

# DIY



BOYS & GIRLS CLUBS  
OF AMERICA

# STEM

# #1

## WEEKLY ACTIVITY GUIDES: ENERGY & ELECTRICITY

This week, we'll be learning about electricity with hands-on experiences that show how energy works in the world around you. You can't see, smell or touch electricity, so it's sometimes hard to even know it's there. From exploring how to use electricity with electromagnets and motors, to building circuits, you'll learn how to create electricity.

### ABOUT THE DIY STEM PROGRAM

DIY STEM is a program supported by Samsung as part of a shared commitment with Boys & Girls Clubs of America to inspire the next generation in science, technology, engineering, and math.

# SAMSUNG

Participate this summer by sharing photos of your experiments on social media **#STEM**



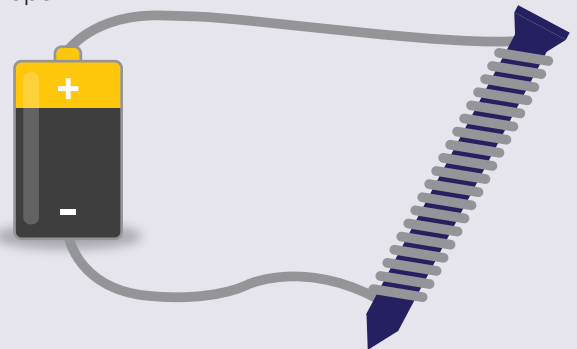
No matter your age, please enjoy conducting these experiments under the supervision of a responsible adult.

### MONDAY: MAKE AN ELECTROMAGNET

PAGE 1

#### MATERIALS:

- Large iron nail (about 3 inches)
- Small iron nail
- D battery
- Paper clips or other magnetic objects
- Copper wire
- Tape



#### LEARNING OPPORTUNITY:

What happens if you increase or decrease the amount of coils you wrap around the nail?

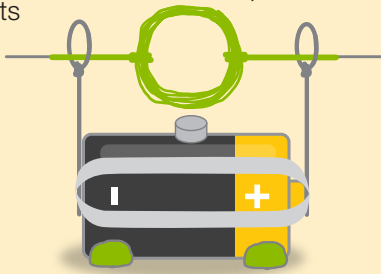
What happens if you change the power source (the type of battery)?

## TUESDAY: CREATE A MOTOR

PAGE 1

### MATERIALS:

- Black permanent marker
  - Scissors
  - Large paper clips
  - Insulated copper wire
  - Neodymium (disc) magnets
  - Sticky tack or modeling clay
  - D battery
  - Large rubber bands
  - Pliers\*
- \*Optional*



### LEARNING OPPORTUNITY:

Hold the other magnet above the armature with the motor spinning. What happens when you move it closer?

What happens when you turn the magnet over and try the activity again?

## WEDNESDAY: STATIC ELECTRICITY

PAGE 2

### MATERIALS:

- Small dish
- Salt
- Pepper
- Wool cloth OR Plastic comb

### WATER BENDER MATERIALS:

- Plastic comb
- Water faucet



### LEARNING OPPORTUNITY:

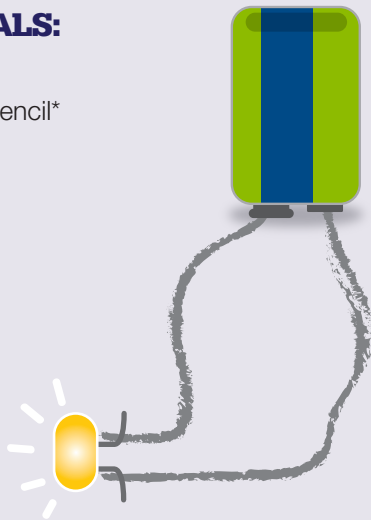
Can you separate the pepper from salt or bend water by rubbing the wool cloth or comb on your pants or shirt?

## THURSDAY: GRAPHITE CIRCUIT

PAGE 2

### MATERIALS:

- Paper
- Graphite pencil\*
- Foil
- 9v battery
- LED lights
- Tape



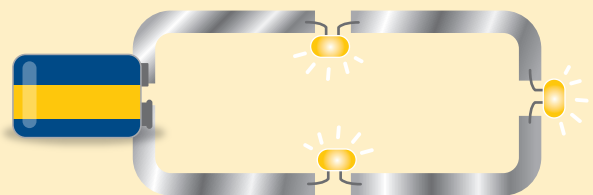
### LEARNING OPPORTUNITY:

Try drawing lines of different lengths. What happens to the brightness of the LED?

Try drawing lines of different thicknesses. What happens to the brightness of the LED?

## FRIDAY: CREATE A CIRCUIT BOARD

PAGE 3



### MATERIALS:

- Glue
  - Aluminum foil
  - Sheet of cardboard
  - 9v battery
  - Tape
  - LED lights (3)
  - Brass fasteners\*
- \*Optional*



### LEARNING OPPORTUNITY:

Can you make a simple circuit and also a parallel circuit?

Try to make a complex circuit with a lot of twists and turns!

