Physics 101

Lab 7: Conservation of Energy

Myat Thit Ko Ko

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Purpose

The purpose of this seventh lab is to obtain practical skills in performing an experiment to find out the values of kinetic energy, elastic potential energy, and gravitational potential energy in three scenarios. The goal is to attest the law of conservation of energy by proving it empirically that our found energy values are equivalent.

Members

This lab group consisted of four members who worked together as a team to make the procedure accurate and fair for everyone.

1. Myat Thit Ko Ko (author)
2. Sarah Ruelas
3. Inigo Mikael Dela Vega
4. Hector Torres

Procedure

The lab consisted of the following steps and procedures.

- Measuring masses of both objects.
- Calculating the spring constant.

Part I: Kinetic Energy & Elastic Potential Energy

- Measuring the distance stretched by the spring upon the application of force.
- Calculating the velocity by using a motion and time sensor.

Part II: Kinetic Energy & Gravitational Potential Energy

- Measuring the exact height differences.
- Calculating the velocity by using a motion and time sensor.

Part III: Gravitation Potential Energy & Elastic Potential Energy

- Measuring the distance stretched by the spring upon gravitational pull of weight.

We used the same spring for the entire lab to maintain consistent spring constant value.

Every calculated value in this lab is rounded to be accurate to 3 significant figures.

