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

Friday, 15th November 2013 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,   O = 16,   Na = 23,   Cl = 35.5,   S= 32.
   1 litre = 1 dm^3 = 1000 cm^3

1. You are provided with the following solutions:
    T: Containing 1.825 g of hydrochloric acid in 0.50 dm^3 of solution;
    Z: Containing 3.575 g of pure hydrated sodium carbonate, Na$_2$CO$_3$.xH$_2$O per 0.25 dm^3 of solution;
    Methyl orange indicator.

Questions

(a) Is the use of phenolphthalein indicator for this experiment as suitable as the methyl orange? Give a reason for your answer.

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

(c) (i) _____ cm^3 of acid required _____ cm^3 of base for complete reaction.
    (ii) With state symbols, write a balanced molecular equation and the corresponding ionic equation for the reaction between **T** and **Z**.

(d) Showing your procedures clearly, determine the value of x in the formula Na$_2$CO$_3$.xH$_2$O and hence name the compound.

2. You are provided with the following:
    P$_1$: 0.5 moldm^{-3} sodium thiosulphate;
    P$_2$: 0.1 moldm^{-3} hydrochloric acid;
    Distilled water;
    Stop watch;
    Plain paper.

The aim of this experiment is to investigate the effect of concentration on the rate of chemical reaction between sodium thiosulphate and hydrochloric acid.

Procedure
(i) Write a clear letter X on a white piece of paper.
(ii) Place a small beaker (100 cm^3) on top of the letter X such that the letter is visible when viewed from above.
(iii) Measure 30 cm^3 of **P$_1$** and put into the beaker in (ii) above.
(iv) Measure 10 cm^3 of **P$_2$** and pour it into a beaker containing solution **P$_1$** in (iii) above and simultaneously start the stop-watch/clock.
(v) Swirl the reaction mixture only once and note the time taken for the letter X to disappear completely.
(vi) Repeat procedure (ii) to (v) by varying the volume of **P$_1$** and distilled water as indicated in Table 1.

Table 1

Experiment	Volume of P_1 (cm³)	Volume of water (cm³)	Volume of P_2 (cm³)	Time t, for the cross to disappear (s)
1	30	0	10	
2	25	5	10	
3	20	10	10	
4	15	15	10	

Questions

(a) Complete Table 1.

(b) Why did the solution become opaque after mixing P_1 and P_2?

(c) With state symbols, write the ionic equation for the reaction.

(d) List four factors which can affect the reaction in (c).

(e) Plot a graph of volume P_1 against time.

(f) Inspect your graph and comment on the effect of concentration on the rate of chemical reaction.

Sample N contains one cation and one anion. Using systematic qualitative analysis procedures, record carefully your experiments, observations and inferences as indicated in Table 2 and finally identify the anion and cation in sample N.

Table 2

S/n	Experiment	Observation	Inference

Conclusion

(i) The cation present in sample N is _____.

(ii) The anion present in sample N is _____.