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Chemistry 203

Pre-Lab Assignment: Hydrolysis of Ethyl Acetate

Exp 5

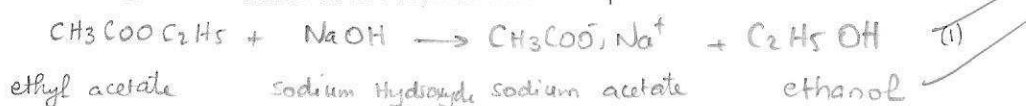
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Lab Section: 8

④ 1. Write the equation of the reaction of the basic hydrolysis of ethyl acetate and name each reactant and each product.



2. 5.00mL of ethyl acetate 0.0100M were mixed with 5.00mL NaOH 0.0100M at 25°C. The reaction was monitored by quenching the reaction with HCl at different time intervals. To do this, 5.00mL aliquot of the reaction mixture was pipetted into an Erlenmeyer flask containing 5.00mL HCl 0.00997M at different time. The excess HCl was back-titrated using standard NaOH 0.0101M solution. The following data was obtained:

Time (s)	V of NaOH (mL)
84	0.50
275	1.40
650	2.15
1199	2.90

⑤ Perform the appropriate calculations to determine the rate constant for the above second order reaction at the given temperature.

second order $\Rightarrow \frac{1}{[A]} = \frac{1}{[A]_0} + kt$

so $k = \text{slope}$

reaction (1) is the same



$n_{\text{HCl excess}} = [\text{HCl}] \cdot V_{\text{HCl}} = [\text{NaOH}] \cdot V_{\text{NaOH added from burette}}$

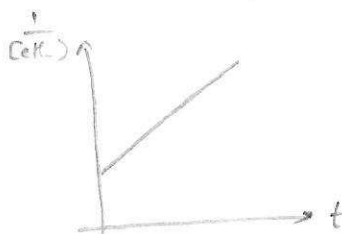
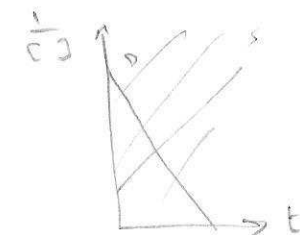
$n_{\text{Ethyl acetate unreacted}} = n_0(\text{HCl}) - n_{\text{HCl excess}} \Rightarrow [\text{ethyl acetate unreacted}] = \frac{n_0(\text{HCl}) - n_{\text{HCl excess}}}{(V_{\text{total}})}$

$t = 84\text{s}; [\text{eth}] = \frac{5.00 \times 0.00997 - 0.0101 \times 0.50}{10} = \frac{8.86 \times 10^{-3} - 5.05 \times 10^{-3}}{2.50} = 1.5 \times 10^{-3} \text{ mol/L}$

$= \frac{n_0(\text{HCl}) - [\text{NaOH}] \cdot V_{\text{added}}}{V}$

$t = 275; [] = \dots$

t sec	[Ethyl] mol/L	$\frac{1}{[]}$ L/mol
84	1.5×10^{-3}	2.2×10^2 2 sig fig
275	3.6×10^{-3}	2.8×10^2
650	2.8×10^{-3}	3.6×10^2
1199	2.1×10^{-3}	4.8×10^2



using linear regression

slope = 0.228

$k = 0.114 \text{ L/mol s}$
0.23
2 sig fig