Lab #_______ Name _______________________________ # ___________

Date ____________________________ Mod _____________

Is it Magnetic?

1. Fill in each table. List things ATTRACTED by a magnet on the LEFT and things NOT ATTRACTED on the RIGHT.

MAGNETIC

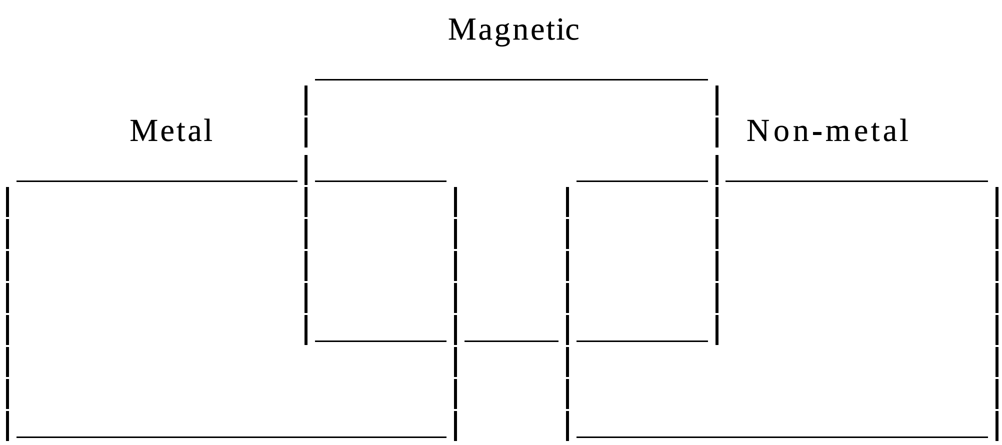
#	Object	Made from	check

NON-MAGNETIC

#	Object	Made from	check

2. Check those boxes above where the object is made of metal.

3. Write the correct number in the correct space.



4. Circle true or false. Then give a reason for your answer.

T F All metals are magnetic.

T F Some non-metals are magnetic.

T F Some metals are magnetic.

Lab #_______ Name ____________________________________# __________

Date ________________________________ Mod ____________

Induced Magnetism

Materials: petri dish, dram cup, steel pin, beaker, water, cork, bar magnet, test tube with iron filings, iron nail

PART 1: The Test Tube Magnet

Procedure:

( )1. Prepare a floating compass similar to the one used in a previous lab on magnetism. Examine your compass. Which end of the pin is pointing north? ________________

( )2. Place your thumb over the stopper and shake the test tube of iron filings for about 5 seconds.

( )3. Carefully bring the end of the test tube near one end of the compass. THE COMPASS PIN SHOULD BE ATTRACTED TOWARD THE IRON FILINGS WITHIN THE TEST TUBE. Bring the same end of the test tube near the other end of the compass. THE COMPASS PIN SHOULD STILL BE ATTRACTED TOWARD THE TEST TUBE.

( )4. Stroke the test tube with the end of the bar magnet in the same manner as demonstrated by your instructor. RUB IN ONE DIRECTION ONLY. DO NOT SHAKE THE TUBE!

( )5. After stroking the test tube with the magnet, bring the end of the test tube first toward one end of the pin compass and then toward the other. ONE POLE OF THE COMPASS SHOULD BE ATTRACTED AND THE OTHER REPELED BY THE TEST TUBE. If your compass fails to do this, repeat step #4.

( )6. Repeat step #2 and #3.

Explanation:

When you rub the test tube with the magnet, you magnetize the iron filings. The iron filings have weak magnetic poles and appear to line up in the magnetic field of the bar magnet. All of these tiny magnets properly aligned act together to produce a strong magnetic field around the entire test tube. The compass needle will be both attracted and repelled by the tube of iron filings. The compass must therefore be interacting with a true magnet. When you shake the test tube, the iron filings are no longer magnetically aligned and the test tube magnet has been changed into a disorganized pile of magnetic filings.

Follow-up:
Each lab partner is to COPY THE ABOVE EXPLANATION on separate sheets of paper and staple them to the back of this page.

PART 2: Induced Magnetism

Procedure:

( )1. Place one pole of a bar magnet near your compass. What happens to the compass needle?

