Chemical Equilibrium Review Quiz

Conceptual Chemical Equilibrium

1)The equilibrium constant for the acid ionization of mercaptoethanol ($HSCH_2CH_2OH$) is 1.91×10^{-10}

$$HSCH_2CH_2OH(aq) \rightleftharpoons H^+(aq) + SCH_2CH{+}2OH^-(aq) \qquad K = 1.91 \times 10^{-10}$$

Which of the following statements is true regarding this equilibrium?

I. The reaction is product favored. II. The reaction is reactant favored.

III. Equilibrium lies far to the right. IV. Equilibrium lies far to the left

2)If the equilibrium is established by initially adding 0.10 mol each of A and B to a 1L container, then which of the following must be true once the mixture achieves equilibrium?

$$A + 2B \rightleftharpoons 2C \qquad K = 320$$

a. [A] = [B] b. [A] = [B] = [C] c. [B] = 2[C] d. [A] > [B] e. [A] < [B]

3)For the reaction $Sb_2S_{3(s)} + 3H_{2(g)} \rightleftharpoons 2Sb_{(s)} + 3H_2S_{(g)}$ circle the following that is true:

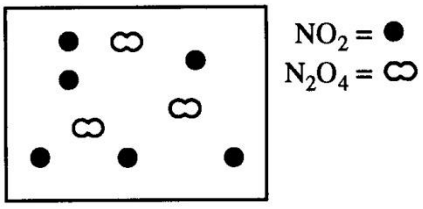
$K_p > K_c$ $K_p = K_c$ $K_p < K_c$

4) Observe the unbalanced reaction $A_{(g)} \rightleftharpoons J_{(g)}$

The partial pressure of these are given under various conditions. Find the coefficients for both.

P_a (atm)	P_J (atm)
4.0	2.0
2.0	1.4
1.0	1.0
.50	.71
.25	.50

$$2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$$



5) The diagram on the left represent a reaction at equilibrium. What must be true?

A) $K = 0$
B) $0 < K < 1$
C) $K = 1$
D) $K > 1$
E) not enough info

5)If a reaction 2/3 A + 1/3 B ⇌ C has a K_{eq} of 8.2×10^{-3} then 3C ⇌ 2A + B would have a K_{eq} of what?

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6)Find K_{eq} for the reaction. Does the reaction favor the forward or reverse direction?

$$2A + 5B_2 \rightleftharpoons 4C + 2D \qquad K_{eq} = ?$$

Where

$E \rightleftharpoons A + F_2$ $K_{eq} = 283.5$

$D \rightleftharpoons F_2 + \frac{1}{2} B_2$ $K_{eq} = 213.7$

$2C + 3D \rightleftharpoons E + 7/2B_2$ $K_{eq} = 849.0$

Using (R)Ice Tables

1) It is found that 0.20M of D is formed at equilibrium when 1.00 mol and 0.800 mol of A and B are placed in a 2000mL container, respectively. Find K.

$$2A(aq) + B(aq) \rightleftharpoons C(g) + D(g)$$

2) The K_{eq} for a rection involving gaseous hydrogen sulfide at some temperature is 9.0×10^{-8}. If 0.24 moles of H_2S are placed in 10.0 L container, determine the concentration of each species when equilibrium is reached.

3)Consider a reaction $3A + 2B \rightleftharpoons C$ where there is an initial concentration for A is to be 0.500 M and the equilibrium concentration for B is 0.250M. What is K_{eq}?

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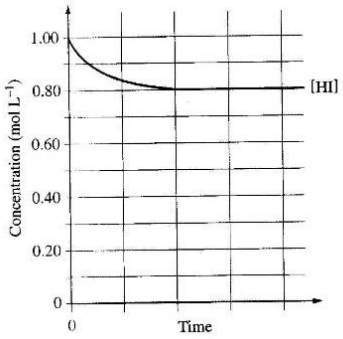
4)Initially, 4.87 mol of $NH_{3(g)}$ and 2.65 mol of $O_{2(g)}$ are added to a 2.50 L container. At equilibrium, the NH_3 concentration is 0.424M. Calculate the equilibrium concentrations of the products at equilibrium.

$$4NH_{3(g)} + 3O_{2(g)} \rightleftharpoons 2N_{2(g)} + 6H_2O_{(g)}$$

5)The rate constant for the first-order decomposition of N_2O_5 to NO_2 and O_2 (all three are gases) is 7.48×10^{-3} min^{-1} at 45 °C. If the reaction begins with only 0.100 atm of N_2O_5 present in the container, how long will it take for the total pressure in the container to rise to 0.145 atm?

6)Acetic Acid dimerizes in an equilibrium mixture such that $HC_2H_3O_2 \rightleftharpoons H_3C_4H_3O_4$. The freezing point of the equilibrium mixture drops by 1.66 degrees Celsius when 3.76 grams of $HC_2H_3O_2$ is dissolved in 100 grams of benzene. What would be the equilibrium constant if the density of benzene is 0.9067 g/ml and the molal freezing-point depression was -5.12 C kg/mol?



7)Gaseous HI decomposes as shown to the left. Find the K_{eq} of the reaction and make a sketch on the graph showing the concentration of each species as a function of time.

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Practice Review problems for Final

Marky is driving and gets distracted from a text from Naomi. He crushes James against a brick wall and sodium azide in Marky's airbag quickly decomposes to sodium and nitrogen gas upon impact to inflate. Because of this, James dies but Marky lives. If 11.8 L was inflated, how much sodium azide, in grams, was in Marky's airbag? Assume STP conditions. $2NaN_{3(s)} \rightarrow 2Na_{(s)} + 3N_{2(g)}$

According to the reaction:

$4Al + 3MnO_2 \rightarrow 2Al_2O_3 + 3Mn$ $\Delta Hrxn = -1789$ kJ/mol rxn

What mass of Mn forms when 1250 kJ is detected?

A mixture of volatile Jamesonnium and ethyl ether are in a beaker at room temperature. It is well mixed and has a vapor pressure of 454 torr. At room temperature, pure Jamesonnium and ethyl ether has a vapor pressure of 420 torr and 520 torr, respectively. What is the mole fraction of Jamesonnium in the mixture?

A proposed mechanism for an unknown exothermic reaction is shown below. Write the overall reaction, and identify the intermediates, the rate-determining step, and the rate law predicted by this mechanism.

Step 1:	$A_2 \rightleftharpoons 3A$	fast
Step 2:	$A + AB \rightarrow C + 2D$	slow
Step 3:	$A + 2D \rightarrow E$	fast

What is the freezing point of a solution comprised of 47.4 g $CaCl_2$ dissolved in 359.5 g water? Kf=1.86 C/m

Alex has a body temperature of 35ºC. On a cold day, what volume of air at 0ºC must Alex with a lung capacity of 3.5 L breathe in to completely fill his lungs?

Calculate the thermal equilibrium when a 12 gram sample of iron at 50 ºC is put into a container that is 12ºC

N_2O has has a density of 2.85 g/L at 25ºC. What is the pressure of the gas?