

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

Name \_\_\_\_\_  
Period \_\_\_\_\_ Date \_\_\_\_\_

1) The following reaction is done in lab:  $\text{NH}_4^+(\text{aq}) + \text{NO}_2^-(\text{aq}) \rightarrow \text{N}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$

Data from many experiments using varying concentrations of reactants are collected. Data is given below.

Run #	initial $[\text{NH}_4^+]$ (M)	initial $[\text{NO}_2^-]$ (M)	Rate (M/s)
1	0.01	0.20	$5.4 \times 10^{-7}$
2	0.02	0.20	$10.8 \times 10^{-7}$
3	0.04	0.20	$21.5 \times 10^{-7}$
4	0.20	0.02	$10.8 \times 10^{-7}$
5	0.20	0.04	$21.6 \times 10^{-7}$
6	0.20	0.06	$32.4 \times 10^{-7}$

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

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2) The following reaction is done in lab:  $\text{A} + \text{B} \rightarrow \text{C}$

Data from many experiments using varying concentrations of reactants are collected. Data is given below.

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

- a) Based on the data above, what is the order of the reaction with respect to A? \_\_\_\_\_
- b) Based on data above, 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 for the reaction. \_\_\_\_\_