( )2. Repeat step #1 with the other end of the magnet. What happens to the compass needle?

( )3. Bring the nail near the compass. Compare the behavior of the compass poles as they react to the nail. What happens to the compass needle? Does the nail behave like a magnet?

( )4. Place the nail against a pole of the bar magnet. Bring the nail (still in contact with the magnet) near your compass. What happens as you bring the nail near the different poles of the compass? Does the nail behave like a magnet?

( )5. Take the magnet away from the nail. What happens? Describe the behavior of induced magnetism.

Explanation:

Induced magnetism is magnetism caused by being near or touching a magnet. In this experiment the nail becomes a magnet through induction because it is touching a bar magnet. The nail is a temporary magnet.

Follow-up:

( )1. Each lab partner is to COPY the above explanation on the sheets of paper used in PART 1 of the laboratory.

( )2. Draw the arrangement of atoms (domains) in the nail while it is touching the bar magnet.

( )3. If the head of the nail is touching the north pole of the magnet, what pole is at the other end of the nail?

Lab #_______ Name _______________________________# __________

Date _________________________________Mod _______

The Deflecting Compass

Materials: D-Cell battery (1.5 V), battery holder with contacts, wire, switch, magnetic compass, 3 connecting wires with alligator clips, tape (optional)

Procedure:

1) Distribute the above materials for each pair of students.

2) Use the alligator clip to attach one of the connecting wires to the + (ANODE) terminal of the battery Connect the other end of this wire to the longest wire in the tray. Line up the center of the long wire with the compass needle by holding it above the compass. (You may wish to tape this wire down in order to hold its position).

3) Attach the other end of the long wire to one side of the push button switch with another connecting wire.

4) Use the third connecting wire to attach the remaining side of the switch to the - (CATHODE) terminal of the battery. Your electric circuit should now look like the one pictured above.

5) Pay attention to the compass needle and press the switch to complete (close) the circuit. What happens?

Explanation:

This laboratory shows that a MAGNETIC FIELD exists around an electric current. As soon as the circuit is completed, by closing the switch, the North-pointing needle of the compass will deflect to the left (the way it is set up in the sketch). This illustrated the LEFT-HAND RULE: When holding the left hand over a compass, such that the flow of electrons is from the wrist to the fingertips, the thumb and the compass needle will point in the direction of the north pole of the magnetic field. (Make sure that the palm is facing the compass).

Questions:

1. What did the compass needle do when the circuit was completed?

2. How did the compass needle deflect when it was above or under the wire?

3. What is the reason for the compass needle to move?

4. What would the compass do if a magnet were to approach it?

5. What can we conclude about the surroundings of an electric current?

Follow-up: Each laboratory partner is to copy the above explanation on a separate sheet of paper and attach it behind this page before turning the lab in for a grade.

Lab #_______ Name ___________________________________# __________

Date _______________________________ Mod ____________

The Floating Compass

Materials: dram cup, beaker, petri dish, pin, cork, bar magnet

Procedure:

1) Fill a dram cup with water.

2) Magnetize a pin by stroking the pointed end several times with the NORTH end of a bar magnet. Always stroke in the same direction.

3) Lay the pin horizontally in the center of a piece of cork and rest the cork and pin on the surface of the water. The water will cut down on friction and allow the pin to turn freely.

4) The cork and pin should come to rest in the center of the water in the dram cup. If you find the cork tends to move to the side and cling to the cup, add water until the cup overflows. This will create a convex surface allowing the cork to float to the highest point on the water's surface.

Let's experiment:

1) Bring your bar magnet NEAR the compass. What happens?

2) Which end of the compass pin is attracted to the NORTH end of your magnet (the point or the blunt end)?

3) What happens when the SOUTH end of the bar magnet is brought near the pointed end of the compass pin?

4) Try stroking the pin point with the SOUTH end of the bar magnet and then bring the NORTH end of the magnet near your compass. What happens?

5) Check to see if your compass pin is really a small magnet by looking for REPULSION from the bar magnet. Are you able to get either end to repel?

Follow-up:

1) Which pole of a magnet must you rub against the pin point if you want the point to be a SOUTH POLE? (Check your answer)

2) Explain how you are able to make the pin's blunt end a NORTH POLE.

