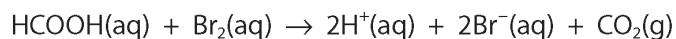# CHEMISTRY

UNIT 4(IAL)

2020 — 2023

1 - (WCH11/4(IAL)_Summer_2020_Q1) - *Rates, Equilibria And Further Organic Chemistry*

Bromine oxidises methanoic acid to carbon dioxide.

The equation for the reaction is

$$HCOOH(aq) + Br_2(aq) \rightarrow 2H^+(aq) + 2Br^-(aq) + CO_2(g)$$

Which of the following methods would **not** be suitable for measuring the progress of this reaction?

☒ **A** colorimetry

☒ **B** measuring electrical conductivity

☒ **C** quenching and titrating with acid

☒ **D** measuring the volume of gas

1 - (WCH11/4(IAL)_Summer_2020_Q1) - *Rates, Equilibria And Further Organic Chemistry*

2 - (WCH11/4(IAL)_Summer_2020_Q2) - *Rates, Equilibria And Further Organic Chemistry*

The rate of the reaction between two compounds, **Y** and **Z**, was investigated.
The results are shown.

Experiment	Initial concentration of **Y** / mol dm^{-3}	Initial concentration of **Z** / mol dm^{-3}	Initial rate / mol dm^{-3} s^{-1}
1	0.64	0.24	8.00×10^{-3}
2	0.64	0.48	3.20×10^{-2}
3	0.32	0.48	3.20×10^{-2}

What are the orders of reaction with respect to **Y** and **Z**?

	Order with respect to **Y**	Order with respect to **Z**
☒ **A**	0	1
☒ **B**	0	2
☒ **C**	1	1
☒ **D**	1	2

3 ▪ (WCH11/4(IAL)_Summer_2020_Q3) ▪ *Rates, Equilibria And Further Organic Chemistry*

The inorganic anti-cancer drug *cis*-platin, $Pt(NH_3)_2Cl_2$, is hydrolysed by water to make it active. The reaction is
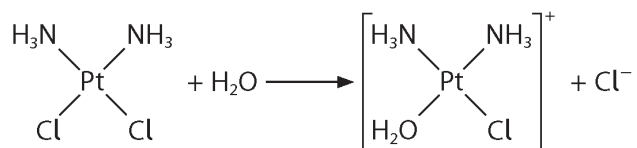
The hydrolysis is first order overall. The half-life can be found from a graph of the concentration of *cis*-platin against time.
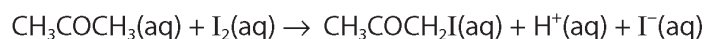

Concentration of *cis*-platin $\times 10^{-3}$ / mol dm^{-3}

Time of reaction / min
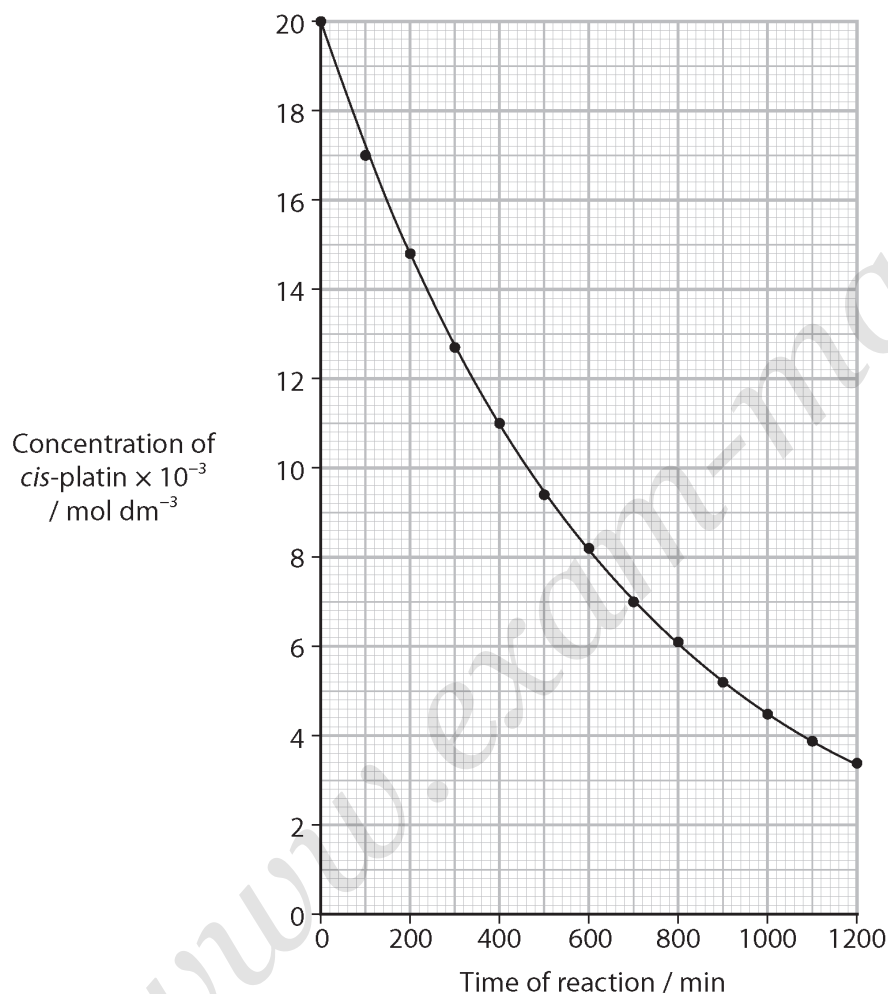
The half-life of the reaction is

