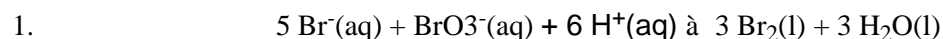


Quiz 14– Kinetics

AP Chemistry

This quiz must be completed and brought to my room before the start of first period on Tuesday. Failure to do so will incur a 25% penalty unless there is a legal reason.

You must show all work in order to receive credit.



In a study of the kinetics of the reaction represented above, the following data were obtained at 298 K.

Experiment	Initial [Br ⁻] (mol L ⁻¹)	Initial [BrO ₃ ⁻] (mol L ⁻¹)	Initial [H ⁺] (mol L ⁻¹)	Rate of Disappearance of BrO ₃ ⁻ (mol L ⁻¹ s ⁻¹)
1	0.00100	0.00500	0.100	2.50 × 10 ⁻⁴
2	0.00200	0.00500	0.100	5.00 × 10 ⁻⁴
3	0.00100	0.00750	0.100	3.75 × 10 ⁻⁴
4	0.00100	0.01500	0.200	3.00 × 10 ⁻³

(a) From the data given above, determine the order of the reaction for each reactant listed below. Show your reasoning.

(i) Br⁻

(ii) BrO₃⁻

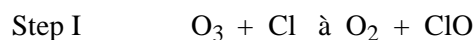
(iii) H⁺

(b) Write the rate law for the overall reaction

(c) Determine the value of the specific rate constant for the reaction at 298 K. Include the correct units.

2. An environmental concern is the depletion of O₃ in Earth's upper atmosphere, where O₃ is normally in equilibrium with O₂ and

O. A proposed mechanism for the depletion of O₃ in the upper atmosphere is shown below.





- (a) Write a balanced equation for the overall reaction represented by Step I and Step II above.
 - (b) Clearly identify the catalyst in the mechanism above. Justify your answer.
 - (c) Clearly identify the intermediate in the mechanism above. Justify your answer.
 - (d) If the rate law for the overall reaction is found to be $\text{rate} = k[\text{O}_3][\text{Cl}]$, determine the following.
 - (i) The overall order of the reaction
 - (ii) Appropriate units for the rate constant, k
 - (iii) The rate-determining step of the reaction, along with justification for your answer.
3. List 4 factors that influence the rate of a reaction
 4. The rate of the reaction $\text{CH}_3\text{COOC}_2\text{H}_5(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{CH}_3\text{COOH}(\text{aq}) + \text{C}_2\text{H}_5\text{OH}(\text{aq})$ shows first order characteristics – that is $\text{rate} = k[\text{CH}_3\text{COOC}_2\text{H}_5]$ – even though this is a second order reaction (first order in $\text{CH}_3\text{COOC}_2\text{H}_5$ and first order in H_2O). Explain.
 5. The rate constant for the second order reaction: $2\text{NOBr}(\text{g}) \rightarrow 2\text{NO}(\text{g}) + \text{Br}_2(\text{g})$ is $0.80/\text{M}\cdot\text{s}$ at 10°C .
 - a. Starting with a concentration of 0.086M , calculate the concentration of NOBr after 22s .
 - b. Calculate the half lives when $[\text{NOBr}]_0 = 0.072\text{M}$ and $[\text{NOBr}]_0 = 0.054\text{M}$