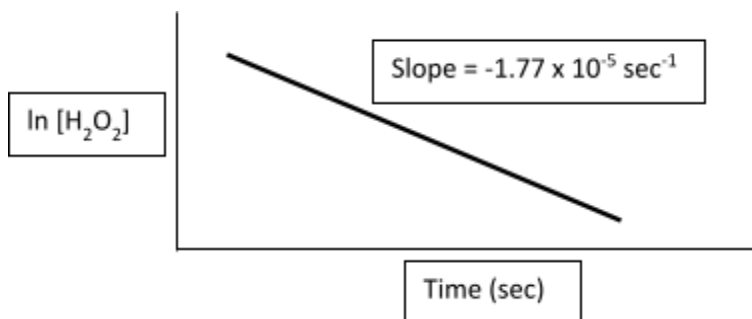


**Advanced Placement Chemistry**  
**Integrated Rate Laws – Lecture Problems**

Name \_\_\_\_\_  
Period \_\_\_\_\_ Date \_\_\_\_\_

1. A first order reaction has a rate constant of  $1.00 \times 10^{-3} \text{ s}^{-1}$  and the initial concentration of the reactant is 1.50 M?
  - a. What is the concentration of the reactant at 1000. seconds?
  - b. Calculate the time that it would take for half of the initial concentration to be used.
2. A second order reaction has a rate constant of  $2.00 \times 10^{-2} \text{ M}^{-1} \text{ s}^{-1}$  and the initial concentration of the reactant is 0.400 M.
  - a. What is the concentration of the reactant at 500. seconds?
  - b. How long would it take for the reactant to reach a concentration of 0.155 M?
3. A zero order has a rate constant of  $5.00 \times 10^{-4} \text{ M/s}$ . If the initial concentration of the reactant is 0.0800 M, at what time does the concentration reach 0.0300 M?

4. Hydrogen peroxide,  $\text{H}_2\text{O}_2$ , decomposes into water and oxygen gas.
  - a. Given the following data, write the rate law for the decomposition of hydrogen peroxide.

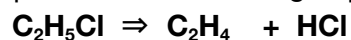


- b. What is the rate constant for the decomposition of hydrogen peroxide in this experiment?
- c. What is the half-life of hydrogen peroxide in this experiment?

5. Using the information in the following table for the reaction  $B \Rightarrow$  products:

Time (seconds)	[B] (mol/L)
0.00	0.0100
1000	0.00625
1800	0.00476
2800	0.00370
3600	0.00313
4400	0.00270

- Determine the order of reaction and write the general rate law.
  - Calculate the rate constant and provide correct units.
  - What is the concentration after 6500 seconds?
6. The following question refers to the gas-phase decomposition of ethylene chloride.



The experiment shows that the decomposition is first order. The following data shows kinetics information for this reaction:

Time (sec)	$\ln [\text{C}_2\text{H}_5\text{Cl}] \text{ (M)}$
1.0	-1.625
2.0	-1.735

- What is the rate constant for this decomposition?
  - What was the initial concentration of the ethylene chloride?
  - What would the concentration be after 5.0 seconds?
  - What is its half-life?
7. The reaction  $A \rightarrow B + C$  is known to be zero order in A with a rate constant of  $2.12 \times 10^{-3} \text{ mol/Ls}$  at  $25^\circ\text{C}$ .
- Write the integrated rate law.
  - What time does it take for the concentration to reach 35% of an initial 0.20 M concentration?
  - If the original concentration was 0.0650 M, calculate the time it would take for 85% of this concentration to be consumed.