CHEM-C1230 Principles of Physical Chemistry 2021

Some questions in the exercises of chapters 6 + 7

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- I cover some questions that don’t have hints on Pearson.
- You will not be penalized for using hints on Pearson.
- Feel free to ask me via Slack or email (han.le@aalto.fi)

Chapter 6

- **Question 5. Thermo - Problem 6.26**
- **Part A**
- T1 = 298.15K
- T2 = 303K
- Note that the question asks you give an answer in $J \cdot mol^{-1}$
- Check chapter 6.3 for this equation (derived from Gibbs-Helmholtz equation)
- $\Delta G_{den} = T_2 \left(\frac{\Delta H^{\circ} \cdot 10^3 - 298.15K \cdot \Delta S^{\circ} \cdot 10^3}{298.15K} + \Delta H^{\circ} \cdot 10^3 \left(\frac{1}{T_2} - \frac{1}{298.15\ K} \right) \right) = ?\ J \cdot mol^{-1}$

Chapter 6

- **Question 5. Thermo - Problem 6.26**
- **Part B**
- We have ΔG_{den} from part A
- Use $\Delta G_{den} = -RTlnK_P$ to find equilibrium constant K_P

- **Part C**
- Stable protein structure remains in the native form (folded).
- Think about the relationship between stability and K_P.

Chapter 7

- **Question 1.**
- Compression factor z: $z = \frac{V_m}{V_m^{ideal}} = \frac{PV_m}{RT}$

- In this question, since z > 1 , $\Delta V > \Delta V_{ideal}$

Chapter 7

- **Question 2. Thermo - Problem 7.5**
- **Part A**
- Work $\mathrm{w} = -\mathrm{nRTln}\left(\frac{\mathrm{V2}}{\mathrm{V1}}\right) = ?\,\mathrm{Joules}$

- **Part B**
- Remember to convert a
- Work $\mathrm{w} = -\mathrm{nRTln}\left(\frac{\mathrm{V2}-\mathrm{n}\cdot\mathrm{b}}{\mathrm{V1}-\mathrm{n}\cdot\mathrm{b}}\right) - n^2 a\left(\frac{1}{V2\cdot 10^{-3}} - \frac{1}{V1\cdot 10^{-3}}\right) = ?\,\mathrm{Joules}$

Chapter 7

- **Question 2. Thermo - Problem 7.5**
- **Part C**

For the van der Waals gas,

$$w = -\int_{V_i}^{V_f}\left(\frac{nRT}{V-nb} - \frac{n^2a}{V^2}\right)dV = -\left[nRT\ln(V-nb) + \frac{an^2}{V}\right]_{V_i}^{V_f}$$