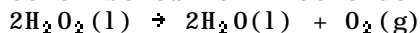


Exam 2 Practice Sheet
 CHM 1046 - Sp 2002
 Dr. Palmer Graves, Instructor

MULTIPLE CHOICE

1. The reaction below is first order in $[H_2O_2]$.



A solution originally at 0.600 M H_2O_2 is found to be 0.075 M after 54 min. The half-life for this reaction is _____ min.

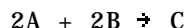
- a) 6.8
 b) 18
 c) 14
 d) 28
 e) 54
2. The activation energy of a first-order reaction that has a rate constant of $4.41 \times 10^{-3} s^{-1}$ at 351K and rate constant of $9.79 \times 10^{-2} s^{-1}$ at 588K is _____ kJ/mol.
- a) 2.67
 b) 2.90
 c) 0.0589
 d) 22.4
 e) 0.450
3. A reaction with activation energy of 123 kJ/mol has a rate constant of $0.200 s^{-1}$ at 311 K. At a temperature of _____ K, the rate constant will be double that at 311 K.
- a) 304
 b) 316
 c) 622
 d) 349
 e) 246
4. Consider the following data at a given temperature:

<u>Equilibrium</u>	<u>K_c</u>
$N_2O_4(g) \rightleftharpoons 2 NO_2(g)$	0.37
$2N_2(g) + 5O_2(g) \rightleftharpoons 2 N_2O_5(g)$	3.9×10^{-4}
$N_2(g) + 2 O_2(g) \rightleftharpoons 2 NO_2(g)$	4.1×10^{-4}

What is the value of K_c for $2 NO_2(g) \rightleftharpoons N_2O_4(g)$ at the same temperature?

- a) 1.6
 b) 2.7
 c) 9.0×10^2
 d) 18
 e) 3.2×10^2

5. The stoichiometric equation for a reaction is:



The mechanism for this reaction is:

- (1) $A + B \rightarrow D$ (slow)
 (2) $D + B \rightarrow E$ (fast)
 (3) $A + E \rightarrow C$ (fast)

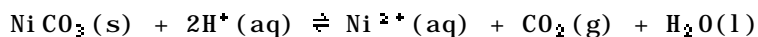
Of the following rate laws, _____ is the correct rate law for this mechanism.

- a) Rate = $k_1[A][B]$
 b) Rate = $k_3[A][E]$
 c) Rate = $k_1[A]^2[B]^2$
 d) Rate = $k_2[D][B]$
 e) Rate = $k_2k_3[A][B][D]$
6. The reaction
 $X + Y \rightleftharpoons 2M$
 has $K_c = 0.89$ at 672 K. At equilibrium, _____.
- a) products predominate substantially
 b) reactants predominate substantially
 c) roughly equal molar amounts of products and reactants are present
 d) only products exist
 e) only reactants exist
7. The equilibrium constant for reaction (1) below is 4.22×10^{-3} . The value of the equilibrium constant for reaction (2) is _____.
- $3A + 2B \rightleftharpoons 2D + E$ (1)
 $2D + E \rightleftharpoons 3A + 2B$ (2)
- a) 5.78×10^{-2}
 b) 4.22×10^{-3}
 c) 1.78×10^{-5}
 d) 237
 e) The value of K_2 cannot be determined from the data given.

8. For the following reaction at 25°C, $K_c = 3.0 \times 10^5$. What is K_p ?

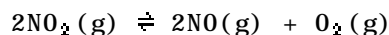


- a) 1.2×10^4
 b) 8.2×10^{-5}
 c) 3.3×10^{-6}
 d) 3.0×10^5
 e) 7.3×10^6
9. The expression for K_c for the reaction below is _____.



- a) $[Ni^{2+}]/[NiCO_3]$
 b) $[NiCO_3]/[Ni^{2+}]$
 c) $[Ni^{2+}][CO_2]/[H^+]^2$
 d) $[Ni^{2+}][H^+]^2$
 e) $[CO_2]$

10. The following reaction was carried out at 25°C with the initial concentration of NO_2 being 0.70 mol/L and no $\text{NO}(\text{g})$ or $\text{O}_2(\text{g})$ initially present. At equilibrium the NO_2 concentration was found to be 0.28 mol/L. Calculate K_c for the reaction.



