CHE 112 - Homework - Ch 17a

OER 17.1-17.3 **Kinetics - Rate Laws** Score: _____/25

Name: _____ Date: _____

[6 pt] 1. The following rate data was collected for the reaction: $\_2\_NO_2(g) \longrightarrow \_2\_NO(g) + \_\_\_O_2(g)$. Using this data, answer the following questions:

Time	$[NO_2]$ (M)	Time	$[NO_2]$ (M)
0	8.00×10^{-3}	200	4.29×10^{-3}
50	6.58×10^{-3}	300	3.48×10^{-3}
100	5.59×10^{-3}	400	2.93×10^{-3}
150	4.85×10^{-3}	500	2.53×10^{-3}

(a) What is the average rate of decomposition of NO_2 between 50-100 seconds using the data below?

(b) How is the rate of consumption of NO_2 related to the rate of production of NO? (in words and an equation)

(c) How is the rate of consumption of NO_2 related to the rate of production of O_2? (in words and an equation)

[4 pt] 2. The following reaction is first order in Br^- and BrO_3^- and second order in H^+.

$$\_5\_Br^-(aq) + \_\_\_BrO_3^-(aq) + \_6\_H^+(aq) \longrightarrow \_3\_Br_2(aq) + \_3\_H_2O(l)$$

(a) Write the rate law.

(b) What is the overall reaction order?

(c) How does the reaction rate change if the H^+ concentration triples? Explain.

(d) How does the reaction rate change if the concentration of Br^- and BrO_3^- is halved? Explain.

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[7 pt] 3. Given the reaction $\_\_H_2O_2(aq) + \underline{\ 3\ } I^-(aq) + \underline{\ 2\ } H^+(aq) \longrightarrow \_\_I_3^-(aq) + \underline{\ 2\ } H_2O(l)$ and the following experimental rate data based on the rate of formation of $I_3^-(aq)$, answer the following questions:

Exp	$[H_2O_2]$ (M)	$[I^-]$ (M)	Rate (M/s)
1	0.100	0.100	1.15×10^{-4}
2	0.100	0.200	2.30×10^{-4}
3	0.200	0.100	2.30×10^{-4}
4	0.200	0.200	4.60×10^{-4}

(a) What is the rate law?

(b) What is the value of the rate constant? 3(b) _____

(c) What is the reaction rate when the initial concentration are:
$H_2O_2 = 0.300$ M and $I^- = 0.400$ M? 3(c) _____

[8 pt] 4. Given the reaction $\underline{\ 2\ } NO(g) + \_\_Cl_2(g) \longrightarrow \underline{\ 2\ } NOCl(g)$ and the following experimental rate data based on the consumption of Cl_2, answer the following questions:

Exp	[NO] (M)	$[Cl_2]$ (M)	Rate (M/s)
1	0.13	0.20	1.0×10^{-2}
2	0.26	0.20	4.0×10^{-2}
3	0.13	0.10	5.0×10^{-3}

(a) What is the rate law?

(b) What is the value of the rate constant? 4(b) _____

(c) What is the reaction rate when both reactant concentrations are 0.12 M? 4(c) _____