

**THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**

032/2

CHEMISTRY PAPER 2

TIME: 2½ Hours.

21 January 1999: A.M.

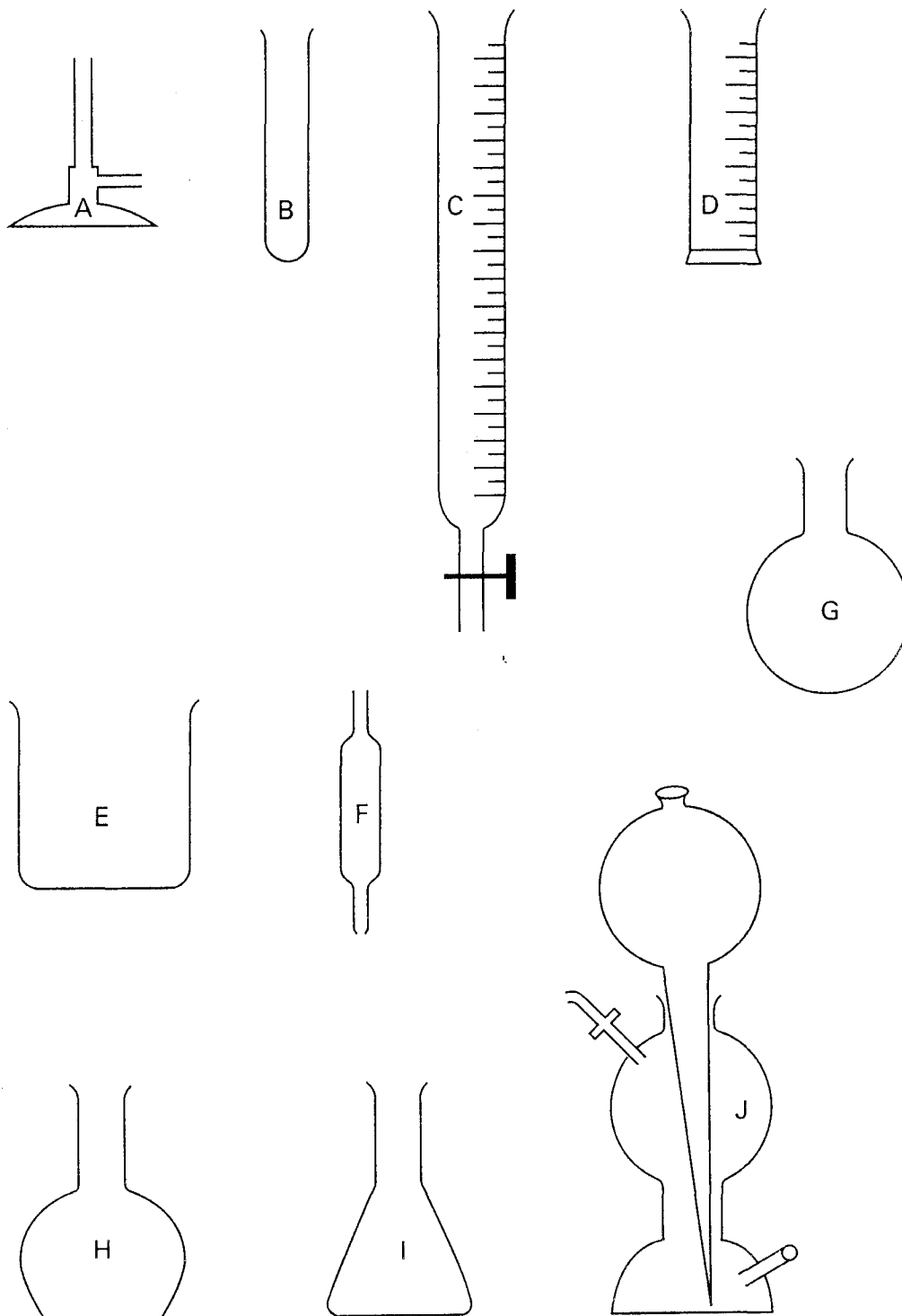
INSTRUCTIONS

1. This paper consists of **FIVE [5]** questions.
2. Answer **ALL** questions in the answer book provided.
3. Wherever calculations are involved, show **clearly** all the steps involved.
4. The marks allocated to each question or parts thereof are indicated in brackets.
5. Qualitative Analysis guide sheets may be used.
6. Wherever necessary the following constants may be used.

