

Candidate Name

Centre Number

Candidate Number



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

CHEMISTRY
PAPER 2

6031/2

NOVEMBER 2022 SESSION

1 hour 30 minutes

Candidates answer on the question paper.

Additional materials:

Data Booklet

Electronic Calculator

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

FOR EXAMINER'S USE

1	
2	
3	
4	
5	
6	
TOTAL	

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[Turn over



Answer all questions

- 1 (a) Distinguish, using a diagram, the behaviour of the ions ${}^1_1\text{H}^-$, ${}^2_1\text{H}^+$ and ${}^4_2\text{He}^{2+}$ in an electric field.

[1]

- (b) A gaseous atom of an element, X, loses electrons to form a cation of the element.

- (i) Name the chemical change that occurs when X loses electrons.

- (ii) Write an equation that represents the chemical change in (i).

[2]

- (c) (i) Write the electronic configuration of O^{2-} ion.

[1]



- (ii) Complete Fig. 1.1, a sketch graph, to show the variation of successive \log_{10} ionisation energies of O^{2+} ion.

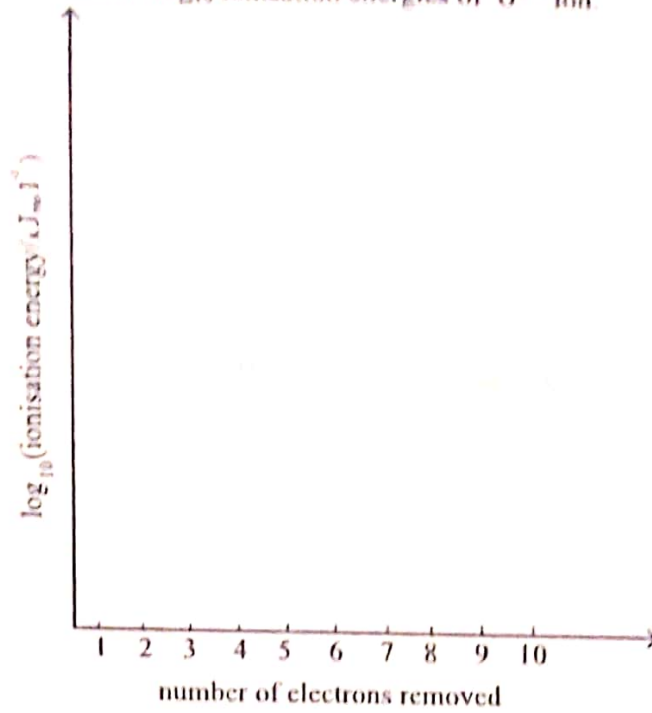


Fig. 1.1

[3]

- (d) Fig. 1.2 shows the mass spectrum of an element Q.

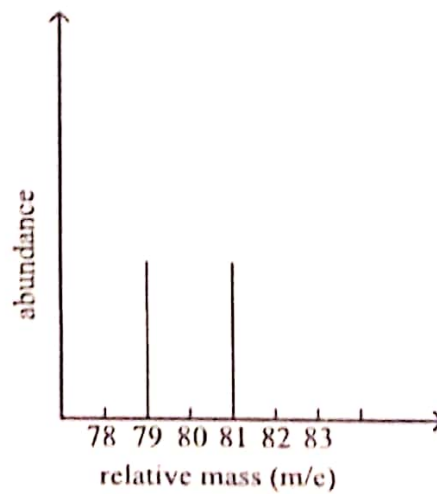


Fig. 1.2

6031/2 N2022

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(i) Determine the relative atomic mass of Q

(ii) Explain why $\text{AgI}_{(s)}$ is insoluble in $\text{NH}_{3(aq)}$.

[3]
[Total: 10]

2 (a) Explain the term

(i) *order of reaction,*

(ii) *rate of reaction.*

[2]



- (b) An experiment was carried out to investigate the kinetics of the reaction shown.

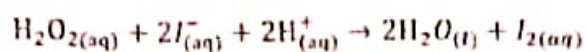


Table 2.1 shows the results of the experiment.

