AML 750: Modern Engineering Materials — Major Test

AML 751: Materials for Marine Vehicles — Max. Marks: 60

Name	
Registration Number	

Note: Answer only inside the boxes (except labeling of axes)

1) [24]

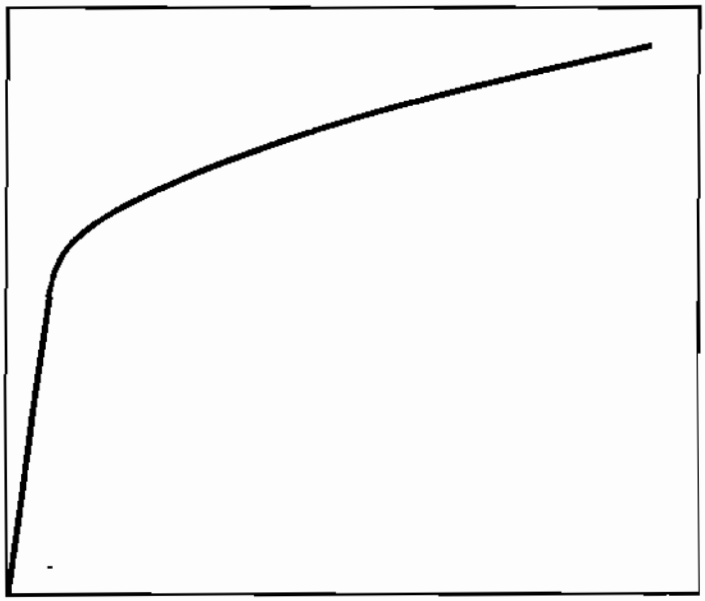
The figure below shows the plot of the result of an uniaxial tension experiment on a polycrystalline metallic specimen till fracture.

a) Label the axes (symbols and words) and the parts of the curve. *(answer part a and b in the figure box)*

b) Explain the mechanisms operating giving rise to the various points and regions on the curve.

c) Replot the data shown in the curve with an alternate set of axes which highlight any instabilities arising during the experimcnt and cxplain the differenees with this curve. *(Answer part c in the empty box).*

d) Are there other kinds of such curves (i.e. with major qualitative differences), which can be seen for polycrystalline metallic materials (i.e. differcnt from the figure)? If yes, give examples with figures. If no, explain why this figure is a standard result.



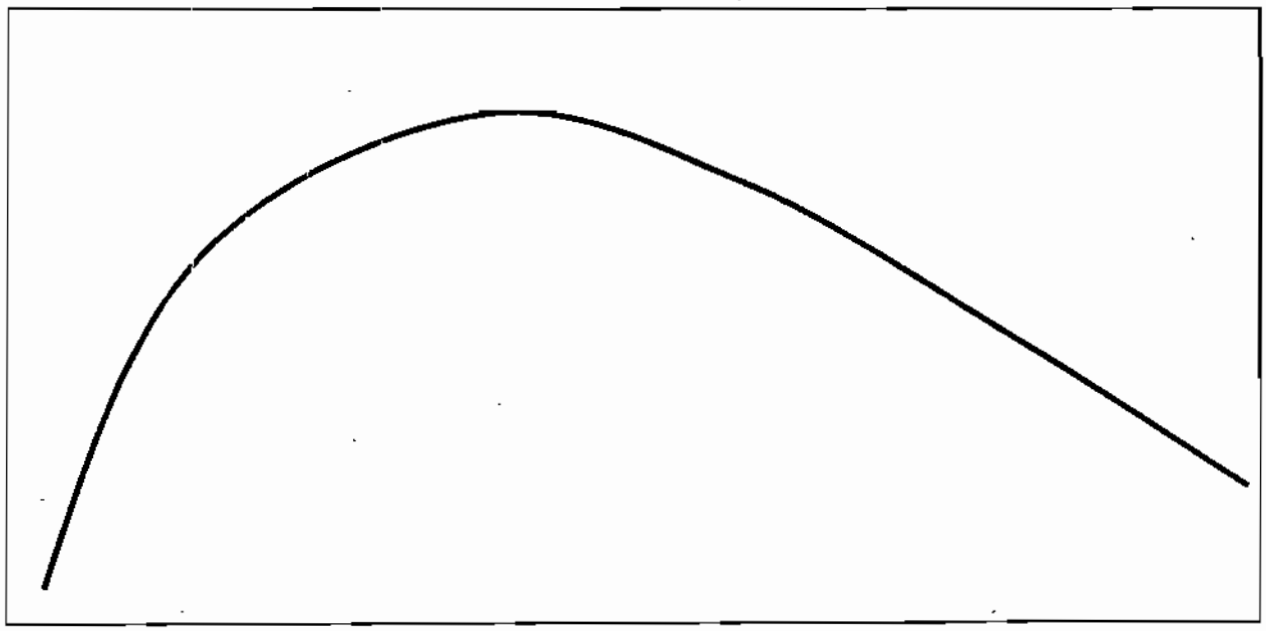
Answer Part d here

2) [20]

In 'precipitation hardening' of an Al- 4% Cu alloy:

a) Outline the process steps used to achieve peak hardness along with the reasons for the choice of steps and the overall process.

b) The hardening curve obtained (at 200°C) is shown in the figure below. Label the axes (with emphasis on scale) and indicate at various parts of the curve the source of hardening and the mechanisms operative.



3) [16]

Calculate the surface enthalpy of a hypothetical cubic close packed crystal (a = 5 Å), where the external surface is of {110} type? Bond energy of material is 10^{-19} J per bond.