Data & Analysis

Part 0: Spring Constant

Mass of the hanging object

Mass of hanging object = 0.100 kg

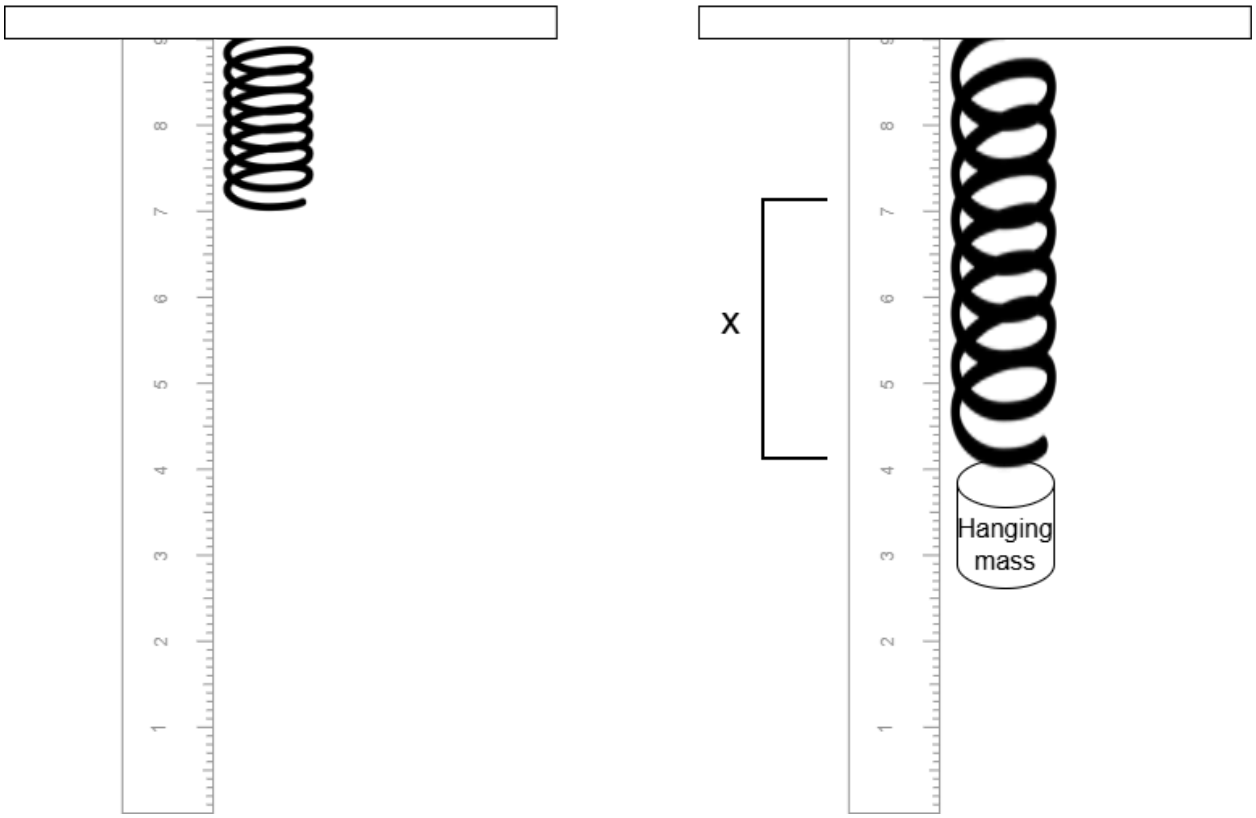


Illustration of the set up

According to Hooke's law,

$F = kx$ where k is a spring constant.