3) Use a carefully labeled diagram of a pin to show how the DOMAINS in the pin would look after rubbing the pin point with the NORTH POLE of a magnet.

4) Which pole of the magnet must be rubbed against the pin point if you want the blunt end to point toward the earth's magnetic north?

Lab #_______ Name ___________________________________# __________

Date _______________________________ Mod ____________

The Field of Force Around a Magnet

Materials: 2 bar magnets, iron filings, masonite base, this sheet of paper, pencil

Procedures:

1. Lay the two bar magnets, end to end, on the table top, with the unlike poles of each magnet about four inches apart.
2. Cover the magnets with the sheet of masonite. Be careful not to change the position of the magnets.
3. Lay this sheet of paper directly on the masonite. Position the blank portion of the paper over the magnets.
4. SPRINKLE iron filings evenly over the sheet of paper.
5. TAP the masonite gently with a pencil. (The filings become arranged in curved paths from the north pole of one magnet to the south pole of the other.)
6. Use your pencil to carefully trace the lines of force shown by the iron filings.
7. Before you turn in your drawing make certain that you do the following: a) label the lines of force; (b) sketch in the positions of the two magnets; (c) correctly label the poles of the magnets; (d) identify your field of force drawing as being either that of attraction or repulsion.
8. Carefully return all materials to their proper locations.

Observations:

Lab #_______ Name ___________________________________# __________

Date _______________________________ Mod ____________

The Field of Force Around a Magnet- part 2

Materials: 2 bar magnets, iron filings, masonite base, this sheet of paper, pencil

Procedures:

1. Lay the two bar magnets, end to end, on the table top, with the like poles of each magnet about four inches apart.
2. Cover the magnets with the sheet of masonite. Be careful not to change the position of the magnets.
3. Lay this sheet of paper directly on the masonite. Position the blank portion of the paper over the magnets.
4. SPRINKLE iron filings evenly over the sheet of paper.
5. TAP the masonite gently with a pencil. (The filings become arranged in curved paths from the north pole of one magnet to the south pole of the other.)
6. Use your pencil to carefully trace the lines of force shown by the iron filings.
7. Before turning in your drawing make certain that you do the following: a) label the lines of force; (b) sketch in the positions of the two magnets; (c) correctly label the poles of the magnets; (d) identify your field of force drawing as being either that of attraction or repulsion.
8. Carefully return all materials to their proper locations.

Observations:

Lab #_______ Name __________________________________# __________

Date ______________________________ Mod ____________

A Simple Galvanometer

Materials: D-Cell battery (1.5 V), battery holder with contacts, switch, 3 connecting wires with alligator clips, cork, 2 pins, thread, bar magnet, wire coil, wooden coil support

PREPARING THE COMPASS:

1) Push a pin longitudinally through a small cork (Fig. A). Stick another pin vertically into the top of the cork for attaching the thread. Tie approximately 6 inches of thread to the upright pin head. Double knot the thread and remove the excess thread.

2) Stroke the pin point with the north pole of the bar magnet. The pin has now been magnetized and the point is now which magnet pole? __________________________Set the compass aside for later use.

CIRCUIIT CONSTRUCTION:

1) Check to make certain the alligator clips at the coil ends are attached to the small nails in the wooden support.

2) Attach one end of a wire connector to the left nail on the support stand and the other end to a switch post.

3) Connect the other end of the switch to the - (CATHODE) of the battery.

4) Connect the + (ANODE) of the battery to the right nail on the support stand. Your electric circuit should look like like the one shown above (Fig. B).

USING THE GALVANOMETER:

1) Holding the end of the thread, hang the pin compass in front of the coil opening so that it will turn freely. Turn the support stand so that the pin point is parallel with the coil opening (Fig. C) and not touching the stand.

2) Press the switch to close the circuit. What happens?

EXPLANATION: When an electric current is led through a coil, the coil is turned into a magnet.

