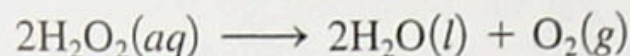


Kinetics

Initial Rates Method Practice

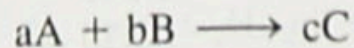
25. At 40°C, $\text{H}_2\text{O}_2(aq)$ will decompose according to the following reaction:



The following data were collected for the concentration of H_2O_2 at various times.

Time (s)	$[\text{H}_2\text{O}_2](\text{mol/L})$
0	1.000
2.16×10^4	0.500
4.32×10^4	0.250

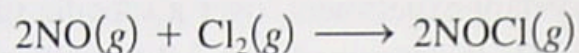
- a. Calculate the average rate of decomposition of H_2O_2 between 0 and 2.16×10^4 s. Use this rate to calculate the average rate of production of $\text{O}_2(g)$ over the same time period.
- b. What are these rates for the time period 2.16×10^4 s to 4.32×10^4 s?
26. Consider the general reaction



and the following average rate data over some time period Δt :

$$-\frac{\Delta \text{A}}{\Delta t} = 0.0080 \text{ mol/L} \cdot \text{s}$$

29. The reaction



was studied at -10°C . The following results were obtained where

$$\text{Rate} = -\frac{\Delta[\text{Cl}_2]}{\Delta t}$$

$[\text{NO}]_0$ (mol/L)	$[\text{Cl}_2]_0$ (mol/L)	Initial Rate (mol/L · min)
0.10	0.10	0.18
0.10	0.20	0.36
0.20	0.20	1.45

- What is the rate law?
- What is the value of the rate constant?

30. The reaction

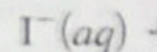


was studied at 25°C . The following results were obtained where

$$\text{Rate} = -\frac{\Delta[\text{S}_2\text{O}_8^{2-}]}{\Delta t}$$

Defining the rate
calculate the value

33. The reaction



was studied, and

$[\text{I}^-]_0$ (mol/L)
0.12
0.060
0.030
0.24

- What is the



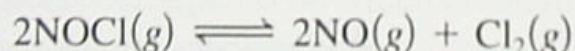
was studied at 25°C. The following results were obtained where

$$\text{Rate} = -\frac{\Delta[\text{S}_2\text{O}_8^{2-}]}{\Delta t}$$

$[\text{I}^-]_0$ (mol/L)	$[\text{S}_2\text{O}_8^{2-}]_0$ (mol/L)	Initial Rate (mol/L · s)
0.080	0.040	12.5×10^{-6}
0.040	0.040	6.25×10^{-6}
0.080	0.020	6.25×10^{-6}
0.032	0.040	5.00×10^{-6}
0.060	0.030	7.00×10^{-6}

- Determine the rate law.
- Calculate a value for the rate constant for each experiment and an average value for the rate constant.

31. The decomposition of nitrosyl chloride was studied:



The following data were obtained where

$$\text{Rate} = -\frac{\Delta[\text{NOCl}]}{\Delta t}$$

0.060

0.030

0.24

- What is the rate law?
- Calculate the rate constant.
- Calculate the initial rate of reaction and OCl^- are

34. The reaction

2NO

was studied, and

$[\text{NO}]_0$
(molecules/cm³)

1.00×10^{18}

3.00×10^{18}

2.50×10^{18}

What would be

wing if the concentra-
d the time in seconds?

w

v

law

w

(g) + CCl₄(g)

Cl₃]

e in seconds and con-

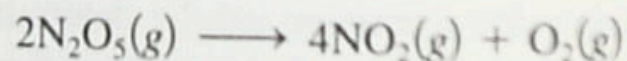
ial Rates Method

NOCl(g)

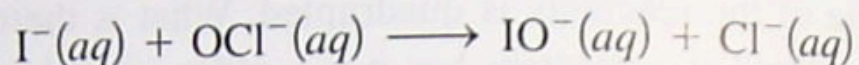
results were obtained

[NOCl] ₀ (molecules/cm ³)	Initial Rate (molecules/cm ³ · s)
3.0 × 10 ¹⁶	5.98 × 10 ⁴
2.0 × 10 ¹⁶	2.66 × 10 ⁴
1.0 × 10 ¹⁶	6.64 × 10 ³
4.0 × 10 ¹⁶	1.06 × 10 ⁵

- What is the rate law?
 - Calculate the value of the rate constant.
 - Calculate the value of the rate constant when concentra-
tions are given in moles per liter.
32. The following data were obtained for the gas-phase decompo-
sition of dinitrogen pentoxide,



[N ₂ O ₅] ₀ (mol/L)	Initial Rate (mol/L · s)
0.0750	8.90 × 10 ⁻⁴
0.190	2.26 × 10 ⁻³
0.275	3.51 × 10 ⁻³

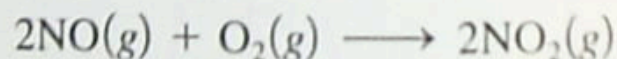


was studied, and the following data were obtained:

$[\text{I}^{-}]_0$ (mol/L)	$[\text{OCl}^{-}]_0$ (mol/L)	Initial Rate (mol/L · s)
0.12	0.18	7.91×10^{-2}
0.060	0.18	3.95×10^{-2}
0.030	0.090	9.88×10^{-3}
0.24	0.090	7.91×10^{-2}

- What is the rate law?
- Calculate the value of the rate constant.
- Calculate the initial rate for an experiment where both I^{-} and OCl^{-} are initially present at 0.15 mol/L.

34. The reaction



was studied, and the following data were obtained where

$$\text{Rate} = -\frac{\Delta[\text{O}_2]}{\Delta t}$$