

Candidate Name

Centre Number

Candidate Number



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

CHEMISTRY
PAPER 2

6031/2

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

For
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Use

- 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]

- 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.

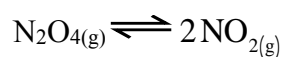
[2]

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

[2]

[Total:10]

- 2 Nitrogen dioxide exists in equilibrium with its dimer, dinitrogen tetraoxide.



The dissociation of $\text{N}_2\text{O}_{4(g)}$ is 90 % complete at 100°C and 100 % complete at 150°C .

- (a) (i) Write the K_p expression for the reaction and state its units.

K_p expression

units

[2]

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

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]

- 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



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

[2]

_____ [1]

[Total: 10]

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

_____ [1]

3 (b) Define the term

(i) *transition metal*,

(ii) *complex ion*.

[2]

(c) State and explain the

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

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

[5]

- 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.

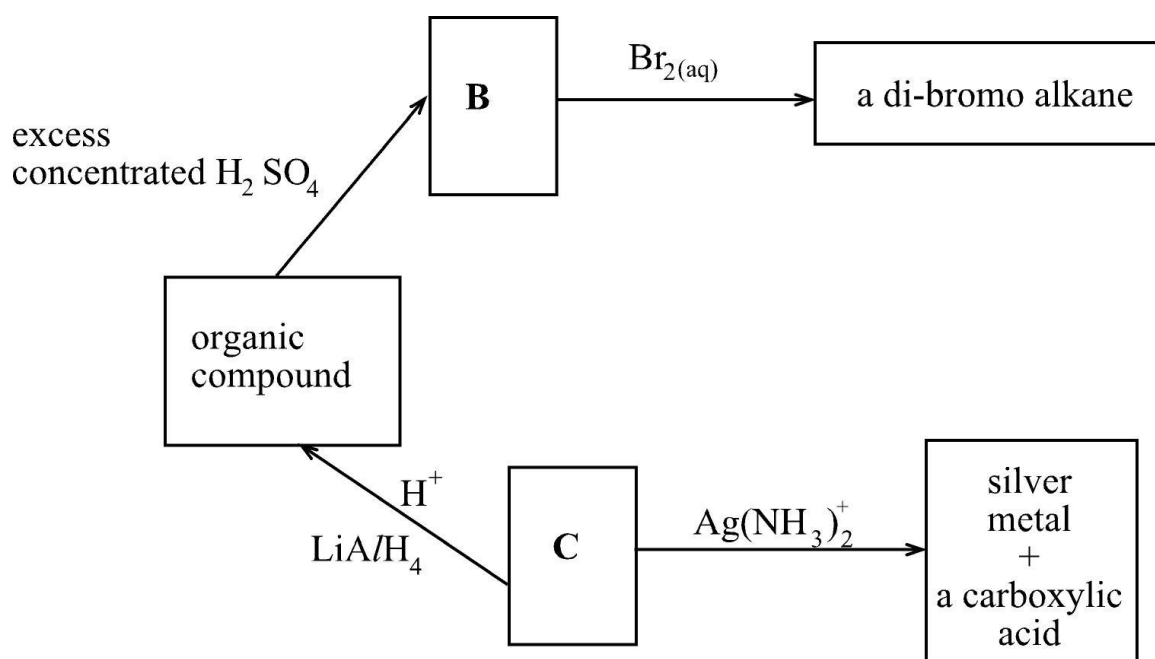


Fig. 4.1

- (i) Deduce the relative molecular mass of the organic compound.

[2]

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

reasons _____

[2]

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



- (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]

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

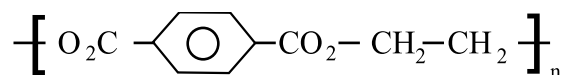


Fig.5.1

- (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.

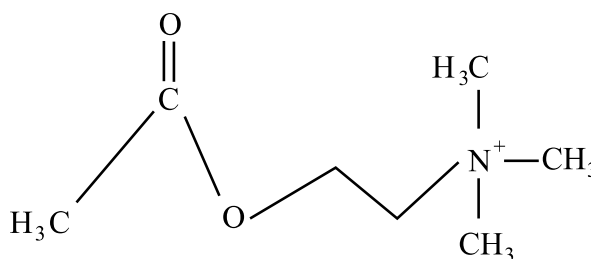


Fig. 5.2

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]

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

_____ [1]

(ii) Give **three** ways in which Henry's law is similar to the partition 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]

- 6 (c) Calculate the volume in dm^3 of each of the gases nitrogen, oxygen and argon which can 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 are 0.0239, 0.0489 and 0.0530 cm^3 dissolved in 1 cm^3 of water at 0°C and 1 atmosphere pressure.]

[2]

[Total:10]