Standard Gibbs energy change: The standard Gibbs energy change is defined as the Gibbs energy change for a process in which the reactants in their standard states are converted to the products in their standard state.

$$\Delta G = \Sigma \Delta_f G^{\circ}_{(Product)} - \Sigma \Delta_f G^{\circ}_{(Reactants)}$$

$$= \left[\text{Sum of the standard Gibbs energy of formation of products}\right] - \left[\text{Sum of the standard Gibbs energy of the formation of reactants}\right]$$

Calculate the standard Gibbs free energy change from the free energies of formation & data for the following reaction $C_6H_{6(l)} + \frac{15}{2} O_{2(g)} \longrightarrow 6CO_{2(g)} + 3H_2O_{(g)}$

Given that $\Delta_f G^\circ [C_6H_{6(l)}] = 172.8 \text{ kJ mol}^{-1}$

$\Delta_f G^\circ [CO_{2(g)}] = -394.4 \text{ kJ mol}^{-1}$ $\quad \Delta_f G^\circ [O_{2(g)}] = 0$

$\Delta_f G^\circ [H_2O_{(g)}] = -228.6 \text{ kJ mol}^{-1}$

tion:

$$\Delta G^\circ = \Sigma \Delta_f G^\circ (\text{Product}) - \Sigma \Delta_f G^\circ (\text{Reactant})$$

$$\Delta G^\circ = [6 \Delta_f G^\circ [CO_{2(g)}] + 3 \Delta_f G^\circ [H_2O_{(g)}]]$$
$$- \Delta_f G^\circ [C_6H_{6(l)}] + \frac{15}{2} \Delta_f G^\circ [O_{2(g)}]$$

$$\Delta G^\circ = 6 \times (-394.4) + 3 \times (-228.6)$$
$$- \{172.8 + 0\}$$

$$\boxed{\Delta G^\circ = -3225 \text{ kJ mol}^{-1}}$$

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