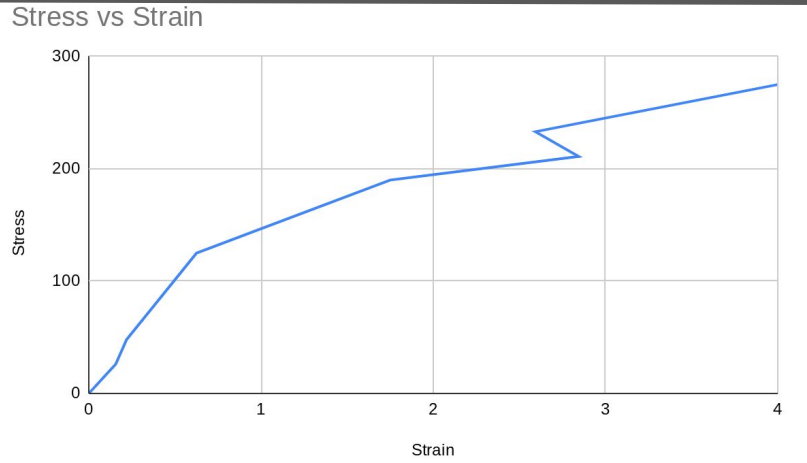
What is Important About Elasticity?

Purpose: The purpose of this experiment is to test the effectiveness of using weights for a tensile test

Hypothesis: If silicone rubber is tested on the weight tensile tester it will make a similar or exactly the same graph as a normal rubber stress vs strain graph



1. Prepare the rubber strips into a dog bone shape
2. Put the rubber into the tensile tester and stretch the rubber until it breaks for each type of rubber, adding weights periodically
3. Write down or download the graph results and repeat until all times are tested with the different types of rubber.
4. Then determine the most optimal rubber for making a balloon based on their graphs.

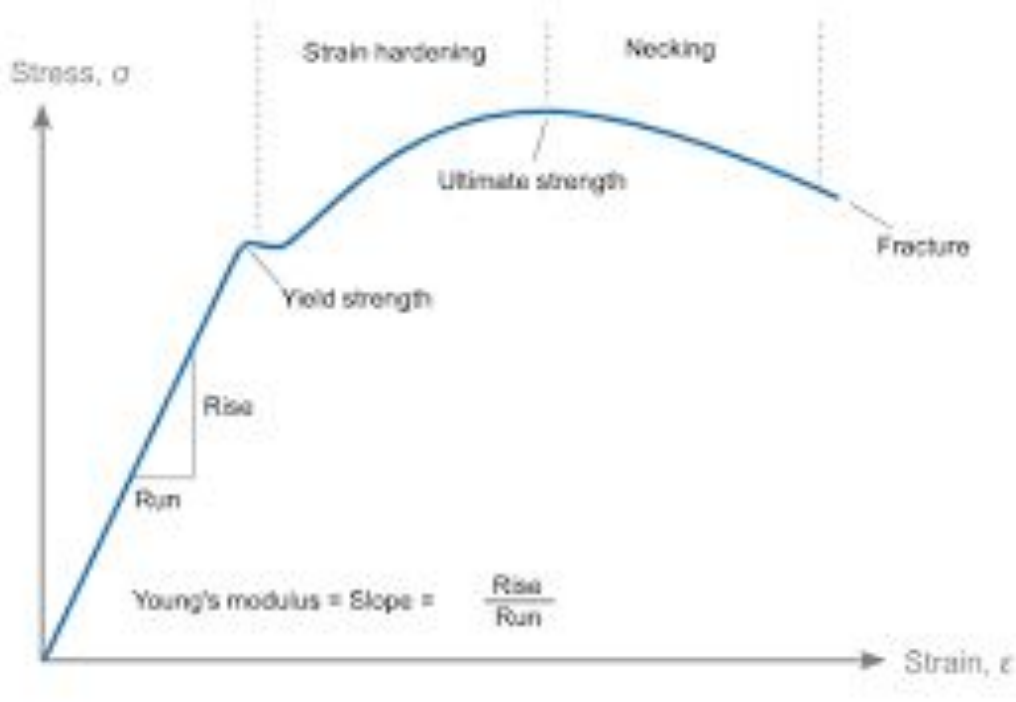
Before, during, and after the tensile tests were done, there were huge margins for error. The first one is the fact the the weight on the rubber was never pulling directly downwards, making it much harder to use the legitimacy of the testing. Secondly, the weight was not put on in even measurements (I.E. I put multiple different weighted weights on). Thirdly, I was not measuring the length of the rubber strip on a recording to look at later, but instead wrote the length of the rubber strip directly after I put the weight on.

