

UNIT-6

Q1 Calculate the enthalpy of formation of $C_6H_6(l)$ given that the enthalpy of combustion of benzene is -3267.7 kJ and the enthalpies of formation of $CO_2(g)$ and $H_2O(l)$ are -393.3 kJ and -286.6 kJ respectively.

Q2 Calculate the enthalpy of combustion of ethylene at 298 K and one atmosphere pressure. Given that enthalpy of formation of $CO_2(g)$, $H_2O(l)$ and $C_2H_4(g)$ are -393.7 , -241.8 and $+52.3 \text{ kJ mol}^{-1}$ respectively.

Q3 Calculate the enthalpy of transition when C (diamond) changes to C (graphite) given that the enthalpies of combustion of C (diamond) and C (graphite) are -393.5 and $-395.4 \text{ kJ mol}^{-1}$ respectively.

Q4 Calculate the enthalpy of hydration of $BaCl_2(s)$ to $BaCl_2 \cdot 2H_2O(s)$ given that the enthalpy of solution of $BaCl_2(s)$ is $-20.6 \text{ kJ mol}^{-1}$ and that of $BaCl_2 \cdot 2H_2O(s)$ is $+8.8 \text{ kJ mol}^{-1}$.

Q5 For a reaction at 298 K



$$\Delta H = 400 \text{ kJ mol}^{-1} \text{ and } \Delta S = 0.2 \text{ kJ K}^{-1} \text{ mol}^{-1}$$

At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range?

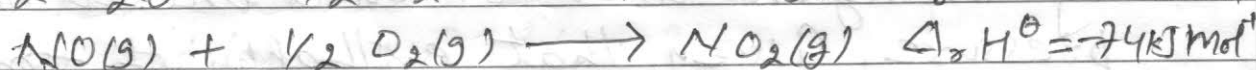
Q6 For a reaction $2A(g) + B(g) \rightarrow 2D(g)$
 $\Delta U_{298} = -10.5 \text{ kJ}$ and $\Delta S^\ominus = -44.1 \text{ J K}^{-1}$
Calculate ΔU_{298} for the reaction and predict whether the reaction is

spontaneous or not.

Q7 Equilibrium constant for the reaction is 10. Calculate the value of ΔG^\ominus ; given.

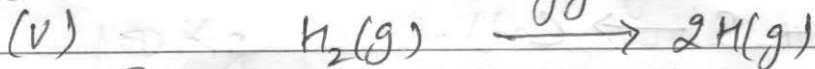
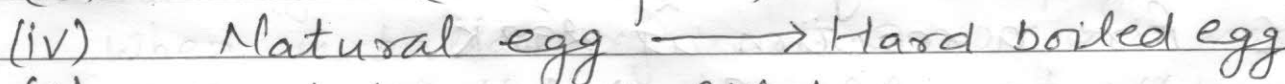
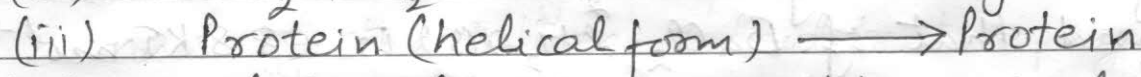
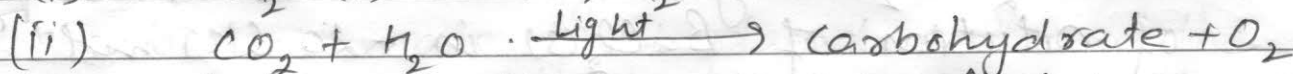
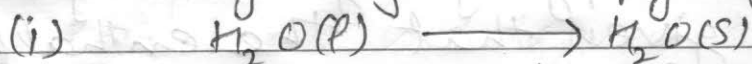
$$R = 8 \text{ J K}^{-1} \text{ mol}^{-1} \quad T = 300 \text{ K}$$

Q8 Comment on the thermodynamic stability of $\text{NO}(\text{g})$ and $\text{NO}_2(\text{g})$ given:



Q10 Calculate the entropy change in surroundings when 1.0 mol of $\text{H}_2\text{O}(\text{l})$ is formed under standard conditions. Given $\Delta H^\ominus = -286 \text{ KJ mol}^{-1}$

Q11 In following changes state whether order has increased or decreased and consequently the direction of change of entropy of system



Q12 If water vapour is assumed to be a perfect gas, molar enthalpy change for vaporisation of 1 mole of H_2O at 1 bar and 100°C is 41 KJ mol^{-1} . Calculate the internal energy change when.

(i) 1 mole of water is vaporised at 1 bar pressure and 100°C .

(ii) 1 mole of water is converted into ice.