

The Sun on the Floor

Physics experiments that can be performed at home

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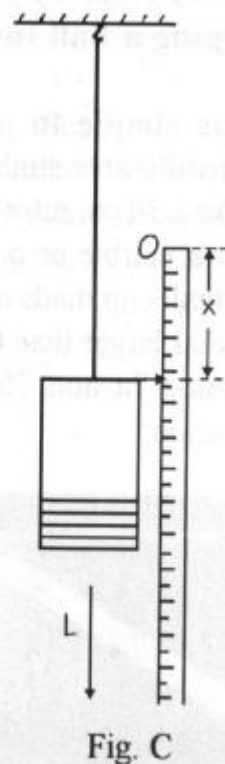
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Does a Rubber Band Obey Hooke's Law?

This experiment is recommended for students of any age. (See Fig. C). One of the possible set-ups is shown on Photo 6. A large aluminium can has been suspended from a rubber band attached to a door knob. A ruler fixed to the door allows the extension x to be determined. As a load L one can use tea-spoons of water, portions of sand, pins, coins, nails, or standard weights if such are available.

You are advised to do this experiment in small steps by loading and unloading the can. This way you can see at what load the elastic limit is exceeded. One can go on increasing the load until the rubber band breaks.

Some students notice that when a certain extension is reached the effect of plastic deformation can be observed. Extension may increase with time, so the technique of reading the extension must be different now than it was with smaller loads.



Much information can be obtained from the load-extension graphs for different samples of rubber bands.

You may be astonished about the size of the load a thin rubber band can withstand.

We found this experiment especially useful for discussion of the errors of measurement, the need for a best fit line, the limited applicability of Hooke's Law even for the best quality springs, the differences between the "loading graph" and the "unloading graph", etc. There are

a number of ways of studying the elastic properties of materials. One can support a ruler at the ends and load it in the centre. One can clamp a bicycle spoke horizontally at one end and load it on the other. In each case a graph of distortion versus load could be obtained, elastic limit determined, or Young's modulus calculated.