CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
J1534

Project Title
A Noisy Gas: Testing Sound Decay in Different Gasses

Abstract

Objectives/Goals
Sound decay is a subject that has not been deeply probed by the scientific community. I would like to expand that knowledge in both myself and others, so with my experiment, I would like to explore the aspects of sound decay, and whether or not it varies directly with the density of the atmosphere it is being tested in. I would like to see a consistent half-life for sound for each trial tested in the same conditions, and a varying half-life in all the different tests, either descending or ascending consecutively.

Methods/Materials
I tested the sound decay of a 127 Hz tuning fork inside of a bell jar dome. The tuning fork was suspended from a stand on the inside, and the bell jar was tilted so the tuning fork would swing and hit a mallet adhered to the bell jar lid. The resulting sound was recorded by a microphone attached to a computer, using volts and seconds for units. The resulting #sound curve# would be analyzed and the half-life of the sound determined. 3 gases were used, each at different pressures. They were carbon dioxide, helium, and air (a mixture composed mainly of nitrogen and oxygen) and they were each tested at 10, 20, and 30 inches of mercury. An additional trial in vacuum was also tested.

Results
The results of this experiment proved to be very interesting.
Half-life when tested in air at 30 inches of mercury: 3.85 seconds
Half-life when tested in air at 20 inches of mercury: 7.15 seconds
Half-life when tested in air at 10 inches of mercury: 5.7 seconds
Half-life when tested in carbon dioxide at 30 inches of mercury: 1.2 seconds
Half-life when tested in carbon dioxide at 20 inches of mercury: 0.75 seconds
Half-life when tested in carbon dioxide at 10 inches of mercury: 0.9 seconds
These results were not ascending or descending consecutively, which led me to my conclusion.

Conclusions/Discussion
With my results, I concluded that sound decay does indeed vary directly to the density of the gas it is transmitted through, but that is not the only factor that affects sound#s half-life. This topic requires further research, involving more complex issues than density, such as the gas#s ability to resonate sound (especially when working with different pressures). The gases themselves appear to have ideal pressures: pressures in which sound is transmitted with the most ease. This theory, however, requires more in depth study.

Summary Statement
I tested the decay of sound emitted from a tuning fork to test the correlation between sound decay and density of the gas it is being tested in.

Help Received
I was greatly assisted in my experiment with the help and expertise of Professor Warren Rogers from Westmont College, whose excellent knowledge in the field of sound helped me set up and test my experiment. I also used equipment from the Westmont physics lab.