QUIZ # 1, Chapter -12

ID # Name: Date:

Attempt all questions.

[2] 1
Q. 1 a) Write down the rate law equation of the following reaction.

\[ 2\text{NO}_2 (g) \rightarrow 2\text{NO} (g) + \text{O}_2 (g) \]

Rate \( = \frac{-\Delta[A\text{NO}_2]}{\Delta t} = k[A\text{NO}_2]^n \)

b) The rate constant \( (k) \) and order of the reactant \( (n) \) must both be determined by

a) Coefficient of balanced equation only.

b) Concentration of the product only.

c) Experiment only.

d) both coefficients of the balanced equation and experiment.

[2.5]
Q. 3.

a) Write down the integrated form of the following equation and unit of the rate constant \( (k) \).

\[ -\frac{\Delta[A]}{\Delta t} = k[A]^n \quad (n=1) \]

b) What is half life time of second order reaction.

\[ a) \ln[A] = -kt + \ln[A]_0 \], Unit of \( k \) = s^{-1}

\[ b) t_{1/2} = \frac{1}{k[A]_0} \]
Q.2. The following data were obtained for the reaction

$$2\text{ClO}_2\ (aq) + 2\text{OH}^-\ (aq) \rightarrow \text{ClO}_3^-\ (aq) + \text{ClO}_2^-\ (aq) + \text{H}_2\text{O}\ (l)$$

where

$$\text{Rate} = \frac{\Delta[\text{ClO}_2]}{\Delta t}$$

(a) **Rate Law**

b) **The value of the rate constant ($k$)**

c) **What would be the value of initial rate for an experiment with $[\text{ClO}_2]_0 = 0.175\text{ mol/L}$, and $[\text{OH}^-]_0 = 0.0844\text{ mol/L}$?**

**Show all calculations**

\[\text{Initial Rate} = \ ?\]

\[\text{[ClO}_2\text{]}_0 = 0.175\text{ mol/L} \]

\[\text{[OH}^-\text{]}_0 = 0.0844\text{ mol/L} \]

\[\text{Rate} = k[\text{ClO}_2]^x[\text{OH}^-]^y\]

\[2.30 \times 10^{-1} = k(0.100)^x(0.100)^y\]

\[5.75 \times 10^{-2} = k(0.050)^x(0.100)^y\]

\[4.0 = \frac{(0.100)^x}{(0.050)^x}\]

\[x = 2\]

\[4.0 = \frac{(0.100)^y}{(0.050)^y}\]

\[y = 1\]

\[\text{Rate} = k[\text{ClO}_2]^2[\text{OH}^-]\]

\[2.30 \times 10^{-1} = k(0.100)^2(0.100)\]

\[k = 2.30 \times 10^{-2}\text{ L}^2/\text{mol} \cdot \text{s}\]

\[\text{Rate} = 0.594\text{ mol/L} \cdot \text{s}\]