AP CHEMISTRY CHAPTER 12 PRACTICE QUIZ

1. The rate law for the reaction

2H+(aq) + 2I-(aq) + H2O2(aq) → I2(aq) + 2H2O(l)

is rate = k[I-][H2O2]

Which statement can be inferred from this rate law?

1. The reaction has a one-step mechanism
2. Doubling the [H+] concentration will double the rate of formation of I2
3. Doubling the [H2O2] will double the rate of formation of I2
4. Doubling the [I-] will quadruple the rate of formation of I2
5. Nitric oxide, NO, reacts with bromine, Br2, to form NOBr according to the equation

2NO(g) + Br2(g) → 2NOBr(g)

This mechanism has been proposed for the reaction:

NO(g) + Br2(g) → NOBr2(g) (slow)

NOBr2(g) + NO(g) → 2NOBr(g) (fast)

Which rate law is consistent with this mechanism?

1. Rate = k[NO][Br2]
2. Rate = k[NO][NOBr2]
3. Rate = k[NO]2[Br2]
4. Rate = k[NO]2[Br2][NOBr2]
5. Use the tabulated data to find the rate law for the reaction

HCOOH(aq) + Br2(aq) → 2H+(aq) + 2Br-(aq) + CO2(g)

|  |  |  |  |
| --- | --- | --- | --- |
| Trial | [HCOOH] | [Br2] | Initial Rate (mol/L. s) |
| 1 | 0.010 M | 0.010 M | 1.5 x 10-3 |
| 2 | 0.020 M | 0.020 M | 3.0 x 10-3 |
| 3 | 0.030 M | 0.020 M | 4.5 x 10-3 |

1. rate = k
2. rate = k[HCOOH]
3. rate = k[HCOOH][Br2]
4. rate = k[HCOOH]2[Br2]
5. For the reaction below, the experimental rate law is given as follows:

Rate = k[(CH3CCl]

(CH3)3CCl(aq) + OH-(aq) → (CH3)3COH(aq) + Cl-(aq)

If some solid sodium hydroxide is added to a solution that 0.010 molar in (CH3)3CCl and 0.10 molar in NaOH, which of the following is true? Assume the temperature and volume remain constant.

1. Both reaction rate and k increase
2. Both the reaction rate and k decrease
3. Both the reaction rate and k remain the same
4. The reaction rate increases but k remains the same
5. The reaction rate decreases but k remains the same
6. The reaction 2NO→ N2 + O2 has the following rate law:

-Δ[NO] = 2k[NO]2

Δt

After a period of 2.0 x 103 s, the concentration of NO falls from an initial value of 2.8 x 10-3 mol/L to 2.0 x 10-3 mol/L. What is the rate constant, k?

1. 7.2 x 10-2 L/mol.s
2. 1.7 x 10-4 L/mol.s
3. 4.0 x 10-4 L/mol.s
4. 4.0 x 10-7 L/mol.s
5. 3.6 x 10-2 L/mol.s

The reaction 2NOBr → 2NO + Br2

exhibits the rate law Rate = k[NOBr]2 = -Δ[NOBr]

Δt

Where k = 1.0 x 10-5 L/mol . s at 25oC. This reaction is run where the initial concentration of NOBr, ([NOBr]o) is 0.100 M.

1. What is the half-life for this experiment?
2. 0.50 s
3. 6.9 x 104 s
4. 1.0 x 10-5 s
5. 1.0 x 106 s
6. none of these
7. For a hypothetical chemical reaction that has the stoichiometry 2X + Y → Z, the following initial rate data were obtained. All measurements were made at the same temperature.

|  |  |  |
| --- | --- | --- |
| Initial Rate Formation of Z  mol/L.s | Initial [X]o  mol/L | Initial [Y]o  mol/L |
| 7.0 x 10-4 | 0.20 | 0.10 |
| 1.4 x 10-3 | 0.40 | 0.20 |
| 2.8 x 10-3 | 0.40 | 0.40 |
| 4.2 x 10-3 | 0.60 | 0.60 |

1. Give the rate law expression for this reaction from the data above. (5)
2. Calculate the specific rate constant for this reaction and specify its units (5)
3. How long must the reaction proceed to produce a concentration of Z equal to 0.20 M, if the initial reaction concentrations are [X]o = 0.80 M, [Y]o = 0.60 M, and [Z]o = 0 M? (5)
4. Select from the mechanisms below the one most consistent with the observed data, and explain your choice. In these mechanisms M and N are reaction intermediates (5)
5. X + Y → M (slow) (3) Y → M (slow)

X + M → Z (fast) M + X → N (fast) N + X → Z (fast)

1. X + X → M (fast)

Y + M → Z (slow)

ANSWERS FOR SAMPLE TEST

1. C
2. A
3. B
4. C
5. A
6. D
7. a. rate = k[Y]

b. k = 7.0 x 10-3/s

c. t = 58 seconds

d. (3) , the rate id dependent on the slow step which only has reactant Y which is consistent with the above data which shows that the rate is only dependent on [Y]