General Chemistry II-Jasperse Name:
Equilibrium Quiz: Due:

Conceptual Questions:

1. Which of the following statements are true? An equilibrium constant K for a reaction tells us:

    1. If you know the actual concentrations, comparison to "K" can tell you whether the system is actually at equilibrium or not
    2. If the system is not at equilibrium initially, comparing the actual concentration to "K" can tell you which direction the reaction will go to achieve equilibrium. (In other words, whether the reaction will go more towards the right side from what it is initially, or whether it will go more towards the left side.)
    3. K can tell you whether products or reactants predominate at equilibrium
    4. K can tell you what the mechanism is.
    5. K can tell you what the rate law is

    a. 1 only
    b. 2 only
    c. 3 only
    d. 1 and 2 only
    e. 1, 2, and 3
    f. 1 and 4 only
    g. 3 and 5 only

2. Which of the following statements are true, assuming the reaction is at equilibrium?

    $A \rightleftharpoons 2B$ $K = 3.6 \times 10^6$

    1. the concentrations of products and reactants are equal
    2. the rates for the forward and reverse reactions are equal
    3. no chemical reactions are occurring
    4. at equilibrium there will be more of product B than there is of reactant A
    5. at equilibrium, there will be more of reactant A than there is of product B

    a) 3 only
    b) 2 and 4
    c) 1 and 2
    d) 4 and 5
    e) 2, 3, and 4 are all true

3. For the reaction $A + 2B \rightarrow C$ the appropriate form for the equilibrium constant expression is:
    a. $[A][B]^2/[C]$
    b. $[C]/[A][B]^2$
    c. $[A][B][C]$
    d. $[A][B]^2[C]$
    e. none of the above

4. In the ICE table started for calculating equilibrium concentrations of the reaction shown, the terms in the "change" column are __________

    $M^{2+} + 4L \rightleftharpoons ML_4^+$

	$[M^{2+}]$	$[L]$	$[ML_4^+]$
I	0.10 *M*	0.32 *M*	0 *M*
C	______	______	______
E			

    a. $-x, -x, +x$
    b. $+x, +x, -x$
    c. $-x, -4x, +x$
    d. $+x, +4x, +x$
    e. $+x, +4x, -x$

5. Given the following reaction at equilibrium, which of the following alterations will increase the amount (in moles) of SO_2:

    $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$ $\Delta H^\circ = +67$ kJ

    a. adding Cl_2 to the system.
    b. removing Cl_2 from the system.
    c. removing SO_2Cl_2.
    d. decreasing the volume of the reaction vessel.

Numerical Questions

6. Given: $A + B \rightleftharpoons 2C$ $K = 1.6 \times 10^{5}$.

What is K for the reaction $2C \rightleftharpoons A + B$ K = ???

a. -1.6×10^{5}
b. 1.6×10^{-5}
c. 1.6×10^{5}
d. 6.3×10^{-5}
e. 6.3×10^{-6}

7. For the following hypothetical equilibrium, what is the value of the equilibrium constant if the concentrations at equilibrium are as shown?

$$A + 2B \rightleftarrows C$$

$[A] = 4.5 \times 10^{-5}$ $[B] = 2.2 \times 10^{-2}$ $[C] = 9.4 \times 10^{-3}$

a. 0.22
b. 9.9
c. 4.3×10^{5}
d. 2.3×10^{8}
e. 9.5×10^{3}

8. What is the equilibrium concentration of Br_2 if [HBr] = 0.20 M and $[H_2]$ = 0.10 M at equilibrium?

$$H_2(g) + Br_2(g) \rightleftharpoons 2HBr(g) \qquad K = 62.5$$

a. 3.2×10^{-2} M
b. 8.0×10^{-4} M
c. 0.20 M
d. 0.10 M
e. 6.4×10^{-3} M

8. When 3.00 mol of A and 3.00 mol of B are placed in a container and allowed to come to equilibrium, the resulting mixture is found to contain 0.50 mol of D. What are the amounts of A and B at equilibrium?

	A(g) +	3B (g) ⇌	C (g) +	D(g)
Initial:	3.00 mol	3.00 mol	0 mol	0.00 mol
Equilibrium:				0.50 mol

a. 2.50 mol A, 2.50 mol B
b. 3.50 mol A, 3.50 mol B
c. 2.50 mol A, 1.50 mol B
d. 3.50 mol A, 4.50 mol B

9. 0.50 mol of I_2 and 0.50 mol of Br_2 are placed in a 1.00 L flask and allowed to reach equilibrium. (There is no BrI at first.) After reaching equilibrium, the flask is found to contain 0.84 mol of BrI. What is the value of K for this reaction?

	$I_2(g)$ +	$Br_2(g)$ ⇌	2 BrI(g)
Initial:	0.50	0.50	0
Equilibrium:			0.84

a) 11
b) 4.0
c) 110
d) 6.1

10. What is the final concentration of A at equilibrium if the initial $[A_2]$ concentration is 0.70M?

$$A_2(g) \rightleftharpoons 2A(g) \qquad K = 2.2 \times 10^{-6}$$

	A_2 (g) ⇌	2A(g)
Initial:	0.70	0
Equilibrium:		

a. 7.7×10^{-7}
b. 2.4×10^{-3}
c. 1.2×10^{-3}
d. 6.2×10^{-4}