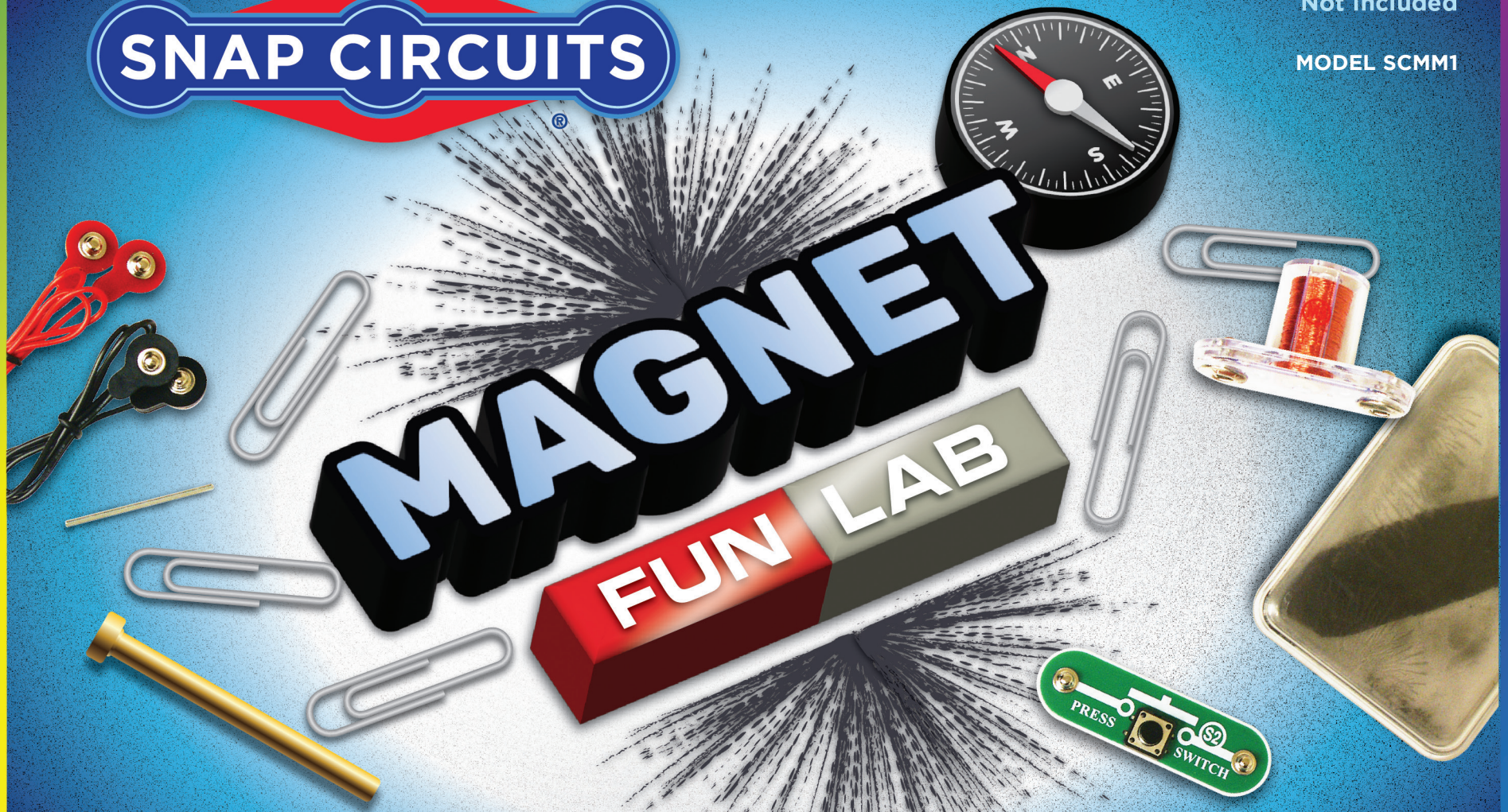
SNAP CIRCUITS®

AGES 8+

Requires 3 AA Batteries
Not Included

MODEL SCMM1



STEM

EXPLORE THE WORLD OF MAGNETISM!

