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

132/3B

CHEMISTRY 3B
ACTUAL PRACTICAL B
(For Both School and Private Candidates)

Time: 3:20 Hours **Friday, 12th May 2017 a.m.**

Instructions

1. This paper consists of **three (3)** questions. Answer **all** the questions.
2. Question number **one (1)** carries 20 marks and the other **two (2)**, 15 marks each.
3. Mathematical tables and non programmable calculators may be used.
4. Cellular phones 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, S = 32, Cl= 35.5, Na = 23, K = 39, Mn = 55, Fe = 56.
   - Molar gas constant = 8.314 J $K^{-1}mol^{-1}$.

1 702132 322010

1. You are provided with the following:
   - **A**: A mixture solution containing NaOH and Na_2CO_3;
   - **B**: 0.2 M hydrochloric acid solution;
   - **C**: Methyl orange indicator;
   - **D**: Phenolphthlaein indicator.

Procedure:

(i) Pipette 25 cm^3 or 20 cm^3 of **A** into a clean conical flask.
(ii) Add to it 4 drops of **D** and titrate the resulting solution with **B** until a colour change is observed.
(iii) Record the first titre volume.
(iv) Add 4 drops of **C** in the mixture solution and continue titrating until the colour changes to just red.
(v) Record the second titre volume.
(vi) Repeat procedures (i) to (v) three times.
(vii) Record your results in a tabular form:

Summary

_____ cm^3 of **A** required _____ cm^3 of **B** in the presence of **D** and _____ cm^3 of **B** in the presence of **C** for complete reaction.

Questions:

(a) Write the ionic equations for the reactions taking place in:
   (i) Procedure (ii)
   (ii) Procedure (iv).
(b) Calculate the:
   (i) Molarity of NaOH and Na_2CO_3 in solution **A**.
   (ii) Concentration of NaOH and Na_2CO_3 in g/l.
   (iii) Percentage composition by mass of NaOH in the mixture solution **A**.

2. You are provided with the following:
   - J_1: A solution containing 49.6 gdm^{-3} of $Na_2S_2O_3.5H_2O$;
   - J_2: A Solution of dilute HNO_3;
   - J_3: Distilled water;
   - Stop watch/clock.

Procedure:

(i) Draw a clear letter "X" on a piece of white paper and place a 100 cm^3 beaker on top of the letter such that it is visible through the solution.
(ii) Measure 5 cm^3 of J_1 into a beaker followed by 5 cm^3 of J_2 and immediately start a stop watch. Stir gently and record the time for letter "X" to disappear.
(iii) Repeat procedure (i) and (ii) varying the volume of water and J_1 as indicated in Table 1.

Table 1: Volume of the mixture

S/n	Volume, J_1 cm^3	Volume, H_2O cm^3	Volume, J_2 cm^3
1	5	0	5
2	4	1	5
3	3	2	5
4	2	3	5

Questions:

(a) Plot a graph of $[S_2O_3^{2-}]$ against time, t.

(b) Plot a graph of $\frac{1}{t}$ against $[S_2O_3^{2-}]$.

(c) From the graphs in (a) and (b), deduce the order of reaction with respect to $Na_2S_2O_3.5H_2O$. Give reasons to your answer.

3. Sample **B** contains two cations and a common anion. Use the information given in the experiment column in Table 2 to complete the observations and inferences and hence identify the two cations and the common anion.

Table 2

S/n	Experiment	Observations	Inferences
(a)	Observe the appearance of sample **B**.		
(b)	Place a little solid sample into a test tube and add 1 ml of conc. H_2SO_4 solution.		
(c)	To a solid sample **B** in a test tube, add manganese dioxide followed by conc. H_2SO_4 and heat.		
(d)	Make a solution of **B** in water and divide the resulting solution into four portions.		
(e)	To the first portion, add copper sulphate solution followed by sodium hydroxide.		
(f)	To the second portion, add sodium hydroxide solution and warm.		
(g)	To the third portion, add sodium hydroxide solution followed by NH_4OH solution.		

Conclusion

(i) The cations in sample **B** were _____ and _____.

(ii) The anion in sample **B** was _____.

(iii) Sample **B** contained _____ and _____ salts.

(iv) Write ionic equations which took place at experiment (b) and (f).