

Instrument Validation

“The Unit”

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This is an amazing experiment measuring pressure vs. altitude. We are using giant balloons filled with helium to send our experiment up in the gondola. Our experiment is made up of a glass container with a one way valve at the top.

Purpose

The purpose of our experiment is to test the reliability of our equipment. Every aspect of our project must be checked thoroughly for possible problems. Our particular experiment consists of withdrawing air from a jar, and measuring the pressure inside. Observing the effects of this will test the success of our one-way valve, as a functioning valve should release air out without allowing it in. Thus, as we suck air out with a syringe, the one-way valve should keep the air from coming back, lowering the overall pressure inside the jar. Also, this experiment will test the reliability of all the electronic instruments, like the LabPro and the computer. If any of these devices malfunction, the experiment will fail, exposing the underlying issue.

Method

- Step 1. Construct a one-way valve on the jar using plastic wrap
- Step 2. Attach the barometer to the jar using a hollow tube
- Step 3. Connect the barometer to the LabPro
- Step 4. Connect the LabPro to the computer
- Step 5. Withdraw 10 mL of air from the jar every ten seconds
- Step 6. Repeat step 5 until 1.5 minutes has passed
- Step 7. Transfer the data from the LabPro onto the LoggerPro program installed into the computer

Observations Concerning Data

We discovered through our experiment that as we withdraw air from inside the jar, the pressure inside decreases (assuming that the one-way valve keeps air from escaping). This is displayed in the 0-80 second time frame on the graph. However, if we refrain from extracting the air and disable the valve, the pressure returns to the normal room standards. This is clearly shown in the 80-100 second time frame on the graph.

Conclusion

As we repeated this experiment several times, we discovered that are equipment's accuracy was plus or minus .6225 kpa (as related to ten second periods of time) compared to our other experiments.

Experiment 1

<u>Time (s)</u>	<u>Pressure (kpa)</u>
0	99.847
10	99.857
20	100.257
30	100.447
40	99.914
50	99.933
60	99.847
70	85.390
80	82.000
90	99.952
100	99.981

Endpoint of drop

$$85.583 - 85.340 = .193$$

Experiment 2

<u>Time (s)</u>	<u>Pressure (kpa)</u>
0	99.847
10	99.847
20	99.835
30	99.428
40	99.127
50	98.235
60	92.121
70	89.329
80	85.583
90	95.271
100	98.929

Endpoint of rise

$$99.981 - 98.929 = 1.052$$

$$\text{Average of values (.193 and 1.052)} = 0.6225$$

$$\text{Accuracy of Equipment} = 0.6225$$

Specifics

Materials:

- One way valve
- Computer
- Labpro
- Barometer
- Jar

Computer:

We understood the different processes that the computer incorporates and were very successful at manipulating for gathering data.

Labpro:

Very reliable. Worked perfectly.

Barometer:

Again no problems worked perfectly.

Jar:

Was air tight. Minimal to no leakage. Worked very well.

Data Received

