Springs in Series and Parallel

Aim

To find out how the spring constant for systems of springs is related to that of a single spring.

Background

Each spring is described by Hooke's law, $F = k\Delta x$, for small extensions, Δx, of the spring.

What to do

1. By plotting a graph of applied force, F, against extension, Δx, find the spring constant, k (restoring force per unit extension) for a single spring. Do not exceed the elastic limit of the spring – use a mass range of 100g to 600g.
2. Connect two springs in series. Find out how the spring constant, k_s, for this system is related to k for the single spring.

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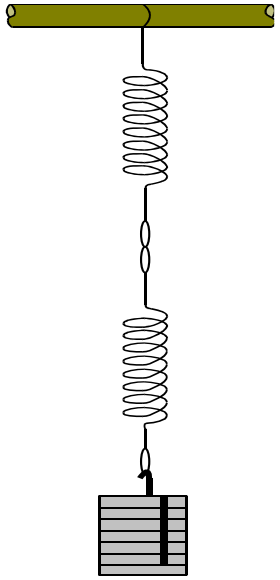
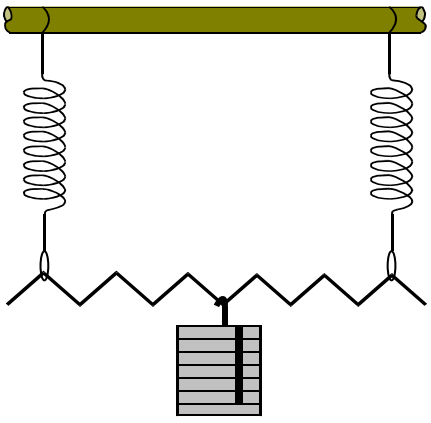


springs in 'series'

3. Now connect two springs in parallel so they jointly support the masses. Find the spring constant for this parallel arrangement, k_p, and find out how it is related to k for a single spring.



springs in 'parallel'

Measurements and observations

Think about table headings and units, decimal places and significant figures.

How did you ensure your measurements minimized systematic and random errors?

Results Table

Can you work out….

The spring constants k, k_s and k_p

. A general rule relating the spring constant of a system of identical springs connected in series or parallel to the spring constant of a single spring.

Use your graph to predict the extension using a mass of 800g. What assumption have you made?