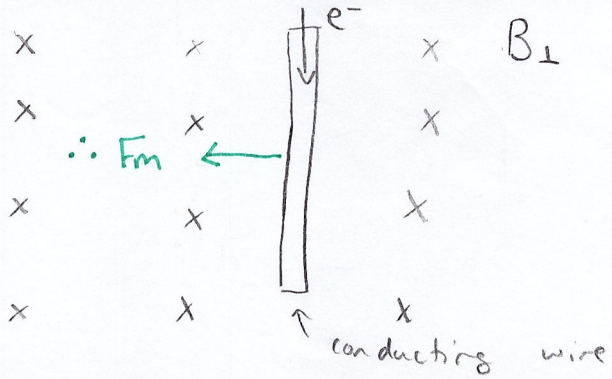
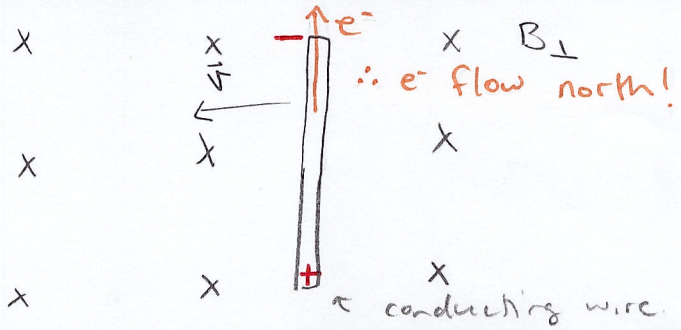
Electromagnetic Induction:
Lenz's Law

- Recall that a conducting wire with a current running through it, will experience a magnetic force when placed in an external magnetic field



- The opposite is true as well. A *conductor forced to move through a magnetic field, can induce/produce an electrical current through the conductor*



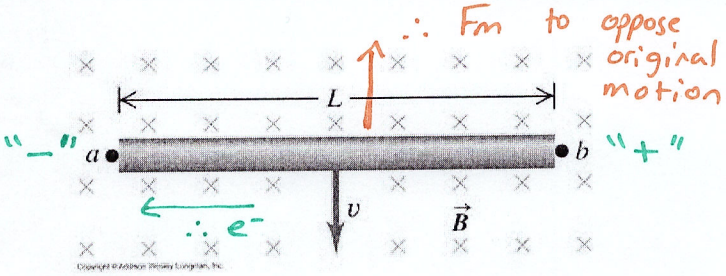
  - The electrons in the conducting wire will move to one end of the conductor, leaving one end positive and one end negative (similar to a voltage source). Thus, if the conducting wire is connecting to a electrical series, the electrons will flow through the electrical series and do work

- The process of producing an induced voltage in a conductor by *forcing the conductor to move through a magnetic field* is known as **electromagnetic induction** and this will result in an **induced current**

- We will use *Lenz's Law* to predict which way the induced current will flow, based on the direction of the magnetic field and the direction the conductor is forced to move
  - **Lenz's Law:** the induced current flows in the direction as to *oppose* the direction of the applied force (motion)
  - Need to use the hand rules in conjunction with Lenz's law

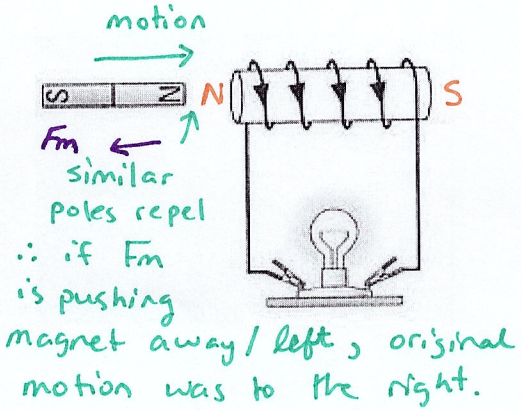
EXAMPLES:

1. Determine which end of the conducting wire will be negative and which end will be positive.



use 3rd hand rule

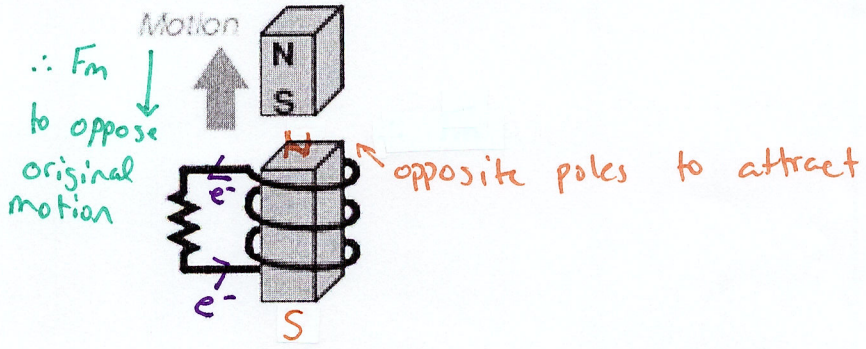
2. The picture shows an induced current flowing through a solenoid due to a magnet moving in relation to the solenoid. Determine which way the magnet needs to move to produce the induced current as shown in the diagram.



use 2nd hand rule!

3. Predict the direction of the induced current in the solenoid.

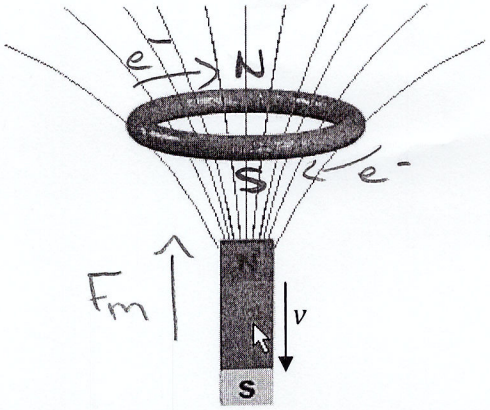
use 2nd hand rule!



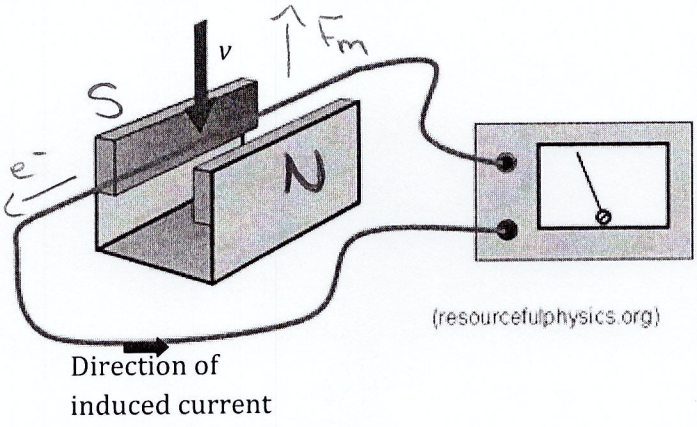
*****Now try pg. 171 #1-7, 9-11*****

Lenz's Law Examples

1. If the magnet is being pulled out of the metal ring, which way is the induced current flowing in the metal ring?



2. If the wire is pushed down between two magnets and the induced current flows in the direction as shown in the diagram below, determine the polarity of the magnets.



3. Determine which way the magnet is moving to produce the induced current shown in the solenoid.