Date Planned : __ / __ / __	Daily Tutorial Sheet - 1	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Advanced (Archive)	Exact Duration :_____

1. The enthalpy for the following reactions $(\Delta H°)$ at 25°C are given below. **(1981)**

(i) $\frac{1}{2}H_2(g)+\frac{1}{2}O_2(g) \longrightarrow OH(g)$ $\Delta H° = -10.06$ kcal

(ii) $H_2(g) \longrightarrow 2H(g)$ $\Delta H° = 104.18$ kcal

(iii) $O_2(g) \longrightarrow 2O(g)$ $\Delta H° = 118.32$ kcal

Calculate the $O-H$ bond energy in the hydroxyl radical.

2. The standard heats of formation of $CCl_4(g), H_2O(g), CO_2(g)$ and $HCl(g)$ at 298 K are $-25.5, -57.8, -94.1$ and -22.1 kcal / mol respectively. Calculate $\Delta H°(298K)$ for the reaction **(1982)**

$$CCl_4(g)+2H_2O(g)\longrightarrow CO_2(g)+4HCl(g)$$

3. The molar heats of combustion of $C_2H_2(g)$, C (graphite) and $H_2(g)$ are 310.62 kcal, 94.05 kcal and 68.32 kcal respectively. Calculate the standard heat of formation of $C_2H_2(g)$. **(1983)**

4. Following statement is true only under some specific conditions. Write the conditions for that in not more than two sentences "The heat energy q, absorbed by a gas is ΔH ". **(1984)**

5. Given the following standard heats of reactions. **(1984)**

(i) heat of formation of water = -68.3 kcal

(ii) heat of combustion of acetylene = -310.6 kcal

(iii) heat of combustion of ethylene = -337.2 kcal

Calculate the heat of reaction for the hydrogenation of acetylene at constant volume $(25°C)$.

6. The bond dissociation energies of gaseous H_2, Cl_2 and HCl are 104, 58 and 103 kcal/mol respectively. Calculate the enthalpy of formation of HCl gas. **(1985)**

7. The standard molar heat of formation of ethane, carbon dioxide and liquid water are $-21.1, -94.1$ and -68.3 kcal respectively. Calculate the standard molar heat of combustion of ethane. **(1986)**

8. An initial mixture of ferric oxide, Fe_2O_3, and aluminium, Al, is used in solid fuel rockets. Calculate the fuel value per gram and fuel value per cc of the mixture. Heats of formation and densities are as follows:

$H_f(Al_2O_3) = -399$ kcal / mol **(1988)**

$H_f(Fe_2O_3) = -199$ kcal / mol

Density of $Fe_2O_3 = 5.2$ g / cc , Density of Al = 2.7 g/cc

9. An athlete is given 100 g of glucose $(C_6H_{12}O_6)$ of energy equivalent to 1560 kJ. He utilizes 50% of this gained energy in the event. In order to avoid storage of energy in the body, calculate the weight of water he would need to perspire. The enthalpy of evaporation of water is 44 kJ/mol. **(1989)**

10. The standard enthalpy of combustion at $25°C$ of hydrogen, cyclohexene $\left(C_6H_{10}\right)$ and cyclohexane $\left(C_6H_{12}\right)$ are $-241, -3800$ and -3920 kJ / mol respectively. Calculate the heat of hydrogenation of cyclohexene. **(1989)**

11. Using the data (all values are in kilocalories per mol at $25°C$) given below, calculate the bond energy of $C-C$ and $C-H$ bonds. **(1990)**

$$C(s) \longrightarrow C(g) \quad ; \quad \Delta H = 172$$

$$H_2(g) \longrightarrow 2H(g) \quad ; \quad \Delta H = 104$$

$$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(\ell) \quad ; \quad \Delta H = -68.0$$

$$C(s) + O_2(g) \longrightarrow CO_2(g) \quad ; \quad \Delta H = -94.0$$

Heat of combustion of $C_2H_6 = -372.0$, Heat of combustion of $C_3H_8 = -530.0$

12. A gas mixture of 3.67 L of ethylene and methane on complete combustion at $25°C$ produces 6.11 L of CO_2. Find out the amount of heat evolved on burning 1L of the gas mixture. The heat of combustion of ethylene and methane are -1423 and -891 kJ mol^{-1} at $25°C$. **(1991)**

13. Determine the enthalpy of the reaction, $C_3H_8(g) + H_2(g) \longrightarrow C_2H_6(g) + CH_4(g)$, at $25°C$, using the given heat of combustion values under standard conditions. **(1992)**

Compound	:	$H_2(g)$	$CH_4(g)$	$C_2H_6(g)$	$C(\text{graphite})$
$\Delta H°(\text{kJ / mol})$	:	-285.8	-890.0	-1560.0	-393.0

The standard heat of formation of $C_3H_8(g)$ is -103 kJ / mol

14. The heat content of the products is more than of that of the reactants in an ..... reaction. **(1993)**

15. The polymerization of ethylene to linear polyethylene is represented by the reaction, $n\left[CH_2 = CH_2\right] \longrightarrow \left[CH_2 - CH_2\right]_n$ Where, n has large integral value. Given that the average enthalpies of bond dissociation for $C = C$ and $C - C$ at 298 K are +590 and +311 kJ/mol respectively, calculate the enthalpy of polymerization per mole of ethylene at 298 K. **(1994)**