<u>RHR #1 and RHR #2 – 9.4</u>

<u>Electromagnets</u> – are temporary magnets created when current is running. These are helpful because we can turn them on/off and we can control the strength and we can reverse the polarity by reversing the current! **Examples**: The magnets holding our school doors open (notice how they don't work sometimes?...current not running there), some doorbells, large junkyard car magnets, accelerating/stopping systems in roller coasters, speakers etc. etc.

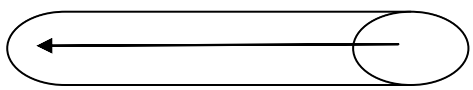
RHR #1 – Right Hand Rule #1 – Discovered by Danish scientist, Oersted.
If current runs in a straight conductor, then a circular magnetic field is created.

RHR #2 – Right Hand Rule #2 – Discovered by a British scientist, Faraday.
If current travels in a circular path, a 'bar magnet' type magnetic field is created.

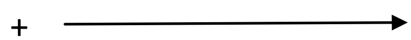
<u>Determining the polarity of the electromagnets</u>
Conventional Current - Benjamin Franklin did some of the initial studies on electricity. He wrongly assumed that the charge moving was positive. This belief was held for some time and the Right Hand Rules assume a positive current. We call this 'convention current'. Of course we know it's electrons (negative charge) that flows in reality. So…figure out which way the electrons flow and the complete oppositie (180°) is 'conventional current'.

* Conventional current is used – it is positive flow – it is opposite to electron flow *

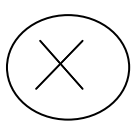
Electron flow



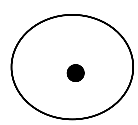
Therefore…conventional current



Current In/Out of page
Sometimes the conductor (usually drawn as a round wire), is shown to be going in/out of page. The conventional current is show to be an 'x' if it is going into page and a 'dot' (•) if coming out of page. To remember – the 'x' is the back of an arrow flying away from you. The dot is the pointy business end of the arrow coming at you!



Going into the page



coming out of the page

<u>RHR #1</u>
The thumb of your **right** hand is the direction of conventional (+) current flow and your fingers wrap in the direction of the circular magnetic field. There is no 'end' to a circle, so there is no 'N' and 'S' pole, but there is a direction to the magnetic fields. The north end of the compass needle will point the way your fingers are wrapping. Draw a diagram here if you need to. Great visuals in your text book!!!

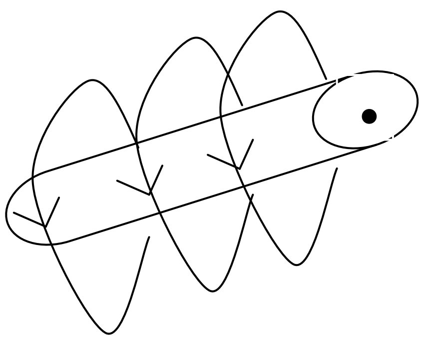
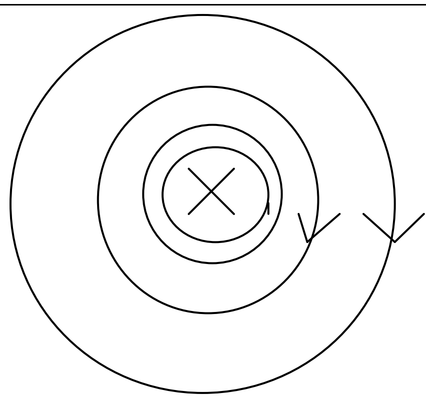
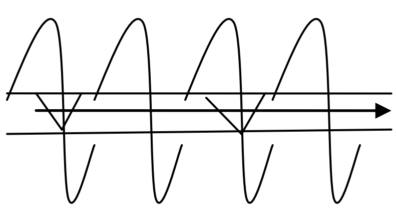
Diagram of rule….

<u>RHR #2</u>

Since the current is travelling in a circle, the fingers of your **right** hand are coiled in the direction of (+) conventional flow and your thumb is pointing to the North pole. Remember, coiled current creates a bar magnet type electromagnet with a distinct North and South pole. This is much more useful than a circular magnetic field! We can repel and attract now. Again…great diagrams in your text. Draw the rule if you need to:

Diagram of rule…

Other tidbits:

	This is how you show magnetic field lines coming down In front of conductor and up and behind. My magnetic lines should be circular. Please figure their ackward shape….best I could do with computer drawing! So a north compass needle would point **down** in **front** of this conductor. And would point <u>up</u> when <u>behind</u> the conductor. Close to conductor, electromagnetic effects are stronger than Earth's magnetic field.
	The magnetic field lines are closer together nearest the conductor since that is where the magnetic field strength is the strongest.
	Coiled conductors are most often drawn with a soft iron core. This soft iron core increases the magnetic strength (an indicator of how much is given by μ. The larger the magnetic permability – μ – the more magnetic strength is increased.). Most often the coiled wire has a soft iron core but it is necessary in drawings to show which way the coils are turning.