

Mini Quiz Equilibrium

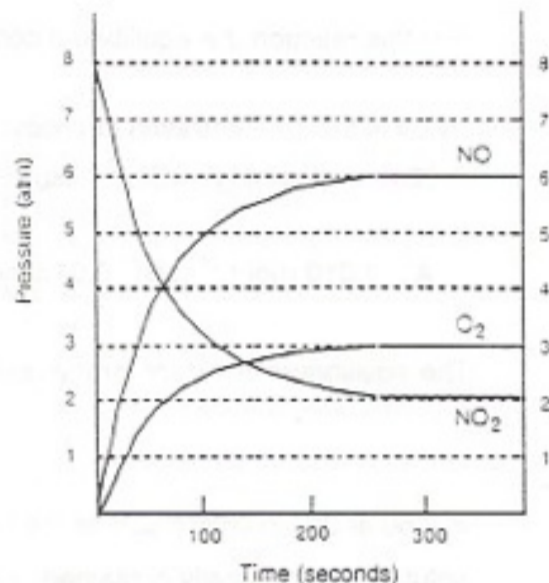
Mini Quiz Name _____

1. _____

A vessel was filled with $\text{NO}_2(g)$ to a pressure of 8 atm. The NO_2 reacted to form $\text{NO}(g)$ and $\text{O}_2(g)$. Plotting the changes in partial pressures of NO_2 , NO , and O_2 with time gave the graph shown at the right. What is the equilibrium constant K_p for the reaction:



- A. 4.5
 B. 9
 C. 18
 D. 23.5
 E. 27



2. _____

Consider the reaction initially at equilibrium in a sealed container at 500 K:



What will be the effect of increasing the volume of the container, while maintaining the temperature at the same value (500 K)?

- A. The percentage of each component in the mixture will stay the same.
 B. The equilibrium constant K_p will increase.
 C. The equilibrium constant K_p will decrease.
 D. The number of moles of SO_3 will increase.
 E. The number of moles of SO_2 and O_2 will increase.

3. _____

When chlorine gas is passed into water, the following equilibrium is established:



Consider the above system at equilibrium. What happens when NaCl is added to it?

- A. The concentration of $\text{HOCl}(aq)$ decreases.
 B. The partial pressure of $\text{Cl}_2(g)$ decreases.
 C. The concentration of H_3O^+ remains unchanged.
 D. K decreases.
 E. K increases.

4. _____

The equilibrium constant K_p for the reaction shown is 1.4×10^{-4} for pressures measured in atmospheres and at a temperature of 900 K.



what is the value of K_c for: 0.0103

5. _____

A solution of carbon dioxide in water contains 99.7% CO_2 and 0.3% H_2CO_3 . What is the equilibrium constant for the reaction:



- A. 0.003
 B. 0.3 M
 C. 0.3 M^{-1}
 D. 0.1 L/mol
 E. 0.1 atm^{-1}

6.

The ion $[\text{Co}(\text{NH}_3)_5\text{SCN}]^{2+}$ reacts with water according to the equation:



For this reaction the equilibrium constant $K = 3.7 \times 10^{-4} \text{ mol}\cdot\text{L}^{-1}$.

What is the concentration of thiocyanate ion (SCN^-) present at equilibrium in a solution that was originally 1.00 M in $[\text{Co}(\text{NH}_3)_5\text{SCN}]^{2+}(\text{aq})$?

- A. $0.010 \text{ mol}\cdot\text{L}^{-1}$ B. $0.013 \text{ mol}\cdot\text{L}^{-1}$ **C. $0.019 \text{ mol}\cdot\text{L}^{-1}$** D. $0.028 \text{ mol}\cdot\text{L}^{-1}$ E. $0.034 \text{ mol}\cdot\text{L}^{-1}$

The equilibrium constant for the reaction



is 0.60 at 0°C in chloroform as the solvent. Calculate the equilibrium concentration of N_2O_4 in a chloroform solution that originally contained only N_2O_4 at a concentration of 1 M. You will find it necessary to solve a quadratic equation to do this problem.

- A. 0.63 M **B. 0.68 M** C. 0.73 M D. 0.78 M E. 0.83 M

At equilibrium at a certain temperature, the equilibrium constant for the reaction shown is 0.10.

