OCR

Oxford Cambridge and RSA

Friday 23 June 2023 – Morning

A Level Chemistry B (Salters)

H433/03 Practical skills in chemistry

Practical Insert

Time allowed: 1 hour 30 minutes

INSTRUCTIONS
- Do **not** send this Insert for marking. Keep it in the centre or recycle it.

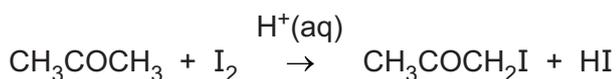**INFORMATION**
- This document has **4** pages.

The iodination of propanone

A group of students completes a practical to confirm the rate equation for the iodination of propanone. They use this information to identify the rate-determining step and a possible mechanism for the reaction.

Introduction

The equation for the reaction is:

$$CH_3COCH_3 + I_2 \xrightarrow{\text{H}^+(aq)} CH_3COCH_2I + HI$$

Reagents

$2.0 \, mol \, dm^{-3}$ propanone solution (highly flammable, irritant)

$2.0 \, mol \, dm^{-3}$ hydrochloric acid (low hazard)

$0.010 \, mol \, dm^{-3}$ iodine solution (low hazard)

Health and safety note

The organic product of the reaction, iodopropanone, is strongly irritant to eyes.
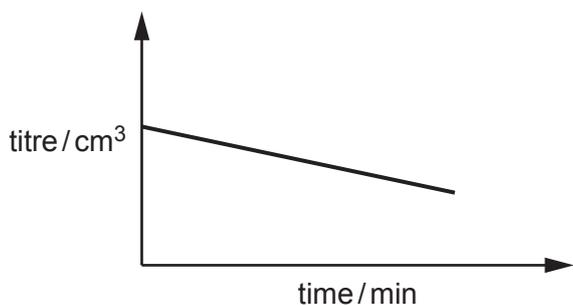
Experiment 1

This experiment determines how the rate of reaction varies with the concentration of iodine.

Method

1. Set up two flasks **A** and **B**
    Flask **A** containing: $25 \, cm^3$ of $2.0 \, mol \, dm^{-3}$ propanone and $25 \, cm^3$ of $2.0 \, mol \, dm^{-3}$ hydrochloric acid.
    Flask **B** containing $50 \, cm^3$ of $0.010 \, mol \, dm^{-3}$ iodine solution.
2. Noting the time, pour the contents of flask **A** into flask **B** and shake well.
3. At known times (5–10 minute intervals), withdraw a $10 \, cm^3$ portion from the reaction flask, quench with sodium hydrogencarbonate solution and titrate with $0.010 \, mol \, dm^{-3}$ sodium thiosulfate.
4. Plot a graph of titre against time.

Results

Experiment 2

This experiment determines how the rate of reaction varies with the concentrations of propanone and hydrochloric acid.

Method

1. Make up three mixtures of hydrochloric acid, propanone solution and water in conical flasks as in **Table 4.1** below, using burettes.
   Note: water is added to some of the mixtures to keep the total volume of solution constant.
2. Add 4.0 cm^3 of iodine solution to each flask in turn, shake and measure the time for the iodine colour to disappear.
3. Calculate the rate of reaction for each run as follows:

$$\text{rate} / \text{cm}^3\,\text{s}^{-1} = \frac{\text{volume of iodine solution used}}{\text{time for iodine colour to disappear}}$$

Results

Table 4.1

	Run A	**Run B**	**Run C**
Volume of 2.0 mol dm^{-3} HCl / cm^3	20.0	10.0	20.0
Volume of 2.0 mol dm^{-3} propanone / cm^3	8.0	8.0	4.0
Volume of water / cm^3	0	10.0	4.0
Volume of 0.01 mol dm^{-3} iodine / cm^3	4.0	4.0	4.0
Time for colour to disappear / sec	115	234	240

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