**Name:

Date:

SBA:** #

**Topic:** Weights and Springs

**Title: Hooke’s law**
**Aim:** To determine the spring constant of a spring

Equation(s):

W = mg
where: W = weight in newtons, N; m = mass in kilograms, kg and g = gravity in newtons per kilograms, N/kg

F = kx
where: F = force in newtons, N; k = spring’s constant or stiffness N/m; x = extension of spring in metres, m.

Gradient/Slope = Δ y ÷ Δx = (*y1 – y2*) ÷ (*x1 – x2*)

1N = 100 g 1 N = 0.1 kg

**Apparatus/Materials:** 6 – 10 five, ten, twenty or one hundred gram masses, a spring balance, a retort stand, a metre stick or ruler

**Method:**1. Set up the apparatus as shown.
2. First, using a ruler, note the original length of the spring in meters and place the reading in the first row titled, ‘Length’.
3. Hang one of the masses onto the spring balance and note its mass and extension.
4. Add the rest of your masses on successively noting the extension each time.
5. Record all observations and results into an appropriate table.
6. Construct a graph of extension, m against load, N.
7. Determine the gradient of the graph (gradient = extension/load = Δy/Δ x)
8. Determine the spring’s constant k by using the equation: k = 1/gradient

 **Observations: (*Describe what you see here*)**

* **Diagram:**

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DIAGRAM SHOWING HOW THE LAB WAS EXECUTED

* **Calculations: (Show ALL working. DO NOT FORGET YOUR UNITS)**1.Gradient/Slope = Δ y ÷ Δx = (*y1 – y2*) ÷ (*x1 – x2*)2. Spring constant = 1 ÷ slope
* **Data and Results:**Table showing the extension of the spring each time 100 g masses were added to it

|  |  |  |  |
| --- | --- | --- | --- |
| **Mass (kg)**  | **Load (N)**  | **Length (m)**  | **Extension (m)**  |
| 0.0  | 0  |  | 0  |
| 0.1  |  |  |  |
| 0.2  |  |  |  |
| 0.3  |  |  |  |
| 0.4  |  |  |  |
| 0.5  |  |  |  |

* **Discussion:**1. What is Hooke’s law?
2. What is termed as the elastic limit?
3. Determine if the spring you used reached its elastic limit.
4. What was the calculated spring constant?
5. State any possible limitation(s) that may have been experienced during this lab.
* **Precautions:**1.

2.
* **Reflection:***\*How can this lab be applied to daily life?
\* How has this lab impacted your understanding of springs?*
* **Conclusion:**  *\* Refer to the aim of this lab and state the calculated value of the spring’s constant.*

**Observation & Recording – Hooke’s Law** a. Student’s ability to record observations and
to collect and organise data; observations and
data may be recorded in:
(i) Prose
Written description of observations
in the correct tense /1
(ii) Table
Appropriate headings /1
Title given /1
(iii) Graph
\* Title for graph /1
\* Title axes labelled for
 both x and y /2
\* Correct scales /2
\* Accurate plotting:
All points plotted correctly /5
Every point incorrectly plotted
minus one point
\* Fine points used /1
\* Best fit line drawn /1

(b) Reporting
Student’s ability to prepare a comprehensive
written report on their assignments using the
following format:
(i) Date (date of experiment) /1
(ii) Aim (what is to be
accomplished by doing the
experiment /1
(iii) Apparatus and Materials
(all equipment and materials
used in the experiment must
be listed) /1
(iv) Method/Experimental
Procedure (step by step
procedure written in past
tense) /2
 **Total: /20**

**Analysis and Interpretation – Hooke’s Law**Student’s ability to:
(a) make accurate calculations for:
\* extension of spring /6
 6 or more points correctly
 plotted (6)
 *For every incorrect point plotted
 deduct one point*
\* Slope of graph Δy ÷ Δx
 complete with correct units /2
\* Stiffness of spring complete
 with correct units /2

(c) Evaluates from data
 (including sources of error)
 *See discussion section for*
 Explanation of results: /8
\* Given (1)

\* Sensible (1)
\* Thorough (2)
 or
 Partial (1)
\* Comparisons or Trends
 mentioned (2)
\* Limitation or Source of Error:
(i) Given (1)
(ii) Plausible (1)
(iii) None given (0)

(f) Draws a conclusion
 justified by data
Given /1
Plausible /1

**Total: /20**