1. A spring is 20 cm long when a load of 10 N is hanging from it, and 30 cm long when a load of 20 N is hanging from it. Draw a graph to work out the length of the spring when: a] there is no load on it; b] there is a load of 5 N on it.

**(Plot x = load, y = spring length)**

1. In a spring experiment, the results were:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| load **(N)** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| length (mm) | 50 | 58 | 70 | 74 | 82 | 90 | 102 | 125 |
| extension (mm) |  |  |  |  |  |  |  |  |

* 1. What is the length of the spring when unstretched?
  2. Copy and complete the table.
  3. Plot a graph of the data. **(Plot x** = **load,** y = **spring extension)**
  4. One of the results is wrong.

(i)Which? (ii) What should the result be?

e] Mark the elastic limit on your graph.

f] What load would give an *extension* of 30 mm?

g] What would be the spring *length* for a load of 4.5 N?

1. Some students carry out an experiment to find out how a spring stretched when loads were added to it. a] Draw a labelled diagram to show what is meant by the extension of the spring. The results of the experiment are shown in the table. One of the readings is incorrect.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| load (N) | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 |
| extension (mm) | 0 | 16 | 32 | 58 | 64 | 80 | 96 | 112 |

b] Use these results to plot a graph. **(Plot x = load,** y **= spring extension)** c] Use your graph to find (i) the extension when the load is 3 N;

(ii) the foad which produces and extension of 40 mm.

d] Label the incorrect point on the graph with the letter E.



1. **(EXTENSION)** An engineer needs to know how far a long beam will sag under a load. The table shows some results:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| load (N) | 1000. | 2000 | 3200 | 4400 | 5200 | 6500 |
| saQ (cm) | 2.0 | 4.0 | 6.6 | 8.8 | 10.4 | 13.4 |

* 1. Plot a graph of the sag against load. **(Plot x = load, y = sag)**
  2. One of the measurements for sag is wrong.

1. Which? (ii) What should the result be?

c] What would be the sag for a load of 4500 **N?** d] What load would give a sag of 5.2 cm?

e] Would a longer beam sag more or less? Sketch its graph on the same axes.