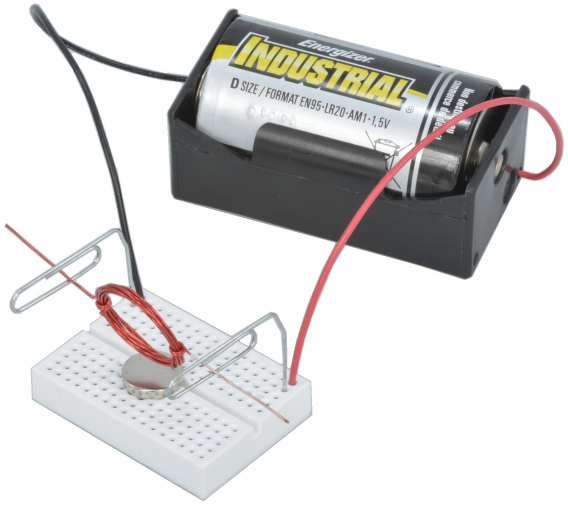
Simple DC Motor

PART NO. 2192296



The electric motor is a staple of the maker's arsenal. DC motors are used in all sorts of robots, gadgets, and technology that assists us everyday. But how many people understand the basic principles of motor operation and can build one from simple electronics parts? When looking inside the mechanism, one will be fascinated by the fundamental principles of electromagnetism that dictate its movement. For science teachers that are looking for a great way to demonstrate the real life application of the often detached physics equations and formulas, this is the perfect kit.

The simple DIY motor kit comes in a classroom pack (p/n: 2192309) with 205 feet of enameled wire, 20 magnets, batteries and battery packs, and 20 small solderless breadboards. One pack should be enough for all class periods if the students break into groups of 2 to 4. This single motor kit with one of each component is made for the private builder looking to learn a little something about electromagnetism. There will be plenty of wire in the single kit to experiment with different coil designs. The DIY motor kit will captivate kids and adults alike.

Time Required: 30 minutes depending on experience

Experience Level: Beginner

Required tools and parts:

- 2 Paperclips per setup
- Fine grit sand paper

Bill of Materials:

Qty	Jameco SKU	Component Name
1	2098419	Magnet wire, 24 AWG, ~200ft
1	2155452	Solderless breadboard
1	215845	D-cell battery
1	216371	Battery holder with wires
1	2238194	Round neodymium magnet

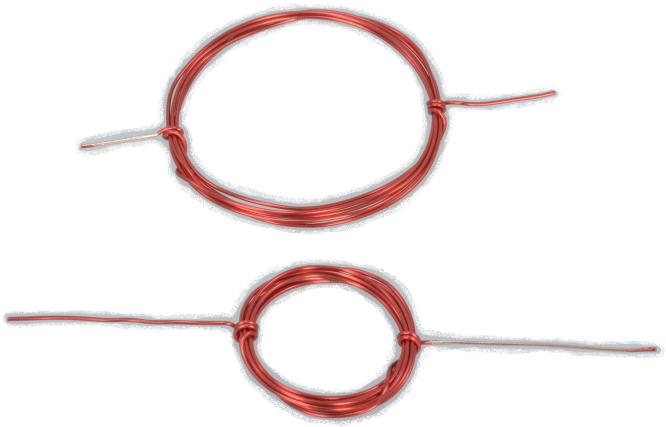
Step 1 - Cut the Wire

Cut about three to five feet of magnet wire off the spool using scissors or wire cutters.

Step 2 - Wind the Coil

Wind the wire around something round about six times to make a coil. A highlighter works nicely. Leave a couple inches loose on each end of the coil. These loose ends will be wrapped around the wire of the coil to hold it together and function as the "motor shaft". Older kits had a larger magnet, so a larger coil was made by wrapping the wire around the battery. You can experiment with different size coils to see which kind spins better.

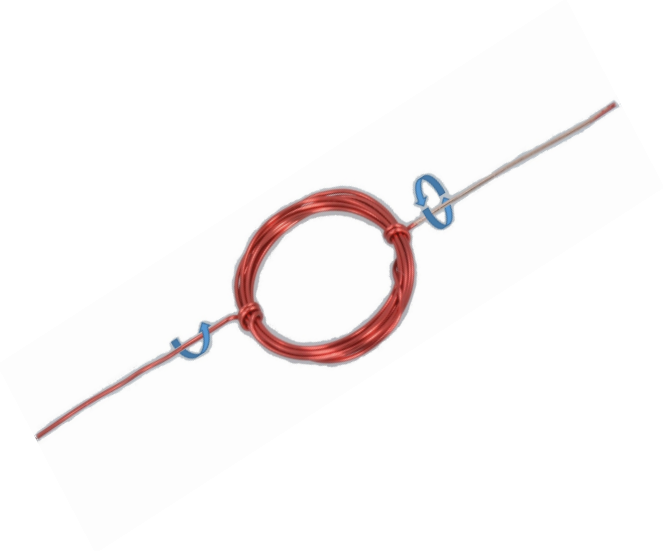
Step 3 - Finish the Coil
Wrap the end around the coil about two or three times to hold it tight. The wire ends should be wrapped on opposite sides of each other. This will create the axis for the coil to spin, so balance is important.