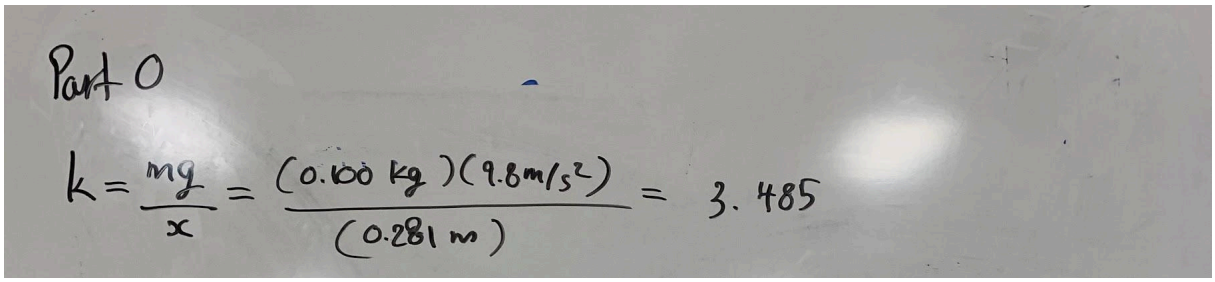
Hence,

$k = F/x$

$= W/x$

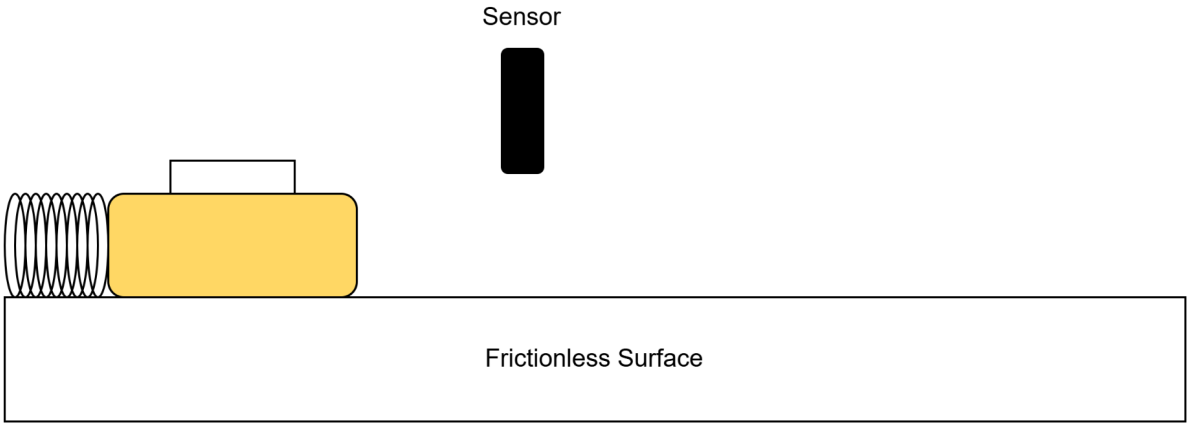
$= mg/x$

x = 0.70 m - 0.419 m = 0.281 m

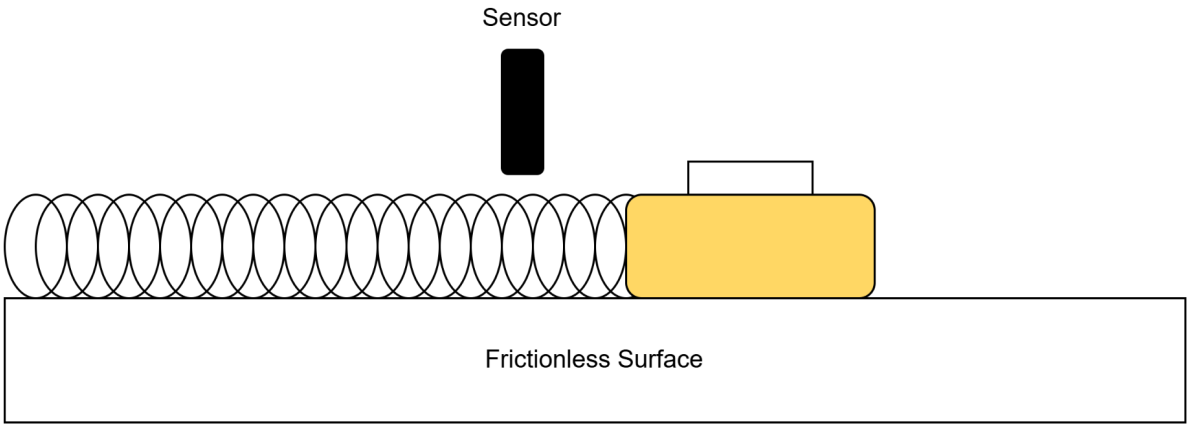


Note that mass is hanged slowly here whereas in part III, mass is dropped on the spring to find the maximum x by gravity.

Part I : Kinetic Energy & Elastic Potential Energy



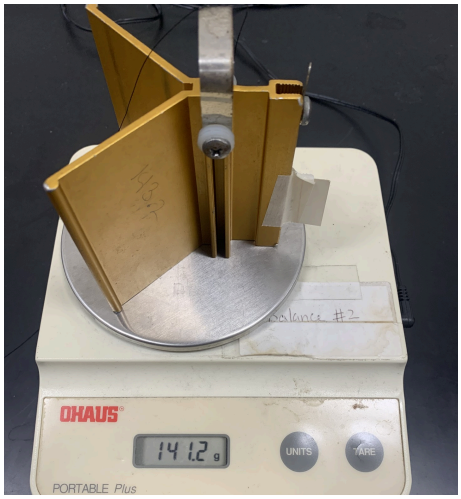
Initial Position



Force Exerted

Illustrations of the set up

Part I : Kinetic Energy & Elastic Potential Energy



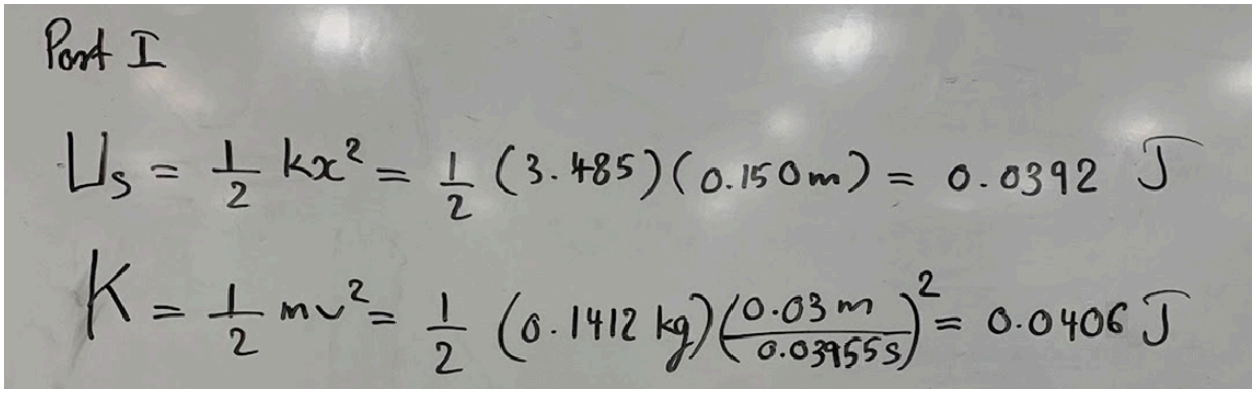
Mass of glider

Mass of glider = 0.1412 kg
k = 3.485

The following table is a summary of our findings based on our data on Task 1.

