

CHE 112 - Homework - Ch 13b
Integrated Rate Laws and Half-Lives

Name: _____

Date: _____

1. The reaction: $\text{CH}_3\text{-N}\equiv\text{C} \longrightarrow \text{CH}_3\text{-C}\equiv\text{N}$ is a first order reaction with a rate constant of $5.11 \times 10^{-5} \text{s}^{-1}$ at 472 K and an initial concentration of the reactant 0.0340 M. Answer the following questions:

(a) What is the molarity of the reactant after 2.00 hours? 1(a) _____

(b) How many minutes does it take for the reactant concentration to decrease to 0.0300 M? 1(b) _____

(c) How many minutes does it take for 20% of the reactant to react? 1(c) _____

(d) What is the half-life in hours of the reaction? 1(d) _____

2. Hydrogen iodide decomposes slowly into H_2 gas and I_2 gas at 600 K. The reaction is second order in HI and the rate constant is $9.7 \times 10^{-6} \text{M}^{-1} \text{s}^{-1}$. If the initial concentration of HI is 0.100M:

(a) What is the molarity after a reaction time of 6.00 days? 2(a) _____

(b) What is the time (in days) when the HI concentration reaches a value of 0.020 M? 2(b) _____

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3. Nitrosyl bromide decomposes at 10°C: $2\text{NOBr}(g) \longrightarrow 2\text{NO}(g) + \text{Br}_2(g)$. Given the following kinetic data determine the order of the reaction and the value of the rate constant for the consumption of NOBr. Attach your graph(s) to the back of the homework.

| Time (sec) | [NOBr] (M) |
|------------|------------|
| 0 | 0.0400 |
| 10 | 0.0303 |
| 20 | 0.0244 |
| 30 | 0.0204 |
| 40 | 0.0175 |

4. Consider the generic reaction $\text{AB} \longrightarrow \text{A} + \text{B}$. Attach your graph(s) to the back of the homework.

| Time (min) | [AB] (M) |
|------------|----------|
| 0 | 0.200 |
| 20 | 0.185 |
| 40 | 0.170 |
| 60 | 0.155 |
| 80 | 0.140 |

(a) Determine the rate order of the reaction. 4(a) _____

(b) What is the value of the rate constant? 4(b) _____

(c) What is the molarity of AB after a reaction time of 126 min? 4(c) _____

(d) What is the time (in minutes) when the AB concentration reaches a value of 0.100 M? 4(d) _____