

Candidate Name

Centre Number

Candidate Number



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

CHEMISTRY

PAPER 2 Theory

4024/2

SPECIMEN PAPER

2 hours

Additional materials: Electronic calculator

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

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

Section A

Answer **all** questions.

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

Section B

Answer any **four** questions.

Write your answers on the separate answer paper provided.

At the end of the examination fasten any separate answer paper used securely to the question paper.

INFORMATION FOR CANDIDATES

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

A copy of the periodic table is on page 17.

This question paper consists of 17 printed pages.

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Section A

Answer **all** the questions in the spaces provided.

- 1 (a) A student prepared a blue solution, **P**, by adding black copper (II) oxide powder to nitric acid as shown in Fig.1.1.

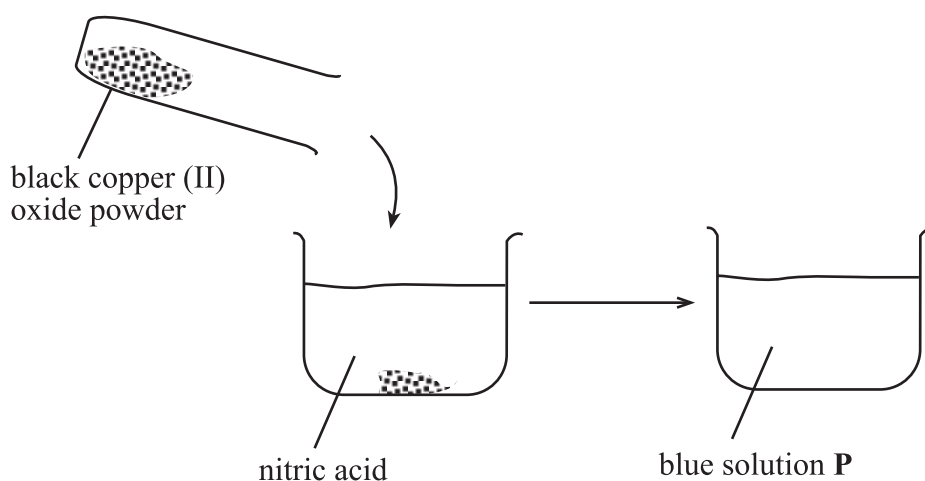


Fig.1.1

- (i) Name **two** chemical substances in the blue solution.

1. _____
2. _____

- (ii) State **two** observations made by the student.

1. _____
2. _____

- (iii) Write a balanced chemical equation for the reaction.

[6]

3

1 **(b)** Write a balanced chemical equation for the reaction that will occur when

(i) zinc granules are added to copper sulphate solution,

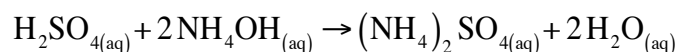
(ii) calcium carbonate is heated strongly.

[2]

[Total:8]

4

- 2 (a) In a titration, 25 cm³ of aqueous ammonia required 21.50 cm³ of 0.1 mol dm⁻³ sulphuric acid for complete neutralisation. The equation for the reaction is:



- (i) Calculate the number of moles of sulphuric acid in 21.50 cm³ of the solution.

- (ii) Deduce the number of moles of ammonia in the 25 cm³ of ammonia.

- (iii) Calculate the concentration of the ammonia solution.

[6]

- (b) (i) Give **one** physical property in which the oxides, CO₂ and SO₂, are similar.

- (ii) Name the industrial process by which CO_{2(g)} is obtained from air.

[2]

[Total :8]

- 3 (a) **Table 3.1** shows some of the gaseous pollutants.

Complete **Table 3.1** by stating a use and an effect of the gases on the environment.

gas	use	effect on the environment
CO ₂		
SO ₂		

[4]

- 3 (b) Explain why **no** chemical reaction takes place when

- (i) aluminium powder that has been exposed to air is added to a solution of iron (II) sulphate,

- (ii) magnesium powder is added to a solution of calcium chloride,

- (iii) zinc oxide is heated in a stream of hydrogen,

- (iv) carbon dioxide is bubbled through a solution of hydrochloric acid.

[4]

[Total:8]

- 4 (a) **Fig.4.1** shows how an organic compound, **Q** is produced from ethene.

