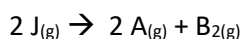


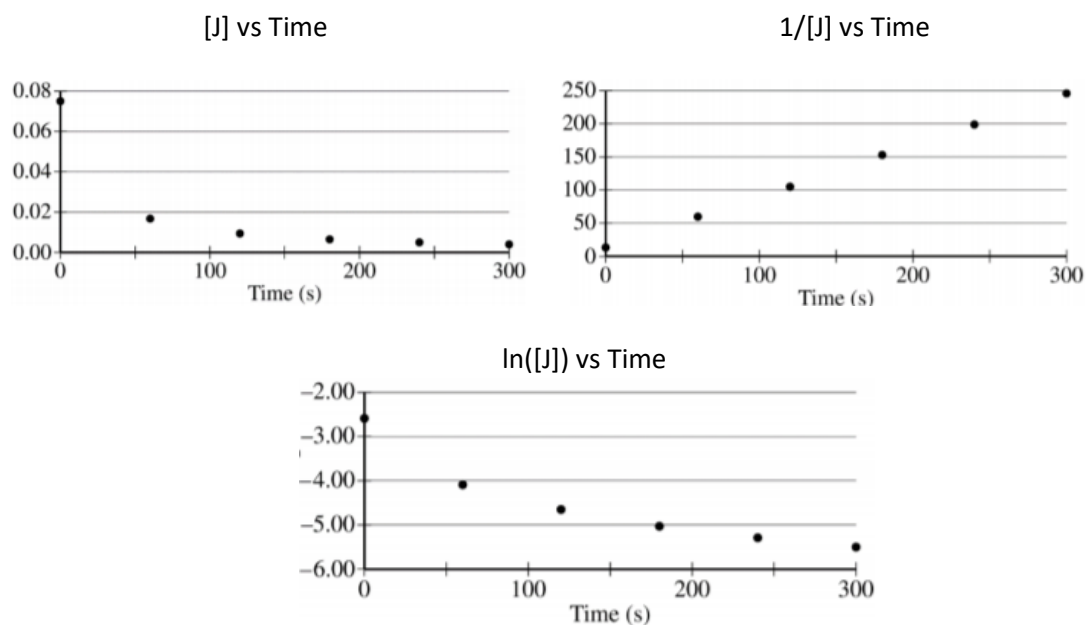
Chemical Kinetics Part 2

Reaction Mechanisms

1) Jamesonnnium decomposes as follows:

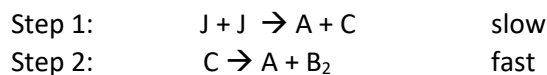


This decomposition is monitored, and its concentration is recorded on the following graphs

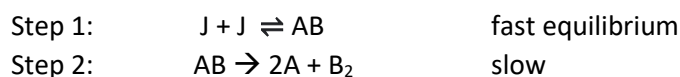


- Based from these graphs, what order is this reaction?
- Write the late raw for the decomposition of Jamesonnnium
- Consider 3 possible mechanisms for the decomposition of Jamesonnnium. All phases are gaseous. Comment on whether these proposed mechanisms are valid for the decomposition of Jamesonnnium. For each, label the intermediate and decide if the rate laws described by these mechanisms are consistent with the rate law in part (b)

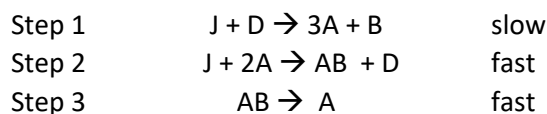
Mechanism I



Mechanism II

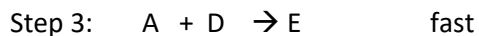
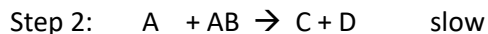


Mechanism III



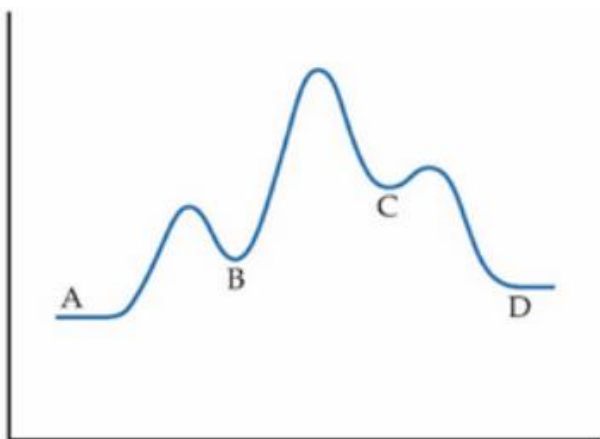
Chemical Kinetics Part 2

- 2) A proposed mechanism for an unknown reaction is shown below. Write the overall reaction, and identify the intermediates, the rate-determining step, and the rate law predicted by this mechanism.



