Assignment-III

Heat treatment and Surface hardening – II

NPTEL-Mooc-3rd week

1. 15 g of gold and 25 g of silver are mixed to form a single phase ideal solution in solid state. If the free energies of pure Au and pure Ag in solid state at 773 K are taken as zero, the chemical potential of Au will be
   a) -8986.9 J/mol.
   b) -5962.3 J/mol.
   c) -12326.7 J/mol.
   d) -2367.7 J/mol.
2. In question no. 1 the chemical potential of Ag will be
   a) -735.6 J/mol.
   b) -990.2 J/mol.
   c) -1831.7 J/mol.
   d) -3272.8 J/mol.
3. In question no. 1, if one atom of Au is added to the solution, the free energy of the solution at 773 K will change by
   a) -8.5×10^{-18} J
   b) -9.5×10^{-19} J
   c) -7.5×10^{-17} J
   d) -1.5×10^{-20} J
4. An alloy contains 60% A, 39.9% B and 0.1% C has two phases α and β at temperature and pressure of 500 K and 1 atm. The two phases will be in equilibrium if
   a) chemical potentials of A, B and C are same in both the phases
   b) chemical potentials of A and B are same in both the phases
   c) crystal structure of both the phases remains same
   d) conditions of both the option (a) and (c) must satisfy
5. For an ideal solution between A and B, the composition for which molar Gibbs free energy of mixing is minimum at temperature and pressure of 300 K and 1atm, respectively
   a) $X_A = 1$, $X_B = 0.5$,
   b) $X_A = 2$, $X_B = 0$,

c) $X_A = 0.5, X_B = 0.5$

d) $X_A = 0.5, X_B = 2,$

6. The composition for which molar Gibbs free energy of the ideal solution is minimum

a) $X_B/ X_A = 0.5 \exp ((G_A^\circ - G_B^\circ)/RT)$

b) $X_B/ X_A = \exp ((2G_A^\circ - G_B^\circ)/RT)$

c) $X_B/ X_A = \exp ((G_A^\circ - G_B^\circ)/RT)$

d) $X_B/ X_A = \exp ((G_A^\circ - 2G_B^\circ)/RT)$

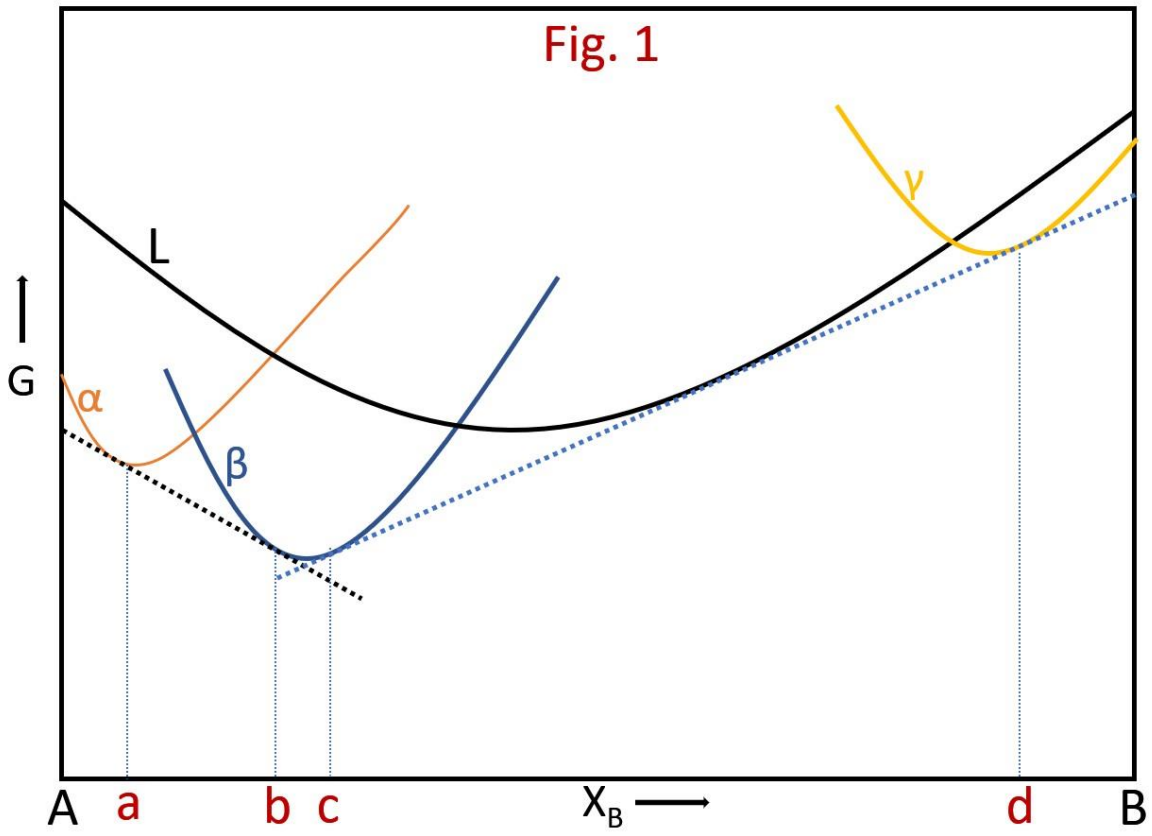
7. In an alloy containing two phases α and β at constant temperature and pressure, if chemical potential of element A is more in phase α than that of element A in phase β, this will lead to

a) no change in concentration of α to β

b) accumulation of A atoms at α/β interface

c) migration of A atoms from α to β

d) migration of A atoms from β to α



8. In the G-X plot shown in Fig. 1, the phases which exist in the region **a-b** will be

a) α

b) β

c) α + β

d) α + β + L

9. In the G-X plot shown in Fig. 1, the phases which exist in the region **b-c** will be

a) α

b) β

c) α + β

d) α + β + L

10. In the G-X plot shown in Fig. 1, the phases which exist in the region **c-d** will be

a) γ

b) β

c) α + β

d) β + L + γ