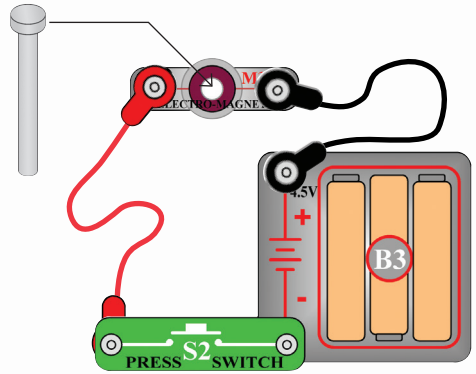
PROJECT 1 Magnets & Electronic Magnets

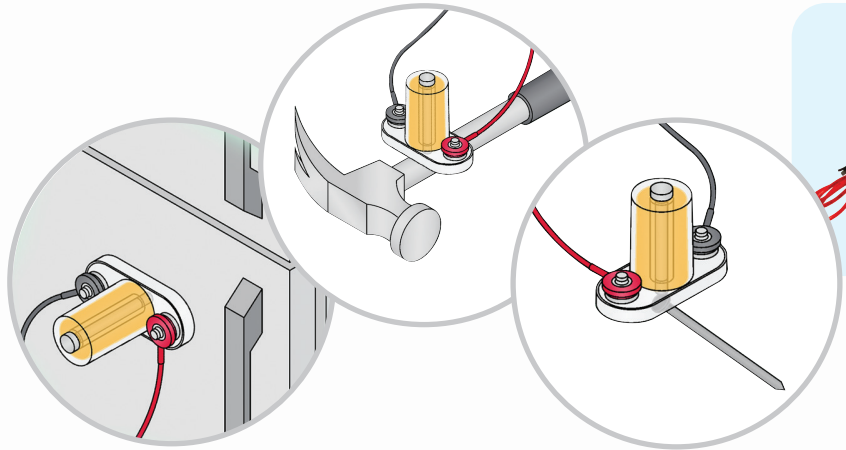
Build the circuit shown on the right. Place the **iron core rod** inside the **electromagnet (M3)**, and install three (3) "AA" alkaline batteries (not included) into the **battery holder (B3)**.

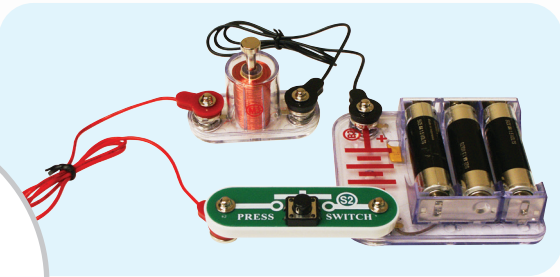
Hold the electromagnet near something made of iron and push the **press switch (S2)**. While pressed, the electromagnet will attract small iron parts like nails, or will stick to a hammer or refrigerator. Release the switch and the attraction disappears.

Pressing the press switch turns on an electric current which transforms the electromagnet from an ordinary coil of copper wire into a magnet.

Notice that the magnet will attract small iron parts and stick to things like the electromagnet did.







All materials have tiny particles with magnetic charges, which are usually so well balanced that you do not notice them unless a magnetic field disturbs them.

Magnets are materials that concentrate their magnetic charges at opposite ends. One side attracts while the other repels, but the overall material is neutral.

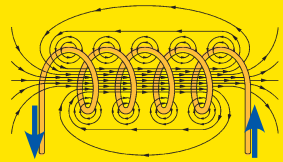
The earth we live on is a giant magnet, due to its iron core. A compass needle always points north because it is attracted to the earth's magnetic field.

An electronic magnet is better than an ordinary magnet because you can turn it on or off with a switch.

Large electromagnets are used to move things around at factories and junkyards.

An electric current flowing in a wire has a tiny magnetic field. By looping a long wire into a coil the tiny magnetic field is concentrated into a large one.

The strength of the magnetic field depends on how much current is flowing in the wire and how many loops of wire.