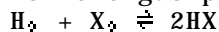
- a) 1.9
 b) 0.94
 c) 0.47
 d) 0.14
 e) 2.1
11. Consider the reaction below:



In an experiment, $\text{CO}(\text{g})$ and $\text{H}_2\text{O}(\text{g})$ are mixed together in such a way that their initial concentrations were 0.35 mol/L and 0.40 mol/L, respectively (there is no CO_2 or H_2 initially present). At equilibrium it was found that the concentration of $\text{CO}(\text{g})$ was 0.19 mol/L. The value of the equilibrium constant for this reaction is

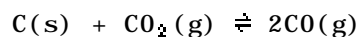
- _____.
- a) 1.0
 b) 0.90
 c) 0.56
 d) 0.34
 e) 1.8
12. For which one of the following reactions are K_c and K_p the same?
- a) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2\text{HCl}(\text{g})$
 b) $2\text{SO}_3(\text{g}) \rightleftharpoons 2\text{SO}_2(\text{g}) + \text{O}_2(\text{g})$
 c) $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$
 d) $\text{C}(\text{s}) + \text{CO}_2(\text{g}) \rightleftharpoons 2\text{CO}(\text{g})$
 e) $2\text{CO}(\text{g}) \rightleftharpoons \text{C}(\text{s}) + \text{CO}_2(\text{g})$

13. For the gas-phase reaction



the equilibrium constant at 501 K is _____ when the equilibrium concentrations of $\text{H}_2 = 0.0025 \text{ M}$, $\text{X}_2 = 0.0050 \text{ M}$, and $[\text{HX}] = 0.0075 \text{ M}$.

- a) 0.22
 b) 60
 c) 1200
 d) 18
 e) 4.5
14. The value of K_c for the following reaction is 1.6:

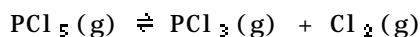


The equilibrium concentration of CO for an equilibrium concentration of CO_2 of 0.50 M is _____ M.

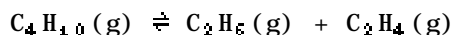
- a) 0.80
 b) 0.75
 c) 0.89
 d) 0.31
 e) 1.12

15. $C_5H_8(g) + 3H_2(g) \rightleftharpoons C_5H_{12}(g)$
 When 1.00 mol C_5H_8 and 3.00 mol H_2 were placed in a 200.0 L container and allowed to reach equilibrium over a catalyst at an elevated temperature, the resulting mixture contained 0.137 mol C_5H_{12} . The equilibrium amount (mol) of H_2 is _____. The initial amount of C_5H_{12} was zero.
- 0.137
 - 0.411
 - 0.0457
 - 2.59
 - 2.86

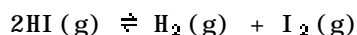
16. The equilibrium partial pressure of PCl_3 in a 3.00 L vessel that was charged with 0.123 atm of PCl_5 , if $K_p = 0.0121$, is _____ atm.



- 0.078
 - 0.0450
 - 0.0900
 - 0.0330
17. The value of K_c for the following reaction is 0.070. What is the equilibrium concentration (M) of C_4H_{10} if the equilibrium concentrations of C_2H_6 and C_2H_4 are both 0.035 M?

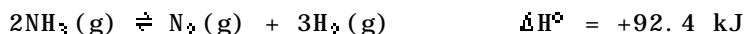


- 0.018
 - 57
 - 0.50
 - 2.0
 - 0.10
18. The value of K_c for the reaction below is 0.016. Under a set of equilibrium conditions, $[HI] = 0.10$ M and $[H_2] = [I_2]$. Calculate the concentration of I_2 (M).



- 1.3×10^{-2}
 - 4.0×10^{-2}
 - 3.1×10^{-1}
 - 1.3 M
 - 0.31
19. For the vapor-phase reaction
 $2AZ \rightleftharpoons A_2 + Z_2$
 $K_c = 16$ at 523 K. If 0.030 mol AZ is introduced into an evacuated 1.00 L vessel at 523 K, then at equilibrium $[Z_2]$ is _____ M.
- 0.003
 - 0.013
 - 0.017
 - 0.24
 - 0.0052

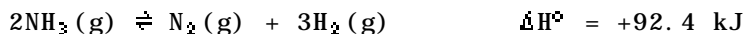
20. Consider the following reaction at equilibrium:



Adding $\text{N}_2(\text{g})$ to the system at equilibrium will _____.

- decrease the concentration of $\text{NH}_3(\text{g})$ at equilibrium
- decrease the concentration of $\text{H}_2(\text{g})$ at equilibrium
- increase the value of the equilibrium constant
- cause the reaction to shift to the right
- remove all of the $\text{H}_2(\text{g})$

21. Consider the following reaction at equilibrium:



This reaction will shift to the right with _____.