A magnetic field is thus created around the compass, when a small current passes through the coil, and this field deflects the compass needle. The more windings in the coil, the stronger the magnetic field and thus the more sensitive the instrument.
The stronger the current passing through the coil, the stronger the magnetic field created around the coil and the more the compass needle will deflect. A larger deflection therefore indicates a larger current. When the current is passed in the opposite direction through the coil, the magnetic poles switch and the compass needle deflects in the opposite direction. The instrument therefore, not only measures the strength but also the direction of weak currents.

QUESTIONS:

1. What makes the compass turn in general?

2. What does the coil turn into when a current passes through it?

3. What will make the galvanometer more sensitive?

4. What two things does a galvanometer measure?

5. Using the left hand rule in which direction was north in the coil's magnetic field? Use a diagram to help me understand your answer.

Follow-up:

Each laboratory partner is to copy the above explanation on a separate sheet of paper and attach it behind this page before turning the lab in for a grade.

Lab #_______ Name ___________________________________# __________

Date _______________________________ Mod ____________

Induced Magnetism

Materials: petri dish, dram cup, steel pin, beaker, water, cork, bar magnet, test tube with iron filings, iron nail

PART 1: The Test Tube Magnet

Procedure:

( )1. Prepare a floating compass similar to the one used in a previous lab on magnetism. Examine your compass. Which end of the pin is pointing north? ________________

( )2. Place your thumb over the stopper and shake the test tube of iron filings for about 5 seconds.

( )3. Carefully bring the end of the test tube near one end of the compass. THE COMPASS PIN SHOULD BE ATTRACTED TOWARD THE IRON FILINGS WITHIN THE TEST TUBE. Bring the same end of the test tube near the other end of the compass. THE COMPASS PIN SHOULD STILL BE ATTRACTED TOWARD THE TEST TUBE.

( )4. Stroke the test tube with the end of the bar magnet in the same manner as demonstrated by your instructor. RUB IN ONE DIRECTION ONLY. DO NOT SHAKE THE TUBE!

( )5. After stroking the test tube with the magnet, bring the end of the test tube first toward one end of the pin compass and then toward the other. ONE POLE OF THE COMPASS SHOULD BE ATTRACTED AND THE OTHER REPELED BY THE TEST TUBE. If your compass fails to do this, repeat step #4.

( )6. Repeat step #2 and #3.

Explanation:

When you rub the test tube with the magnet, you magnetize the iron filings. The iron filings have weak magnetic poles and appear to line up in the magnetic field of the bar magnet. All of these tiny magnets properly aligned act together to produce a strong magnetic field around the entire test tube. The compass needle will be both attracted and repelled by the tube of iron filings. The compass must therefore be interacting with a true magnet. When you shake the test tube, the iron filings are no longer magnetically aligned and the test tube magnet has been changed into a disorganized pile of magnetic filings.

Follow-up:
Each lab partner is to COPY THE ABOVE EXPLANATION on separate sheets of paper and staple them to the back of this page.

PART 2: Induced Magnetism

Procedure:

( )1. Place one pole of a bar magnet near your compass. What happens to the compass needle?

( )2. Repeat step #1 with the other end of the magnet. What happens to the compass needle?

( )3. Bring the nail near the compass. Compare the behavior of the compass poles as they react to the nail. What happens to the compass needle? Does the nail behave like a magnet?

( )4. Place the nail against a pole of the bar magnet. Bring the nail (still in contact with the magnet) near your compass. What happens as you bring the nail near the different poles of the compass? Does the nail behave like a magnet?

( )5. Take the magnet away from the nail. What happens? Describe the behavior of induced magnetism.

Explanation:

Induced magnetism is magnetism caused by being near or touching a magnet. In this experiment the nail becomes a magnet through induction because it is touching a bar magnet. The nail is a temporary magnet.

Follow-up:

( )1. Each lab partner is to COPY the above explanation on the sheets of paper used in PART 1 of the laboratory.

( )2. Draw the arrangement of atoms (domains) in the nail while it is touching the bar magnet.

( )3. If the head of the nail is touching the north pole of the magnet, what pole is at the other end of the nail?

Lab #_______ Name _______________________________# __________

Date _________________________________Mod _______

The Deflecting Compass

Materials: D-Cell battery (1.5 V), battery holder with contacts, wire, switch, magnetic compass, 3 connecting wires with alligator clips, tape (optional)

Procedure:

1) Distribute the above materials for each pair of students.

