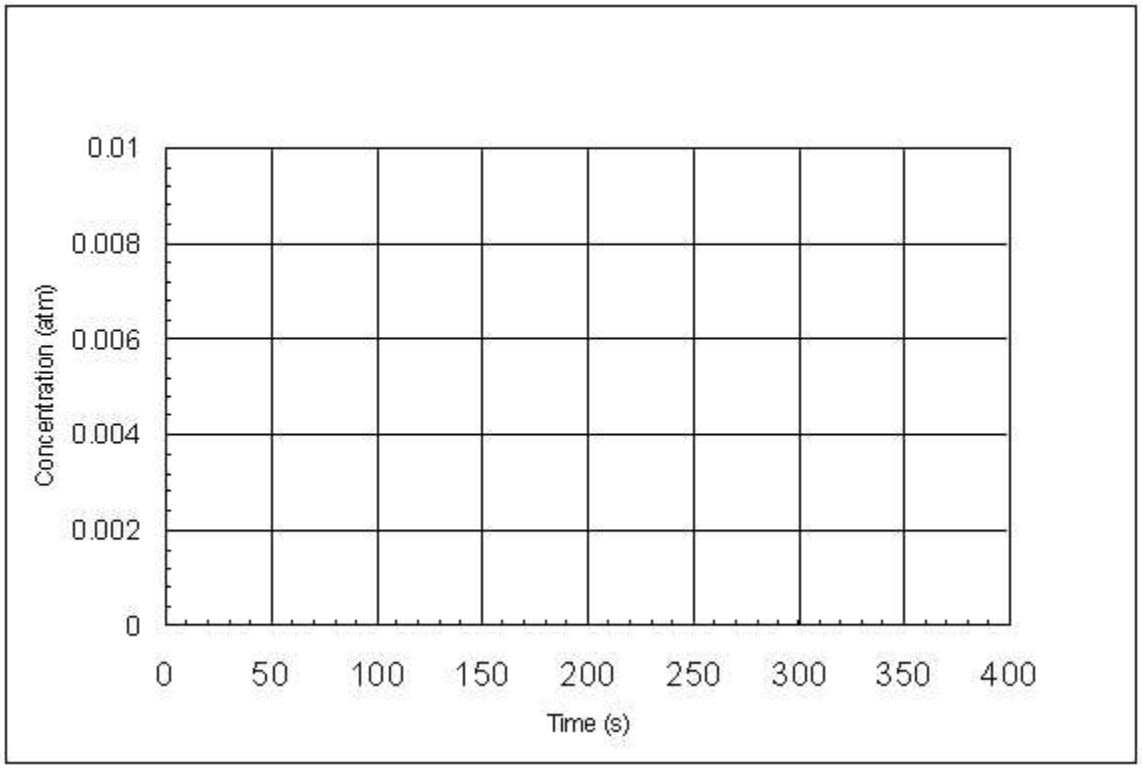
Chemistry 146 – Van Bramer
Spring Problem Set – Week 3

