THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

732/2A **CHEMISTRY 2A**

(ACTUAL PRACTICAL 2A)

Time: 3 Hours **Year: 2022**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question number **one (1)** carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
4. Cellular phones and any unauthorized materials are not allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet (s)

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1. Measure 10 ml of solution **A** and dilute it with distilled water up to 150 cm^3 of solution using a measuring cylinder. Then titrate **A** (from the burette), against 20.00 cm^3 or 25.00 cm^3 of **B** (in a titration flask) using **MO** until the end point. Record the results including one rough and three accurate volumes in a tabular form. After titration, candidates were required to answer the following questions:
    a) (i) What is the volume of the pipette used?
    (ii) Present your results in an appropriate tabular form.
    b) What is the colour of the indicator before and at the equivalence point?
    c) Calculate the concentration of HCl in solution **B** in mol dm^{-3}.
    d) Calculate the concentration (in mol dm^{-3}) of Na_2CO_3 after dilution of solution **A**.
    e) Calculate the concentration (in mol dm^{-3}) of Na_2CO_3 before dilution of solution **A**.
    f) If the diluted 10 ml of solution **A** contains 0.888 g of impure sodium carbonate, what is the percentage composition of sodium carbonate in the solution?
    g) If solution **A** was made by dissolving a known mass of impure sodium carbonate and distilled water was added to make the solution up to 250cm^3 in a graduated flask, give one reason why the impure sodium carbonate was dissolved in water first and then made up to 250 cm^3 of solution, rather than being dissolved in 250 cm^3 of distilled water.

1. You are provided with 0.02 M solution labelled P1, 0.05 M oxalic acid made up in 0.5 M labelled P2, a stop watch, a thermometer and other relevant materials. Perform an experiment to assess the effect of temperature on the rate of chemical reaction by following the procedures:

(i) Put water in a 250 or 300 cm^3 beaker about two thirds and heat the content to about 100˚C. Use this as water bath.

(ii) Measure 10 cm^3 of portions of P1 and P2 and transfer them into two separate test tubes

(iii) Put the test tubes in the water bath.

(iv) Allow the contents of the two test tubes to warm up to 50˚C.

(v) Pour both solutions, P1 and P2, into a 50 cm^3 beaker and immediately start a stopwatch and record the time taken for the purple color to disappear.

(vi) Repeat procedure (ii) to (v) except that instead of 50 ºC in procedure (iv) use temperatures, 60 ˚C, 70 ˚C and 80 ˚C.

Question:

a) Complete the following Table

Table of Results

Temperature, T		$\frac{1}{T}(K^{-1})$	**Time, t (s)**	**Rate** $\left[\frac{1}{t}(S^{-1})\right]$	$\log\left(\frac{1}{t}\right)$
°C	K				
50					
60					
70					
80					

b) Write a balanced ionic equation for the reaction.

c) With reference to the results in (a), explain the relationship between temperature and reaction timec)

d) Plot a graph of log (1/t) as a function of 1/T.

e) Determine the activation energy of the reaction given that the Arrhenius equation can be presented by the relation $\log\left(\frac{1}{t}\right) = \frac{-E_a}{2.303R}\frac{1}{T} + \log A$, where $\mathbf{E}_a$ is the activation energy and **R** is the gas constant $= 8.314 Jmol^{-1}K^{-1}$

2. Sample from the industry was brought to the college laboratory as X. Perform systematic qualitative analyses to identify the cation and anion which cause the contamination of water. Prepare a relevant Table showing the qualitative analysis results. Base your experiment on the listed tests and then answer the questions that follow:

(i) Appearance of sample X.

(ii) Action of heat on sample X in a test tube

(iii) Action of dilute sulphuric acid on a solid sample.

(iv) Action of concentrated sulphuric acid on solid sample.

(v) Flame test.

(vi) Solubility of the sample.

(vii) Action of dilute hydrochloric acid to a sample solution.

(viii) Action of aqueous ammonia to the original sample solution followed by ammonium oxalate.

Questions

(a) What are the cation and anion present in the water source?

(b) Write the reaction equation to indicate what took place in test (iii).