Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

CHEMISTRY 6031/2

PAPER 2

SPECIMEN PAPER 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Data Booklet
Mathematical Tables and/or 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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Answer **all** questions

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1 The mass spectrum of a compound consisting of carbon, hydrogen and oxygen only showed major peaks at m/e values of 15;29;45 and 60. A 3.0 g portion of the compound was completely burnt in oxygen and produced 6.66 g of carbon dioxide and 3.6 g of water.

(a) Calculate the mass of each element in the 3.0 g portion of the compound.

(i) carbon

mass of carbon _____

(ii) hydrogen

mass of hydrogen _____

(iii) oxygen

mass of oxygen _____ [3]

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1 **(b)** Determine the empirical formula and molecular formula of the compound.

empirical formula _____

molecular formula _____ [3]

(c) Identify the species responsible for each peak in the mass spectrum.

_____

_____

_____

_____ [2]

(d) Draw the displayed structural formula of the compound.

[2]
[Total:10]

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2 Nitrogen dioxide exists in equilibrium with its dimmer,dinitrogentetraoxide.

$$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$$

The dissociationof $N_2O_{4(g)}$is 90 % complete at 100°C and 100 % complete at 150 °C.

(a) **(i)** Write the $K_p$expression for the reaction and state itsunits.

$K_p$expression

units

[2]

(ii) 4 moles of N_2O_4 were heated to 100 °C in a 1 dm^3container.

Calculate the number of moles, at equilibrium, of

1. N_2O_4,

2. NO_2.

[2]

(iii) Calculate the $K_c$using the values obtained in **a(ii).**

[1]

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2 **(a)** **(iv)** State and explain the effect of reducing the temperature to 60 °C, on the value of K_c.

*effect*_____

*explanation*_____

_____ [2]

(b) **(i)** Draw a dot and cross diagrams for

1. N_2O_4,

2. NO_2.

[2

(ii) State the bond angle O- N- O in N_2O_4.

_____ [1]

[Total:10]

3 **(a)** Write down the electronic configuration of the Cu^+ ion.

_____ [1]

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3 **(b)** Define the term

(i) *transition metal,*

_____

_____

_____

(ii) *complex ion.*

_____

_____

_____ [2]

(c) State and explain the

(i) observations made whenaqueous ammonia is added to a solution of copper sulphate until in excess,

_____

_____

_____

_____

_____

_____

_____

(ii) trend in densities of transition elements titanium to copper.

_____

_____

_____ [5]

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3 **(d)** Explain why the melting point of calcium is less than that of manganese.

_____

_____

_____ [2]

[Total:10]

4 **(a)** **Fig. 4.1**is a reaction scheme for an organic compound and some of its products. A volume of 0.56 dm^3 of hydrogen gas was produced when 3.70 g of the organic compound was reacted with excess sodium metal.

