Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Mechanics And Materials

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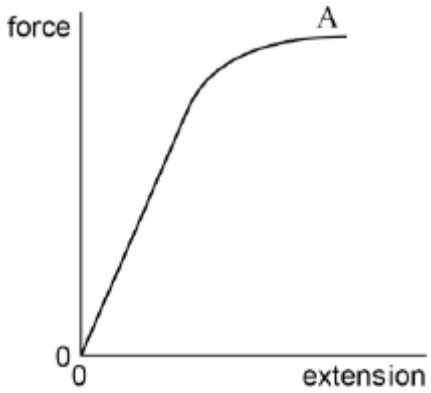
Name of the Student:_____
Max. Marks : 16 Marks **Time : 16 Minutes**

Q1.

A student adds a series of masses to a vertical metal wire of circular cross–section and measures the extension of the wire produced. The figure below is a force-extension graph of the data.



(a) Mark on the figure the point P, the limit beyond which Hooke's law is no longer obeyed.

(1)

(b) Outline how the student can use these results and other measurements to determine the Young modulus of the wire.

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(3)

(c) When the wire has been extended to A, the masses are removed one by one and the extension re-measured.

Draw, on the figure above, the shape of the graph that the student will obtain.

(1)

(d) Explain why the graph has the shape you have drawn.

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(2)

(e) The metal wire is used to make a cable of diameter 6.0 mm. The Young modulus of metal of the cable is 2.0×10^{11} Pa.

Calculate the force necessary to produce a strain of 0.20% in the cable.

force = _____ kN

(3)

(f) The cable is used in a crane to lift a mass of 600 kg.

Determine the maximum acceleration with which the mass can be lifted if the strain in the cable is not to exceed 0.20%.

acceleration = _____ m s^{-2}

(3)

(g) An engineer redesigns the crane to lift a 1200 kg load at the same maximum acceleration.

Discuss the changes that could be made to the cable of the crane to achieve this, without exceeding 0.20% strain.

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(3)

(Total 16 marks)