

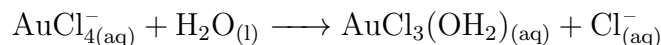
Chemistry 2740 Spring 2022 Assignment 2

Due: Thursday, May 5 at noon

Assignments submitted after that time will not be accepted unless there are extenuating circumstances.

Total marks: 24

Fry and coworkers have studied the hydrolysis of tetrachloroaurate(III) in aqueous solution, from which they obtained the apparent first-order rate constant for the following elementary reaction:¹



1. Why is the first-order rate constant only an “apparent” rate constant? How does the apparent rate constant relate to the elementary rate constant? [4 marks]
2. The measured rate constants were as follows:

$T/^{\circ}\text{C}$	10.0	15.3	20.0	26.0	34.5
$k_{\text{app}}/10^{-2}\text{s}^{-1}$	0.40	0.60	0.97	1.55	3.10

Calculate the elementary rate constant at each temperature for this reaction. [4 marks]

3. Determine the entropy and enthalpy of activation. [14 marks]
4. What does the entropy of activation tell us about the nature of the transition state? [2 marks]

Data: Mole density (c_w) of water

$T/^{\circ}\text{C}$	10.0	15.3	20.0	26.0	34.5
$c_w/\text{mol L}^{-1}$	55.45	55.42	55.39	55.31	55.16

¹F. H. Fry et al., *Inorg. Chem.* **5**, 1943 (1966)