PHYSICS

ELECTROMAGNETISM

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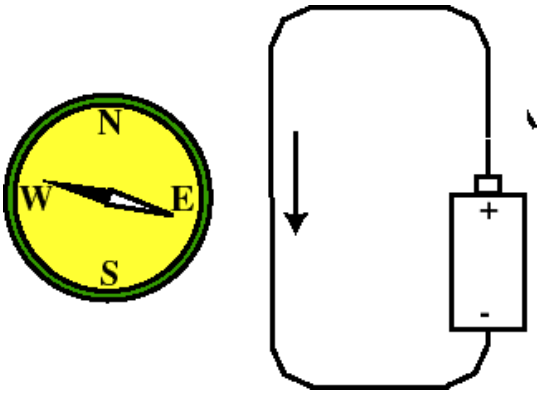
Electric Charges and Magnetic Poles

Based on our knowledge of electricity and atomic structure we already know that atoms consist of positive protons and negative electrons. These two oppositely charges particles are attracted to one another and repelled by particles of the same charge.

These "opposites attract" and "likes repel" properties can also be seen when referring to the dipoles of a magnet. Perhaps there is a connection between electricity and magnetism.

Electromagnetism

In 1819, Hans Christian Oersted discovered that when he closed the switch on an electric circuit, the current of electrons had an affect on some compasses that were near by. He noted that the compasses all lined up in the same way when placed near a functioning circuit. It was then discovered that a current carrying wire creates a magnetic field around it called ***electromagnetism***.



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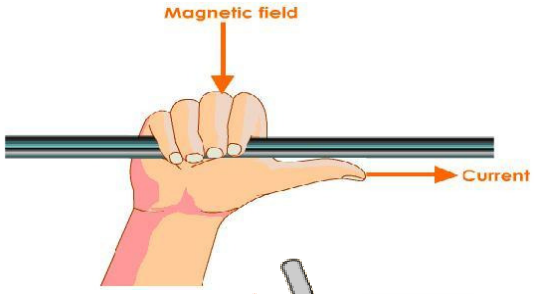
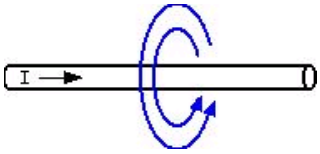
Magnetic Field of a Straight Conductor

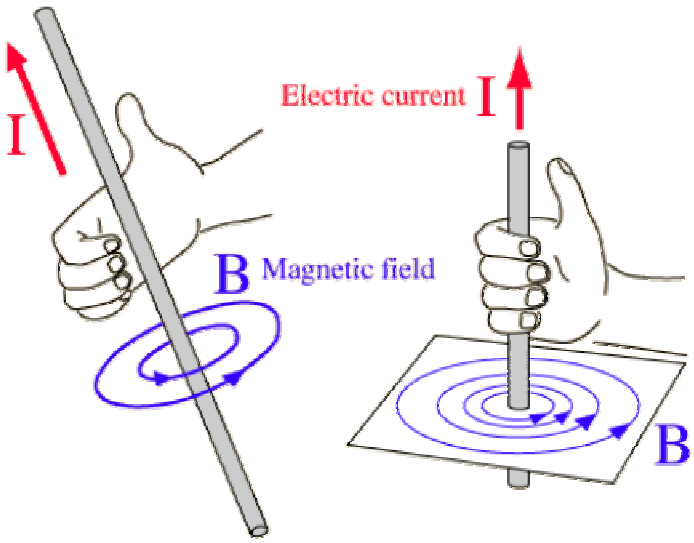
When a current moves through a conductor it sets up a magnetic field around the wire. For a straight conductor, the magnetic field surrounds the wire as a set of concentric circles.

Right-Hand Rule #1

The magnetic field lines will flow in a specific direction depending on the flow of the current. One can discover the direction of flow by using their ***RIGHT*** hand.







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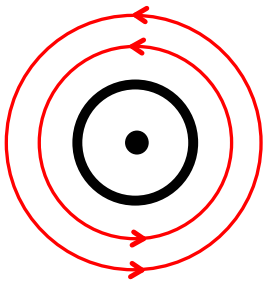
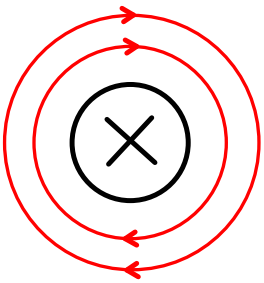
Other depictions for straight conductors:

Sometimes, you will see wires drawn in a way so they are coming out of the page at you.

