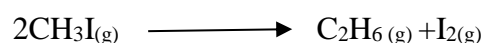


Series N°4

Chemical kinetics

Exercise 01:

We propose to study the kinetics of the decomposition reaction of methyl iodide, CH₃I, whose chemical equation is written :



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

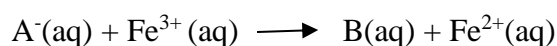
t, min	0	30	60	100	150
(CH ₃ I), M	0,10	$7,75 \cdot 10^{-2}$	$6,00 \cdot 10^{-2}$	$4,25 \cdot 10^{-2}$	$2,79 \cdot 10^{-2}$

From these results,

- Show, by calculation, that the reaction kinetics are of 1st order.
- What is the value of the rate constant, k?
- Calculate the half-life time.

Exercise 02 :

The first step in the oxidation of the ascorbate ion, A⁻, by the cytochrome, Fe³⁺, is an elementary reaction whose chemical equation is written:



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

[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

- Explain why the experimental kinetics are pseudo-first-order (first-order degeneracy).
- Write down the rate equation and calculate the rate constant.
- Starting with [A⁻]_i = $2,0 \cdot 10^{-3}$ M and [Fe³⁺]_i = $5 \cdot 10^{-6}$ M, calculate t_{1/2}. What happens if the initial concentrations are halved?