**Properties of Magnetic Objects – Field Lines**

**Materials**: 1 “cut” nail Plastic lid for a float (fast food drink lid)

 Aluminum pie tin Bar magnet

 Glass beaker Water

You may be wondering (*after the previous lab*) if a floating magnetized nail would behave the same way even if it fell into the water and got wet.

**FOLLOW UP ORIENTATION PROCEDURES**:

1. Place the pie tin in front of you. Because this is a very sensitive “testing” arrangement, check to see that there are no metallic objects near, around, underneath or directly above the pie tin.

2. Add water to the aluminum pie tin (using the glass beaker) until it is a little less than ½ filled.

3. “Magnetize” the cut nail. [*To magnetize the nail, you must hold a “demagnetized” nail on one end and rub a magnet from that end to the other end. Rub only in one direction for 5-6 strokes*.]

4. Lay the plastic lid on the water and place the “magnetized” nail on the lid as shown in the picture on the right.

5. Spin the float and allow the nail to orient itself:

Back of room

Front of room

Make a drawing or sketch in the circle within the box to the right showing the orientation of the magnetized nail once it stopped floating. Be sure to indicate the pointed end of the nail verses the “flat” head of the nail.

**PREDICTIONS**:

1. What do you predict would happen if you dipped the “magnetized” nail into the water of the pie tin and placed it back on the float? Would it behave more like a “demagnetized” nail or more like a magnetized nail [*Record your prediction*]
* What ideas, experiences or evidence did you use to make your prediction?
1. What do you predict would happen if you brought one end of your magnet [N] near BUT NOT TOUCHING the pointed end of the floating nail? [*Record your prediction*]

N S

1. What do you predict would happen if you reverse the magnet so that you bring the other end of the magnet [S] near the pointed end of the floating nail? Describe what happens to the floating nail. [*Record your prediction*]

**EXPERIMENT**: *You will test your prediction now and record all your observations*.

1. What do you actually observe after you dip the “magnetized” nail into the water, place it back in the floating lid, and allow it to orient itself again on the float? Did wetting the nail change its behavior significantly?

N S

2. What do you actually observe to happen when you bring one end of your magnet [N] near BUT NOT TOUCHING the pointed end of the floating nail. Describe what happens to the floating nail. Draw the nail in the floating lid to the right.

3. What do you actually observe to happen when you reverse the magnet so that you bring the other end of the magnet [S] near the pointed end of the floating nail. Describe what happens to the floating nail. Draw the nail in the floating lid to the right.

S N

**ORIENTATION PROCEDURES (USING A MAGNET)**:

*You have previously observed some influences between two “magnetized” nails. Now we will observe how a floating “magnetized” nail is influenced by a bar magnet.*

1. Lay a bar magnet in the center of an open area on your table. Check to see that there are no metallic objects near, around, underneath or directly above the area.

2. Use the diagram below as your guideline for the predictions and observations:

* There are eight positions shown around the bar magnet which are supposed to be somewhat equidistant and symmetrical as shown.

N S

**PREDICTION**

1. Predict how a floating “magnetized” nail will orient itself in the pie tin if placed at each of the locations shown. Draw **arrows** (in the image above) to represent the nail … where the point of the arrow represents the pointed end of the nail.

**EXPERIMENTATION**

1. Move the pie tin with the floating nail in any of the positions shown. Observe and record how the floating “magnetized” nail finally orients itself after settling down.

2. Carefully move the pie tin to the next position CLOCKWISE. Observe and record the nail’s orientation. Repeat this procedure for all eight positions around the bar magnet.

N S

3. Compare your observations with that of other students. What did you observe that was the same (if anything)? What was different (if anything)? Record your findings.

**CONCLUSIONS AND QUESTIONS**

1. Remember back to static electricity …

a. What happens to static electricity when water (humidity) is high in a room?

b. Based on this lab, would this same effect hold true for magnetism? What is the evidence for your decision?

2. Based on the bar magnet and various positions of the pie tin around it …

a. Describe the pattern of behavior you observed for the floating nail in various positions around the bar magnet. (For example, does the same end of the floating nail always point toward the same end of the magnet?)

b. Did any other students show a kind of “looping” pattern based on the direction the nail pointed? What implications does this have in understanding magnetism?

3. Which statement seems most true to you at this point? You must give evidence to back up your decision:

a. Static Electricity and Magnetism are basically the same phenomenon looking from different angles

b. Static Electricity and Magnetism are basically different phenomenon

c. We do not yet have enough evidence which would distinguish the relationship between Static Electricity and Magnetism.

4. Continue to collate a summary of “big ideas” related to static electricity and magnetism.

**ANSWERS**

**EXPERIMENT**:

5. Spin the float and allow the nail to orient itself:

Back of room

Front of room

Make a drawing or sketch in the circle within the box to the right showing the orientation of the magnetized nail once it stopped floating. Be sure to indicate the pointed end of the nail verses the “flat” head of the nail.

**The nail points toward “N”**

**of the earth’s N pole.**

1. What do you actually observe when you dipped the “magnetized” nail into the water and allowed it to orient itself again on the float? (For example, did wetting the nail change its behavior significantly?) What was the final resting position of the nail?

**The nail came to same resting position as before.**

N S

2. What do you actually observe to happen when you bring one end of your magnet [N] near BUT NOT TOUCHING the pointed end of the floating nail. Describe what happens to the floating nail. [*Draw the nail in the circle to indicate its orientation*]

**The nail pointed directly at the N pole.**

S N

3. What do you actually observe to happen when you reverse the magnet so that you bring the other end of the magnet [S] near the pointed end of the floating nail. Describe what happens to the floating nail. [*Draw the nail in the circle to indicate its orientation*]

**The nail pointed away from the S pole.**

**ORIENTATION PROCEDURES (USING A MAGNET)**:

*You have previously observed some influences between two “magnetized” nails. Now we will observe how a floating “magnetized” nail is influenced by a bar magnet.*

**EXPERIMENTATION**: [*Actual Observations*]

Draw the actual orientation of the floating nail in various positions around the magnet. Draw **arrows** to represent the nail where the point of the arrow represents the pointed end of the nail.

S N



**The nail orientation will vary depending on which field line it aligns to. [The point end of the magnetized nail is “S”.]**

**CONCLUSIONS AND QUESTIONS**

1. Remember back to static electricity …

1. What happens to static electricity when water (humidity) is high in a room?

**Humidity absorbs charges so static electricity is reduced or stopped.**

B. Based on this lab, would this same effect hold true for magnetism? What is the evidence for your decision?

**Magnetism is unaffected by water. A magnet will work underwater. This was observed by the pie tin experiment when the magnet was dipped in water. The results were the same as when the magnet was dry.**

2. Based on the bar magnet and various positions of the pie tin around it describe the pattern of behavior you observed for the floating nail in various positions around the bar magnet. (For example, does the same end of the floating nail always point toward the same end of the magnet?)

**When the nail was magnetized, the same end was attracted to the N pole of the magnet and repelled from the S pole of the magnet.**

3. Which statement seems most true to you at this point? You must give evidence to back up your decision:

*Static Electricity and Magnetism are basically the same phenomenon looking from different angles*

**Static Electricity and Magnetism are basically different phenomenon**

*We do not yet have enough evidence which would indicate the relationship between Static Electricity and Magnetism.*