**Section 1. Kinetics**

1. A proposed mechanism for a given reaction is:

A 🡪 B + C (slow step)

B + A 🡪 2D (fast step)

The proposed mechanism corresponds to which rate law?

a. rate = k[A]

b. rate = k[A]2[B]

c. rate = k[A]2

d. rate = k[B][C]/[A]

1. A reaction follows the rate law: rate = k[D]2 Which graph will be linear?

a. [D] vs. time

b. ln [D] vs. time

c. [D]2 vs. time

d. 1/[D] vs. time

1. Here is kinetics data for 2A + B 🡪 C + 2D

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | [A] M | [B] M | Initial Rate M/s |
| 1 | 0.11 | 0.22 | 2.7 X 10-3 |
| 2 | 0.11 | 0.44 | 5.4 X 10-3 |
| 3 | 0.22 | 0.22 | 2.7 X 10-3 |
| 4 | 0.22 | 0.44 | 5.4 X 10-3 |

What is the reaction rate law?

a. rate = k[A]2[B]

b. rate = k[A][B]2

c. rate = k[A][B]

d. rate = k[B]

1. The rate law for a reaction has the form rate = k[X]a[Y]b The vales for a and b are determined by:

a. analyzing the reaction coordinate diagram

b. deriving the rate law from reaction stoichiometry

c. deriving the rate law from the rate law for similar reactions

d. demining initial rates after [X] and [Y] have been varied systematically

**Section 2. Equilibrium,**

1. The solubility of barium fluoride is 0.018 molL-1 at 25 °C. What is its solubility product constant at 25 °C?

a. 3.6 X 10-2

b. 1.2 X 10-5

c. 2.3 X 10-5

d. 5.8 X 10-6

1. For the following reaction at equilibrium:

Fe3+ (aq)+ SCN- (aq) FeSCN2+(aq)

Pale yellow colorless red

Which addition leaded to the described color change?

1. Added Ag+ reacts with SCN- and the red color intensity increases
2. Fe(NO3)3 is added and the red color intensity decreases
3. NaSCN is added and the red color intensity decreases
4. Added Hg2+ reacts with the SCN- and the red color decreases
5. Which is a stronger acid and why, CF3COOH or CI3COOH?

a. CI3COOH because of the size of the I atom

b. they are of equal acidity

c. CI3COOH because of the molar mass

d. CF3COOH because of the electronegativity

1. A reaction has a positive ΔH° and a negative ΔS°. What is true about K when the reaction is at equilibrium?

a. K<1

b. K>1

c. nothing about K can be determined without a numerical value for ΔH°

d. nothing about K can be determined without a numerical value for ΔG°

1. Which statement is true for this reaction at equilibrium?

N2(g) + 3H2 (g) 2NH3 (g)

* 1. The rate of the forward reaction is greater than the rate of the reverse reaction
  2. The rate of the forward reaction equals the rate of the reverse reaction
  3. Neither forward nor reverse reaction proceeds at equilibrium
  4. The concentrations of the reacts and products are equal

**Section 3. Thermodynamics**

1. The equilibrium constant for a reaction is 4.3 X 1020 at 25 °C. At this temperature the reaction is

a. instantaneous, but not spontaneous

b. spontaneous but not instantaneous

c. instantaneous, but it cannot be determined if it is spontaneous

d. spontaneous, but it cannot be determined if it is instantaneous

1. For a reaction at equilibrium at a particular temperature and pressure which is true?

a. ΔG <0

b. ΔG>0

c. ΔG = 0

d. ΔG° = 0

1. Which substance is in its standard state at 298K?

a. H2O (s)

b. S(l)

c. Pb(s)

d. Hg(s)

1. Use the information below to approximate the boiling point of bromine:

a. 31°C

b. 40 °C

c. 127 K

|  |  |  |
| --- | --- | --- |
| Substance | ΔH° kJ/mol | S° J/Kmol |
| Br2(l) | 0 | 152 |
| Br(g) | 31 | 245 |

d. 333 K

1. Given:

4HCl (g) + O2(g) 🡪 2Cl2(g) + 2H2O (l) ΔH° = -148.4 kJ

HF(g) 🡪 ½ H2(g) + ½ F2(g) ΔH° = +680.0 kJ

H2(g) + ½ O2(g) 🡪 H2O (l) ΔH° = -285.8 kJ

What is the change in enthalpy for this reaction?

2HCl (g) + F2(g) 🡪 Cl2 (g) + 2HF (g)

1. -1148/4 kJ
2. -165.8 kJ
3. +165.8 kJ
4. +988.4 kJ

**Section 4. Electrochemistry**

1. This reaction takes place in an aqueous acidic solution

Cr2O72- + Sn2+ 🡪 Cr3+ + Sn4+

When balanced the smallest whole – number coefficient for Cr2O72- is :

a. 4

b. 3

c. 2

d. 1

1. How many seconds are required to deposit 1.32 g of copper from a CuSO4 solution using a current of 0.938 amps?

a. 4.22 X 10-2

b. 2.14 X 103

c. 3.76 X 103

d. 4.27 X 103

1. Consider this reaction at 25°C:

Cu2+(aq) + Fe(s) 🡪 Cu(s) + Fe2+ (aq)

When [Fe2=] = 2.0M and [Cu2=] = 1.0 M what is true?

a. E is greater than E°

b. E is less than E°

c. E equals E°

d. Both E and E° equal zero

**Section 5. Solutions**

1. Water and octane (C8H18­)are immiscible because

a. they both have polar bonds which are mutually repulsive

b. hydrogen bonding between octane molecules causes formation of a bilayer

c. one compound is polar and the other is nonpolar

d. these liquids have very different densities

1. What is the molality of the solution made by dissolving 15.0g of NaNO3 in 175g of H2O?

a. 0.00101

b. 0.0857

c. 0.176

d. 1.01

1. What is the freezing point of a solution of 12.8g of naphthalene (C10H8­) dissolved in 500g of benzene (C6H6)? The normal freezing point of pure benzene is 5.48°C and its Kf is 5.12°C/*m*

a. 6.50°C

b. 4.46°C

c. -1.02°C

d. -4.48°C

**Section 6. Nuclear**

1. Complete this nuclear equation

13755Cs 🡪 ? + 0-1e + 00

a. 13756Ba

b. 13754Xe

c. 13656Ba

d. 13756Cs

1. Carbon-14 is used to date objects. It has a half-life of 5715 years. A piece of charcoal from a site was found to have only 45% of the radiation compared to fresh wood from the same site. How old is the charcoal?

a. 2.2 X 103 years

b. 2.6 X 103 years

c. 4.0 X 103 years

d. 6.6 X 103 years

Answers

1. A
2. D
3. D
4. D
5. C
6. D
7. D
8. A
9. B
10. D
11. C
12. C
13. D
14. A
15. D
16. D
17. B
18. C
19. D
20. B
21. A
22. D