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Jordan University of Science & Technology
Department of Applied Chemistry
CH102 Exam II
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Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	B	D	C	B	B	A	D	D	D	B	D	C	B	D	B
	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✗	✗	✓

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Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	B	A	D	D	D	B	D	A	A	D	B	A	D	A	B
	✗	✗	✓	✓	✗	✗	✗	✗	✗	✗	✓	✗	✗	✓	✓

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Circle the best correct answer for all the following questions?

1. If the half-life, $t_{1/2}$, for a first order reaction is 495 seconds, then the rate constant for this reaction is:
A) $3.20 \times 10^{-4}\ s^{-1}$ B) $1.40 \times 10^{-3}\ s^{-1}$ C) $2.4 \times 10^{-3}\ s^{-1}$ D) $2.0 \times 10^{-2}\ s^{-1}$

2. Consider the reaction A + B → Products. If the rate expression is given by rate = k[A][B], which of the following is not correct for this reaction?
A) The reaction is first order in A B) The reaction is first order in B
C) The reaction is overall second order
D) Doubling the concentration of both A and B should double the rate.

3-5.Consider the following rate data for the reaction below at certain temperature:
2A + 3B → D

Experiment	Initial [A], M	Initial [B], M	Initial rate , $M.s^{-1}$
1.	0.10	0.30	7.22×10^{-5}
2.	0.10	0.60	1.44×10^{-4}
3.	0.20	0.60	5.67×10^{-4}

3. The reaction is ------ order in A and ------- order in B, respectively:
A) first, first B) second, second C) second, first D) first, second

4. What is the rate constant for the reaction?
A) $0.024\ M^{-1}s^{-1}$ B) $0.024\ M^{-2}s^{-1}$ C) $0.004\ M^{-1}s^{-1}$ D) $0.004\ M^{-2}s^{-1}$

5. If the rate of disappearance of A is $0.02\ Ms^{-1}$. What is the rate of disappearance of B?
A) $0.06\ Ms^{-1}$ B) $0.03\ Ms^{-1}$ C) $0.02\ Ms^{-1}$ D) $0.04\ Ms^{-1}$

6. The value of the rate constant for a reaction can be increased if:
A) The temperature of the reaction is increased.
B) The concentration of the reactants is increased
C) The activation energy of the reaction is increased.
D) The concentration of the products is increased.

7. The reaction 2A → Products is second order in A. If the initial concentration of A is 0.80 M, and it took 500 seconds for the concentration of A to drop to 0.45 M. The concentration of A after 1800 seconds will be:
A) 0.41 M B) 0.21 M C) 0.15 M D) 0.32 M

8. According to the collision theory:
A) All collisions will give products
B) only active collisions may give products
C) only collisions with proper orientation of the reacting atoms and/or molecules will give products
D) both B and C are important factors to give products.

9. The reaction A → products is a first order with $k = 0.12\ s^{-1}$. How many seconds it will take for the initial concentration to drop to 40 % of its value?
A) 14.3 s B) 8.52 s C) 4.26 s D) 7.64 s

10. Which of the following is correct about the activation energy for a certain reaction?

A) It changes with changing temperature of the reaction
B) It is constant regardless of temperature.
C) It depends on the initial concentration of the reactants.
D) It depends on the initial concentration of the products.

11-12. Consider the reaction $2A + B \rightarrow 2C + D$, if the mechanism of this reaction is:

$2A \rightarrow 2C + I$ (slow)
$I + B \rightarrow D$ (fast)

11.This reaction is:

A) First order in A and first order in B
B) second order in A and zero order in B
C) Second order in B
D) second order in A and first order in I.

12. The intermediate in this reaction is--------.

A) C B) B C) I D) D

13. Which of the following is correct about a catalyst for a reaction at equilibrium?

A) Increases the amount of products present at equilibrium.
B) Increases the rate at which the equilibrium is reached but decreases the equilibrium constant.
C) Increases the rate at which the equilibrium is reached without changing the equilibrium constant.
D) The reaction needs less amounts of reactants to reach equilibrium.