Introduction

In this slideshow I will show you what tensile strength is, what I tested, the inaccuracies in my testing as well as what I could do better.

Background Research

Some research I have conducted has been on the basics of tensile testing, which includes knowing how to read Young's modulus graphs which show the elasticity and rigidness of a material. Then I learned about how engineers make those graphs. They make those graphs by using a tensile tester which pulls a material downward and pulls until it snapped, recording all of that information and putting it in a graph.

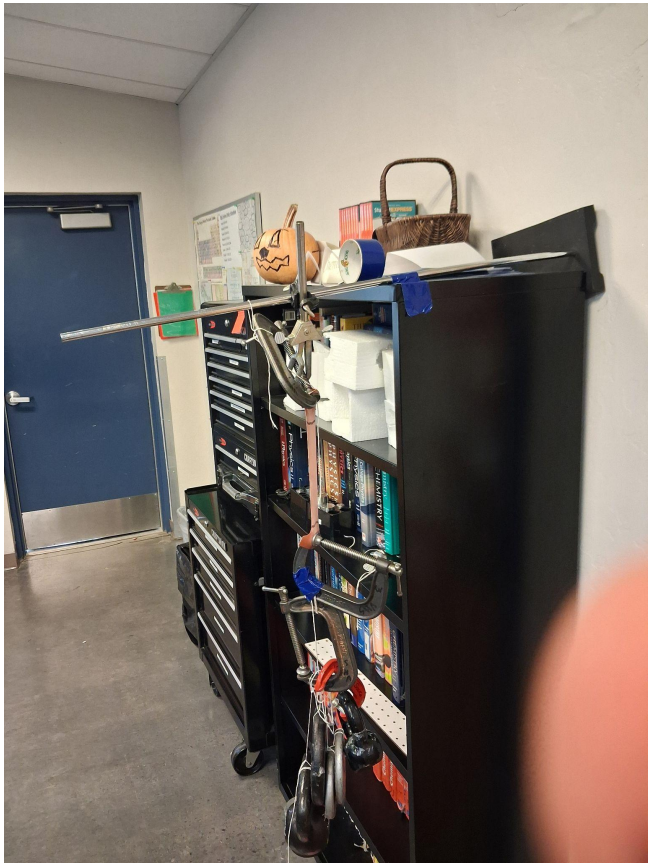


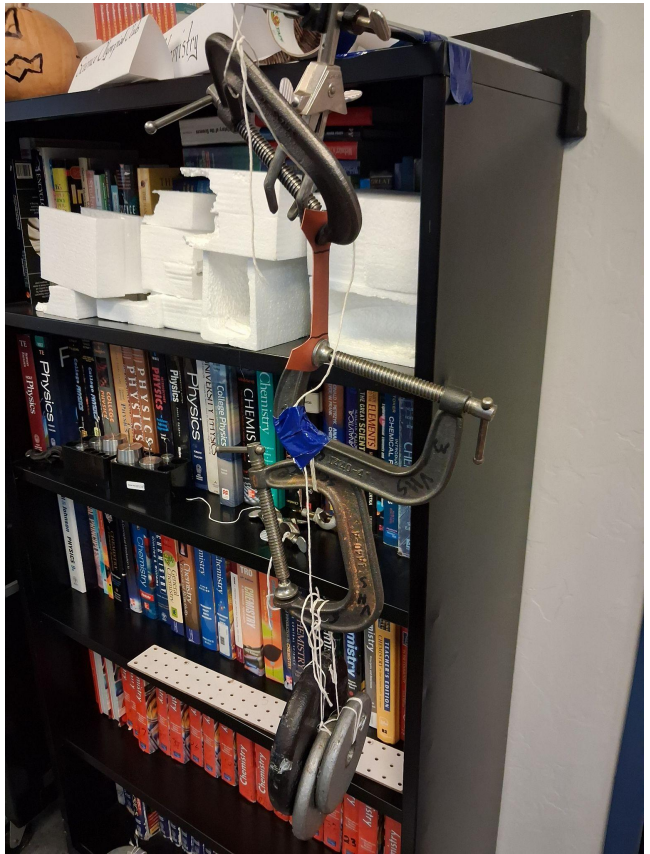
Procedure

1. Cut out 3 “dogbone” shaped pieces of the chosen material
2. Draw a line at both ends of the dog bone in the middle part
3. Clamp the top, then the bottom of one of the pisces
4. Add a weight to the bottom clamp, and then measure the distance between the two marked lines
5. Repat step 4 until it snaps

Experiment Materials

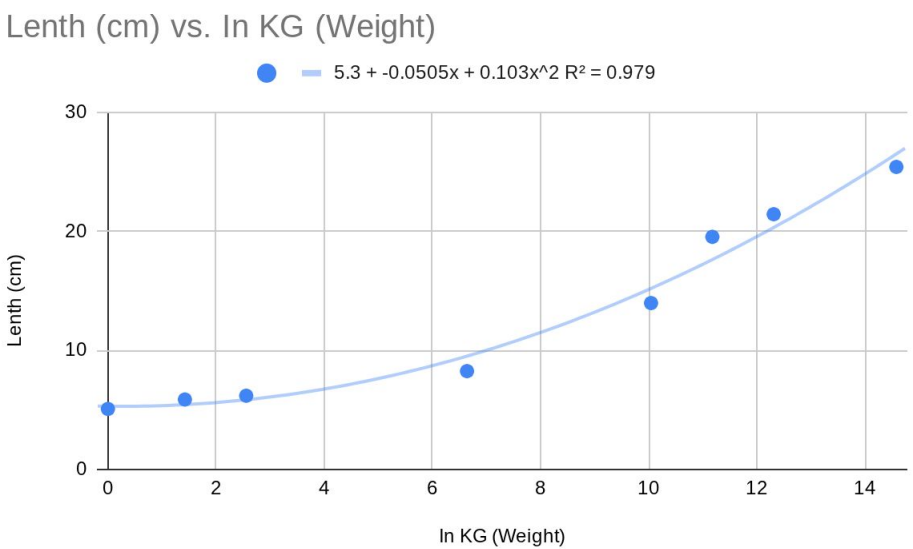
Setup





Stretching

In KG (Weight)	Lenth (cm)	In KG (Weight)	Lenth (cm)	In KG (Weight)	Lenth (cm)
