

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

0032/2

CHEMISTRY 2

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

TIME 2½ Hours

9 November 2000 A.M.

Instructions

1. This paper consists of FIVE (5) questions.
2. Answer ALL questions.
3. Wherever calculations are involved, show clearly all the steps involved.
4. The marks allocated to each question or part thereof are indicated in parentheses.
5. Qualitative Analysis guide pamphlets are allowed after a thorough check by the supervisor.
6. Write your Examination Number on each page of your answer booklet(s).

7. The following constants may be used:

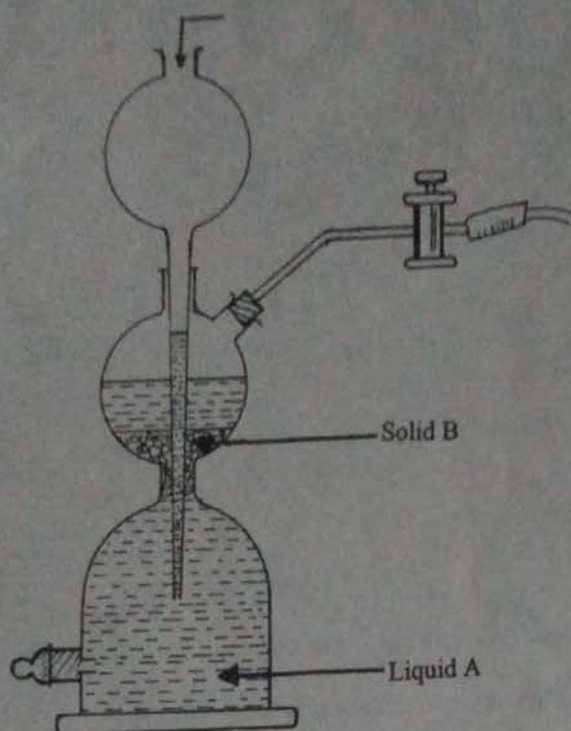
Atomic weight : H = 1, K = 39, O = 16, Na = 23, Cl = 35.5

Molar volume of a gas = 22.4 dm^3 at s.t.p.



This paper consists of 5 printed pages.

1. (a) The following is a diagram of Kipp's apparatus.



Name liquid A and solid B when the apparatus is being used to produce the following gases:

- (i) Hydrogen (2 marks)
- (ii) Carbondioxide. (2 marks)
- (b) Draw a labelled diagram of an apparatus which can be used in demonstrating the extreme solubility of ammonia in water. (3 marks)
- (c) Briefly explain how you would show that charcoal absorbs ammonia gas if you were only supplied with a small trough, a test-tube, mercury, a small piece of charcoal, a source of dry ammonia gas, test-tube holder and a stand fitted with a clamp. (3 marks)
2. (a) Briefly explain how you would distinguish between the following solutions:
- (i) Calcium hydroxide and sodium hydroxide solution; (½ mark)
- (ii) Dilute sulphuric acid and dilute hydrochloric acid. (½ mark)
- (b) Calculate the volume of distilled water which must be added to 100 cm³ of 0.4 M sodium hydroxide solution so as to obtain a solution which is exactly 0.05 M. (2 marks)
- (c) If 50 cm³ of 0.1 M sulphuric acid were added to 50 cm³ of 0.1 M sodium hydroxide solution, calculate the volume of a 0.2 M sodium hydroxide solution which is to be added to the mixture so as to complete the neutralization of the acid. (2½ marks)

- (d) 20 cm³ portions of a certain potassium hydroxide solution were separately titrated against 0.1 M hydrochloric acid using methyl orange as an indicator. A copy of the burette readings was made but some of the readings and titre values were un-intentionally not copied.

Titration number	Trial	1	2	3
Final burette reading (cm ³)	20.15	38.10	18.95	
Initial burette reading (cm ³)	2.05		0.95	18.95
Volume used (cm ³)	18.10	17.95		18.05

- Complete the table (1½ marks)
 - Calculate the average volume of the acid used. (1 mark)
 - Calculate the concentration of the solution in moles per dm³. (2½ marks)
 - If the solution was made by dissolving 5.6 grams of potassium hydroxide contaminated with sodium chloride in distilled water and then the solution was diluted to 1000 cm³ with distilled water, calculate the percentage by mass of sodium chloride in the impure alkali. (3½ marks)
3. The reaction between element M and dilute sulphuric acid is as follows:



In an experiment to determine the volume of hydrogen liberated by various masses of M, the following data was collected.

