

Section 13-2 (AP Chem)
Rate Laws from Experimental Data

Name _____
Period _____ Date _____

1. The reaction $\text{NH}_4^+ (\text{aq}) + \text{NO}_2^- (\text{aq}) \rightarrow \text{N}_2 (\text{g}) + 2 \text{H}_2\text{O} (\text{l})$ was performed with the following concentrations and determined rates:

Experiment	Initial $[\text{NH}_4^+]$, M	Initial $[\text{NO}_2^-]$, M	Initial Rate, M/s
1	0.10	0.020	5.4×10^{-7}
2	0.20	0.020	10.8×10^{-7}
3	0.40	0.020	21.5×10^{-7}
4	0.020	0.20	10.8×10^{-7}
5	0.020	0.40	21.6×10^{-7}
6	0.020	0.60	32.4×10^{-7}

- a. Based on the above data, what is the order of the reaction with respect to NH_4^+ ? _____
- b. Based on the above data, what is the order of the reaction with respect to NO_2^- ? _____
- c. Write the Rate Law for the reaction. Rate = _____
- d. Calculate the rate constant, k . _____
- e. What is the initial rate of the reaction when $[\text{NH}_4^+] = 0.50 \text{ M}$ and $[\text{NO}_2^-] = 0.030 \text{ M}$? _____

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2. For the reaction $a\text{A} + b\text{B} \rightarrow c\text{C}$, the following data were collected.

Experiment	Initial $[\text{A}]$, M	Initial $[\text{B}]$, M	Initial Rate, M/s
1	0.10	0.10	4.0×10^{-5}
2	0.10	0.20	4.0×10^{-5}
3	0.20	0.10	16.0×10^{-5}

- a. Based on the above data, what is the order of the reaction with respect to A? _____
- b. Based on the above data, what is the order of the reaction with respect to B? _____
- c. Write the Rate Law for the reaction. Rate = _____
- d. Calculate the rate constant, k . _____