DEFINITION OF A MAGNET

Magnets are objects that have a north and south pole at opposite ends. A magnet contains electrons that have both uneven orbits and uneven spins. Those magnetic atoms are aligned in nice straight rows inside each domain. And those domains are also lined up all in the same direction. And only with ALL of these conditions satisfied does this piece of metal become a magnet.

WHAT USE ARE MAGNETS?

Maybe you think magnets are interesting; maybe you think they're boring! What use are they, you might ask, apart from in childish magic tricks and scrapyards?

You might be surprised just how many things around you work by magnetism or electromagnetism.

Every electric appliance with an electric motor in it (everything from your electric toothbrush to your lawn mower) uses magnets to turn electricity into motion.

There are magnets in your refrigerator holding the door closed. Magnets read and write data (digital information) on your computer's hard drive. More magnets in your headphones help to turn stored music back into sounds you can hear. If you're sick with a serious internal illness, you might have a type of body scan called NMR (nuclear magnetic resonance), which draws the world beneath your skin using patterns of magnetic fields.

Magnets are in so many things around us that we use daily.

STEAM EXTREME

6 THINGS TO KNOW ABOUT MAGNETS

1. A magnet has two ends called **poles**, one of which is called a north pole or north-seeking pole, while the other is called a south pole or south-seeking pole.

2. The north pole of one magnet attracts the south pole of a second magnet, while the north pole of one magnet repels the other magnet's north pole. So we have the common saying: **like poles repel, unlike poles attract.**

3. A magnet creates an invisible area of magnetism all around it called a **magnetic field.**

4. The north pole of a magnet points roughly toward Earth's north pole and vice-versa. That's because Earth itself contains magnetic materials and behaves like a gigantic magnet.

5. If you cut a bar magnet in half, you get two brand new, smaller magnets, each with its own north and south pole.

6. If you run a magnet a few times over an un-magnetized piece of a magnetic material (such as an iron nail), you can convert it into a magnet as well. This is called **magnetization.**

STEAM EXTREME

STEAM EXTREME

HANDS ON ACTIVITY: MAGIC MAGNETIC FLUID

- GRADES: 8-12
- In this fun, engaging activity, students are introduced to a unique type of fluid—FERROFLUIDS—whose shape can be influenced by magnetic fields! Students act as materials engineers and create their own ferrofluids. They are challenged to create art sculpures by observing the liquids reactions to magnets. As they observe fluid properties as a standalone-fluid and under an imposed magnetic field, they come to understand the components of ferrofluids and their functionality.
- THE STEPS: Put ferrofluid (a liquid made of tiny pieces of iron suspended in oil) in an empty fish tank (wearing gloves). Almost instantly it will change shape when it's in the presence of a magnetic field. Use a magnet wand and watch the magic. The magnet pushes and pulls the ferrofluid using the force. This shows magnets don't even have to touch but the closer they are the stronger the force.
- THE MAGIC: Magnetic liquids respond to magnets by manipulating a pool of ferrofluid to make it "dance." Ferrofluid is a magnetic material made by suspending trillions of tiny iron particles in an oily liquid. The iron particles respond to magnetic fields, enabling ferrofluids to be used to fix leaks in oil pipelines, for example.

STEAM EXTREME

HANDS ON ACTIVITY: THE MAGNET STATIONS

- GRADES: K-3
- **STATION 1: MAGNETIC MATERIALS & THE MAGNET BOARD** Magnetic force acts at a distance, but only on some materials. At this station, students explore which types of materials are attracted to magnets and which are not by testing out attraction between magnets and various types of metal, plastic, paper, and so forth. If something sticks to the wall it's magnetic, if they're not, they'll bounce off.
- **STATION 2: ATTRACTION AND REPULSION** Forces that act at a distance can both pull magnets together or push them apart depending upon how the magnets are oriented. At this station, students explore how magnets with labeled poles interact with each other.
- **STATION 3: STRENGTH OF MAGNETIC FORCE** How strong the force a magnet applies can be a factor of the type of magnet or how many magnets are working together. Students experiment with different types (strengths) of magnets and combining magnets.
- **STATION 4: DISTANCE AND MAGNETIC FORCE** At this station, students conduct a short investigation to provide evidence that magnetic force strength increases the closer a magnet is to the object on which the force is applied.

STEAM EXTREME

HANDS ON ACTIVITY: POWER OF THE MAGNET

- GRADES: K-2
- Like gravity, magnetism is invisible – you can't see it, although its effects are all around us. There's a big difference between the forces: gravity works on all matter. But magnetism only works on some things, and not on others. How can you find out what a magnet will pulls, and what it won't?
- **FIGURE IT OUT:** Gather together a large number of items made of all different substances: glass, plastic, wood, paper, different kinds of metal, and so forth. Try touching each with a magnet. Separate the items into two groups: those that stick to the magnet, and those that don't.
  - **FINDINGS:** What is similar about the things in each pile? What makes the piles different? What can you conclude about which materials are affected by magnets, and which are not?