Daily Tutorial Sheet-10	Level-2

116.(B) For a reaction to be spontaneous ΔG must be negative. According to relationship of ΔG,

$$\Delta G = \Delta H - T \cdot \Delta S$$

If ΔH and ΔS both are positive, then term T. ΔS will be greater than ΔH at high temperature and consequently ΔG will be negative at high temperature. (Boiling point of water) and reaction becomes feasible.

117.(B) Entropy of vapour is higher than liquid higher than solid.

118.(C) $\Delta G = \Delta H - T\Delta S$

If $\Delta G = -ve \Rightarrow$ reaction is spontaneous $\Delta H > 0$ and $\Delta S > 0$

It implies that entropy term can make ΔG negative which is possible at higher temperature.

119.(A) $\Delta G = \Delta H^\circ - T\Delta S^\circ = \left(179.1 - \frac{298 \times 160.2}{1000}\right) kJ / mol = 179.1 - 47.74 = 131.36\, kJ = +ve$

$\Rightarrow$ non-spontaneous at 298K.

Let at T, reaction is spontaneous.

$\Delta G \le 0 \Rightarrow \Delta H - T\Delta S \le 0$

$$T \ge \frac{\Delta H}{\Delta S} = \frac{179.1 \times 1000}{160.2} K$$

$T \ge 1118\, K$

120.(D) $\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3$

$$\Delta S = 50 - \left(\frac{1}{2} \times 60 + \frac{3}{2} \times 40\right) = 50 - 90 = -40\, kJ / mol$$

$\Delta G = 0 = -30 \times 10^3 - T \times (-40)$

$40T = 30 \times 10^3 \Rightarrow T = 750\ K$

121.(C) $\Delta G = \Delta G^\circ + RT\ell nQ$

At equilibrium $\Delta G = 0$ and $\Delta G^\circ = \Delta H - T\Delta S^\circ$ and $Q = K$

$$\ell nK = -\frac{\Delta H^\circ - T\Delta S^\circ}{RT}$$

122.(D) $\Delta S = -ve$

$\Delta H = -ve$

$\Delta G = \Delta H - T\Delta S$

For a reaction to be spontaneous ; $\Delta G = -ve$ which can be below a certain temperature only

123.(B) $\Delta G = \Delta H - T\Delta S = -2808 - 310 \times 182.4 \times 10^{-3} = -2864.5\ kJ$

124.(A) Since, expansion occurred at constant temperature,

$$\Delta S = nR \ln \frac{V_2}{V_1} = \frac{1}{32} \times 8.314 \ln \frac{3.0}{0.75} = 0.36\ JK^{-1}$$

Since, this is case of free expansion, $P_{ext} = 0 \Rightarrow -W = P_{ext}\Delta V = 0, q = 0$

Also, since, $\Delta T = 0 \Rightarrow \Delta H = \Delta E = 0$.

125.(B) $Cu_2O(s) + \frac{1}{2}O_2(g) \rightleftharpoons 2CuO(s)$

$\Delta G^{\circ}_{reaction} = [2 \times (-30.4)] - (-34.98) = -25.82$ kcal

and $-25.82 \times 10^3 = -2.303 \times 2 \times 298 \log K$

$\therefore$ $K \approx 10^{19}$, a very high value, hence reaction will be almost complete with a trace of Cu_2O.