Step 4 - Sand the Insulation

Read this step before you begin sanding, for not sanding correctly will result in a non-functioning motor coil. Magnet wire is coated with an enamel insulation, so you will need to expose the conductive copper in key areas on each "shaft".

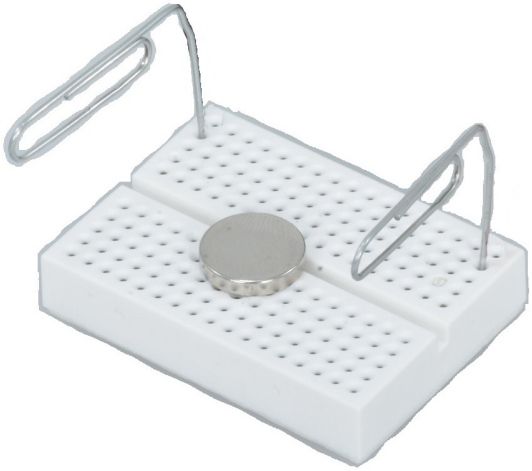
With a piece of sand paper, sand off **all** the insulation on **one side only** to expose shiny copper. For opposite side wire, you will only sand **halfway around** the insulation. This part is easiest if you lay the coil flat on a table and sand outward from the coil to the end of the wire. You should have a coil with one lead wire that is completely sanded all the way around, and the other wire has half of the insulation remaining.



Step 5 - Paperclips
Take two paperclips and straighten the outer most loop. The coil "shafts" will rest inside the loop of the paperclip suspended over the magnet. You'll want the coil as close to the magnet without touching it to get the strongest effect from the magnetic field. Experiment with different heights.

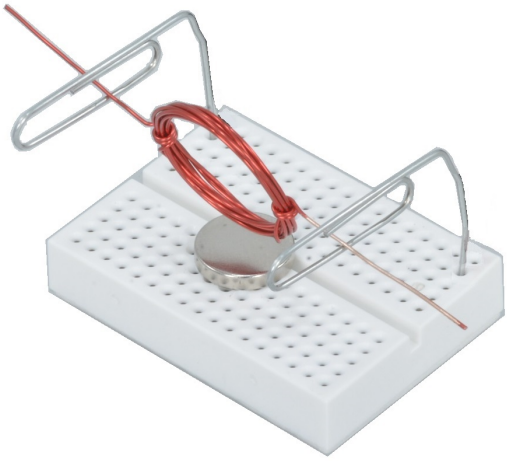
Step 6 - Breadboard Setup
Insert a paperclip in one end of the breadboard, and insert the other paperclip in the opposite end of the breadboard (lengthwise).

Place the magnet on the breadboard between the two paperclips.



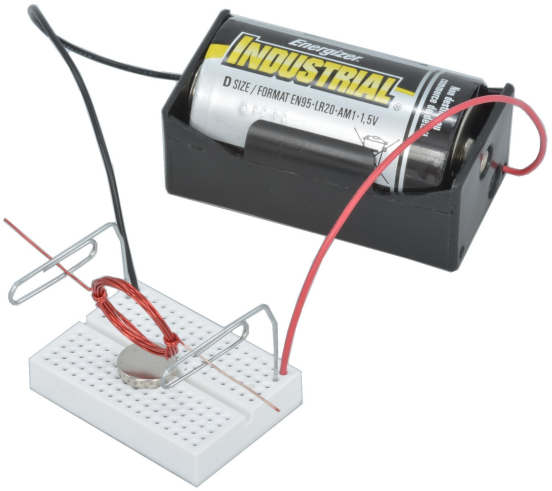
Step 7 - Place the Coil

Set the coil in the two loops of the paperclips. You will be able to see if you need to do a little straightening to make the coil balanced.



Step 8 - Add Power

Insert the battery into the battery holder. Insert one wire from the battery holder into the same row as one of the paperclips. Insert the other wire from the battery holder into the same row as the other paperclip.



Step 9 - All Systems Go

Give the coil a little flick, and it should start spinning. If it's well balanced, it will keep spinning for as long as the battery has power and the contact points remain clean. If it doesn't spin, try setting the coil the opposite way or flip the magnet over. You can also try switching the power wires. Still not working? Make sure you removed the insulation as shown in step 4.

Step 10 - Going Beyond

There are some modifications you can do to experiment and see what happens with different configurations. What if your coil has more or less windings than what was suggested? How about a bigger or smaller coil? Does moving the magnet to a different position have any effect? What if you used two magnets, or more battery power?