

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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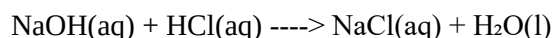


1. You are required to determine the purity of an impure NaOH solution contaminated with NaCl by using pure HCl.

(a) How much volume of the acid was required to neutralize completely 20 cm³ or 25 cm³ of the base?

Assume 25 cm³ of base was used and titre readings gave an average volume of acid as 20.0 cm³ = 0.020 dm³.

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



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

Mass of HCl = 0.73 g

Volume = 0.2 dm³

Molar mass of HCl = 36.5 g/mol

Moles of HCl = $0.73 \div 36.5 = 0.02 \text{ mol}$

Molarity = $0.02 \div 0.2 = 0.1 \text{ mol/dm}^3$

Volume of acid used = 20.0 cm³ = 0.020 dm³

Moles of HCl = $0.1 \times 0.020 = 0.002 \text{ mol}$

From the reaction, moles of NaOH = moles of HCl = 0.002 mol

Volume of NaOH = 25 cm³ = 0.025 dm³

Molarity of base = $0.002 \div 0.025 = 0.08 \text{ mol/dm}^3$

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

Volume = 0.25 dm³

Moles = $0.08 \times 0.25 = 0.02 \text{ mol}$

Mass of pure NaOH = $0.02 \times 40 = 0.8 \text{ g}$

Mass of impure sample = 1.1 g

Percentage purity = $(0.8 \div 1.1) \times 100 = 72.73 \text{ percent}$

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

Mass of impurity = $1.1 \text{ g} - 0.8 \text{ g} = 0.3 \text{ g}$

Percentage by mass of NaCl = $(0.3 \div 1.1) \times 100 = 27.27 \text{ percent}$

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

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 ₂ SO 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

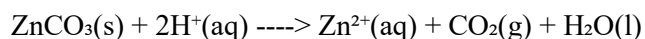
(b) Conclusion

(i) The cation in sample V is Zn²⁺ and the anion is CO₃²⁻

(ii) The name of sample V is zinc carbonate

(iii) The chemical formula of sample V is ZnCO₃

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



Explanation: The dilute HCl reacted with zinc carbonate releasing carbon dioxide gas and forming soluble Zn²⁺ ions.