For the reaction $2\ NO_2 <-> 2\ NO + O_2$ At 300 C

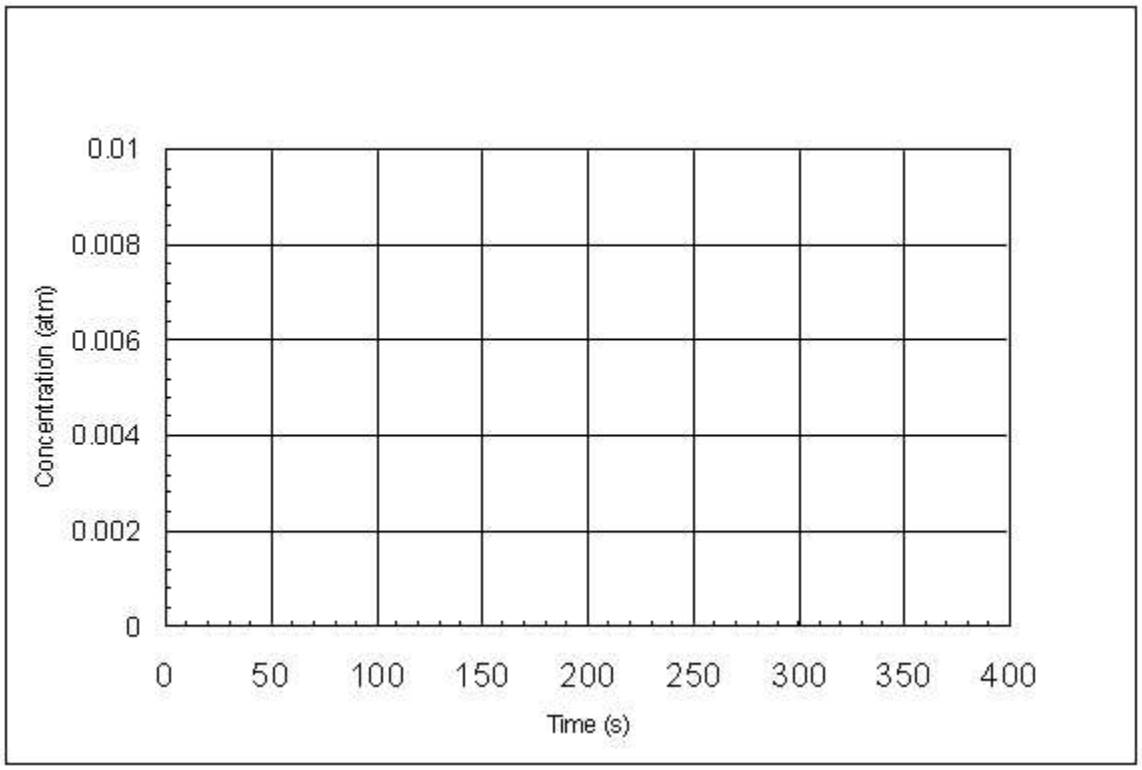
Kinetics Data

Experimental Data from Zumdahl			
time (s)	**NO_2 (atm)**	**NO (atm)**	**O_2 (atm)**
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

