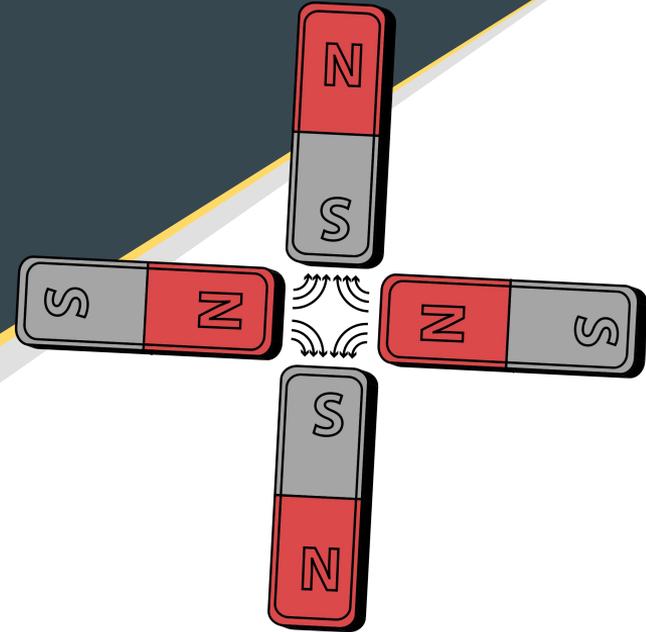


# Magnetism

Kate, Haley, Jackson, Cole,  
Tristan, & Taylor  
Period 1



# Review of Concepts

-The magnetic field in the Earth is created by the rotation of the iron core →  
MAGNETIC FIELDS ARE CREATED FROM THE MOTION OF ELECTRIC CHARGES

-Magnetic field lines move from North to South

- Strength of the magnetic field around a current carrying wire depends on  $I$  (How much current passes through the wire) and  $r$  (How you are from the wire)

- The magnetic field intensity is proportional to the number of loops

$$B = \mu_0 I / (2\pi r)$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ Tm/A}$$

\*measured in Teslas

# Review of the Concepts Continued

- A changing magnetic field will induce a voltage - Electromagnetic induction (Faraday's Law)

-The amount of voltage depends not only on the strength of the magnetic field, but also on the cross sectional-area of the coil

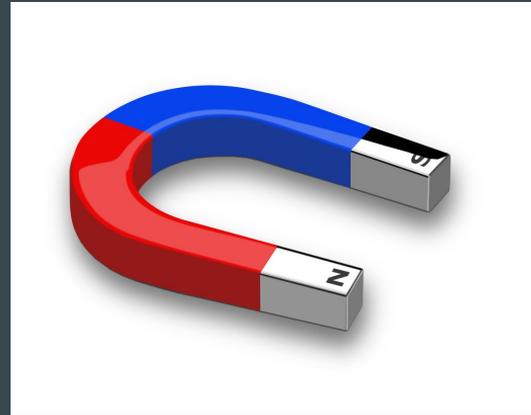
$$\Phi = BA \sin \theta$$

\*Measured in webers (Wb)

$$V = N \Delta \Phi / \Delta t$$

$$V_P / N_P = V_S / N_S \quad (\text{for transformers})$$

$$P = I_P V_P = I_S V_S$$



# Review of the Concepts Continued

-Both the current in the wire and the motion of a moving charge create a force that act on each other (equal and opposite)

