Chem 1515
During Class Invention
Spring 2007

Name_____
TA Name _____
Lab Section #_____

1. List four factors which affect the rate of a chemical reaction. For each provide a brief statement describing how it affects the speed of a chemical reaction. **See Appendix III for recommended demonstration, video, or computer resources.**

   The four factors are;

Temperature - **the rate of a reaction increases with increasing temperature. (demonstration of alka-seltzer tablet dropped into ice water, room temperature water, and hot water.)**

Concentration - **the rate of a reaction increases with increasing concentration of reactants (pressure changes behave in the same way as concentration) (demonstration of the addition of zinc to 1 M HCl and 6 M HCl)**

Catalyst - **the rate of a reaction increases with addition of a catalyst. (demonstration of the addition of KI to a sample of H_2O_2)**

Surface area - **the rate of a reaction increases with increased surface area of the reactant. (demonstration of burning lycopodium powder)**

2. Define the term *chemical kinetics*.

Chemical kinetics is the study of;

1. **the rate at which reactants are converted to products during the course of a chemical reaction.**
2. **The factors, which include temperature, pressure, concentration, catalyst and surface area that effect the rate of a chemical reaction.**
3. **The sequence of steps, or the mechanism, which we believe occurs when reactants are converted to products.**

3. Define the term *reaction rate*.

For a chemical reaction its rate, or rate of reaction, is expressed in terms of how fast the concentration of a substance changes in the course of a chemical reaction.

$$\textbf{rate of reaction} = \frac{\Delta[\text{product}]}{\text{time}}\textbf{, or}$$

$$\textbf{rate of reaction} = -\frac{\Delta[\text{reactant}]}{\text{time}}$$

For the following chemical reaction

$$2N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$$

write the rate equation in terms of the change in concentration of N_2O_5 with time, $\Delta[NO_2]$ with time and $\Delta[O_2]$ with time.

$$\textbf{rate} = -\frac{\Delta[N_2O_5]}{\Delta t} = \frac{1}{2}\frac{\Delta[NO_2]}{\Delta t} = 2\frac{\Delta[O_2]}{\Delta t}$$

4. Using the plot below, define the terms *average rate*, *instantaneous rate* and *initial rate*. **See Appendix III for recommended demonstration, video, or computer resources.**

Given a set of data which provides the concentration for a reactant which has been measured at different times and plotting this data the different rate can be determined as shown below.