Index	Time (s)
1	0.0415
2	0.0376

t average = 0.3955 s
Length of paper = 0.03 m
Distance stretched = 665 mm - 515 mm = 150 mm = 0.150 m



% error =	$\frac{\lvert 0.0392 - 0.0406 \rvert}{(0.0392+0.0406)/2}$	x 100 % =	3.51%

Part II : Kinetic Energy & Gravitational Potential Energy

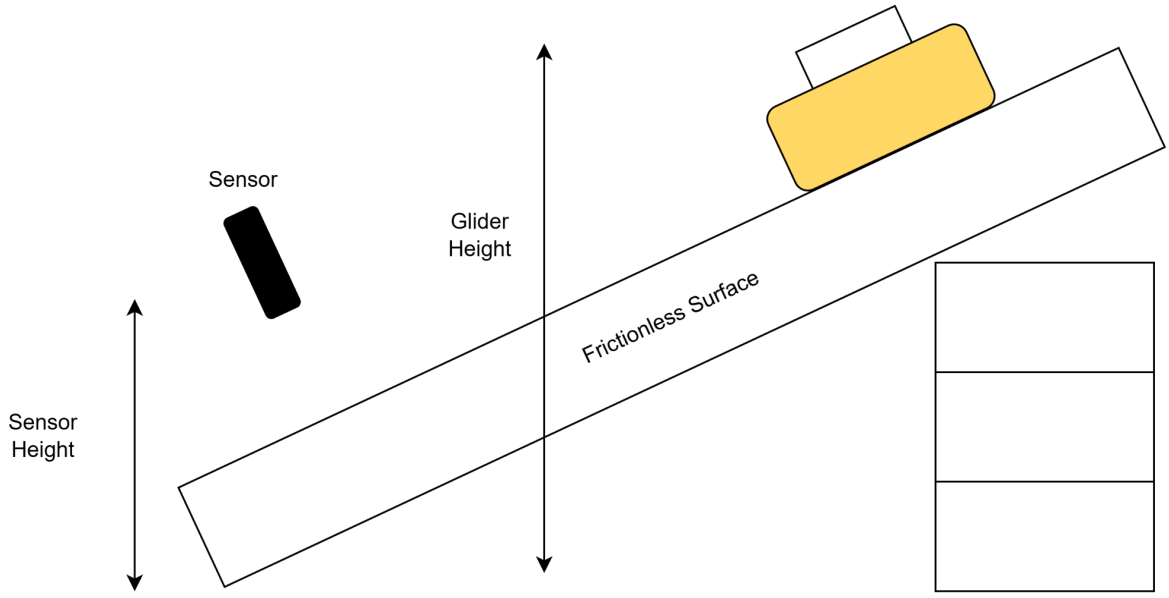
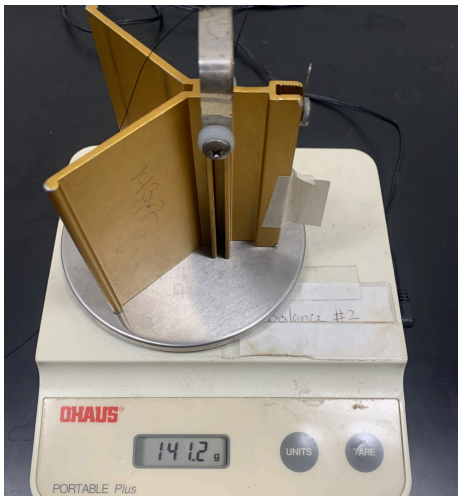


