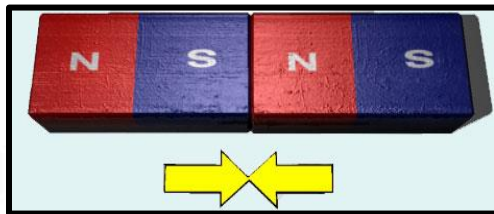


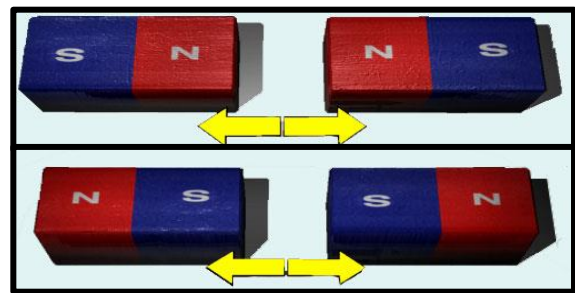
Marvelous Magnets

Background: A magnet is an object that produces a magnetic field. Magnets attract (pull together) or repel (push apart) other magnets depending on the orientation of the poles; south-south and north-north will repel, south-north will attract. Magnets attract ferromagnetic materials (materials that contain iron, nickel, or cobalt). Metal materials will only be magnetic if they contain iron, nickel, or cobalt. Steel is an alloy made with iron.

Objectives: Conduct an experiment with a magnet to determine which materials are magnetic and which are non-magnetic and that not all metals are magnetic. Observe the magnetic force of magnets by using two magnets to attract the opposite poles (south-north) and repel like poles (south-south, north-north).



ATTRACT



REPEL

Vocabulary: Hypothesis, Magnetic, Non-magnetic, Magnetic Force, Cobalt, Iron, Nickel, Steel, Attract, Repel, Poles, Alloy

Materials: Two magnets, collection of household items to test (coins, pipe cleaner, screws/washers, paperclip, plastic, keys, something wooden, pencil, steel wool, sock, aluminum foil, etc.).

Procedure:

Part 1:

1. Gather items to test.
2. Sit in a comfortable work space.
3. Scientists make a hypothesis before they start an experiment. A hypothesis is a best guess based on what is already known. Make a hypothesis, your best guess, about whether each item is magnetic or non-magnetic.
4. Sort the items you think are magnetic in one area and the items you think are non-magnetic in another area based on your hypothesis. There should be two piles at the end of this step. Why do you think the items are magnetic? Why are the others non-magnetic?

5. Now it's time to take out the magnet and test your hypothesis!
6. Use the magnet to test each item one at a time. Was your hypothesis correct? What properties do the magnetic items share? Are they made of similar materials?

Part 2:

1. You will need two magnets for this experiment.
2. Place the two magnets next to each other. What happens? Try to pull the magnets apart. Can you feel a magnetic force?
3. Challenge yourself to make the magnets attract (pull) and repel (push). What do you observe? Can you feel the magnetic force? Magnets have two different poles, south and north. When south and north poles are close together they will attract. When a south-south or north-north poles are close they will repel.

Laboratory Connection: Scientists at Brookhaven National Laboratory use magnets in their atom smasher!

Resources:

- View Virtual Magnets:
<https://micro.magnet.fsu.edu/electromag/java/magneticlines2/index.html>
- More information about magnets:
<https://www.magcraft.com/magnet-university>
- More about Magnetism:
<https://school-for-champions.com/science/magnetism.htm#.XoTaC4hKiUk>
- Videos about magnets:
<https://www.bbc.co.uk/bitesize/topics/zyttyrd/resources/1>
- Three National Laboratories Achieve Record Magnetic Field for Accelerator Focusing Magnet:
<https://www.bnl.gov/newsroom/news.php?a=217097>
- Branley, Franklyn. What Makes a Magnet? Harper Collins, 1996.
- Fowler, Alan. What Magnets Can Do. Children's Press, 1995.
- Hewitt, Sally. Forces Around Us. Bt Bound, 2001.