Badji Mokhtar University Annaba **2023/2024**
Faculty of Science
Department of Material Sciences

Series N°4

Chemical kinetics

Exercise 01:

We propose to study the kinetics of the decomposition reaction of methyl iodide, CH_3I, whose chemical equation is written :

$$2CH_3I_{(g)} \longrightarrow C_2H_{6\,(g)} + I_{2(g)}$$

The concentration of $_{CH3I}$was monitored as a function of time at 25°C. The results obtained are shown in the table below:

t ,min	0	30	60	100	150
(CH_3I), M	0,10	$7{,}75 \cdot 10^{-2}$	$6{,}00 \cdot 10^{-2}$	$4{,}25 \cdot 10^{-2}$	$2{,}79 \cdot 10^{-2}$

From these results,

a) Show, by calculation, that the reaction kinetics are of^{1st} order.
b) What is the value of the rate constant, k?
c) Calculate the half-life time.

Exercise 02 :

The first step in the oxidation of the ascorbate ion, A^-, by the cytochrome, $Fe^{3+,}$ is an elementary reaction whose chemical equation is written:

$$A^-(aq) + Fe^{3+}(aq) \longrightarrow B(aq) + Fe^{2+}(aq)$$

From the initial concentrations shown in the table below, we observe pseudo-first-order kinetics (first-order degeneration):

$[A^-]_i$, M	**$[Fe^{3+}]_i$, M**	**k', s^{-1}**
$2{,}0 \cdot 10^{-3}$	$5{,}0 \cdot 10^{-6}$	11,40
$1{,}0 \cdot 10^{-3}$	$5{,}0 \cdot 10^{-6}$	5,70
$5{,}0 \cdot 10^{-4}$	$5{,}0 \cdot 10^{-6}$	2,85

a) Explain why the experimental kinetics are pseudo-first-order (first-order degeneracy).
b) Write down the rate equation and calculate the rate constant.
c) Starting with **$[A-]_i$** = $2{,}0 \cdot 10^{-3}$ M and **$[Fe^{3+}]_i$** = $5. 10^{-6}$ M, calculate $t_{1/2.}$ What happens if the initial concentrations are halved?