Year 11 Physics Taster Session:

Practical - Combining springs in series and parallel

In this experiment, you will be using combinations of springs to contribute to your understanding of the property of materials.

AIMS:

To determine relationship for combinations of springs in series and parallel

To use these relationships to contribute to a measurement of the property of a material independent of its shape.

Below and on the back of this sheet are the instructions you need to follow to complete this experiment. You should be aiming to complete the practical within the hour to give you a really good understanding of how practicals are completed in Physics at A level.

Equipment:

Springs

100g masses

1kg mass

Stand with boss and clamp

Metre rule

Safety goggles

Original measurements:

Original length of spring:

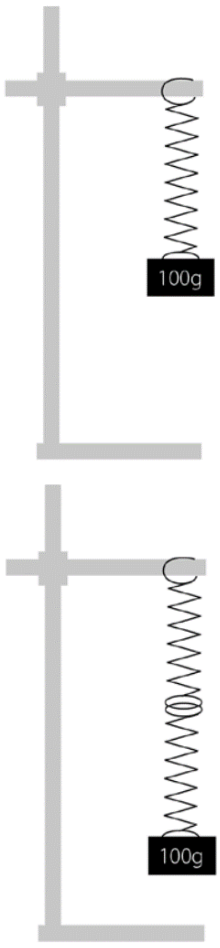
Maximum load to spring:

Health and safety: Safety goggles must be worn at all times due to the risk of the tensioned wire snapping and causing damage to eyes

Springs in series:

1. Measure the original length of the spring, *L*, and record overleaf.
2. Load the spring with 100g and determine the extension, *x*.
3. Connect two springs in series and measure the new extension.
4. Continue up to 5 springs.
5. Plot a graph of the number of springs, *N*, along the x-axis against extension on the y-axis.
6. Use this graph to calculate the strain given by (*x/NL*)

Experimental set up:



Results:

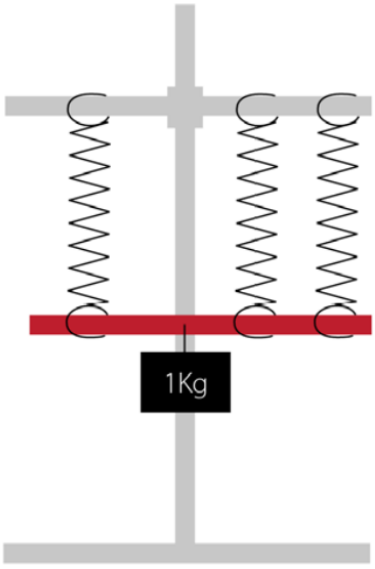
Be careful with your significant figures!

Number of springs in series	Extension of spring (m)

Springs in parallel:

1. Set up the apparatus with two springs.
2. Add a load of 1kg to the lower rod (shown in red)
3. Determine the extension which this produces
4. Compare this extension with that for one spring overleaf.
5. Estimate the anticipated extension of one spring with a 1kg mass.
6. Increase the number of springs to 3 and record the new extension.
7. Repeat this up to a maximum of six springs.
8. Note the relationship observed between the number of springs and extension.
9. Plot an appropriate graph to demonstrate this relationship.

Experimental set up:



Comments:

Compare this extension with that for one spring overleaf.

Estimate the anticipated extension of one spring with a 1kg mass.

Results:

Number of springs in parallel	Extension of spring (m)

Comments:

Note the relationship observed between the number of springs and extension.

Extension:

Young modulus = *(F/A)/(x/L)* spring constant *k=F/x*

Which of these constants relates solely to the material and is independent of shape, and which is a function of the shape of the object?

Explain how these two experiments support your conclusion.