Daily Tutorial Sheet-13	Level-3

147.(B) **(i)** $Mg(s) + Cl_2(g) \longrightarrow MgCl_2(s) \quad \Delta H_1 = -642$

(ii) $Mg(s) + \frac{1}{2}Cl_2(g) \longrightarrow MgCl(s) \quad \Delta H_2 = -125$

(iii) $2MgCl \longrightarrow MgCl_2 + Mg \quad \Delta H = ?$

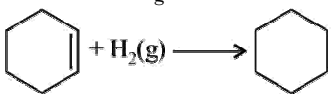
$\Delta H = \Delta H_1 - 2\Delta H_2 = -642 - 2\times(-125) = -392 \text{ kJ mol}^{-1}$

148.(B) $TNT_{(s)} \longrightarrow$ 6 mol gaseous products.

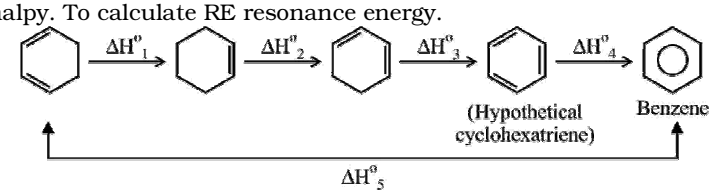
$\Delta E = -\frac{8180}{0.01} = -818 \text{ Kcal/mol} \; ; \quad \Delta ng = 6$

$\Delta H = \Delta E + \Delta ng\, RT = -818 + \frac{6\times2\times298}{1000} = -818 + 3.576 = -814 \text{ Kcal / mol.}$

149.(A) $\Delta H - \Delta U = \Delta n_g RT = -3\times8.314\times10^{-3}\times298 = -7.43 \text{ kJ}$

150.(4)  $\cdot\ \Delta H = -119 \text{ kJ mol}^{-1}$

This shows that the generation of one $(C=C)$ bond in cyclohexene requires 119 kJ mol^{-1} of enthalpy. To calculate RE resonance energy.



$\Delta H_1^o = \Delta H_2^o = \Delta H_3^o = 119 \text{ kJ mol}^{-1}, \Delta H_4^o = RE$

$\Delta H_5^o = \Delta_f H^o \text{ (benzene)} - \Delta_f H^o \text{ (cyclohexene)} = 46 - (-156) = 205 \text{ kJ mol}^{-1}.$

$\therefore$ From Hess' law: $\Delta H_4^o = \Delta H_5^o - (\Delta H_1^o + \Delta H_2^o + \Delta H_3^o) = 205 - 3\times119 = -152 \text{ kJ mol}^{-1}$

$\therefore \quad -38x = -152$

$x = 4$

151.(4) $\frac{1}{2}X_2 + \frac{1}{2}Y_2 \longrightarrow XY; \Delta H = -100 \text{ kJ}$

Let the bond dissociation energy of $X_2, Y_2,$ and XY be $a : \frac{a}{2} : a$ (the given ratio) kJ mol^{-1}, respectively.

$\therefore \quad \frac{a}{2} + \frac{a}{4} - a = -100 \quad \therefore \quad a = 400 \quad \Rightarrow \quad 100x = 400 \quad \Rightarrow \quad x = 4$

152.(6) $KCl(s) \longrightarrow K^{\oplus}(g) + Cl^{-}(g), \quad \Delta H_1 = 181 \text{ kcal mol}^{-1}$

$KCl(s) + aq \longrightarrow K^{\oplus}(aq) + Cl^{-}(aq), \quad \Delta H_2 = 1.0 \text{ kcal mol}^{-1}$

Let the enthalpy of hydration of $K^{\oplus}$ is $2Cl$ kcal mol^{-1}

$K^{\oplus}(g) + aq \longrightarrow K^{\oplus}(aq), \Delta H_3 = 2a$

$Cl^{-}(g) + aq \longrightarrow Cl^{-}(aq), \; \Delta H_4 = a$

$\therefore \quad \Delta H_3 = -\Delta H_1 + \Delta H_2 - \Delta H_4$

$2a = -181 + 1 - a$

$3a = -180, a = -60$

$\therefore \quad \Delta_{hyd}H^{-} \text{ of } K^{\oplus} = 2a = -60\times2 = -120 \quad \therefore \quad -20x = -120 \quad \Rightarrow \quad x = 6$