0	5.08	0	5.08	0	5.08
1.423	5.873	1.423	5.398	1.423	5.556
2.557	6.191	5.505	6.033	4.825	7.62
6.639	8.255	8.907	8.731	8.907	15.72
10.041	13.97	11.175	15.24	11.175	18.57
11.175	19.53	12.309	17.46		
12.309	21.43				
14.577	25.4				



Newtons	Stress(N/cm2)	Newtons	Stress(N/cm2)	Newtons	Stress(N/cm2)
0	0	0	0	0	0
13.95963	26	13.95963	26	13.95963	26
25.08417	48	54.00405	104	47.33325	91
65.12859	125	87.37767	168	87.37767	168
98.50221	190	109.62675	211	109.62675	211
109.62675	211	120.75129	233		
120.75129	233				
143.00037	275				

9.81 x Weight = Newtons

Newtons/ Cross Sectional Area = Stress

Delta L= Original length - New Length

Delta L/ Original length = Strain

Stress/Strain= Young’s Modulus

Delta L(Absolute Vaule)(cm)	Strain	Delta L(Absolute Vaule)(cm)	Strain	Delta L(Absolute Vaule)(cm)	Strain
0	0	0	0	0	0
0.793	0.1561023622	0.318	0.0625984252	0.476	0.0937007874
1.111	0.2187007874	0.953	0.1875984252	2.54	0.5
3.175	0.625	3.651	0.7187007874	10.64	2.094488189
8.89	1.75	10.16	2	13.49	2.655511811
14.45	2.844488189	12.38	2.437007874		
13.175	2.593503937				
20.32	4				