$$F_{\mathbf{B}} = qvB\sin\theta$$

$$F_{\mathbf{B}} = ILB\sin\theta$$

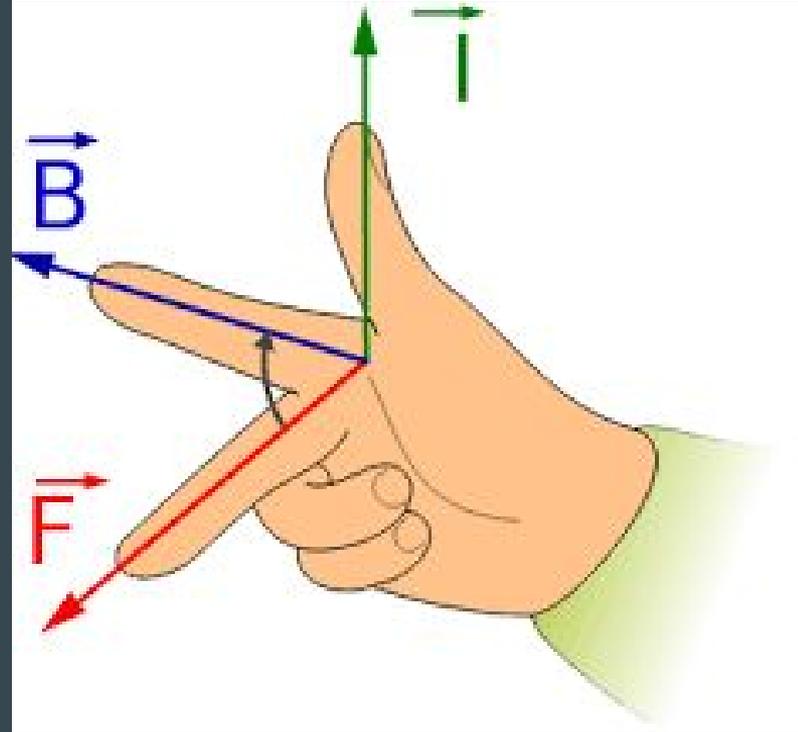


# Misconception/Common Mistake #1

-The Right Hand Rule ONLY applies to positive charges, NOT ELECTRONS

-When dealing with electrons, simply use your LEFT hand, or just switch the directions

-Also when using the right hand rule make sure the current/velocity is the thumb, the magnetic field is the pointing finger, and the force is the middle finger

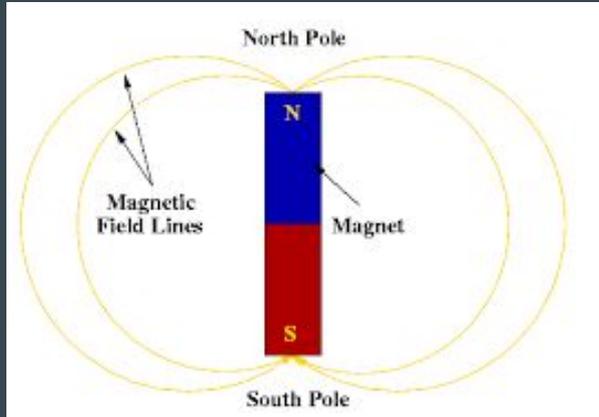


# Misconception/Common Mistake #2

FALSE: Earth's magnetic field is created by magnetic materials at the poles.

IN REALITY: Earth's magnetic field is created by the churning of the molten liquid outer core in the Earth that is constantly moving as the Earth rotates.

The poles have greater magnetic field strength of any other spot on a magnet.

