Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **It’s Electric! It’s Magnetic!**

**Storyline:** We are going to inhabit a new planet, once we are one our new planet to explore, we will need tools. Tools to help build the things we need and tools to help explore our new surroundings. Using the given terms, build and test the strength of several versions of an electromagnet to help pick up objects in our labs and on the planet’s surface. In order to do this we must investigate the forces that magnets put on other objects.

**Materials**

-plastic disk with iron fillings -small round magnet

-bar magnets

**Procedure**

1. Lay the plastic disk on your table and shake it gently back and forth until you get a thin layer of fillings inside the disk. The fillings should not all be in a lump on one end.

2. Life the disk and hold it over your magnets (try to keep the baggie as flat as possible). What shape do the filings make?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Place the magnets into four different arrangements. Use multiple combinations including: two bar magnets, a bar and a round, etc. (Picture above)

4. Draw the shapes the filings make. Include the outline of the magnets underneath.

5. Annotate each drawing with the following

A. “N” or “S” ends of the magnets

B. Force arrows to show whether the ends of the magnets REPEL or ATTRACT each other.

C. Be specific about the directions the fillings take INSIDE the clump, not just the outline of the clump of filings.

|  |  |
| --- | --- |
| Figure1 | Figure 2 |
| Figure 3 | Figure 4 |

**Storyline continued:** We are now on the new planet named “Murphy”. You need to explore this new mysterious planet, but in order to do so you need tools. You have now explored a little with magnets and you have decided you want to make an electromagnetic to help pick up objects in our labs and on Planet Murphy’s surface. Write 3 testable questions about your electromagnetic grabber, the fields they create, or their strength that you may be able to answer based on the observations of the magnets that you made. REMEMBER, a testable question is specific and measurable!

Testable Question 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Testable Question 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Testable Question 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Day 2: It’s Electric! It’s Magnetic!**

With your group select your design your electromagnetic grabber, testable Question, create your procedure, decide how you will analyze your data and get Ms. Murphy’s approval.

**Design**: Draw the outline/design of your electromagnetic grabber below (Directions are under day 3)

|  |  |
| --- | --- |
| Question: What is your testable question? |  |
| Hypothesis:  |  |
| Procedure: Remember your procedure must be numbered, and very detailed |  |
| Data: How will you collect and organize your data? |  |
| Analyze: How will you analyze your data? |  |

X\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ms. Murphy approval

**Day 3**

Keep in mind you may have to share supplies with another class. You will have to remake you electromagnetic grabber each day, so try to get your testing done in one class period.

You will be given the following materials and directions to build your electromagnetic grabber.

**Materials:**

-2 D batteries per group - steel bolt - insulated wire (8-10in)

- Popsicle sticks -Paper clips -Tape

1. Wrap the wire in a tight, even coil around the bolt. Leave 3 or 4 inches of wire loose at each end. Keep wrapping the wire until you get the end of the bolt. There may be as many as 3 or 4 layers of wire all the way up or down the bolt. Your electromagnetic should look something like this:

2. Attach one end of the wire to the positive (+) end of one of your batteries. Attach the other end of the wire to the negative end (-) of your battery pack. Tape the wired to the battery so they stay in place. WARNING: Once the exposed parts of the wire are connected to the battery, they will get HOT!

3. Tape the wrapped bolt AND the battery to a Popsicle stick to serve as a grabber.

4. Test your grabber according to your procedure, collect and analyze your data.