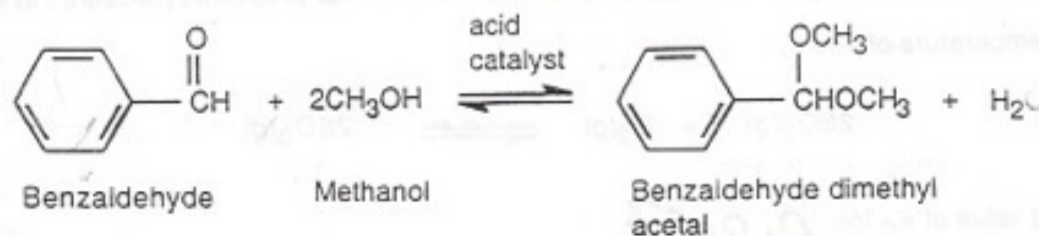


Which one of the following best describes what happens when 5.6 mol of $\text{H}_2\text{O}(\text{g})$, 12.6 mol of $\text{Cl}_2\text{O}(\text{g})$, and 3.0 mol of HOCl are placed in a 1 L vessel and allowed to come to equilibrium?

	moles $\text{H}_2\text{O}(\text{g})$	moles $\text{Cl}_2\text{O}(\text{g})$	moles $\text{HOCl}(\text{g})$
A.	increase	increase	decrease
B.	increase	decrease	increase
C.	no change	decrease	increase
D.	decrease	decrease	increase
E.	increase	no change	decrease

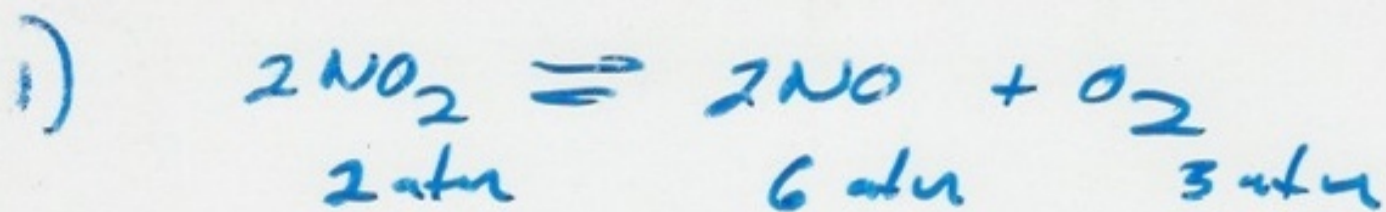
9.

Which experimental method would be the **most** effective in increasing the conversion of benzaldehyde to benzaldehyde dimethyl acetal according to the acid-catalyzed equilibrium shown?

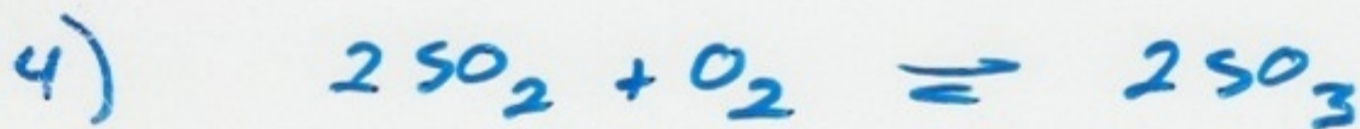


- A. Double the concentration of benzaldehyde.
B. Double the concentration of methanol.
 C. Double the concentration of water.
 D. Double the concentration of the acid catalyst.
 E. Use a different catalyst.

