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 **Tuesday, 08th November 2016 a.m.**

Instructions

1. This paper consists of **three (3)** questions. Answer **all** the questions.
2. Question 1 carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
3. Qualitative Analysis Guidance Pamphlets may be used after a thorough check by the supervisor.
4. Cellular phones and calculators are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. You may use the following constants:
   Atomic masses:
   H = 1, C = 12, N = 14, O = 16, Na = 23, Cl = 35.5.
   1 litre = 1 dm^3 = 1000 cm^3.

1. You are provided with the following solutions:
   Q: Contains 36.5 g of hydrochloric acid in 1 litre of the solution;
   P: Contains 4.0 g of impure ammonium hydroxide per 0.25 dm^3 of the solution;
   Methyl orange indicator.

Procedure:
(i) Measure exactly 10 cm^3 of **Q** by using 10 cm^3 measuring cylinder and pour into 100 cm^3 measuring cylinder. Carefully add distilled water to 100 cm^3 mark then stir. Fill the resulting solution into a burette.
(ii) Titrate **Q** against **P** using two drops of the indicator; obtain three accurate values. Record your results in a tabular form.

Questions:
(a) What if phenolphthalein indicator was used in place of methyl orange indicator for the titration of the given solutions? Give reasons for your answer.

(b) (i) _____ cm^3 of **P** required _____ cm^3 of **Q** for complete reaction.
(ii) Write a balanced chemical equation for the reaction between **Q** and **P**.

(c) Showing your procedures clearly, calculate the percentage by weight of the impurity in the ammonium hydroxide.

2. You are provided with the following:
BB: A 0.25 M sodium thiosulphate solution;
DD: A of 0.10 M hydrochloric acid solution;
A stop watch/clock; a white plain paper with a cross and a thermometer.

Procedure
(i) Place a 100 cm^3 beaker on top of a cross on the plain paper provided such that the cross is visible through the solution when viewed from above.
(ii) Prepare a water bath using a 250 cm^3 or a 300 cm^3 beaker.
(iii) Measure exactly 10 cm^3 of **BB** and 10 cm^3 of **DD** and pour into separate boiling test tubes.
(iv) Put the two boiling test tubes into the water bath in (ii) above and warm the contents to 40 °C.
(v) Immediately pour the hot solutions **BB** and **DD** into the 100 cm^3 beaker in (i) above and simultaneously start the stop watch/clock. Record the time taken in seconds, for the cross to disappear completely.
(vi) Repeat procedure (iii) to (v) at different temperatures, 50 °C, 60 °C and 70 °C. Record your readings in a tabular form as shown in Table 1:

Table 1

Temperature (°C)	Time (sec)	$\frac{1}{\text{time}}$ (sec^{-1})
40		
50		
60		
70		

Questions

(a) (i) Record the room temperature.
(ii) Complete the table by filling the blank columns.

(b) Plot a graph of temperature against time from your results.

(c) Write a balanced ionic equation for the reaction between the dilute acid and sodium thiosulphate.

(d) What does $\frac{1}{\text{time}}$ represent?

(e) From the obtained data, what do you observe about the effect of increasing temperature on the rate of the reaction?

3. You are provided with sample **R** containing one cation and one anion. Carry out the guided systematic procedure in the Table 2 to identify the cation and anion present in the sample **R**.

Table 2

S/n	Experiments	Observation	Inference
(a)	Observe sample **R**.		
(b)	Heat sample **R** in a dry test tube.		
(c)	Prepare a stock solution of sample **R**. Devide the resulting solution into six portions then add:		
	(i) dilute HCl solution in small quantities then in excess to the first portion.		
	(ii) small amount of concentrated H_2SO_4 to the second portion, then warm.		
	(iii) NaOH solution to the third portion, drop-wise till excess.		
	(iv) dilute NH_4OH in small amount then in excess to the fourth portion.		
	(v) $FeSO_4$ solution followed by conc. H_2SO_4 to the fifth portion.		
	(vi) KI solution to the sixth portion, warm then cool the mixture.		

Conclusion

(i) Cation present in **R** is _____.
(ii) Anion present in **R** is _____.
(iii) The chemical formula for **R** is _____.
(iv) Write the equations for the reactions that took place at experiments (b) and (c) (ii).