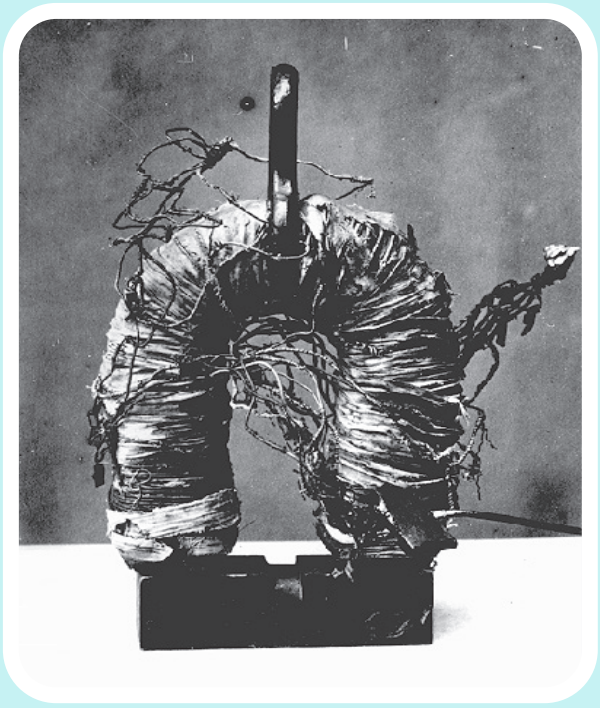
STEM Sims™

Electromagnets



Electromagnets

Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

They let our doorbells ring and power some cars. They're electromagnets. Take the following brief quiz to see how much you already know about electromagnets. See the bottom of page 4 to check your answers.

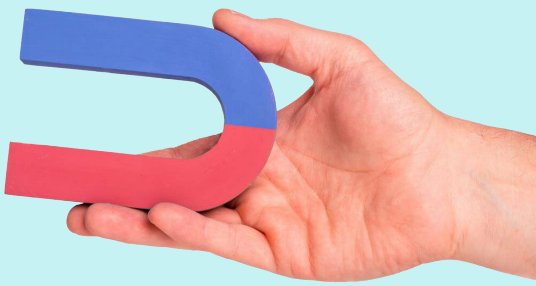
1. Who is credited with discovering the relationship between electricity and magnetism?
   a. Albert Einstein
   b. Isaac Newton
   c. Hans Christian Ørsted
   d. Marie Curie

2. Where was the world's first commercial maglev train launched, using electromagnets to levitate the train?
   a. Birmingham, England
   b. New York City, USA
   c. Tokyo, Japan
   d. Shanghai, China

3. Which of these everyday items does NOT use an electromagnet?
   a. microwave oven
   b. blender
   c. electric guitar
   d. traditional light bulb

4. What is the name of the largest electromagnet in the world, used in scientific research?
   a. The Big Magnet
   b. The Gigantic Electromagnet
   c. The Superconducting Super Collider
   d. The Large Hadron Collider

5. What is the world's biggest electromagnet used to study?
   a. to study tiny particles, smaller than you can see
   b. to make the biggest refrigerator magnet ever
   c. to power all the lights in a city
   d. to create a giant robot



Build Your Own Electromagnet!

Get ready to unleash your inner scientist! In this hands-on lab, you'll build your own electromagnet using simple materials like a battery, wire, and a nail. Discover the magic of turning electricity into magnetism and explore how to control the strength of your creation. Prepare to be amazed as you pick up metal objects with the power of your homemade electromagnet!

Materials Required

1- D-cell battery 1- long piece of insulated copper wire (about 3 feet)
1- large iron nail (at least 3 inches long). Small paper clips or other small metal objects
Optional: Sandpaper (to clean the ends of the wire)

Safety First!

- Make sure to have adult permission before completing this activity.
- Always handle batteries with care. Do not short-circuit the battery by connecting the positive and negative terminals directly.
- If using sandpaper, be careful not to scratch yourself.

Procedure

1. **Prepare the wire:** If the ends of your wire have a coating on them, carefully use sandpaper to remove a small amount of insulation from both ends to expose the bare copper wire. This will allow for good electrical contact.
2. **Create the coil:** Wrap the wire tightly around the iron nail, leaving about 6 inches of wire free at each end. The more turns you make, the stronger your electromagnet will be. Make sure the coils are close together and neat.
3. **Connect to the battery:** Hold one end of the wire against the positive (+) terminal of the battery and the other end against the negative (-) terminal. You can use tape to secure the wires in place.
4. **Test your electromagnet:** Bring the tip of the nail near the pile of paper clips or other small metal objects. Observe what happens. How many paper clips can your electromagnet pick up?
5. **Experiment!**
    - **Change the number of coils:** Unwind some of the wire from the nail and test the electromagnet again. What happens when you have fewer coils?
    - **Reverse the battery:** Switch the wires on the battery terminals so that the wire that was connected to the positive terminal is now connected to the negative terminal, and vice versa. Does this change how the electromagnet works?

Questions

1. What happened when you changed the number of coils?

2. What happened when you reversed the battery connections?

3. Why do you think these changes affected the strength of your electromagnet?

Electromagnets

Talk About a Big Magnet!

Imagine a giant racetrack, but instead of cars, it accelerates tiny particles to almost the speed of light! That's essentially what the Large Hadron Collider (LHC) is. Buried 100 meters underground near Geneva, Switzerland, it's the largest and most powerful particle accelerator in the world.

So, what's the point of smashing these particles together? Well, it's like breaking open a toy to see how it works. By studying the collisions, scientists can learn about the fundamental building blocks of the universe and the forces that hold them together.

The LHC is a marvel of engineering. It's a 27-kilometer ring of superconducting magnets that guide two beams of particles in opposite directions. When these beams collide, they create showers of new particles that are detected by massive detectors. These detectors are like giant cameras, capturing the fleeting existence of these particles and providing clues about their properties.

One of the most famous discoveries made at the LHC was the Higgs boson in 2012. This particle helps explain why other particles have mass, a fundamental question that had puzzled physicists for decades.

But the LHC is not just about fundamental research. The technologies developed to build and operate it have applications in various fields, including medicine, computing, and materials science. For example, the LHC's powerful magnets are used in cancer therapy, and its grid computing network is used for climate modeling and drug discovery.

The LHC is a testament to human curiosity and ingenuity. It's a tool that allows us to probe the deepest mysteries of the universe and push the boundaries of our knowledge. Who knows what amazing discoveries await us in the future?

Please visit our site for more helpful information:
STEMsims.com

Answers: Page 2 Answers: 1) c, 2) a, 3) d, 4) d, 5) a. **Page 3 Answers: Build Your Own Electromagnet!** 1) The more coils, the stronger the electromagnet and the greater the number of paperclips that could be lifted. 2) The electromagnet still picked up the same number of paperclips. 3) Answers will vary.