B9 Energy, Springs and Materials

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Give numeric answers in SI form, without prefixes. Assume extension is proportional to tension in questions B9.1 - B9.5 & B9.7.

B9.1 A spring of natural length 50 cm is stretched to 56 cm when a force of 4.0 N is applied.

a) How much work is done on the spring to stretch it?

b) How much elastic potential energy (EPE) is stored in the spring?

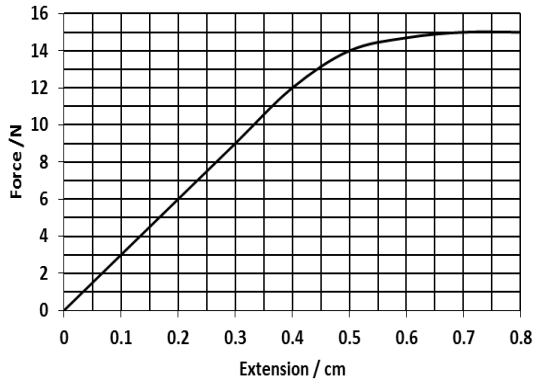
B9.2 A spring of natural length 30 cm with spring constant 8.0 N cm^{-1} stretches by an extra 20%. Work out how much elastic potential energy is stored in the spring.

B9.3 A spring with natural length 75 cm requires a force of 300 N in order for it to stretch to 85 cm. How much EPE would be stored in the spring if it were stretched to 90 cm?

B9.4 60 J of work is done to stretch a spring with spring constant 7.5 N cm^{-1} from its natural length of 0.24 m to some new length. Work out this new length.

B9.5 Calculate how much extra work must be done in order to stretch a spring from 17 cm to 20 cm, if its spring constant is 300 N m^{-1} and natural length 15 cm.

B9.6 Estimate the work done in stretching the spring in the graph below:



B9.7 A wire of natural length 50 cm, diameter 1.5 mm and Young's modulus 3.2 GPa is stretched to a new length of 52.4 cm, which is below the limit of proportionality. How much work was done in order for this to happen?