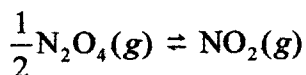


-3.5 ea

CHM 152/54 QUIZ 3 25 PTS FALL 04 NAME: Key

1. The equilibrium constant,  $K_c$ , for the reaction



is 3.3 at 100°C. The value for the equilibrium constant will be changed if

1. concentrations are given in atmospheres instead of moles per liter.
2. the temperature is changed to 200°C.
3. the equation above is doubled.

[A] 2 and 3 only      [B] 1 and 2 only      [C] 1 only      [D] 1, 2, and 3      [E] 2 only

Explanation: 1. There is a change in moles of gas

2.  $K_c$  is temp. dependent.

3.  $K_c = \frac{[NO_2]}{[N_2O_4]^{1/2}}$  but doubled would be  $K_c = \frac{[NO_2]^2}{[N_2O_4]}$

2. Which of the following statements is true in a reaction system at equilibrium?

1. The number of collisions per unit time between reactants is equal to the number of collisions per unit time between products.
2. Reactants are reacting to form products at the same rate as products are reacting to form reactants.
3. The product of the concentrations of the products divided by the product of the concentrations of the reactants is always a constant.

[A] 1 only      [B] 2 only      [C] 1, 2, and 3      [D] 3 only      [E] 1 and 2 only

3. The equilibrium constant at 1300 K for the reaction  $H_2(g) + Br_2(g) \rightleftharpoons 2HBr(g)$  is  $1.6 \times 10^5$ . The value of K for the reverse reaction is

[A]  $6.3 \times 10^{-5}$       [B]  $-1.6 \times 10^5$       [C]  $1.6 \times 10^{-5}$       [D]  $1.6 \times 10^5$       [E]  $6.3 \times 10^{-6}$

Reverse Rxn:  $2HBr(g) \rightleftharpoons H_2(g) + Br_2(g)$

$$K_c = \frac{[H_2][Br_2]}{[HBr]^2} \quad \text{as written above} \quad K_c = \frac{[HBr]^2}{[H_2][Br_2]}$$

there is a reciprocal relationship so  $\frac{1}{1.6 \times 10^{-5}} = 6.25 \times 10^{-6}$   
more on back

# Key

4. For which of the following values of the equilibrium constant does the reaction mixture consist mainly of reactants?

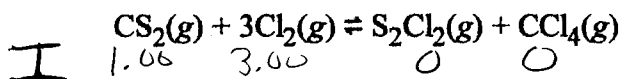
[A]  $10^0$       [B]  $10^3$       [C]  $10^{-3}$       [D]  $10^{-5}$       [E]  $10^5$

the "ratio" is

$$\frac{[\text{Products}]^{\text{Coeff.}}}{[\text{Reactants}]^{\text{Coeff.}}}$$

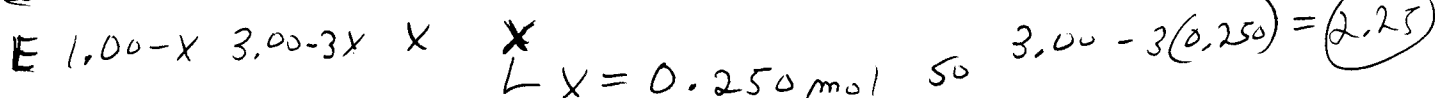
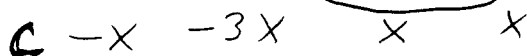
SMALL #

5. Carbon disulfide and chlorine react according to the following equation:

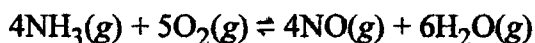


When 1.00 mol of  $\text{CS}_2$  and 3.00 mol of  $\text{Cl}_2$  are placed in a 2.00-L container and allowed to come to equilibrium, the mixture is found to contain 0.250 mol of  $\text{CCl}_4$ . What is the amount of  $\text{Cl}_2$  at equilibrium?

[A] 0.25 mol      [B] 2.25 mol      [C] 0.50 mol      [D] 2.75 mol      [E] 0.75 mol



6. Which expression correctly describes the equilibrium constant for the following reaction?



[A]  $K_c = \frac{[\text{H}_2\text{O}][\text{NO}]}{[\text{NH}_3][\text{O}_2]}$

[B]  $K_c = \frac{4[\text{NH}_3] + 5[\text{O}_2]}{6[\text{H}_2\text{O}] + 4[\text{NO}]}$

[C]  $K_c = \frac{[\text{H}_2\text{O}]^6 + [\text{NO}]^4}{[\text{NH}_3]^4 [\text{O}_2]^5}$

[D]  $K_c = \frac{6[\text{H}_2\text{O}] + 4[\text{NO}]}{4[\text{NH}_3] + 5[\text{O}_2]}$

[E]  $K_c = \frac{[\text{NH}_3]^4 + [\text{O}_2]^5}{[\text{H}_2\text{O}]^6 [\text{NO}]^4}$

\* none since [C] mistakenly had a + sign

7. If  $K = 0.145$  for  $\text{A}_2 + 2\text{B} \rightleftharpoons 2\text{AB}$ , then for  $4\text{AB} \rightleftharpoons 2\text{A}_2 + 4\text{B}$ ,  $K$  would equal

[A] 2.63.

[B] 6.90.

[C] -0.145.

[D] 0.145.

[E] 47.6.

$$K_{c1} = \frac{[\text{AB}]^2}{[\text{A}_2][\text{B}]^2} = 0.145$$

$$K_{c2} = \frac{[\text{A}_2]^2 [\text{B}]^4}{[\text{AB}]^4}$$

$$\therefore K_{c2} = \left(\frac{1}{K_{c1}}\right)^2 = \left(\frac{1}{0.145}\right)^2 = 47.6$$