2) Use the alligator clip to attach one of the connecting wires to the + (ANODE) terminal of the battery Connect the other end of this wire to the longest wire in the tray. Line up the center of the long wire with the compass needle by holding it above the compass. (You may wish to tape this wire down in order to hold its position).

3) Attach the other end of the long wire to one side of the push button switch with another connecting wire.

4) Use the third connecting wire to attach the remaining side of the switch to the - (CATHODE) terminal of the battery. Your electric circuit should now look like the one pictured above.

5) Pay attention to the compass needle and press the switch to complete (close) the circuit. What happens?

Explanation:

This laboratory shows that a MAGNETIC FIELD exists around an electric current. As soon as the circuit is completed, by closing the switch, the North-pointing needle of the compass will deflect to the left (the way it is set up in the sketch). This illustrated the LEFT-HAND RULE: When holding the left hand over a compass, such that the flow of electrons is from the wrist to the fingertips, the thumb and the compass needle will point in the direction of the north pole of the magnetic field. (Make sure that the palm is facing the compass).

Questions:

1. What did the compass needle do when the circuit was completed?

2. How did the compass needle deflect when it was above or under the wire?

3. What is the reason for the compass needle to move?

4. What would the compass do if a magnet were to approach it?

5. What can we conclude about the surroundings of an electric current?

Follow-up: Each laboratory partner is to copy the above explanation on a separate sheet of paper and attach it behind this page before turning the lab in for a grade.

Magnetism Vocabulary

1. Magnet
2. Poles
3. Attract
4. Repel
5. Law of Magnetic Poles
6. Horseshoe & Bar magnets
7. Magnetize
8. Domain
9. Magnetic fields of force
10. Force
11. Magnetic substances
12. Nonmagnetic substances
13. 3 magnetic naturally occurring elements
14. Compass
15. Permanent magnet
16. Temporary magnet
17. Lodestone
18. Electromagnet
19. Gavlanometer
20. Generator

Questions for Reference Reading - Reference sheet 7-1

*** ANSWER USING COMPLETE SENTENCES ON YOUR OWN PAPER. ***

1. What is it that surrounds every magnet?
2. What makes up a magnetic field?
3. Are you able to see lines of force?
4. If lines of force are invisible how can we tell where they are?
5. What exactly is a force?
6. What is it that all forces must have?
7. Which pole of a magnet do the lines of force leave? What happens at the other pole?
8. What is it that the lines of force never do?
9. Where are the lines of force around a magnet most concentrated?
10. A magnet is strongest where?
11. What are UNLIKE poles?
12. What happens to the lines of force when two UNLIKE poles are brought together?
13. Copy figure 7-6. Why do the lines of force look as they do?
14. Figure 7-7 shows two LIKE poles being brought close together. Explain the behavior of the lines of force.
15. Why is the earth considered to be a huge magnet?
16. The earth really has how many poles? 1 2 3 4
17. Are the north and south poles marked on a map the same as the earth's magnetic poles? (Want to change your answer to number 16?)
18. Since the earth is a giant magnet what does it have that all other magnets also have? (see question #1)
19. Why does a hand-held compass point in a north-south direction?

TEST - ELECTRICITY AND MAGNETISM

NAME________________________________
MOD ________STUDENT NUMBER_______
DATE _________________________________

1. Magnets can be made of (carbon, silicon, iron, gallium).

2. The space around a magnet contains a(n) _________________________________that exerts a force on other magnets.

3. Alternating current is current that _____________________________ direction.

4. In a cathode ray tube (protons, neutrons, electrons) are beamed across an aluminum sheet causing a green light to be emitted.

5. Electrons have been observed to be repelled by the south pole of a magnet. The south pole of the magnet may also be referred to as the (positive, negative) pole of the magnet.