MAGNET FUN LAB

PARTS LIST

QTY.	ID	NAME	PART #
❒ 1	B3/ B3B	Battery holder	6SCB3/ 6SCB3B
❒ 1		Compass	6SCCOM
❒ 1		Iron fillings pack	6SCIF
❒ 1		Jumper wire, black	6SCJ1
❒ 1		Jumper wire, red	6SCJ2
❒ 1		Electromagnet	6SCM3
❒ 1		Iron core rod	6SCM3B
❒ 1		Paperclips 4 pcs	6SCM3P
❒ 2		Magnet	6SCMAG
❒ 1	S2	Press switch	6SCS2
❒ 1		Thin rod	MWK01P5

IMPORTANT:
If any parts are missing or damaged,
DO NOT RETURN TO RETAILER.
Call toll-free (800) 533-2441 or email us at:
support@elenco.com.
You may order additional/replacement part at
elenco.com/replacement-parts

Installing batteries:

- Remove the safety cover from the battery holder (if your holder has one) with a screwdriver.
- Insert three (3) 1.5V AA batteries (not included) in the holder. Be sure to orient the battery "+" as marked in the holder.
- Replace the cover (if your holder had one). When installing a battery, be sure the spring is compressed straight back, and not bent up, down, or to one side.
- Battery installation should be supervised by an adult.

PROJECT 2 Magnetic Fields

1. The magnetic field is an area around a magnet where it can affect other objects. It is strongest at the ends of the magnet. Use the circuit from the preceding project to compare the magnetic fields of the electromagnet and magnet.

   Hold your compass next to the electromagnet and push the press switch (S2). Move the compass all around the electromagnet and watch where the compass points. Shake the iron filings pack to spread the filings evenly, then move the pack around on top of the electromagnet and see how the fillings change (fresh batteries are recommended, and the fillings may not move much). Do the same with the magnet.

2. The magnetic field created by a magnet occurs in a loop. You can see this using paper clips.

3. Loop two paper clips together. Hold them near the magnet, and move them around it to see the magnetic field. Do the same with the electromagnet, with the switch pressed.

4. Hold the compass near the electromagnet and note the orientation of its arrow. Next, flip the electromagnet around, reversing the wires to it. Now the other side of the compass needle is attracted to the electromagnet (magnetic field is reversed). The direction of a magnetic field from a current flowing in a wire (or coil of wire) depends on the direction of the electric current.

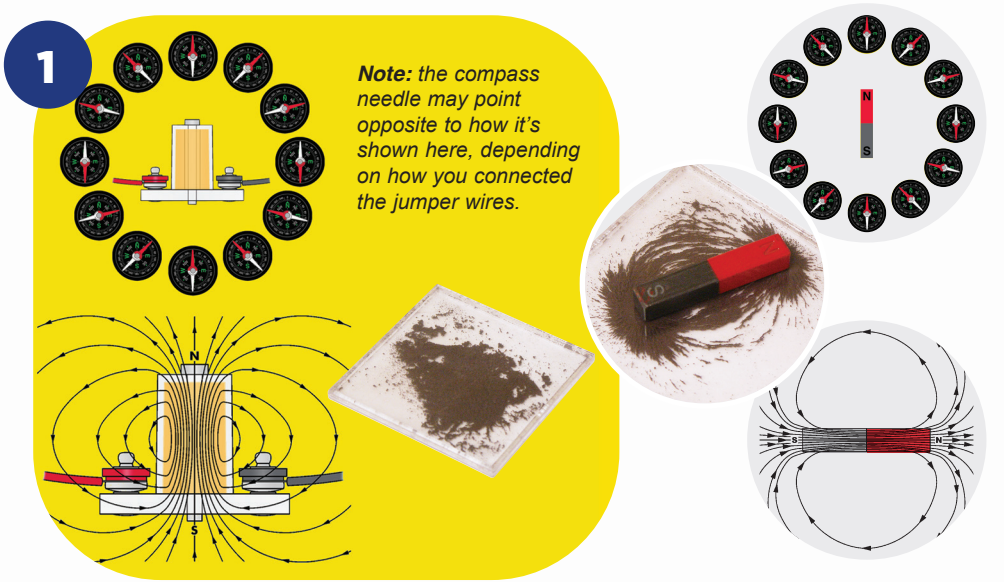
5. Remove the iron core rod from the electromagnet. Now push the press switch again and try to pick up things with the electromagnet. The attraction is now very weak.

