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THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN SECONDARY EDUCATION EXAMINATION

732/2A

CHEMISTRY 2A
(ACTUAL PRACTICAL A)

Time: 3 Hours **Thursday, 15th May 2014 a.m.**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question 1 carries **forty (40)** marks and the rest carry **thirty (30)** marks each.
4. Write your **Examination Number** on every page of your answer booklet(s).
5. A qualitative analysis guide sheet may be used.
6. Mathematical tables and non-programmable calculators may be used.
7. Cellular phones are **not** allowed in the examination room.
8. The following constants might be useful in your calculations:

Atomic masses:

H = 1; C = 12; O = 16; Na = 23; Cl = 35.5.

1 Litre = $1dm^3$ = $1000 cm^3$

1. (a) Perform a titration experiment using the following requirements:

SC: A solution of 4.30g impure sodium carbonate in $125cm^3$ solution.
HD: A solution of 7.3g HCl made up to $1dm^3$.
MO: Methyl orange indicator.

Procedure

Put **HD** into a burette and mount the burette on a retort stand. Pipette $20\ cm^3/25\ cm^3$ of **SC** into a conical flask. Add to it about 2 drops of **MO**. Titrate **HD** against **SC** at least three times.

Questions

(i) Find the volume of acid required to neutralize **SC** solution.
(ii) Write balanced molecular; and ionic equations for the reaction.
(iii) What colour change was observed in this experiment?
(iv) Why was an indicator necessary in this titration?
(v) What do you think was the reason for using Methyl Orange instead of POP?

(b) From the titration you performed, calculate:
(i) Molarity of **HD**.
(ii) Molarity of **SC**.
(iii) Mass of sodium carbonate present in $1dm^3$ of impure sample.

(c) Suppose that the impurities contained in **SC** is water of crystallization in the formula $Na_2CO_3.TH_2O$, calculate the value of T, and hence the % purity of the sample in a solution.

2. You are provided with the following:

NS: a solution of $0.35M Na_2S_2O_3.5H_2O$
HA: a solution of dilute Hydrochloric acid
Distilled water
Stop watch.

Theory

The rate of reaction between thiosulphate ions and an acid is expressed by the equation:

$$Rate = k[S_2O_3^{2-}]^x[H^+]^y$$

where the integer x and y are orders of reaction with respect to thiosulphate concentration and acid concentration respectively.

Procedure

(i) Using a blue/ black pen (**not a marker pen**) write a sign **S** on a piece of white paper and place 75 cm^3 beaker on top of it such that the sign is visible through the solution.

(ii) Use a 10 cm^3 measuring cylinder to measure out 4 cm^3 of **NS** and 12 cm^3 of distilled water and put the mixture into a 75 cm^3 beaker.

(iii) Using another 10cm^3 measuring cylinder, measure 8 cm^3 of **HA** solution and at convenient time pour **HA** into the beaker containing **NS** and distilled water mixture; and immediately start the stopwatch.

(iv) Record the time taken for precipitates to cause disappearance of sign **S** completely as observed through the beaker.

(v) Repeat the procedure using the following readings of **NS**: 8 cm^3, 12 cm^3, and lastly 16 cm^3; each time **NS** filled with distilled water up to 16 cm^3. The volume of **HA** should be 8 cm^3 throughout.

Questions

(a) Tabulate your results as follows (consider units).

Exp. No.	Vol. of $Na_2S_2O_3$ (cm^3)	Time (sec)	$\frac{1}{t}$ (s^{-1})
1			
2			
3			
4			

(b) Assuming that the volumes of individual solutions are directly proportional to their concentrations:
   (i) Write a balanced ionic equation for the reaction in this experiment.
   (ii) Find the value of **x** shown on the equation in theoretical part.
   (iii) Given that the value of **y** = 2, find the value of **k**.
   (iv) State the order of reaction for this experiment.

(c) Giving one reason, explain how the speed of reaction would be affected if:
   (i) Molarity of thiosulphate would be 0.2M.
   (ii) The value of **k** would be less than the one found in this experiment.

3. The compound in sample **F** is an unknown salt that contains one anion and a cation. Using a relevant data presentation table:
   (a) Carry out an experiment to identify the cation and anion based on the following tests:

(i) Appearance
(ii) Solubility
(iii) Flame test
(iv) Action with dilute HCl
(v) Action with Barium nitrate (solution)
(vi) Action with silver nitrate solution
(vii) Action with sodium hydroxide solution
(viii) Action with ammonium solution

Note: Use standard scientific reporting format in presenting your findings.

(b) (i) Write your summary based on the cation and anion present in sample **F**.
(ii) Write the molecular formula for the compound in sample **F**.
(iii) Name the compound.

(c) From the experiment write:
(i) Molecular and ionic equation for reaction in test (viii).
(ii) Ionic equation for the reaction in test (vi).
(iii) Write the name of the compound formed in test (viii).