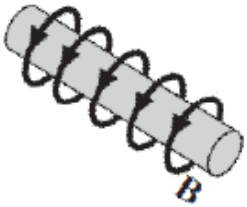
Current coming out of the page

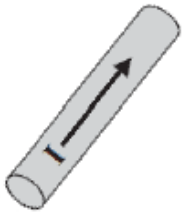


Current going into the page



Examples: Determine the Current (I) or the Magnetic Field (B) in the following straight conductors





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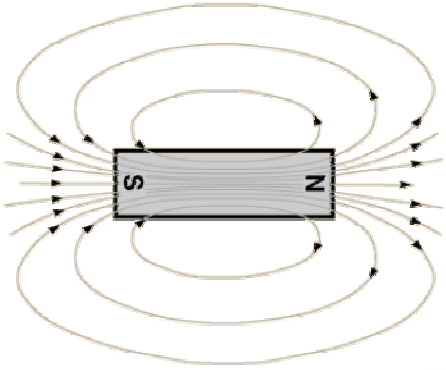
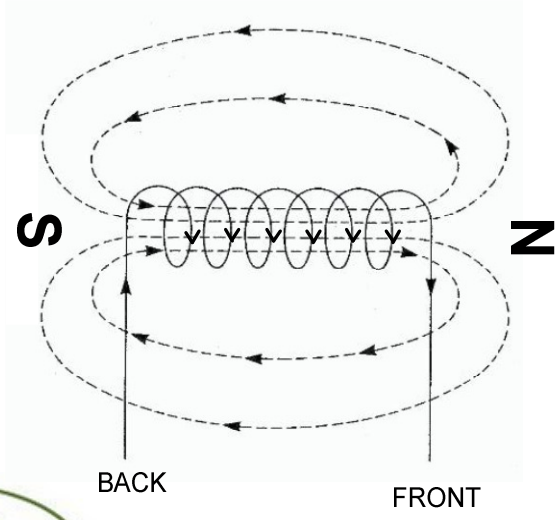
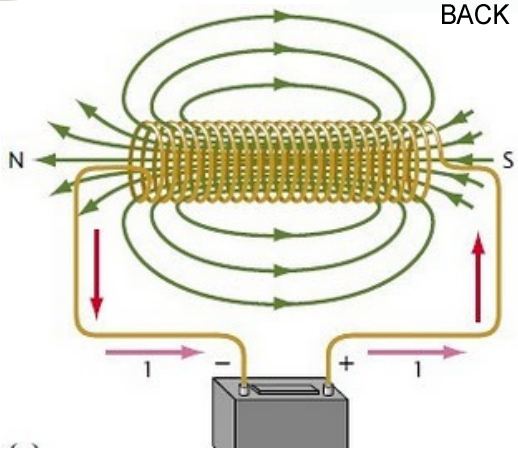
Magnetic Field of a Coiled Conductor (Solenoid)

When a current moves through a conductor it sets up a magnetic field around the wire. For a coiled conductor, the magnetic field sets up in such a way to create magnetic field lines similar to that of a bar magnet (complete with ***N*** and ***S*** poles).







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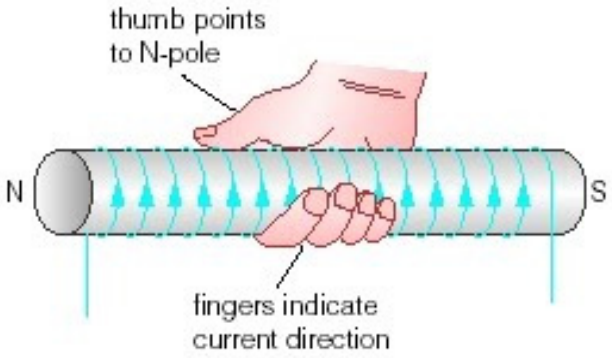
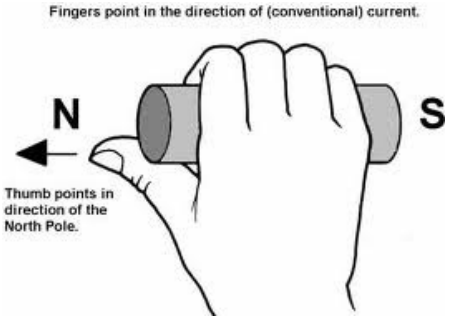
Magnetic Field of a Coiled Conductor (Solenoid)

Right-Hand Rule #2

The magnetic field lines will flow in a specific direction setting up a North and South pole depending on the flow of the current. One can discover the direction of flow by using their ***RIGHT*** hand.

For this version of the rule, the fingers of the right hand are used to represent the current through the coiled wires and then your thumb will point in the direction of the North Pole.





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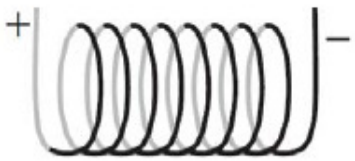
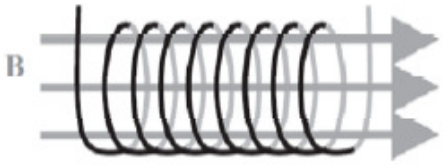
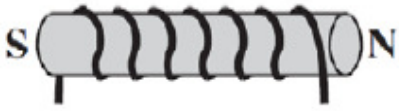
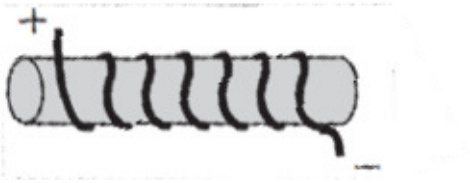
Magnetic Field of a Coiled Conductor (Solenoid)

Examples: Determine the Current (I) or the Magnetic Field (B) in the following solenoids.









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MOVIE TIME - ELECTROMAGNETISM