

Chapter 13 Practice
Dr. Palmer Graves, Instructor

MULTIPLE CHOICE

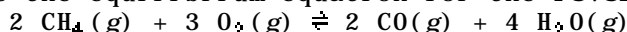
Section 13.2 The Equilibrium Constant K_c

- Which statement about the equilibrium constant is true? The value of K_c
 - changes as product concentration changes.
 - changes as reactant concentration changes.
 - changes as temperature changes.
 - never changes.
- Nitric oxide reacts with oxygen to form nitrogen dioxide:

$$2 \text{NO}(g) + \text{O}_2(g) \rightleftharpoons 2 \text{NO}_2(g)$$
 What is K_c for the forward reaction if the equilibrium concentration of NO is 0.200 M, O_2 is 0.100 M, and NO_2 is 0.250 M at 25°C?
 - 8.00×10^{-2}
 - 6.41×10^{-2}
 - 12.5
 - 15.6
- A mixture of carbon monoxide, hydrogen, and methanol is at equilibrium. The balanced chemical equation is: $\text{CO}(g) + 2 \text{H}_2(g) \rightleftharpoons \text{CH}_3\text{OH}(g)$. At 250°C, the mixture contains 0.0960 M CO, 0.191 M H_2 , and 0.150 M CH_3OH . What is the value for K_c ?
 - 2.33×10^{-2}
 - 0.244
 - 4.09
 - 42.8

Section 13.3 The Equilibrium Constant K_p

- Write the equilibrium equation for the reverse reaction:



- $$K_p' = \frac{[\text{P}_{\text{CH}_4}]^2 [\text{P}_{\text{O}_2}]^3}{[\text{P}_{\text{CO}}]^2 [\text{P}_{\text{H}_2\text{O}}]^4}$$
- $$K_p' = \frac{[\text{P}_{\text{CO}}]^2 [\text{P}_{\text{H}_2\text{O}}]^4}{[\text{P}_{\text{CH}_4}]^2 [\text{P}_{\text{O}_2}]^3}$$
- $$K_p' = \frac{2[\text{P}_{\text{CO}}] + 4[\text{P}_{\text{H}_2\text{O}}]}{2[\text{P}_{\text{CH}_4}] + 3[\text{P}_{\text{O}_2}]}$$
- $$K_p' = \frac{2[\text{P}_{\text{CH}_4}] + 3[\text{P}_{\text{O}_2}]}{2[\text{P}_{\text{CO}}] + 4[\text{P}_{\text{H}_2\text{O}}]}$$

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5. The oxidation of sulfur dioxide by oxygen to sulfur trioxide has been implicated as an important step in the formation of acid rain: $2 \text{SO}_2(g) + \text{O}_2(g) \rightleftharpoons 2 \text{SO}_3(g)$. If the equilibrium partial pressures of SO_2 , O_2 , and SO_3 are 0.564 atm, 0.102 atm, and 0.333 atm respectively at 1000K, what is K_p at that temperature?
- 0.292
 - 3.42
 - 5.79
 - 8.11
6. If $K_c = 2.0 \times 10^{33}$ at 25°C , for the following reaction: $\text{H}_2(g) + \text{Cl}_2(g) \rightleftharpoons 2 \text{HCl}(g)$, then find K_p at the same temperature.
- 8.2×10^{31}
 - 9.7×10^{32}
 - 2.0×10^{33}
 - 4.9×10^{34}

Section 13.4 Heterogeneous Equilibria

7. For the reaction, $\text{A}(g) + 2 \text{B}(g) \rightleftharpoons 2 \text{C}(g)$, $K_c = 1 \times 10^{-10}$ at 25°C . Which of the following statements is true?
- $\Delta n = +1$
 - The concentration of the products is greater than the concentration of the reactants.
 - The reaction is favored in the reverse direction.
 - The value of K_p will be larger than the value for K_c .

Section 13.5 Using the Equilibrium Constant

8. For the reaction: $4 \text{HCl}(g) + \text{O}_2(g) \rightleftharpoons 2 \text{Cl}_2(g) + 2 \text{H}_2\text{O}(l)$, the equilibrium constant is 0.063 at 400 K. If the reaction quotient is 0.100, which of the following statements is **not** correct?
- $[\text{HCl}]$ will increase.
 - $[\text{O}_2]$ will increase.
 - $[\text{Cl}_2]$ will decrease.
 - $[\text{H}_2\text{O}]$ will increase.
9. Cyclohexane (CH) undergoes a molecular rearrangement in the presence of AlCl_3 to form methylcyclopentane (MCP) according to the equation: $\text{CH} \rightleftharpoons \text{MCP}$. If $K_c = 0.143$ at 25°C for this reaction, find the equilibrium concentrations of CH and MCP if the initial concentrations are 0.200 M and 0.100 M respectively.
- $[\text{CH}] = 0.0625$ and $[\text{MCP}] = 0.0625$ M
 - $[\text{CH}] = 0.138$ and $[\text{MCP}] = 0.162$ M
 - $[\text{CH}] = 0.262$ M and $[\text{MCP}] = 0.0375$ M
 - $[\text{CH}] = 0.283$ and $[\text{MCP}] = 0.0167$ M
10. When baking soda is heated it decomposes according to the following reaction:
 $2 \text{NaHCO}_3(s) \rightleftharpoons \text{Na}_2\text{CO}_3(s) + \text{H}_2\text{O}(g) + \text{CO}_2(g)$
If sufficient baking soda is placed in a container and heated to 90°C , the total pressure of the gases is 0.5451 atm. What is the value of K_p at that temperature?
- 0.07428
 - 0.2973
 - 0.4228
 - 1.091

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11. Which of the following changes in reaction conditions will **not** alter the equilibrium concentrations?
- a) Addition of an inert gas to the reaction mixture.
 - b) Addition of reactants or products.
 - c) Decreasing the pressure or volume.
 - d) Increasing the temperature.

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1. c)	Chapter: 13	QUESTION: 4
2. d)	Chapter: 13	QUESTION: 7
3. d)	Chapter: 13	QUESTION: 9
4. a)	Chapter: 13	QUESTION: 17
5. b)	Chapter: 13	QUESTION: 18
6. c)	Chapter: 13	QUESTION: 20
7. c)	Chapter: 13	QUESTION: 36
8. d)	Chapter: 13	QUESTION: 38
9. c)	Chapter: 13	QUESTION: 48
10. a)	Chapter: 13	QUESTION: 54
11. a)	Chapter: 13	QUESTION: 63