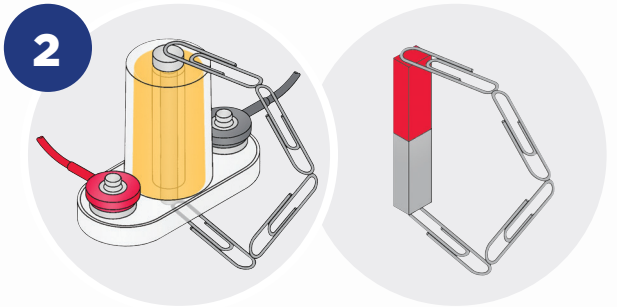
6. The iron core rod concentrated the magnetic effects of the electromagnet. You can use the compass to see that electronic field is now much weaker.

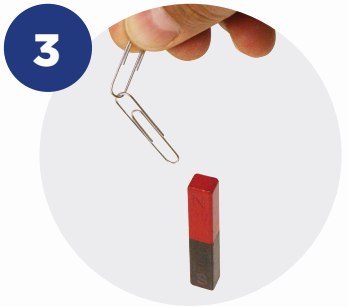
   Materials made of iron concentrate their magnetic effects at both ends. The center of the material is magnetically neutral because the attraction from each end is the same.

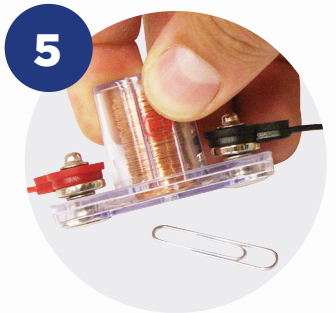
   The magnetic field created by the electromagnet works the same way. It is strongest at both ends but neutral in the center. But the electromagnet is hollow—so iron at one end will be sucked into the middle.

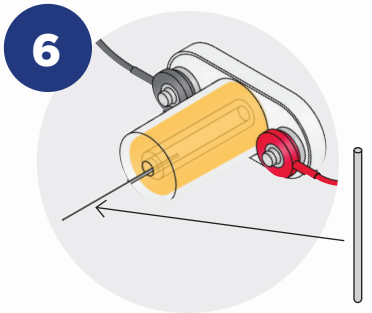
   Lay the electromagnet on its side. Hold the thin rod next to the center hole and push the press switch to suck it inside. Hold the switch and gently pull the rod to see how much suction the electromagnet has.









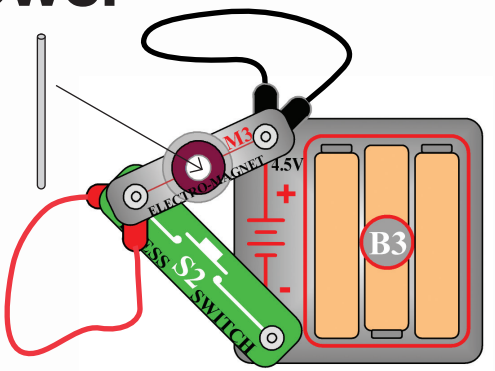


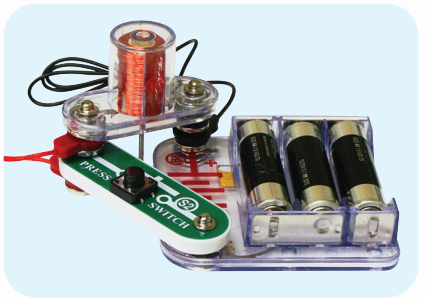
PROJECT 3 Electromagnet Tower

Build the circuit as shown and drop the thin rod into the **electromagnet (M3)**. Push the **press switch (S2)** several times. The thin rod gets sucked into the electromagnet and can be suspended there, or you can bounce it up and down.

When you push the press switch, the thin rod gets sucked up and wiggles up and down until settling in position just below center. See how high you can get the thin rod to go, then try with old and brand new batteries. Also try adjusting the height of the electromagnet.

Part B: With the switch pressed and the thin rod suspended in mid-air, hold the magnet near the thin rod. Notice that one side of the magnet repels the thin rod but the other side attracts it.





PROJECT 4 Be a Magician

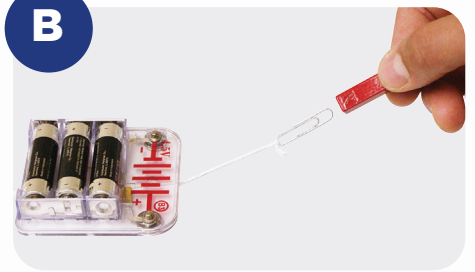
Part A: Secure the magnet in place with nothing beneath it. Tie a paper clip to a few inches of string or thread (not included) and place it on the magnet. Slowly pull the string away so the paper clip is suspended in air. Hold the paper clip in place with a weight, as shown.