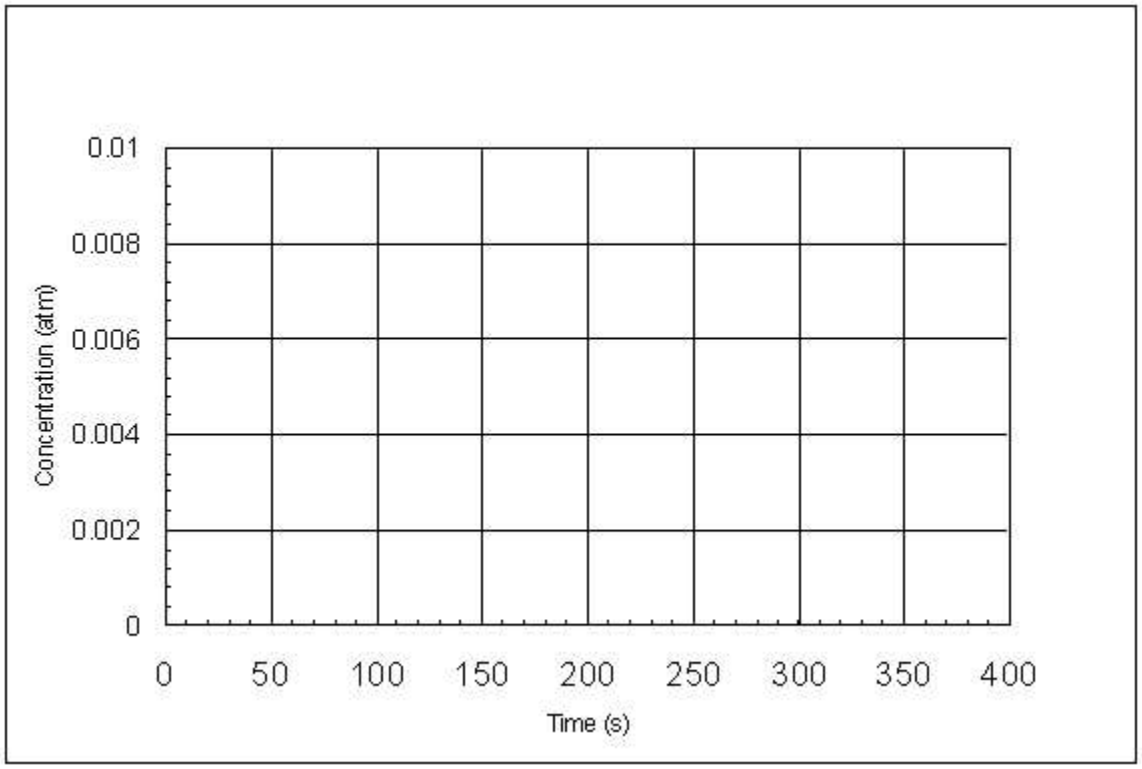
1. Plot NO_2 pressure vs time



2. Plot NO pressure vs time



3. Plot O_2 pressure vs time

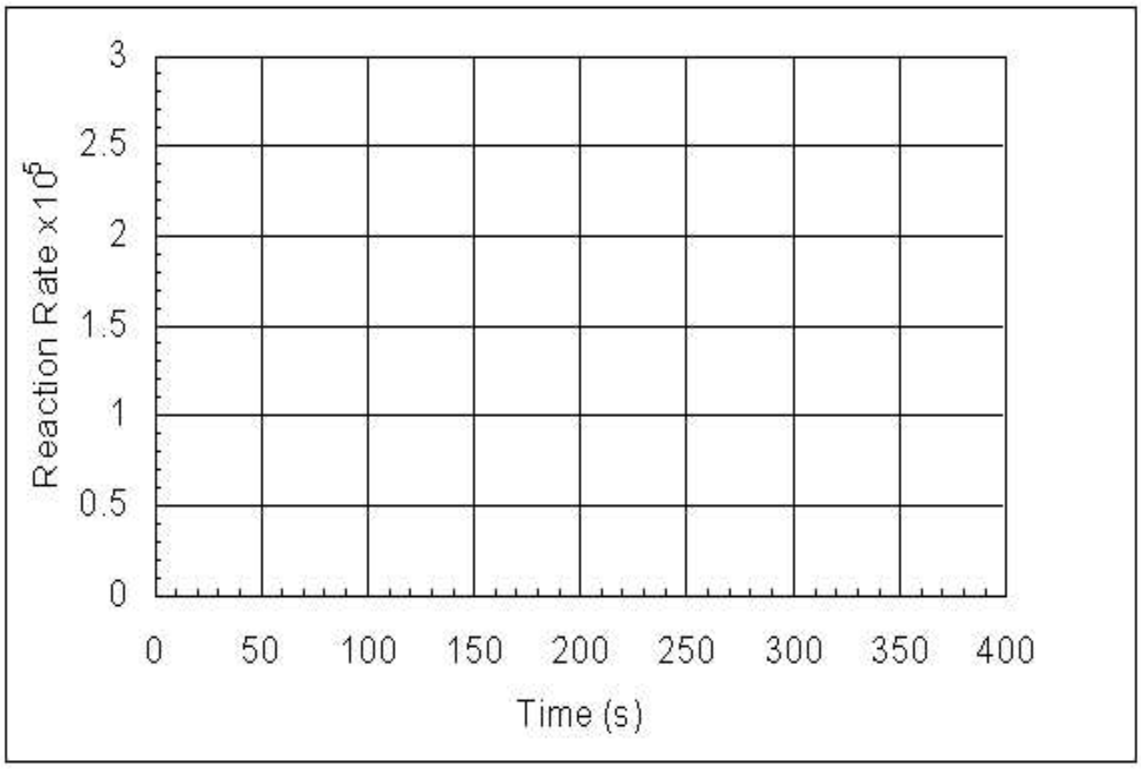


Rate of the reaction:

Calculate the average concentration and the average rate of the reaction for each of the time differences. What are the appropriate units for the rate of the reaction?

- 0-50 s
- 50-100 s
- 100-150 s
- 150-200 s
- 200-250 s
- 250-300 s
- 300-350 s
- 350-400 s

Graph the rate of the reaction for each time increment.



Rate Constant

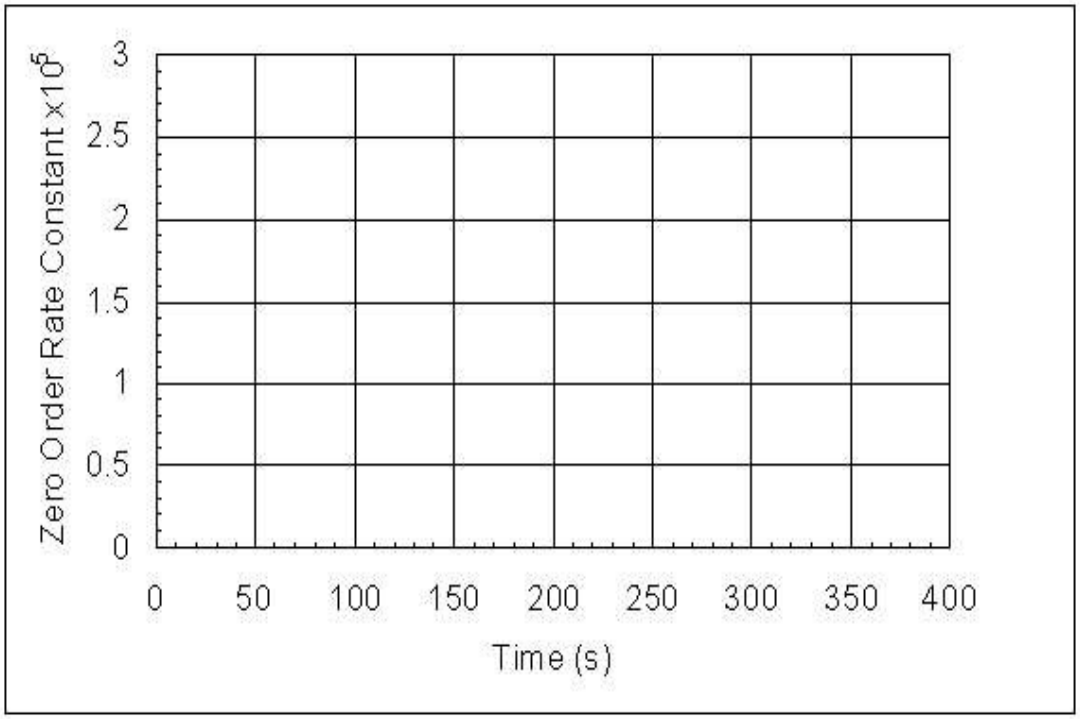
The rate equation for a chemical reaction follows the form: Rate = k[reactant]^x where:

