CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
J0712

Project Title
The Effect of Different Sized Rods and Amount of Wrapped Wire on an Electromagnet

Abstract

Objectives/Goals
The purpose of this project was to find out if different sizes of rods have an affect on the strength of an electromagnet.

Methods/Materials
1- 12 volt battery; 1- Roll of 30 guage wire; 4 - Solid steel rods of different diameters (2 at 1/8# & 2 at ½ in); 1 # Hollow copper rod; 1 # Switch; 1 # Pack metal safety pins; 5 # Coated Paper Clips; 7 # 3.7 (g) nails.

The first thing I did was create an electromagnet using the materials above. Two of the different sized rods were wrapped 100 times each with 14 gage wire. Then each rod was attached to the 12 volt battery. The 14 gage wire produced no results. The wire was to too thick and 30 gage wire was then used. This produced the results for the experiment.

The first of the rods used was the copper,it had no charge. The copper rod was no longer used throughout the experiment.

The next rod used was the 1/8 inches in diameter. This rod was wrapped 100 times with the wire. I was able to pick up 37.6 grams of metal with this rod connected to the battery. Next I used the ½ inch diameter rod. This rod was also wrapped 100 times with the wire. This time I was able to pick up 95 grams of metal.

After I tested the two above rods, I then used the 1/8 inch diameter rod that was wrapped 200 times with the 30 gage wire. This picked up 41.3 grams of metal.

The last rod I tested was the ½ inch diameter rod that was wrapped 200 times with the 30 gage wire. This picked up 98.7 grams of metal.

Results
Just as I had hypothesized, the thicker the rod, (larger diameter), held the most weight. Adding to this was when wrapped more times with the wire, it was a bit stronger. Also, the hollow copper rod was not magnetic and held no magnetic charge.

Conclusions/Discussion
Why did the magnetic field increase when you wrapped the rod with more wire?
The magnetic field increased because you increased the number of coils, and thus, the strength of the field. As long as you wrap it in the same direction, the field will continue to increase with each additional coil.

Summary Statement
It was my hypothesis that if you have two rods with two different diameters, the thicker if the two rods will hold more magnetic weight than the thinner rod.

Help Received
Father helped cut display board with saw.