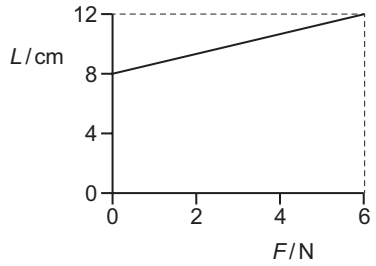
20 A spring is fixed at one end. The length L of the spring is increased by applying a tensile force F to the other end.

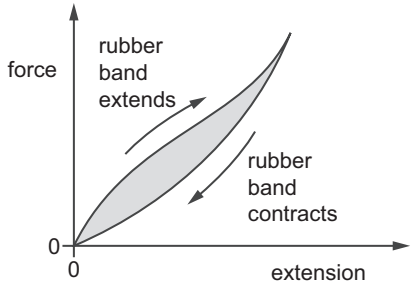
The graph shows the variation of L with F.



What is the elastic potential energy of the spring when F is 6.0 N?

A 0.12 J **B** 0.24 J **C** 0.36 J **D** 0.60 J

23 The diagram shows a force–extension graph for a rubber band as the band is extended and then the stretching force is decreased to zero.



What can be deduced from the graph?

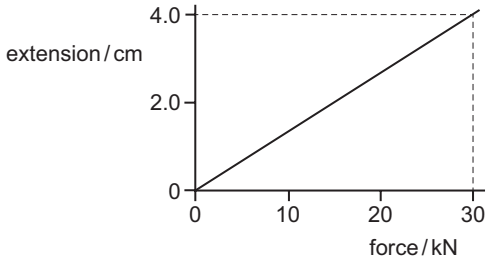
A The rubber band does **not** return to its original length when the force is decreased to zero.

B The rubber band obeys Hooke's law for the extensions shown.

C The rubber band remains elastic for the extensions shown.

D The shaded area represents the work done in extending the rubber band.

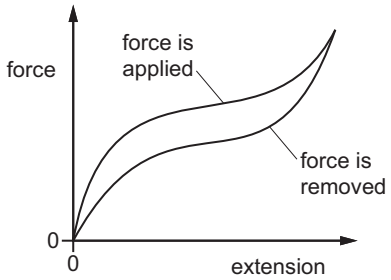
23 The graph shows how the extension of a spring varies with the force used to stretch it.



What is the elastic potential energy of the spring when the extension is 4.0 cm?

A 60 J **B** 120 J **C** 600 J **D** 1200 J

21 The graph shows the variation in extension with force for a sample of rubber.



The top line shows the variation in extension as a force is applied.

The bottom line shows the variation in extension as the force is removed.

What is represented by the area between the two lines?

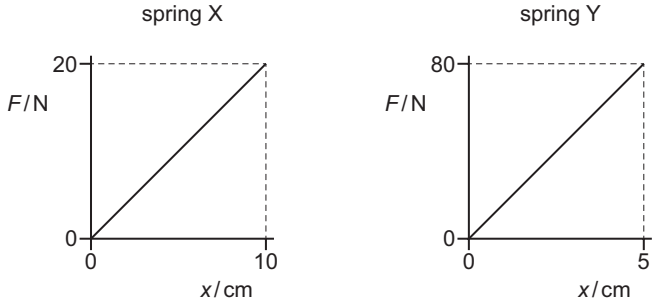
A the work done as the force is applied

B the work done as the force is applied minus the work done as the force is removed

C the work done as the force is removed

D the work done as the force is removed plus the work done as the force is applied

22 Two springs X and Y stretch elastically. The graphs show the variation with extension x of the force F applied to each spring.



Which statement is correct?

A When each spring is given the same extension, the energy stored in Y is 4 times the energy stored in X.

B When each spring is given the same extension, the energy stored in Y is 8 times the energy stored in X.

C When the same force is applied to each spring, the energy stored in Y is 4 times the energy stored in X.

D When the same force is applied to each spring, the energy stored in Y is 8 times the energy stored in X.

23 Which phrase describes the strain at the elastic limit on a stress–strain graph?

A the maximum strain below which Hooke's law is obeyed

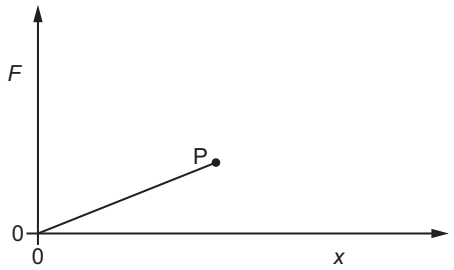
B the maximum strain below which the deformation is plastic

C the minimum strain above which Hooke's law is obeyed

D the minimum strain above which the deformation is plastic

23 A wire of length L is stretched to determine its limit of proportionality.

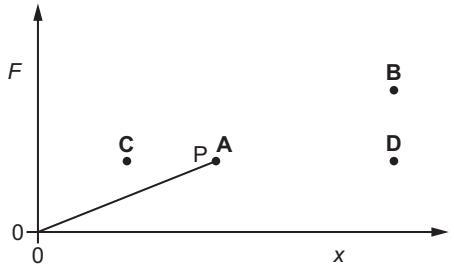
The graph shows the variation of the extension x with the force F applied to the wire.



The limit of proportionality is shown by point P on the graph.

The experiment is repeated with another wire of length $2L$ but of the same material and same diameter as the first wire.

Which point on the graph shows the limit of proportionality for the new wire?



18 A spring of unstretched length 0.10 m is suspended vertically from a support.

A weight of 2.0 N is attached to the bottom of the spring and its length increases to 0.15 m.

An additional weight of 4.0 N is then added to the bottom of the spring.

The spring obeys Hooke's law.

How much extra elastic potential energy is stored in the spring due to the addition of the 4.0 N weight?

A 0.067 J **B** 0.13 J **C** 0.20 J **D** 0.40 J

19 A wire is extended by a tensile force so that its deformation is elastic.

What is meant by elastic deformation?

A The extension of the wire is proportional to the tensile force.

B The extension of the wire is **not** proportional to the tensile force.

C When the tensile force is removed, the wire does **not** return to its original length.

D When the tensile force is removed, the wire returns to its original length.