

Young Modulus Past Paper Questions

Name

1. As part of a quality check, a manufacturer of fishing line subjects a sample to a tensile test. The sample of line is 2.0 m long and is of constant circular cross-section of diameter 0.50mm. Hooke's law is obeyed up to the point when the line has been extended by 52mm at a tensile stress of 1.8×10^8 Pa. The maximum load the line can support before breaking is 45 N at an extension of 88 mm.

(a) Calculate

(i) the value of the Young modulus,

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(ii) the breaking stress (assuming the cross-sectional area remains constant),

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(iii) the breaking strain.

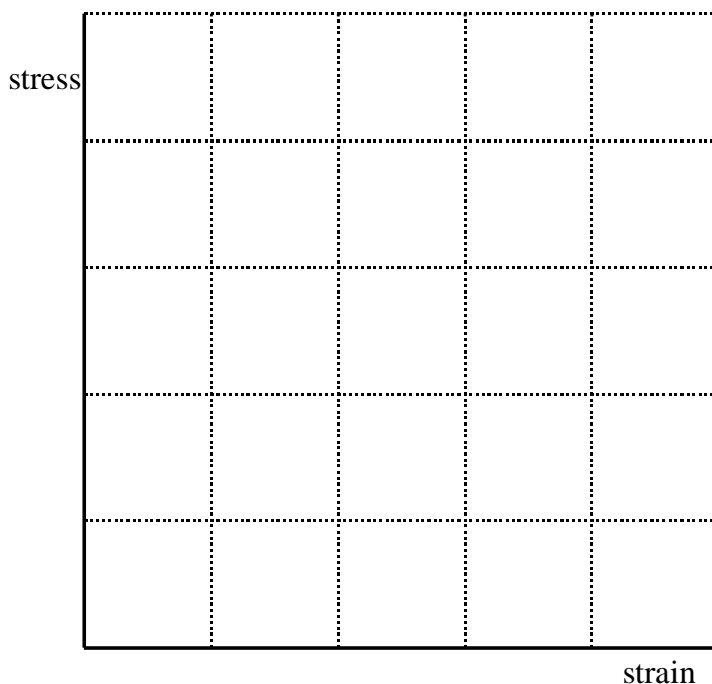
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(5)

(b) Sketch a graph on the axes below to show how you expect the tensile stress to vary with strain. Mark the value of stress and corresponding strain at

(i) the limit of Hooke's law,

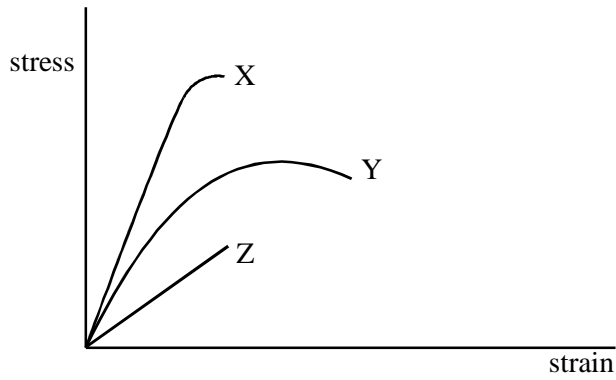
(ii) the breaking point.



(4)

(Total 9 marks)

2. The diagram shows tensile stress-strain curves for three different materials X, Y and Z.



For each material named below, state which curve is typical of the material, giving the reasoning behind your choice.

