

Kinetics Hand-In Assignment

Name: _____

1. Consider the following reaction: $\text{CO}_2(\text{g}) + \text{NO}(\text{g}) \rightarrow \text{CO}(\text{g}) + \text{NO}_2(\text{g})$, where CO_2 , NO , and CO are colorless and NO_2 is brown.

Suggest a method which could be used to monitor the rate of this reaction. (1 point)

2. A chemist wishes to determine the rate of reaction of zinc with hydrochloric acid. The equation for the reaction is: $\text{Zn}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{H}_2(\text{g}) + \text{ZnCl}_2(\text{aq})$.

A piece of zinc is dropped into 1.00 L of 0.100 mol/L HCL and the following data were obtained:

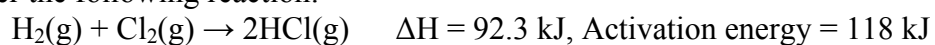
Time (s)	Mass of Zinc (g)
0	0.016
4	0.014
8	0.012
12	0.010
16	0.008
20	0.006

- (a) Calculate the average rate of reaction for the consumption of Zn in g/Ls for the entire 20s. (1 point)

- (b) What would happen to the rate of reaction if 1.0 mol/L HCl was used instead? Explain why. (3 points)

3. In the following reaction, $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$, H_2 is used up at a rate of 3.0×10^{-4} mol/Ls. Calculate the rate of formation of NH_3 . (2 points)

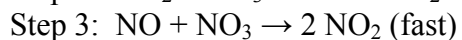
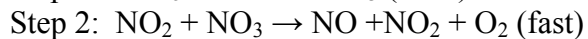
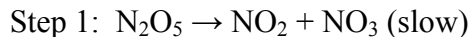
4. Consider the following reaction:



- (a) Sketch and label a potential energy diagram for the reaction: (4 points)

- (b) Explain how the diagram would be different if a catalyst was used. (1 point)

5. A reaction occurs with the following mechanism:



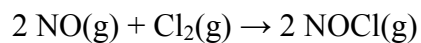
Determine

(a) The net reaction. (2 points)

(b) The intermediate(s). (1 point)

(c) The rate determining step. (1 point)

6. Determine the differential rate equation for the following reaction and data. (4 points)



Trial	Initial Concentration [NO] (mol/L)	Initial Concentration [Cl ₂] (mol/L)	Initial Rate (mol/Ls)
1	0.010	0.010	1.2×10^{-4}
2	0.010	0.020	2.3×10^{-4}
3	0.020	0.020	9.6×10^{-4}