Mini Quiz



$$K_p = \frac{(6)^2 (3)}{(2)^2} = \underline{27}$$

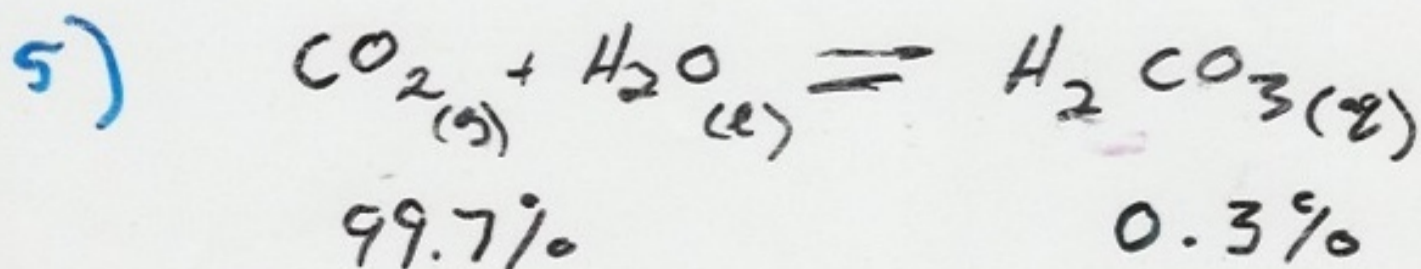


$$K_p = 1.4 \times 10^{-4}$$

$$K_p = K_c (RT)^{\Delta n}$$

$$\Delta n = 2 \text{ mol gas} - 3 \text{ mol gas} = -1$$

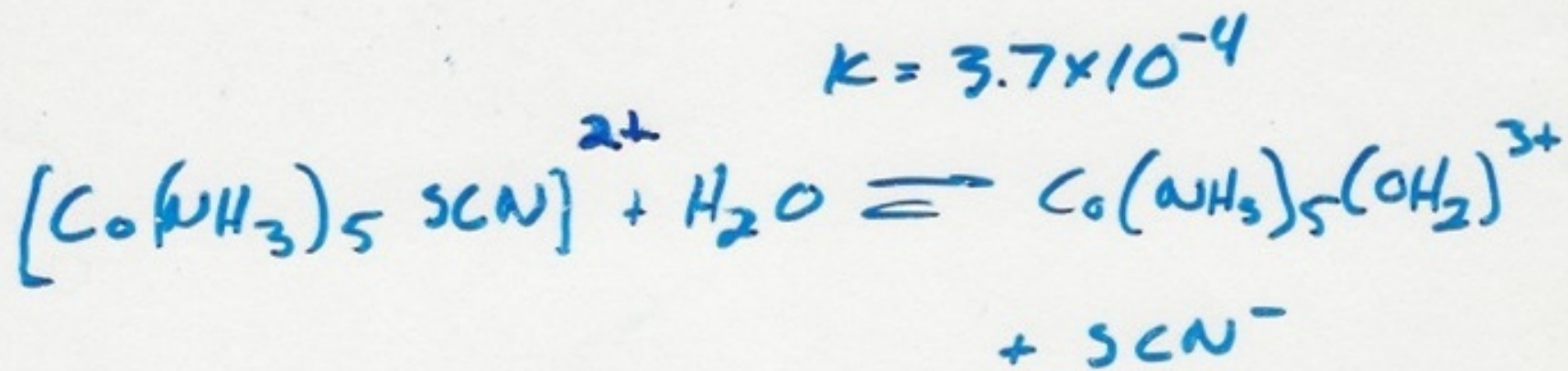
$$K_c = \frac{1.4 \times 10^{-4}}{\left[\left(0.0821 \frac{\text{L atm}}{\text{mol K}} \right) (900 \text{ K}) \right]^{-1}} = \underline{0.0103}$$



$$K = \frac{[\text{H}_2\text{CO}_3]}{[\text{CO}_2]} = \frac{0.3}{99.7} = \underline{0.003}$$

6)

$$K = 3.7 \times 10^{-4}$$



start 1 M

End 1 - x

x

x

$$K = \frac{x \cdot x}{1 - x} = 3.7 \times 10^{-4}$$

Assume x is much smaller than 1

$$x^2 = 3.7 \times 10^{-4}$$

$$x = .019 = [\text{SCN}^-]$$

at Equilibrium

7

$$K = 0.60$$



start

$$1.0 \frac{\text{mol}}{L}$$

End

$$1.0 - x$$

$$2x$$

$$\frac{(2x)^2}{1-x} = 0.60$$

$$4x^2 = .60 - .60x$$

$$4x^2 + .60x - .60 = 0$$

$$x = \frac{-.60 \pm \sqrt{.60^2 - 4(4)(-.60)}}{2(4)}$$

$$\frac{-.60 \pm \sqrt{10}}{8}$$

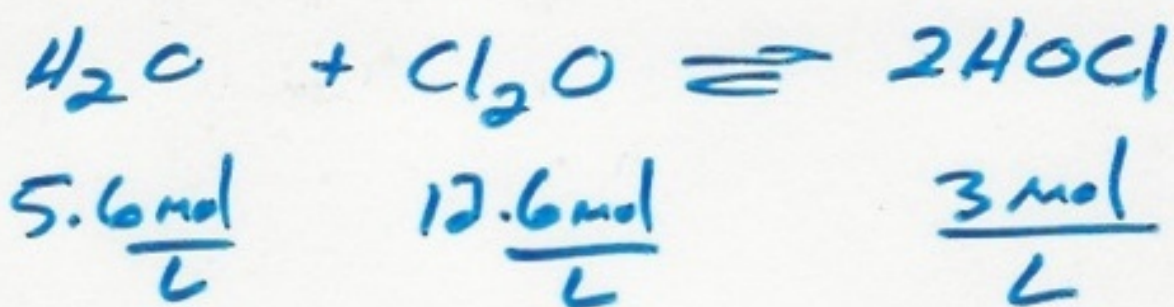
$$x = 0.32M$$

$$[N_2O_4] = 1 - 0.32$$

$$= \underline{0.68M}$$

$$K = 0.10$$

8)



$$Q = \frac{(3)^2}{(5.6)(12.6)} = 0.127$$

$$Q > K$$