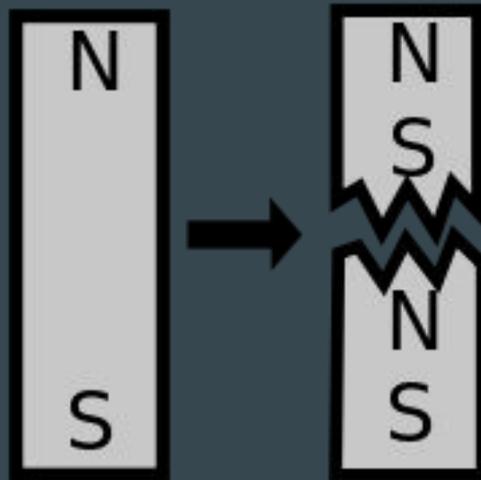


# Misconception/Common Mistake #3

-Cutting a magnet in half WILL NOT result in a monopole

→ there will always be a north and a south pole

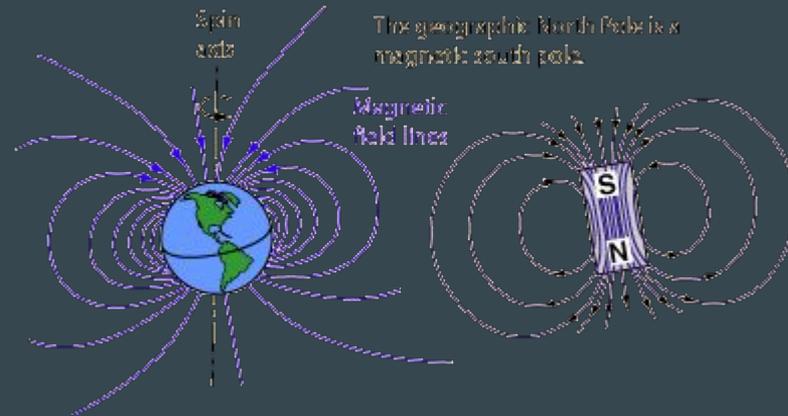
-If you cut a magnet in half, the result will be two smaller magnets, both with a north and south pole.



# Misconception/Common Mistake #4

-The north pole of the Earth is actually the south pole of Earth's magnetic field in terms of magnets.

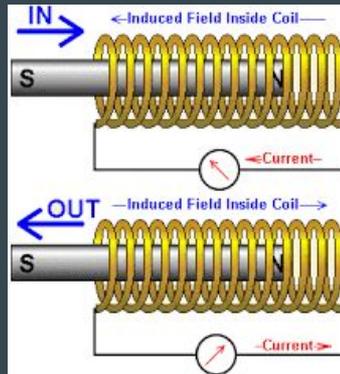
-If you think of Earth like a bar magnet, the north pole we all recognize today is really the south pole of the bar magnet.



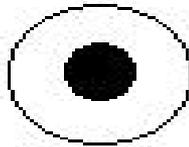
# Misconception/Common Mistake #5

If one of the coils in a transformer has more voltage (more coils), it will have less current. Induced current in a coil of wire will make a magnetic field that resists motion both into and out of the coil. That's why you can't make a transformer with one coil on one side and an infinite number of coils on the other side.

Doubling the number of coils doubles the voltage at the expense of more work necessary to move the magnet.



## Misconception/Common Mistake #6



**This symbol denotes the movement of charges, or a vector force, directly out of the page.**



**This symbol denotes the movement of charges, or a vector force, directly into the page**

# Multiple Choice #1

A 0.90 m long straight wire on board the Voyager spacecraft carries a current of 0.10 A perpendicular to Jupiter's strong magnetic field of  $5.0 \times 10^{-4}$  T. What is the magnitude of the magnetic force experienced by the wire?

- A. 4.5 N
- B.  $1.2 \times 10^{-3}$  N
- C.  $1.5 \times 10^{-4}$  N
- D.  $4.5 \times 10^{-4}$  N



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## Multiple Choice #2

At the equator where the Earth's  $3.0 \times 10^{-5}$  T magnetic field is parallel to the surface of the Earth, Emma is spinning her wedding ring, which has a diameter of 2.0 cm, on top of the table. What is the change in flux through the ring if Emma spins it on its edge?

- A.  $3.77 \times 10^{-8}$  Wb
- B.  $9.42 \times 10^{-9}$  Wb
- C.  $9.42 \times 10^{-5}$  Wb
- D.  $3.77 \times 10^{-4}$  Wb



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## Multiple Choice #3

If a wire is bent into a loop,

- A. There is a stronger field inside and outside of the coil
- B. There is a weaker field inside and outside of the coil
- C. There is a weaker field inside the coil and a stronger field outside of the coil
- D. There is a stronger field inside of the coil and a weaker field outside of the coil

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- D. There is a stronger field inside of the coil and a weaker field outside of the coil**

## Multiple Choice #4

Niagara Falls sends  $3,000\text{ V}$  to a step-up transformer that sends  $120,000\text{ V}$  to homes in NYC. If there are  $2,000$  loops in the primary end of the transformer, how many loops are in the secondary?

- A. 50 loops
- B. 80,000 loops
- C. 50,000 loops
- D. 80 loops

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## Multiple Choice #5

In Fred's color TV, electrons are shot toward the screen through a  $1.0 \times 10^{-3}$  T magnetic field set up in the picture tube. If the electrons each experiences a magnetic force of  $3.5 \times 10^{-15}$  N, at what speed are they propelled through the picture tube?

- A.  $2.2 \times 10^7$  m/s
- B. 0 m/s
- C.  $3.0 \times 10^8$  m/s
- D.  $2.0 \times 10^5$  m/s

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