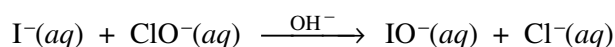


2005 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS

3. Answer the following questions related to the kinetics of chemical reactions.



Iodide ion, I^{-} , is oxidized to hypoiodite ion, IO^{-} , by hypochlorite, ClO^{-} , in basic solution according to the equation above. Three initial-rate experiments were conducted; the results are shown in the following table.

Experiment	$[\text{I}^{-}]$ (mol L ⁻¹)	$[\text{ClO}^{-}]$ (mol L ⁻¹)	Initial Rate of Formation of IO^{-} (mol L ⁻¹ s ⁻¹)
1	0.017	0.015	0.156
2	0.052	0.015	0.476
3	0.016	0.061	0.596

(a) Determine the order of the reaction with respect to each reactant listed below. Show your work.

(i) $\text{I}^{-}(\text{aq})$

(ii) $\text{ClO}^{-}(\text{aq})$

(b) For the reaction,

(i) write the rate law that is consistent with the calculations in part (a);

(ii) calculate the value of the specific rate constant, k , and specify units.

The catalyzed decomposition of hydrogen peroxide, $\text{H}_2\text{O}_2(\text{aq})$, is represented by the following equation.



The kinetics of the decomposition reaction were studied and the analysis of the results show that it is a first-order reaction. Some of the experimental data are shown in the table below.

$[\text{H}_2\text{O}_2]$ (mol L ⁻¹)	Time (minutes)
1.00	0.0
0.78	5.0
0.61	10.0