H = 1, C = 12, N = 14, O = 16, Na = 23,
S = 32, Ca = 40, Fe = 56, Cu = 64.0

1 Give the name and one use of the following pieces of apparatus labelled A, B, E, F, G, H, I, and J.

10 marks

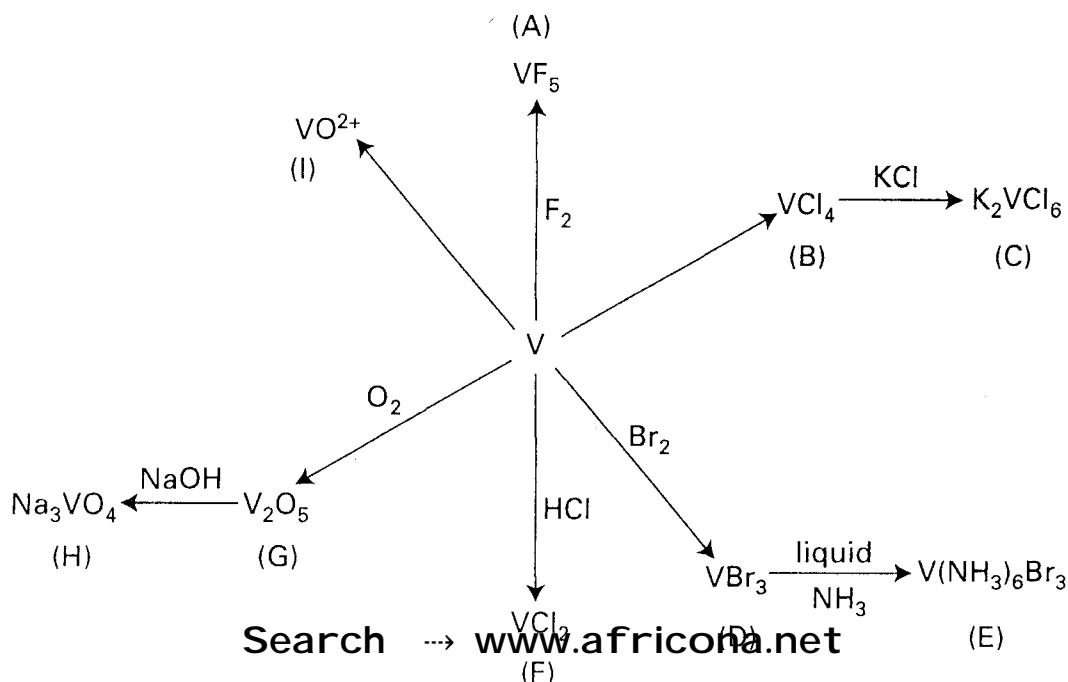


- 2 In a titration experiment 1M H₂SO₄ (sulphuric acid) and NaOH (sodium hydroxide) gave the following results:

The volume of pipette used = 25.0 cm³.

Burette readings/ cm ³	PILOT	1	2	3
Final reading	14.00	26.60	39.00	42.50
Initial Reading	01.00	14.00	26.60	30.00
Titre				

- (a) Complete the table by filling in the third value in each column. **2 marks**
- (b) Calculate the mean titre of this experiment **1 mark**
- (c) Write a balanced chemical equation for the reaction which took place. **2 marks**
- (d) What is the acid to base ratio ($\frac{\text{acid}}{\text{base}}$) mole ratio? **1 mark**
- (e) Calculate the molarity of sodium hydroxide and its concentration in g/dm³. **4 marks**
- 3 (a) What is a redox reaction? **1 mark**
- (b) In a certain experiment when powdered zinc was added to copper(II) sulphate the following happened.
Copper ions were reduced to a red-brown deposit of copper and zinc dissolved to form a solution.
- (i) Write a simple equation for the reaction above.
- (ii) Write the half equation reaction representing the loss of electrons or oxidation (LEO)
- (iii) Write the half equation reaction representing the gain of electrons or reduction (GER)
- (iv) Write the overall ionic equation for the reaction. **4 marks**
- (c) Certain features of the element vanadium, V, are represented in the figure below. Study the diagram and then answer the questions which follow.



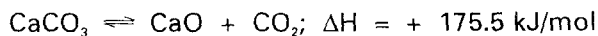
- (i) What is the oxidation number of vanadium in compounds A, B, C, D, E, F, G, H and I?
 (ii) What can you deduce about the oxidising power of the halogens towards vanadium?
5 marks

4 A sample of 2.0 g of calcium carbonate and 25 cm³ (excess) of 2.0 M nitric acid were mixed and the loss of mass recorded at various time intervals as follows.

Time (min)	2	4	6	8	10	12
Loss in mass (g)	0.11	0.34	0.52	0.66	0.75	0.82

The maximum loss was 0.87 g.

- (a) Plot a suitable graph for this data, showing clearly that the rate of reaction was quickest during the 2nd up to the 4th minute interval.
4 marks
- (b) From the reaction equation, calculate the mass of carbon dioxide evolved.
2 marks
- (c) The equation for the dissociation of calcium carbonate is



What will be the effect on the proportion of calcium carbonate in the equilibrium mixture of

- (i) increasing the temperature.
 (ii) increasing the pressure.
2 marks
- (d) What conditions would be suitable for manufacturing calcium oxide from calcium carbonate on a large scale?
2 marks

5 An unknown sample **N** containing one anion and one cation was analysed by performing the experiments illustrated in the table below. Complete the table and identify the cation, anion and compound **N**.

	EXPERIMENT	OBSERVATION	INFERENCE
(a)	Appearance of sample N held in air	White powder	
(b)	Sample N was heated	Odourless, colourless gas which turned blue litmus paper pale red was given off	
(c)	Sample N was dissolved in distilled water, and in dil. HCl	Sample N was insoluble in water but dissolved in dil. HCl with strong effervescence of odourless, colourless acidic gas which turned lime water milky	
(d)	Sample N was dissolved in nitric acid to become an original solution (O.S.). To O.S. sodium hydroxide solution was added drop wise and then in excess.	White precipitate insoluble in excess NaOH (aq) was observed.	
(e)	To O.S. ammonium chloride solution was added, followed by ammonium hydroxide solution drop by drop.	White precipitate	
(f)	To original solution ammonium oxalate was added.	White precipitate	
(g)	To O.S. dilute sulphuric acid was added.	White precipitate	
(h)	Flame test on sample N	It burned with brick-red colouration.	

The cation is

The anion is

Compound **N** is

10 marks