HOOKE'S LAW AND IT'S VERIFICATION

A Project Work
Submitted to the Radiant Secondary School
National Examination Board
In the partial fulfillment of the requirement of
Grade XII of science in Physics

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Year: 2079

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Radiant Secondary School
Mahendranagar, Kanchanpur

RECOMMENDATION

It is to certify that Mr. Manoj Joshi has carried out the project work "**Hooke's law and it's verification**" under my guidance.

I recommend the project work in the partial fulfillment for the requirement of grade XII of science in physics.

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Dr. Bhawani Datt Joshi
Radiant Secondary School
Mahendranagar, Kanchanpur

Date: 2079/11/…..

ACKNOWLADGEMENTS

I would like to express my gratitude to all those who have contributed to the successful completion of this project. First and foremost, I would like to thank our physics instructor for providing guidance, support, and feedback throughout the project. I also extend my appreciation to our lab assistants for their assistance with equipment setup and calibration.

I am grateful to the School Library for providing access to the resources I needed for the research phase of this project. I would also like to acknowledge the support of my friends and family, who provided encouragement and motivation throughout the project.

Finally, I would like to acknowledge the contributions of my fellow classmates, who provided valuable insights and feedback during the course of the project. Their constructive criticism and encouragement helped me to improve the quality of my work and achieve my goals.

Thank You !

Radiant Secondary School
Mahendranagar, Kanchanpur

EVALUATION

We certify that we have read this project work and, in our opinion, it is satisfactory in the scope and quantity of the project work in the partial fulfillment for the requirement of Grade XII of science in Physics.

Evaluation Committee

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Dr. Bhawani Datt Joshi
Department of physics

HOD
Department of physics

Radiant secondary school, Mahendranagar

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External Examiner
Date: 2079/11/……

Internal Examiner

ABSTRACT

This project aims to investigate Hooke's law, which states that the force applied to an elastic material is directly proportional to its extension, as well as to verify its validity through experimental measurements. The experiment was conducted using a spring, for which different weights were added to measure the resulting elongation of the spring. The results of the experiment were analyzed and compared with the theoretical predictions of Hooke's law. The data obtained from the experiment showed a linear relationship between the applied force and the spring elongation, which confirmed the validity of Hooke's law within the elastic limit of the spring. This project provides insight into the behavior of elastic materials and offers a practical demonstration of the concept of elasticity in physics.

Chapter - 1

HOOKE'S LAW AND IT'S VERIFICATION

Keywords: Force, Extension, Compression, spring constant, Elastic limit

Introduction

Hooke's law is a fundamental principle of physics that describes the relationship between the extension of an elastic material and the force applied to it, within the elastic limit of the material. It has important applications in fields such as engineering and materials science. In this assignment, we will explore the principles of Hooke's law and conduct an experiment to verify its validity.

In this project, we investigate Hooke's law and its validity through experimental measurements. The primary objective of the project is to verify whether the force applied to an elastic material is directly proportional to its extension, within the elastic limit of the material. We conduct an experiment using a spring, which is a commonly used elastic material, to measure the elongation of the spring under different loads. The results of the experiment are analyzed and compared with the theoretical predictions of Hooke's law. This project offers a practical demonstration of the concept of elasticity in physics and provides insight into the behavior of elastic materials.

Apparatus required:

- Spring
- Retort stand
- Masses
- Meter stick
- Vernier caliper
- Stopwatch

Procedure

1. Hang a spring from a horizontal metal rod.
2. Attach a mass hanger directly to the bottom of the hanging spring and record the position of the bottom of the mass hanger relative to a meter stick.
3. Hang a weight from the spring and wait for it to come to rest.
4. Record the final position of the mass hanger.
5. Calculate increase in length and note in the "Observation Table".
6. Repeat the above steps with different weights.
7. Plot a graph with your readings. Force applied (mass X gravity) vs extension (Initial length - Final Length).