(a) copper

reasoning
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(b) glass

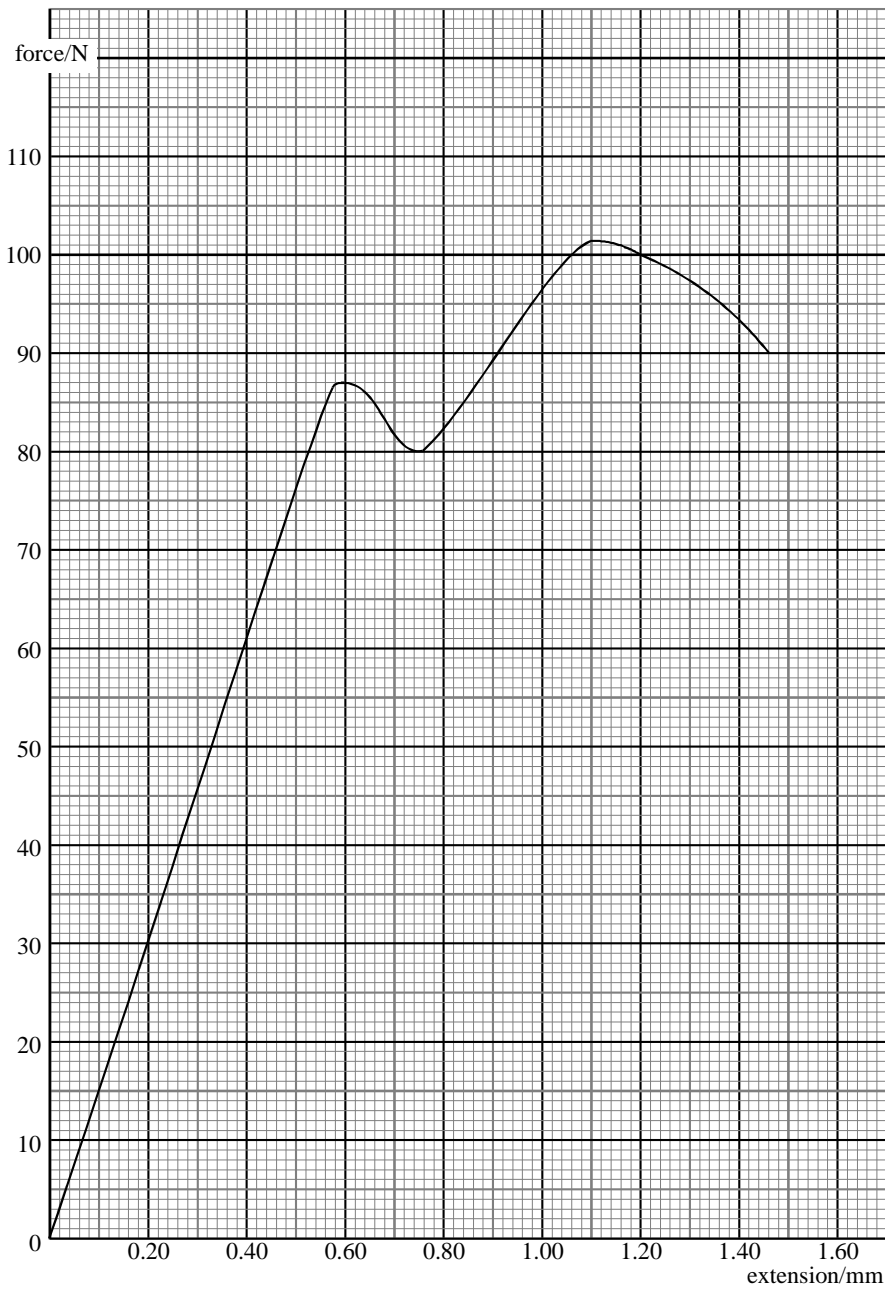
reasoning
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(c) hard steel

reasoning
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(Total 6 marks)

3. A student carries out an experiment to investigate how the extension of a steel wire varies with an increasing tensile force. The results of the experiment are shown plotted on the graph. The initial length of the wire is 0.50m and its diameter is 0.80 mm. The wire breaks at an extension of 1.46 mm.



Use information from the graph to determine the Young modulus for the material:

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Use information from the graph to estimate the yield stress for the material:

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(Total 6 marks)

4. (a) (i) Draw and label suitable apparatus required for measuring the Young modulus of a material in the form of a long wire.

(ii) List the measurements you would make when using the apparatus described in part (i).

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(iii) Describe briefly how the measurements listed in part (ii) would be carried out.

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(iv) Explain how you would calculate the Young modulus from your measurements.

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(Total 13 marks)