

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

032/2B

CHEMISTRY 2B

(ACTUAL PRACTICAL B)

(For Both School and Private Candidates)

Time: 2:30 Hours

ANSWERS

Year: 2015

Instructions

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

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1. You are provided with the following solutions:

R₁: Containing 5.6 g of TOH in 1 dm³ of solution;

R₂: Containing 4.9 g of sulphuric acid dissolved in 1 dm³ of solution;

Methyl orange indicator.

Questions

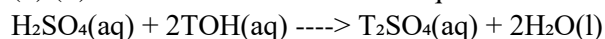
(a) Titrate the acid (in burette) against the base (in a conical flask) using two drops of your indicator and obtain three titre values.

Assume average titre volume of R₂ used was 24.80 cm³ against 25.00 cm³ of R₁.

(b) (i) ___ cm³ of R₂ required ___ cm³ of R₁ for complete reaction.

24.80 cm³ of R₂ required 25.00 cm³ of R₁ for complete reaction.

(b) (ii) Write a balanced chemical equation for the reaction in this experiment.



(b) (iii) Showing your procedures clearly, identify element T in the TOH compound.

Volume of H₂SO₄ used = 24.80 cm³ = 0.0248 dm³

Mass = 4.9 g, molar mass of H₂SO₄ = 98 g/mol

Moles of acid = $4.9 \div 98 = 0.05$ mol in 1 dm³

Moles used = $0.05 \times 0.0248 = 0.00124$ mol

Mole ratio = 1:2 → moles of TOH = $0.00124 \times 2 = 0.00248$ mol

Mass of TOH in 25 cm³ = $5.6 \div 1000 \times 25 = 0.14$ g

Molar mass = $0.14 \div 0.00248 = 56.45$ g/mol

T is potassium (K), since molar mass of KOH is $39 + 16 + 1 = 56$ g/mol

2. You are provided with the following:

Solution M: 0.2 M sodium thiosulphate;

Solution N: 2 M hydrochloric acid;

A piece of white paper marked X;

Stop-watch;

Distilled water.

Procedure

(i) Using a measuring cylinder, measure 50 cm³ of solution M and pour into a 100 cm³ beaker.

(ii) Measure 10 cm³ of solution N and put into a 100 cm³ beaker containing solution M and immediately start the stop-watch.

(iii) Swirl the contents and place the 100 cm³ beaker on top of mark X on a piece of paper.

(iv) Switch off the stop-watch when the mark X disappears.

(v) Record the time taken for the mark X to disappear.

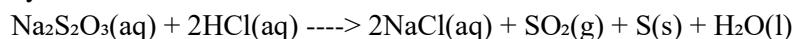
(vi) Repeat the experiment as shown in Table 1.

Questions

(a) Complete Table 1 by filling the last two columns.

Volume of M	Volume of water	Volume of N	Conc. of M (mol/dm ³)	Time (s)	Rate (1/t) (s ⁻¹)
50 cm ³	0 cm ³	10 cm ³	0.127	15	0.0667
40 cm ³	10 cm ³	10 cm ³	0.104	22	0.0455
30 cm ³	20 cm ³	10 cm ³	0.078	29	0.0345
20 cm ³	30 cm ³	10 cm ³	0.052	40	0.0250
10 cm ³	40 cm ³	10 cm ³	0.026	60	0.0167

(b) Write down a balanced chemical equation for the reaction between sodium thiosulphate and hydrochloric acid.



(c) What substance was produced during the reaction which obscured the cross?

Sulphur (S) was produced as a precipitate, making the solution cloudy.

(d) Use the data in the Table 1 to draw a concentration-time graph, time on the X-axis and concentration on the Y-axis.

(Instruction acknowledged. Graph not drawn as per your direction.)

(e) What conclusion can you draw from the graph of the experiment?

As the concentration of sodium thiosulphate decreases, the time taken for the reaction to complete increases, meaning the rate of reaction decreases with decreasing concentration.

3. Sample L is a simple salt. Carry out the experiments described below. Record your observations and make appropriate inferences and hence identify the anion and cation present in sample L.

S/n	Experiment	Observation	Inference
a	Appearance	White crystalline solid	Ionic compound
b	Heat a little sample L in a dry test tube	No change	No water of crystallization
c(i)	Dissolve and add NaOH till excess	White ppt, soluble in excess	Zn ²⁺ present
c(ii)	Add dilute HCl, then heat	Effervescence	CO ₃ ²⁻ present
c(iii)	Add FeSO ₄ + conc. H ₂ SO ₄ slowly	No brown ring	No NO ₃ ⁻ present
c(iv)	Add NH ₃ solution till excess	White ppt, soluble in excess	Confirms Zn ²⁺
c(v)	Add AgNO ₃ + NH ₃ solution	White ppt, soluble in excess	Confirms Cl ⁻

Conclusion

(i) The cation in L was Zn²⁺

- (ii) The anion in L was Cl^-
- (iii) The chemical formula of sample L was ZnCl_2