

Name _____

Period _____

Chemical Kinetics Homework #3
Graphical Methods

1) Use the data table to answer the following questions for the reaction:



CONCENTRATION (mol/L) at 300 °C

TIME (sec)	NO ₂	NO	O ₂
0	0.0100	0	0
50	0.0079	0.0021	0.0011
100	0.0065	0.0035	0.0018
150	0.0055	0.0045	0.0023
200	0.0048	0.0052	0.0026
250	0.0043	0.0057	0.0029
300	0.0038	0.0062	0.0031
350	0.0034	0.0066	0.0033
400	0.0031	0.0069	0.0035

- a) Graph the data with time (independent variable) on the x-axis and concentration (dependent variable) on the y-axis. All three lines should be on the same graph. Attach the computer generated graph to this paper.
- b) Calculate the rate of nitrogen monoxide production in molar per second for the first 50 seconds.
- c) Calculate the rate of oxygen production in molar per second for the first 50 seconds.
- d) Calculate the rate of nitrogen monoxide production between 200 and 250 seconds.
- e) How does the value in part d compare to the first 50 seconds of the reaction?
- f) How do the reaction rates of the two products compare to each other? How does this experimental data support the balanced equation?
- g) How can you tell from the graph which species is a reactant and which is a product?

2) A reaction is performed using a strip of magnesium placed into a gas—collecting tube containing 0.4 M HCl. As the reaction proceeds the tube fills with hydrogen gas, displacing water and HCl. Use the data table to answer the following question for this reaction:

TIME (min)	VOLUME OF H ₂ Gas (mL)	TIME (min)	VOLUME OF H ₂ GAS (mL)
0	0.0	10.0	40.6
2.0	4.3	12.0	44.1
4.0	10.2	14.0	46.8
6.0	22.3	16.0	47.0
8.0	31.7	18.0	47.0

- a) Graph the data. Attach a computer generated graph to this paper.
- b) Write the equation for the reaction.

- c) Calculate the reaction for the first 2 minutes.

- d) Calculate the reaction rate between 2 to 4 minutes.

- e) Calculate the reaction rate between 4 and 6 minutes.

- f) Compare the reaction rate for the first 2 minutes to that between 4 and 6 minutes.

- g) What is the reason for the difference in the reaction rates for the first 2 minutes compared to that of the third 2 minutes (question f)?

- h) Compare the reaction rate between 4 and 6 minutes to that between 14 and 16 minutes

- i) What is the reason for the difference in the reaction rate between 4 and 6 minutes, and the reaction rate between 14 and 16 minutes?

- j) How would the *volume measurements* differ if the experiment had been done with 0.8M HCl?

- k) How would the *graph* differ with 0.8M HCl?