Altitude vs. Temperature vs. Pressure

METROPOLITAN
Community College

INTRODUCTION

In our experiment we sought to measure the change in temperature and pressure in 5 liquids; water, salt water, rubbing alcohol, honey, and oil along the high altitude balloon flight. We did not know what to expect with the rubbing alcohol, oil, or honey, but we did know that water had a high freezing point, while salt water had a low freezing point.

METHOD

We first had to adequately enclose the liquids in their plastic vials. To do this we cut holes into top of the the vials before inserting the voltage sensor and sealing it with hot glue.

To find the temperature, we had to convert the voltage of the liquids into Celsius with the equation (100*Liquid Voltage-273).

There was already a pressure and altitude sensor logging the data so we did not need to calculate that.

Fun Facts

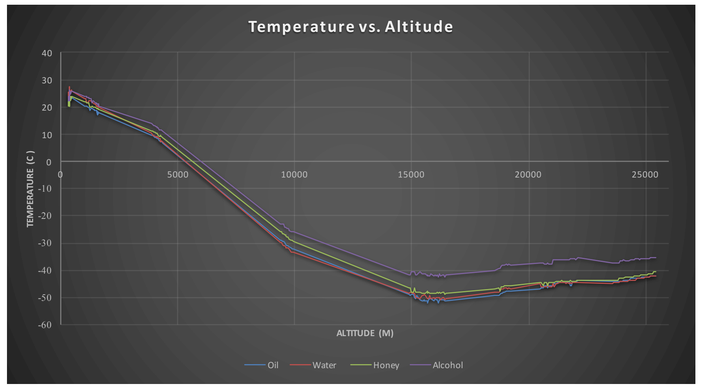
High Altitude Balloons can reach speeds of over 100 mph!

There are many guidelines that the FAA requires you to follow to launch a HAB, and on of them is that it can't be over 12 pounds!

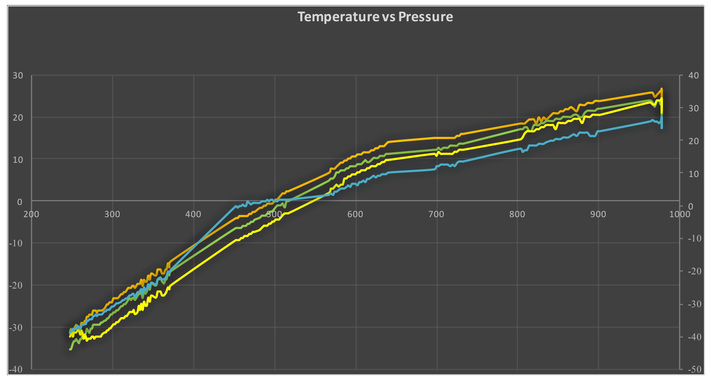
RESULT

Our data collected by the sensors appeared to have faired well at first but once it reached maximum altitude and onward we see variations in our data, and after the high altitude balloon came down we discovered that three of the five vials were missing their contents which contributed to our inability to get clear and precise data. We had to completely throw out our data for salt water due to its inconclusiveness.

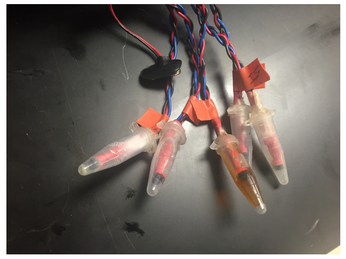
Graph one shows most of the liquids decreasing at the same temperature



Graph two shows that temperature and pressure are directly related



Altitude is in Meters and temperature is in Celsius



CONCLUSIONS

From our experiment we were able to conclude that the temperature of the liquids and their relationship to altitude is indeterminate. Assuming that temperature decreases, the graph should have been inversely proportional to the altitude, but that was not the case.

With out data, water was the most unusual liquid, along with rubbing alcohol. This was expected with water since it expands when frozen, but rubbing alcohol was a bit of a shock. We attribute this to its molecules inability to bond strongly hydrogen which causes it to take a longer time to freeze, usually at temps below 89 degrees Celsius, so it was more resilient to the cold then the other liquids and consequently did not dip as low as the others.

The error in our graphs are believed to be caused by the evaporation of certain liquids. Our vials could only hold 1.5 mL this made it hard for the sensors to detect anything if the liquids lost even half of its volume. If we could redo this experiment we would opt for bigger vials and glue the sensors into the vial more securely.

CONTACT

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