Name(s)	Project Number
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Project Title

Energy Gain in the Gauss Accelerator

Abstract

Objectives
The gauss accelerator is a simple device that accelerates a ball bearing using magnets without an external power source. This project investigates the factors that affect the energy delivered by the gauss accelerator. The project hypothesis was that the initial speed of the ball bearing will have no effect on the amount of energy delivered by the gauss accelerator, and that increasing the separation of the magnets would lower the energy gained.

Methods
A wooden rail was constructed, connected to a wooden ramp. 5 Neodymium magnets were placed at equal spacing along the track, with a single ball bearing on the exit side of each magnet. A ball bearing was released at varying heights on the ramp. The starting speed of the initial ball bearing, and the exit speed of the final ball bearing was measured. 10 trials were taken with 5 different starting speeds, and 5 different magnet separations for a total of 250 trials.

Results
In all but one of the separation distances, as the starting speed was increased, the energy gained was decreased (refuting the hypothesis). At 4cm, 6cm, 7cm, and 8cm separation the difference in energy gain from lowest to highest starting speed was 54%, 60%, 73%, and 62% respectively. At 5cm separation the difference was 139%. This experiment explores the possible reasons for this difference. The maximum energy gain was achieved at 0.7 m/s starting speed and 6cm magnet separation.

Conclusions
Although the gauss accelerator is simple the factors are complex, and the results of this project may be helpful in designing real world magnetic accelerators for use in real world applications.

Summary Statement

How does changing the initial ball velocity and magnet spacing in the Gauss Accelerator affect the energy delivered to an accelerated ball bearing.

Help Received

My father helped me with constructing the wooden rail and ramp.