

Non Sibi High School

Andover's Chem 550/580: Advanced Chemistry

Chapter 19, Review Quiz 1

1

Sketch a completely-labeled reaction energy profile (reaction progress diagram) for an exothermic reaction. Indicate any effects a catalyst would have the sketch.

2

The following mechanism has been proposed for a reaction:



Identify the intermediate and write the overall balanced equation for the reaction.

3

If the rate of formation of hydrogen gas in the reaction $4\text{PH}_3(\text{g}) \longrightarrow 6\text{H}_2(\text{g}) + \text{P}_4(\text{g})$ is found to be $0.0066 \text{ M}\cdot\text{s}^{-1}$, what is the rate of disappearance of PH_3 gas?

4

For the reaction $\frac{1}{2}\text{Cl}_2(\text{g}) + \text{NO}(\text{g}) \longrightarrow \text{NOCl}(\text{g})$, the following data were collected:

Experiment	$[\text{Cl}_2]$ (M)	$[\text{NO}]$ (M)	Initial Rate ($\text{M}\cdot\text{min}^{-1}$)
1	0.12	0.12	0.0025
2	0.24	0.12	0.0050
3	0.48	0.48	0.16

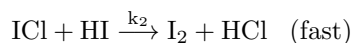
Determine the overall order of the reaction, write the rate law, and calculate the value of k with units.

5

Concentration versus time data were collected for the reaction $2\text{N}_2\text{O}_5(\text{g}) \longrightarrow \text{O}_2(\text{g}) + 4\text{NO}_2(\text{g})$. Graphs of $[\text{N}_2\text{O}_5]_t$ v. t , $\ln[\text{N}_2\text{O}_5]_t$ v. t , and $1/[\text{N}_2\text{O}_5]_t$ v. t were plotted, and the data points on the graph of $\ln[\text{N}_2\text{O}_5]_t$ v. t were found to fit a straight line most closely. Is the reaction zero-order, first-order, or second-order?

6

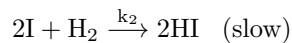
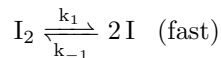
For the reaction $2\text{ICl} + \text{H}_2 \longrightarrow \text{I}_2 + 2\text{HCl}$, consider the following proposed mechanism:



Deduce a rate law for the overall reaction that is consistent with the proposed mechanism above.

7

For the reaction $\text{H}_2 + \text{I}_2 \longrightarrow 2\text{HI}$, consider the following proposed mechanism:



Deduce a rate law for the overall reaction that is consistent with the proposed mechanism above.

8

The activation energy for a reaction is 92 kJ/mol. If $k = 3.3 \times 10^{-5} \text{ s}^{-1}$ at 75°C for the reaction, calculate k for the reaction at 35°C .



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