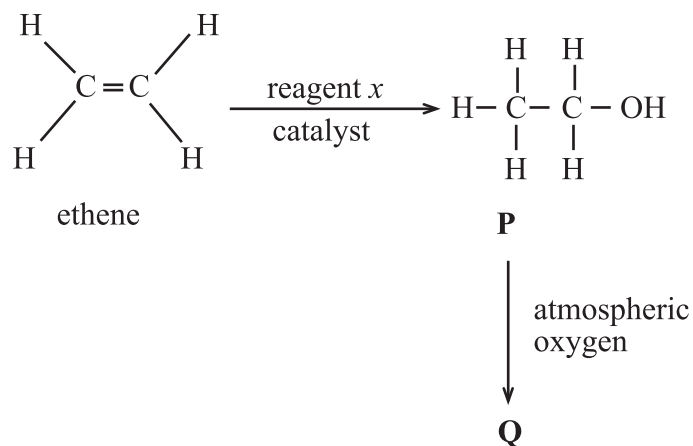


Fig.4.1

- (i) Name
1. reagent *x*, _____
 2. compound **P**, _____
- (ii) Draw the displayed structural formula of **Q**.
- (iii) Give any **two** uses of **P**.
1. _____
 2. _____

- (iv) Describe **anyone** chemical test that is used to distinguish ethene from **P**.

[6]

- (b) **Fig.4.2** shows the structure of a protein molecule.

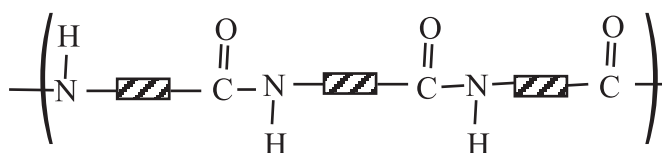


Fig.4.2

- (i) Name the smaller units (monomers) that make up the protein molecule.
- (ii) Describe how the protein molecule can be broken down into the smaller units.

[2]

[Total:8]

- 5 **Fig.5.1** shows a set up of apparatus that was used to identify a blue pen that was used to write a bad message by a student. The ink that was used to write the message is marked **M**. Sample inks 1,2 and 3 were taken from pens suspected to have been used.

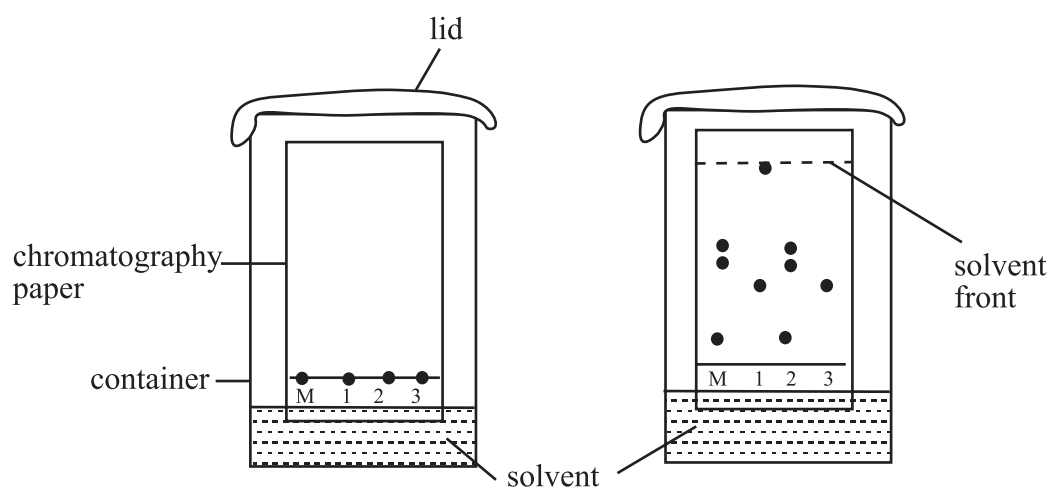


Fig.5.1

- (a) (i) State the number of dyes in ink **M**.

- (ii) Describe **one** difference and **one** similarity between inks in samples 1 and 3.

difference _____

similarity _____

[3]

- (iii) Identify with reasons the sample ink that could have been used to write the bad message.

ink _____

reason _____

[4]

- (b) (i) Name **one** property that determines the distance travelled by a dye in chromatography.

- (i) The solvent travelled 8.0 cm and the dye in ink 3 travelled 3.0 cm.

Calculate the R_f value of the dye in ink 3.

- (iii) State the importance of R_f values.

[3]

- (c) Explain why the container in **Fig.5.1** was covered.

_____ [1]

[Total: 8]

10

Section: B

Answer any **four** questions from this section.

- 6 (a) Define the term *ionic bonding*.

[2]

- (b) The table shows some physical properties of three compounds.

compound	electrical conductivity	melting point
naphthalene	does not conduct	low
copper (II) chloride	good conduction when in solution	high
ethane	does not conduct	low

- (i) Explain why

1. copper (II) chloride has a higher melting point than ethane,
2. naphthalene does not conduct electricity

- (ii) Describe and explain what happens when

1. solid naphthalene is added to water,
2. an electric current is passed through a concentrated solution of copper (II) chloride.

