Daily Tutorial Sheet-9	Level-2

106.(ACD) Absolute value of heat content, internal energy and Gibbs energy of the system can not be calculated. Absolute value of entropy can be calculated.

107.(ACD) $H_2O(s) \longrightarrow H_2O(\ell)$ [spontaneous process because $\Delta G < O$; $\Delta S < O$]

108.(A) $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(g) \qquad \Delta_r H^\circ_{298\,K} = -241\,kJ/mol^{-1}$

$$\Delta_r H^\circ_{373\,K} = \Delta_r H^\circ_{298\,K} + \Delta C_P(T_2 - T_1) = -241.8 + \left[(C_P)_{H_2O} - (C_P)_{H_2} - \frac{1}{2}(C_P)_{O_2}\right](373 - 298)$$

$$= -241.8 + [33.6 - 28.8 - \frac{1}{2} \times 29.4] \times (373 - 298) \times 10^{-3} = -242.6\,kJ/mol$$

109.(D) Larger the molecule, more is the entropy. Also, Entropy of a molecule is larger in gaseous state them in solid state.

$\Rightarrow \quad S_{C_2H_2} < S_{C_2H_6};\ S_{CO_2} > S_{CO};\ S_{I_2(s)} < S_{I_2(g)}$

110.(A) $Protein_A(S) \rightleftharpoons Protein_A(\ell)\ \Delta_r H_A = 2.73\,kcal/mol$

$Protein_B(S) \rightleftharpoons Protein_B(\ell)\ \Delta_r H_B = 3.0\,kcal/mol$

$\Delta S_A = \frac{\Delta_r H_A}{T_A} = \frac{2.73}{273} \times 10^3 = 10\,Jmol^{-1}K^{-1}$ and $\Delta S_A = \frac{\Delta_r H_B}{T_B} = \frac{3.03}{303} \times 10^3 = 10\,Jmol^{-1}K^{-1}$

111.(A) Using : $-\Delta_r G^\circ = RT\,\ell n\,K_{eq} \quad \Rightarrow \quad -\Delta_r G^\circ = 8.314 \times 298 \ln 10^{-14} = 7.99 \times 10^4\,J$

112.(B) $\Delta G = \Delta H - T\Delta S$ At equilibrium, $\Delta G = 0$

For a reaction to be spontaneous ΔG should be negative, so T should be greater than T_e.

113.(B) Standard Gibb's energy of formation (ΔG°_f) of a substance is defined as the Gibb's energy change when mole of the substance is formed from its elements in their standard states. The following reaction define ΔG°_f, $\frac{1}{2}H_2(g) + \frac{1}{2}F_2(g) \longrightarrow HF(g)$

114.(B)

$$\begin{tikzcd} C \arrow[r] \arrow[d] & D \arrow[d] \\ A & B \end{tikzcd}$$

Given, $\Delta S_{(A\to C)} = 50\,eu$

$\Delta S_{(C\to D)} = 30\,eu \quad ; \quad \Delta S_{(B\to D)} = 20\,eu$

Where, eu is entropy unit

Therefore, $\Delta S_{(A\to B)} = \Delta S_{(A\to C)} + \Delta S_{(C\to D)} + \Delta S_{(D\to B)}$

$$= \Delta S_{(A\to C)} + \Delta S_{(C\to D)} - \Delta S_{(B\to D)} = 50 + 30 - 20 = 60\,eu$$

115.(D) Variation of K_{eq} with temperature t is given by van't Hoff equation $\ln K_{eq} = -\underbrace{\frac{\Delta H^\circ}{R}}_{A} \cdot \frac{1}{T} + \underbrace{\frac{\Delta S^\circ}{R}}_{R}$

Slope of the given line is positive indicating that term A is positive thus ΔH° is negative. Thus, reaction is exothermic.