

Unit 13 – Chapter 12: Experiment 30 Rate Law of Crystal Violet Reaction

Name _____

Conclusion Questions

Period _____

- 1) Hydrogen peroxide decomposes to water and oxygen by the following reaction:



At 40°C, the following data was taken for initial rates of reactions:

[H ₂ O ₂] (moles/liter)	Initial Rate (M/min)
0.1000	1.93 X 10 ⁻⁴
0.2000	3.86 X 10 ⁻⁴
0.3000	5.79 X 10 ⁻⁴

- What is the order of the reaction?
 - Write the rate law.
 - Calculate the rate constant.
 - Calculate the half-life for the reaction.
- 2) Hydrogen peroxide is sold commercially at a 30.0% solution. If the solution is kept at 40°C, how long will it take for the solution to become 10.0% H₂O₂? (Use the reaction order from problem #1)
- 3) The decomposition of HI to H₂ and I₂ is second order. Its half-life is 85 seconds when the initial concentration is 0.15 M.
- What is *k* for the reaction?
 - How long will it take to go from 0.300 M to 0.100 M?
- 4) Consider the data presented from the following reaction: $\text{A}_{(g)} \rightarrow \text{B}_{(g)}$

Time (seconds)	[A] (moles/liter)
0	0.100
40	0.067
80	0.045
120	0.030
160	0.020

- Determine if the reaction is of the 1st order or 2nd order using the appropriate data and graphs
- What is the value of the rate constant?
- What is the half-life of the reaction?

- 5) Element decomposition is of the 1st order. Americium-241 is used in smoke detectors. It has a rate constant for radioactive decay of $k = 1.6 \times 10^{-3} \text{ yr}^{-1}$. By contrast, iodine-125, which is used to test for thyroid functioning, has a rate constant for radioactive decay of $k = 0.011 \text{ day}^{-1}$.
- What are the half-lives of these two isotopes?
 - Which one decays at a faster rate?
 - How much of a 1.00 mg sample of each isotope remains after three half-lives?
- 6) A first-order reaction is 75% complete at 320 seconds.
- What are the first and second half-lives in 320 seconds.
 - How long does it take for 90% completion?