PHY245 Materials Homework Number Two.

To be handed in on Friday the 22nd January 2016

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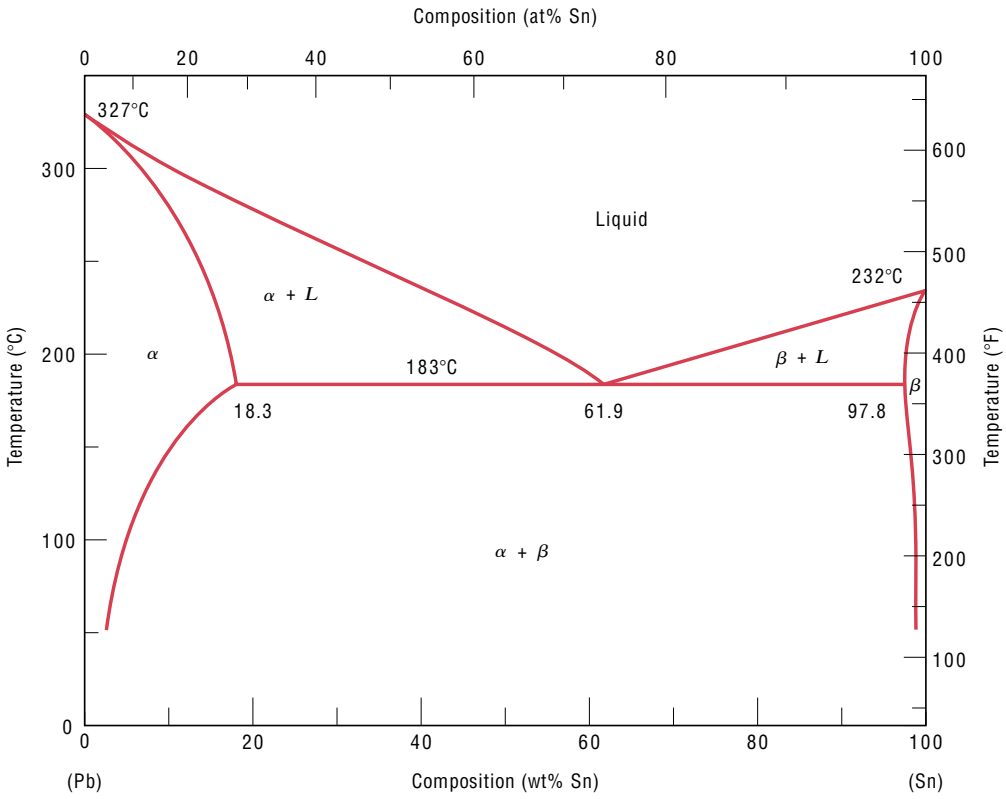
03/12/2015

1.) Draw the stress-strain diagram including an engineering stress-strain curve for a ductile metal, indicate on the diagram the following;
(a) The resilience of the material (1)
(b) The yield strength at a strain offset of X (1)
(c) The true stress-strain curve (1)
(d) The tensile strength (1)
(e) The elastic limit (1) [5 Marks]

2.) Derive an expression for root mean square (rms) micro state diffusion of particles from a common origin. (4)
State any assumptions you make (3). State why the rms diffusion is more useful than the average displacemnt. (2)
Use this equation to define the diffusion coefficient (1) [10 marks]

3.) On the next page is the Lead-Tin phase diagram.
For a 40 wt% Sn?60 wt% Pb alloy at 150 C,
(a) What phase(s) is (are) present? (2)
(b) What is (are) the composition(s) of the phase(s)? (4)
(c) Calculate the relative amount of each phase present in terms of mass fraction (4) [10 Marks]


Composition (at% Sn)
0
20
40
60
80
100
327°C
Liquid
232°C
α + L
α
183°C
β + L
β
18.3
61.9
97.8
α + β
Temperature (°C)
Temperature (°F)
300
200
100
0
600
500
400
300
200
100
0
20
40
60
80
100
(Pb)
Composition (wt% Sn)
(Sn)