6. A television picture tube is a(n) ______________________________tube

7. The field of a magnet runs from the _______________ pole to the _________________pole.

8. An electric current running through a wire creates a____________________________

9. The device used in the classroom to detect a small amount of electric current is a(n): (voltmeter, galvanometer, ammeter, electroscope)

10. A material through which electricity can move is a(n): (conductor, insulator, carrier, conduit)

11. An object having either too many or too few electrons has a(n): (magnetic field, electric current, electric charge, magnetic pole)

12. A static discharge differs from an electric current in that a static discharge:
a) is a flow of electrons
b) lasts only a fraction of a second
c) results because a force is placed on the electrons

13. Object #1 is charged positively, and object #2 is repelled when brought close to object #1. We can infer that object #2 is:
a) positive b) negative c) neutral d) magnetic

14. One source of constant electric currect is a(n):
a) battery b) conductor c) switch d) electroscope

**** Tell which is the stronger electromagnet in each of the following pairs:

15. a) an electromagnet with 20 turns b) an electromagnet with 40 turns

16. a) an electromagnet with an iron core b) an electromagnet with no core

17. A moving magnetic field: a) changes its poles b) induces an electric current c) loses its power

18. Moving a magnet faster in a coil: a) increases its magnetism b)increases the induced electric current c) decreases the induced electric currect

19. A stronger magnet induces: a) a weaker electric current b) a weaker magnetic field c) a stronger electric current

20. To induce a larger electric current: a) use a straight wire b) use a coil of wire c) do not use any wire

21. A magnetic field around an electromagnet moves when the electromagnet is turned on and off.(true or false)

22. A magnetic field moving out from or back to a coil can induce an electric current in a second coil.(true or false)

23. Mr. Miller demonstrated an induction coil to the class. (We used one when "BOBBING FOR COINS")How many coils would be found inside the induction coil? a) one b) two c) lots and lots

24. Magnets lose their magnetism when they are: a) heated b) cooled c) put in water

25. Dropping a magnet: a) does not affect it b) makes it stronger c) makes it weaker

26. All metals are attracted to magnets.(true or false)

27. In "MOST" materials, the north and south poles of atoms: a) all point in the same direction b) point in many different directions c) are made of iron

28. Atoms may act like tiny magnets.(true or false)

29. Many atoms facing the same way make a magnet.(true or false)

30. In a magnetic material, the atoms can line up so their poles face the same way.(true or false)

----------------------------- Essay--------------------------------------

Use the space below to make drawings of magnetic fields surrounding: A) a single bar magnet; B) magnets with like poles facing each other; and D) two magnets with unlike poles facing each other. Label each drawing so that I will be able understand what it is that you are trying to show. Briefly explain each of your drawings.

What Is A Magnetic Field?

Seeing magnetic fields.
There is an invisible pattern of magnetism around every magnet. This pattern is called a magnetic field. There is a way you can see this magnetic field. Place sheet of paper over a bar magnet and sprinkle some iron filings on the paper. Then tap the paper gently.
You will see the iron filing make a pattern on the paper. This is a picture of the magnetic field of the magnet. The lines you see are called lines of force. They are closest together at the poles of the magnet. A magnet is strongest at the poles. You can tell where the poles are by looking at the lines of force.

BQ- What is a magnetic field? Where is a magnet strongest? What do you call the pattern of lines formed by the iron filings?

Magnetic fields affect each other.
Put the north poles of two bar magnets near each other without letting them touch. Then make a picture of their magnetic fields with paper and iron filings. The picture shows that the magnetic fields bend away from each other. You learned in another lesson that like poles repel away from each other. The lines of force show this. Arrange the magnets so that unlike poles are facing each other. Make a picture of the magnetic fields now. The lines of force show that the two unlike poles attract each other. Every magnet has a magnetic field around it. The magnetic field of one magnet affects the magnetic field of another magnet.

BO- What do the lines of force show when two magnetic poles are near each other? How are the lines of force in repelling fields different from the lines of force in attracting fields?
WHAT YOU LEARNED.

1. Every magnet has a magnetic field around it.
2. Magnetic fields affect each other.

SCIENCE WORDS
1. Magnetic field – the pattern of magnetism around a magnet
2. Lines of force – the lines that show a magnetic field

ANSWER THESE
1. Magnet fields are weakest at the poles
   a. weakest at the poles
   b. strongest at the poles
   c. visible when they go through paper
2. Pictures of magnetic fields
3. This picture of a magnetic field shows