Rate/Equilibrium Review

1. Enough A, B, C and D are are placed in a container so that their concentrations would be.5M. The equilibrium system is as follows. A + B <---> C + D The reaction has a change in enthalpy of +250 KJ. Keq is .25

a. Is the system at equilibrium? No. The Q value is 1. This is greater than .25

b. If not, which way will the reaction shift to attain equilibrium? Since Q is greater than 1, the product concentration (numerator) is too large and the reaction will proceed to the left on the way to equilibrium.

c. What will happen to the value of the equilibrium constant if the temperature is increased? Since the reaction is endothermic, when heat is put into the system the reaction will shift “away from the increase” and move to the right.

2. For the system A + B <---> 2C the equilibrium constant is .25. If 2.0 moles of A and 2.0 moles of B are placed in a 4.0 liter container at 25 C, what will be the equilibrium concentrations of all species?

This problem is an “initial concentration” problem, so you will to “ice” it.
At equilibrium, the concentrations will be .5 – x for both A and B. The concentration of C will be 2x. Using these values, the equilibrium expression will be a perfect square, so
.5 = 2x/.5-x X = .1 [A] = .4 M [B] = .4 M and [C] = .2 M

3. USE THE FOLLOWING DATA FOR THE REACTION: A + B ----> C

	Conc. A(M)	Conc. B(M)	RateM/s
Exp. 1	2	2	4
Exp. 2	2	4	32
Exp. 3	10	4	800.0

a. Write the rate law for this reaction. $r=k[A]^2[B]^3$ When [B] doubled and [A] was constant, the rate change factor was 8, so 2x = 8 and x = 3. When the change factor of A was 5 and [B] was constant, the rate change factor was 25, so 5x=25 and x = 2

b. Solve for K--include units. K = .125 $1/M^4s$ or .125 l4/mole4s These values are obtained by plugging one set of data into the rate law equation.

c. Calculate the value of R if A is .20 M and B is .40 M. R = 1 M/s Use the value of K from above and plug a set of data in the rate law equation. R = .00032 $1/M^4s\ (2M)^2(2M)^3$

d. What is the overall reaction order? 5 the sum of the exponents.

An equilibrium system is represented according to the following equation:

$A_{2(g)}$ + $B_{2(g)}$ <-------> $2AB_{(g)}$

The Keq is .4600, and .2000 moles of A_2 and .3000 moles of B_2 are placed in a 6.000 liter container with .4000 moles of AB.

4. What quantity of (AB) reacts or is produced? Any of these. You don't know what happens, but you can freely choose the variable.
a. x b. 2x c. 3x d. any of these

5. If 3x of AB were produced(THIS MAYOR NOT BE WHAT ACTUALLY HAPPENS), the quantity at equilibrium would be:

a. .067 + 3x b. .067 - 3x c. .067 – x

You have .067 M initially. If 3x is produced, you now have .067 + 3x

6. If the amount of A_2 which reacts or is produced is defined as x, then x is equal to:
a. -.01468 b. -.265 c. + .01468 d. + .07182 e. none of these

Either a or c would be accepted in this case. If you assume the reaction shifts right, the answer is a. If you assume that x was produced, that is the reaction shifts left, the answer is c.

7. The concentration of AB at equilibrium is:
a. .09636 M b. .08168 M c. .04768 M d.03764 M e. none of these

.03764 M. The reaction moved left, and the amount of AB decreased by 2x

8. The concentration of A_2 at equilibrium is:
a. .09636 M b. .08168 M c .04768 M d. .03764 M e. none of these

.04768 M The reaction moved left and the amount of A_2 increased by x.

9. Which way did the reaction shift to attain equilibrium?
a. left b. right c. there was no change

Left. Q = 2.72 which is bigger that Kc, so the numerator needed to get smaller and the denominator bigger in order to reach Kc.