Mass of metal reacted (g)	Volume of hydrogen liberated at s.t.p. (dm ³)
1	0.92
2	1.84
3	2.77
4	3.69
5	4.61
6	5.53

- Plot a graph of volume of hydrogen liberated against mass of element M reacted. (2 marks)
 - Determine the slope of the graph in 3(a) above. (1½ marks)
 - What does the slope represent? (1 mark)
 - Use the slope in 3(b) (i) above to calculate the relative atomic mass of element M. (3 marks)
4. (a) State the colour of the flame when each of the following substances burns in oxygen:
- Sulphur
 - Phosphorus
 - Magnesium
 - Sodium
- (2 marks)

(b) Write balanced chemical equations and state the observations which would be made when each of the following compounds is strongly heated in a test tube:

(i) Iron (II) sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$)

(2 marks)

(ii) Lead (IV) oxide (PbO_2)

(1½ marks)

(c) With the aid of chemical equations briefly state how the following compounds can be prepared from the given solutions in a school chemistry laboratory:

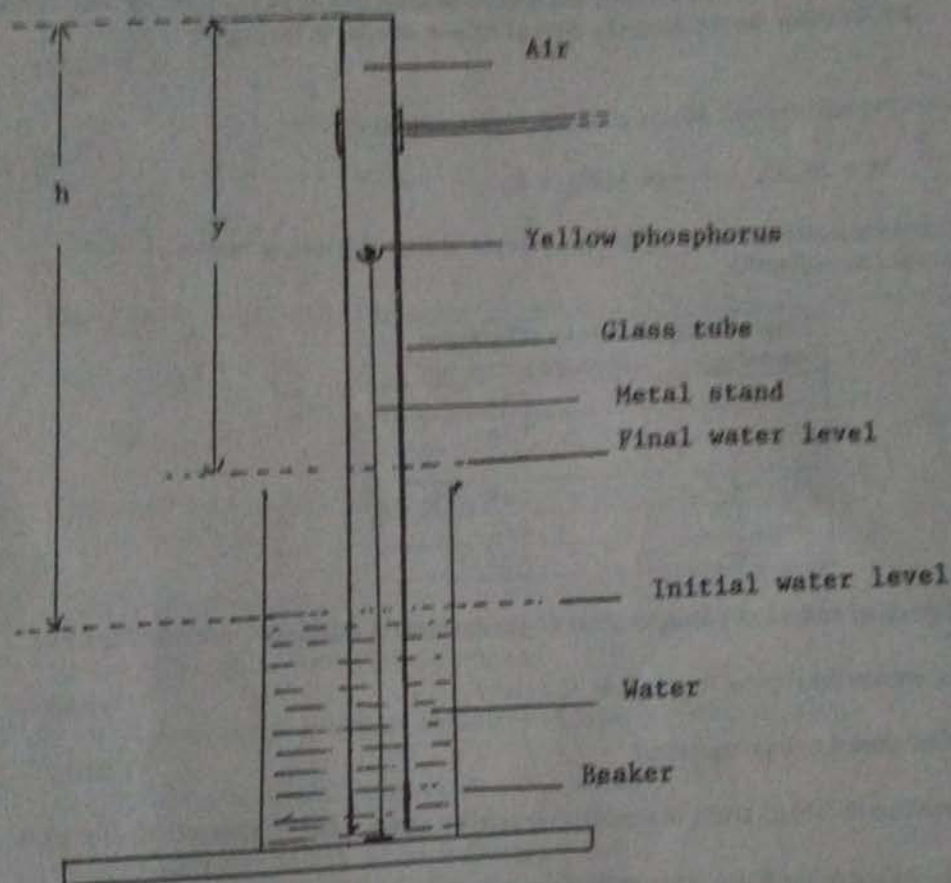
(i) Zinc carbonate from zinc chloride solution.

(1½ marks)

(ii) Iron (III) oxide from iron (III) chloride solution.

(2 marks)

(d) Study the apparatus below very carefully and then answer the questions below.



(i) In what experiment is this apparatus used?

(1 mark)

(ii) What does the ratio $\frac{h-y}{h}$ represent?

(½ mark)

(iii) What does the quantity $\frac{(h-y)100}{h}$ represent?

(½ mark)

5. (a) Sample SS was a simple salt containing one cation and one anion. The tests carried out on sample SS and the observations made were entered in the table shown below.

You are required to complete the table and deduce the anion and cation which were present in the sample.

TEST	OBSERVATIONS	INFERENCE	
(i) Appearance	White deliquescent crystals		(1 mark)
(ii) A little of solid SS was heated in a test tube	Light brown gas with a sweetish smell was evolved. A white residue was left.		(1 mark)
(iii) A solution of SS in distilled water was prepared. Sodium hydrogen carbonate solution was then added to the solution.	No reaction was observed		(½ mark)
(iv) The mixture of solutions in (iii) above was gradually heated to boiling.	A white ppt gradually formed and an effervescence of colourless gas which turned lime water milky was seen.		(½ mark)
(v) The ppt formed in (iv) above was isolated, washed and dried. The dry ppt was then flame-tested.	A brick-red flame was observed.		(½ mark)

- (b) (i) The cation was and the anion was (1 mark)
- (ii) Write down an equation for the reaction which took place when the mixture in (a)(iii) above was gradually heated to boiling. (½ mark)
- (iii) Write a confirmatory test for the anion present in sample SS. (½ mark)
- (iv) What would have happened if a little portion of sample SS was mixed with copper turnings and treated with cold moderately concentrated sulphuric acid? (2 marks)

Write balanced equations for the reactions which would have taken place.