

Lesson 21: LeChatelier's Principle

text: 298-313

what to know:

- how changes in concentrations of reactants and products affect equilibrium and concentrations of other reactants and products at equilibrium, §7-5
- how changes in volume, pressure and temperature affect equilibrium and concentrations of reactants and products at equilibrium, §7-5
- heterogeneous equilibrium, §7-6
- how a catalyst affects equilibrium
- concepts of extraction, partition coefficients and chromatography, §7-7
- gas synthesis, p-302, & hemoglobin and oxygen transport p-306-307

questions:

1. Write equilibrium constant expressions (K_p) for the reactions,
 - a. $2\text{PbS}(s) + 3\text{O}_2(g) \rightleftharpoons 2\text{PbO}(s) + 2\text{SO}_2(g)$
 - b. $2\text{HgO}(s) \rightleftharpoons 2\text{Hg}(l) + \text{O}_2(g)$
2. Consider the reaction, $\text{N}_2\text{O}_4(g) \rightleftharpoons 2\text{NO}_2(g)$ [$K_p = 11$ at 100°C . &endothermic] at equilibrium in a closed container, and assume that V and T are constant unless otherwise specified.
 - a. What would happen to the $P(\text{NO}_2)$ if more N_2O_4 was introduced?
 - b. What would happen to the $P(\text{NO}_2)$ if the volume of the container was decreased?
 - c. What would happen to the $P(\text{N}_2\text{O}_4)$ if the volume of the container was decreased?
 - c. What would happen to the actual number of moles of NO_2 if the volume of the container was decreased?
 - e. What would happen to the $P(\text{NO}_2)$ if the temperature was increased?
 - f. What would happen to the K_p if the temperature was increased?
 - g. What would happen to the K_p if the volume of the container was decreased?
 - h. What would happen to the K_p if a catalyst was introduced?
 - i. What would happen to the K_p if He gas was introduced into the container?
3. Explain why changing the volume of a gaseous system at equilibrium shifts the equilibrium but does not change K_p , whereas a change in temperature changes both. Explain.
4. If you want to extract a compound from a water solution into an organic solvent, do you want a large or small partition coefficient. Explain your choice.
5. Describe the function of the stationary and mobile phases in chromatography.
6. What are synthesis gas and water gas, how are they made and what are they used for?
7. How does the partial pressure of O_2 relate to the saturation of hemoglobin and myoglobin?