

Name:

Student code:

Laboratory Task I

50 points

RESULTS SHEET

A. Standardisation of Iodine Solution

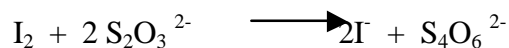
Concentration of standard $\text{Na}_2\text{S}_2\text{O}_3$ in bottle : 0.01970..... M

Titration Number	Volume		
	1	2	3
aliquot of I_2 (mL)	5.00	5.00	5.00
initial buret reading (mL)	0.00	0.00	0.00
final buret reading (mL)	10.00	10.05	9.95
standard $\text{Na}_2\text{S}_2\text{O}_3$ (mL)	10.15	10.10	10.05

The value of titre = mL

Calculation for iodine concentration:

mol ratio of $\text{I}_2 : \text{S}_2\text{O}_3^{2-} =$



$$[\text{I}_2] \cdot V_{\text{I}_2} = \frac{[\text{S}_2\text{O}_3^{2-}] \cdot V_{\text{S}_2\text{O}_3^{2-}}}{2}$$

$$[\text{I}_2] = \frac{0.01970 \times 10.10}{2 \times 5.00} = 0.0199 \text{ M}$$

1 mark for correct mol ratio.

max 2 marks for correct calculation.

-1 mark for less than 2 or more than 3 significant figures.

Concentration of I_2

M

Accuracy (max 7 marks)-recalculated using student's data

7 marks

Sliding scale 7 marks for 0 to 0.5 % deviation.

0 mark for greater than 3.0 % deviation.

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B. A kinetic study of the acid catalyzed reaction between acetone and iodine in aqueous solution

B-1. Calculation for initial concentrations (M) in the solution mixtures

Flask No.	Concentration			
	I	II	III	IV
[I ₂], M	0.00498	0.00998	0.00498	0.00498
[acetone], M	1.69	1.69	3.39	1.69
[HCl], M	0.0250	0.0250	0.0250	0.0500

0.25 mark for each correct concentration of I₂ and HCl.

0.5 mark for each correct concentration of acetone.

B-2. Calculation for the concentration (M) of iodine remaining in Flasks I to IV at 7 minutes.

Flask No.	Volume			
	I	II	III	IV
initial buret reading (mL)	0.00	0.00	0.00	0.00
final buret reading (mL)	8.35	18.55	6.75	6.85
standard Na ₂ S ₂ O ₃ (mL)	8.35	18.55	6.75	6.85

[I ₂] remaining at 7 minutes (M)	0.00412	0.00914	0.00332	0.00338
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0.5 mark for each correct calculation of remaining iodine.

B-3. Calculation for initial rate of disappearance of I₂ at 7 minutes for Flasks I to IV (in M s⁻¹)

$$\text{Initial rate of disappearance of iodine (M s}^{-1}\text{)} = - \frac{d[\text{I}_2]}{dt}$$

Flask No.	I	II	III	IV
Calculation for rate	$\frac{0.00498-0.00412}{7 \times 60}$	$\frac{0.00997-0.00914}{7 \times 60}$	$\frac{0.00498-0.00333}{7 \times 60}$	$\frac{0.00498-0.00338}{7 \times 60}$
Initial rate	2.05×10^6	1.98×10^6	3.95×10^6	3.811×10^6

4 marks for correct calculation.

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Laboratory Task I**B-4. Calculation for the kinetic orders x, y and z**

$$\text{rate} = - \frac{d[I_2]}{dt} = k[\text{CH}_3\text{COCH}_3]^x [I_2]^y [H^+]^z$$

Calculation for x	Calculation for y	Calculation for z
$\frac{\text{Rate (III)}}{\text{Rate (I)}} = \frac{3.95 \times 10^{-6}}{2.05 \times 10^{-6}}$ $2^x = 1.93$ $x = 0.95$	$\frac{\text{Rate (II)}}{\text{Rate (I)}} = \frac{1.98 \times 10^{-6}}{2.05 \times 10^{-6}}$ $2^y = 0.965$ $y = -0.051$	$\frac{\text{Rate (IV)}}{\text{Rate (I)}} = \frac{3.81 \times 10^{-6}}{2.05 \times 10^{-6}}$ $2^z = 1.86$ $z = 0.90$
x = 1 (integer)	y = 0 (integer)	z = 1 (integer)

max 1 mark for each correct calculation

Write rate equation or rate law

$$\text{Rate} = k[\text{CH}_3\text{COCH}_3][H^+]$$

2 marks

B-5. Calculation for the rate constant, k, for Flasks I to IV with proper unit.

Flask No.	I	II	III	IV
Calculation	$\frac{2.05 \times 10^{-6}}{(1.69)(0.0250)}$	$\frac{1.98 \times 10^{-6}}{(1.69)(0.0250)}$	$\frac{3.95 \times 10^{-6}}{(3.39)(0.0250)}$	$\frac{3.81 \times 10^{-6}}{(1.69)(0.0500)}$
Rate Constant k =	4.85×10^{-5}	4.68×10^{-5}	4.66×10^{-5}	4.51×10^{-5}
Unit	$M^{-1} s^{-1}$	$M^{-1} s^{-1}$	$M^{-1} s^{-1}$	$M^{-1} s^{-1}$

Max 0.5 mark for each correct calculation.
1 mark for correct unit.

$$\text{B-6. Mean value of rate constant} = 4.68 \times 10^{-5}$$

22 marks

Accuracy: (max 22 marks)-recalculated using student's data.

Sliding scale 22 marks for 0 to 6% deviation.

0 mark for greater than 18% deviation.

0 mark for greater than $\pm 10\%$ deviation.