CHEM-C1230 Principles of Physical Chemistry 2021

Some questions in the exercises of chapters 4 + 5

Chapter 4

- **Question 1**
- For the overall reaction:

$$\begin{aligned} \cancel{N_2}\,(g) + \cancel{2}\,\cancel{O_2}(g) &\rightarrow 2NO_2(g), \\ 2NO(g) &\rightarrow \cancel{N_2}\,(g) + \cancel{O_2}\,(g), \\ \\ 2NO(g) + O_2(g) &\rightarrow 2NO_2(g), \end{aligned}$$

$$\Delta H^{\circ}_{A} = 66.4\ \text{kJ}$$
$$\Delta H^{\circ}_{B} = -180.4\ \text{kJ}$$

- $\Delta H = \Delta H^{\circ}_{A} + \Delta H^{\circ}_{B}$

- **Question 5.**
- ½ N2 + ½ O2 → NO
- $\Delta H^{\circ}_{f}\,(NO, g) = \Delta H^{\circ}_{f}(No, g, T = 298.15K) + \Delta C_p\,\Delta T$

Chapter 5

- **Thermo - Problem 5.32**
- Part A
- T = 298 K: (n and m are coefficients)

$$\Delta S^0 = \sum_n nS^0(products) - \sum_m mS^0(reactants)$$

- At T = 359 K:
- Take S_m^o from part A.

$$S_m\,(T) = S_m^o + \int_{298.15}^{T_f} \frac{\Delta C_{P,m}(T')dT'}{T'}$$

Chapter 5

- **Thermo - Problem 5.32**
- Part B
- T = 298 K:

$$\Delta H_R^o = H_{prod}^o - H_{react}^o$$

- At T = 359 K:
- Take H_R^o from part A.

$$\Delta H_R^o(T) = \Delta H_R^o(T = 298.15K) + \int_{T_1}^{T} C_P(T')\,dT'$$

Chapter 5

- **Thermo - Problem 5.32**
- Part C.

$$\Delta S_{surroundings} = \frac{-dq}{T} = \frac{-\Delta H^{\circ}_{reaction}}{T}$$

- Part D.

$$\Delta S_{universe} = \Delta S_{reaction} + \Delta S_{surroundings}$$