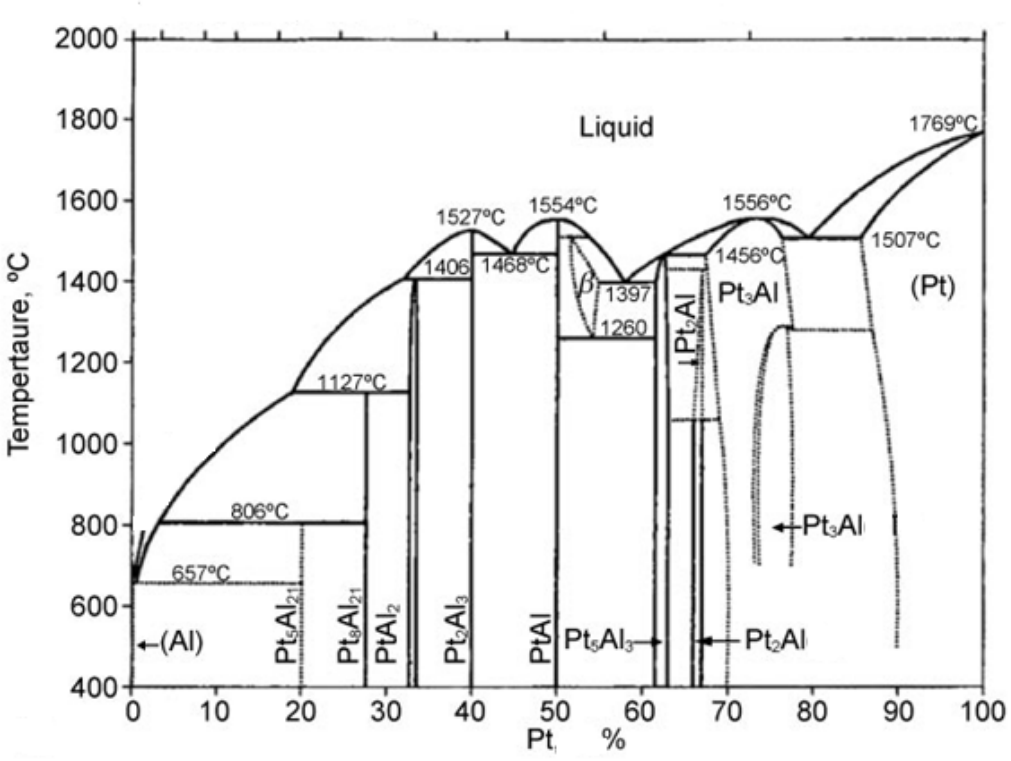
Aerospace Materials I. Final exam 20/01/2012

Name……

1. (1.5p) For potassium chloride (KCl), (a) verify that the compound has the cesium chloride structure and (b) calculate the packing factor for the compound. (rK+ = 0.133 nm and rCl- = 0.181 nm)

2. (1.5 p) The planar density of the (112) plane in BCC iron is 9.94 × 1014 atoms/cm2. Calculate (1) the planar density of the (110) plane and (2) the interplanar spacings for both the (112) and (110) planes. On which plane would slip normally occur?



3. (2p) In the above figure can be seen the Al-Pt phase diagram. Answer with an explaination when proceed:

   a) Maximum solubility of Pt in Al and Al in Pt, at temperature when it happens.

   b) Do the following alloys Al-15%Pt and Al-95% the same process capability under the technological point of view? Indicate at least one advantage and one disadvantage for each one to be processed.

c) Point out the differences between Pt5 Al21 and β?

d) Indicate three phases with congruent melting and three with non congruent melting.

e) Indicate present phases and it chemical composition for an alloy Al-25%Pt at 1400ºC, 1130ºC, 1000ºC, 810ºC y 600ºC

f) Explain the difference between the phases at 1000ºC and at 810ºC?

g) What happend at 1127ºC?

h) What happend at 1397ºC?

4. (1.5p) It was made a tensile test on a brass specimen of rectangular section with the following dimensions: 3,2 mm x 19,1 mm. With the data from the next table, answer the following questions:

Load (N)	0	1380	2780	5630	7430	8140	9870	12850	14100	14300	13830	12500
Length (mm)	63,50	63,53	63,58	63,63	63,70	63,75	64,14	65,41	66,68	67,95	69,22	70,49
σ_n (MPa)												
ε_n												

a) Plot the data in terms of nominal stress vs. Strain.

b) Calculate the Young Modulus. (E= 40GPa)

c) Determinate the Yield Strength (σy=150 MPa)

d) Determinate the Ultimate Tensile Strength (R=234 MPa)

e) Calculate de Resilience Modulus (Ur= 0.28 MPa)

5. (1.5p) It has been designed a composite material with an epoxi matrix and reinforced with continous fibres in longitudinal position. The composite should have a maximum amount of reinforcement of 40% in volume and the minimum values of young Modulus and Tensile Strength are, respectively, 5.5·104 and 1.2·103 Mpa. As reinforcing materials are available grass fibers, carbon fobers and aramide fibers. Calculate for the three reinforcements the value for Ec and σc. Which of those reinforcements is best candidate for the required properties? Why?

Material	σ (MPa)	E (GPa)
Epoxi	69	3,1
Glass fiber	2000	72
C fiber	3500	350
Aramide fiber	3500	124

6. (0.5p) Compare, in general terms, the electrical conductivity of metals, ceramis and polymers. Why the electrical conductivity in metals, ceramics and polymers are so different.

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7. (0.5p) Explain the difference between the Neel temperature and the Curie temperature in magnetic materials. WHy is important to know the value of these temperatures.

8. (0.5p) Indicate some structural differences between ceramic and glasess. What is the main difference between their processing methods?

9. (0.5p) How id the effect, in termoplastic polymers, of the strain rate and the temperature on the strength/strain of the material.

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