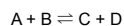


HW03 - Chemical Equilibria 1

Question 1

3 pts

When the chemical reaction



is at equilibrium, which of the following is true?

- both the forward and reverse reactions have stopped
- neither the forward nor the reverse reactions have stopped
- all four concentrations are equal
- the sum of the concentrations of A and B equals the sum of the concentrations of C and D

Question 2

3 pts

Explain why equilibrium constants are dimensionless.

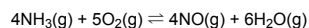
- They are dimensionless because the pressures or concentrations we put in are all for the substances in their standard states.
- They are not really dimensionless, but we must treat them as such in order to be able to take $\ln(K)$ in the expression:

$$\Delta G^\circ = -RT \ln K$$
- Activities (which are dimensionless) are actually what should be used in the mass action expression and therefore equilibrium constants. Concentration and pressure *values* are used in place of activities of species. Therefore true equilibrium constants have no units.
- This is a trick question. Equilibrium constants have units that involve some multiple of atmospheres or moles per liter.

Question 3

3 pts

The expression for K_c for the reaction



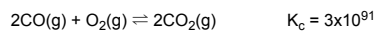
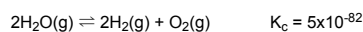
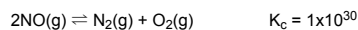
at equilibrium is:

- $\frac{[\text{NO}]^4[\text{H}_2\text{O}]^6}{[\text{NH}_3]^4[\text{O}_2]^5}$
- $\frac{[\text{NO}][\text{H}_2\text{O}]}{[\text{NH}_3][\text{O}_2]}$
- $\frac{[\text{NH}_3]^4[\text{O}_2]^5}{[\text{NO}]^4[\text{H}_2\text{O}]^6}$
- $[\text{NH}_3]^4[\text{O}_2]^5$

Question 4

3 pts

Consider the following reactions at 25°C:



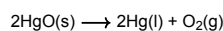
Which compound is most likely to dissociate and give $\text{O}_2(\text{g})$ at 25°C?

- CO
- NO
- H_2O
- CO_2

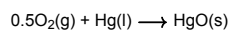
Question 5

3 pts

At 600°C, the equilibrium constant for the reaction



is 2.8. Calculate the equilibrium constant for the reaction

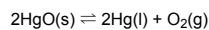


- 1.7
- 0.60
- 1.1
- 0.36

Question 6

3 pts

Consider the reaction



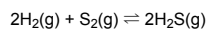
What is the form of the equilibrium constant K_c for this reaction?

- $[\text{Hg}]^2 [\text{O}_2]$
- $\frac{[\text{O}_2]}{[\text{HgO}]^2}$
- $\frac{[\text{Hg}]^2 [\text{O}_2]}{[\text{HgO}]^2}$
- $[\text{O}_2]$

Question 7

4 pts

$K_c = 2.6 \times 10^8$ at 825 K for the reaction



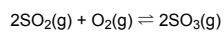
The equilibrium concentration of H_2 is 0.0020 M and S_2 is 0.0010 M. What is the equilibrium concentration of H_2S ?

- 10 M
- 1.0 M
- 0.10 M
- 0.0010 M

Question 8

4 pts

Consider the reaction below



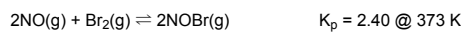
At 1000 K the equilibrium pressures of the three gases in one mixture were found to be 0.562 atm SO_2 , 0.101 atm O_2 , and 0.332 atm SO_3 . Calculate the value of K_p for the reaction.

- 3.46
- 0.171
- 0.289
- 2.64

Question 9

4 pts

Consider the following reaction:



Calculate K_c for this reaction at 100°C.

- 73.5
- 7440
- 0.0784
- 19.7