[9]

- (c) Element **X** has 9 protons and 10 neutrons.

- (i) Draw a diagram to show the full electronic structure of X.
- (ii) State **two** physical properties of the compound formed when X reacts with sodium.

[Total:15]

11

- 7 (a) Cast iron from the blast furnace contains 4 to 5 % carbon and other impurities.
- (i) Name **one** other impurity in cast iron.
- (ii) Describe how the impurities are removed in the oxygen lance furnace.
- [3]
- (b) The structural formulae of butenedioic acid is shown in **Fig. 7.1**.

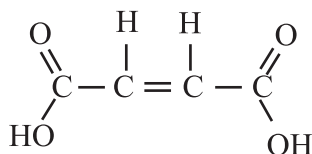


Fig. 7.1

- (i) Give the empirical formulae of butenedioic acid
- (ii) Describe how butenedioic acid reacts with
1. aqueous bromine,
 2. sodium carbonate,
 3. magnesium.
- (iii) Draw the structural formula of the product formed when butenedioic acid reacts with bromine.
- [5]

- (c) **Fig.7.2** shows the reaction of ethene molecules to produce **N**.

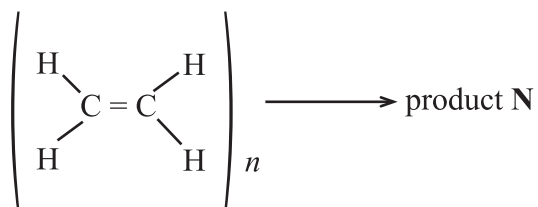


Fig. 7.2

- (i) Name
1. this type of reaction,
 2. product **N**.
- (ii) Draw the displayed structural formula of **N**.
- (iii) State any **two** uses of the product **N**
- (iv) Describe how product **N** can be safely disposed from the environment

[7]

[Total:15]

- 8 (a) Describe how a pure sample of sodium chloride can be prepared from solutions of hydrochloric acid and sodium hydroxide of known concentrations.

[4]

- (b) Fig.8.1 shows chemical tests carried out on a salt to identify the ions present in the salt.

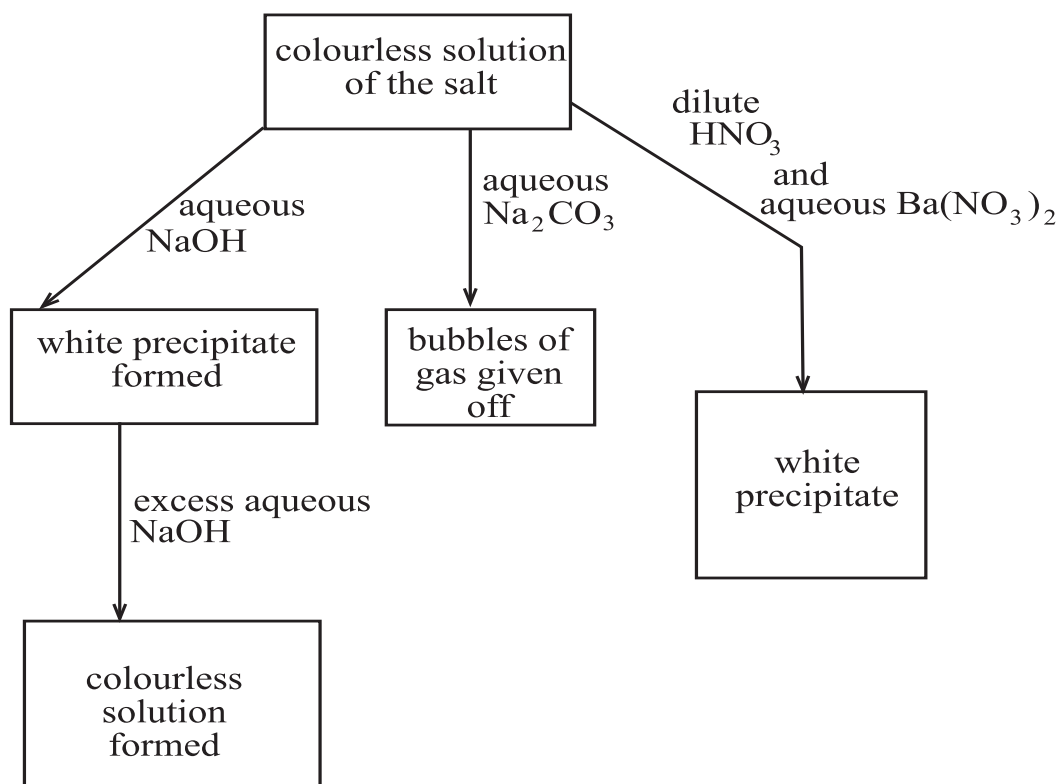


Fig.8.1

- (i) Deduce the cations and anions in the salt.
- (ii) Iodide ions were suspected to be present in the salt.

