

ASTRONOMY #2: BAR MAGNETS AND EARTH'S MAGNETIC FIELDS

ESSENTIAL QUESTION: How does Earth act like a Bar Magnet?

A bar magnet is made of ferromagnetic material, or material containing Iron. Each magnet has a magnetic North and a magnetic South Pole.

You will be conducting a series of investigations to get familiar with bar magnets and their magnetic properties.



INVESTIGATION #1: Using one bar magnet and 10 paperclips, identify the area of the magnet where the attractive force is the strongest. Is it near the center of the magnet or at the poles (ends) of the magnet?

DIAGRAM YOUR RESULTS

Conclusion: The attractive force on the paperclips from the bar magnet seems to be the strongest _____ (in the center of the magnet at the poles) of the bar magnet.

INVESTIGATION #2: You will need two bar magnets. Explore the attractive force between two bar magnets when different ends are placed near each other.

PART 1 - Position two bar magnets with their North ("Like") poles facing each other. Use arrows to show the direction of force you feel. Do they **attract** (pull toward) or **repel** (push away) from each other? Repeat with the two South poles facing each other.



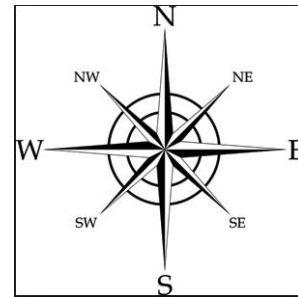
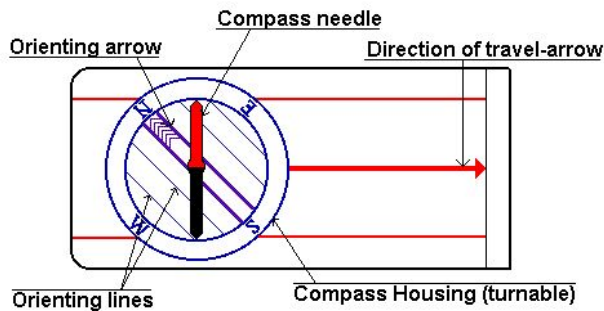
Conclusion: Two bar magnets with "Like" poles facing each other will _____ (attract repel) each other.

PART 2 - Position two bar magnets with a North pole and a South pole (opposite poles) facing each other. Do they **attract** (pull toward each other) or **repel** (push away)?



Conclusion: Two bar magnets with opposite poles facing each other will _____
(attract repel) each other.

INVESTIGATION #3: You will need a compass, bar magnet and an iron nail (a ferromagnetic material).



First you need some directions to get your bearings, Looking outside of our classroom windows you would be facing **West**. The front of Smart faces **South**.

1. Holding the compass flat in your hand, **identify the direction in which the red part of the compass needle is pointing.** _____ (N, S, W, E). Keeping the compass in your hand, turn your body in a different direction. **Which direction does the compass needle point?** _____ (N, S, W, E).

The compass needle always points _____ (North, South, West, East)

2. Place the North end of the bar magnet near the red end of the compass needle. **How does the compass needle respond? Was the compass needle attracted to the magnet or did it repel from it?**

Repeat but this time place the South end at the end of the compass needle. **How does the compass needle respond?**

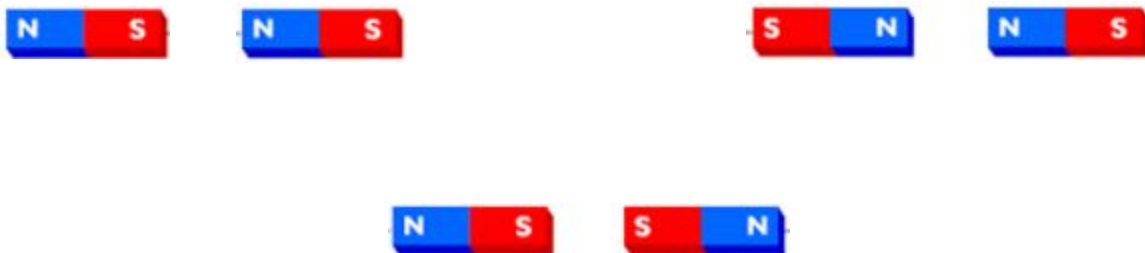
3. Take the head (flat part) of the iron nail (ferromagnetic material) and place it near the red part of the compass needle. Try to move the compass needle around in circles with the nail. Does the needle follow, repel or is there no reaction from the needle?

Repeat this but this time use the point of the nail near the red part of the needle. Does the needle follow, repel or is there no reaction from the needle?

Conclusion: Based on the 2 investigations, the compass needle on a compass _____ (is, is not) magnetic.
Give evidence to support your answer.

INVESTIGATION #4: You will need a petri dish containing iron filings and two bar magnets. You will be drawing the magnetic field lines created from these two magnets.

1. Place the two bar magnets on the top of the petri dish with the north and south pole facing each other but not touching. Draw the pattern (magnetic field lines) created between and around the two magnets from the iron filings.
2. Repeat with north to north and then south to south poles facing but not touching.



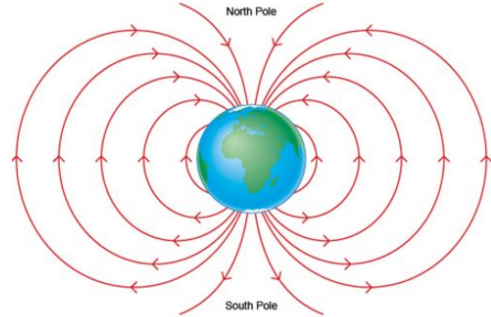
Conclusion: The iron filings seem to repel each other when _____ (like, opposite) poles were facing each other and attract when _____ (like, opposite) poles were facing each other.

Name _____ Date _____ Hour _____

ASTRONOMY #2 - EARTH'S MAGNETIC FIELD

Use your results from the Bar Magnet Investigations to answer the following questions.

Earth has a magnetic field that extends from the Earth's interior to prevent solar winds from stripping away protective layers of our atmosphere.



1-2. Compasses always point _____ (North, South, West, East) due to the force of _____ (attraction or repulsion) between the magnetic needle and a magnet or other magnetic material.

3. How is Earth's magnetic field similar to a bar magnet?

4. What direction would Earth's imaginary bar magnet be facing in order to attract the compass in the direction that it does? (North at the North Pole and South facing the South pole South facing the North Pole and North facing the South pole)?

5. What material would Earth's core (interior) need to be made of in order to act like a magnet creating magnetic fields?

6. Earth's core is always in motion, what causes this motion?

7. Based on the evidence gathered from your investigation, what are the two causes of Earth's magnetic field?