Part B: Hold the magnet near the paper clip and lift it off the ground, without it touching the magnet. Move it around in mid-air.

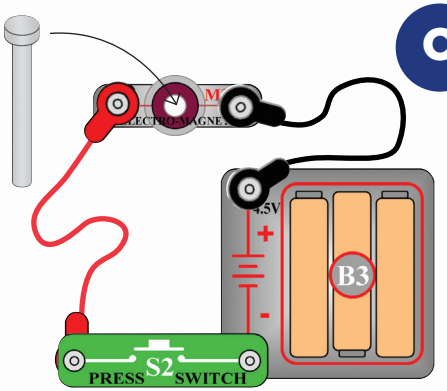
Part C: Build the circuit shown and place the iron core rod in the electromagnet (M3). Secure the paper clip-string with a weight above the circuit, as shown. Push the press switch (S2) to pull the paper clip towards the electromagnet. Attract and release the paper clip by pressing and releasing the switch.

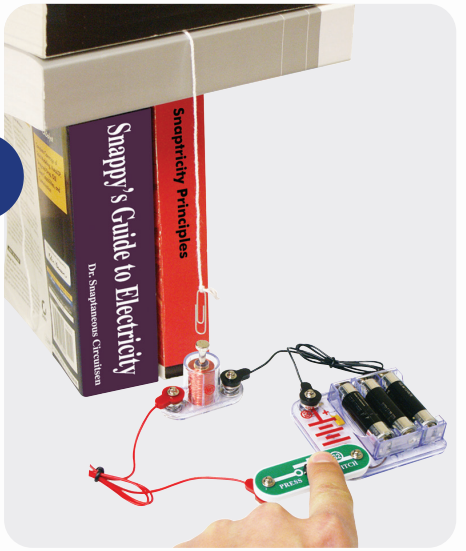
A

B



C



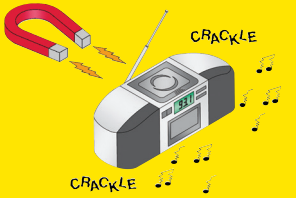


A magnet has a magnetic field, and a battery has an electric field. The north and south poles of a magnet are comparable to the positive and negative terminals of a battery.

Electric and magnetic fields affect each other. If you place a magnet next to a radio your reception can be disturbed.

Magnet - magnetic field

Battery - electric field



PROJECT 5 Compass

1. Hold your compass away from everything, notice that the red arrow always points north. Spin it around, the red arrow will adjust and resume pointing north.

   The earth's core is made of iron, which has a magnetic field. The compass points north because it is attracted to this magnetic field. This allows compasses to be used for navigation.

2. Now place the compass next to a large iron object, such as a refrigerator or car. If the object is heavy enough, the red arrow will point toward it.

   Large iron objects also exert a small magnetic field, which may attract a nearby compass. The magnetic field is much weaker than the earth's, but much closer to the compass.

3. Now place your magnet near the compass. The red arrow will immediately point toward the black "S" side of the magnet, ignoring a nearby refrigerator.

   Magnets have been induced to have a concentrated magnetic field at either end. This magnetic field is much stronger than ordinary iron objects that may be nearby.

4. Tie the magnet to a string and hold it near the compass. Gently spin the magnet, and see how the compass needle moves.

All materials have tiny particles with electric charges, but these are so well balanced that you do not notice them unless an outside voltage disturbs them. The same tiny particles also have magnetic charges, which are usually so well balanced that you do not notice them unless a magnetic field disturbs them.

Magnets are materials that concentrate their magnetic charges at opposite ends. One side attracts while the other repels, but the overall material is neutral. Most magnets are made of iron. The name "magnet" comes from magnetite, an iron ore that magnetism was first seen in.

The earth we live on is a giant magnet, due to its iron core. A compass needle always points north because it is attracted to the earth's magnetic field. The opposite ends of a magnet are often labeled north and south, representing the north and south poles of the earth. A compass actually points to the earth's magnetic north pole (which is in the Arctic Ocean just north of Canada), not the geographic north pole.

