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, 12th 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, S= 32, K = 39.
   1 litre = 1 dm^3 = 1000 cm^3.

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1. You are provided with the following solutions:
   JJ: Containing 3.0 g of acetic acid in 0.50 dm^3 of solution;
   KK: Containing 1.5 g of impure potassium hydroxide in 250 dm^3 of solution;
   Phenolphthalein indicator.

Questions

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

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

(c) (i) _____ cm^3 of **JJ** required _____ cm^3 of **KK** for complete reaction.
   (ii) Write a balanced chemical equation for the reaction between **JJ** and **KK**.

(d) Showing your procedures clearly, calculate the percentage purity of potassium hydroxide.

2. You are provided with the following:
   $\mathbf{L_1}$: 0.50 M sodium thiosulphate;
   $\mathbf{L_2}$: 0.10 M hydrochloric acid;
   Distilled water;
   Stop watch;
   Plain paper.

Theory

When a solution of sodium thiosulphate is mixed with hydrochloric acid, they react quantitatively and gradually the solution becomes opaque.

Procedure

(i) Write a clear letter X on a white piece of paper.
(ii) Place a 100 cm^3 beaker on top of letter X, such that the letter X is visible when viewed from above.
(iii) Using a measuring cylinder, measure 25 cm^3 of $\mathbf{L_1}$ and pour into the 100 cm^3 beaker in (ii) above.
(iv) Measure 25 cm^3 of $\mathbf{L_2}$ and pour it into the beaker containing solution $\mathbf{L_1}$ in (iii) above and immediately start the stop watch/clock.
(v) Shake the reaction mixture only once and record the time taken for the letter X to disappear completely.
(vi) Repeat steps (ii) to (v) by varying the volume of $\mathbf{L_1}$ and distilled water as indicated in Table 1.

Table 1

Volume of L_1 in cm^3	Volume of water in cm^3	Volume of L_2 in cm^3	Time (t)/s	Rate of reaction $\frac{1}{t}(s^{-1})$
25	0	25		
20	5	25		
15	10	25		
10	15	25		
5	20	25		

Questions

(a) What is the aim of this experiment?

(b) Complete Table 1.

(c) Write the electronic configuration of the product which causes the solution to cloud letter X.

(d) With state symbols, write the ionic equation for the reaction between L_1 and L_2.

(e) Plot a graph of volume of L_1 against rate of reaction.

(f) What can you conclude from the graph?

3. Sample **U** contains one cation and one anion. Using systematic qualitative analysis procedures, record carefully your experiments, observations, inferences and finally identify the anion and cation present in sample **U**. Record your work in a tabular form as Table 2 shows.

Table 2: Table of results

S/n	Experiment	Observation	Inference

Conclusion

(i) The cation in sample **U** is _____.

(ii) The anion in sample **U** is _____.