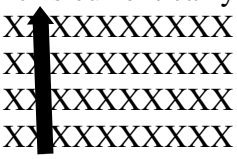
6. The magnetic field to the left of this wire will be _____ 

7. Which is the north pole? (A or B) A  B

8. What is the direction of the current in the wire that would produce this field? 

9. The magnetic field to the left of this wire will be _____. 

10. What is the direction of the force on this current carrying wire in this magnetic field?



Magnetism Problems

11. A wire 0.5 m long carrying a current of 8 A is at right angles to a uniform magnetic field. The force on the wire is 0.4 N. What is the strength of the magnetic field?
12. The current through a wire 0.8 m long is 5A. The wire is perpendicular to a 0.6 T magnetic field. What is the magnitude of the force on the wire?
13. A wire 25 cm long is at right angles to a 0.3 T uniform magnetic field. The current through the wire is 6 A. What is the magnitude of the force on the wire?
14. A wire 35 cm long is parallel to a 0.53 T uniform magnetic field. The current through the wire is 4.5 A. What force acts on the wire?

15. A wire carrying a current of 2 A is at right angles to a uniform magnetic field in which the magnetic induction is 0.2 T. If the length of the wire in the field is 10 cm, what is the force on the wire?
16. A wire carries a current of 20 A from east to west. Assume that the magnetic field of the earth is horizontal at this location directed from south to north and that is has a magnitude of $5 * 10^{-5}$ T. Find the force on a 30 m length of the wire. How is the force changed if the current runs west to east?
17. What force does two parallel wires exert on each other at a distance of 0.1 m apart when one wire carries 1 A of current and the other carries 2 A of current. The currents are in the same direction and each wire is 1 m long.
18. A duck flying due east passes over Atlanta, where the magnetic field of the Earth is $5 * 10^{-5}$ T directed north. The duck has a positive charge of $4 * 10^{-8}$ C. If the magnetic force acting on the duck is $3 * 10^{-11}$ Newtons upward, what is the duck's velocity?
19. A proton moves eastward in the plane of the Earth's magnetic equator so that its distance from the ground remains constant. What is the speed of the proton if Earth's magnetic field points north and has a magnitude of $5*10^{-5}$ T?
20. A proton moves at a speed of $2 * 10^{7}$ m/s at right angles to a magnetic field with a magnitude of 0.1 T. Find the magnitude of the acceleration of the proton.

MAGNETIC INDUCTION AROUND A STRAIGHT WIRE

21. What is the magnetic induction at a point 0.5 m from a straight wire carrying 1 A of current?

22. What current should be passed through a straight wire to produce a magnetic field of 2×10^{-8} T at a distance of 0.01 m from the wire?

23. At what distance from a wire carrying a 10-A current is the current equal to that of the earth's magnetic field, namely 5×10^{-5} T?

24. What is the strength of the magnetic field at a point 5 cm from a straight wire carrying a current of 2 A?

25. How large should a current in a wire be so that the magnetic induction at a distance of 10 cm from the wire is 5.0×10^{-6} T?

26. Two parallel straight wires are 1.0 m apart. Each wire carries 2.0 A of current in the same direction. What is the resultant magnetic induction produced by both wires at a point (a) midway between them; (b) 1/4 of the distance from one wire?

27. If the two wires of problem 6 carry the same current but in opposite directions, what is the resultant magnetic induction at a point (a) midway between them; (b) l/4 of the distance from one wire?

28. Two parallel, straight wires, 1 m apart, carry currents of 2 A and 4 A, respectively. At what points between the two wires is the resultant magnetic induction zero when both currents are in the same direction?

THE GALVANOMETER, THE VOLTMETER AND THE AMMETER

29. A galvanometer has a resistance of 50.0 Ω and requires 75.0 mA to produce full-scale deflection. What resistance must be connected in series with the galvanometer in order to use it as a voltmeter for measuring a maximum of 300.0 V?

30. What resistance must be connected with the galvanometer in problem 9 to convert it into an ammeter reading 0-l0.0 A? How should this resistance be connected to the galvanometer?

31. A galvanometer movement has a resistance of 2.5 Ω and when fully deflected has a potential difference of 50 mV across it. What series resistance is required to enable the instrument to be used as a voltmeter reading 1.0 V full-scale?

32. What shunt resistance must be connected across the galvanometer in problem 12 to produce an ammeter reading 7.5 A full-scale?