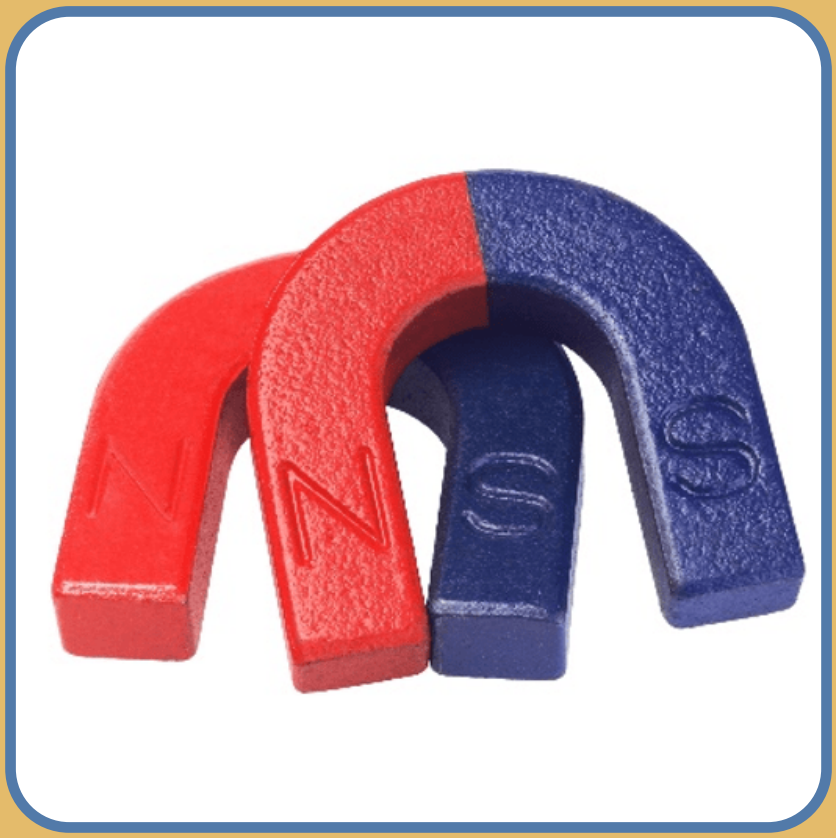
STEM Sims™

Generator



STEM Sims™

Generator

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

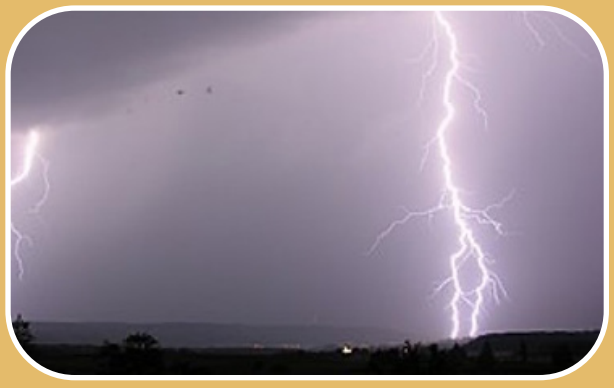
Electricity is one of the wonders of the modern world that makes life easier and more enjoyable. Take the following brief quiz to see how much you already know about generators and making electricity. See the bottom of page 4 to check your answers.

1. In what year was the first electric car created?
   a. 1510
   b. 1832
   c. 1920
   d. 1956

2. About how many volts can an electric eel deliver?
   a. 6
   b. 60
   c. 600
   d. 6,000

3. The typical taser used by law enforcement delivers a charge of about how many volts?
   a. 50
   b. 500
   c. 5,000
   d. 50,000

4. About how many volts does a single bolt of lightning deliver?
   a. 300,000
   b. 3,000,000
   c. 30,000,000
   d. 300,000,000



5. Which country uses the greatest amount of electricity on a per capita basis?
   a. United States
   b. China
   c. India
   d. Iceland

Need A Lift?

Magnetic fields are used to lift many things, including junk cars and roller coasters. In this investigation, you'll see if you can use simple materials to generate a magnetic field strong enough to lift an object. Get ready to lift your spirits and conduct an experiment involving magnets and electricity.

Materials

50-cm of 20-gauge insulated magnet wire
one 16-penny galvanized nail
one large metal paperclip
one "D"-Cell battery
one piece of sandpaper

Directions

1. 1. Use the sandpaper to remove about 5-cm of insulation from both ends of the wire.
2. Try to lift the paperclip by touching the end of the 16-penny nail to the clip. Note your results.
3. Wrap the wire around the nail making two loops of wire around the middle of the nail.
4. Repeat step #2.
5. Continuing wrapping the wire around the nail only this time making 10 more loops around the nail. make sure to have the loops be very close together around the nail.
6. Repeat step #2.
7. Continue wrapping the wire around the nail in an increasing number of loops until the nail successfully lifts the paperclip.
8. Repeat step #2.

Questions

1. Before wrapping the nail with the wire, was the nail magnetic or nonmagnetic?

2. How many loops were needed for the nail to lift the paperclip?

3. What were the loops around the nail providing that allowed the clip to be lifted by the nail?

4. Describe all the forces involved with the wrapped nail lifting the paperclip.

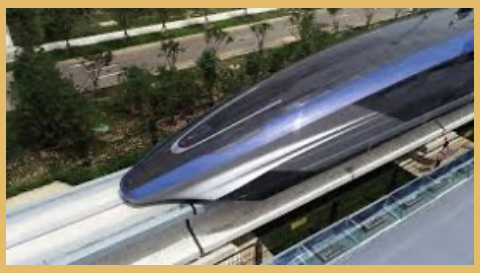
Generator

Lifting Passengers

The world's current fastest train is in Japan and can reach speeds as high as 360 km/hr (225 mph). The "bullet" train uses a magnetic field to lift the train off the track and move on a cushion of air. This reduces the friction between the train and track that slows down the train and makes the train capable of reaching much higher speeds than traditional trains. The magnetic field also helps to keep the track on the "tracks" and reduces the chances of a train derailing.

The United States averages about 100 train derailments each year with very few leading to death or serious injuries. However, in locations prone to earthquakes, such as Japan, the likelihood of derailments with serious injuries is much higher. The newest version of Japan's bullet trains that use electromagnetic levitation can withstand earthquakes as strong as 6 on the Richter scale with very low chances of derailment. The newest trains have sensors that immediately slow the train down when small Earth vibrations are detected. An earthquake of 7.4 in Japan in 2022 did not results in any injuries even though 16 of the 17 train cars derailed.

China currently has the longest high-speed railway network in the world with more than the 40,000 kilometers of track. China is building a newer version of a train using a similar technology called the Shanghai Maglev train. This train will travel at a breath-taking speed of 600 km/hr (375 mph). The new bullet train has a planned launch date of 2025.



Please visit our site for more helpful information:

STEMsims.com

Answers: Page 2 Answers: 1) b, 2) c, 3) c, 4) b, 5) d. **Page 3 Answers: Need a Lift?** 1) Non-magnetic. 2) Answers will vary. 3) A magnetic field and force. 4) Magnetic force was used to overcome force of gravity.