INDIAN SCHOOL MUSCAT
CLASS XI
CHEMISTRY WORK SHEET - 11
THERMODYNAMICS

1.	What will be the sign of entropy change for the following changes? a) In an isolated system, two identical gases are allowed to mix under identical conditions. b) $I_2(g) \rightarrow I_2(s)$ c) $H_2(g) + I_2(g) \rightarrow 2HI(g)$ d) Dissolution of sugar in water contained in a thermos flask.
2.	Calculate the K_c at 298 K for the reaction $H_2 + I_2 \rightleftharpoons 2HI$, if ΔG°_f (HI) = 1.3kJ/mole.
3.	For the equilibrium $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ at 25 ^{0}C, K= 1.8 x 10^{-7}. Calculate ΔG° of reaction.
4.	For the reaction $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$, calculate the ΔG at 600 K if enthalpy and entropy changes are –110kJ/mole and 150 J/Kmole.
5.	ΔH and ΔS for the reaction $Ag_2O \rightleftharpoons 2Ag + ½ O_2$ are 30.56 KJ/mole and 60 J/K respectively. Calculate the temperature at which the free energy change for this reaction will be zero. Predict whether the forward reaction will be favoured above/below this T.
6.	For the synthesis of NH_3, $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, calculate K_p at 300K if ΔH°_f of NH_3 as -46.2 kJ/mole and ΔS° for the reaction is 198.3 J/Kmole.
7.	Differentiate between a) closed system and an isolated system b) heat of formation and heat of reaction c) heat of hydration and heat of solution
8.	The ΔH_{vap} of water at 100^{o}C is 41kJ/mole. Calculate the internal energy change.
9.	Define C_v and C_p for an ideal gas. Derive a relationship between C_v and C_p.
10.	Calculate the ΔH^0_f of benzene if ΔH_{comb} of benzene, carbon and hydrogen are 3267, 393 and 286 kJ/mole respectively.
11.	The mean bond enthalpies of N≡N and H-H are 946 and 436 kJ/mole respectively. If heat of formation of ammonia is -46kJ/mole, calculate the mean BE in ammonia.
12.	Explain the formation of NaBr using Born-Haber cycle.
13.	Calculate heat change at constant pressure if heat change at constant volume for the reaction $NH_2CN(g) + 3/2\ O_2(g) \rightarrow N_2(g) + CO_2(g) + H_2O(l)$ at 298K is -742 kJ/mole.
14.	Calculate the entropy change in surroundings when 36 g of water is formed under standard conditions. ΔH^0_f of water = -286kJ/mole
15.	What is the work done on a gas when 10 lt of the gas is compressed to 4.5 lt under a constant pressure of 10^3 kPa?
16.	Calculate the work done when 2.5 moles of an ideal gas at 300K is isothermally and reversibly compressed from a volume of 5m^3 to a volume of 2 m^3.
17.	What would be the work done when the pressure of 2 moles of an ideal gas is changed from 2 bar to 5 bar isothermally and reversibly at 25^{o}C?
18.	When will heat change at constant volume and heat change at constant pressure be equal?
19.	Dissolution of ammonium chloride in water is endothermic yet it is a spontaneous

	process. Explain.
20.	Define (i) Heat capacity (ii) Molar heat capacity (iii) Enthalpy of a reaction (iv) Entropy (v) Gibb's free energy (vi) Residual entropy
21.	Derive the relationship between Cp and Cv
22.	State i. Hess's law of constant heat summation ii. Second law of thermodynamics iii. Third law of thermodynamics
23.	Discuss the role of temperature in determining the spontaneity of a process
24.	Derive the relation $\Delta H = \Delta U + \Delta n_g RT$
25.	Comment on the following statements (i) An exothermic reaction is always thermodynamically spontaneous. (ii) The entropy of a substance increases when going from liquid state to vapour state at any temperature. (iii) A reaction with $\Delta G^0 > 0$ always has an equilibrium constant greater than one