

Lab Info: Experiment 20

Kinetics

The Rxn is the same as Rxn #7 in Redox Lab (Lab #18)

net ionic



↑  
can write H<sup>+</sup> as H<sub>3</sub>O<sup>+</sup> with 2 extra H<sub>2</sub>O here (as in book)

$$\text{rate} = k [S_2O_3^{2-}]^x [H^+]^y$$

but if hold [H<sup>+</sup>] constant

$$\text{rate} = k' [S_2O_3^{2-}]^x$$

has [H<sup>+</sup>] constant + k

→ X = order of rate law (not X in plot)

- X = 0 (zero order)
- 1 (1st order)
- or 2 (2nd order)

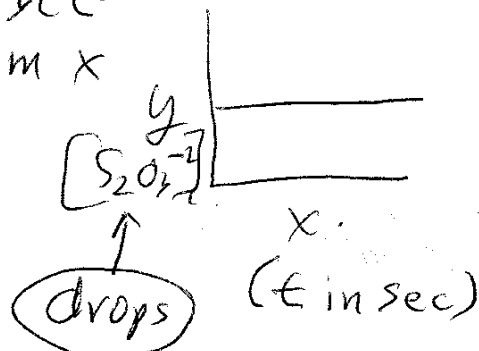
this expt not looking for (y)

If (order  $x=0$ ), rate =  $k' [S_2O_3^{2-}]^0 = k'$  (page 2)

$$+ [S_2O_3^{2-}]_t = [S_2O_3^{2-}]_0 - kt$$

(y)
b
m x

eqn line =  $y = b + mx$   
 General  
 ↑ intercept    slope

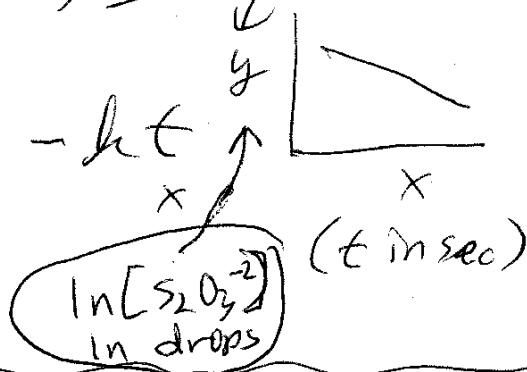


See p. 66 in lab book

If (order  $x=1$ ), rate =  $k' [S_2O_3^{2-}]^1$

$$+ \ln [S_2O_3^{2-}]_t = \ln [S_2O_3^{2-}]_0 - kt$$

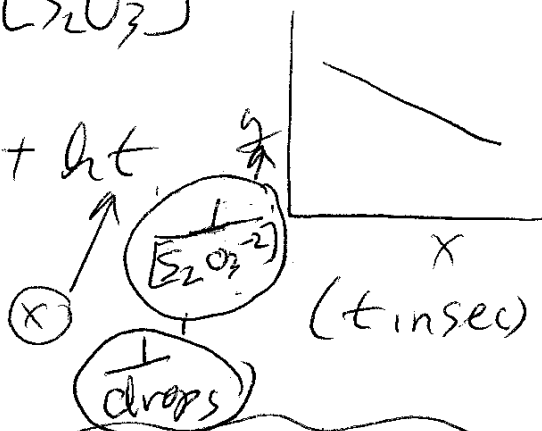
y
b
x



If (order  $x=2$ ), rate =  $k' [S_2O_3^{2-}]^2$

$$+ \left( \frac{1}{[S_2O_3^{2-}]_t} \right) = \left( \frac{1}{[S_2O_3^{2-}]_0} \right) + kt$$

(y)
intercept
(x)
↑
↑
↑
(1/drops)



These are integrated rate laws

plot + choose best fit

(page 3)

order = zero, first, or second  
with respect to  $[S_2O_3]$

$k$  is always  $(+ \#)$  + is  
slope of best line

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We can also use comparison method  
see p. 63 lab book for simple  
Rxn's by inspection (as in examples  
in lecture) or

$$\text{equation order} = \frac{\log \left( \frac{\text{rate}_1}{\text{rate}_2} \right)}{\log \left( \frac{\text{concentration}_1}{\text{concentration}_2} \right)}$$

where you choose rate<sub>1</sub> + rate<sub>2</sub>  
for change only in one  
concentration (like in the  
simple inspection method)  
(try the simple inspection method)  
does not answer lab question