THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/2A **CHEMISTRY 2A**

(ACTUAL PRACTICAL A)

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2019**

Instructions

1. This paper consists of two questions.
2. Answer all questions.

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Prepared by: Maria Marco for TETEA

1. You are required to determine the purity of an impure NaOH solution contaminated with NaCl by using pure HCl.

(a) How much volume of the acid was required to neutralize completely 20 cm^3 or 25 cm^3 of the base?

Assume 25 cm^3 of base was used and titre readings gave an average volume of acid as 20.0 cm^3 = 0.020 dm^3.

(b) Write a balanced chemical equation for this reaction.

$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$

(c) Calculate the molarity of the acid and that of the base.

Mass of HCl = 0.73 g
Volume = 0.2 dm^3
Molar mass of HCl = 36.5 g/mol
Moles of HCl = 0.73 ÷ 36.5 = 0.02 mol
Molarity = 0.02 ÷ 0.2 = 0.1 mol/dm^3

Volume of acid used = 20.0 cm^3 = 0.020 dm^3
Moles of HCl = 0.1 × 0.020 = 0.002 mol
From the reaction, moles of NaOH = moles of HCl = 0.002 mol
Volume of NaOH = 25 cm^3 = 0.025 dm^3
Molarity of base = 0.002 ÷ 0.025 = 0.08 mol/dm^3

(d) Calculate the percentage purity of the base (NaOH).

Volume = 0.25 dm^3
Moles = 0.08 × 0.25 = 0.02 mol
Mass of pure NaOH = 0.02 × 40 = 0.8 g
Mass of impure sample = 1.1 g
Percentage purity = (0.8 ÷ 1.1) × 100 = 72.73 percent

(e) What is the percentage by mass of NaCl?

Mass of impurity = 1.1 g – 0.8 g = 0.3 g
Percentage by mass of NaCl = (0.3 ÷ 1.1) × 100 = 27.27 percent

2. Sample V is a simple salt containing one cation and one anion. Carry out the experiments described and record observations and inferences.

(a) Experimental Table

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S/N	Experiment	Observation	Inference
a	Appearance of sample V	White crystalline solid	Sample was a typical ionic salt
b	Added distilled water and warmed	Dissolved completely	Sample was soluble in water
c	Added concentrated H_2SO_4	Effervescence observed	Presence of CO_3^{2-} anion
d	Heated strongly	Residue remained white	Stable salt, no water of crystallization or decomposition
e(i)	Added NaOH in excess to solution	White precipitate formed, dissolved in excess	Presence of Zn^{2+}
e(ii)	Added $MgSO_4$ solution, warmed	White precipitate formed	Confirmed CO_3^{2-} ion
e(iii)	Added ammonia solution in excess	White precipitate dissolved	Confirmed Zn^{2+} ion

(b) Conclusion

(i) The cation in sample V is Zn^{2+} and the anion is CO_3^{2-}

(ii) The name of sample V is zinc carbonate

(iii) The chemical formula of sample V is $ZnCO_3$

(c) With the aid of a balanced ionic equation, explain the effect of the dilute HCl to the sample V in experiment (e).

$ZnCO_3(s) + 2H^+(aq) \longrightarrow Zn^{2+}(aq) + CO_2(g) + H_2O(l)$

Explanation: The dilute HCl reacted with zinc carbonate releasing carbon dioxide gas and forming soluble Zn^{2+} ions.

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