

1. Write the equilibrium constants K and K_c for the following equilibria:

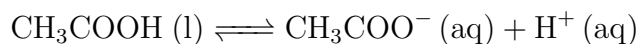
(a)



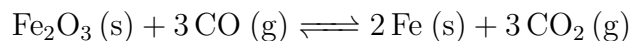
(b)



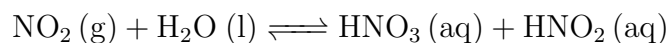
(c)



(d)



(e)



2. (a) Consider the equilibrium $\text{X}(\text{g}) \rightleftharpoons \text{Y}(\text{g})$. A series of experiments were performed by combining the listed amounts of X and Y and allowing the mixtures to reach equilibrium at the same temperature. Which experiment has the largest amount of Y at equilibrium?

Experiment A: 3 moles of X and 4 moles of Y

Experiment B: 1 mole of X and 6 moles of Y

Experiment C: 6 moles of X and 3 moles of Y

Cannot be determined

(b) For the same equilibrium reaction, if $K > 1$, which experiment has the largest amount of Y at equilibrium?

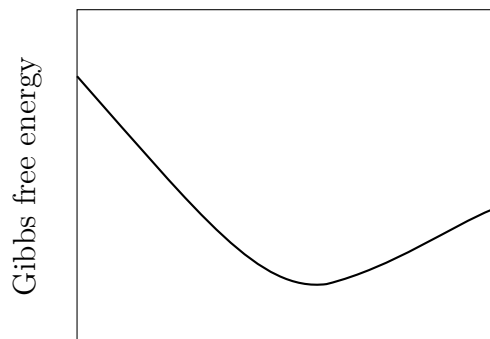
Experiment A: 3 moles of X and 4 moles of Y

Experiment B: 1 mole of X and 6 moles of Y

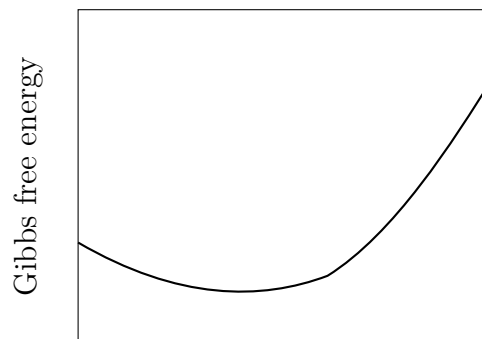
Experiment C: 6 moles of X and 3 moles of Y

Cannot be determined

3. Label each graph with either $K > 1$ or $K < 1$.

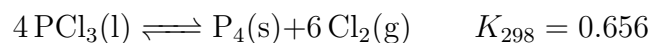


Reactants \longrightarrow Products



Reactants \longrightarrow Products

4. Consider the following equilibrium reaction:



ΔH_f° (kJ/mol)	Value
$\text{PCl}_3(\text{l})$	-287.0
$\text{P}_4(\text{s})$	0

(a) Circle all the statements that are true:

$\text{PCl}_3(\text{l})$ is thermodynamically stable at low temperatures

The reaction is spontaneous at high temperatures

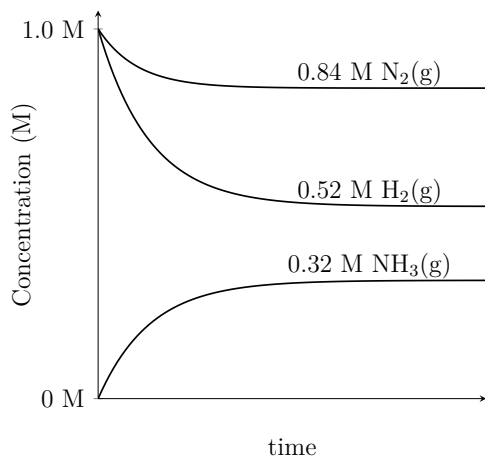
$K = K_C$

At equilibrium, there are 4 mol of $\text{PCl}_3(\text{l})$, 1 mol of $\text{P}_4(\text{s})$ and 6 mol of $\text{Cl}_2(\text{g})$

(b) Calculate $\Delta G_{298\text{K}}^\circ$

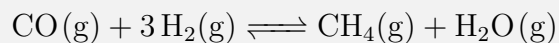
(c) What is the partial pressure of $\text{Cl}_2(\text{g})$ when $\text{PCl}_3(\text{l})$ is sealed in a 1.0 L container at 298 K and equilibrium is reached?

5. Write the balanced equilibrium reaction based on the graph of concentration vs time, and determine K and K_C at standard conditions.



Homework Problem 23

1. At 298 K, a 2.0 L rigid flask is at equilibrium:



with these quantities: 0.12 mol CO, 0.36 mol H_2 , 0.48 mol CH_4 , and 0.48 mol H_2O . Calculate the equilibrium constant K .