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

132/3B

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

Time: 3:20 Hours **Monday, 21st May 2018 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 and any unauthorised materials 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, Na = 23, K = 39, Mn = 55.
   - Molar gas constant = 8.314 J $K^{-1}mol^{-1}$.

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1. You are provided with the following solutions:
   KK: 0.02 M potassium permanganate;
   LL: Impure 1.7 g of hydrogen peroxide in 1 dm^3 of aqueous solution;
   SS: 1 M sulphuric acid.

Theory

The reaction between potassium permanganate and hydrogen peroxide in acidic medium is a redox reaction. In this reaction, the MnO_4^- ions act as an oxidizing agent while H_2O_2 act as a reducing agent.

Procedure

(i) Pipette 25 cm^3 or 20 cm^3 of **LL** into a conical flask.
(ii) Add 25 cm^3 or 20 cm^3 of solution **SS** into conical flask in (i).
(iii) Titrate the mixture against solution **KK** until a permanent pink colour just appears in the conical flask.
(iv) Record the titre volume and repeat titration to obtain 3 readings.
(v) Record the volume of the pipette used.

Questions

(a) Write half and overall ionic equations of the reaction between potassium permanganate and hydrogen peroxide.
(b) Calculate the percentage purity of hydrogen peroxide.

2. You are provided with the following:
   U: A solution of 0.02 M $KMnO_4$;
   V: A solution of 0.05 M oxalic acid in 0.5 M H_2SO_4;
   Thermometer and stopwatch.

Theory

In acidic medium oxalic acid is oxidized by $KMnO_4$ and completion of the reaction is indicated by the disappearance of the purple colour of the permanganate ion.

Procedure

(i) Put about 250 cm^3 of water into a 300 cm^3 beaker; heat the beaker. This is your water bath.
(ii) Measure 10 cm^3 of solution **U** and 10 cm^3 of solution **V** and put them into separate test tubes.
(iii) Put thermometer into a test tube containing solution **U** and heat the test tube in a water bath, allow the content to warm to 50°C.
(iv) Pour hot solution **U** into the test tube containing solution **V**; immediately start a stopwatch and record the time taken for the purple colour to disappear.
(v) Repeat the experiment at the temperatures 60°C, 70°C and 80°C.
(vi) Record your results in a tabular form.

Questions

(a) Write half ionic equations for the reaction.
(b) Plot a graph of log t (sec) against $\frac{1}{T}$ (K^{-1}).

(c) Use the graph in (b) to determine the activation energy of the reaction.

3. You are provided with sample **T** containing two cations and two anions. Carry out the experiments described in Table 1. Record carefully your observations, make appropriate inferences and finally identify the cations and anion present in sample **T**.

Table 1: Table of results

S/n	Experiment	Observations	Inference
1	Take a spatulaful of sample T into a boiling test tube then add about 3 cm^3 of distilled water. Heat gently the mixture for about one minute while swirling the test tube. Filter to obtain a clear solution and divide the resulting solution into three portions.		
	1. To the first portion add NaOH.		
	2. To the second portion add dilute HNO_3 followed by $AgNO_3$ and then NH_3 solution.		
	3. To the third portion, add ammonia solution.		
2	(a) Dissolve the residue in a little quantity of HCl as possible and identify any resulting gas.		
	(b) Dilute the resulting solution in 2 (a) with distilled water and divide the solution into two portions.		
	(i) To the first portion, add dilute NH_4OH till no further change.		
	(ii) To the second portion add ammonium oxalate.		

Conclusion

(i) The cations in sample **T** are _____ and _____.

(ii) The anions in sample **T** are_____ and _____.

(iii) The compounds in the mixture are _____ and _____.