

### How does an electric motor work?

Electric motors use the properties of electromagnetism to produce motion. Although there are many different types of motors, they all have a magnet and coils of wire in common. Either the coil of wire or the magnet is fixed, leaving the other free to spin. When current, or electricity, from the battery flows through the wire, the coil acts like a magnet. The magnetic field of the coil of wire interacts with the magnetic field of the magnet. The poles of the magnet and the poles of the wire coil attract and repel each other, causing the spindle in the motor to rotate. This spinning is eventually transferred to the axle and to the wheels.

### How does a battery work?

Most batteries are powered by chemical reactions. They store that chemical energy and then convert it into electrical energy. The electrical energy flows out of the battery when it is used to power an appliance. Electric vehicles use rechargeable batteries. They are recharged at a charging station and during regenerative braking.

### What is regenerative braking?

Typically, when you press the brakes in your car, the energy of the car's motion, called kinetic energy, is lost to friction and heat. Regenerative braking captures that kinetic energy which is then used to charge the batteries. When the brake is pressed, it causes the motor to spin in the opposite direction, turning the motor into a generator. The energy or electricity generated is then stored in the car's batteries. Regenerative braking works best for city driving, where there is stop and go traffic.

### Want to build an electric motor?

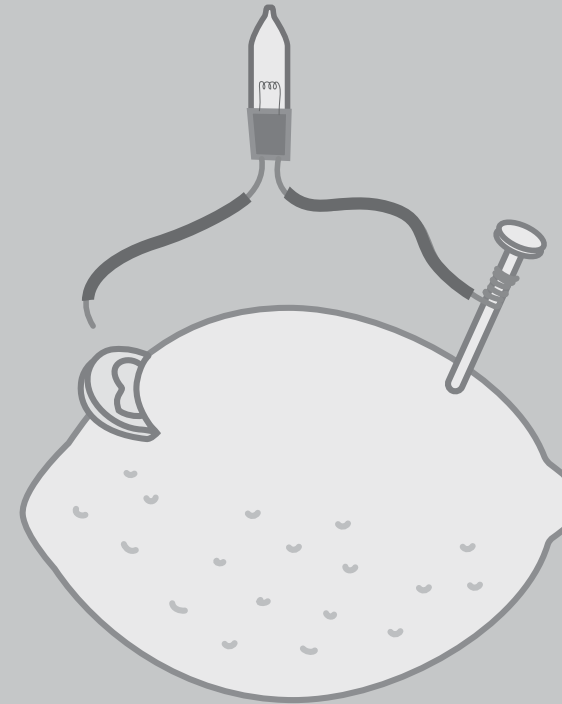
Visit [Exploratorium.edu/snacks/](http://Exploratorium.edu/snacks/) and click on "stripped down motor" to find out how.

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# Unplugged: The Electric Truck

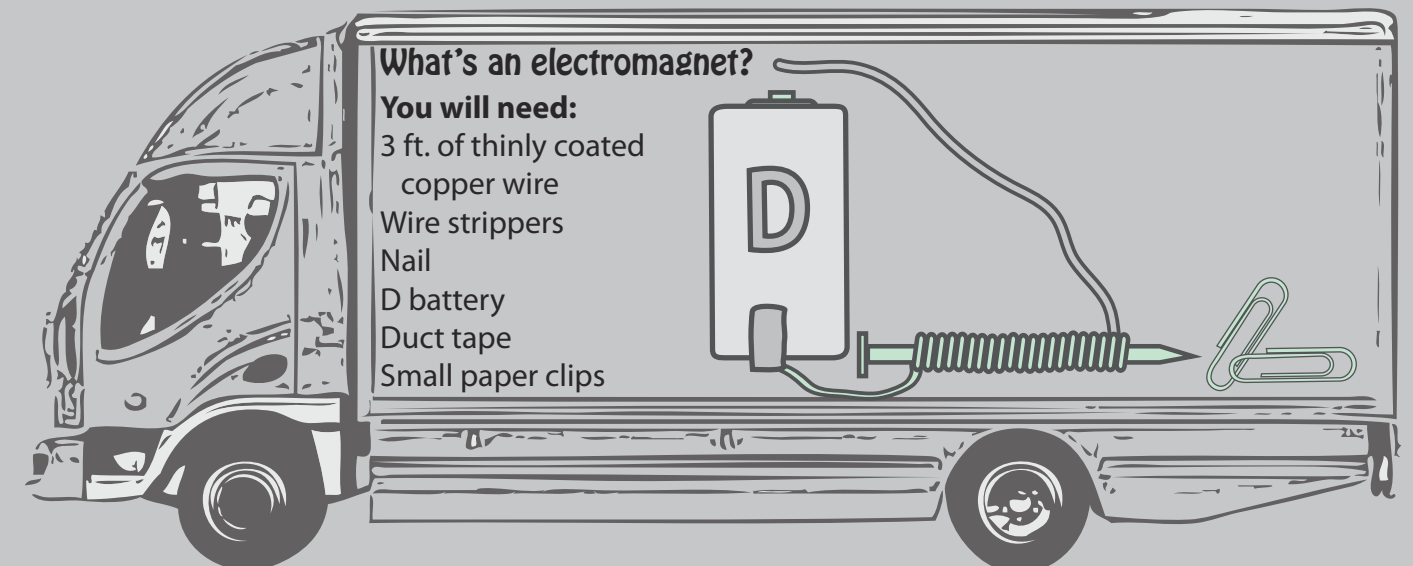


### What's a battery?

#### You will need:

Lemon  
Sharp knife  
Penny  
Christmas tree bulb with wire on both sides  
Wire strippers  
Nail

1. Cut a slit in one end of the lemon, big enough for the penny. Stick the penny into the slit.
2. Strip the plastic coating off the ends of the wire.
3. Wrap one end of the wire on the end of the nail.
4. Put the bulb in between the nail and the penny.
5. Poke the nail into the other end of the lemon.
6. Touch the other end of the wire to the penny. What happens?



### What's an electromagnet?

#### You will need:

3 ft. of thinly coated copper wire  
Wire strippers  
Nail  
D battery  
Duct tape  
Small paper clips

1. Strip the coating off the ends of the wire.
2. Carefully wrap the coated part of the wire around the nail, leaving room at each end to attach it to the battery. The more wire you wrap, the more powerful the magnet will be.
3. Attach each end of the wire to an end of the battery, taping the bottom one down with duct tape.
4. What happens if you hold the nail near the paper clips? What happens if you take the wire on and off the battery?

**What's different about an electric vehicle? Look inside to find out.**

# How is an electric vehicle different from a vehicle with an internal combustion engine?