9.81 x Weight = Newtons

Newtons/ Cross Sectional Area = Stress

Delta L= Original length - New Length

Delta L/ Original length = Strain

Stress/Strain= Young’s Modulus

Young's modulus		Young's modulus		Young's modulus
0		0		0
166.557377		415.3459119		277.4789916
219.4779478		554.3756558		182
200		233.7551356		80.21052632
108.5714286		105.5		79.45737583
74.17854671		95.60904685		
89.8398482				
68.75				

9.81 x Weight = Newtons

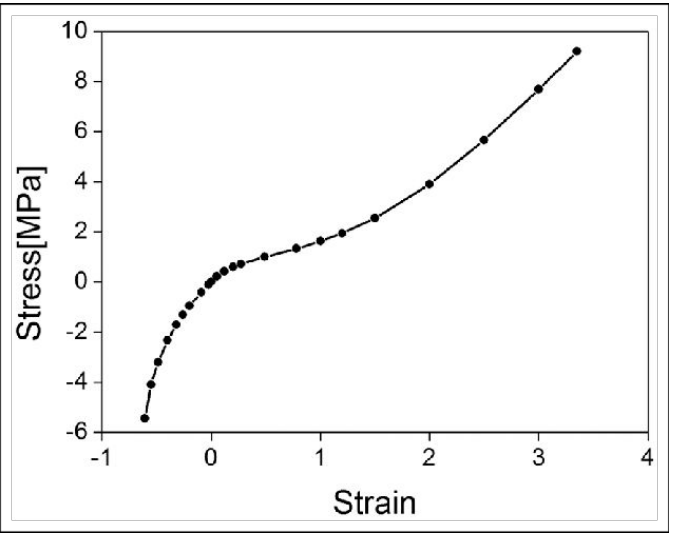
Newtons/ Cross Sectional Area = Stress

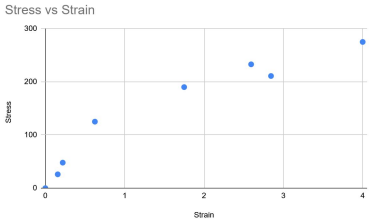
Delta L= Original length - New Length

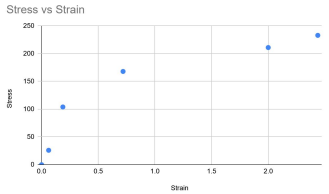
Delta L/ Original length = Strain

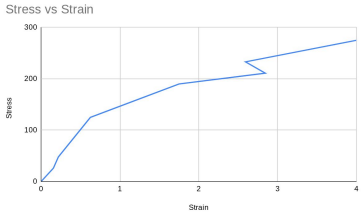
Stress/Strain= Young's Modulus

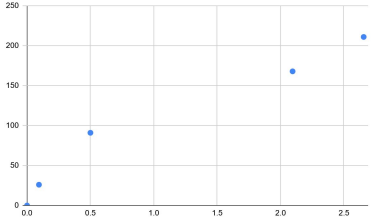
I have compared my graphs to ones online. They are much more precise and use different procedures and looking at the comparison:











Conclusion

Results:

In the testing, I was able to test 3 strips of silicone rubber using varied weights to calculate the Young's Modulus of silicone rubber

Analysis

Before, during, and after the tensile tests were done, there were huge margins for error. The first one is the fact the weight on the rubber was never pulling directly downwards, making it much harder to use the legitimacy of the testing. Secondly, the weight was not put on in even measurements (I.E. I put multiple different weighted weights on). Thirdly, I was not measuring the length of the rubber strip on a recording to look at later, but instead wrote the length of the rubber strip directly after I put the weight on.

My hypothesis was was upheld because the graph on the rubber strip did look like a normal rubber test graph.

References

Briggs, B. N., & Forbes , M. H. (2025, August 12). *Mechanics of Elastic Solids - Lesson*. TeachEngineering.org. https://www.teachengineering.org/lessons/view/cub_surg_lesson02 This is for base research about tensile strength

Urone, P. P., & Hinrichs, R. (2022, July 13). *5.3 elasticity: Stress and strain - college physics 2E*. 5.3 Elasticity: Stress and Strain. https://openstax.org/books/college-physics-2e/pages/5-3-elasticity-stress-and-strain

This is for the calculations that are needed after the experiment is over