PROJECT 6 Magnet vs. Magnet

Place the magnets so the red sides face each other. Slowly move one towards the other and try to push it away and swing it without them touching.

Notice how the red sides repel each other.

Place the two magnets on opposite sides of the compass; move them around and watch the compass needle go crazy.

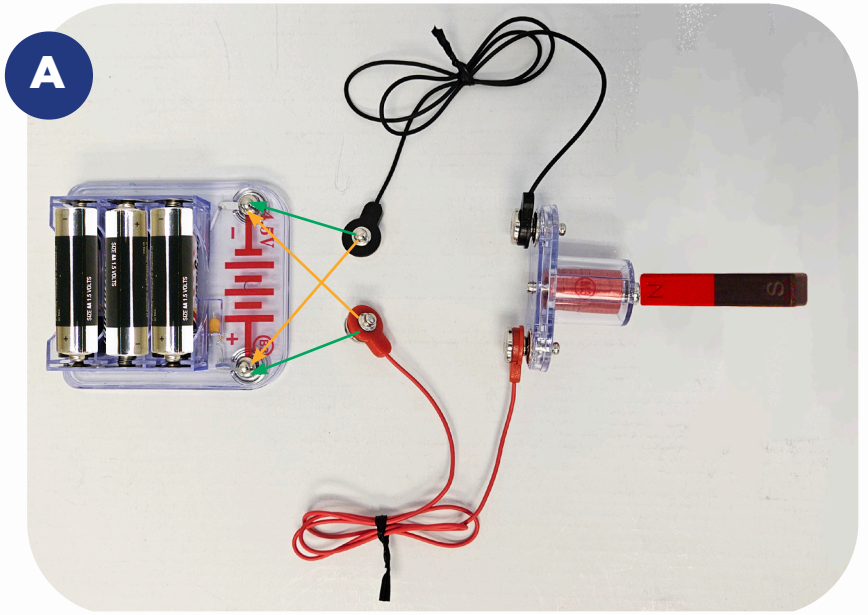
PROJECT 7 Reversing Electromagnetism

Part A: Place the iron core rod in the electromagnet (M3), connect the red & black jumper wires to it, and lay it next to the compass as shown.

Now touch the ends of the jumper wires to the snaps on the battery holder as shown with either the green or organge lines, reversing the connections (so both are green or orange) several times.

Reversing the battery connections reverses the electromagnet's magnetic field, causing it to either push or pull the bar magnet.

Part B: Try this with a suspended paperclip as done in part C of project 4. Stand the electromagnet beneath the paperclip, then reverse the wires to the battery to reverse the paperclip attraction.



WARNING: SHOCK HAZARD.
Never connect Snap Circuits® to the electrical outlets in your home in any way!

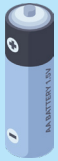
WARNING: CHOKING HAZARD.
Small parts—not for children under 3 years old.

Adult Supervision: Because children's abilities vary so much, even with age groups, adults should exercise discretion as to which experiments are suitable and safe (the instructions should enable supervising adults to establish the experiment's suitability for the child). Make sure your child reads and follows all of the relevant instructions and safety procedures, and keeps them at hand for reference. This product is intended for use by adults and children who have attained sufficient maturity to read and follow directions and warnings.

WARNING: Always check your wiring before turning on a circuit. Never leave a circuit unattended while the batteries are installed. Never connect additional batteries or any other power sources to your circuits.

This instruction manual must be retained since it contains important information.

Batteries: x3



- Use only 1.5V AA type, alkaline batteries (not included).
- Insert batteries with correct polarity.
- Do not mix old and new batteries.
- Remove batteries when they are used up.
- Do not mix alkaline, standard (carbon-zinc), or rechargeable batteries.
- Do not connect batteries or battery holders in parallel.
- Do not short circuit the battery terminals.
- Never throw batteries in a fire or attempt to open its outer casing.
- Batteries are harmful if swallowed, so keep away from small children.
- Non-rechargeable batteries should not be recharged. Rechargeable batteries should only be charged under adult supervision, and should not be recharged while in the product.

If you have any problems, contact: Elenco® Electronics, LLC

150 Carpenter Ave, Wheeling, IL 60090 (800) 533-2441 support@elenco.com elenco.com