14. Which of the following is considered a conjugate acid-base pair according to Bronsted-Lowery concept?

A) H_2S/HS^- B) H_3PO_4/PO_4^{3-} C) H_2CO_3/CO_3^{2-} D) NH_4^+/NH_2^-

15-17. Given the equilibrium $N_2O_{4\,(g)} \leftrightarrow 2NO_{2\,(g)}$, K = 0.213 at 100 ° C and the concentration of $N_2O_{4\,(g)}$ at equilibrium equal 0.0045 M:

15. Calculate the concentration of NO_2 at equilibrium?

A) 0.0166 M B) 0.0310 M C) 0.0022 M D) 0.0775 M

16. Calculate the initial concentration of N_2O_4; assuming initial concentration of NO_2 is zero?

A) 0.0200 M B) 0.0155 M C) 0.0400 M D) 0.0096 M

17. Calculate the equilibrium constant, K, for the following reaction: $4NO_{2\,(g)} \leftrightarrow 2N_2O_{4\,(g)}$ at 100 ° C?

A) 22 B) 2.2 C) 9.4 D) 88

18. For the reaction A → Products; the concentration of A droped from 0.80 M to 0.50 M when time of the reaction changed from 1.00 minute to 1.50 minutes. The average rate of A is-----.

A) 0.005 M/s B) – 0.005 M/s C) 0.010 M/s D) – 0.01 M/s

19. A Bronested-Lowery acid is defined as a substance that-------.

A) Increases $[H^+]$ when placed in H_2O
B) Decreases $[H^+]$ when placed in H_2O
C) Acts as a proton acceptor in any system
D) Acts as a proton donor in any system

20-22. Given the following equilibrium:

$2SO_{3\,(g)} \leftrightarrow 2SO_{2\,(g)} + O_{2\,(g)}$ $\Delta H° = +99$ kJ/mol

20. Calculate the equilibrium constant , K , for the reaction if the amounts at equilibrium are: $O_2 = 0.105$ M , $SO_3 = 6.52 \times 10^{-3}$ M and $SO_2 = 1.29 \times 10^{-3}$ M .

A) 6.78×10^{-2} B) 1.34×10^{-2} C) 4.12×10^{-3} D) 4.35×10^{-2}

21. Consider the above reaction at equilibrium. Adding O_2 gas to the reaction will:

A) increase the concentration of SO_2 gas at equilibrium.
B) decrease the concentration of SO_3 gas at equilibrium.
C) increase the value of equilibrium constant.
D) cause the reaction to shift to the left.

22. Consider the above reaction at equilibrium , the amount of $SO_{2\,(g)}$ produced can be maximized (increased) by carring out the reaction :

A) at higher temperature B) adding more $O_{2\,(g)}$
C) at lower temperature D) adding a catalyst

23-25 : Given the following heterogeneous equilibrium : $C_{(s)} + CO_{2\,(g)} \leftrightarrow 2\,CO_{(g)}$. $K = 1.6$.

23. What is the equilibrium concentration of CO if the concentration of $CO_{2\,(g)}$ at equilibrium = 0.50 M

A) 0.80 M B) 0.89 M C) 0.75 M D) 0.31 M

24. What will be the effect of adding more solid carbon to the container of the above reaction at equilibrium ?

A) shift the equilibrium to left B) shift the equilibrium to right
C) change the value of equilibrium constant D) no effect

25. What will be the effect of decreasing the volume of the container?

A) shift the equilibrium to left B) shift the equilibrium to right
C) change the value of equilibrium constant D) no effect

26. The reaction A → Products is first order. Which of the following plots is linear?

A) $[A]_t$ vs. t B) $\ln[A]_t$ vs. t C) $1/[A]_t$ vs. t D) $[A]_t$ vs. 1/t

27. What is the pH of a solution that contains 3.98×10^{-9} M hydroxide ion?

A) 8.400 B) 5.60 C) 9.00 D) 3.98

28. What is the concentration of H^+ (in mol/L) in a solution with pH= 4.282?

A) 4.282 B) 1.92×10^{-10} C) 5.224×10^{-5} D) 5.224×10^{-4}

29. A second order reaction has a half-life of 18 s when the initial concentration of the reactant is 0.71 M. The rate constant for this reaction is ------- $M^{-1}s^{-1}$.

A) 7.8×10^{-2} B) 3.8×10^{-2} C) 1.3 D) 18

30. The rate constant for a particular reaction is $1.3 \times 10^{-4}\ s^{-1}$ at 100 ^{0}C, and $1.1 \times 10^{-3}\ s^{-1}$ at 150 ^{0}C. what is the activation energy for this reaction? (R= 8.314 J/mol-K)

A) 16 kJ B) 56 kJ C) 22 kJ D) 64 kJ