Springs

In this activity you will investigate the **relationship** between the stretching **force** on a steel spring and the **extension** it produces.

* You can stretch a spring by hanging a mass from it.
* Add a 100g mass to the spring and measure the **extension** it produces.

#### Remember:

**100g = 1N on Earth**

* Record your results in a spreadsheet
* Repeat this for masses up to 600g.
* For greater **accuracy** repeat the experiment once more times find the mean extension.

The **extension** of a spring tells us how much its length has increased from its original length. To measure **extension** you subtract the original (unloaded) length from the stretched length.

The extension is the extra length form the original position to the new stretched position – be careful NOT to measure the total length of the spring

**Example table**

This is the loaded reading - record this in your table and calculate the extension

This is the unloaded reading - record this **above** your table from the ruler

|  |  |  |  |
| --- | --- | --- | --- |
| **Unloaded reading on ruler / cm** | 2.4 |  |  |
|  | **Loaded reading on ruler / cm** |  |
| **Force / N** | **1st go** | **Check** | **Mean** | **Extension/cm** |
| 1 | 4.4 | 4.6 | 4.5 | 2.1 |
| 2 | 6.3 | 6.7 | 6.5 | 4.1 |

i.e when the force is 1 N the extension = 4.5 – 2.4 = 2.1 cm

 when the force is 2 N the extension = 6.5 – 2.4 = 4.1 cm etc.**Graph**

* Plot a graph of **Force (Weight)** against **extension**. Make sure you label your axes and give the correct **unit**.
* You should be able to draw a straight **line of best fit** through the points on the graph. The **line of best fit** is useful, as it smoothes out errors of measurement.



**Conclusion**: Use you graph to find:

1. The relationship between **Force** and **extension**.
2. The **gradient** (slope) of your graph. This is the spring constant in the equation below. Give the units of the **spring constant.**

**Force = spring constant x extension F = kx**

This equation is called **Hooke’s Law.** All springs obey this equation, they just have different **spring constants**.

**Evaluation**

1. Were there any points that lie quite far from the line of best fit? We call these points **anomalous** results. You should circle these points on your graph.
2. What sources of error might have caused some of your points to lie off your **line of best fit**?
3. What changes could you make to your experiment to help improve the **accuracy** of your experiment?

Learning points:

Know that there is a relationship between the extension of a spring and the force applied to it.

Know how to calculate the gradient of a straight-line graph and appreciate its significance.

Improve your skills at writing a conclusion and evaluation.