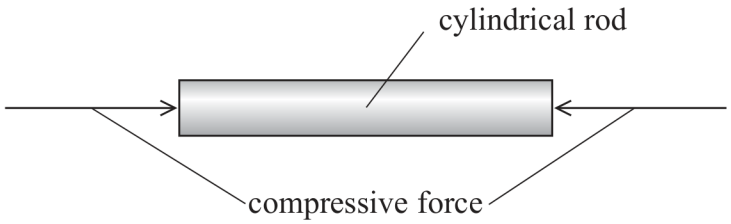
14 An engineer is designing a metal part for a machine. The part is in the form of a cylindrical rod. The part is designed to behave elastically when compressive forces are applied, as shown.



(a) State what is meant by elastic deformation.

(1)

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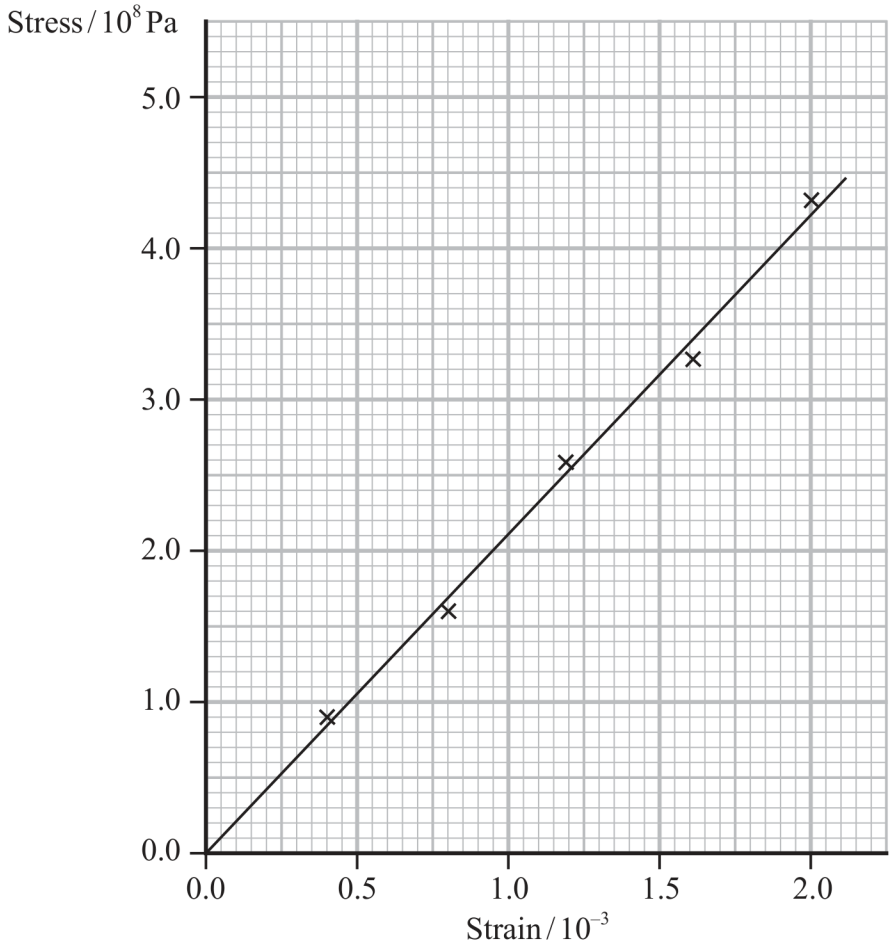
(b) A compressive stress-strain graph for one metal is shown.



DO NOT WRITE IN THIS AREA

(i) Show that the Young modulus for this metal is about 2×10^{11} Pa.

(2)

(ii) The metal part must not compress more than 0.60 mm when a force of 9.5×10^{5} N is applied.

Deduce whether this metal is suitable for the part.

length of part = 0.84 m
cross-sectional area of part = 4.8×10^{-3} m^2

(4)

(Total for Question 14 = 7 marks)