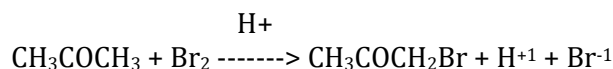


# AP Wkst 5b (Rate Law Practice)

(1) The bromination of acetone is acid-catalyzed:

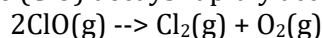


The rate of disappearance of bromine was measured for several different concentration of acetone, bromine, and  $\text{H}^+$  ions:

$[\text{CH}_3\text{COCH}_3]$	$[\text{Br}_2]$	$[\text{H}^+]$	Rate
0.30	0.050	0.050	$5.7 \times 10^{-5}$
0.30	0.10	0.050	$5.7 \times 10^{-5}$
0.30	0.050	0.10	$1.2 \times 10^{-4}$
0.40	0.050	0.20	$3.1 \times 10^{-4}$
0.40	0.050	0.050	$7.6 \times 10^{-5}$

- (a) What is the rate law for the reaction? (Find the order for each of the three reactants.)  
(b) Determine  $k$ , and show the correct units.

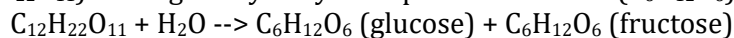
(2) Chlorine oxide ( $\text{ClO}$ ) decays rapidly according to the reaction:



From the following data, determine the reaction order and calculate the rate constant. Show the correct units and justify your answer.

Time (s)	$[\text{ClO}]$
$0.12 \times 10^{-3}$	$8.49 \times 10^{-6}$
$0.96 \times 10^{-3}$	$7.10 \times 10^{-6}$
$2.24 \times 10^{-3}$	$5.79 \times 10^{-6}$
$3.20 \times 10^{-3}$	$5.20 \times 10^{-6}$
$4.00 \times 10^{-3}$	$4.77 \times 10^{-6}$

(3) Sucrose ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ ) undergoes hydrolysis to product fructose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) and glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ):



Time (min)	$[\text{C}_{12}\text{H}_{22}\text{O}_{11}]$
0	0.500
60.0	0.400
96.4	0.350
157.5	0.280

- (a) Determine the order of the reaction and the rate constant. Show units.  
(b) How long does it take to hydrolyze 95% of the sucrose?  
(c) Explain why  $[\text{H}_2\text{O}]$  is not in the rate law even though water is a reactant.