- increasing both temperature and pressure
- increasing temperature and decreasing pressure
- decreasing both temperature and pressure
- decreasing temperature and increasing pressure
- the addition of extra N_2 to the container

22. What is the conjugate acid of NH_3 ?

- NH_3
- NH_2^+
- NH_3^+
- NH_4^+
- NH_4OH

23. What is the pH of a solution in which the molar concentration of HCl is 1.3×10^{-11} ?

- 1.00
- 10.89
- 3.11
- 6.00
- 7.00

24. What is the pH of a 0.015 M solution of barium hydroxide?

- 12.48
- 12.18
- 1.82
- 10.35
- 1.52

25. What is the pOH of a 0.015 M solution of barium hydroxide?

- 12.18
- 12.48
- 1.52
- 1.82
- 10.35

26. In basic solution, _____.

- $[\text{H}_3\text{O}^+] = [\text{OH}^-]$
- $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
- $[\text{H}_3\text{O}^+] < [\text{OH}^-]$
- $[\text{H}_3\text{O}^+] = 0 \text{ M}$
- $[\text{OH}^-] > 7.00$

27. What is the pH of an aqueous solution at 25°C in which $[H^+]$ is 0.0025 M?
a) +3.40
b) +2.60
c) -2.60
d) -3.40
e) +2.25
28. What is the pH of an aqueous solution at 25°C in which $[OH^-]$ is 0.0025 M?
a) +2.60
b) -2.60
c) +11.40
d) -11.40
e) -2.25
29. What is the pH of a solution that contains 3.98×10^{-3} M hydronium ion at 25°C?
a) 8.400
b) 5.600
c) 9.000
d) 3.980
e) 7.000
30. Calculate the pOH of a solution at 25°C that contains 1.94×10^{-10} M hydronium ions.
a) 1.940
b) 4.288
c) 7.000
d) 14.000
e) 9.712
31. Which solution below has the highest concentration of hydroxide ions?
a) pH = 3.21
b) pH = 12.59
c) pH = 7.93
d) pH = 9.82
e) pH = 7.00
32. The $[H^+]$ in an aqueous solution at 25°C whose pH is 8.11 is _____ M.
a) 7.76×10^{-9}
b) 1.31×10^8
c) 7.76×10^9
d) 1.31×10^{-8}
e) 8.12×10^{-8}
33. The $[H^+]$ in a solution at 25°C with a pH of 4.39 is _____ M.
a) 3.9×10^{-4}
b) 0.64
c) 0.012
d) 4.1×10^{-5}
e) 2.5×10^4
34. The H^+ concentration in a solution at 25°C with a pH of 3.75 is _____ M.
a) 5.6×10^3
b) 7.5×10^{-3}
c) 5.6×10^{-11}
d) 1.8×10^{-4}
e) 10.25

35. The $[\text{OH}^-]$ and pH of a 0.0012 M $\text{Ba}(\text{OH})_2$ solution at 25°C are _____ M and _____, respectively.
- a) 0.00060, -2.62
 - b) 0.0012, +2.92
 - c) 0.0024, +11.38
 - d) 0.0024, +2.62
 - e) 0.0012, -2.92
36. The pH of a 0.011 M NaOH solution at 25°C is _____.
- a) 1.96
 - b) 4.51
 - c) 12.04
 - d) 12.90
 - e) -1.96
37. What is the pH of a 0.053 M solution of KOH?
- a) 6.91
 - b) 12.72
 - c) 7.33
 - d) 1.28
 - e) -1.28

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1. b	Chapter: 14	QUESTION: 61
2. d	Chapter: 14	QUESTION: 76
3. b	Chapter: 14	QUESTION: 77
4. b	Chapter: 14	QUESTION: 83
5. a	Chapter: 14	QUESTION: 90
6. c	Chapter: 15	QUESTION: 11
7. d	Chapter: 15	QUESTION: 12
8. a (value of R needed)	Chapter: 15	QUESTION: 18
9. c	Chapter: 15	QUESTION: 42
10. c	Chapter: 15	QUESTION: 54
11. c	Chapter: 15	QUESTION: 55
12. a	Chapter: 15	QUESTION: 56
13. e	Chapter: 15	QUESTION: 57
14. c	Chapter: 15	QUESTION: 58
15. d	Chapter: 15	QUESTION: 59

16. d

Chapter: 15 QUESTION: 60

17. a

Chapter: 15 QUESTION: 63

18. a

Chapter: 15 QUESTION: 64

19. b

Chapter: 15 QUESTION: 67

20. b

Chapter: 15 QUESTION: 74

21. b

Chapter: 15 QUESTION: 75

22. d

Chapter: 16 QUESTION: 9

23. e

Chapter: 16 QUESTION: 17

24. a

Chapter: 16 QUESTION: 18

25. c

Chapter: 16 QUESTION: 19

26. c

Chapter: 16 QUESTION: 20

27. b

Chapter: 16 QUESTION: 22

28. c

Chapter: 16 QUESTION: 23

29. a

Chapter: 16 QUESTION: 25

30. b

Chapter: 16 QUESTION: 29

31. b

Chapter: 16 QUESTION: 31

32. a

Chapter: 16 QUESTION: 34

33. d

Chapter: 16 QUESTION: 35

34. d

Chapter: 16 QUESTION: 37

35. c

Chapter: 16 QUESTION: 39

36. c

Chapter: 16 QUESTION: 40

37. b

Chapter: 16 QUESTION: 43