Describe a chemical test and observations to show the presence of the iodide ions.

[7]

- (c) A student placed a few calcium granules in a flask containing cold water coloured with universal indicator. The gas given off was collected in a measuring cylinder inverted in water as shown in **Fig. 8.2**

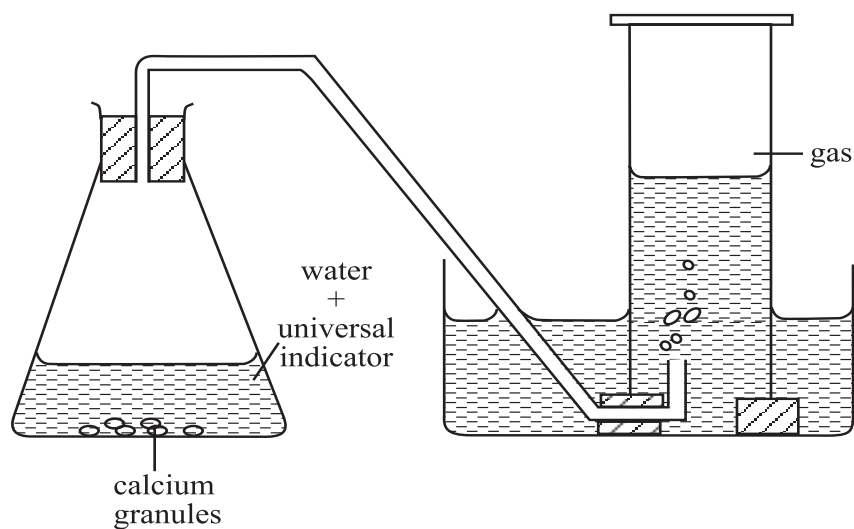


Fig. 8.2

- (i) State and explain any **one** observable change that occurs in the flask.
- (ii) Name the gas produced.
- (iii) Describe a test for the gas produced.

[4]
[Total:15]

- 9 Fig.9 shows the main steps in the manufacture of sulphuric acid.

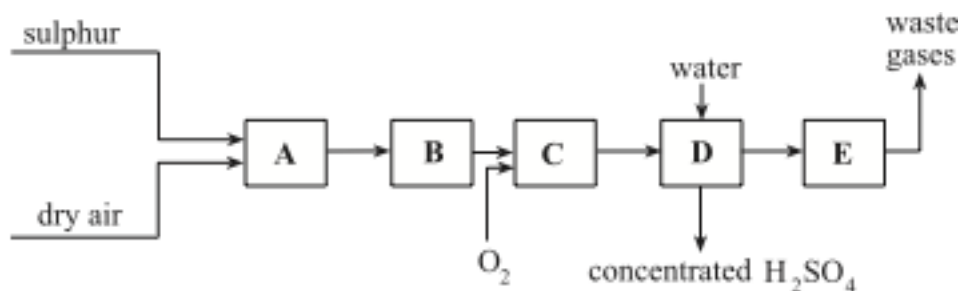


Fig.9

- (a) (i) Choose from the letters A - E, the box that would be labelled
1. catalytic converter,
 2. chimney,
 3. purifier
- (ii) Identify **one** error on the flow diagram and describe how this can be corrected.
- (iii) State any **one** condition used in C and write the overall equation for the reaction which takes place.

[12]

- (b) Describe how sulphuric acid is converted into ammonium sulphate fertilizer.

[3]

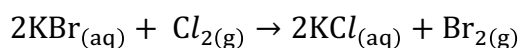
[Total:15]

10 (a) State

- (i) **two** different physical properties of bromine and iodine,
- (ii) **two** similar chemical chemical properties of bromine and iodine.
- (iii) any **two** uses of chlorine.

[6]

(b) Chlorine reacts with potassium bromide as shown.



- (i) State **one** observation made as the reaction occurs.
- (iii) Name, with a reason, this type of reaction.

[4]

(c) Explain why

- (i) incineration is a controversial method of waste disposal
- (ii) the use of landfills as method of waste disposal is being discouraged.

[5]

[Total: 15]

The volume of one mole of any gas is 28 dm^3 at room temperature and pressure (r.t.p.)