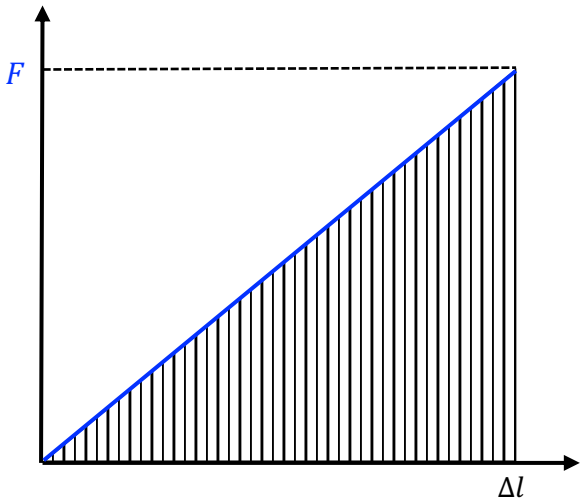
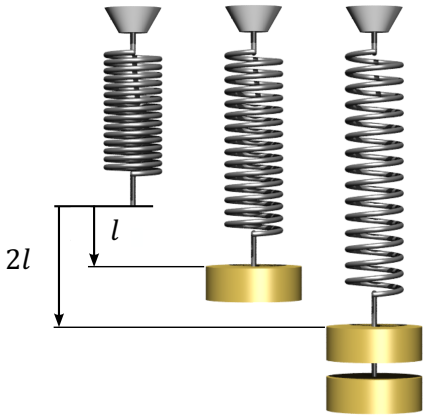
4.10.2 Area under the stress-strain graph

videos

We have already seen that the area under a force-extension graph is a measure of the energy stored in a spring.

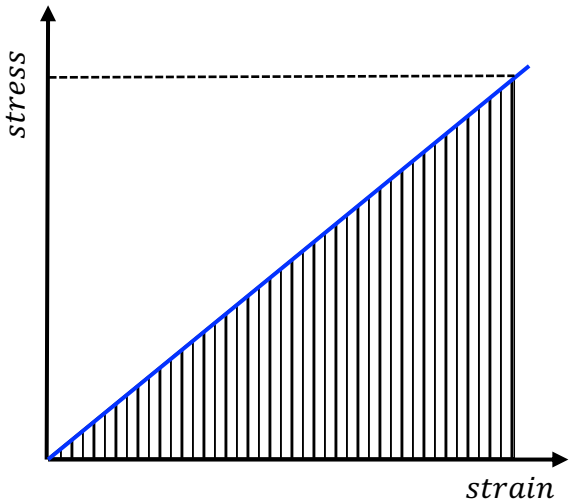




(1) The energy stored in a spring is the area under the graph, above. Write an expression for energy in terms of F and Δl.

(2) Using Hooke's law (F=kΔl), substitute for F in your expression above, to obtain a formula for the energy stored in a stretched spring.

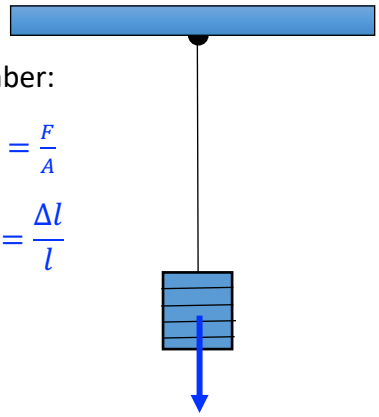
Now consider the stress-strain graph.



Remember:

$$stress = \frac{F}{A}$$

$$strain = \frac{\Delta l}{l}$$



(3) What does the area under the stress-strain graph represent? Hint – work out ½ × stress × strain, substituting in the formulae above.

Techniques for measuring Young's Modulus

Have a look at the following web link to see how the Young modulus is obtained experimentally.

http://www.cyberphysics.co.uk/topics/forces/young_modulus.htm

(4) Sketch a diagram of the experimental setup, below.

(5) Why are two wires used?

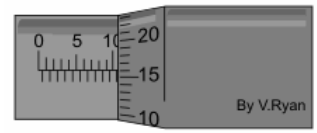
(6) To see how a vernier measuring device works, have a look at the following:

https://tinyurl.com/ycadd4lf

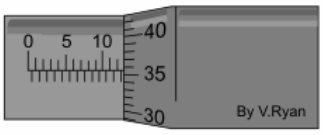
(7) The screw-guage micrometer is used to measure the diameter of the metal wire. Have a look at the following web link to see how it works and work out the readings on the micrometers, below:

http://www.technologystudent.com/equip1/microm1.htm

diagram from www.technologystudent.com



ANSWER: _____



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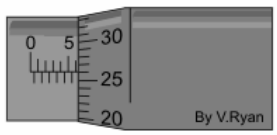

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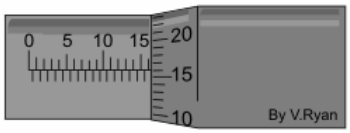

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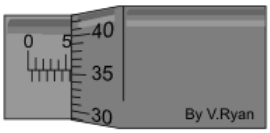

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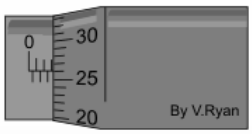

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