☐ **A** 430 min

☐ **B** 460 min

☐ **C** 590 min

☐ **D** 600 min

4 - (WCH11/4(IAL)_Summer_2020_Q4) - *Rates, Equilibria And Further Organic Chemistry*

Propanone reacts with iodine in acidic solution.

$$CH_3COCH_3(aq) + I_2(aq) \rightarrow CH_3COCH_2I(aq) + H^+(aq) + I^-(aq)$$

The rate equation for the formation of iodopropanone is found to be

$$rate = k[CH_3COCH_3(aq)][H^+(aq)]$$

(a) Which of the following is true?

(1)

☐ **A** the units for the rate constant are $dm^3 \, mol^{-1} \, s^{-1}$

☐ **B** the reaction is a first order reaction overall

☐ **C** the units for the rate are $dm^3 \, mol^{-1} \, s^{-1}$

☐ **D** doubling the concentrations of propanone and of iodine quadruples the rate

(b) Which of the following is **not** true?

(1)

☐ **A** the reaction rate increases if the temperature is raised

☐ **B** the rate constant increases if the temperature is raised

☐ **C** the addition of a small amount of sodium hydroxide decreases the reaction rate

☐ **D** the rate is unchanged when the hydrogen ion concentration is doubled

5 - (WCH11/4(IAL)_Summer_2020_Q5) - *Rates, Equilibria And Further Organic Chemistry*

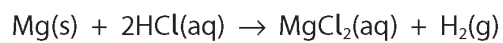The equation shows the hydrolysis of a bromoalkane.

$$RBr + OH^- \rightarrow ROH + Br^-$$
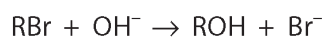
The rate equation is rate = k[RBr]

RBr is most likely to be

☒ **A** bromomethane

☒ **B** 2-bromopropane

☒ **C** 1-bromo-2-methylpropane

☒ **D** 2-bromo-2-methylpropane

6 - (WCH11/4(IAL)_Summer_2020_Q6) - *Rates, Equilibria And Further Organic Chemistry*

The equation for an exothermic reaction is shown.

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

Which of these is true?

⊠ **A** ΔH is positive

⊠ **B** $\Delta S_{surroundings}$ is positive

⊠ **C** ΔS_{system} is negative

⊠ **D** ΔS_{total} is negative

ANSWERS

1 ▪ (WCH11/4(IAL)_Summer_2020_Q1) ▪ *Rates, Equilibria And Further Organic Chemistry*

C

2 ▪ (WCH11/4(IAL)_Summer_2020_Q2) ▪ *Rates, Equilibria And Further Organic Chemistry*

B

3 ▪ (WCH11/4(IAL)_Summer_2020_Q3) ▪ *Rates, Equilibria And Further Organic Chemistry*

B

4 ▪ (WCH11/4(IAL)_Summer_2020_Q4) ▪ *Rates, Equilibria And Further Organic Chemistry*

Question Number	Answer	Mark
(a)	**The only correct answer is A** (the units for the rate constant are $dm^3 \, mol^{-1} \, s^{-1}$) *B is incorrect because the reaction is second order overall* *C is not correct because the units of rate are always $mol \, dm^{-3} \, s^{-1}$* *D is not correct because the rate would double as iodine is zero order*	(1)

Question Number	Answer	Mark
(b)	**The only correct answer is D** (the rate is unchanged when the hydrogen ion concentration is doubled) *A is incorrect because the rate of reaction does increase with temperature* *B is incorrect because the rate constant depends on the temperature and increases as temperature rises* *C is not correct because sodium hydroxide would neutralise some of the $[H^+]$ catalyst so change rate*	(1)

5 ▪ (WCH11/4(IAL)_Summer_2020_Q5) ▪ *Rates, Equilibria And Further Organic Chemistry*

D

6 ▪ (WCH11/4(IAL)_Summer_2020_Q6) ▪ *Rates, Equilibria And Further Organic Chemistry*

B

7 ▪ (WCH11/4(IAL)_Summer_2020_Q7) ▪ *Rates, Equilibria And Further Organic Chemistry*

A

8 ▪ (WCH11/4(IAL)_Summer_2020_Q8) ▪ *Rates, Equilibria And Further Organic Chemistry*

B