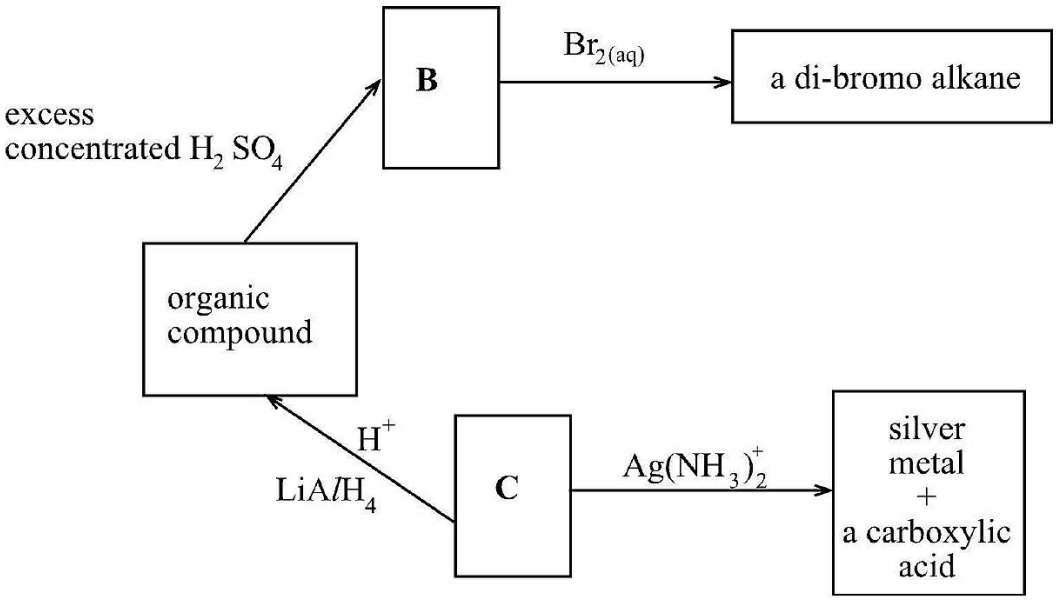


Fig. 4.1

(i) Deduce the relative molecular mass ofthe organic compound.

[2]

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4 (a) (ii) Deduce, with reasons, the structural formula of the organic compound.

*reasons*_____

_____

_____ [2]

(b) **W** and **Z** are two isomers of butanol

W: $CH_3CH_2CH_2CH_2OH$

Z: $CH_3CH_2CHOHCH_3$

(i) State the type of isomerism exhibited by the two molecules.

_____ [1]

(ii) Draw the displayed formula of the third isomer of butanol.

[1]

(iii) Describe how you would distinguish between the two isomers **W** and **Z**.

_____

_____

_____ [4]

[Total:10]

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5 **(a)** **Fig.5.1** represents a polymer.

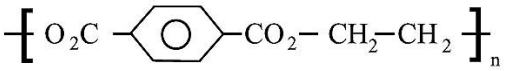


Fig.5.1

(i) Draw the structures of the monomers that make up the polymer.

(ii) State

1. **one** condition used for the formation of the polymer.

_____

2. the type of polymerisation in the formation of the polymer.

_____ [4]

(b) The structure of acetylcholine, a neurotransmitter substance, is shown in **Fig. 5.2.**

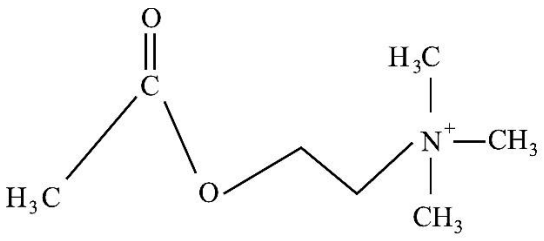


Fig. 5.2

For Examiner's Use

5 **(b)** Give the structural formulae of the products formed when acetylcholine is

(i) warmed with water,

(ii) reacted with ammonia.

[4]

(c) Describe and explain what happens when

(i) silver nitrate solution is added to a solution of tetramethylammonium chloride,

_____

_____

_____

(ii) water is added to tetramethylammonium chloride salt.

_____

_____

_____ [2]

[Total:10]

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6 (a) (i) State Henry's Law.

_____ [1]

(ii) Give **three** ways in which Henry's law is similar to thepartion law.

1. _____

_____

2. _____

_____

3. _____

_____ [4]

(b) The solubilities of ammonia, carbon dioxide and oxygen in water at a constant temperature and pressure are in the ratio 29 000: 35 : 1 respectively.

Explain this trend.

_____

_____

_____

_____ [3]

For Examiner's Use

6 (c) Calculate the volume in dm^3 of each of the gases nitrogen, oxygen and argon which van be boiled off from a saturated solution of air in 1 dm^3 of water.

[air contains 78 % nitrogen, 21 % oxygen and 1 % argon. The respective solubilities of the gases a0.0239, 0.0489 and 0.0530 cm^3 dissolved in 1 cm^3 of water at 0°C and 1 atmosphere pressure.

[2]
[Total:10]