

EXAMINATION

1. The following information is given for the reaction of ethyl acetate with sodium hydroxide:

$$\text{CH}_3\text{COOC}_2\text{H}_5 + \text{OH}^- \rightarrow \text{CH}_3\text{COO}^- + \text{C}_2\text{H}_5\text{OH}$$

At 25°C, the rate constant for the reaction is $1.5 \times 10^{-4} \text{ s}^{-1}$. The initial concentration of ethyl acetate is 0.1 mol dm^{-3} and the initial concentration of hydroxide ions is 0.05 mol dm^{-3} .

(a) Write the rate equation for the reaction.

(b) Calculate the half-life of the reaction.

(c) Calculate the concentration of ethyl acetate after 10 minutes.

ANSWERS

(a) $\text{Rate} = k[\text{CH}_3\text{COOC}_2\text{H}_5][\text{OH}^-]$

(b) $t_{1/2} = \frac{1}{k} \ln 2 = \frac{1}{1.5 \times 10^{-4} \text{ s}^{-1}} \ln 2 = 4620 \text{ s} = 77 \text{ min}$

(c) $\ln \frac{[\text{A}]_t}{[\text{A}]_0} = -kt$
 $\ln \frac{[\text{A}]_t}{0.1} = -1.5 \times 10^{-4} \times 600$
 $\ln \frac{[\text{A}]_t}{0.1} = -0.09$
 $\frac{[\text{A}]_t}{0.1} = e^{-0.09} = 0.914$
 $[\text{A}]_t = 0.0914 \text{ mol dm}^{-3}$

KINGSTON



Year	2010	2011	2012	2013
1	1	1	1	1
2	1	1	1	1
3	1	1	1	1
4	1	1	1	1
5	1	1	1	1
6	1	1	1	1
7	1	1	1	1
8	1	1	1	1
9	1	1	1	1
10	1	1	1	1

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