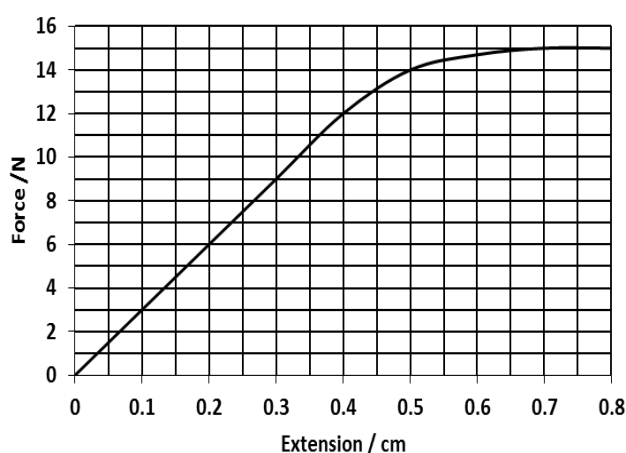## B9   Energy, Springs and Materials

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   An unstretched spring of length 30 cm with spring constant 8.0 N cm^{-1} is stretched by 20% of its original length. 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?