

Unit 13 – Chapter 12: Kinetics

Name _____

Assignment #1: Differential Rate Law

Period _____

- 1) Consider the general reaction: $aA + bB \rightarrow cC$
and the following average rate data over some time period Δt :

$$-\frac{\Delta A}{\Delta t} = 0.0080 \text{ mol/L} \cdot \text{s}$$

$$-\frac{\Delta B}{\Delta t} = 0.0120 \text{ mol/L} \cdot \text{s}$$

$$-\frac{\Delta C}{\Delta t} = 0.0160 \text{ mol/L} \cdot \text{s}$$

Determine a set of possible coefficients to balance this general reaction.

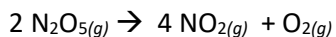
- 2) The reaction: $2 \text{I}^-_{(aq)} + \text{S}_2\text{O}_8^{2-}_{(aq)} \rightarrow \text{I}_{2(aq)} + 2 \text{SO}_4^{2-}_{(aq)}$ was studied at 25°C. The following results were obtained where

$$\text{Rate} = -\frac{\Delta[\text{S}_2\text{O}_8^{2-}]}{\Delta t}$$

$[\text{I}^-]_0$ (mol/L)	$[\text{S}_2\text{O}_8^{2-}]_0$ (mol/L)	Initial Rate (mol/L · s)
0.080	0.040	12.5×10^{-6}
0.040	0.040	6.25×10^{-6}
0.080	0.020	6.25×10^{-6}
0.032	0.040	5.00×10^{-6}
0.060	0.030	7.00×10^{-6}

- Determine the rate law.
- Calculate a value for the rate constant for each experiment and an average value for the rate constant.

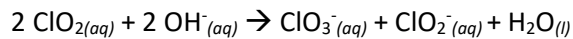
3) The following data were obtained for the gas-phase decomposition of dinitrogen pentoxide,



$[\text{N}_2\text{O}_5]_0$ (mol/L)	Initial Rate (mol/L · s)
0.0750	8.90×10^{-4}
0.190	2.26×10^{-3}
0.275	3.26×10^{-3}
0.410	4.85×10^{-3}

Defining the rate as $-\frac{\Delta[\text{N}_2\text{O}_5]}{\Delta t}$, write the rate law and calculate the value of the rate constant.

4) The following data were obtained for the reaction:



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

$[\text{ClO}_2]_0$ (mol/L)	$[\text{OH}^-]_0$ (mol/L)	Initial Rate (mol/L · s)
0.0500	0.100	5.75×10^{-2}
0.100	0.100	2.30×10^{-1}
0.100	0.0500	1.15×10^{-1}

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