- Rate is the rate of the reaction
- k is the rate constant for the reaction
- [reactant] is the concentration of the reactant
- x is the order of the reaction

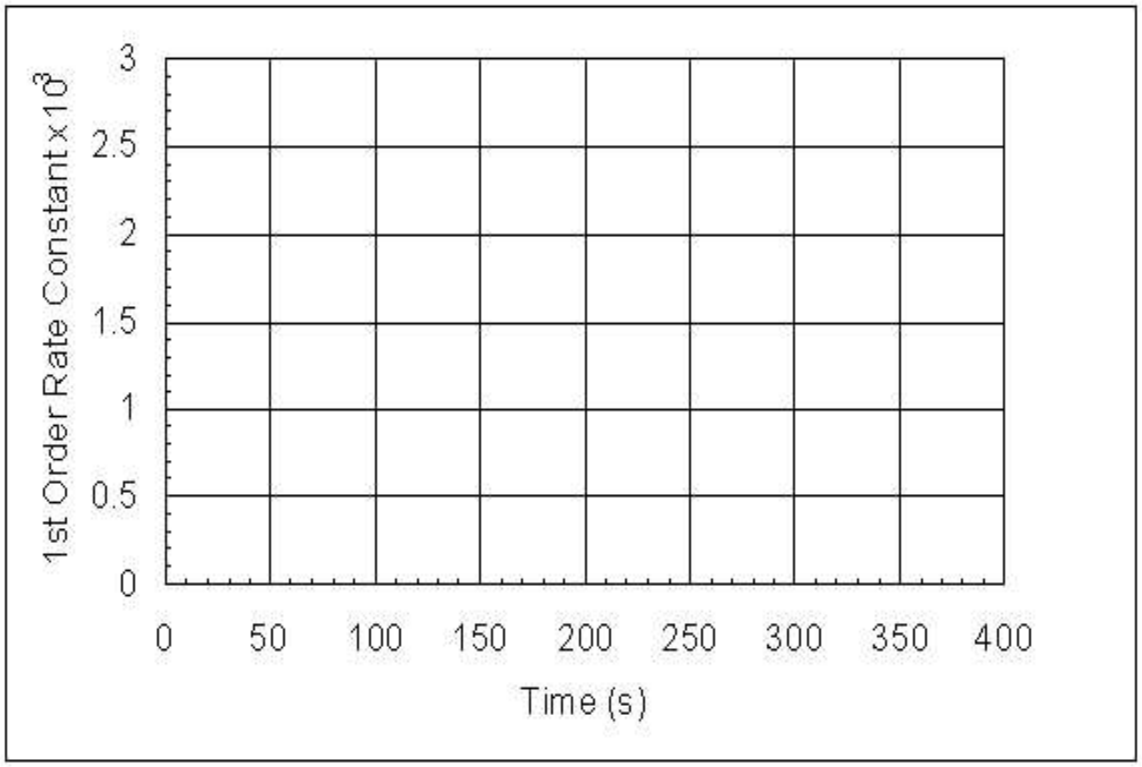
Based upon the figures below, which of the following equations best fits this experimental data. Then determine the rate equation for this reaction. Include the order of the reaction and the rate constant.

- rate = k [NO2]^0
- rate = k [NO2]^1
- rate = k [NO2]^2

1. For the reaction of NO2, assume the reaction is zero order and calculate the rate constant k at each time interval and plot the results below. What are the units for k if the reaction is zero order? Comment on how well this assumption works.



2. For the reaction of NO2, assume the reaction is first order and calculate the rate constant k at each time interval. What are the units for k if the reaction is zero order? Comment on how well this assumption works.



3. For the reaction of NO2, assume the reaction is second order and calculate the rate constant k at each time interval. What are the units for k if the reaction is second order? Comment on how well this assumption works.