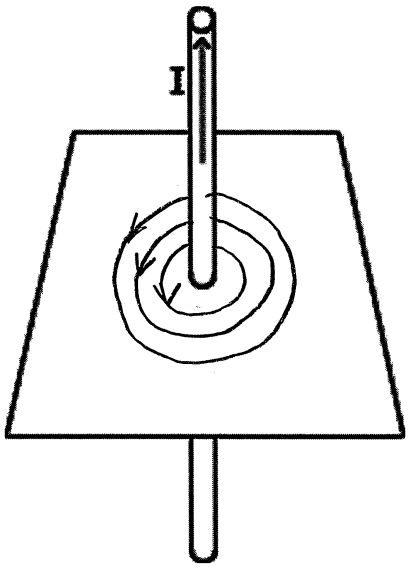
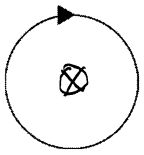
# Electromagnetism Worksheet

1. A wire carrying a large constant electric current passes through the center of a perpendicular cardboard as shown.



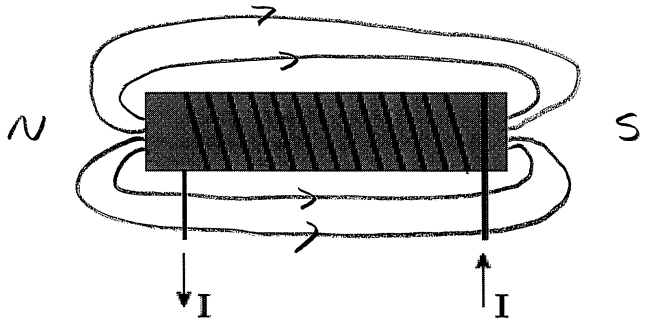

Draw the magnetic field surrounding the wire.

2. The current in a loop of wire is flowing clockwise as shown.



Indicate the direction of the magnetic field at the center of the loop.

3. A constant electric current is flowing through a solenoid as shown.




Draw the magnetic field surrounding the solenoid.

4. A wire 0.50 m long carrying a current of 8.0 A is at right angles to a 0.40 T magnetic field. Calculate the magnitude of the force acting on the wire?

$F = BIL \sin\theta$

$= (.4)(8)(.5)$

$= 1.6\ N$

5. A wire 75 cm long carrying a current of 6.0 A is at right angles to a uniform magnetic field. The magnitude of the force acting on the wire is 0.60 N. What is the strength of the magnetic field?

$F = BIL \sin\theta$

$B = \frac{F}{IL} = \frac{(.6)}{(6)(.75)} = 0.13\ T$

6. The force acting on a wire at right angles to a 0.80 T magnetic field is 3.6 N. The current the wire is 7.5 A. What length of wire is in the magnetic field?

$F = BIL \sin\theta$

$L = \frac{F}{BI} = \frac{3.6}{(.8)(7.5)} = 0.6\ m$

7. A wire 0.25 m long is in a 0.80 T magnetic field. A 0.35 N force acts on the wire. What is the magnitude of the current flowing through the wire?

$F = BIL \sin\theta$

$I = \frac{F}{BL} = \frac{(.35)}{(.8)(.25)} = 1.75\ A$

8. A 5.0 cm long copper wire of mass 2.0 mg is suspended in a magnetic field of 1.0 T. What is the magnitude of the current flowing in the wire?


$\Sigma F = ma$

$F_B - F_g = 0$

$F_B = F_g$

$BIL \sin\theta = mg$

$I = \frac{mg}{BL} = \frac{(2\times10^{-6}\ kg)(9.8)}{(1)(.05)} = 3.9\times10^{-4}\ A$

$(4\times10^{-4}\ A$ if $g = 10)$

9. A 0.50 m wire is placed perpendicular to Earth's magnetic field ($5.0 \times 10^{-5}$ T). The force acting on the wire is $6.0 \times 10^{-4}$ N up. What is the magnitude and direction of the current in the wire?

$F = BIL \sin\theta$

$I = \frac{F}{BL} = \frac{(6 \times 10^{-4})}{(5 \times 10^{-5})(.5)} =$ 24A east

10. A wire 0.50 m long carrying a current of 2.0 A directed towards the north is at right angles to a uniform magnetic field. The force on the wire is 0.40 N towards the west. What is the magnitude and direction of the magnetic field?

$F = BIL \sin\theta$

$B = \frac{F}{IL} = \frac{0.40}{2(.5)} =$ 0.4 T down

11. A power line carries a 4000 A current from east to west parallel to the surface of the Earth. The Earth's magnetic field is $5 \times 10^{-5}$ T. Calculate the magnitude and direction of force acting on the wire.

$F = BIL \sin\theta$

$= (5 \times 10^{-5})(4000)(1)$

$=$ 0.2 N down

12. A 5.0 cm wire of mass 0.045g is suspended in a magnetic field of 1.2 T pointing to the north. What is the magnitude and direction of the current flowing in the wire?


$\Sigma F = ma$

$F_B - F_g = ma$

$F_B = F_g$

$BIL = mg$

$I = \frac{mg}{BL} = \frac{(0.045 \times 10^{-3})(9.8)}{(1.2)(.05)} =$ $7.4 \times 10^{-3}$ A east

($7.5 \times 10^{-3}$ A east for $g = 10$)