

## The Effect Of Various Factors On The Strength Of Electromagnets

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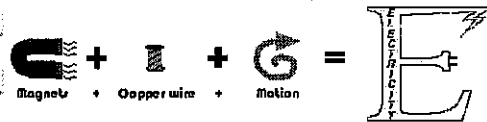
## Overview

- Background information
- Problem
- Procedure
- Results
- Error
- Conclusion

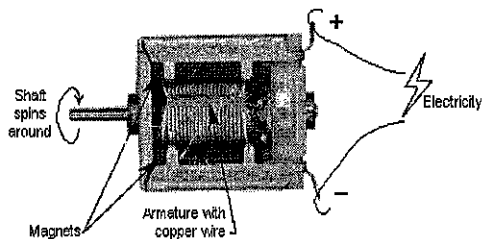
## What is electricity?

- Electricity is the flow of electrons through a circuit.
- Electricity produces a magnetic field around anything it flows through.

## How Electricity is Generated



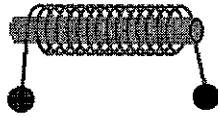
## Electromagnet/Generator



## What is electromagnetism?

- Electromagnetism involves passing current through an object (usually wire) to produce a magnetic field, which can be used to create temporary magnets.
- Primary method used by power plants to produce electricity.

## Electromagnetism



The soft iron core "concentrates" the magnetic field, making a strong electromagnet

## Objective

To determine the effects of three factors, such as contact area, current, and the number of wire layers on the strength of an electromagnet.

## Hypothesis

If we increase the number of layers of wire on the rod, the amount of current passing through the wire, and use the largest contact area, the amount of mass that will be held by the magnet will increase.

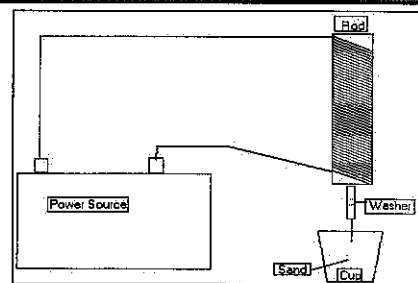
## Procedure

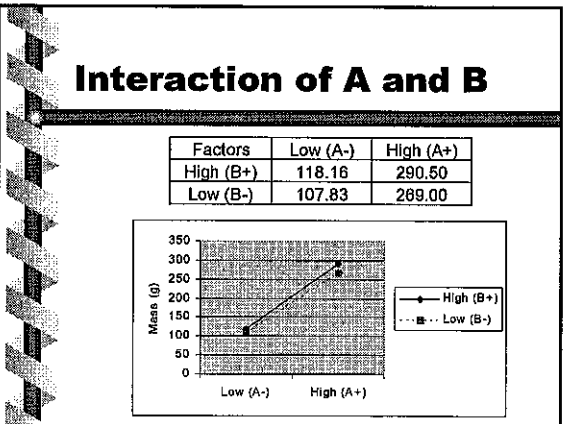
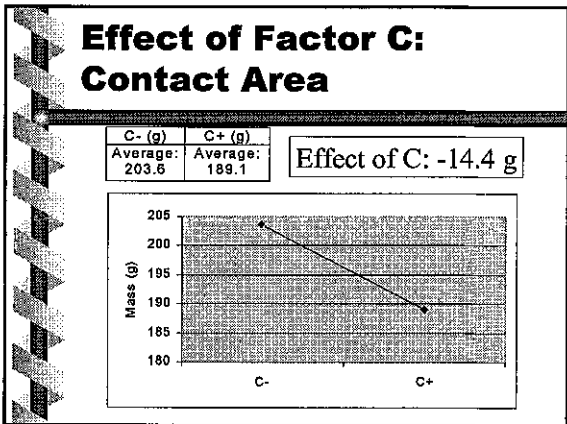
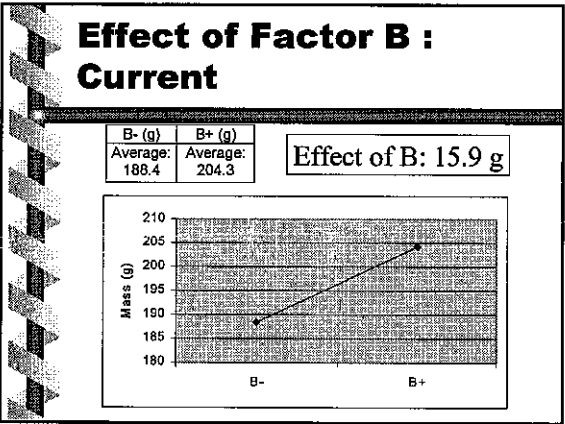
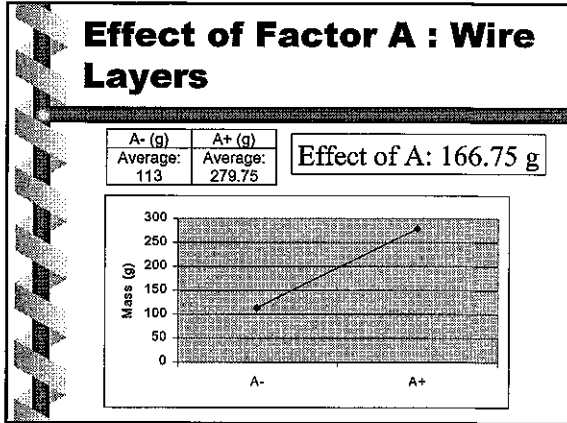
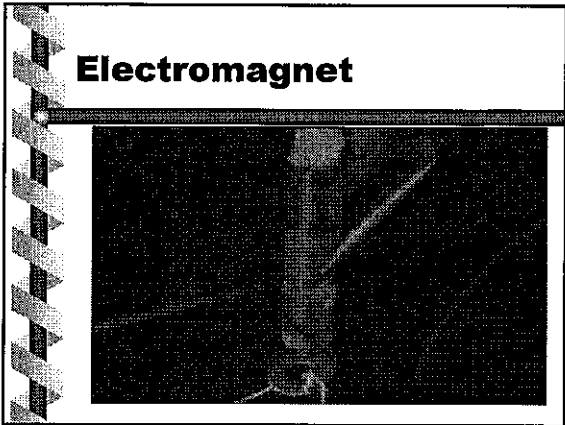
- Randomize trials
- Configure each variable for the given trial.
- Add mass to vessel to test.
- Record results