Illustration of the set up

Part II : Kinetic Energy & Gravitational Potential Energy



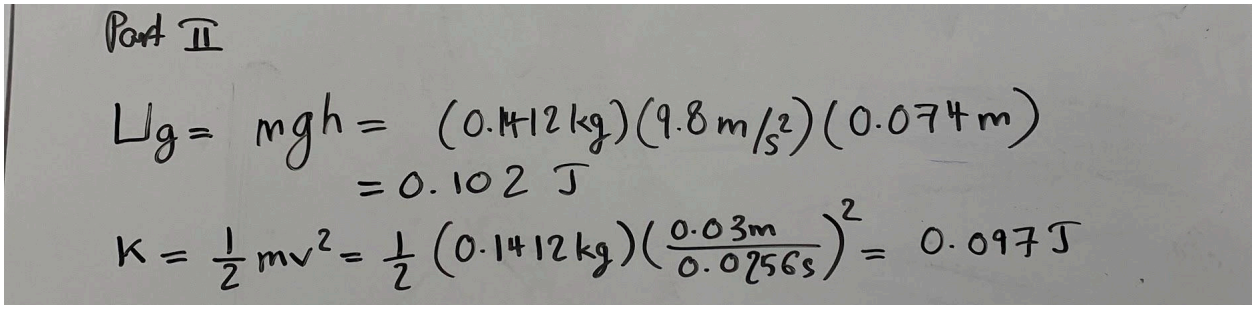
Mass of glider

Mass of glider = 0.1412 kg

The following table is a summary of our findings based on our data on Task 1.

Index	Time (s)
1	0.0255
2	0.0256

t average = 0.0256 s
Length of paper = 0.03 m
Height difference = Height of glider paper - Height of sensor gate =0.279 m - 0.205 m = 0.074 m



