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

732/2B **CHEMISTRY 2B**

(PRACTICAL B)

Time: 3 Hours **Year: 2020**

Instructions

1. This paper consists of **three (03)** questions.
2. Answer **all** the questions.
3. Question **one (1)** carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
4. Qualitative Analysis Guide Sheet may be used after a thorough check by the supervisor.
5. Cellular phones, programmable calculators and any unauthorised materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. You may use the following constants:
   Molar masses: H = 1; C = 12; O = 16; Na = 23; S = 32; K = 39; Mn = 55.
   1 Litre = 1 dm^3 = 1000 cm^3.

2. You are provided with solution **SN** (a solution of 0.5 M $Na_2S_2O_3$) and **CL** (a solution of 0.15 M HCl) and distilled water. You are also provided with a stop watch, 200 cm^3 or 250 cm^3 beaker; 50 cm^3 beaker, two - 10 cm^3 measuring cylinders and other relevant reagents and apparatuses.

Procedure

(i) Using a **ball pen**, write a mark **"X"** on the white clean paper. Put a 50 cm^3 beaker on top of the mark.

(ii) Measure 2 cm^3 of **SN** and 8 cm^3 of distilled water using a 10 cm^3 measuring cylinder (or burette). Mix and put them in the beaker on top of the **"X"** marked paper.

(iii) Using another 10 cm^3 measuring cylinder, measure out 10 cm^3 of **CL** and pour it into the beaker containing **SN** and distilled water; and immediately start the stopwatch.

(iv) Record the time taken for the mark **"X"** to be covered by precipitations formed.

(v) Repeat procedure (i) – (ii) with other volumes as shown in Table 2.

Table 2: Experiment Data

Experiment No.	Volume of SN (cm^3)	Volume of H_2O (cm^3)	Volume of CL (cm^3)	Time (s)	$\frac{1}{t}$ (s^{-1})
1	2	8	10		
2	4	6	10		
3	6	4	10		

Questions

(a) Complete Table 2 with the relevant experimental data.

(b) If the rate expression is: Rate = $k[Na_2S_2O_3]^m [HCl]^n$; where m = 1 and n = 2, find the value of the constant k.

(c) Giving one reason, state how the rate of reaction would have been affected if the temperature of the reacting solutions was 10 °C.

(d) (i) Compute the rate of reaction when the volume of **SN** is 10 cm^3.
(ii) Determine the time taken for **"X"** to disappear in this volume.

3. A sample of salt **Y** contains **one** cation and **one** anion. You are required to perform a systematic qualitative analysis experiment to identify the ions present in the salt, based on the following tests:
(i) Appearance of sample **Y**.
(ii) Solubility.
(iii) Action of heat on the dry sample.
(iv) Action with concentrated H_2SO_4 followed by MnO_2.

1. You are provided with solution **PP** (1.58 g/dm^3 $KMnO_4$), **AA** (1.575 g/0.5 dm^3 $H_2C_2O_4.VH_2O$) and **SA** (2 M H_2SO_4). You are also provided with heat source, water bath, thermometer and other relevant reagents and apparatuses.

Procedure

(i) Pipette 20 cm^3 or 25 cm^3 of **AA** into a clean conical flask. Add the same volume of **SA** and heat the mixture solution until the solution attains a temperature of about 70 °C.

(ii) Put **PP** into a burette and titrate it against the hot solution containing **AA** and **SA** until the colour changes from colourless to pink.

(iii) Repeat the procedures (i) and (ii) three more times.

Questions

(a) (i) Copy and fill Table 1 with relevant experimental results

Table 1: Experimental results

Burette Readings	**Titration number**			
	Pilot	**1**	**2**	**3**
Final volume (cm^3)				
Initial volume (cm^3)				
Volume used (cm^3)				

(ii) Find average titre value.

(iii) Show half and the overall ionic redox reaction equations.

(b) Why is the solution pink in colour at the end point?

(c) Calculate the:

(i) molarity of $H_2C_2O_4$.

(ii) value of **V** in the compound $H_2C_2O_4.VH_2O$.

(iii) molar mass of $H_2C_2O_4.VH_2O$.

(v) Action of aqueous NaOH on the solution of **Y**.
(vi) Action of potassium ferrocynide on the solution of **Y**.

Questions

(a) Prepare a relevant Table showing the qualitative analysis results.

(b) What gas was evolved in test (iv)?

(c) What was the purpose of doing test (vi)?