## Procedure

**Materials:** 3 Steel bolts  
20 meters of enameled copper wire  
Universal power supply  
Funnel  
1 Meter of string  
Sand  
Cup  
50 Washers

## Diagram

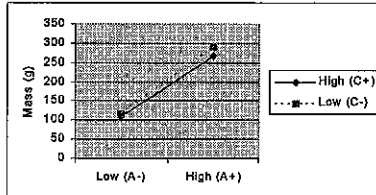




- ### A B Interaction
- The interaction of Factor A and Factor B is 5.585.
  - This means that there is little correlation between the number of layers and the current with respect to the magnet's ability to hold mass.

## Interaction of A and C

Factors	Low (A-)	High (A+)
High (C+)	109.50	266.83
Low (C-)	116.50	290.66

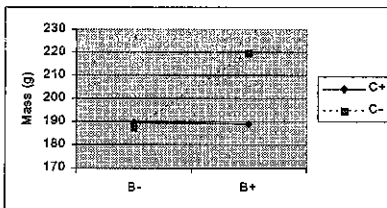


## A C Interaction

- The interaction Factor A and Factor C is **-7.415**.
- This means that there is little correlation between the number of wire layers and contact area.

## Interaction of B and C

Factors	Low (B-)	High (B+)
High (C+)	189.33	189.00
Low (C-)	187.50	219.67



## B C Interaction

- The interaction of Factor B and Factor C is **-16.25**.
- This means that as current and contact area both go up, the amount of mass supported decreases.

## Analysis Summary

- Factor A had the most significant effect on the electromagnet.
- The largest interaction occurred between Factor B and C, which are current and contact area.

## Experimental Error

- Heat affected the strength of the electromagnet.
- Inconsistency in the pouring of sand.
- Imperfections in electromagnet construction.

## **Conclusion**

- **Wire wraps have the largest effect on the strength of an electromagnet.**
- **Current slightly increased the strength of the electromagnet.**
- **Contact area slightly decreased the strength of the electromagnet.**

## **Conclusion**

**Our hypothesis proved to be incorrect**

## **Further Research**

- **Possible limits of variables**
- **Tests of other variables**
- **Different magnet configurations**