Table 2.1

experiment No	volume/cm ³						relative rate/s ⁻¹
	H ₂ O ₂	KI	H ₂ SO ₄	NaS ₂ O ₃	H ₂ O	Starch	
1	20	20	10	3	0	2	2.22×10^{-2}
2	20	10	10	3	10	2	1.11×10^{-2}
3	10	20	10	3	10	2	1.12×10^{-2}
4	10	10	20	3	10	2	5.50×10^{-2}

Determine the order of reaction with respect to

(i) hydrogen peroxide, H₂O_{2(aq)},

(ii) iodide ions, I_(aq)⁻,

(iii) hydrogen ions, H_(aq)⁺.

[3]

6031/2 N2021

[Turn over



(c) (i) Write a rate equation for the reaction.

(ii) State the species involved in the rate determining step of the reaction mechanism.

(iii) Suggest how the relative rate of the reaction was monitored.

[4]

(d) Explain why the total volume of the mixture was kept constant for all the experiments.

[1]

[Total: 10]

3 (a) Describe the observations made when magnesium burns in oxygen.

[2]

(b) (i) Write a balanced chemical equation for the reaction of magnesium with steam.

(ii) State the trend in solubility of Group (II) oxides.



- (ii) Explain why it is better to treat acid indigestion using a suspension of magnesium hydroxide rather than using calcium hydroxide

[4]

- (c) (i) Describe the bonding and structure in

1. CO_2 ,

2. SiO_2 .

[3]

- (ii) Give any one use of SiO_2 .

[1]

[Total: 10]



- 4 (a) The structural formula of benzocaine is shown in Fig. 4.1.

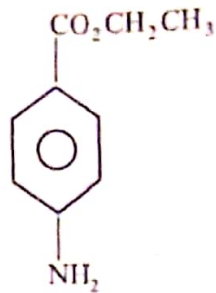
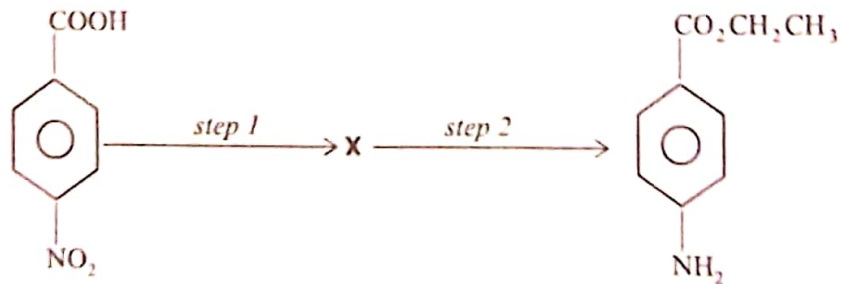


Fig. 4.1

- (i) Name any **two** functional groups present in benzocaine.
1. _____
2. _____
- (ii) Give the structural formulae of the organic products formed when benzocaine is heated in dilute hydrochloric acid.

[4]

- (b) Benzocaine can be produced from compound B using the reaction scheme shown in Fig. 4.2.



compound B

Fig. 4.2

- (i) Name compound B.
- _____



(ii) Suggest a possible structure for X.

(iii) State the reagents and conditions for steps 1 and 2.

Step 1 reagent(s) _____

conditions _____

Step 2 reagent(s) _____

conditions _____ [6]
[Total: 10]

5 (a) Compound A is a hydrocarbon with molecular formula C_4H_8 .

Draw the displayed structural formulae of the isomers of A other than geometrical isomers.

(b) Fig. 5.1 shows an organic compound G.



compound G

Fig. 5.1



(i) Write the structural formulae of the organic products formed when **G** reacts with

1. SOCl_2 ,

2. hot acidified KMnO_4 ,

3. 2,4-DNPH in acidified methanol.

(ii) Name the type of reaction that occurs between **G** and SOCl_2 .

_____ [5]

(c) Suggest, with a reason, one use of a Platinum Group Metal.

use: _____

reason: _____

_____ [2]

[Total: 10]



(ii) State any other **three** application(s) of genetic fingerprinting.

- 1. _____

- 2. _____

- 3. _____

[3]
[Total:10]

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