## WEEKLY ACTIVITY GUIDES: ENERGY & ELECTRICITY

*This week, we'll be learning about electricity with hands-on experiences that show how energy works in the world around you. You can't see, smell or touch electricity, so it's sometimes hard to even know it's there. From exploring how to use electricity with electromagnets and motors, to building circuits, you'll learn how to create electricity.*

### Monday: Make an Electromagnet

#### Materials:

- Large iron nail (about 3 inches)
- Small iron nail
- D battery
- Paper clips or other magnetic objects
- Copper wire
- Tape

#### Electromagnet

1. Wrap the copper wire around the nail, leaving about 8-12 inches of wire loose at each end. Make sure the wire doesn't overlap.
2. Tape the ends of the wire to each terminal of the battery. Point the nail toward the paper clips.
3. You have an electromagnet! Electricity is traveling through your nail in a current, which changes the arrangement of the molecules, so they align with polarity.

### Tuesday: Create a Motor

#### Materials:

- Black permanent marker
- Scissors
- Large paper clips
- Insulated copper wire
- Neodymium (disc) magnets
- Sticky tack or modeling clay
- D battery
- Large rubber bands
- Pliers\*

\*Optional

#### Motors

1. Cut a 12-inch piece of wire.
2. Starting in the center of the wire, wrap both ends around the permanent marker to make 4 1/2 loops.
3. Then carefully remove the wire, holding the loops together.
4. To make a bundle, wrap each end of wire several times around the loops to hold them in place. Position the ends so they are directly across from each other and extend out in a straight line on either side of the bundle to form an axle. What you just made is called the armature.
5. Hold the wire bundle you have made so it would be flat against a wall. Color the top side of each wire end with the marker. Leave the bottom side of each wire bare.
6. Carefully bend each paperclip to form a small loop by wrapping one end around a small object, such as a

pencil or pen. If you prefer, use thick wire and pliers instead of a paper clip. Be sure to use caution when using the pliers. If you don't have a battery holder, wrap the rubber band tightly around the length of the battery. Insert the paper clips so each one is touching one of the terminals, securely held by the rubber band. Use the clay or sticky tack to attach the curved side of the battery firmly to a table or other flat surface.

7. Set one neodymium (disc) magnet on top of the battery at its center. Position the armature in the paper clip loops with the shiny, uncolored side touching the paper clips. Make sure it doesn't touch the magnet. (If your motor doesn't start immediately, try starting it by spinning the wire bundle. Since the motor will only spin in one direction, try spinning it both ways.)

8. If your motor is still not working, make sure the paper clips are securely attached to the battery terminals. You may also need to adjust the insulated wire so both ends are straight and the bundle you have made is neat, with the wire ends directly opposite of each other.

## Wednesday: Static Electricity

### Salt and Pepper Materials:

- Small dish
- Salt
- Pepper
- Wool cloth or plastic comb

### Separate Pepper from Salt

1. Put some salt and pepper in the small dish and stir it together.
2. Use the wool cloth or plastic comb and run it through your hair.
3. Hold the statically charged object over the dish.
4. The object will attract the pepper and cause it to jump out of the dish.
5. If you hold the wool cloth or plastic comb too close to the salt and pepper the salt might jump too. Practice holding it different lengths from the dish.

### Water Bender Materials:

- Plastic comb
- Water faucet

### Use a Comb to Bend Water

1. Charge your plastic comb (or wool cloth) again by running it through your hair.
2. Hold your charged comb close to (but not touching) a small stream of water coming from the faucet.
3. Watch the water bend!

## Thursday: Graphite Circuit

### Materials:

- Paper
- Graphite pencil\*
- Foil
- 9V battery
- Led lights
- Tape

\*Make sure graphite pencils are art pencils

### Make your own LED Circuit

1. Use your graphite pencil to draw a design on your paper. It is best to draw something simple where all the lines are connected, or just one continuous line like the outline of a car. Make sure to draw bold and thick lines, at least 1/4" in diameter.
2. Leave at least a 1/2" gap in the line on the right and left side of your drawing. (Break the continuous line twice.)
3. Mark one line positive and one line negative.
4. Place your battery on one of the gaps. Align the positive and negative ends of the battery with the graphite lines.
5. Take an LED and bend the bottom ends of the wires.

6. Tape the wire at the end of the lines across the other gap, aligning positive and negative wires, making sure your LED stands up and doesn't rest on the paper. The wires should be in contact with the graphite lines. (The longer side of the LED is the positive side).

7. Watch what happens!

## **Friday: Create A Circuit Board**

### **Materials:**

- Glue
- Aluminum foil
- Sheet of cardboard
- 9V battery
- Led lights (3)
- Brass fasteners\*

### **Make Your Own Circuit**

1. Glue aluminum foil in a maze pattern onto your sheet of cardboard. Make sure to leave gaps every few inches, for a maximum of 3 or however many LED lights you have. The gaps are where you'll place the LED lights and battery.

2. Take an LED and bend the bottom ends of the wires.

3. Tape the wire at the end of the lines across the other gap, with each wire touching the aluminum foil. Make sure your LED stands up and doesn't rest on the paper.

4. Place your battery on one of the gaps. Make sure the positive and negative ends of the battery touch the aluminum foil on both sides.

5. Take the optional brass fasteners and place them in one of the gaps of aluminum foil – they will act as a switch. Touch them to the aluminum oil and then move them away.