

Homework 6 – Chemical Equilibrium

Name: _____

Exercise 6A.7(a) (5 points)Establish the relation between K and K_C for the reaction: $\text{H}_2\text{CO(g)} \longleftrightarrow \text{CO(g)} + \text{H}_2\text{(g)}$ **Exercise 6A.10(a)** (5 points)

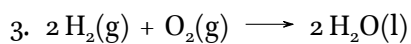
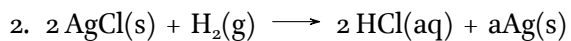
The standard Gibbs energy of formation of $\text{NH}_3\text{(g)}$ is -16.5 kJ/mol at 298 K . What is the reaction Gibbs energy when the partial pressures of the N_2 , H_2 , and NH_3 (treated as perfect gases) are 3.0 bar , 1.0 bar , and 4.0 bar , respectively? What is the spontaneous direction of the reaction in this case?

Exercise 6B.1(a) (5 points)

The standard reaction enthalpy of $\text{Zn(s)} + \text{H}_2\text{O(g)} \longleftrightarrow \text{ZnO(s)} + \text{H}_2\text{(g)}$ is approximately constant at $+224 \text{ kJ/mol}$ from 920 K up to 1280 K . The standard reaction Gibbs energy is $+33 \text{ kJ/mol}$ at 1280 K . Estimate the temperature at which the equilibrium constant becomes greater than 1.

Exercise 6C.2(a) (15 points)

Devise cells in which the following are the reactions and calculate the standard cell potential in each case. Write your devised cell using line notation (e.g. $\text{Cd}|\text{Cd}(\text{NO}_3)_2(\text{aq})||\text{NiCl}_2(\text{aq})|\text{Ni}$)

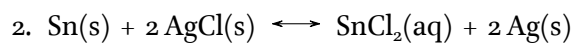
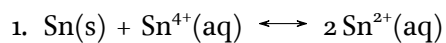


Exercise 6C.3(a) (5 points)

Use the Debye-Hückel limiting law and the Nernst equation to estimate the potential of the cell $\text{Ag}|\text{AgBr(s)}|\text{KBr(aq, } 0.050 \text{ mol/kg)}||\text{Cd(NO}_3)_2\text{(aq, } 0.010 \text{ mol/kg)}|\text{Cd}$ at 25°C .

Exercise 6D.1(a) (10 points)

Calculate equilibrium constants of the following reactions at 25°C from standard potential data:



Pioneers

By Carol Lynn Pearson

My people were Mormon pioneers.
Is the blood still good?
They stood in awe as truth
Flew by like a dove
And dropped a feather in the West.
Where truth flies you follow
If you are a pioneer.
I have searched the skies
And now and then
Another feather has fallen.
I have packed the handcart again
Packed it with the precious things
And thrown away the rest.
I will sing by the fires at night
Out there on uncharted ground
Where I am my own captain of tens
Where I blow the bugle
Bring myself to morning prayer
Map out the miles
And never know when or where
Or if at all I will finally say,
"This is the place,"
I face the plains
On a good day for walking.
The sun rises
And the mist clears.
I will be all right:
My people were Mormon Pioneers.