Asssignment-2

Heat treatment and Surface hardening – II

NPTEL-Mooc-2nd week

1) Which of the following assumptions, in general, are valid for formation of binary solid solution of A and B with same crystal structure.

a) Different crystal structure of A and B, and can be mixed in all proportion of A and B.

b) Same crystal structure of A and B, and can be mixed in all proportions of A and B.

c) Different crystal structure of A and B, but **can-not** be mixed in all proportion of A and B.

d) Same crystal structure A and B, but **can-not** be mixed in all proportions of A and B.

2) The change of equilibrium transformation temperature (ΔT) of α-iron into γ-iron for raising pressure from 1 to 100 atmosphere will be

a) –0.78 K

b) –0.89 K

c) –0. 95 K

d) +1.0 K

Use following data: T_{tr} (transformation temperature) at 1 atm. pressure is 1183 K, ΔH_{tr} ($\alpha \rightarrow \gamma$) $=9.0\times10^{-3} m^3$.atm/mol, ΔV_{tr} ($\alpha \rightarrow \gamma$) = – 0.06×10^{-6} m^3/mol. Hint: use Clapeyron equation and $\Delta T = \frac{dT}{dP} \times \Delta P$.

3) The change in free energy of mixing (ΔG_{mix}) for ideal binary solid solution when 1 mole of A is mixed with 2 mole of B at 220 ºC is:

a) –2045 J/mol.

b) –2586.3J/mol.

c) - 3340 J/mol.

d) 4500 J/mol.

4) 10 g of gold and 25 g of silver are mixed to form a single- phase ideal solid solution. The mole fraction of gold and silver are: (given that the atomic weight of gold and silver are 196.97 and 107.87 g/mole, respectively).

a) 0.18 and 0.82, respectively.

b) 0.12 and 0.88, respectively.

c) 0.10 and 0.90, respectively.

d) 0.13 and 0.87, respectively.

5) If iron (saturation vapor pressure of 1.3×10^{-4} mbar corresponding to temperature of 1196 ºC) and Cr (saturation vapor pressure of 1.3×10^{-4} mbar corresponding to temperature of 993 ºC) were placed in furnace maintained at temperature of 990 ºC and pressure of 1.3×10^{-4} mbar. Then, which of following statement is **correct.**

a) Iron has higher tendency to form vapors than Chromium.

b) Chromium has higher tendency to form vapors than Iron.

c) Both having same tendency.

d) None of these.

6) Which of the following expression is correct for molar entropy of mixing (ΔS_{mix}) and molar free energy of mixing (ΔG_{mix}) of binary ideal solid solution of elements A and B, respectively.

a) $\Delta S_{mix} = -R (X_A \ln X_A + X_B \ln X_B)$ and $\Delta G_{mix} = RT (X_A \ln X_A + X_B \ln X_B)$.

b) $\Delta S_{mix} = -R (X_B \ln X_A + X_A \ln X_B)$ and $\Delta G_{mix} = RT (X_B \ln X_A + X_A \ln X_B)$.

c) $\Delta S_{mix} = RT (X_B \ln X_A + X_A \ln X_B)$ and $\Delta G_{mix} = -R (X_B \ln X_A + X_A \ln X_B)$.

d) $\Delta S_{mix} = RT (X_A \ln X_A + X_B \ln X_B)$ and $\Delta G_{mix} = - R (X_A \ln X_A + X_B \ln X_B)$.

7) The configurational entropy (S_1) before mixing of elements A and B and its value is:

a) k ln ω and its value is 1, respectively.

b) ω ln k and its value is 0, respectively.

c) Both (a) and (b).

d) Neither (a) nor (b).

8) The change in entropy ($\Delta S_{confi.}$) accompanying the formation of a binary ideal solution (of A and B) is **dependent** upon:

(a) Temperature.

(b) Mole fractions of A and B.

(c) Both (a) and (b).

(d) None of these.

9) In question 4, what will be the molar entropy of mixing?

a) 5.6 J/mol. K

b) 4.9 J/mol. K

c) 3.9 J/mol. K

d) 7.2 J/mol. K

10) In question 4, what will be the molar Gibbs free energy of mixing ($\Delta G_{mix.}$) at 500 K considering ($\Delta H_{mix}=0$)?

a) –1970 J/mole

b) –900 J/mole

c) –1850 J/mole

d) –1870 J/mole