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**
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**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:

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

### 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.

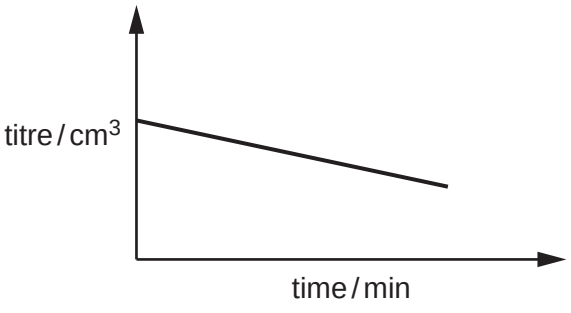
## Experiment 1

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 $dm^{-3}$ HC$l$ / $cm^3$ | 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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