% error =	| 0.102 - 0.097 |	x 100 % =	5.03%
	(0.102+0.097)/2		

Part III: Gravitation Potential Energy & Elastic Potential Energy

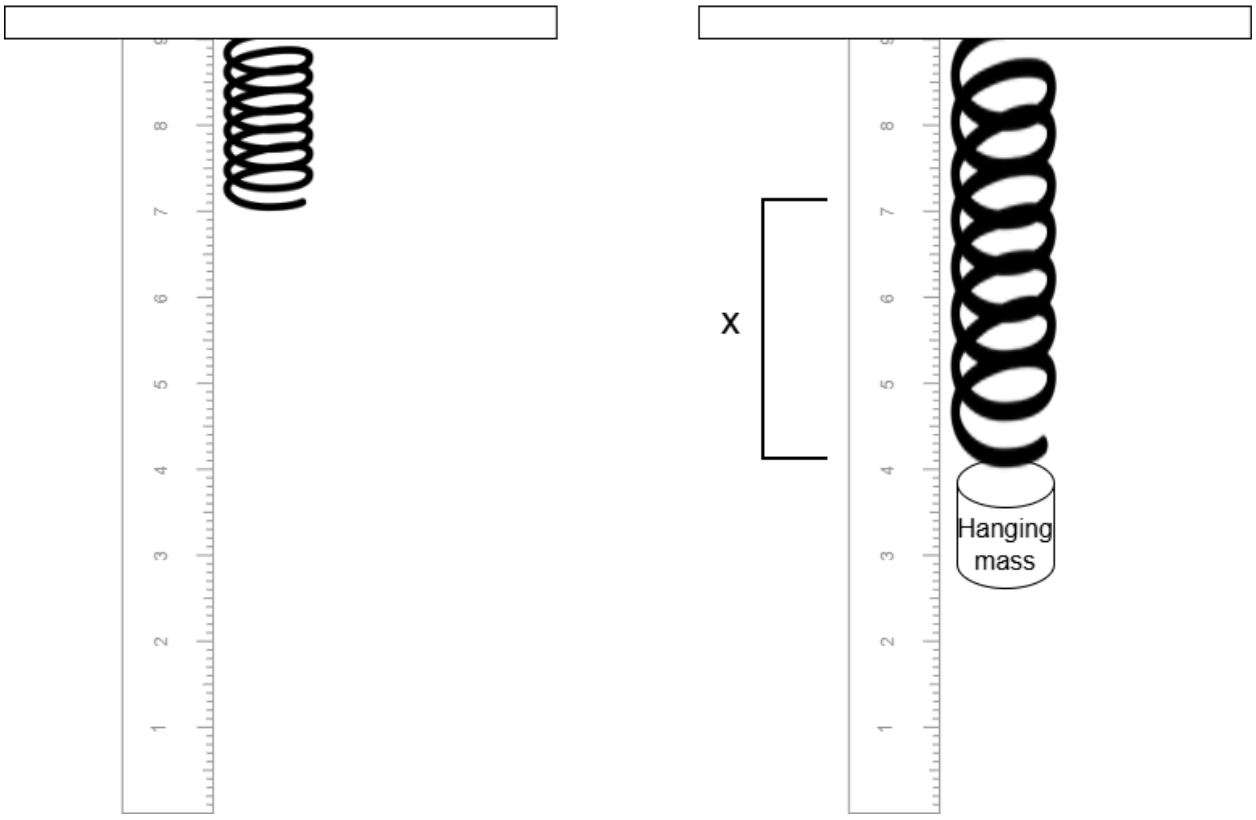
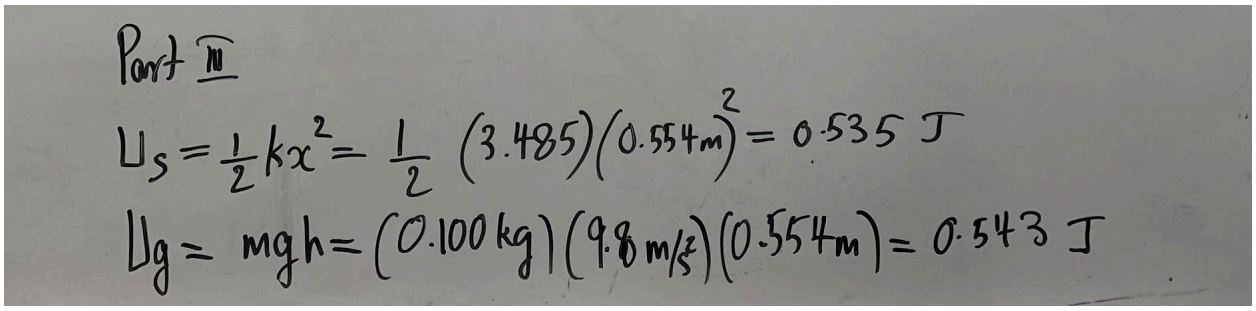


Illustration of the set up

Part III: Gravitation Potential Energy & Elastic Potential Energy

Mass of the hanging object

Mass of hanging object = 0.100 kg
k = 3.485
x = h = 0.70 m - 0.146 m = 0.554 m



% error =	$\frac{\lvert 0.535 - 0.543 \rvert}{(0.535+0.543)/2}$	x 100 % =	1.48%

Analysis

Error percentage is found to be the lowest for part III where we only had a single variable to measure and thus, resulting in less human error. Our only concern was that the spring constant may change slightly if the spring accidentally reaches beyond the elastic limit of proportionality.

Error percentage is found to be the highest for part II where we had to measure the exact height difference by using meter rules. This was quite tricky as the accurate height data demanded accurate positioning and thorough data reading. In order to keep part II error percentage less than 5%, we had to come up with some creative ways such as taping our phones to the ruler to ensure that the meter rule is perfectly horizontal or vertical during measurements.

Conclusion

Our error percentages were found to be less than 10%. Therefore, it is deemed satisfactory. This lab was rather fun and seeing the law of conservation of energy in action was empirically satisfying.

Summary

Experiment Title: Conservation of Energy

Student’s name: Myat Thit Ko Ko

Date: 03/26/2026

Purpose: To find out the values of kinetic energy, elastic and gravitational potential energy

Procedure: Measuring data, recording time lapses, calculating values.

Data: 2x2x1 = 5 points total

Analysis: Error percentages were 3.51%, 5.03%, and 1.48% respectively.

Conclusion: Satisfactory