Activation Energy

- 1) Write 3 forms of the Arrhenius equation.
- 2) For an unknown reaction,
 - a) find the activation energy required to have a reaction with a rate of $2.5 \times 10^{-4} \text{ M}^{-1}\text{s}^{-1}$ at 327 deg C to transition to a rate of $3.5 \times 10^{-3} \text{ M}^{-1}\text{s}^{-1}$ at 377 deg C.
 - b) Determine the rate constant at 700K
- 3) A graph for a reaction is shown below



- a) Label the axis, the reactants, and products.
- b) Label the transition states, where intermediates could be found and show the activation energies.
- c) How many steps would this mechanism have? Which step is rate-determining?
- d) Which step has the smallest rate constant?
- e) Show the effects of a catalyst being introduced in the second step of the mechanism.
- f) Is this reaction overall endothermic or exothermic?

Chemical Kinetics Part 2

Integrated Rate Laws and Half-Lives

- 1) Write the equations for a zero, first, and second order integrated rate law, and then write the equations for their respective half-lives.
- 2) What is the difference between a rate law and an integrated rate law?
- 3) Cyclopropane isomerization is first order. Rate Constant of this is 9.2 s^{-1} at 1000 deg C . If 0.6 M of cyclopropane is used, what is the concentration after 0.10 seconds?
- 4) Decomposition of Jamesonite is a first order reaction with a half-life of 12 seconds. What percentage of Jamesonite would be consumed after 108 seconds?
- 5) The decomposition of Jamesium $\text{Jm} \rightarrow 2\text{A} + \text{B}_2\text{X}$ is shown below and is a second order reaction. Find the half-life of this reaction.

Time (min)	Jm [M]
0	1.000
30	.799
40	.638
60	.510
80	.408
100	.326

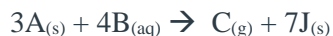
- 6) Aqueous sodium benzoate reacts with aqueous benzene to form a reaction. The resulting reaction is highly unstable and has a half-life of 0.58 minutes. How long would it take, in minutes, for the concentration of benzoate to drop from 8.54 M to 1.12 M ? Through experimental analysis, this reaction was shown to be a zero-order reaction.
- 7) Given the rate equation for an unknown compound, $\text{rate} = k[\text{A}]^1[\text{B}]^0$, 45.6 percent of reactant A remained after 5.5 hours. What is the half-life for this reaction?
- 8) The Decomposition of Jamesonium $2 \text{J}_{(\text{g})} \rightarrow 2 \text{A}_{(\text{g})} + \text{B}_{2(\text{g})}$ is shown to be a second-order reaction. If there is an initial concentration of Jamesonium of 5.64 M , what would be the final concentration after 146 minutes assuming this reaction has a half-life of 12.9 minutes?

Chemical Kinetics Part 2

By agreeing to work on this worksheet provided by James, I agree to neither enlist, nor offer or receive help either passively or actively while I or anyone around me is taking the quiz.

Review of Kinetics Part 1

1) James is trying to synthesize Jamesonium (J) via the following reaction:



- a) Assume Product $C_{(g)}$ is shown to be forming at a rate of .0072 M/s. What are the rates of change for A, B and J?
 - b) Assume the rate of appearance for J is 1.2M/min, what is the rate of disappearance of B?
 - c) Mark said that the concentration of Jamesonium, a second order reaction, remains constant overtime. Mark got smacked across the face as a result. Explain why this was necessary.
 - d) What are four ways you can speed up this reaction and explain each.
- 3) A first order reaction of a nitrite ion has a half life of 230 seconds. What is its rate constant?
- 4) The half-life for a first order reaction is 231 seconds. What percent remains after 10 minutes?
- 5) Data for a certain reaction is given below. What is the order and the rate constant for this reaction?

[A]	[B]	Initial Rate
.200	.200	.028
.200	.100	.058
.200	.200	.082
.400	.400	.23

- 6) Reaction has the overall units of 3.5. What are the units for the rate constant?

Chemical Kinetics Part 2