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Chapter 7

Equilibria for Multiple Component Systems

- 7.2. With only a single component and phase, if only $\text{Fe}_2(\text{SO}_4)_3$ were present in our system, we would have $C - P + 2 = 1 - 1 + 2 = 2$ degrees of freedom.
- 7.4. For a single-component system, there will never be negative degrees of freedom. The maximum number of phases that can exist in equilibrium is three, so the Gibbs phase rule would yield $1 - 3 + 2 = 0$ degrees of freedom (like might occur at the triple point). For a two-component system, the maximum number of phases that can exist in equilibrium is four. There will never be negative degrees of freedom.
- 7.6. In this reaction, there are only three independent components (the amount of the fourth can be determined from the equilibrium constant) and 3 phases, two solids and a gas mixture. Therefore, there are $3 - 3 + 2 = 2$ degrees of freedom.
- 7.8. For water: $n = \frac{pV}{RT} = \frac{(23.76 \text{ torr})(5.00 \text{ L})}{(0.08205 \text{ L} \cdot \text{atm/mol} \cdot \text{K})(298.15 \text{ K})} \times \frac{1 \text{ atm}}{760 \text{ torr}} = 6.39 \times 10^{-3} \text{ mol}$ of water is needed to ensure that there is a liquid and gas phase. This equals 0.115 grams.
For methanol:
- $$n = \frac{pV}{RT} = \frac{(125.0 \text{ torr})(5.00 \text{ L})}{(0.08205 \text{ L} \cdot \text{atm/mol} \cdot \text{K})(298.15 \text{ K})} \times \frac{1 \text{ atm}}{760 \text{ torr}} = 3.36 \times 10^{-2} \text{ mol}$$
- of methanol is needed to ensure that there is a liquid and gas phase. This equals 1.08 grams.
- 7.10. Since, according to equation 7.11, $a_i = \frac{p_i}{p_i^*}$, and since $p_i^* = 760 \text{ torr}$, we can calculate a_i :

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Daniel Reger



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Solutions Manual: Understanding Physics Like a Nerd Without Becoming One & More Kalayu Belay, James Strohaber, 2018-01-15 This solution manual is a companion book written by the authors of Understanding Physics like a Nerd without Becoming One More The character of the book solves the problems that were assigned at the end of each chapter The authors believe their readers will be inspired by the tactics employed by Cassie to tackle the problems based on the lessons she learned from Professor James *Student Solutions Manual for Physical Chemistry* David Ball, 2002-09 The manual consists of complete solutions to all odd end of chapter exercises and problems *Solutions Manual to accompany Combinatorial Reasoning: An Introduction to the Art of Counting* Duane DeTemple, William Webb, 2014-09-29

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