CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

J1706

Project Title

Flying High: How Ambient Temperature Affects the Buoyancy of Helium Filled Latex Balloons

Abstract

Objectives/Goals

The objective of my project was to determine how different ambient temperatures would affect the buoyancy and rate of lift decay of helium-filled balloons.

Methods/Materials

The initial buoyancy of six helium-filled latex balloons was measured using a gram scale. Six balloons were placed in three different temperature zones, two balloons in each zone at 10 degrees Celsius, 24 degrees Celsius, and 38 degrees Celsius. The buoyancy of the balloons was measured every hour for nine hours and the rate of lift decay was logged on a chart.

Results

The balloons in the coldest temperature zone maintained the highest buoyancy for the longest period of time. The balloons in the hottest temperature zone lost buoyancy the quickest.

Conclusions/Discussion

Helium-filled latex balloons float because the helium inside the balloons is less dense and therefore lighter than the air around it. Since the weight of the displaced air is greater than the weight of the balloon (along with the helium inside it and the attached ribbon) the balloon floats upward. Latex balloons have a permeable membrane, which means that there are small holes in the surface that allow atoms of helium to escape. As more helium atoms escape, buoyancy decreases, resulting in lift decay. The balloons in the hottest temperature zone lost buoyancy quickest. It could be concluded that the higher temperature caused the helium atoms and particles in the latex to vibrate faster, putting pressure on and expanding the latex, and increasing the area of the holes in the permeable membrane, allowing more helium atoms to escape. This resulted in rapid lift decay. In the coldest temperature, the opposite was true; the particles vibrated at a slower rate, the area of the holes in the permeable membrane decreased, and buoyancy was maintained.

Summary Statement

My project tests the effects of ambient temperatures on the buoyancy and rate of lift decay of helium-filled latex balloons.

Help Received