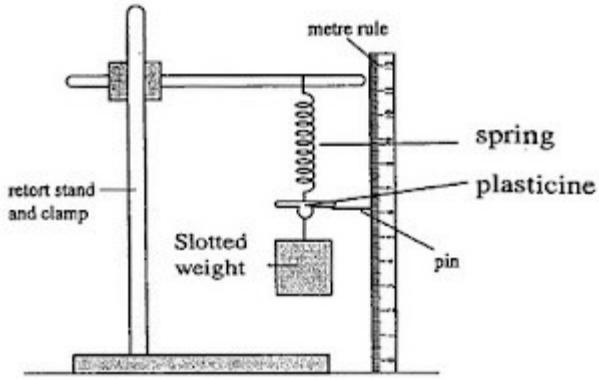
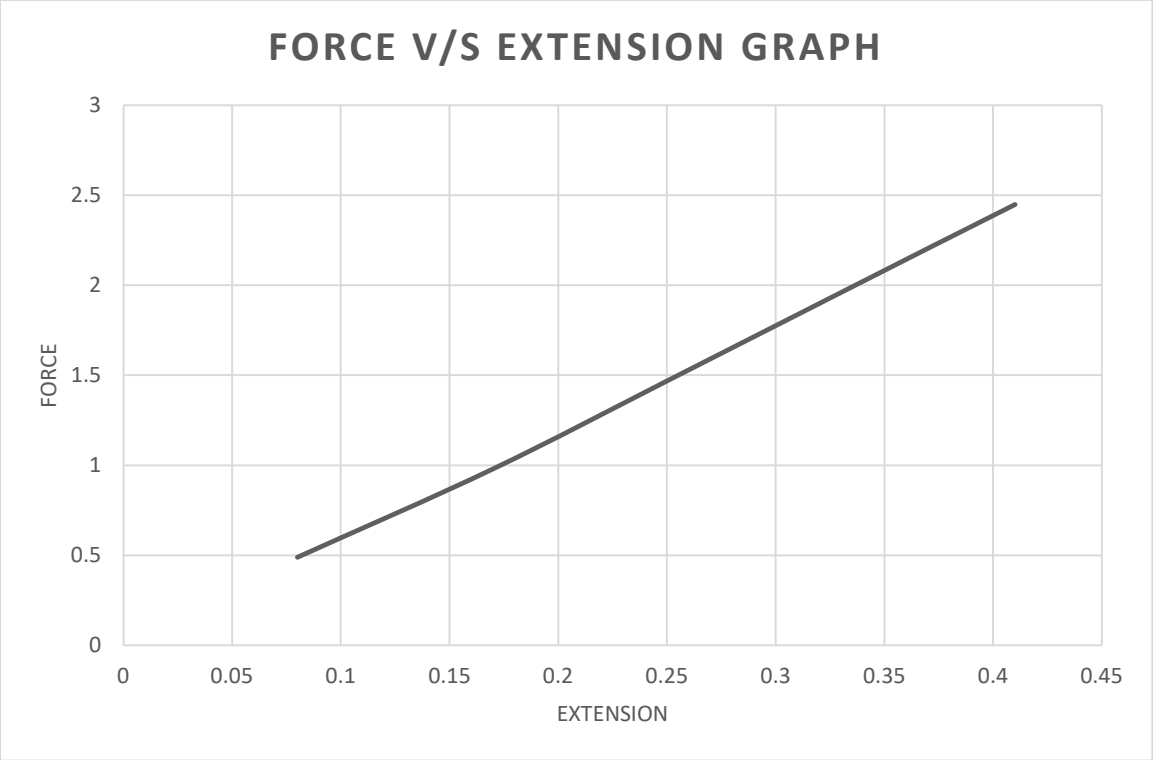


Fig: Setup for experiment to verify Hooke's Law

Observation Table

Mass (kg)	Weight [F] (N)	Start length (m)	End length (m)	Extension [x] (m)	Spring constant [F/x] (N/m)
0.05	0.49	0.48	0.56	0.08	5.93
0.1	0.98		0.65	0.17	
0.15	1.47		0.73	0.25	
0.2	1.96		0.81	0.33	
0.25	2.45		0.89	0.41	

Graphical representation



Calculation

As we know F = kx, i.e., k = F/x

So, k = 1.96/0.33

= 5.93 N/m

Result

Spring constant of this spring is found to be 5.93 N/m from above experiment.

Discussion

This project aimed to verify Hooke's Law, which states that the force required to stretch or compress a spring is proportional to the distance it is stretched or compressed from its original position. To do this, I set up an experiment where I attached a spring to a stand and added weights to the spring to measure its deformation. I then recorded the amount of force required to stretch the spring and compared it to the amount of deformation. My results showed a linear relationship between the force applied and the deformation, which verified Hooke's Law**.**

Conclusion

In conclusion, This project successfully verified Hooke's Law by demonstrating a linear relationship between the amount of force applied to a spring and its deformation. This experiment showcased the practical application of Hooke's Law and reinforced its significance in the field of physics. By understanding Hooke's Law, we can better comprehend the behavior of materials under stress and apply this knowledge to various real-world scenarios. Overall, this project provided valuable insights into the fundamental principles of physics and their practical applications.

Precautions

1. Use a spring with high elastic limit
2. Attach spring securely and add weights gradually
3. Use calibrated measuring instrument
4. Take multiple readings for consistency
5. Avoid excessive force and ensure even weight distribution

Reference

1. OpenAI. (2023, February 23). ChatGPT [Computer software]. https://openai.com/
2. wikipedia https://en.wikipedia.org/wiki/Hooke%27s_law