FLINN SCIENTIFIC

Name_____

Properties of Magnets Worksheet

Observations

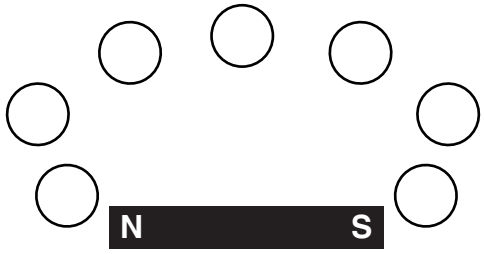
North pole/north pole interactions

South pole/south pole interactions

North pole/south pole interactions

Magnetic Fields

Fill in each circle to indicate the direction of the red tip of the compass needle as the compass is moved around the magnet.



Draw the magnetic field lines of a single permanent magnet.

Draw the magnetic field lines of the two magnets with north and south poles facing each other.

Draw the magnetic field lines of the two magnets with either north or south poles facing each other.

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Properties of Magnets Worksheet Continued

Magnetic properties of different materials *(put a check in the appropriate column):*

	Magnetic	Nonmagnetic
Aluminum foil		
Iron nail		
Plastic straw		
Copper wire		

Post-Lab Questions

1. Describe what happens when two identical poles of the bar magnet face each other. What happens when two opposite poles face each other?

2. What polarity must the red tip of the compass needle be since it points toward the south pole of the magnet?

3. Draw a picture to show what would happen if a bar magnet was cut into two equal pieces. Label the north and south poles of each "new" magnet.

4. How does the direction of the compass needle change as the compass is moved along a magnetic field line?

5. How do the iron filings align themselves in relation to the magnetic field? Do the magnetic field lines ever cross?

6. Where is the magnetic field the strongest? How can you tell? Compare the strength of the magnetic field to the closeness of the magnetic field lines in that region.

7. Is a typical refrigerator door made of iron or aluminum? Explain.

Name_____

Build an Electromagnet Worksheet

Number of paper clips picked up by the electromagnet (with nail core):

Effect on the compass needle.

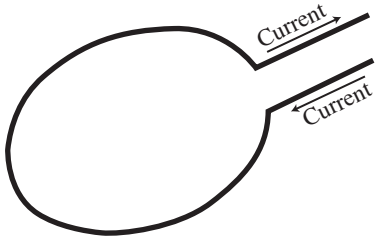
Number of paper clips picked up by the coil of wire (without nail core):

Effect on the compass needle.

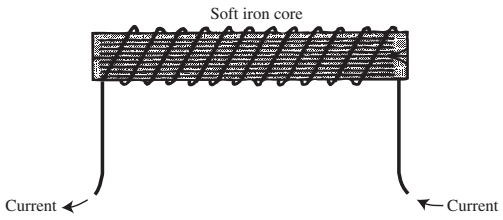
Post-Lab Questions

1. Compare the strength of the electromagnet with the iron nail core to the one without. Why would an iron core have this effect?

2. Draw the direction of the magnetic field surrounding the wire loop.



3. Draw the magnetic field lines around the electromagnet.



4. Calculate the magnetic field produced by an electromagnet (solenoid) with 100 loops per centimeter with a current of 1 amp. What is the magnetic field of the same electromagnet with an iron nail core? ($\mu_o = 4\pi \times 10^{-7}$ T•m/A, magnetic susceptibility, *k*, of air and iron is about 1 and 200, respectively.)

Name_____

Electromagnetic Induction Worksheet

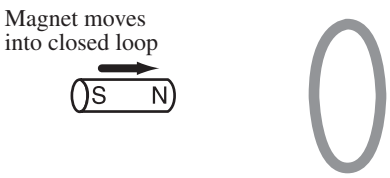
Observed deflection of the compass needle. What movement produces the strongest deflection?

Post-Lab Questions

1. The 60-mL jar with the coiled wire and compass inside is a simple galvanometer, or a device that detects very small currents. What property of electric current does this simple galvanometer detect?

2. The bottle preform with coiled wire and moving magnet is a simple solenoid. When the magnet moves through the solenoid, a current is produced in the coiled wire which is then detected by the galvanometer. Based on your observations, what type of magnet motion produced the most current (the largest deflection of the compass needle)?

3. As the magnet enters the coil loop from the left, what direction does the induced electric current flow in the wire loop? Indicate the current direction on the figure.



Name_____

Build a DC Motor Worksheet

Observations

Post-Lab Questions

1. Explain how the DC motor works.

2. What is the purpose of sanding only half the enamel off the ends of the coil armature?

3. How does the external magnet polarity determine the spin direction?

4. If the coil armature was larger, how would this affect the performance of the motor?

5. If the coil armature had more windings, how would this affect the performance of the motor?