

## Energy changes and rates of reactions

### Assignment-1

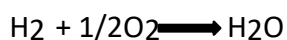
According to Hess law

$$\Delta H_f = [\sum \Delta H_f (\text{products})] - [\sum \Delta H_f (\text{reactants})]$$

$\Delta H_f$  of individual products or reactants can be found from standard enthalpy of formation.



Considering individual reactions in the product side



$$\Delta H_{\text{H}_2\text{O}} = -242.76 \text{ KJ/mol}$$



$$\Delta H_{\text{SO}_2} = -297.19 \text{ KJ/mol}$$

$$\Delta H_{\text{O}_2} = 0 \text{ KJ/mol}$$

Considering individual reactions in the reactant side

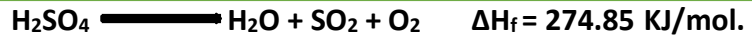
$$\Delta H_{\text{H}_2\text{SO}_4} = -814.8 \text{ KJ/mol}$$

$$\Delta H_f = [\sum \Delta H_f (\text{products})] - [\sum \Delta H_f (\text{reactants})]$$

$$\Delta H_f = [\Delta H_{\text{H}_2\text{O}} + \Delta H_{\text{SO}_2} + \Delta H_{\text{O}_2}] - [\Delta H_{\text{H}_2\text{SO}_4}]$$

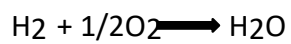
$$\Delta H_f = [-539.95] - [-814.8]$$

$$\Delta H_f = 274.85 \text{ KJ/mol.}$$



Considering individual reactions in the product side

$$\Delta H_{\text{N}_2} = 0 \text{ KJ/mol}$$



$$\Delta H_{\text{H}_2\text{O}} = -242.76 \text{ KJ/mol}$$

Considering individual reactions in the reactant side

$$\Delta H_{\text{O}_2} = 0 \text{ KJ/mol}$$

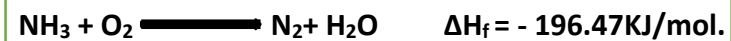
$$\Delta H_{\text{NH}_3 (g)} = -46.29 \text{ KJ/mol}$$

$$\Delta H_f = [\sum \Delta H_f (\text{products})] - [\sum \Delta H_f (\text{reactants})]$$

$$\Delta H_f = [\Delta H_{\text{N}_2} + \Delta H_{\text{H}_2\text{O}}] - [\Delta H_{\text{O}_2} + \Delta H_{\text{NH}_3 (g)}]$$

$$\Delta H_f = [0 - 242.76] - [0 - 46.29]$$

$$\Delta H_f = -196.47 \text{ KJ/mol.}$$





Considering individual reactions in the product side

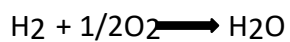
$$\Delta \text{H}_{\text{O}_2} = 0$$

$$\text{KJ/mol } \text{H} + \text{F} \rightarrow \text{HF}$$

$$\Delta \text{H}_{\text{HF}} (\text{g}) = -541.8/\text{mol}.$$

Considering individual reactions in the reactant side

$$\Delta \text{H}_{\text{F}_2} = 0 \text{ KJ/mol}.$$



$$\Delta \text{H}_{\text{H}_2\text{O}} = -283.46 \text{ KJ/mol}.$$

$$\Delta \text{H}_f = [\sum \Delta \text{H}_f (\text{products})] - [\sum \Delta \text{H}_f (\text{reactants})]$$

$$\Delta \text{H}_f = [\Delta \text{H}_{\text{HF}} (\text{g}) + \Delta \text{H}_{\text{O}_2}] - [\Delta \text{H}_{\text{F}_2} + \Delta \text{H}_{\text{H}_2\text{O}}]$$

$$\Delta \text{H}_f = [-541.8 + 0] - [-283.46 + 0]$$

$$\Delta \text{H}_f = -258.34 \text{ KJ/mol}.$$

